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# Wellhead Protection Plan Unit Well 14 City of Madison, Wisconsin



*City of Madison  
Wisconsin*

*Prepared for:*  
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## **EXECUTIVE SUMMARY**

## EXECUTIVE SUMMARY

This report is a Wellhead Protection Plan (WHPP) for City of Madison Unit Well 14. The primary purposes of this WHPP are to define the WHPA for Unit Well 14 and establish specific criteria for protection of Unit Well 14 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 for Unit Well 14 to conform to the requirements of the Wisconsin Administrative Code, Chapter NR 811, Section 16(5), for wellhead protection (WHP) planning.

Unit Well 14 is located at 5130 University Avenue in the western part of the City of Madison. Construction of Unit Well 14 was completed in 1960. Unit Well 14 is 715 feet deep, is open to the lower bedrock (sandstone) aquifer, and has a design capacity of approximately 2,400 gallons per minute (gpm).

Land use in the vicinity of Unit Well 14 is primarily residential and commercial.

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 (Krohelski et. al., 2000) including Unit Well 14. ZOCs extend northwest, west, and southwest of Unit Well 14 in the simulated upgradient groundwater flow directions.

Figure 3-5 shows the wellhead protection area (WHPA) for Unit Well 14. 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 14. 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.

A contaminant source inventory (CSI) was performed for the Unit Well 14 area during February 2005. Known potential and existing contaminant sources within the Unit Well 14 WHPA include sanitary sewer; spill sites; active aboveground storage tank (AST); active and closed underground storage tank (UST) sites; closed leaking underground storage tank (LUST) sites; road salt use; and probable use of pesticide, herbicide, and nutrients on residential and commercial lawns. Several other potential and existing contaminant sources were identified in other ZOCs.

Programs and activities to be used by the City of Madison and others for WHPA management at Unit Well 14 are grouped into five principal categories as follows:

1. Existing Programs
  - a. Clean Sweep Collection Program
  - b. On-site waste disposal system maintenance
  - c. 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 meeting
  - c. News releases
  - d. Informational materials distributed to residents in WHPA
  - e. Land use and contamination source awareness
  - f. School programs

Some of these programs and activities are currently being performed, while others are new and will be implemented immediately to help protect Unit Well 14.

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 14, or one or more of the City's other water supply wells became contaminated or removed from service. Well 14 is part of the Main Pressure Zone. Other wells in the Main Pressure Zone, or water from Zone 7, can serve this area in the event of a Well 14 failure.

The City of Madison has a WHP ordinance and overlay zoning district. The WHP ordinance helps ensure that other potential contaminant sources are not located in the Unit Well 14 WHPA.



## **CHAPTER 1**

### **INTRODUCTION AND BACKGROUND**

## 1.0 INTRODUCTION AND BACKGROUND

### 1.1 INTRODUCTION

This report is a WHPP for City of Madison Unit Well 14. The primary purposes of this WHPP are to define the WHPA for Unit Well 14 and establish specific criteria for protection of Unit Well 14 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.

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 14 to conform to the requirements of the Wisconsin Administrative Code, Chapter NR 811, Section 16(5), for WHP planning. A copy of this section of the code is in Appendix A. The project scope included the following:

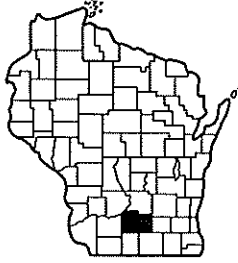
1. Research available information regarding the geology and hydrogeology of the well sites and aquifer parameters.
2. Research well construction and proposed operation of Unit Well 14.
3. Coordinate with Dane County Regional Planning Commission (DCRPC) for previously delineated 5-year TOT capture zones for Unit Well 14.
4. Perform a CSI to identify and characterize existing and potential contamination sources within the 5-year TOT capture zone and within a ½-mile radius of Unit Well 14.
5. Assist with the determination of a WHPA for Unit Well 14.
6. Assist with the development of WHP management strategies.

### 1.2 LOCATION AND BACKGROUND

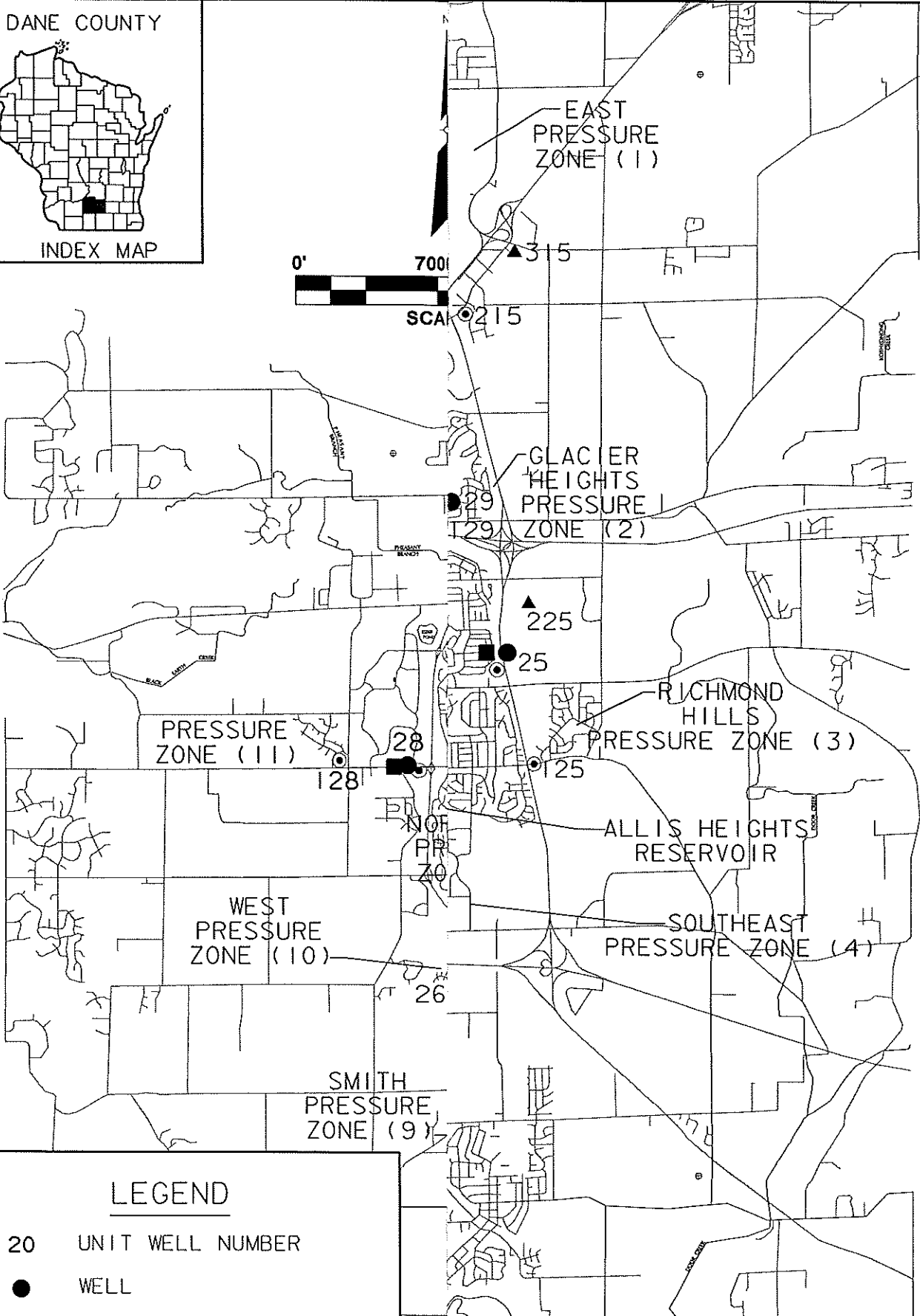
Unit Well 14 is located at 5130 University Avenue in the northwestern part of the City of Madison. The site is in the NE¼, SW¼ of the SE¼, of Section 18, Township 7 North, Range 9 East, Dane County, Wisconsin. Figure 1-1 shows the location of Unit Well 14 and other water system facilities in the City of Madison. A portion of the survey plat showing the well site is in Appendix B. Construction of Unit Well 14 was completed in 1960.

The City water system serves approximately 218,000 people and consists of 24 active wells, 28 booster pumping facilities, 24 ground storage reservoirs, 5 elevated water storage tanks, and approximately 840 miles of water transmission and distribution mains. Because of the varying topography in the Madison area, the water system is divided into 11 separate pressure zones.

DANE COUNTY



INDEX MAP



LEGEND

- 20 UNIT WELL NUMBER
- WELL
- RESERVOIR
- ▲ ELEVATED STORAGE
- ⊙ BOOSTER PUMP STATION

**FIGURE 1-1**  
**LOCATION OF UNIT WELL 14 & OTHER WATER**  
**SYSTEM FACILITIES**  
 MADISON WATER UTILITY  
 MADISON, WISCONSIN

LEVELS UP 2, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100  
 PRJ = \\usstps01\data\work\Projects\82359\gra\V7 dgn\14FIG1-1.dgn  
 DATE=Fri, Sep 8, 08:03:45 2006  
 DGN = \\usstps01\data\work\Projects\82359\gra\V7 dgn\14FIG1-1.dgn

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Unit Well 14 is located on the west end of the City's Main Pressure Zone. Unit Well 14 is located approximately 1.65 miles west of Unit Well 6 and 2.9 miles east of Unit Well 28.

### **1.3 UNIT WELL 14**

Unit Well 14 was constructed to a depth of 715 feet. The well is cased with 24-inch OD steel casing grouted to a depth of 117.5 feet below ground. A 22-inch diameter open borehole extends from 117.5 feet to the bottom of the well. Sandstone bedrock was encountered at a depth of 75 feet. Thin beds of shale were encountered over the intervals of 250 to 265 feet, and 695 to 700 feet. Rhyolite was encountered at a depth of 705 feet. Unit Well 14 was test pumped at a rate of 4,200 gpm and had a specific capacity of 51.2 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 14 was 17.8 feet below ground. In 2004, the static water level was approximately 27 feet below ground. A construction report and formation log prepared by the WGNHS is in Appendix C.

**CHAPTER 2**  
**HYDROGEOLOGIC CONDITIONS**

## 2.0 HYDROGEOLOGIC CONDITIONS

### 2.1 LAND USE, TOPOGRAPHY, AND DRAINAGE

Land use in the area is primarily commercial and residential. Current zoning immediately around Unit Well 14 is Residential (R1) and Commercial (C3). A portion of the City of Madison zoning map for the Unit Well 14 area is in Appendix D. The western boundary of the Village of Shorewood is located 1,500 feet east of Unit Well 14.

Unit Well 14 is located in a till covered area, on the west edge of a hill, approximately 1,600 feet south of Lake Mendota. The ground surface elevation at Unit Well 14 is approximately 875 feet above mean sea level (MSL). The elevation of the hilltop immediately east of Unit Well 14 is approximately 960 feet MSL. Locally, drainage from Unit Well 14 is northwest and north toward Lake Mendota.

### 2.2 GEOLOGY

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

Figure 2-1 is a geologic cross-section through Unit Wells 6, 14, and 28. A formation log for strata encountered at Unit Well 14 is in Appendix C. The stratigraphic sequence encountered in the wells is briefly described in the following.

#### 2.2.1 Precambrian Basement Bedrock

Precambrian bedrock was encountered in water supply Unit Well 14 at a depth of 705 feet below ground surface. The Precambrian bedrock encountered in Unit Well 14 is rhyolite (Wisconsin Geological and Natural History Survey (WGNHS) well log DN-715).

#### 2.2.2 Cambrian Bedrock

Cambrian age rocks encountered in Unit Well 14 include, in ascending order, Mount Simon Formation, Eau Claire Formation, Wonewoc Formation, and the Tunnel City Group.

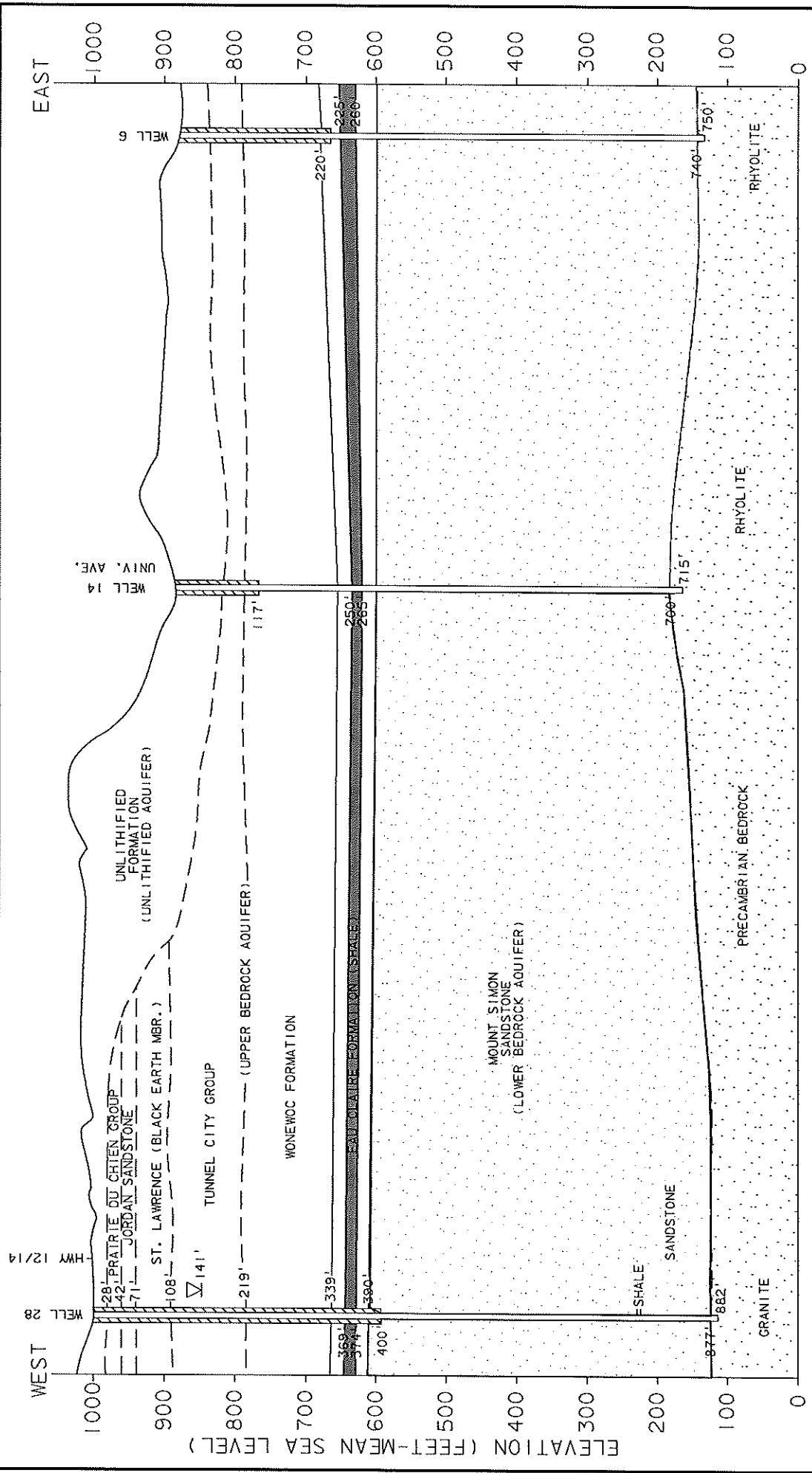
Cambrian age rocks are relatively flat lying in the Madison area in the east-west direction and dip slightly to the south. The cross-section shows a gentle dip toward Unit Well 14. The thickness of deep rock units appears to be relatively consistent in the Madison area, although there are textural and compositional changes, laterally. The occurrence and thickness of the upper Tunnel City Group bedrock varies, because it is the upper erosional surface. The boundary between the Wonewoc Formation and Tunnel City Group is not known with certainty. It is assumed that glauconitic sandstones described by the WGNHS are part of the Tunnel City Group. Figure 2-1 shows the strata above the Tunnel City Group at Unit Well 14 consists of unlithified deposits. A greenish-gray to grayish-red, dolomitic shale layer approximately 15 feet thick appears to be laterally extensive through the middle part of the Eau Claire Formation.

\$\$\$RFO1\$\$  
 \$\$\$RFO2\$\$  
 \$\$\$RFO3\$\$  
 \$\$\$RFO4\$\$

\$\$\$RFO1\$\$  
 \$\$\$RFO2\$\$  
 \$\$\$RFO2\$\$

\$\$\$DATE\$\$

\$\$\$LEVELS\$\$  
 \$\$\$PRF\$\$  
 \$\$\$DATE\$\$  
 \$\$\$DATE\$\$



LEGEND

- WELL CASING
- POTENTIOMETRIC SURFACE DEPTH (FEET)
- OPEN BOREHOLE



FIGURE 2-1  
 GEOLOGIC CROSS-SECTION THROUGH  
 MADISON UNIT WELLS 28, 14 & 6  
 MADISON, WISCONSIN

MARCH 2002

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### 2.2.3 Unlithified Deposits

Bedrock is mantled by unlithified glacial till and alluvial deposits. Clayton and Attig (1997) classify the local near surface unlithified deposits in the immediate vicinity of Unit Well 14 as part of the Horicon Member of the Holy Hill Formation. Clayton and Attig (1997) report that the near surface formation is non-uniform, collapsed, supraglacial till, and sorted supraglacial debris.

At Unit Well 14, the driller described the formation from the top of the sandstone bedrock (encountered at a depth of 75 feet) to the ground surface as yellow-brown sand (10-75 feet depth), gravelly (stoney) sand with clay (1-10 feet), and dark yellow brown sandy, gravelly clay (0 to 1 feet in depth).

Soils in the immediate vicinity of Unit Well 14 are classified as the Batavia silt loam, McHenry silt loam, Whalan silt loam, Dodge silt loam, and Sable silty clay loam (Hole, 1968; USDA, 1978). The Whalan silt loam and Sable silty clay loam have fair contaminant attenuation potential. The Batavia silt loam, McHenry silt loam, and Dodge silt loam have good contaminant attenuation potential. The DCRPC assigned a risk classification of low to moderate from surface activities in the Unit Well 14 area on the basis of several factors including soil properties (DCRPC, 1999).

## 2.3 HYDROGEOLOGY

In the study area, groundwater occurs within the lower bedrock aquifer, the upper bedrock aquifer, and the unlithified (sand and gravel) aquifer. Locally, the upper bedrock aquifer and sand and gravel aquifer are used for private domestic supplies. Municipal and industrial wells are constructed into the lower bedrock aquifer. Following is a brief discussion about the aquifers:

### 2.3.1 Lower Bedrock Aquifer

The lower bedrock aquifer occurs in the Mount Simon Formation and lower part of the Eau Claire Formation. The Precambrian bedrock is the base of the lower bedrock aquifer and the shale layer in the Eau Claire Formation is the upper confining unit. Water occurs within horizontal and vertical fractures, along bedding planes, and between sand grains in the aquifer. The saturated thickness of the lower bedrock aquifer appears to be approximately 435 feet thick in Unit Well 14. The hydraulic conductivity of the lower bedrock aquifer is estimated to be approximately 10 feet per day (ft/day) (Krohelski et. al., 2000). Unit Well 14 is cased to a depth approximately 117 feet, which is 133 feet above the Eau Claire shale confining layer; therefore, Unit Well 14 is open to more saturated thickness than the lower bedrock aquifer.

The grouted casing in Unit Well 14 terminates above the upper bedrock aquifer and Eau Claire confining layer. Water levels measured in Unit Well 14 are believed to be representative of the composite upper and lower bedrock aquifers. It was reported by the Madison Water Utility that the static water level in Unit Well 14 in 2004 was approximately 27 feet below ground level (approximately 848 feet MSL). Figure 4 in Appendix E shows the simulated potentiometric surface in the lower bedrock (Mount Simon) aquifer and shows the groundwater flow direction toward Unit Well 14 is from northwest, west and southwest (DCRPC, 2004). Figure 4 shows the potentiometric surface elevation in the vicinity of Unit Well 14 at less than 860 feet MSL. 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 shale and within the Wonewoc Formation and Tunnel City Group. Water occurs within fractures, along bedding planes, and between sand grains in the sandstone.

At Unit Well 14, the thickness of the bedrock formation above the shale confining layer is 175 feet. The saturated thickness of the upper bedrock aquifer is also 175 feet. Figure 3 (DCRPC, 2004) in Appendix F shows the simulated potentiometric (water table) surface in the upper bedrock aquifer and unlithified (sand and gravel) aquifer. The elevation of the water table surface at Unit Well 14 was not measured. Figure 3 in Appendix F shows the elevation of the simulated water table surface in the vicinity of Unit Well 14 at approximately 860 feet above MSL.

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 occurs in the near surface sand and gravel deposits. The unlithified materials are thin in the vicinity of Unit Well 14. The driller did not report whether saturated formation was encountered in the unlithified materials. Where present, the hydraulic conductivity of the sand and gravel aquifer varies. 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**

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). Swanson (1996) estimated that the recharge rate in Dane County ranges from 0.3 to 6.7 in/yr and has an average value of 2.6 in/yr. Precipitation infiltrates through the till layer, and recharges the unlithified and shallow bedrock aquifers. In some areas, a small percentage of water moves downward from the upper bedrock aquifer through the Eau Claire confining layer and into the lower bedrock aquifer. Map 7 in Appendix E shows the location of Well 14, 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.

## **CHAPTER 3**

### **WELLHEAD PROTECTION AREA DELINEATION**

### 3.0 WELLHEAD PROTECTION AREA DELINEATION

This chapter describes methodologies used to define the Zone of Influence (ZOI) and ZOC for Unit Well 14.

#### 3.1 ZOI

The ZOI for Unit Well 14 was estimated in accordance with Wisconsin Department of Natural Resources (DNR) requirements based on 30 days of continuous pumping at the rated pump capacity, assuming no aquifer recharge. The ZOI was determined using the Theis equation. The estimated ZOI for Unit Well 14 to a radius where there is 1-foot of drawdown, is approximately 10.1 miles. The estimated ZOI to a radius of zero drawdown is approximately 21.5 miles. These estimated ZOI are believed to be conservatively large, because the Theis equation does not incorporate aquifer recharge or the effects of potential hydraulic boundaries. For the calculation, it was assumed that the majority of the open borehole, open to both the lower and upper bedrock aquifers, supplies water to Unit Well 14. Distance–drawdown calculations are 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 14. 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 original groundwater flow model was converted from a three-layer model to a four-layer model. The sand and gravel aquifer is Layer 1. The upper bedrock aquifer is Layer 2. The Eau Claire Formation is layer 3, and the lower bedrock aquifer is Layer 4. The model was recalibrated and various boundary conditions were modified (DCRPC, 2001). Other aquifer parameters input into the model were as previously described in Chapter 2 and in Krohelski et. al., 2000.

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, projected 2030 pumping was distributed evenly among the City's existing and planned wells for an average rate of 1.4413 MGD. Pumping at a rate of 1.4413 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 14 is 1.728 MGD. Pumping at a rate of 1.728 MGD is equivalent to pumping continuously at a rate of 1,200 gpm.

Simulation No. 3 was performed using full design capacity. Full capacity for Unit Well 14 is 3.456 MGD. Pumping at a rate of 3.456 MGD is equivalent to pumping continuously at a rate of 2,400 gpm.

Simulation No. 4 was performed using the average pumping rate for Unit Well 14 for the maximum year. The maximum pumpage year for Unit Well 14 was 2000 when Unit Well 14 was pumped at an average rate of approximately 2.5 MGD. Pumping at a rate of 2.5 MGD is equivalent to pumping continuously at a rate of 1,736 gpm.

PATH3D (Zheng, 1991) was used to determine the time-related ZOCs for Unit Well 14. Particles were input in the model around Unit Well 14 and then tracked backward from the well to points where they enter the groundwater flow system.

### 3.3 ZOC

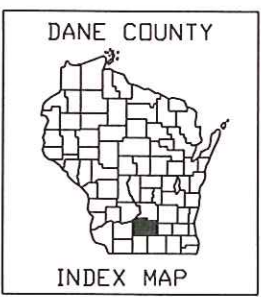
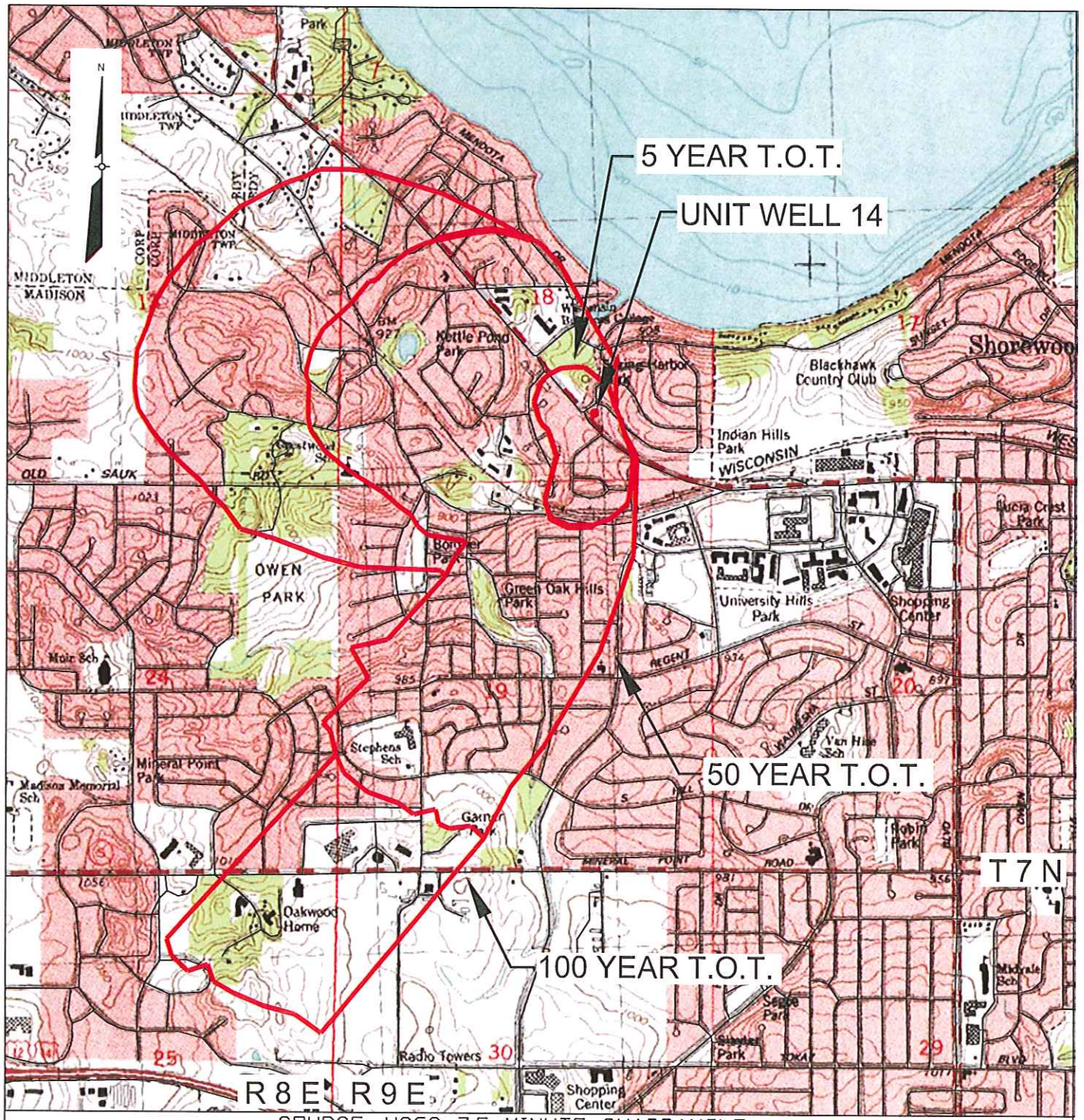
The area that recharges or contributes water to Unit Well 14 is defined as the ZOC. The areal extent of the ZOC (capture zone) depends on the pumping rate, amount of horizontal and vertical recharge, aquifer characteristics, pumping duration, and other stresses such as other pumping wells. It is beneficial to know the well capture zone, because contaminants introduced within the zone could reach Unit Well 14.

Figure 3-1 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 14 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 14 based on the one-half design capacity pumping rate (Simulation No. 2). Figure 3-3 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 14 based on the full design capacity pumping rate (Simulation No. 3). Figure 3-4 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 14 based on the average pumping rate for Unit Well 14 for the maximum year (Simulation No. 4).

The capture zones extend toward the northwest, west, southwest, and west in the simulated upgradient groundwater flow directions. 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 are generally more conservatively large compared to the ZOCs delineated using the Simulations Nos. 1, 2, and 4 pumping rates.

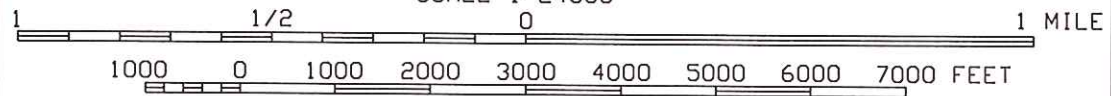
Figure 2 in Appendix H shows ultimate regional ZOCs for Unit Well 14 and for other wells in Dane County. Groundwater flow pathlines extend upgradient from Well 14 to the groundwater divide located approximately 7 to 8 miles west-northwest of Well 14 and are located entirely within Dane County.

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SOURCE: USGS 7.5 MINUTE QUADRANGLE, MADISON WEST & MADISON EAST WISCONSIN, 1983

T.O.T. = TIME OF TRAVEL  
 Z.O.C.s = ZONES OF CONTRIBUTION  
 SCALE 1: 24000

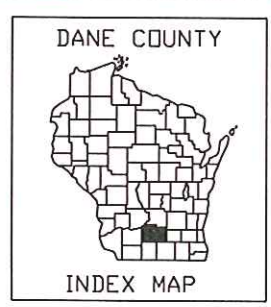
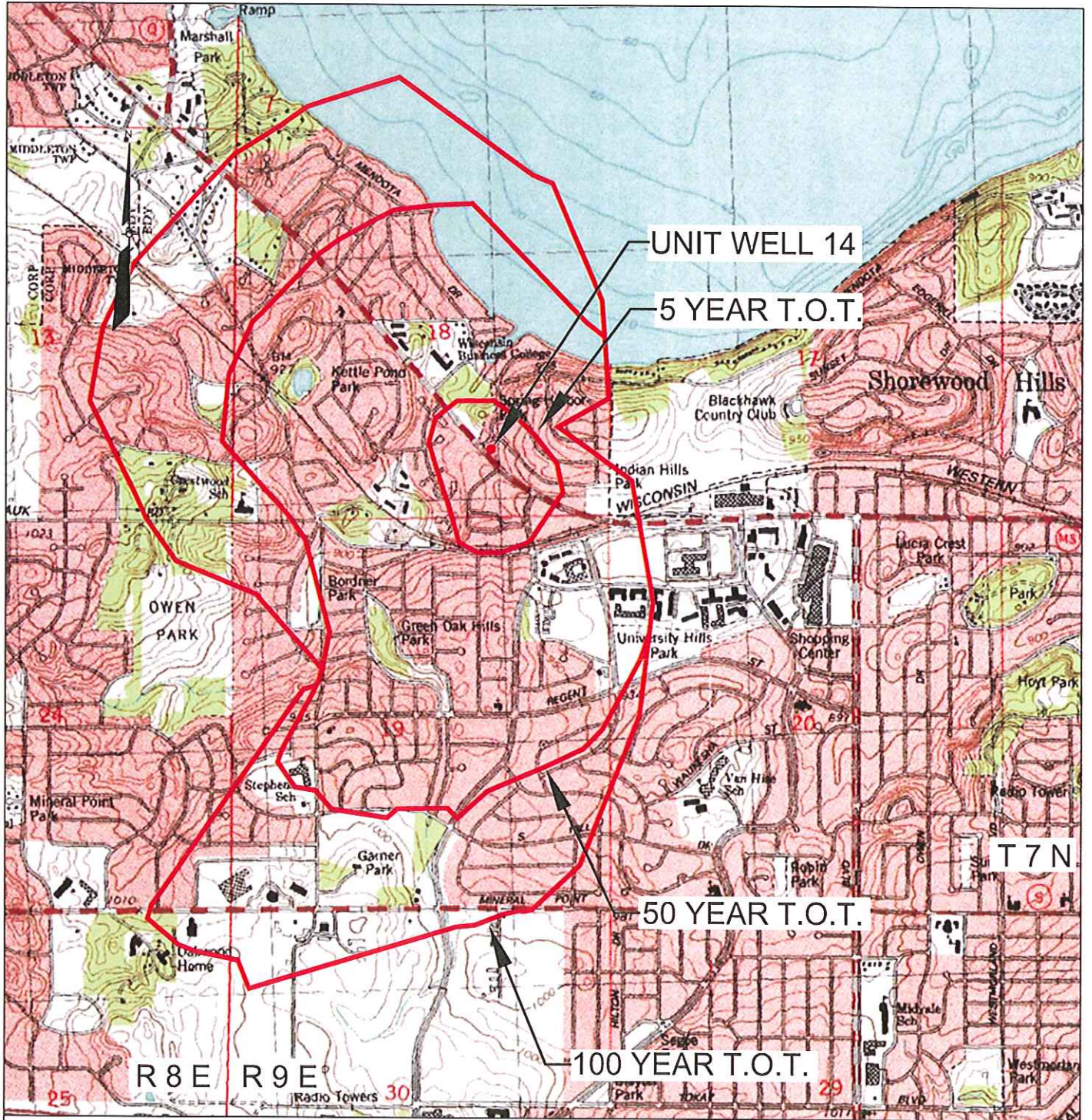


CONTOUR INTERVAL 10 FEET  
 DATUM IS MEAN SEA LEVEL



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

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SOURCE: USGS 7.5 MINUTE QUADRANGLE,  
 MADISON WEST & MADISON EAST WISCONSIN, 1983

T.O.T. = TIME OF TRAVEL  
 Z.O.C.s = ZONES OF CONTRIBUTION

SCALE 1: 24000

CONTOUR INTERVAL 10 FEET  
 DATUM IS MEAN SEA LEVEL

# EarthTech

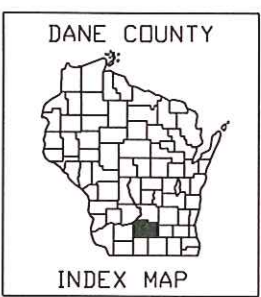
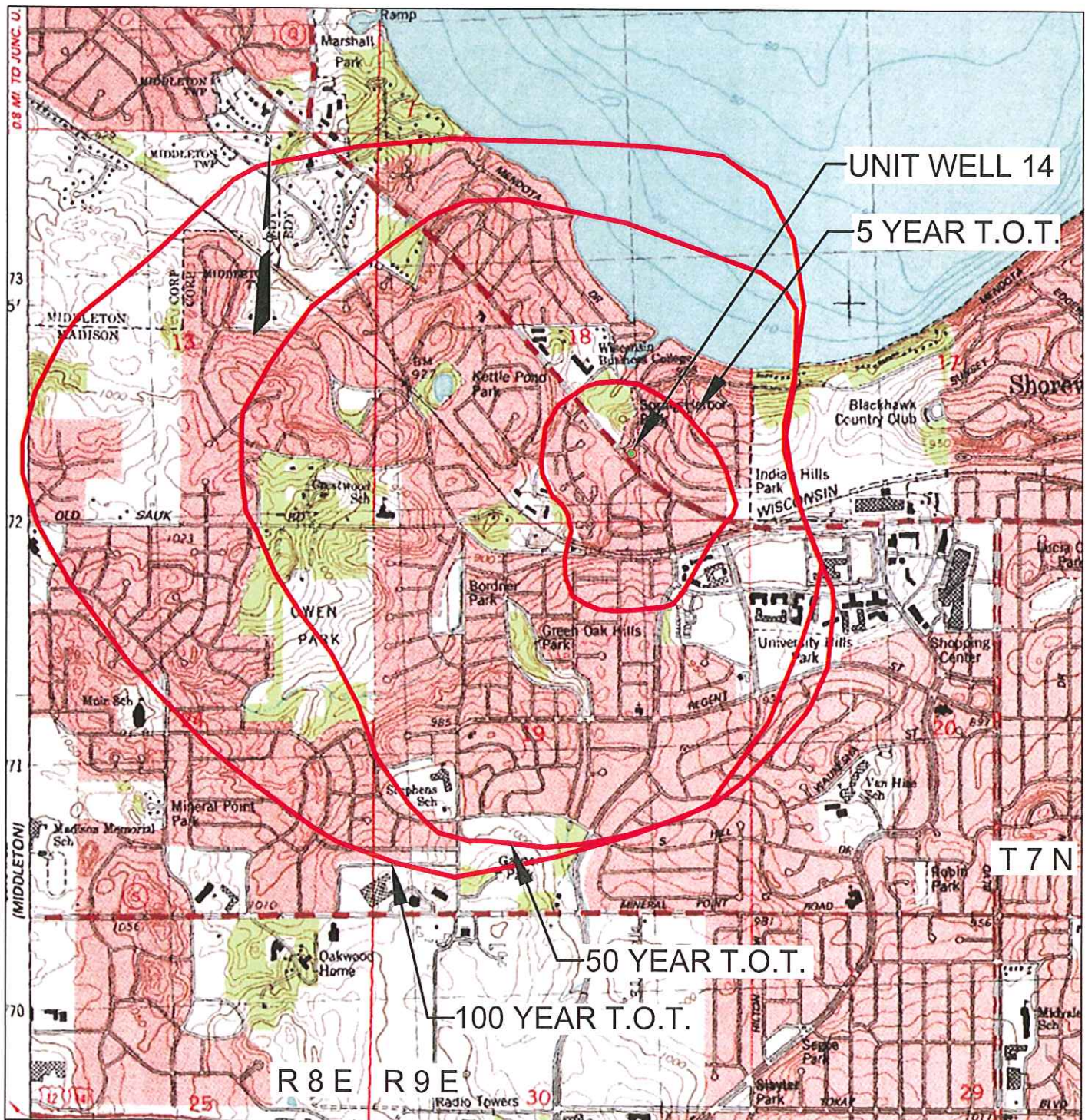
A Tyco International Ltd. Company

FIGURE 3-2  
 5, 50 & 100 YEAR T.O.T. Z.O.C.s ASSUMING  
 50 PERCENT CAPACITY PUMPING RATE  
 MADISON, WISCONSIN

MARCH 2005

82359

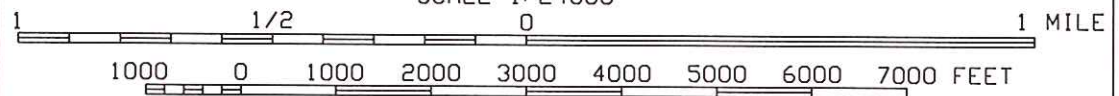
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SOURCE: USGS 7.5 MINUTE QUADRANGLE,  
 MADISON WEST & MADISON EAST WISCONSIN, 1983

T.O.T. = TIME OF TRAVEL  
 Z.O.C.s = ZONES OF CONTRIBUTION

SCALE 1: 24000



CONTOUR INTERVAL 10 FEET  
 DATUM IS MEAN SEA LEVEL

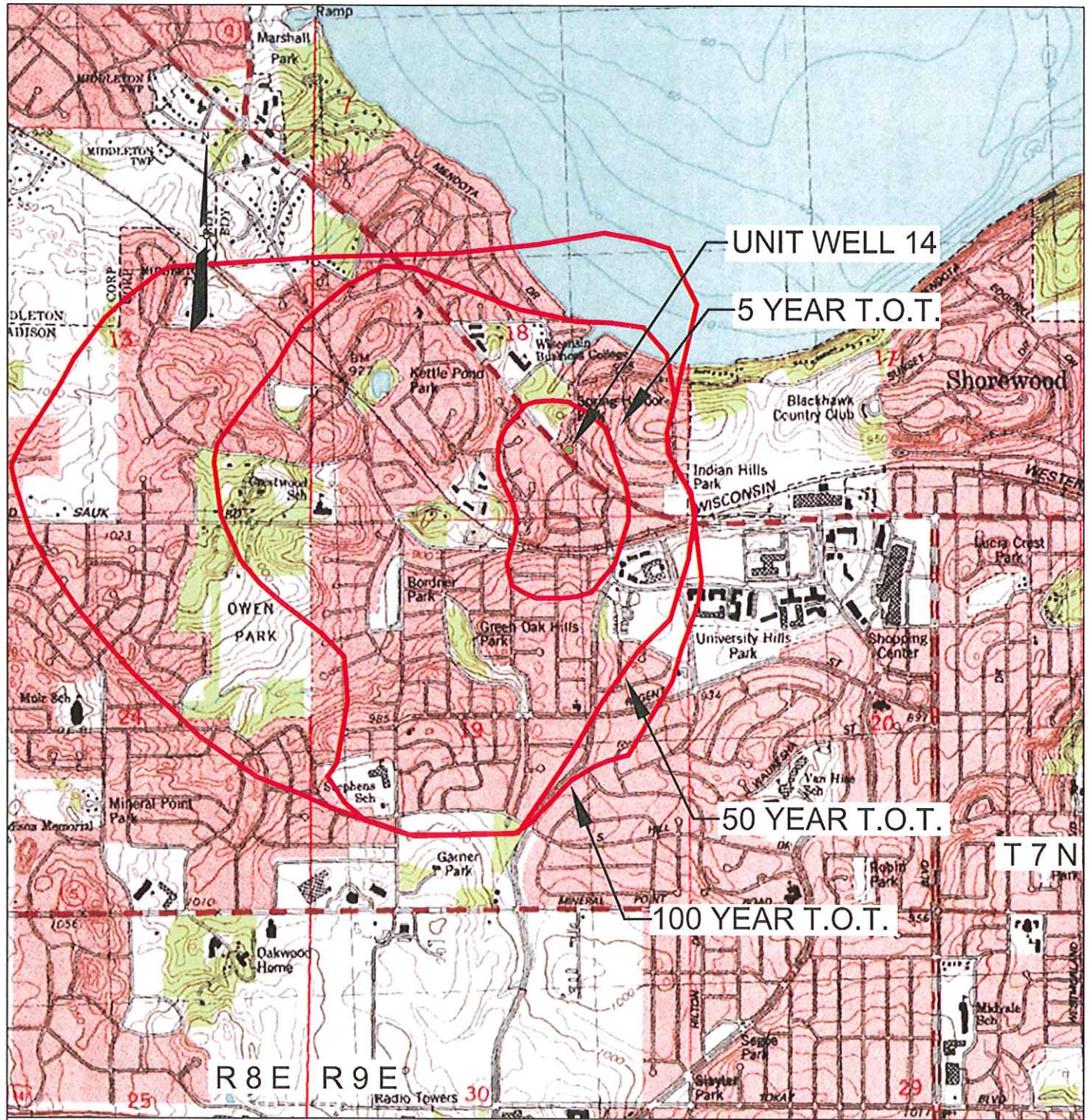


FIGURE 3-3  
 5, 50 & 100 YEAR T.O.T. Z.O.C.s ASSUMING  
 FULL CAPACITY PUMPING RATE  
 MADISON, WISCONSIN

MARCH 2005

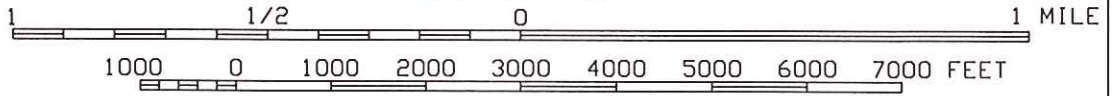
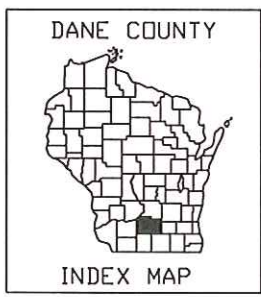
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SOURCE: USGS 7.5 MINUTE QUADRANGLE,  
 MADISON WEST & MADISON EAST WISCONSIN, 1983

T.O.T. = TIME OF TRAVEL  
 Z.O.C.s = ZONES OF CONTRIBUTION  
 SCALE 1: 24000



CONTOUR INTERVAL 10 FEET  
 DATUM IS MEAN SEA LEVEL



FIGURE 3-4  
 5, 50 & 100 YEAR T.O.T. Z.O.C.s ASSUMING  
 PUMPING AT AVERAGE RATE DURING  
 THE MAXIMUM YEAR  
 MARCH 2005 MADISON, WISCONSIN 82359



**TABLE 3-1  
SUMMARY OF EXTENT OF ZOCs (CAPTURE ZONE)  
WELLHEAD PROTECTION UNIT WELL 14  
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)	1.4413 (1,000 GPM)	1.728 (1,200 GPM)	3.456 (2,400 GPM)	2.5 (1,736 GPM)
<b>Upgradient Extent of ZOC (feet)</b>				
5-year TOT	800 - 1,500	800 - 1,350	1,350 - 2,150	1,100 - 2,050
50-year TOT	4,000 - 6,000	3,500 - 5,200	5,300 - 5,850	4,950 - 5,750
100-year TOT	6,300 - 9,300	5,300 - 8,000	8,450	7,800
<b>Downgradient Extent of ZOC (feet)</b>				
5-year TOT	300	550	850	450

Notes:

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

### 3.4 WELLHEAD PROTECTION AREA

The Wisconsin Administrative Code (Chapter NR 811.16(5)(e)) requires that a WHPA for municipal water supply wells “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 14. It is possible that Unit Well 14 could be pumped at maximum capacity without interruption. Therefore, Simulation No. 3 provides a realistic, but very conservative model of well capture zones for Unit Well 14. Simulation No. 3 was used to generate the long-term capture zones and WHPA for Unit Well 14.

The 5-year TOT ZOC for Unit Well 14 extends up to 2,150 feet upgradient of the well in the southerly direction, and approximately 850 feet downgradient from the well. The 100-year TOT ZOC extends approximately 8,450 feet upgradient from Unit Well 14 in the westerly direction. Protecting the entire 100-year TOT ZOC from Unit Well 14 to the upgradient boundary at the same level of protection, as the area within the 5-year TOT ZOC is likely too severe.

Figure 3-5 shows the WHPA for Unit Well 14. Two zones of protection are within the WHPA. Zone A is the area around Unit Well 14 that is defined by the 5-year TOT ZOC delineated for Simulation No. 3 (full design capacity pumping rate). Zone B is the area around Unit Well 14, beyond Zone A, that is defined by a 1,200-foot fixed radius around Unit Well 14. This radius is selected because the Wisconsin Administrative Code Chapter NR 811.16(4) requires a 1,200-foot separation distance between a municipal water supply well and certain contamination sources.

The boundary of Zone B is slightly larger than the 5-year TOT ZOC delineated for Unit Well 14 in the downgradient direction from the well, but is smaller on the upgradient side in the southerly direction. 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. The WHPA is located entirely within the City of Madison.

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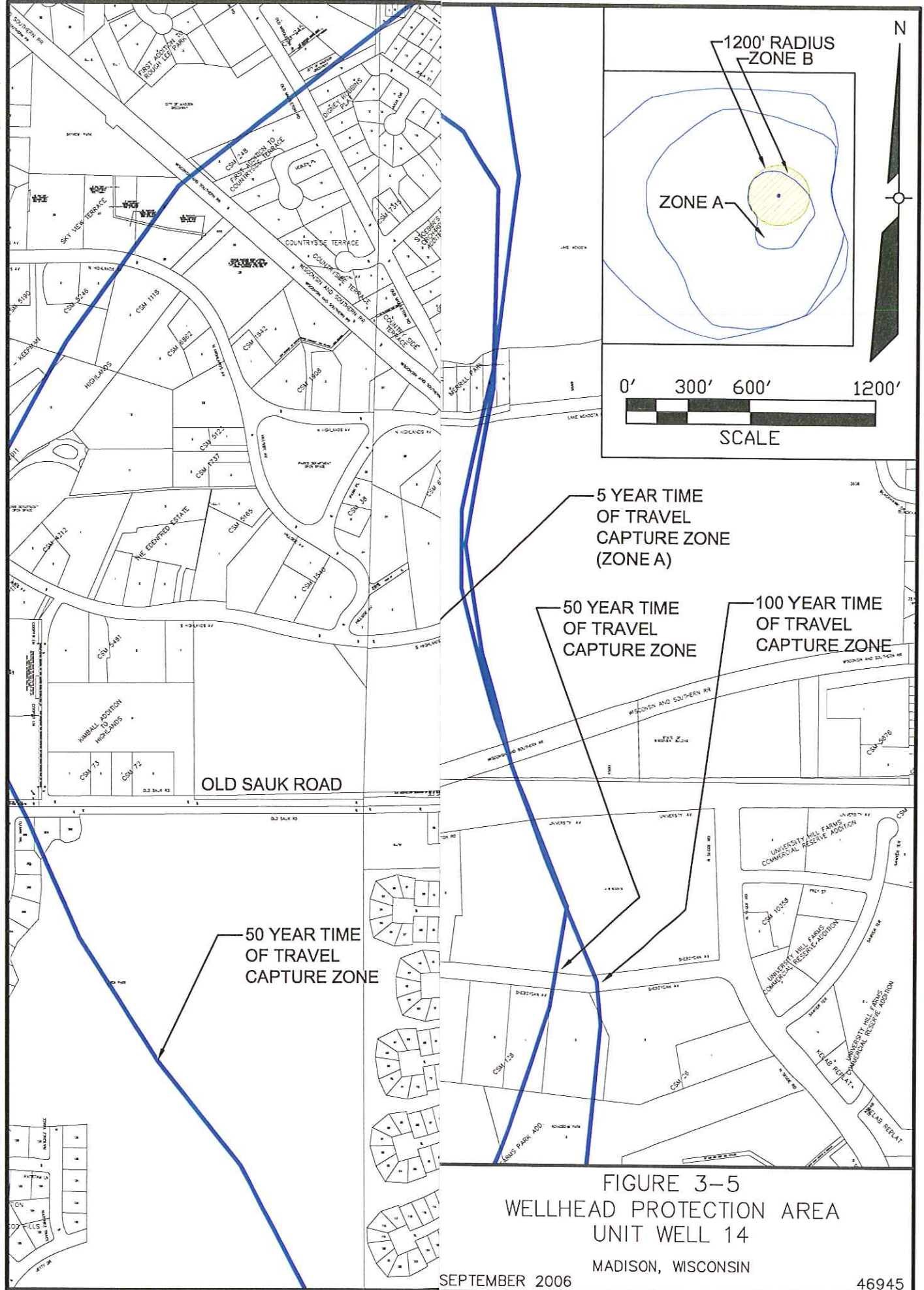


FIGURE 3-5  
 WELLHEAD PROTECTION AREA  
 UNIT WELL 14

MADISON, WISCONSIN

SEPTEMBER 2006

46945

**CHAPTER 4**  
**POTENTIAL CONTAMINANT SOURCES**

## 4.0 POTENTIAL CONTAMINANT SOURCES

### 4.1 CONTAMINANT SOURCE INVENTORY

A CSI was performed for the Unit Well 14 area during February 2005. The CSI consisted of a search of government records, interviews, and a reconnaissance survey of the area within a ½-mile radius and the recharge area equivalent to the delineated 100-year TOT of Unit Well 14. General land use observations and reconnaissance were made on February 1, 2005.

Figure 4-1 shows the location of potential, existing, and former contaminant sources in the WHPA within a ½-mile radius and the recharge area equivalent to the delineated 100-year TOT of Unit Well 14. Table 4-1 summarizes potential contaminant sources that were identified and/or reported to be within the WHPA and review area.

Potential, existing, and former contaminant sources within the WHPA and ZOCs for Unit Well 14 include former spills and potential spills along roads and main transportation corridors; active AST sites; active and closed UST sites; closed LUST sites; drycleaners; road salt use; and probable use of pesticide, herbicide, and nutrients on commercial and residential lawns.

Based on the available information, the following are descriptions of known potential, existing, and former contaminant sources in the WHPA within a ½-mile radius and within the recharge area equivalent to the delineated 100-year TOT of Unit Well 14:

The nearest storm sewer is located in University Avenue, approximately 300 feet south of Unit Well 14.

The nearest sanitary sewer main is located in University Avenue, approximately 60 feet south of Unit Well 14. A sewer lateral extends to Unit Well 14.

Based on the site reconnaissance, the nearest private well is located along Spring Drive, north of Unit Well 14, adjacent to Lake Mendota. The well appeared to be a driven point, which likely terminates in the shallow subsurface material, well above the interval open to Unit Well 14.

There are no apparent private sewage disposals systems in the vicinity of Unit Well 14.

Based on the site reconnaissance and a review of the Wisconsin registered storage tank list, only one active UST site is located within approximately 1,200 feet of Unit Well 14. The site is located at 1133 Risser Road, which is approximately 1,000 feet northwest of Unit Well 14. Eight closed, removed, or abandoned UST sites are located within 1,200 feet of Unit Well 14.

There are three reported LUST sites within 600 feet of Unit Well 14, all of which are closed. The first site is located approximately 400 feet southeast of Unit Well 14 at 5109 Flambeau Road. The second site is located approximately 550 feet southeast of Unit Well 14 at 5109 Flambeau Road. The third site is located approximately 600 feet southeast of Unit Well 14 at 5101 University Avenue. One additional closed LUST site is reported within 1,200 feet northwest of Unit Well 14, at 1110 Spring Harbor Drive.

**TABLE 4-1  
CONTAMINANT SOURCE INVENTORY SUMMARY  
WELLHEAD PROTECTION UNIT WELL 14  
MADISON, WISCONSIN  
MARCH 2005**

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 14	Location within Capture Zone	Estimated Threat to Supply Wells
1	Madison Gas & Electric Co. 5130 University Avenue Madison, WI	EDR Report- WI - Registered AST (Facility ID 664698)	Active AST: 480-gallon diesel for backup generator (Tank ID No. 919876).	Active	50 ft.	Adjacent to well, Zone A	Moderate
2	Midas Auto Service Experts 5201 University Avenue Madison, WI	Visual Inspection	Automotive fluids.	Active	170 ft. southwest	Zone A	Moderate
3	Jenkins Research Manufacture 5221 University Avenue Madison, WI	EDR Report- EPA ID No. WID988575965 - RCRA-Small Quantity Generator, FINDS - RCRAIS	Small quantity generator.	Active	200 ft. west/southwest	Zone A	Moderate
4	Marshall Erdman & Associates Inc. 5117 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 108128), WRRSER	Abandoned without product UST: 1,111-gallon leaded gasoline (Tank ID No. 273077).	Abandoned	300 ft. south	Zone A	Low
5	Sahagian Property 5109 Flambeau Road Madison, WI	EDR Report- WI - LUST (DNR Activity No. 03-13-193973), Registered UST (Facility ID 163071)	LUST case of unreported substance closed on 5/10/99 (soil contamination). Closed/Removed USTs: 300-gallon fuel oil (Tank ID No. 433821).	Closed/Removed	400 ft. southeast	Zone A	Low
6	Ted Finman (Former Owner) 5129 Tomahawk Trail Madison, WI	EDR Report- WI - Registered UST (Facility ID 135549)	Closed UST filled with inert material: 300-gallon fuel oil (Tank ID No. 273167).	Closed	400 ft. northeast	Zone A	Low
7	Joyce Beverage and Marshall Erdman & Associates Inc. (Former Owners) 5105 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 97727)	Closed/Removed USTs: 10,000-gallon diesel (Tank ID No. 271800); 1,000-gallon leaded gasoline (Tank ID No. 271799). Abandoned without Product UST: 1,111-gallon contents unknown (Tank ID No. 273078).	Closed/Removed/ Abandoned	450 ft. south	Zone A	Low
8	5237 University Avenue Madison, WI	EDR Report- WI - SPILLS (DNR Activity No. 04-13-047902)	250 gallons of diesel fuel spilled into the storm sewer due to a traffic accident on 12/5/92, open case - historic spill.	Open	450 ft. west	Zone A	Low
9	Bachmann Property 5101 Flambeau Road Madison, WI	EDR Report- WI - LUST (DNR Activity No. 03-13-002697), Registered UST (Facility ID 79657)	LUST case of unreported substance closed on 6/13/96 (soil contamination). Closed/Removed UST: 300-gallon fuel oil (Tank ID No. 274022).	Closed/Removed	550 ft. southeast	Zone A	Low
10	Docter Inn 5101 University Avenue Madison, WI	EDR Report- WI - LUST (DNR Activity No. 03-13-002369), Registered UST (Facility ID 69855)	LUST case of unreported substance closed on 5/19/95 (soil contamination). Closed/Removed USTs: 1,000-gallon used motor oil (Tank ID No. 273850), 1,000-gallon fuel oil (Tank ID No. 273851).	Closed/Removed	600 ft. southeast	Zone A	Low
11	Patricia Lew (Former Owner) 5108 Tomahawk Trail Madison, WI	EDR Report- WI - Registered UST (Facility ID 198479), BRRTS (DNR Activity No. 09-13-297283)	Closed/Removed UST: 564-gallon fuel oil (Tank ID No. 760758). UST closure of 564-gallon fuel oil tank on 7/3/00 with no site investigation required.	Closed/Removed	650 ft. northeast	Zone A	Low
12	Virginia & Jackson Tiffany 1134 Minocqua Crescent Madison, WI	EDR Report- WI - Registered UST (Facility ID 90788)	Closed/Removed UST: 500-gallon fuel oil (Tank ID No. 274131).	Closed/Removed	700 ft. north	Zone A	Low
13	Warren Gabelman (Former Owner) 1133 Risser Road Madison, WI	EDR Report- WI - Registered UST (Facility ID 142749)	Active UST: 550-gallon fuel oil (Tank ID No. 273216).	Active	1,000 ft. northwest	Zone B	Low

TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 28	Location within Capture Zone	Estimated Threat to Supply Wells
14	Spring Harbor School 1110 Spring Harbor Drive Madison, WI	EDR Report- WI - LUST (DNR Activity No. 03-13-001089), Registered UST (Facility ID 678979), WRRSER	LUST case of unknown hydrocarbon closed on 5/16/94 (soil contamination). Closed/Removed USTs: 4,000-gallon unleaded gasoline (Tank ID No. 271610); 2 - 6,000-gallon fuel oil (Tank ID Nos. 273947 and 273948); and 6,000-gallon unleaded gasoline (Tank ID No. 271609).	Closed/Removed	1,200 ft. northwest	½ mile radius	Low
15	610 N Whitney Way Madison, WI	EDR Report- WI - SPILLS (DNR Activity No. 04-13-483997)	94 gallons of mineral oil slowly released from 4/15/03 to 4/23/03 at a public property, case closed (soil contamination).	Closed	1,250 ft. southwest	½ mile radius	Low
16	Suzy Peterson (Former Owner) 1102 Merrill Springs Road Madison, WI	EDR Report- WI - Registered UST (Facility ID 135164)	Closed/Removed UST: 1,000-gallon unleaded gasoline (Tank ID No. 273708).	Closed/Removed	1,300 ft. northeast	½ mile radius	Low
17	Ruth Andrews (Former Owner) 5100 Lake Mendota Drive Madison, WI	EDR Report- WI - Registered UST (Facility ID 129366)	Closed/Removed UST: 500-gallon fuel oil (Tank ID No. 274149).	Closed/Removed	1,300 ft. northeast	½ mile radius	Low
18	Crestwood Auto Clinic 5325 Old Middleton Road Madison, WI	EDR Report WI - Registered UST (Facility ID 65119)  Visual Inspection	Closed/Removed UST: 550-gallon used motor oil (Tank ID No. 273745).	Closed/Removed	1,460 ft. southwest	Zone A	Low
19	Tom Towell (Former Owner) 5201 Old Middleton Road Madison, WI	EDR Report- WI - Registered UST (Facility ID 138072)	Closed/Removed UST: 560-gallon fuel oil (Tank ID No. 273467).	Closed/Removed	1,500 ft. south	Zone A	Low
20	Blackhawk County Club 4500 Old Middleton Road Shorewood Hills, WI	EDR Report- WI - BRRTS (DNR Activity No. 09-13-293093)  Visual Inspection	UST/AST closed on 9/28/90, no site investigation required. Grass Areas: Nutrient, pesticide, herbicide loading.	Active	1,560 ft. east	½ mile radius	Low-Moderate
21	Joyce Zeid 1775 Norman Way Madison, WI	EDR Report- WI - Registered UST (Facility ID 97762)	UST Abandoned Without Product: 750-gallon fuel oil (Tank ID No. 272435).	Abandoned	1,750 ft. northwest	½ mile radius	Low
22	Catherine E. Gempeler-Beck (Former Owner) 5006 Lake Mendota Drive Madison, WI	EDR Report- WI - Registered UST (Facility ID 180499)	Closed UST filled with inert material material: 1,111-gallon fuel oil (Tank ID No. 490430).	Closed	1,750 ft. northeast	½ mile radius	Low
23	Klinke Cleaners- University 5441 University Avenue Madison, WI	EDR Report- EPA ID WID988627964 - RCRA-Small Quantity Generator, FINDS - RCRAIS and WI Environmental Site Registry  Visual Inspection	Dry cleaning fluids; conditionally exempt small generator.	Active	2,000 ft. northwest	½ mile radius	Moderate

TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 28	Location within Capture Zone	Estimated Threat to Supply Wells
24	Stop-N-Go (gas station) Store No. 253 5445 University Avenue Madison, WI	EDR Report- WI - LUST (DNR Activity Nos. 03-13-000295 and 03-13-282730), Registered UST and AST (Facility ID 681573), BRRTS (DNR Activity No. 09-13-321405)  Visual Inspection	Diesel LUST case closed on 12/14/93 (soil contamination). Diesel and unleaded gasoline LUST cases closed on 8/24/04 (soil contamination). Closed/Removed USTs: 12,000-gallon leaded gasoline (Tank ID No. 271815); 1,000-gallon used motor oil (Tank ID No. 273059); 10,000-gallon diesel (Tank ID No. 271818); 2 - 12,000-gallon unleaded gasoline (Tank ID Nos. 271817 and 271816); 6,000-gallon kerosene (Tank ID No. 271819); 500-gallon kerosene (Tank ID No. 273049). Active USTs: 10,000-unleaded gasoline (Tank ID No. 273053); 2 - 6,000-gallon unleaded gasoline (Tank ID No. 273051); 6,000-gallon diesel (Tank ID No. 273050). Active AST: 4,000-gallon chemical (Tank ID No. 202370). A 500-gallon kerosene tank was removed on 8/05/01, no site investigation required.	Active	2,090 ft. northwest	½ mile radius	Moderate
25	Valvoline Instant Oil Change 5522 University Avenue Madison, WI	EDR Report- EPA ID No. WID988611703 - RCRA-Small Quantity Generator, FINDS - RCRAIS and WI Environmental Site Registry;  Visual Inspection	Conditionally exempt small generator.	Active	2,250 ft. northwest	50 year TOT	Low
26	Sally Rowe UW Safety Department 401 N Whitney Way Madison, WI	EDR Report- WI - Registered UST (Facility ID 143988)	Abandoned UST Without Product: 1,111-gallon leaded gasoline for government fleet (Tank ID No. 272848). Active AST: 1,000-gallon fuel oil for government fleet (Tank ID No. 272402).	Abandoned/Active	2,250 ft. south	½ mile radius	Low
27	American Red Cross 4860 Sheboygan Avenue Madison, WI	EDR Report- Nuclear Regulatory Commission Material Licensing Tracking System (License No. 48-15423-02)  WI - Registered UST and AST (Facility ID 10-150198), Registered AST, BRRTS (DNR Activity No. 09-13-291422)  Visual Inspection	Closed/Removed USTs: 3,000 gallon diesel for (Tank ID No. 271542); Irradiators self shielded less than 10,000 curies Active AST: 280-gallon fuel oil (Tank ID No. 202309). UST closure of 13,000-gallon diesel tank on 3/27/96, no site investigation required.	Closed/Removed/ Active	2,300 ft. southeast	½ mile radius	Low
28	Richard Lunde 5430 Greening Lane Madison, WI	EDR Report- WI - Registered UST (Facility ID 123223)	Closed/Removed UST: 500-gallon fuel oil (Tank ID No. 272154).	Closed/Removed	2,350 ft. northwest	½ mile radius	Low
29	Osthoff Property 5521 Gettle Avenue Madison, WI	EDR Report- WI - LUST (DNR Activity No. 03-13-001941), Registered UST (Facility ID 76980)	Fuel oil LUST case closed on 10/24/94 (soil contamination). Closed/Removed UST: 250-gallon fuel oil (Tank ID No. 273658).	Closed/Removed	2,550 ft. southwest	½ mile radius	Low
30	Zudnancich-Meeker Property 309 Park Way Madison, WI	EDR Report- WI - LUST (DNR Activity No. 03-13-275811), Registered UST (Facility ID 637933)	Diesel LUST case closed on 1/15/02. Closed/Removed UST: 550-gallon fuel oil (Tank ID No. 817592).	Closed/Removed	2,660 ft. southwest	100 year TOT	Low
31	Edward & Marilyn Schten 5710 Arbor Vitae Place Madison, WI	EDR Report- WI - Registered UST (Facility ID 74382)	Closed/Removed UST: 500-gallon fuel oil (Tank ID No. 273536).	Closed/Removed	2,750 ft. southwest	50 year TOT	Low
32	Spring Harbor Auto Clinic 5530 University Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 69686)  Visual Inspection	Closed/Removed USTs: 4,000-gallon diesel (Tank ID No. 272770); 2 - 4,000-gallon leaded gasoline (Tank ID Nos. 272771 and 272772); 2 - 4,000-gallon unleaded gasoline (Tank ID Nos. 272773 and 272774).	Active	2,860 ft. northwest	50 year TOT (sidegradient)	Moderate



TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 28	Location within Capture Zone	Estimated Threat to Supply Wells
33	5806 Old Sauk Road Madison, WI	EDR Report- WI - SPILLS (DNR Activity No. 04-13-043024)	3 gallons of mineral oil with PCBs was spilled on 8/15/88 when a pole mounted transformer overloaded; case open-historic spill; further action may not be necessary; (soil contamination).	Open	2,950 ft. southwest	50 year TOT	Low
34	Glen Oak Hills Park Storm Water Outlet N. and S. Kenosha Drive Madison, WI	Visual Inspection	Runoff to drainage ways and detention areas.	Active	3,000 - 3,200 ft. southwest	50 year TOT	Low
35	Badger Wash (brushless automatic) 5532 University Avenue Madison, WI	Visual Inspection	Automobile cleaning fluids.	Active	3,020 ft. northwest	50 year TOT	Low-Moderate
36	Wisconsin Department of Transportation 4802 Sheboygan Ave Madison, WI	EDR Report- EPA ID No. WID038975793 - RCRA-Small Quantity Generator, FINDS - RCRAIS and Wisconsin Environmental Site Registry; Nuclear Regulatory Commission Material Licensing Tracking System;  WI - Registered UST (Facility ID 681464), SPILLS (DNR Activity No. 04-13-044037)	Conditionally exempt small quantity generator. Closed/Removed UST: 8,000-gallon fuel oil (Tank ID No. 272357). Civil Defense Equipment (License No. 48-07436-03). SPILLS: 1 pint of waste toner was spilled on 8/30/89 due to non-tight seal, open case - historic spill, contamination was contained and recovered.	Closed/Removed/ Open	3,050 ft. southeast	50 year TOT	Low
37	Hilldale Towers- Apartment Complex 4817 Sheboygan Avenue Madison, WI	EDR Report- WI - Registered UST and AST (Facility ID 681298)	Closed/Removed UST: 1,000-gallon fuel oil (Tank ID No. 10389). Active AST: 650-gallon fuel oil (Tank ID No. 455381).	Closed/Removed/ Active	3,050 ft. southeast	50 year TOT	Low
38	Wallace Haven (Former Owner) 1650 Norman Way Madison, WI	EDR Report- WI - Registered UST (Facility ID 118857)	Closed/Removed UST: 500-gallon fuel oil (Tank ID No. 274066).	Closed/Removed	3,150 ft. northwest	50 year TOT	Low
39	Scott Oil Co. Inc. (Former Owner) 5602 University Avenue Madison, WI	EDR Report- EPA ID No. WIR000047928 - RCRA-Small Quantity Generator, FINDS - RCRAIS and WI Environmental Site Registry  WI - LUST (DNR Activity No. 03-13-002570), Registered UST (Facility ID 83344)	Conditionally exempt small quantity generator; LUST case closed on 7/11/02 (soil contamination). Closed/Removed USTs: 8,000-gallon unleaded gasoline (Tank ID No. 272107), 2 - 10,000-gallon unleaded gasoline (Tank ID Nos. 272105 and 272106), 1,000-gallon used motor oil (Tank ID No. 271718), 1,000-gallon fuel oil (Tank ID No. 271717).	Closed/Removed	3,300 ft. northwest	50 year TOT	Low
40	Ann Christensen 15 N Rock Road Madison, WI	EDR Report- WI - Registered UST (Facility ID 53184)	Closed/Removed UST: 500-gallon fuel oil (Tank ID No. 273399).	Closed/Removed	3,350 ft. southwest	50 year TOT	Low
41	Ian Powell 1 Wakeman Street Madison, WI	EDR Report- WI - Registered UST (Facility ID 633064)	Closed/Removed UST: 500-gallon fuel oil (Tank ID No. 802495).	Closed/Removed	3,350 ft. southwest	50 year TOT	Low
42	Pam Crawford (Former Owner) 313 Bordner Drive Madison, WI	EDR Report- WI - Registered UST (Facility ID 116401)	Closed/Removed UST: 250-gallon fuel oil (Tank ID No. 273621).	Closed/Removed	3,400 ft. southwest	50 year TOT	Low
43	Nancy Shook (Former Owner) 1614 Laurel Crest Madison, WI	EDR Report- WI - Registered UST (Facility ID 669376)	Closed/Removed UST: 1,000-gallon fuel oil (Tank ID No. 935676).	Closed/Removed	3,500 ft. northwest	50 year TOT	Low

TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 28	Location within Capture Zone	Estimated Threat to Supply Wells
44	Kathryn Delahaney (Former Resident) 101 N Rosa Road Madison, WI	EDR Report- WI - Registered UST (Facility ID 98425)	Closed/Removed UST: 500-gallon fuel oil (Tank ID No. 273554).	Closed/Removed	3,750 ft. southwest	Upgradient 50 year TOT	Low
45	Paul Mackendrick (Former Owner) 208 Bordner Drive Madison, WI	EDR Report- WI - Registered UST (Facility ID 117216)	Closed/Removed UST: 560-gallon fuel oil (Tank ID No. 273566).	Closed/Removed	3,750 ft. southwest	Upgradient 50 year TOT	Low
46	George Robbins 5737 Cedar Place Madison, WI	EDR Report- WI - Registered UST (Facility ID 82194)	Closed/Removed UST: 560-gallon fuel oil (Tank ID No. 273816).	Closed/Removed	3,750 ft. southwest	50 year TOT	Low
47	Sally Rowe UW Safety Department 6021 S Highlands Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 58525)	Closed/Removed UST: 150-gallon leaded gasoline for government fleet (Tank ID No. 273348).	Closed/Removed	4,200 ft. southwest	50 year TOT	Low
48	Julie Kaeser (Former Owner) Manchester 5750 Elder Place Madison, WI	EDR Report- WI - Registered UST (Facility ID 627949)	Closed/Removed UST: 1,000-gallon fuel oil (Tank ID No. 786654).	Closed/Removed	4,250 ft. southwest	50 year TOT	Low
49	Mark Isenburg (Former Resident) 5627 Crestwood Place Madison, WI	EDR Report- WI - Registered UST (Facility ID 4446)	Closed/Removed UST: 500-gallon fuel oil (Tank ID No. 10441).	Closed/Removed	4,300 ft. southwest	50 year TOT	Low
50	UW Madison President Residence 6022 Old Sauk Road Madison, WI	EDR Report- WI - BRRTS (DNR Activity No. 09-13-295564)	UST closed on 12/18/91, no site investigation required.	Closed	4,300 ft. southwest	50 year TOT	Low
51	6010 Old Middleton Road Madison, WI	EDR Report- WI - SPILLS (DNR Activity No. 04-13-190370)	15 gallons of mineral oil slowly released at a power generating transfer facility from 6/20/94 to 6/27/94, case closed (contaminated soil clean-up).	Closed	4,350 ft. northwest	50 year TOT	Low
52	Mary Carbone 6115 North Highlands Avenue Madison, WI	EDR Report- WI - Registered UST (Facility ID 108753)	Closed/Removed UST: 3,000-gallon fuel oil (Tank ID No. 273461).	Closed/Removed	4,450 ft. west/northwest	50 year TOT	Low
53	Trust of Larson (Former Owner) 1818 Camelot Drive Madison, WI	EDR Report- WI - Registered UST (Facility ID 125856)	Closed/Removed USTs: 300-gallon unleaded gasoline (Tank ID No. 273369) and 300-gallon fuel oil (Tank ID No. 273370).	Closed/Removed	4,700 ft. northwest	50 year TOT	Low
54	Thomas A. Lockyear 1821 Thorstrand Road Madison, WI	EDR Report- WI - Registered UST (Facility ID 136431)	Closed/Removed UST: 1,000-gallon fuel oil (Tank ID No. 273181).	Closed/Removed	5,350 ft. northwest	100 year TOT	Low
55	Jacobson Building 6130 University Avenue Middleton, WI	EDR Report- EPA ID No. WID988574125 - RCRA-Small Quantity Generator, FINDS - RCRAIS	RCRA Small quantity generator.	Active	5,550 ft. northwest	100 year TOT	Low
56	Phyllis R. Andringa (Former Resident) 6402 Antietam Lane Madison, WI	EDR Report- WI - Registered UST (Facility ID 118542)	Closed/Removed UST: 1,111-gallon fuel oil (Tank ID No. 273503).	Closed/Removed	5,650 ft. southwest	100 year TOT	Low

TABLE 4-1 (cont.)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 28	Location within Capture Zone	Estimated Threat to Supply Wells
57	Beth Johnson (Former Resident) 6405 Antietam Lane Madison, WI	EDR Report- WI - Registered UST (Facility ID 56813)	Closed/Removed UST: 1,000-gallon fuel oil (Tank ID No. 272309).	Closed/Removed	5,750 ft. southwest	100 year TOT	Low
58	The Garden (gas station) 6136 University Avenue Madison, WI	Visual Inspection	Automotive fluids.	Active	5,800 ft. northwest	100 year TOT	Low
59	St. Dunstons Episcopal (Former Owner) 1818 Saint Dunstan Drive Madison, WI	EDR Report- WI - Registered UST (Facility ID 132684)	UST Temporarily Out-of-Service: 500-gallon fuel oil (Tank ID No. 273316).	Temporarily Out of Service	6,000 ft. northwest	100 year TOT	Low
60	6409 Appalachian Way Madison, WI	EDR Report- WI - SPILLS (DNR Activity No. 04-13-041341)	Unreported quantity of unreported substance deliberately spilled at an industrial facility on 7/28/86. Case open-historic spill (soil contamination).	Open	6,000 ft. west	100 year TOT	Low
61	125 Nautilus Avenue Madison, WI	EDR Report- WI - SPILLS (DNR Activity No. 04-13-039847)	Unreported quantity of unreported substance spilled on 7/20/84 when a connection let loose on a truck, case open-historic spill.	Open	6,150 ft. southwest	100 year TOT	Low
62	Numerous Properties throughout Area	Visual Inspection	Parking Surfaces: Runoff to drainage ways and detention areas.	Active	Variable	All Zones	Low - Moderate
63	Numerous Properties throughout Area	Visual Inspection	Grass Areas: Potential nutrient loading.	Active	Variable	All Zones	Low - Moderate
64	University Avenue, Old Middleton Road, Old Sank Road, and N. Whitney Way Madison, WI	Visual Inspection	Salt application. Potential spills.	Active	Variable	All Zones	Low

## Notes:

1. Zone A = Within 5 year TOT ZOC
2. Zone B = Beyond Zone A, but within 1200-ft. radius.
3. Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)
4. National Priorities List (NPL)
5. Resource Conservation and Recovery Act- Large Quantity Generator (RCRA-LQG)
6. Resource Conservation and Recover Act- Small Quantity Generator (RCRA - SQG)
7. The Facility Index System (FINDS)
8. Wisconsin DNR Spills Database (SPILLS)
9. Wisconsin Leaking Underground Storage Tank List (LUST)
10. Wisconsin Environmental Repair Program Sites (ERP)
11. Underground Storage Tank (UST)
12. Aboveground Storage Tank (AST)
13. Bureau (of Commerce) Remediation and Redevelopment Tracking System (BRRTS)
14. Wisconsin (WI)
15. Resource Conservation and Recovery Information System - Treatment, Storage, and Disposal Facilities (RCRAIS)
16. Wisconsin Department of Natural Resources (DNR)
17. Environmental Protection Agency (EPA)
18. Time of Travel (TOT)
19. List of Licensed Landfills (WF/LF)

Based on the site reconnaissance and a review of the Wisconsin registered storage tank list, the nearest AST is believed to be located within 50 feet and directly adjacent to Unit Well 14. The tank contains diesel fuel for the backup generator.

Based on the review of Wisconsin spills, one active spill is located approximately 450 feet west of Unit Well 14. The spill occurred in December 1992 and is considered a historic case. No other closed or active spill sites are reported within 1,200 feet of Unit Well 14.

A dry cleaning business is located approximately 2,000 feet northwest of Unit Well 14.

The nearest golf course is Blackhawk Country Club, located approximately 1,500 feet east of Unit Well 14.

There are no apparent solid waste storage sites in the Unit Well 14 WHPA. Former solid waste disposal sites for wood, brush, and demolition debris are located approximately 0.6 to 1.5 miles east of Unit Well 14. Former solid waste sites for garbage, trash, and/or hazardous materials are located approximately 2 to 2.5 miles northwest, west, and southwest of Unit Well 14 (DCRPC, 1999).

There are no apparent cemeteries in the vicinity of Unit Well 14. There are no apparent ponds in the vicinity of Unit Well 14.

There are no sludge or septage spreading areas in the Unit Well 14 WHPA. The nearest sludge or septage application areas are located approximately 3.5 miles west of Unit Well 14 (DCRPC, 1999).

According to the DNR BRRTS website, there are no properties with residual groundwater contamination exceeding Ch. NR 140 enforcement standards as recorded on the GIS registry in the vicinity of Unit Well 14.

No bulk salt storage sheds or bulk pesticide, fertilizer storage, and/or mix-load sites were identified within the ½-mile radius or the recharge area equivalent to the delineated 100-year TOT of Unit Well 14, or within the upgradient recharge area.

The separation distances between Unit Well 14 and potential contaminant sources identified in Wisconsin Administrative Code NR 811.16 are summarized in Table 4-2. It appears that required separation distances from Unit Well 14 and potential contaminant sources identified in the code are currently being met.

#### **4.2 LAND USES AND WELLHEAD PROTECTION PLANNING**

Existing land uses in the vicinity of Unit Well 14 are generally compatible with WHP planning. Land uses summarized in Table 4-2 should be prohibited in the vicinity of Unit Well 14, within the respective minimum separation distances shown. Also, it is not desirable to have commercial, manufacturing, or industrial districts located in WHPAs. Land uses summarized in Table I-1 in Appendix I should be prohibited from WHPA Zones A and B. Where any of the uses listed in Table I-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 I summarize several 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 14  
MADISON, WISCONSIN**

Potential Contamination Source	Minimum Separation Distance
Storm Sewer	50 feet
Sanitary Sewer	200 feet <sup>1</sup>
Sanitary Lift Station	200 feet
Single Family Residential Fuel Oil Tank	200 feet
Septic Tank Receiving Less than 8,000 gpd	400 feet
Cemetery	400 feet
Stormwater Drainage 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
Industrial, Commercial, or Municipal Wastewater Lagoons or Storage Structures	1,000 feet
Manure Stacks or Storage Structures	1,000 feet
Septic Tanks or Soil Absorptive Units Receiving Greater than 8,000 gpd	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
Gasoline or Fuel Oil Storage Tanks not Approved by Comm 10.10	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, June 2003.

Footnote:

<sup>1</sup> Lesser separation for sanitary sewer may be allowed if the sewer is constructed of water main materials and pressure tested. Less than 50 feet separation is not allowed.

**CHAPTER 5**  
**MANAGEMENT STRATEGIES**

## 5.0 MANAGEMENT STRATEGIES

### 5.1 ALTERNATIVE MANAGEMENT STRATEGIES

Table 5-1 summarizes key elements of a management plan developed for the City of Madison. Activities were identified for resource management within the delineated WHPA and within far upgradient ZOCs.

The various activities can be grouped into five principal categories as follows:

1. Existing programs
2. Land use controls
3. Intergovernmental cooperation
4. Monitoring
5. Public education and awareness

Because all landowners within the WHPA rely on groundwater resources for water supply, and a few maintain private water supply wells, 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 other ZOCs.

#### 5.1.1 Category 1 - Existing Programs

##### 5.1.1.1 Hazardous Waste Collection/Disposal Program (Clean Sweep)

The Dane County Department of Public Works and the City of Madison Department of Public Health co-sponsor the Clean Sweep Collection Program. The Clean Sweep program involves collection and disposal of residential, agricultural, and small business hazardous chemicals and wastes. 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. Collections are held between 7:30 a.m. and 2:00 p.m. on Tuesdays, Wednesdays, Fridays, and Saturdays; May 1 through October 31. The Clean Sweep site is located at the Dane County Highway Garage, 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) 294-5366 or (608) 294-5358. Clean Sweep Collection Program web sites are at:

[www.danecountycleansweep.com](http://www.danecountycleansweep.com)

and

[www.cityofmadison.com/health/envhealth/clnswp.html](http://www.cityofmadison.com/health/envhealth/clnswp.html)

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

**TABLE 5-1  
SUMMARY OF MANAGEMENT STRATEGIES  
WELLHEAD PROTECTION AREA PLAN - UNIT WELL 14  
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"> <li>Hazardous waste collection and disposal. Residential, agricultural, and small business hazardous waste. Commercial with small fee. May through October collections in Madison.</li> <li>Target local property owners and residents to participate.</li> </ul>	<ul style="list-style-type: none"> <li>Dane County Department of Public Works</li> <li>City of Madison Department of Public Health</li> </ul>	1. Spring 2007.  2. As needed.	1. <b>Madison Water Utility</b> send information about the Clean Sweep Collection Program to property owners in the WHPA, to encourage participation in the program.  2. <b>Dane County</b> sponsors advertising and feature articles.
	b. On Site Waste Disposal System (Septic) Maintenance	<ul style="list-style-type: none"> <li>Maintenance/servicing contract currently required for system owners on record.</li> <li>Orders issued to confirmed failing system owners.</li> <li>Include all property/septic system owners in WHPA in notification database.</li> <li>Conduct Public Education.</li> </ul>	<ul style="list-style-type: none"> <li>Dane County Environmental Health Department</li> </ul>	1. Spring 2007, then annually  2. Summer / Fall 2007  3. Every 3 years	1. <b>Madison Water Utility</b> request that the Dane County Environmental Health Department 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. <b>Madison Water Utility</b> prepare an article for newspaper release about septic system dos and don'ts.  3. <b>Dane County Environmental Health Department</b> 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"> <li>Enforce well abandonment ordinance(s) (Dane County Chapter 45, and City of Madison General Ordinance Sec. 13.21) and review new well construction.</li> <li>Require proper abandonment of unused and unsafe wells.</li> <li>Update well inventory in WHPA once every 5 years.</li> <li>Familiarize with WI Admin. Codes, Chapters NR 141, 811, and 812.</li> </ul>	<ul style="list-style-type: none"> <li>Wisconsin DNR</li> <li>Dane County Environmental Health Department</li> <li>City of Madison</li> </ul>	<ol style="list-style-type: none"> <li>Winter 2006 / 2007, then annually</li> <li>Winter 2006 / 2007, then every five years (2011)</li> <li>Spring 2007</li> <li>2007, then every five years</li> <li>Ongoing</li> <li>Spring 2007</li> <li>As needed</li> </ol>	<ol style="list-style-type: none"> <li><b>Madison Water Utility</b> request that the Dane County Environmental Health Department provide them the names and addresses of owners of private wells located in the Unit Well 14 WHPA.</li> <li><b>Madison Water Utility</b> 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.</li> <li><b>Madison Water Utility</b> 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.</li> <li><b>Madison Water Utility</b> update the private well inventory for wells located in the WHPA.</li> <li><b>City of Madison and Dane County</b> enforce existing well abandonment ordinances, to ensure that all private wells are permitted, or properly abandoned if unused.</li> <li><b>Madison Water Utility</b> request that Dane County consider proximity and depth of proposed private wells relative to Unit Well 14 prior to issuing permits for construction of new private water supply wells.</li> <li><b>Madison Water Utility</b> direct residents to the DNR private well code (Chapter NR 812) or to the Wisconsin DNR private well section (608-266-0821) when questions arise about private water supply wells.</li> </ol>

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"> <li>Enforce existing rules.</li> </ul>	<ul style="list-style-type: none"> <li>Wisconsin DNR</li> <li>Dane County</li> <li>Madison Metropolitan Sewerage District (MMSD)</li> </ul>	1. Spring 2007	1. <b>Madison Water Utility</b> provide a copy of the WHPA and recharge area maps to the MMSD and request that sludge not be spread in the Unit Well 14 recharge area equivalent to the 50-year TOT capture zone.
				2. Spring 2007	2. <b>Madison Water Utility</b> 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 14 recharge area equivalent to the 50-year TOT capture zone.
				3. Ongoing	3. <b>Madison Water Utility</b> encourage development of additional authorized septage discharge points in the City of Madison wastewater treatment system.
				4. Ongoing	4. <b>DNR</b> enforce rules, particularly in WHPAs.
				5. 2007	5. <b>Dane County</b> develop regulatory program including ordinance.
	e. Spill Notification and Awareness of Remedial Investigation and Cleanup	<ul style="list-style-type: none"> <li>Monitor and keep informed of potential contamination sources in the WHPA and recharge areas.</li> <li>Work with DNR to achieve investigation and cleanup of known contamination sources.</li> </ul>	<ul style="list-style-type: none"> <li>Wisconsin DNR</li> <li>Dane County Emergency Management</li> <li>Wisconsin DATCP and COMM</li> <li>City of Madison Fire Department</li> </ul>	1. Spring 2007	1. <b>Madison Water Utility</b> 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 14 WHPA or in upgradient recharge areas.
				2. 2007, then ongoing	2. <b>Madison Water Utility</b> 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"> <li>Enforce existing zoning.</li> <li>Discourage conditional uses or zoning changes that increase risk to groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> <li>Dane County Planning and Development</li> </ul>	1. 2007 - Ongoing	1. <b>City of Madison</b> amend WHP ordinance and add WP-14 Wellhead Protection District No.14.
				2. 2007	2. <b>City of Madison</b> provide Dane County with a copy of the WHP ordinance and WHPA map.
				3. 2007	3. <b>Dane County</b> 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"> <li>Cooperate in land use planning to protect groundwater resources and WHPAs.</li> <li>Keep apprised of development in WHPA.</li> <li>Ensure development complies with separation distances between the well and potential contamination sources as required by WI Admin. Code, Chapter NR 811.16.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison Planning and Development Department</li> <li>Dane County Planning and Development Department</li> <li>City of Middleton</li> <li>Village of Shorewood Hills</li> </ul>	1. Spring 2007	1. <b>City of Madison</b> provide Dane County, City of Middleton, and the Village of Shorewood Hills with a copy of: <ol style="list-style-type: none"> <li>The WHPP and maps showing the Unit Well 14 WHPA and ZOCs.</li> <li>A summary of separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.16(4)(d)).</li> <li>A list of potential contamination sources that can threaten groundwater.</li> <li>A list of high risk land uses that should be prohibited from WHPAs.</li> </ol>
				2. 2007 – Ongoing	2. <b>City of Madison Planning and Development Department</b> ensure that development complies with separation distances required between municipal water supply wells and potential contamination sources.
				3. 2007 – Ongoing	3. <b>City of Madison</b> encourage the City of Middleton, Village of Shorewood Hills, and Dane County Boards to review proposed development in the ZOCs in their jurisdiction, with regard to Unit Well 14 recharge area.
				4. 2007	4. <b>City of Madison Planning and Development Department</b> 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. 2007 – Ongoing	5. <b>City of Madison Planning and Development Department</b> 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.
4. Monitoring	a. Contaminant Source Inventory (CSI) Maintenance	<ul style="list-style-type: none"> <li>Update CSI and conduct windshield survey</li> </ul>	<ul style="list-style-type: none"> <li>Madison Water Utility</li> </ul>	1. January 2005, then every 5 years (January 2010)	1. <b>Madison Water Utility</b> update the CSI by conducting a windshield survey of properties located in the WHPA and by performing State and Federal database checks.
	b. Water Quality Monitoring	<ul style="list-style-type: none"> <li>Conduct sampling of supply wells.</li> </ul>	<ul style="list-style-type: none"> <li>Madison Water Utility</li> </ul>	1. As required – Ongoing	1. <b>Madison Water Utility</b> perform water quality monitoring as required by DNR and as otherwise needed.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
5. Public Education and Awareness	a. Availability of WHPP	<ul style="list-style-type: none"> <li>Provide copies to Water Utility Office, Public Library, City Hall, City of Middleton, Village of Shorewood Hills, and Dane County.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> </ul>	1. Spring 2007 2. Spring 2007 3. Spring 2007	1. <b>City of Madison</b> provide copies of the WHPP for review by the public at the Water Utility Office, Madison Public Library, and City Hall. 2. <b>City of Madison</b> provide copies of the WHPP to the City of Middleton, Village of Shorewood Hills, and Dane County. 3. <b>Madison Water Utility</b> communicate the availability of the plan through a newspaper article.
	b. Public Informational Meetings	<ul style="list-style-type: none"> <li>Perform as part of a City Committee meeting or Common Council Meeting.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> </ul>	1. Spring / Summer 2007 2. Spring / Summer 2007	1. <b>City of Madison</b> 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. <b>City of Madison</b> provide WHPA maps for public review and an information sheet or brochure available for public use.
	c. News Releases	<ul style="list-style-type: none"> <li>Issue early in program implementation, and reinforce annually, as necessary.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> </ul>	1. 2007, then annually	1. <b>Madison Water Utility</b> will provide a news release to the local newspaper, about the WHPP for Unit Well 14.
	d. Informational Materials Distributed To Residents in WHPA	<ul style="list-style-type: none"> <li>Hazardous Waste Collection (Clean Sweep) Program</li> <li>Materials describing proper use and application of fertilizers and pesticides.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> <li>Wisconsin DNR</li> <li>University Extension Office</li> </ul>	1. 2007, then ongoing 2. 2007	1. <b>Madison Water Utility</b> 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: <ol style="list-style-type: none"> <li>Information about hazardous waste collection/disposal program (Clean Sweep) activities.</li> <li>Materials describing the proper use and application of lawn fertilizers and pesticides.</li> <li>Wellhead protection planning</li> <li>Annual Consumer Confidence Report (CCR) containing information about WHP planning.</li> </ol> 2. <b>Madison Water Utility</b> update information in website ( <a href="http://www.madisonwater.org">http://www.madisonwater.org</a> ) about WHP planning.

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"> <li>Notify and offer guidance to owners of potential high risk land uses in WHPA.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> </ul>	1. 2007	<p>1. <b>Madison Water Utility</b> 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"> <li>a. Leaking underground and above ground storage tanks.</li> <li>b. Materials describing the proper use and application of lawn fertilizers and pesticides.</li> </ul>
	f. School Programs	<ul style="list-style-type: none"> <li>Participate in school programs.</li> </ul>	<ul style="list-style-type: none"> <li>City of Madison</li> <li>University Extension Office</li> <li>Madison Public Schools</li> </ul>	<p>1. 2007</p> <p>2. 2007</p>	<p>1. <b>Madison Water Utility</b> inform schools about the availability of tours at water supply facilities.</p> <p>2. <b>Madison Water Utility</b> prepare a water/groundwater fact sheet for school education.</p>

Agriculture, Trade and Consumer Protection (DATCP). Additional information about the Clean Sweep Collection Program is in Appendix J.

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

#### **5.1.1.2 On-Site Waste Disposal System Maintenance**

The nearest private sewage disposal systems are located approximately 3.5 miles west of Unit Well 14 and are located well beyond the 100-year TOT ZOC for Well 14. The sites are likely low risk to Unit Well 14, although it appears that the ultimate ZOC for Well 14 extends into unsewered areas in far upgradient areas.

The Dane County Human Services Department, Environmental Health Services has an existing program for maintenance/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 a \$26 filing fee at the time the maintenance/servicing is performed.

The Dane County Environmental Health Services 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. Education will improve awareness on the part of private well owners of the importance of proper well abandonment. There appear to be a few private wells located beyond the WHPA, but within the 100-year TOT ZOC for Unit Well 14. One well record was found for a private well (5024 Lake Mendota Drive) located in the Unit Well 14 WHPA. A private well was observed at 5120 Spring Drive and also appears to be within the WHPA. The existing private wells are owned by private residents and are likely terminated in the upper bedrock aquifer, or sand and gravel aquifer.

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 K. Other information about wells and well abandonment is in Appendix L.

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 Dane County Health Services Division 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 Dane County Environmental Health Services provide them the names and addresses of owners of private wells located in the Unit Well 14 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 send information to property owners located within the Unit Well 14 WHPA, 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 14 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) or to the Wisconsin DNR private well section (608-266-0821) when questions arise about private water supply wells.
8. The Madison Water Utility will prepare a newspaper article about proper abandonment of unused private wells.

#### **5.1.1.4 Land Application of Sludge and Septage**

There are four permitted septage application sites located approximately 3.5 to 4 miles due west of Unit Well 14. The sites are likely low risk to Unit Well 14. The Wisconsin DNR issues permits for septage and sludge disposal sites in Wisconsin.

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 14 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 14 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**

There are four closed LUST sites, one closed leak site, and one open spill site within the Unit Well 14 WHPA. The following will be completed for this management activity:

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 14 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 a WHP ordinance. 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 14 WHPA. A copy of the WHP ordinance is in Appendix M.

The following will be completed for this management activity:

1. The City of Madison will amend Section 28.06 of the Madison General Ordinances and add Wellhead Protection District No. 14.
2. The City of Madison will provide Dane County with a copy of the WHP ordinance and Unit Well 14 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, the City of Middleton, and Village of Shorewood Hills with a copy of:
  - a. The WHPP and maps showing the Unit Well 14 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 encourage the City of Middleton, and the Village of Shorewood Hills to review proposed development in the ZOCs in their jurisdiction, with regard to the Unit Well 14 recharge area.
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 Dane County, the City of Middleton, and Village of Shorewood Hills.
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 14 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 14, 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 14, 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 both water accountability in the distribution system and water conservation by the public.

During 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 N.

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

### 5.3 CONTINGENCY PLAN

The Utility has formulated a contingency plan for providing water in the event that Unit Well 14 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 14, 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 14 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 14, other wells in Zone 6, such as Wells 6 and 19, or Wells in Zone 7 could be used to serve the area.

Additionally, the City's wells and wellfields are widely spaced and generally have different recharge areas, thereby making them less vulnerable to potential localized contamination. Unit Well 14 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 14 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 14 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 14 ZOCs include property in the City of Madison, City of Middleton, and the Village of Shorewood Hills. 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

**TABLE 5-2  
EMERGENCY CONTACT NUMBERS  
WELLHEAD PROTECTION PLAN, UNIT WELL 14  
MADISON, WISCONSIN**

Emergency Contact	Name	Phone No.
Water Utility Emergency Service	On-call	Office: 608-266-4665
General Manager	David Denig-Chakroff	Office: 608-266-4651
Principal Engineer	Alan Larson	Office: 608-266-4653
Civil Engineer	Dennis Cawley	Office: 608-261-9243
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	Tim Studer	608-827-1050
Village of Shorewood Hills	Village Hall	608-267-2680
State Patrol	Emergency Administration	911 608-266-3212
Hazardous Material Response Team (DNR) Wisconsin Division of Emergency Mgt.	Leroy Conner	1-800-943-0003 (Menu)
Electric Utility	Madison Gas & Electric Emergency Service	608-252-1111

work together to consider the needs for WHP during planning and permitting processes. The City will provide Dane County, the City of Middleton, and the Village of Shorewood Hills with a copy of the WHPP and maps showing the Unit Well 14 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. The WHP ordinance helps ensure that future potential contamination sources located within the City of Madison are not located in the Unit Well 14 WHPA.