Wellhead Protection Plan
Unit Well 19
City of Madison, Wisconsin

Prepared for:
Madison Water Utility
119 East Olin Avenue
Madison, WI 53713

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W233 N2080 Ridgeview Parkway
Waukesha, WI 53188-1020

March 2011

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EXECUTIVE SUMMARY

This Wellhead Protection Plan (WHPP) has been prepared for City of Madison Unit Well 19. The primary goals of this WHPP are to define the WHPA for Unit Well 19 and establish specific criteria for protection of Unit Well 19 and groundwater resources in the WHPA including management strategies to maintain a high quality water supply, free of contamination. The primary goal of wellhead protection (WHP) planning is to protect water supply wells from contamination and, thereby, protect people who obtain their water supply from those wells. This WHPP was prepared to meet the requirements of the Wisconsin Administrative Code (WAC), Chapter NR 811, Section 16(5), for wellhead protection (WHP) planning.

Unit Well 19 is located at 2526 Lake Mendota Drive in the north-central part of the City of Madison. Construction of Unit Well 19 was completed in 1970. Unit Well 19 is 718 feet deep, is open to the lower bedrock (sandstone) aquifer, and has a design capacity of approximately 2,200 gallons per minute (gpm).

Unit well 19 is located in the northwest corner of the Biocore Prairie, which is part of the University of Wisconsin (UW) System, Lakeshore Nature Preserve. Land use in the area surrounding Well 19 is comprised of primarily undeveloped land, with the UW Nature Preserve to the north, east, and south, and UW System Eagle Heights Apartments complex to the west.

As part of the Dane County regional hydrologic study, a regional groundwater flow model was prepared for Dane County and was used to delineate time-related (5-, 50-, and 100-year time of travel (TOT)) zones of contribution (ZOCs) for municipal wells (Update Krohelski et. al., 2000) including Unit Well 19. The ZOCs for Unit Well 19 extend to the north and northeast in the simulated upgradient groundwater flow directions.

Figure 3-5 shows the wellhead protection area (WHPA) for Unit Well 19. 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 19. The WHPA will provide a conservative protection zone to account for changes in pumping rates, pumping duration, and interference drawdown from other existing and future wells.

As part of the WHP planning activities, a contaminant source inventory (CSI) was performed for the WHPA of Unit Well 19 in November and December, 2010. Known potential and existing contaminant sources within the Unit Well 19 WHPA include sanitary sewer; a closed leaking underground storage tank (LUST) site; an active above ground storage tank (AST); road salt use; and potential use of pesticide, herbicide, and nutrients on garden plots and on residential and commercial lawns.

Programs and activities to be used by the City of Madison and others for WHPA management at Unit Well 19 are grouped into five principal categories as follow:

1. Existing Programs

    a. Clean Sweep Collection Program
    b. On-site waste disposal (septic) system maintenance
    c. Private well abandonment

d. Land application of sludge and septage
e. Spill notification and awareness of remedial investigation and cleanup

2. Land Use Controls

a. Existing zoning/WHP overlay zoning and ordinance

3. Intergovernmental Cooperation

a. Land use planning and site plan review

4. Monitoring

a. CSI maintenance
b. Water quality monitoring

5. Public Education and Awareness

a. Availability of WHPP
b. Public informational meetings
c. News releases
d. Informational materials distributed to residents in WHPA
e. Land use and contaminant source awareness
f. School programs

Some of these programs and activities are currently being performed, while others are new and will be implemented immediately to help protect Unit Well 19.

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 19, or one or more of the City's other water supply wells become contaminated or out of service. Well 19 is part of the Main Pressure Zone. Other wells in the Main Pressure Zone can serve this area in the event Unit Well 19 is out of service.

This WHPP was prepared to provide measures to protect the City's water supply from becoming contaminated through the release of regulated or unregulated hazardous substances to the groundwater supply. The City has an existing WHP ordinance and overlay zoning district. The WHP ordinance and overlay zoning district helps ensure that no new potential contaminant sources are located in the Unit Well 19 WHPA. The ideas and actions presented in this WHPP should assist the City in their goal of maintaining a safe and plentiful water supply for years to come.

1.0 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

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

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

This WHPP was prepared for Unit Well 19 to conform to the requirements of the Wisconsin Administrative Code, Chapter NR 811, Section 16(5), for WHP planning, a copy of which is included in Appendix A. The project scope as defined by the Water Utility included the following tasks:

1. Research available information regarding the geology and hydrogeology of the well sites and aquifer parameters.

2. Research well construction and proposed operation of Unit Well 19.

3. Coordinate with the Utility to obtain the previously delineated WHPA's, which include the modeled 5, 50, and 100-year Time of Travel (TOT) capture zones for Unit Well 19, and a 1,200 foot set-back radius around Well 19.

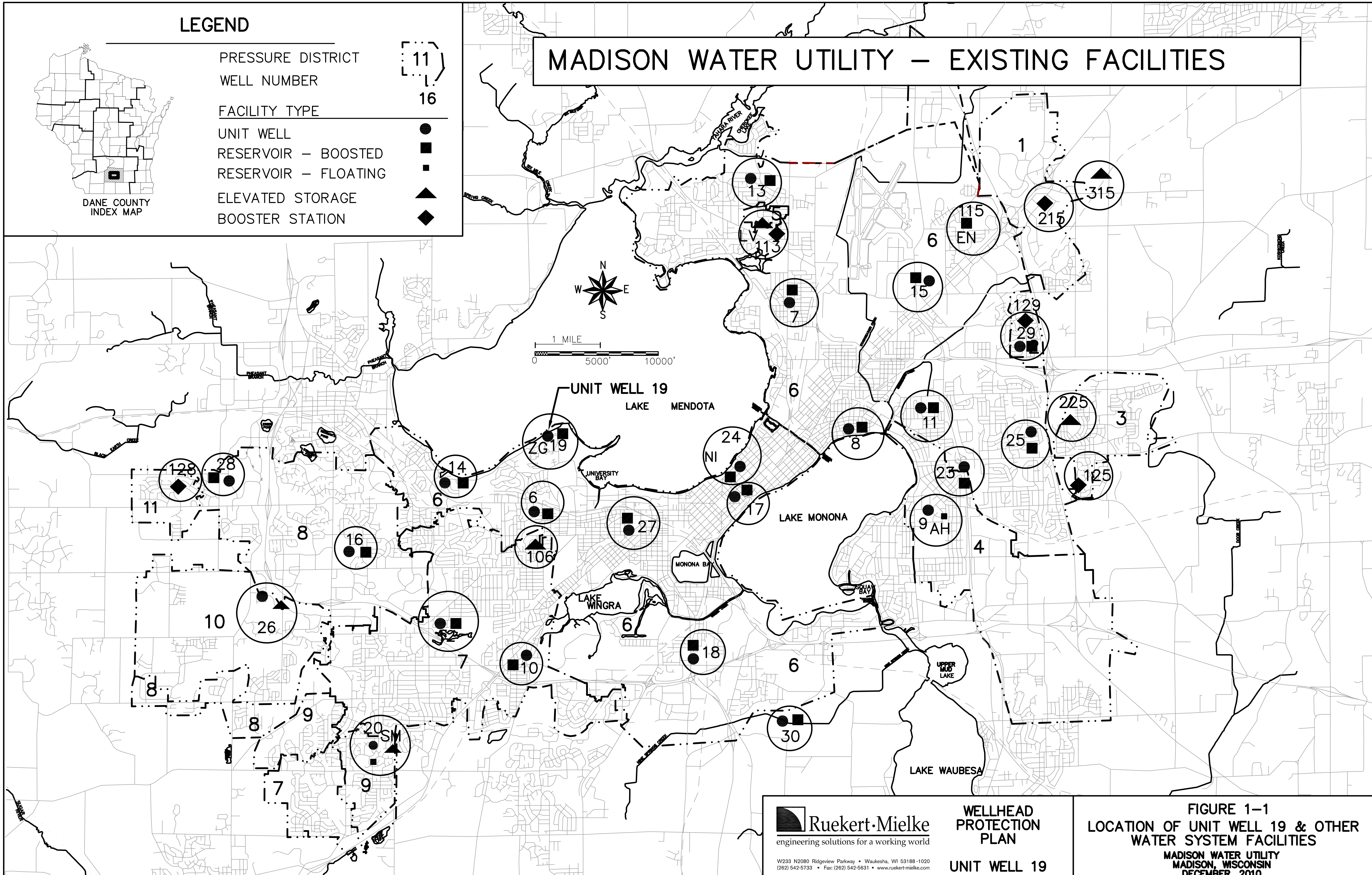
4. Perform a Potential Contaminant Source Inventory (CSI) to identify and characterize existing and potential contamination sources within a 1/2-mile radius and within the recharge area equivalent to the 100-year TOT capture zone delineated for Unit Well 19.

5. Assist with the development of WHP management strategies.

1.2 LOCATION AND BACKGROUND

Unit Well 19 is located at 2526 Lake Mendota Drive, near the north-central part of the City of Madison. The well site is located in the NW¼, NE¼ of Section 16, Township 7 North, Range 9 East, Dane County, Wisconsin. Figure 1-1 shows the location of Unit Well 19 and other water system facilities in the City of Madison. A portion of the survey plat showing the well site is included in Appendix B. Construction of Unit Well 19 was completed in 1970.

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


MADISON WATER UTILITY – EXISTING FACILITIES
LEGEND
PRESSURE DISTRICT 11
WELL NUMBER 16
FACILITY TYPE
UNIT WELL
RESERVOIR – BOOSTED
RESERVOIR – FLOATING
ELEVATED STORAGE
BOOSTER STATION
DANE COUNTY INDEX MAP
N
S
E
W
1 MILE
0
5000'
10000'
UNIT WELL 19
LAKE MENDOTA
LAKE MONONA
MONONA BAY
LAKE WINGRA
UPPER MUD LAKE
LAKE WAUBESA
UNIVERSITY BAY
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WELLHEAD PROTECTION PLAN
UNIT WELL 19
FIGURE 1–1
LOCATION OF UNIT WELL 19 & OTHER WATER SYSTEM FACILITIES
MADISON WATER UTILITY
MADISON, WISCONSIN
DECEMBER, 2010

The Utility serves approximately 235,000 people and consists of 22 deep wells, 28 booster pumping facilities, 24 ground storage reservoirs and approximately 840 miles of water transmission and distribution mains. The water system is divided into 10 pressure districts, or zones. The nearest Utility well to Unit Well 19 is Well 6, which is located approximately 1.1 miles south of Unit Well 19 in the northwest portion of pressure District 6, the City's Main Pressure Zone.

1.3 UNIT WELL 19

Unit Well 19 is constructed to a depth of 718 feet. The well is cased with 30-inch OD steel casing, which is grouted to a depth of 260 feet below ground surface. A 26-inch diameter open borehole extends from 260 feet to 711.5 ft bgs, where the wellbore then narrows to 24-inch diameter to a depth of 714 ft bgs. The bottom 4 feet of the wellbore is completed to a diameter of 17 inches.

Sandstone bedrock was encountered at a depth of 15 feet in Unit Well 19. The predominant lithology encountered in the open wellbore was sandstone, with minor amounts of other material randomly distributed throughout the formation open to the well bore. Shale was encountered in the Eau Claire formation between the depths of 220 to 225 ft bgs and 245 to 255 ft bgs, and at the base of the well, in the Pre-Cambrian-age formation, at a depth of 710 to 718 ft bgs. A zone of conglomerate was encountered near the base of the Mount Simon formation, at a depth of 640 to 645 ft bgs. Several thin carbonate Beds were present near the top of the Mount Simon, between the depths of 255 to 258 ft bgs, 300 to 305 ft bgs, and 365 to 370 ft bgs.

Well 19 was test pumped at a rate of 2,250 gpm for 10-hours, and had a specific capacity of 14.1 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 19 was 62.8 feet below top of casing. The most recent static water level measurement was 66.5 feet, as measured on January 26, 2011. A construction report and formation log prepared by the WGNHS is in Appendix C.

2.0 HYDROGEOLOGIC CONDITIONS

2.1 LAND USE, TOPOGRAPHY, AND DRAINAGE

Unit Well 19 is located in the northwest corner of the Biocore Prairie, which is part of the University of Wisconsin (UW) System, Lakeshore Nature Preserve. Land use in the area surrounding Well 19 is comprised of undeveloped land, with the UW Nature Preserve to the north, east, and south, and UW System Eagle Heights Apartments complex to the west. Located directly south of the underground reservoir of Unit Well 19, and within the UW Nature Preserve, is the UW Eagle Heights Community Gardens, which contains numerous individual plots managed and cared for by residents of Eagle Heights and other UW and Madison communities. Current zoning immediately around Unit Well 19 is Residential (R4) and Conservancy (C). A copy of the City of Madison zoning map, which identifies the location of Unit Well 19 is included in Appendix D. The north-eastern boundary of the Village of Shorewood Hills is located approximately 2,700 feet southwest of Unit Well 19. At its closest point, to the southwest of Frautschl Point, Lake Mendota is approximately 900 feet northwest of Unit Well 19.

Unit Well 19 is located in an area covered by a relatively thin veneer of glacial till. The topography in the immediate vicinity of the well site is relatively flat to gently rolling, with moderately steep slopes to Lake Mendota, approximately 900 feet to the northwest. The ground surface elevation at Unit Well 19 is approximately 898 feet above mean sea level (MSL). Locally, drainage from Unit Well 19 is predominantly to the northeast, towards Lake Mendota.

2.2 GEOLOGY

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

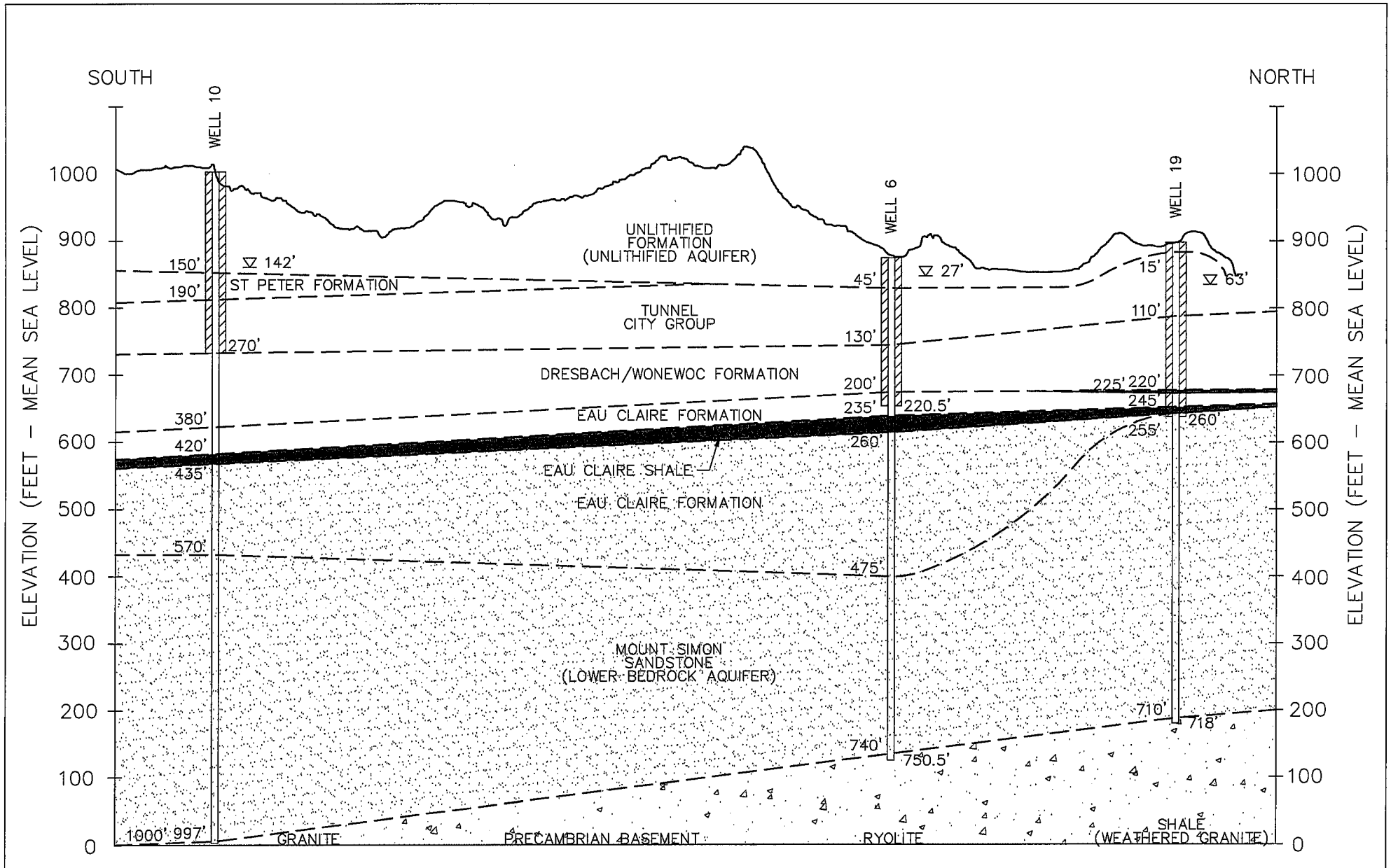
Figure 2-1 is a geologic cross-section through Unit Wells 10, 6, and 19. A formation log for strata encountered at Unit Well 19 is in Appendix C. A brief description of the stratigraphic sequence encountered in Unit Well 19 follows.

2.2.1 Precambrian Basement Bedrock

Precambrian-age bedrock was encountered in Unit Well 19 at a depth of 710 feet below ground surface. The Precambrian-age bedrock encountered in Unit Well 19 is described as shale (Wisconsin Geological and Natural History Survey (WGNHS) well log DN-715), but is likely weathered Precambrian-age igneous or metamorphic bedrock.

2.2.2 Cambrian Bedrock

Cambrian-age rocks encountered in Unit Well 19 include, in ascending order, the following units: Mount Simon Formation, Eau Claire Formation, Wonewoc Formation, and the Tunnel City Group.



LEGEND

- WELL
- POTENTIOMETRIC SURFACE DEPTH (FEET) (AT TIME OF CONSTRUCTION)
- WELL CASING
- OPEN BOREHOLE

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FIGURE 2–1

GEOLOGIC CROSS–SECTION THROUGH MADISON UNIT WELLS 10, 6 & 19

MADISON, WISCONSIN
NOVEMBER, 2010

The Cambrian-age bedrock formations in the Madison area are generally relatively flat lying in the east-west direction and dip slightly to the south. The cross-section shows a very gentle dip to the south towards Unit Wells 6 and 10. 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. As shown in Figure 2-1 the strata above the Tunnel City Group at Unit Well 19 consists of the Ordovician-age St. Peter sandstone, which is present in Unit Well 10 and subsequently pinches out to the north, and unconsolidated deposits (silt, clay and sandy material). A yellow-gray to grey, dolomitic, silty-shale layer ranging in thickness from approximately 5 to 25 feet thick appears to be laterally extensive through the Eau Claire Formation The depth of the Eau Claire shale ranges from 420 feet in well 10 to 220 feet in well 19.

2.2.3 Unlithified Deposits

The bedrock in the well 19 study area is covered by unlithified (unconsolidated) glacial till and alluvial deposits. Clayton and Attig (1997) classify the local near surface unlithified deposits in the immediate vicinity of Unit Well 19 as part of the Horicon Member of the Holy Hill Formation, which were deposited by the Green Bay Lobe. Clayton and Attig (1997) report that the near surface formation is uniform till deposited during the last part of the Wisconsin Glaciation, with the surficial geology generally consisting of a smooth streamlined topography with drumlins.

At Unit Well 19, the driller described the formation from the top of the sandstone bedrock (encountered at a depth of 15 feet) to the ground surface as clay and sand, with the WGNHS classifying the material as orange-brown clay and sand.

Surficial soils in the immediate vicinity of Unit Well 19 consist of the Dodge silt loam, McHenry silt loam, and the St. Charles silt loam (NRCS web Soil Survey, 2008). The McHenry, St. Charles, and Dodge silt loam are considered to have good contaminant attenuation potential. The DCRPC assigned a risk classification of low to moderate from surface activities in the Unit Well 19 area on the basis of several factors including soil properties, depth to water, and depth to bedrock, (DCRPC, 1999).

2.3 HYDROGEOLOGY

In the Unit Well 19 study area, groundwater occurs within the lower bedrock aquifer, the upper bedrock aquifer, and the unconsolidated (sand and gravel) aquifer. Municipal and industrial wells are constructed into the lower and deeper bedrock aquifer. Review of the available private well data bases indicates that no private or residential wells are present in the upper bedrock aquifer or sand and gravel aquifer in the WHPA or 100-year capture zone of Unit Well 19. A brief discussion of the aquifers at the site follows.

2.3.1 Lower Bedrock Aquifer

The Mount Simon Formation and lower part of the Eau Claire Formation comprise the lower bedrock aquifer. Precambrian-age bedrock forms the base of the lower bedrock aquifer, while the shale layer in the Eau Claire Formation acts as the upper confining unit. Water occurs within the lower bedrock aquifer in horizontal and vertical fractures, along bedding planes, and

in the more porous and less well cemented portions of the lower sandstone formations. The saturated thickness of the lower bedrock aquifer appears to be approximately 650 feet thick in Unit Well 19. The hydraulic conductivity of the lower bedrock aquifer is estimated to be approximately 10 feet per day (ft/day) (Krohelski et. al., 2000).

The grouted casing in Unit Well 19 is set to a depth of 255 feet below ground surface, which is five feet below the Eau Claire shale confining layer. Therefore, Unit Well 19 is open to only the lower bedrock aquifer, and water levels measured in Well 19 are believed to represent the potentiometric surface lower bedrock aquifer. The static water level in Unit Well 19, as measured upon completion of the well in April 1970, was approximately 63 feet below the top of casing.

The simulated potentiometric surface in the lower bedrock (Mount Simon) aquifer using 2000 head data is presented in Figure 4 of Appendix E, and indicates that the general direction of deep groundwater flow is toward Unit Well 19 from west-northwest, west and southwest. The 2030 simulated potentiometric surface in the Mount Simon aquifer is presented in Figure 6 of Appendix E, and indicates that the general direction of deep groundwater flow is toward Unit Well 19 from the north-northeast (DCRPC, 2004). The potentiometric surface elevation in the vicinity of Unit Well 19 in 2000 was approximately 850 feet MSL and slightly less than 840 feet MSL in 2030.

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

2.3.2 Upper Bedrock Aquifer

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

At Unit Well 19, the thickness of the bedrock above the shale confining layer in the Eau Claire Formation is 157 feet. The elevation of the water table surface at Unit Well 19 was not measured. The elevation of the simulated water table surface in the vicinity of Unit Well 19 is approximately 855 feet above MSL (Figure 3 [DCRPC, 2004] in Appendix F). The saturated thickness of the upper bedrock aquifer at Well 19 is estimated at approximately 175 feet.

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

2.3.3 Sand and Gravel Aquifer

The sand and gravel aquifer (or upper unconsolidated aquifer) occurs in the relatively shallow sand and gravel deposits (if present). The unlithified materials are thin in the vicinity of Unit Well 19 and the driller did not report whether saturated formation was encountered in the unlithified materials during drilling activities. The hydraulic parameters of the upper sand and gravel aquifer can vary significantly (by several orders of magnitude) over very short distances.

For modeling purposes, Krohelski, et. al., 2000, assumed a hydraulic conductivity of 7 ft/day and a porosity of 20 percent for the sand and gravel aquifer.

2.3.4 Groundwater Flow System

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

Recharge to the unconsolidated aquifer and shallow bedrock aquifers is provided by precipitation that infiltrates through the till layer and into the upper bedrock aquifer. In some areas, a small percentage of water moves downward from the upper bedrock aquifer through the Eau Claire confining layer and into the lower bedrock aquifer. Map 7 in Appendix E shows the location of Well 19, and areas of recharge to and discharge from the lower bedrock (Mount Simon) aquifer (Bradbury et. al, 1999; DCRPC 1999). Discharge from the unlithified and shallow bedrock aquifers is to pumping wells and/or to surface waters (lakes, streams, and wetlands) in the area. Locally, discharge from the lower bedrock aquifer is primarily to pumping wells.

3.0 WELLHEAD PROTECTION AREA DELINEATION

This chapter describes methodologies used to define the Zone of Influence (ZOI) and ZOC for Unit Well 19.

3.1 ZOI

The ZOI for Unit Well 19 was estimated in accordance with Wisconsin Department of Natural Resources (DNR) requirements, and was based on 30 days of continuous pumping at full capacity, assuming no recharge to the aquifer. The ZOI for Unit Well 19 was determined using the Jacob modified nonequillibrium equation to estimate the theoretical drawdown in the well, followed by calculating the slope of the cone of depression. The ZOI was then determined by graphical analysis to be approximately 30,000 feet (5.7 miles). These estimated ZOI is considered to offer a conservative estimate of the extent of the ZOI because the Jacob modified nonequillibrium equation does not account for recharge to the aquifer, aquifer heterogeneity, or the effects of potential hydraulic boundaries. For the ZOI calculation, it was assumed that the entire open borehole (open to the lower sandstone bedrock aquifer), supplies water to Unit Well 19. Distance–drawdown calculations are presented in Appendix G.

3.2 GROUNDWATER MODEL DEVELOPMENT AND ZOC DELINEATION

As part of the Dane County regional hydrologic study, a regional groundwater flow model was prepared for Dane County and was used to delineate time-related ZOCs for municipal wells (Krohelski et. al., 2000) including Unit Well 19. The Dane County regional hydrologic study was conducted cooperatively by the WGNHS, DCRPC, and the United States Geological Survey (USGS). The USGS modular groundwater modeling code (MODFLOW (McDonald & Harbaugh, 1988)) was used to simulate groundwater flow. After the calibrated groundwater flow model was prepared, PATH3D (Zheng, 1991) was used to determine time-related ZOCs.

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

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

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

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

Simulation No. 2 was performed using the "maximum sustained pumping rate" or "one-half design capacity" (Bradbury, 1998). The maximum sustained pumping rate (one-half design capacity) for Unit Well 19 is 1.567 MGD, and is equivalent to pumping continuously at a rate of 1,088 gpm.

Simulation No. 3 was performed using full design capacity. Full capacity for Unit Well 19 is 3.132 MGD. Pumping at a rate of 3.456 MGD is equivalent to pumping continuously at a rate of 2,175 gpm.

Simulation No. 4 was performed using the average pumping rate during the maximum pumpage year for Unit Well 19. The maximum pumpage year for Unit Well 19 was 2005. The calculated average pumping rate during 2005 was 1,019 gpm, which is equivalent to 1.467 MGD.

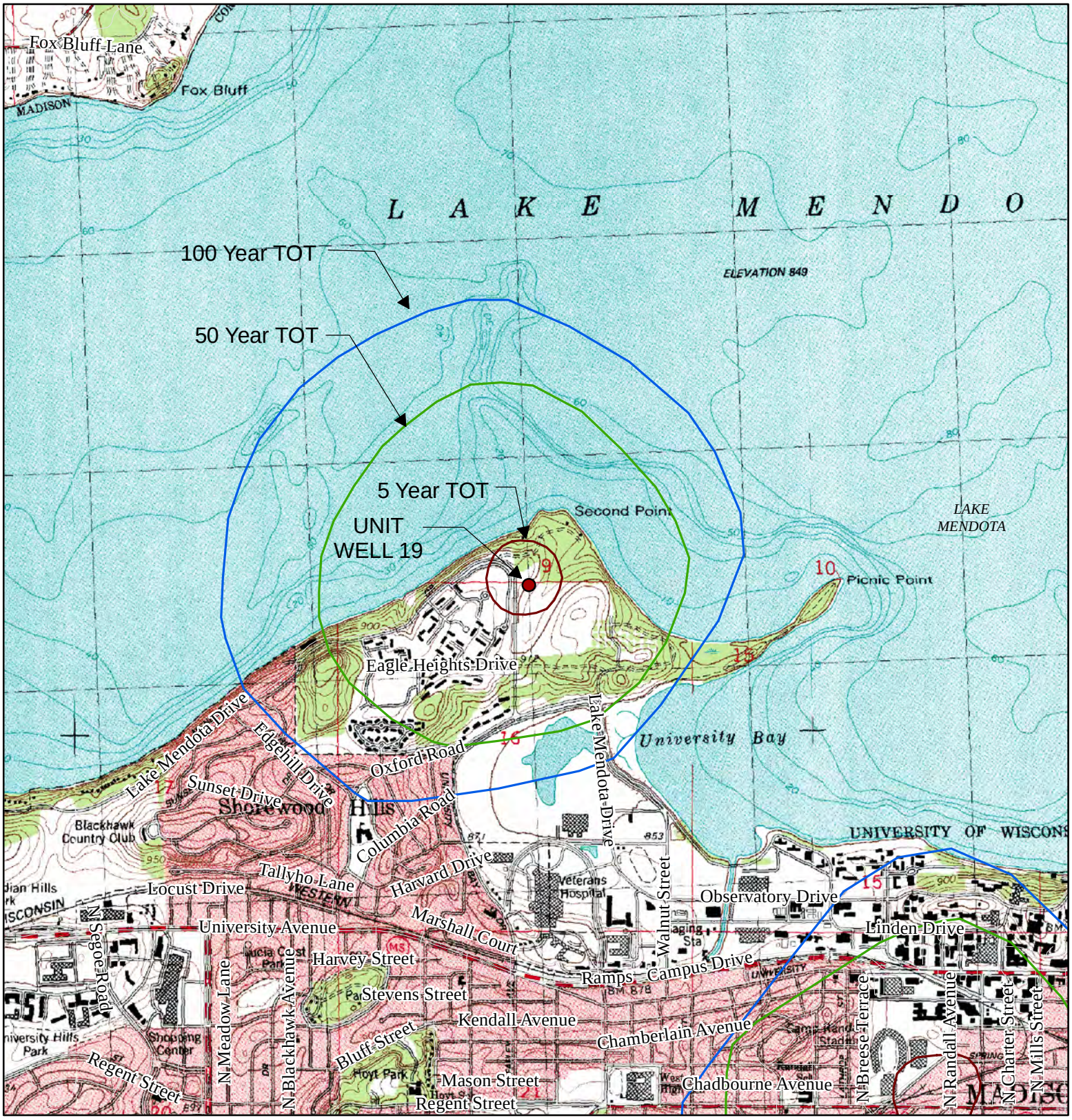
PATH3D (Zheng, 1991) was used to determine the time-related ZOCs for Unit Well 19. Particles were input in the model around Unit Well 19 and then tracked backward from the well to points where they enter the groundwater flow system.

3.3 ZOC

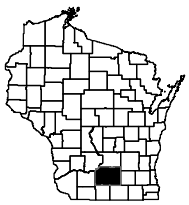
The area that recharges or contributes water to Unit Well 19 is defined as the zone of capture (ZOC), or more commonly referred to as the capture zone. The areal extent of the capture zone depends on the pumping rate, amount of horizontal and vertical recharge, aquifer hydraulic characteristics, pumping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

Figure 3-1 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 19 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 19 based on the one-half design capacity pumping rate (Simulation No. 2). Simulation No. 3 is illustrated in Figure 3-3, and shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 19 based on the full design capacity pumping rate. Figure 3-4 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 19 based on the average pumping rate for Unit Well 19 for the maximum year (Simulation No. 4).

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



Dane County



Index Map

FIGURE 3-1

5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING
PROJECTED 2030 PUMPING RATE
UNIT WELL 19
MADISON, WISCONSIN

1 0.5 0 1 Miles

2,000 1,000 0 2,000 4,000 6,000 Feet

N

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

Scale 1:24,000

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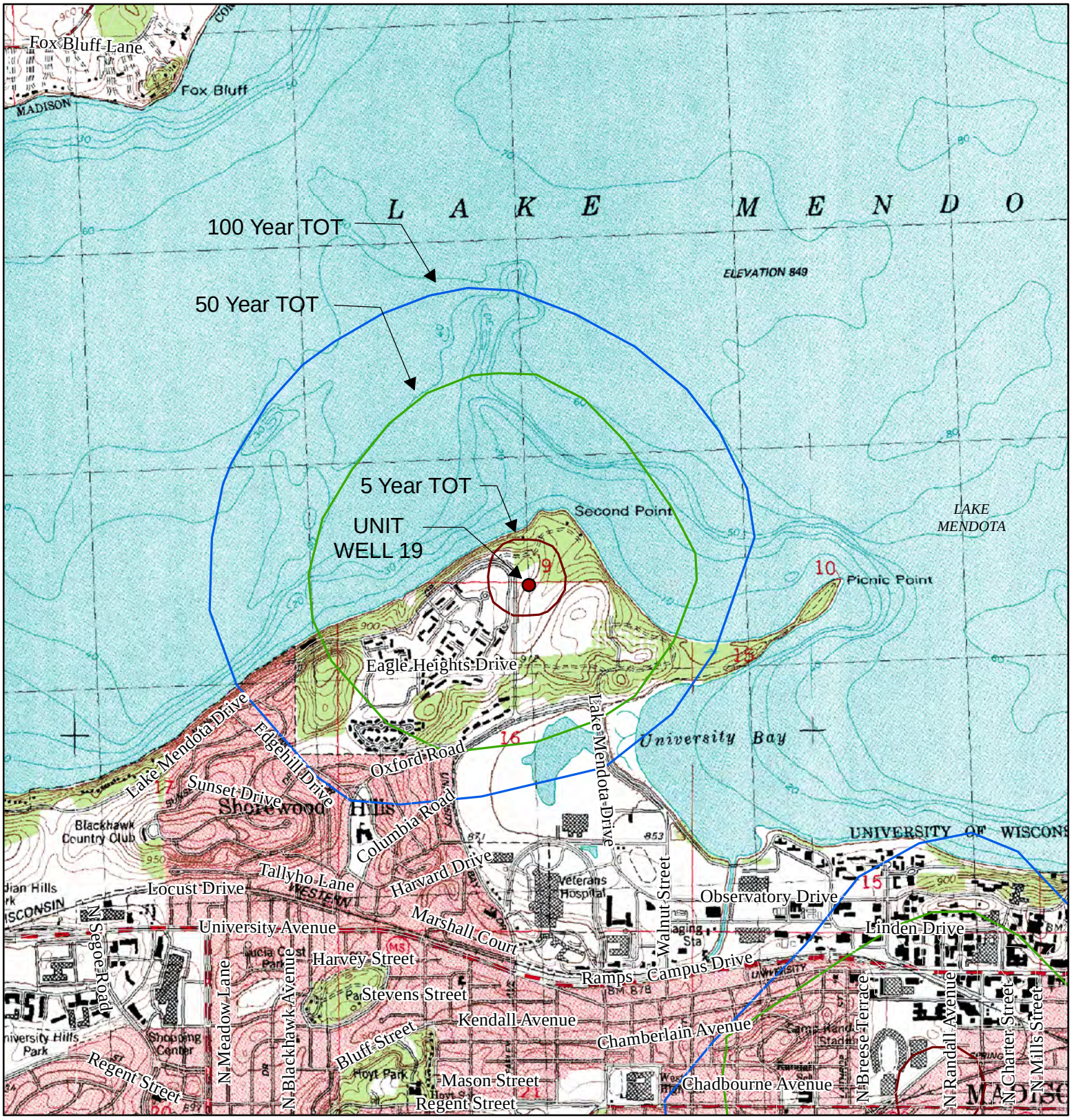

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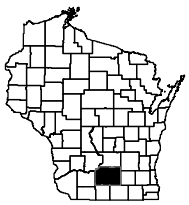

Index Map

FIGURE 3-2

5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING
50 PERCENT CAPACITY PUMPING RATE
UNIT WELL 19
MADISON, WISCONSIN

1 0.5 0 1 Miles

2,000 1,000 0 2,000 4,000 6,000 Feet

N

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

Scale 1:24,000

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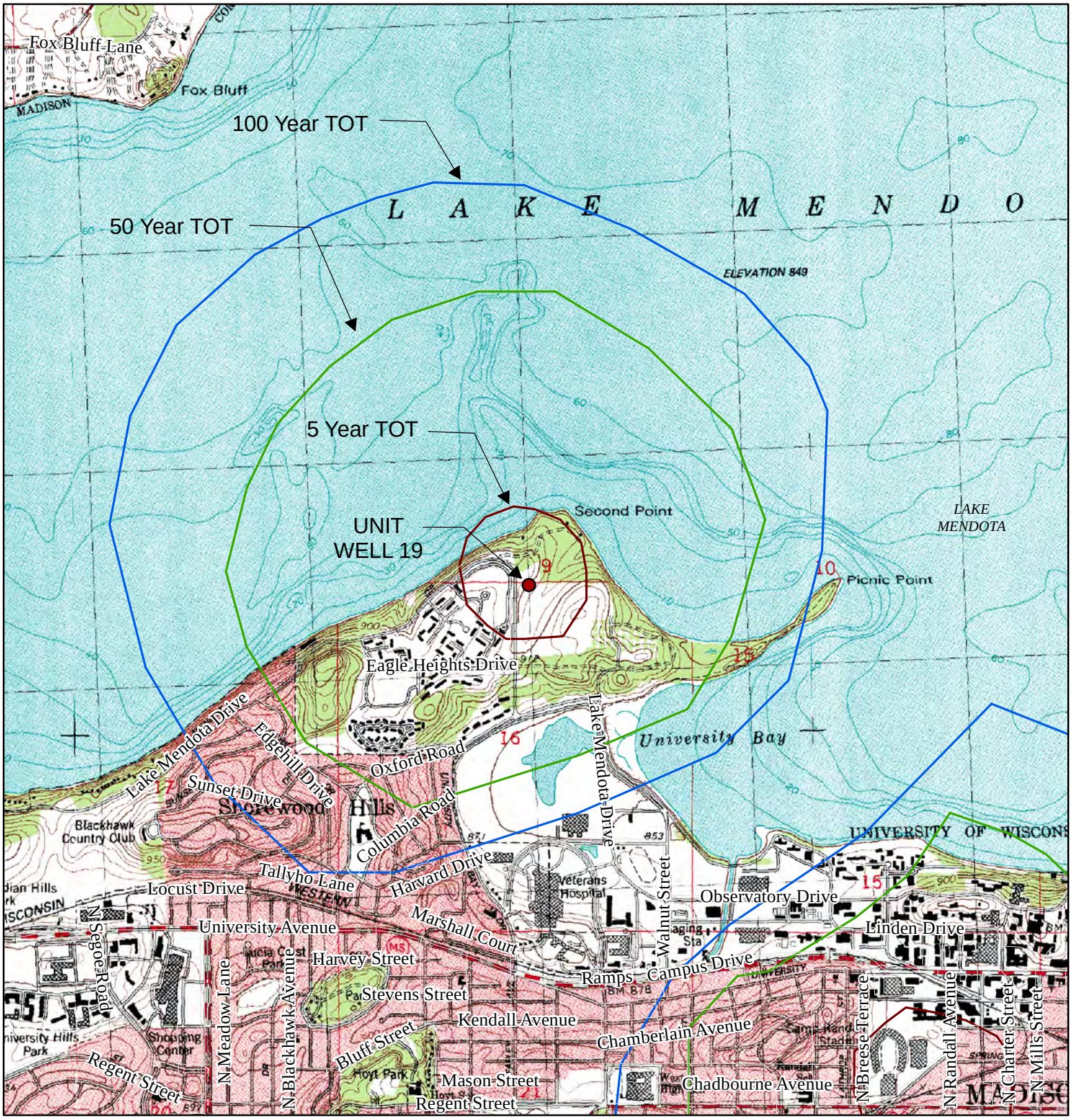

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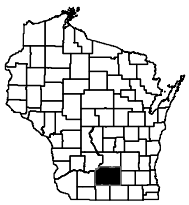

Index Map

FIGURE 3-3

5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING
FULL CAPACITY PUMPING RATE
UNIT WELL 19
MADISON, WISCONSIN

1 0.5 0 1 Miles

2,000 1,000 0 2,000 4,000 6,000 Feet

N

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

Scale 1:24,000

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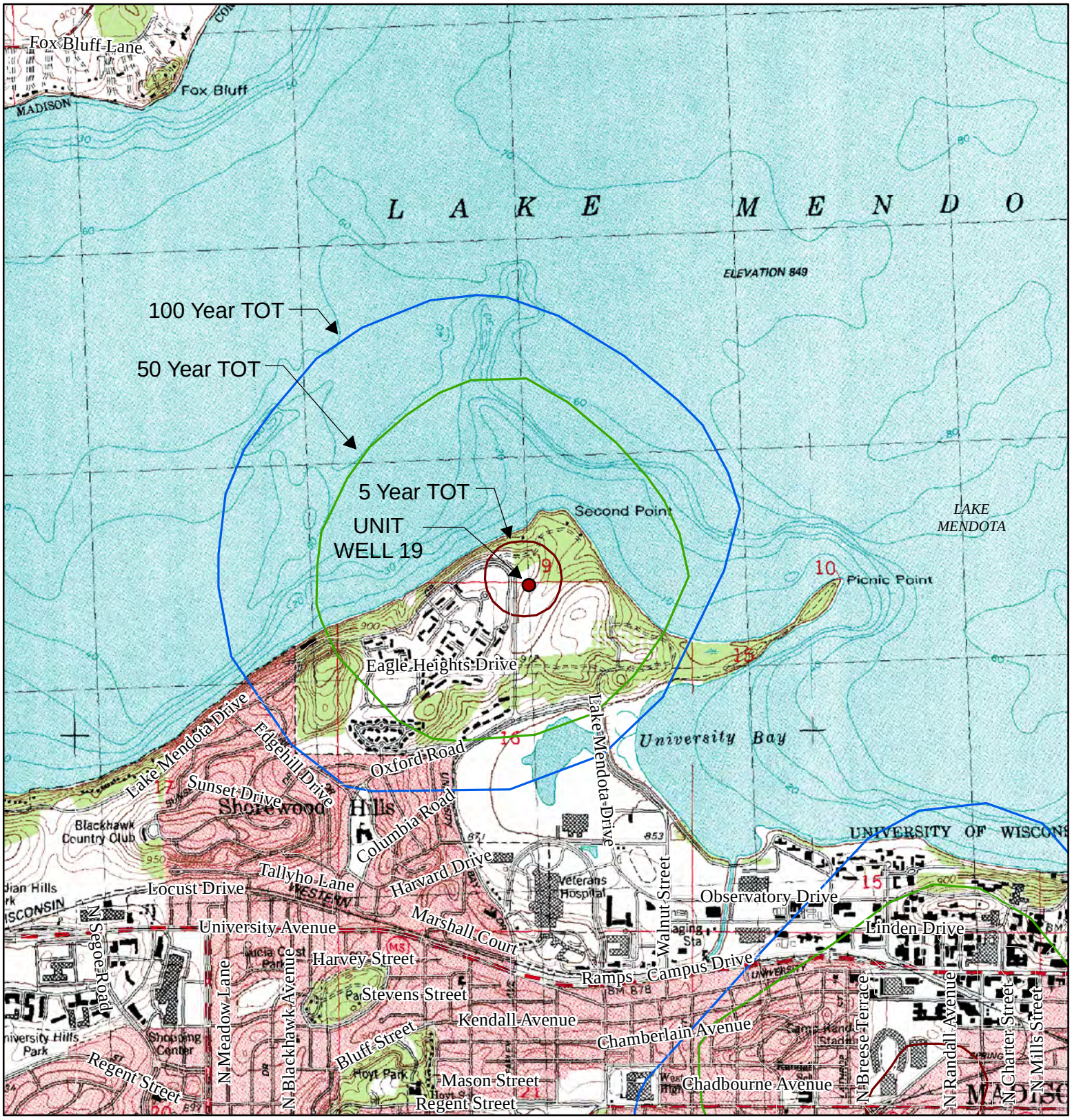

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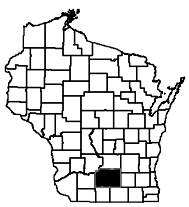

Index Map

FIGURE 3-4

5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING
PUMPING AT AVERAGE RATE DURING
THE MAXIMUM YEAR
UNIT WELL 19
MADISON, WISCONSIN

1 0.5 0 1 Miles

2,000 1,000 0 2,000 4,000 6,000 Feet

N

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

Scale 1:24,000

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TABLE 3-1
SUMMARY OF EXTENT OF ZOCs (CAPTURE ZONE)
WELLHEAD PROTECTION UNIT WELL 19
MADISON, WISCONSIN

Item	Simulation No. 1 (projected 2030 pumping rates)	Simulation No. 2 (one-half design capacity pumping rates)	Simulation No. 3 (continuous pumping at full capacity)	Simulation No. 4 Average Pumping Rate During Maximum Pumpage Year
Simulated Pumping Rate (MGD)	1.440 (1,000 GPM)	1.567 (1,088 GPM)	3.132 (2,175 GPM)	1.467 (1,019 GPM)
Upgradient Extent of ZOC (feet)				
5-year TOT	600 – 700	600 – 700	1,150 – 1,250	650 – 700
50-year TOT	3,000 – 3,200	3,000 – 3,300	4,100 – 4,600	2,850 – 3,250
100-year TOT	4,200 – 4,600	4,400 – 4,850	5,200 – 6,600	4,100 – 4,800
Downgradient Extent of ZOC (feet)				
5-year TOT	400	500	750	450

Notes:

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

Figure 2 in Appendix H shows ultimate regional ZOCs for Unit Well 19 and for other select high capacity wells in Dane County. Groundwater flow path lines extend upgradient from Well 19 for a distance of slightly more than 1 mile.

3.4 WELLHEAD PROTECTION AREA

The Wisconsin Administrative Code (Chapter NR 811.16(5) (e)) requires that a WHPA for a municipal water supply well "encompass, at a minimum, that portion of the recharge area equivalent to a 5-year TOT to the well." Any of the four simulations described above could be used to model the 5-year TOT ZOC for Unit Well 19. It is possible that Unit Well 19 could be pumped at maximum capacity without interruption. Therefore, to provide a very conservative estimate (over estimation) of the capture zone for Well 19, simulation No. 3 was used to generate the long-term capture zone and WHPA for Unit Well 19 in this WHPPP.

In Simulation No. 3, the 5-year TOT ZOC for Unit Well 19 extends in the upgradient direction up to approximately 700 feet, and approximately 500 feet down gradient from the well. In the same simulation, the 100-year TOT ZOC extends approximately 1 mile to 1.25 miles up gradient from Unit Well 19. More than half of the 50 and 100-year TOT ZOC extends beneath Lake Mendota.

Figure 3-5 shows the WHPA for Unit Well 19. Two zones of protection are identified within the WHPA. Zone A is the area around Unit Well 19 that is defined by the 5-year TOT ZOC delineated for Simulation No. 3 (continuous pumping at full capacity). Zone B is the area around Unit Well 19, beyond Zone A, that is defined by a 1,200-foot fixed radius around Unit Well 19. This radius is selected because the Wisconsin Administrative Code Chapter (WAC) NR 811.16(4) requires a 1,200-foot separation distance between a municipal water supply well and select contamination sources. WAC ch. NR 811 specifies lesser separation distances for other potential contamination sources.

For Unit Well 19, the delineated boundary of WHPA Zone B is slightly larger than the modeled 5-year TOT ZOC. The delineated WHPA for Unit Well 19 should provide a conservative zone of protection for the well and should account for changes in pumping rates, pumping duration, interference drawdown from other existing and future wells, changes in head in the aquifer, and prevent future new potential contaminant sources or activities from occurring within the delineated WHPA. The WHPA is located entirely within the City of Madison, with a portion of the 50-year and 100-year TOT capture zones extending over the northwest corner of the Village of Shorewood Hills.

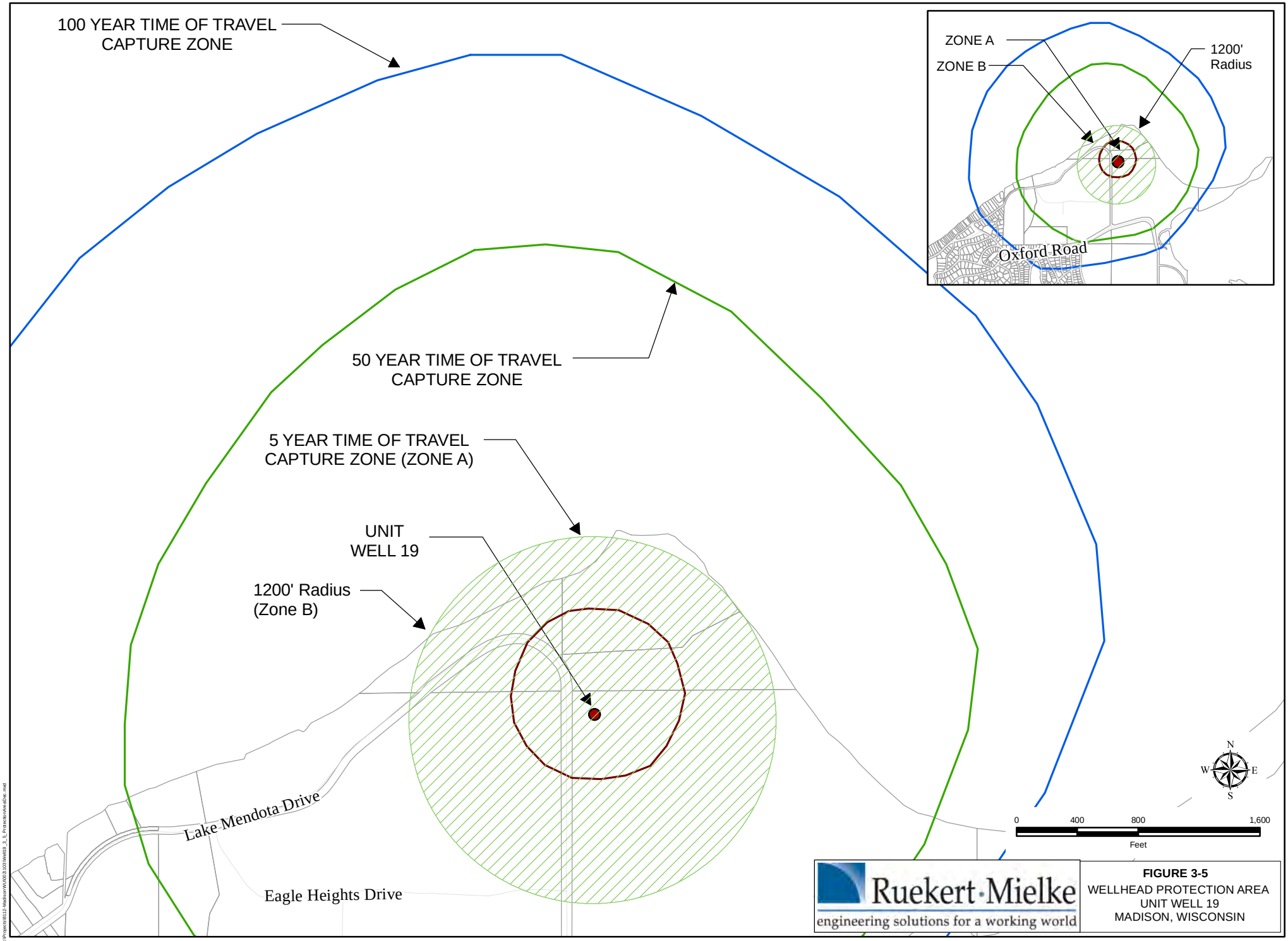

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FIGURE 3-5
WELLHEAD PROTECTION AREA
UNIT WELL 19
MADISON, WISCONSIN

4.0 POTENTIAL CONTAMINANT SOURCES

4.1 CONTAMINANT SOURCE INVENTORY

A contaminant source inventory (CSI) was performed for the Unit Well 19 study area during November 2010. The CSI consisted of a search of government records, applicable DNR Web sites, and a windshield reconnaissance survey of the area within a ½-mile radius and the recharge area equivalent to the delineated 100-year TOT of Unit Well 19, as applicable (the windshield survey did not include the area in the 100-year TOT that was projected beneath Lake Mendota). The windshield survey also included visual observation of the general land use and activities, which may adversely impact Unit Well 19 in the future.

The locations of identified potential, existing, and former contaminant sources in the WHPA, within a ½-mile radius of Unit Well 19, and within the recharge area equivalent to the delineated 100-year TOT of Unit Well 19 are illustrated on Figure 4-1 and 4-1P. A summary of the identified potential contaminant sources within the WHPA study area is presented in Table 4-1.

Potential, existing, and former contaminant sources within the WHPA and capture zone for Unit Well 19 include active above ground storage tank (AST) sites; closed leaking underground storage tank (LUST) sites; closed and active underground storage tank (UST) sites, a Bureau for Remediation and Redevelopment Tracking System (BRRTS) site, road salt use; and probable use of pesticide, herbicide, and nutrients on commercial and residential lawns and gardens. 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 50 and 100-year TOT of Unit Well 19.

The nearest sanitary sewer main is located Lake Mendota Drive, approximately 260 feet west of Unit Well 19. A sewer lateral extends to Unit Well 19. Additional sanitary sewers are located throughout the study area.

Based on the site reconnaissance and a review of the Wisconsin registered storage tank list, one active AST site located within the WHPA of Unit Well 19. The active site consists of a 490-gallon fuel oil (diesel) tank located approximately 50 feet north west of Unit Well 19 and is associated with the emergency generator set-up at Unit Well 19. The tank is reported to be of single wall construction. It is not known if secondary containment is utilized at this location. This site is considered to present a moderate to high threat of contamination to Unit Well 19.

There is one reported LUST site in the WHPA of Unit Well 19. The site, referred to as the University of Wisconsin/Jackson Property, was closed by the DNR on April 10, 2000. The site was characterized by soil and groundwater contamination and was closed with a groundwater use restriction due to on-site groundwater contamination, which exceeded the WAC ch. NR 140 enforcement standard (ES). At the time of site closure, one shallow monitoring well was reported to contain benzene at a concentration exceeding the ES. The ES for benzene is 5 parts per billion. The University of Wisconsin/Jackson Property site boundary is located approximately 410 feet north of Unit Well 19. The former UST and impacted monitoring well are located approximately 1,100 feet from Unit Well 19. According to documentation in the site closure report, the shallow groundwater flow direction in the vicinity of the impacted groundwater is generally to the north, towards Lake Mendota, which is approximately 30 feet

100 Year TOT

50 Year TOT

1/2 Mile Radius

5 Year TOT

UNIT
WELL 19

1200'
Radius

N
W E
S

0 400 800 1,600

Feet

55 POTENTIAL CONTAMINANT SOURCE OR ROUTE TOT-TIME OF TRAVEL

Eagle Heights Drive
University Houses
Lake Mendota Drive
University Bay Drive
Lake Mendota Drive
Haight Road
Oxford Road
Bowdoin Road
Dartmouth Road
Sweetbriar Road
Wellesley Road
Amherst Drive
Circle Close
Topping Road
Highbury Road
Tallyho Lane
Harvard Drive
Columbia Road
Unnamed
Yale Road
Hunter Hill
Colgate Road
Hartford Drive
Beloit Court
Cornell Court
Walnut Street
Marsh Terrace
Sumac Drive
Edgehill Parkway
Edgehill Drive
Crestwood Drive
Shady Lane
Viburnum Drive
Sunset Drive
Blackhawk Drive
Oak Way
Wood Lane
Wood Circle
Maple Terrace
Burbank Place
Fern Drive
Highbury Road
Western Road
Locust Drive
Purdue Street
Old Middleton Road
University Avenue

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FIGURE 4-1
CONTAMINANT SOURCE INVENTORY
UNIT WELL 19
MADISON, WISCONSIN

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TABLE 4-1
CONTAMINANT SOURCE INVENTORY SUMMARY
WELLHEAD PROTECTION UNIT WELL 19
MADISON, WISCONSIN
DECEMBER 2010

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 19	Location within Capture Zone	Estimated Threat to Supply Wells
1(A5)	Madison Gas & Electric/Well 19 2526 Lake Mendota Dr	Site Reconnaissance EDR Report- WI - Registered AST (Facility ID 664700)	Operational AST. 490 gallons fuel oil, single wall, secondary containment unknown	Active	50 ft. Northwest	Zone A	Moderate - High
2	City of Madison Streets throughout Area	Site Reconnaissance City Maps	Sanitary Sewer	Active	260 ft. (West at Nearest Point)	Zone B	Low - Moderate
3	UW Madison/Eagle Heights Community Gardens	Site Reconnaissance, UW System Web site	Organic Gardens, therefore organic fertilizers and potentially subject to inorganic pesticides, herbicides and fertilizers.	Active	700 ft. South	Zone B	Low
4(A2)	UW Madison/Jackson Property 1601 Lake Mendota Dr Madison, WI	EDR Report – WI WRRSER DNR Remediation and Redevelopment and BRRTS Web sites WI - LUST (DNR Activity No. 03-13-000338)	LUST, Petroleum contamination, soil and groundwater. Case closed on 10/05/2000 with groundwater use restriction and place on GIS Registry.	Closed with Groundwater Use Restriction and GIS Registry	950 ft. North (Site Boundary)	Zone A	Low - Moderate
5 (A3)(A4)	UW Foundation 1601 Lake Mendota Dr Madison, WI	EDR Report- WI - Registered UST's (Facility ID 130873)	Closed/removed, 300-gallon gasoline Closed/removed, 500-gallon fuel oil	Closed	1,100 ft. Southwest (exact location unknown)	Zone B	Low
6	UW System/Maintenance Yard Southwest corner of Eagle Heights Dr. & Lake Mendota Dr.	Site Reconnaissance	Miscellaneous Storage and Recyclables, Appliances, and Soil.	Active	1,400 ft. Southwest	½-mile radius	Low
7	Madison Gas and Electric Utility Haight Rd.	Site Reconnaissance	Transformers	Active	2,550 ft. Southwest	½-mile radius	Low
8(1)	UW System Environmental Health & Safety, Office Building, Family Housing, University Houses	EDR Report- WI - Registered UST (Facility ID 115222)	Closed/Removed USTs: 500-gallon unleaded (Tank ID No. 272710); 500-gallon leaded gasoline (Tank ID No. 272711).	Closed	2,900 ft. Southwest	Zone B	Low
9 (B7, B8)	UW System Environmental Health & Safety Maintenance 2902 Haight Rd.	EDR Report - Site Reconnaissance	Two operational AST's. Approximately 500 gallons each. Fenced-in. No apparent secondary containment.	Active	2,900 ft. Southwest	50 year TOT	Low - Moderate
10(B6)	UW System Environmental Health & Safety Maintenance 2902 Haight Rd.	EDR Report- WI - Registered UST (Facility ID 609955)	Closed/Removed USTs: Five, 700-gallon UST's unknown contents. Two 550-gallon gasoline UST's	Closed	2,900 ft. Southwest	50 year TOT	Low
11	UW Madison/University Houses Community Gardens	Site Reconnaissance, UW System Web site	Gardens, potentially subject to inorganic pesticides, herbicides and fertilizers.	Active	3,500 ft. Southwest	50 year TOT	Low
12(10)	Nancy Westman 1234 Dartmouth Rd Shorewood Hills, WI	EDR Report- WI - Registered UST (Facility ID 113128)	Closed/Removed, 360-gallon Fuel Oil	Closed	3,700 ft. Southwest	50 year TOT	Low
13(12)	Classic Home Residential Design 1210 Bowdoin Rd Shorewood Hills	EDR Report- WI - Registered UST (Facility ID 702934)	Closed/Removed, 1000-gallon Fuel Oil	Closed	3,780 ft. Southwest	100 year TOT	Low
14(13)	Sachnoff & Weaver 2816 Columbia Rd Shorewood Hills	EDR Report- WI - Registered UST (Facility ID 180271)	Closed/Removed, 1000-gallon Fuel Oil	Closed	3,850 ft. Southwest	100 year TOT	Low

TABLE 4-1
CONTAMINANT SOURCE INVENTORY SUMMARY
WELLHEAD PROTECTION UNIT WELL 19
MADISON, WISCONSIN
DECEMBER 2010

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 19	Location within Capture Zone	Estimated Threat to Supply Wells
15(17)	Robert Burris 1015 University Bay Dr Shorewood Hills	EDR Report- WI - Registered UST (Facility ID 158179)	Closed/Removed, 1000-gallon Fuel Oil	Closed	4,700 ft. South-Southwest	100 year TOT	Low
16(16)	Mark Bryden 1201 Shorewood Blvd Shorewood Hills	EDR Report- WI - Registered UST (Facility ID 63948)	Closed/Removed, 500-gallon Fuel Oil	Closed	3,900 ft. Southwest	100 year TOT	Low
17(11)	Frank Remington 1224 Dartmouth Rd Shorewood Hills, WI	EDR Report- WI - Registered UST (Facility ID 79204)	Closed/Removed, 560-gallon Fuel Oil	Closed	3,900 ft. Southwest	100 year TOT	Low
18(14)	2902 Columbia Rd Shorewood Hills	EDR Report- WI - Registered UST (Facility ID 112604)	Closed/Removed, 1000-gallon Fuel Oil	Closed	4,400 ft. Southwest	100 year TOT	Low
19(19)	Eric Smith 1107 Amherst Dr Shorewood Hills	EDR Report- WI - Registered UST (Facility ID 75927)	Closed/Removed, 1000-gallon Fuel Oil	Closed	4,250 ft. Southwest	100 year TOT	Low
20(18)	Shorewood Hills Elementary 1105 Shorewood Blvd Shorewood Hills	EDR Report- FINDS – Registry ID 110036725087	No Information	No Information	4,440 ft. Southwest	100 year TOT	Low
21(D23)	Hastings Estate 3326 Lake Mendota Dr Madison	EDR Report- BRRTS	Chlorinated/Stoddard Solvents. No site investigation required, lab results indicate non detect to low level contamination. End date 10/03/2005	Closed	4,650 ft. West-Southwest	100 year TOT	Low
21(D24)	Hastings Estate 3326 Lake Mendota Dr Madison	EDR Report- WI - Registered UST (Facility ID 703609)	Closed/Removed, 550-gallon gasoline	Closed	4,650 ft. West-Southwest	100 year TOT	Low
22(E26)	Tom Glas 3415 Crestwood Dr Madison	EDR Report- WI - Registered UST (Facility ID 275281)	Closed/Removed, 550-gallon Fuel Oil	Closed	4,700 ft. Southwest	100 year TOT	Low
23(E27)	Marjorie Bridgeman 3417 Crestwood Dr Madison	EDR Report- WI - Registered UST (Facility ID 275281)	Closed/Removed, 550-gallon Fuel Oil	Closed	4,750 ft. Southwest	100 year TOT	Low
24(25)	Alfred Dally 3428 Viburnum Dr, Madison, WI	EDR Report- WI - Registered UST (Facility ID 51463)	Closed/Removed, 1500-gallon Fuel Oil	Closed	5,050 ft. Southwest	100 year TOT	Low
25(F29) (F30)	Village of Shorewood Hills 1008 Shorewood Blvd Shorewood Hills	EDR Report- WI - Registered UST's (Facility ID 275264 and 275265) SHWIMS (Facility ID 113118500)	Closed/Removed, two-1,000-gallon gasoline Closed	Closed	4,950 ft. Southwest	100 year TOT	Low

TABLE 4-1
CONTAMINANT SOURCE INVENTORY SUMMARY
WELLHEAD PROTECTION UNIT WELL 19
MADISON, WISCONSIN
DECEMBER 2010

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 19	Location within Capture Zone	Estimated Threat to Supply Wells
26(G31)	Kathy Marshall 3433 Crestwood Dr Shorewood Hills	EDR Report- WI - Registered UST (Facility ID 863885)	Closed/Removed, 1000-gallon Fuel Oil	Closed	5,200 ft. Southwest	100 year TOT	Low
27(32)	Steven Burrill 3429 Edgehill Pky Madison	EDR Report- WI - Registered UST (Facility ID 134174)	Closed/Removed, 1000-gallon Fuel Oil	Closed	5,000 ft. Southwest	100 year TOT	Low
28(G33)	Norman Property 3441 Crestwood Dr Shorewood Hills	EDR Report WI - LUST (DNR Activity No. 03-13-001476) WI - Registered UST (Facility ID 863885)	Activity Closed, Low Risk, Soil Contamination Closed/Removed, 1000-gallon Fuel Oil	Closed Closed	5,340 ft. Southwest	100 year TOT	Low
29	Numerous Properties and Roadway throughout Area	Site Reconnaissance	Parking Surfaces and Roads: Runoff to drainage ways and detention areas.	Active	Variable	All Zones	Low - Moderate
30	Numerous Properties throughout Area	Site Reconnaissance	Grass Areas: Potential nutrient loading.	Active	Variable	All Zones	Low - Moderate

Notes:

1. Zone A = Within 5 year Time of Travel (TOT) Capture Zone
2. Zone B = Beyond Zone A, but within 1200-ft. radius.
3. Leaking Underground Storage Tank (LUST)
4. Bureau for Remediation and Redevelopment Tracking System (BRRTS) on the Web
5. Wisconsin Department of Natural Resources (DNR)
6. Underground Storage Tank (UST)
7. Aboveground Storage Tank (AST)
8. Wisconsin Remedial Response Site Evaluation Report (WRRSER)
9. Solid and Hazardous Waste Information Management System (SHWIMS)
10. Facility Index System (FIND)

north of the monitoring well. Impacted soils were excavated and removed from the site. This site is considered to present a low threat to Well 19.

The only other reported LUST site identified within the study area of Unit well 19 is located within the 100-year TOT, at a distance of approximately 5,340 feet from Well 19. This site has been was closed by the DNR and is not considered to pose a threat to Unit well 19.

Two UST sites were identified in the WHPA of Unit Well 19. Both sites have been closed by DNR, with the tanks being removed from the ground and transported offsite for disposal. Both these sites are considered to present a low risk, or threat, to Well 19.

One site that was not identified in the EDR Report, but was identified during the windshield survey was present within the WHPA. The site is the Eagle Heights Community Gardens, an organic garden for residents of the Eagle Heights student housing and the UW and Madison communities. Inorganic pesticides and fertilizers are not allowed. The gardens are considered to represent a low threat of contamination to the aquifer.

The only potential contaminant sites located outside the WHPA, but within a ½-mile radius of Unit Well 19 are two closed UST sites. Both of these sites have been closed by DNR, with the tanks being removed from the ground and transported offsite for disposal. Both these sites are considered to present a low risk, or threat, to Well 19.

In the interval between 1,200-foot radius and the ½-mile radius of Unit Well 19, two potential contaminant sites were identified. Both of these sites were identified during the windshield survey. One site is the UW System storage yard, which contains dumpsters for recyclables, soil piles, trimmings, used appliances, and miscellaneous storage. The other site is a Madison Gas and Electric power/transformer station. Both these sites are considered to present a low risk of contamination to Unit Well 19.

In the interval between the ½-mile radius and within the 100-year TOT ZOC of Unit Well 19, twenty-three potential contaminant sites were identified. Fifteen sites are closed UST sites. These sites are considered to present a low risk of contamination to Unit Well 19. Two sites are in use AST sites. These sites are between 3,850 and 3,950 feet south of Unit Well 19. One site consists of a 660 gallon diesel tank and the other is a 2,000 gallon diesel tank. These sites are considered a low to moderate risk of contamination to Unit Well 19. Another site was the Shorewood Hills Elementary School that was included on the Facility Index System (FINDS) list. No information of potential contamination or violations was found on this site, it is therefore considered to present a low risk of contamination to Unit Well 19. Was closed LUST site was reported within the 100-year TOT. This site is located approximately 5,340 feet side to down gradient. The tanks have been removed from the ground and taken off site for disposal. This site is considered to present a low risk of contamination to Unit Well 19.

Two sites, or activities, are present in random locations throughout the WHPA and within the 100-year TOT ZOC of Unit Well 19. These areas consist of numerous properties, yards and grass areas, and parking lots and roadways where runoff of salt and other potential contaminants or spilled substances can migrate to porous areas and infiltrate to the groundwater system. These sites are considered a low to moderate risk of contamination to Unit Well 19.

There are no apparent private septic systems, storm sewers, or wells in the WHPA or within the 100-year TOT of Unit Well 19. Review of the Dane County Comprehensive Plan indicates that the closest private septic systems to Unit Well 19 are located approximately 1.8 miles to the north-northwest, across Lake Mendota in the Town of Westport.

There are no apparent solid waste storage sites in the CSI study area of Unit Well 19.

There are no apparent historic or active spill sites within the CSI study area of Unit Well 19.

There are no apparent cemeteries in the CSI study area of Unit Well 19. There are no apparent ponds in the vicinity of Unit Well 19.

There are no sludge or septage spreading areas in the Unit Well 19 WHPA. The nearest sludge or septage application areas are located approximately 3.5 miles west of Unit Well 19 (DCRPC, 1999).

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

The separation distances between Unit Well 19 and potential contaminant sources identified in the CSI are summarized in Table 4-2. It appears that the required separation distances from Unit Well 19 and potential contaminant sources identified in the WAC ch. NR 811.16 are currently being met.

4.2 LAND USES AND WELLHEAD PROTECTION PLANNING

Existing land uses in the vicinity of Unit Well 19 are generally compatible with WHP planning. Land uses and activities summarized in Table 4-2 should be prohibited in the vicinity of Unit Well 19, within the respective minimum separation distances shown. It is generally not desirable to have manufacturing or industrial districts located in WHPAs. Land uses summarized in Table 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 various potential sources of groundwater contamination and land uses, and their relative risk to groundwater, respectively.

TABLE 4-2
MINIMUM SEPARATION REQUIREMENTS
BETWEEN PUBLIC WELLS AND
POTENTIAL CONTAMINANT SOURCES
WELLHEAD PROTECTION PLAN, UNIT WELL 19
MADISON, WISCONSIN

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

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

Footnote:

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

5.0 MANAGEMENT STRATEGIES

5.1 ALTERNATIVE MANAGEMENT STRATEGIES

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

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

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

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

5.1.1 Category 1 - Existing Programs

5.1.1.1 Hazardous Waste Collection/Disposal Program (Clean Sweep)

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

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

www.danecountycleansweep.com

and,

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

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

TABLE 5-1
SUMMARY OF MANAGEMENT STRATEGIES
WELLHEAD PROTECTION AREA PLAN - UNIT WELL 19
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)	• Hazardous waste collection and disposal. Residential, agricultural, and small business hazardous waste. Commercial with small fee. May through October collections in Madison. • Target local property owners and residents to participate.	• Public Health Madison and Dane County (PHMDC) • PHMDC	1. Spring 2011. 2. As needed.	1. Madison Water Utility send information about the Clean Sweep Collection Program to property owners in the WHPA, to encourage participation in the program. 2. Dane County sponsors advertising and feature articles.
	b. On Site Waste Disposal System (Septic) Maintenance	• Maintenance/servicing contract currently required for system owners on record. • Orders issued to confirmed failing system owners. • Include all property/septic system owners in WHPA in notification database. • Conduct Public Education.	• PHMDC	1. Spring 2011, then annually 2. Summer / Fall 2011 3. Every 3 years	1. Madison Water Utility request that the PHMDC provide information to owners of private sewage disposal systems about sewage system maintenance, and the types of waste that should not be disposed of in a septic system. 2. Madison Water Utility prepare an article for newspaper release about septic system dos and don'ts. 3. Public Health Madison and Dane County ensure that system maintenance and pumping are performed.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
1. Existing Programs (cont.)	c. Private Well Abandonment	• Enforce well abandonment ordinance(s) (Dane County Chapter 45 and City of Madison General Ordinance Sec. 13.21) and review new well construction. • Require proper abandonment of unused and unsafe wells. • Update well inventory in WHPA once every 5 years. • Familiarize with WI Admin. Codes, Chapters NR 141, 811, and 812.	• Wisconsin DNR • Public Health Madison and Dane County • City of Madison	1. Summer 2011, then annually 2. Summer 2013, then every five years (2016) 3. Ongoing 4. 2011, then every five years 5. Ongoing 6. Spring 2011 7. As needed	1. **Madison Water Utility** request that PHMDC provide them the names and addresses of owners of private wells located in the Unit Well 19 WHPA. 2. **Madison Water Utility** determine the location of other private water supply wells that may be located within the WHPA and which are not recorded in the County database. 3. **Madison Water Utility** send private well owners within the WHPA, DNR pamphlets about well upkeep and proper abandonment procedures in the event the owners abandon their existing wells. 4. **Madison Water Utility** update the private well inventory for wells located in the WHPA. 5. **City of Madison and Dane County** enforce existing well abandonment ordinances, to ensure that all private wells are permitted, or properly abandoned if unused. 6. **Madison Water Utility** request that Dane County consider proximity and depth of proposed private wells relative to Unit Well 19 prior to issuing permits for construction of new private water supply wells. 7. **Madison Water Utility** direct residents to the DNR private well code (Chapter NR 812), to the Wisconsin DNR private well section (608-266-0821), and to licensed well drillers and pump installers when questions arise about private water supply wells.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
1. Existing Programs (cont.)	d. Land Application of Sludge and Septage	• Enforce existing rules.	• Wisconsin DNR • Dane County • Madison Metropolitan Sewerage District (MMSD)	1. Spring 2011	1. **Madison Water Utility** provide a copy of the WHPA and recharge area maps to the MMSD and request that sludge not be spread in the Unit Well 19 recharge area equivalent to the 50-year TOT capture zone.
				2. Spring 2011	2. **Madison Water Utility** provide a copy of the WHPA and recharge area maps to the DNR Watershed Management office (608-267-7694 (central office) 608-275-3325 (Fitchburg office)) and request that new permits for sludge and septage spreading not be issued for properties located in the Unit Well 19 recharge area equivalent to the 50-year TOT capture zone.
				3. Ongoing	3. **Madison Water Utility** encourage development of additional authorized septage discharge points in the City of Madison wastewater treatment system.
				4. Ongoing	4. DNR enforce rules, particularly in WHPAs.
				5. Ongoing	5. **Dane County** develop regulatory program including ordinance.
	e. Spill Notification and Awareness of Remedial Investigation and Cleanup	• Monitor and keep informed of potential contamination sources in the WHPA and recharge areas. • Work with DNR to achieve investigation and cleanup of known contamination sources.	• Wisconsin DNR • Dane County Emergency Management • Wisconsin DATCP and COMM • City of Madison Fire Department	1. Spring 2011	1. **Madison Water Utility** request that DNR, City Police, and the Dane County Emergency Management Office inform the City about future events (spills, leaks, investigations, etc.) that occur in the Unit Well 19 WHPA or in upgradient recharge areas.
				2. 2011, then ongoing	2. **Madison Water Utility** monitor the status of existing and potential contamination sources in the WHPA, investigations regarding nature and extent of releases, and the status of cleanup activities, then determine if Utility action is needed.
2. Land Use Controls	a. Existing Zoning/Wellhead Protection Overlay Zoning and Ordinance	• Enforce existing zoning. • Discourage conditional uses or zoning changes that increase risk to groundwater.	• City of Madison • Dane County Planning and Development	1. 2011	1. **City of Madison** amend WHP ordinance and revise WP-19 Wellhead Protection District No.19.
				2. 2011	2. **City of Madison** provide Dane County with a copy of the WHP ordinance and WHPA map.
				3. Ongoing	3. **Dane County** consider developing WHP Overlay District ordinance.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
3. Intergovernmental Cooperation	a. Land Use Planning and Site Plan Review	• Cooperate in land use planning to protect groundwater resources and WHPAs. • Keep appraised of development in WHPA. • Ensure development complies with separation distances between the well and potential contamination sources as required by WI Admin. Code, Chapter NR 811.16.	• City of Madison Planning and Development Department • Dane County Planning and Development Department • Village of Shorewood Hills	1. Spring 2011 2. Ongoing 3. Ongoing 4. Ongoing 5. 2011 – Ongoing	1. City of Madison provide Dane County and the Village of Shorewood Hills with a copy of: a. The WHPP and maps showing the Unit Well 19 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. City of Madison Planning and Development Department ensure that development complies with separation distances required between municipal water supply wells and potential contamination sources. 3. City of Madison encourage the Village of Shorewood Hills to review proposed development in the ZOCs in their jurisdiction, with regard to Unit Well 19 recharge area. 4. City of Madison Planning and Development Department develop an Environmental Permits Checklist for site plan review. The checklist will help ensure compliance with local, County, and State permits and will raise awareness about groundwater protection. 5. City of Madison Planning and Development Department provide a copy of the WHPA map and Site Plan Review Environmental Permits Checklist to developers and property owners and require that the developer indicate on the environmental permits checklist and hazardous substances reporting form whether the proposed development is in a WHPA.
4. Monitoring	a. Contaminant Source Inventory (CSI) Maintenance	• Update CSI and conduct windshield survey	• Madison Water Utility	1. December 2010, then every 5 years (December 2015)	1. Madison Water Utility update the CSI by conducting a windshield survey of properties located in the WHPA and by performing State and Federal database checks.
	b. Water Quality Monitoring	• Conduct sampling of supply wells.	• Madison Water Utility	1. As required – Ongoing	1. Madison Water Utility perform water quality monitoring as required by DNR and as otherwise needed. The Utility will continue to present the results on their website. (www.madisonwater.org)

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	• Provide copies to Water Utility Office, Public Library, City Hall, Village of Shorewood Hills, and Dane County.	• City of Madison	1. Spring 2011 2. Spring 2011 3. Spring 2011	1. **City of Madison** provide copies of the WHPP for review by the public at the Water Utility Office, Madison Public Library, and City Hall. 2. **City of Madison** provide copies of the WHPP to the Village of Shorewood Hills and Dane County. 3. **Madison Water Utility** communicate the availability of the plan through a newspaper article.
	b. Public Informational Meetings	• Perform as part of a City Committee meeting or Common Council Meeting.	• City of Madison	1. Winter 2011 2. Spring / 2011	1. **City of Madison** 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. **City of Madison** provide WHPA maps for public review and an information sheet or brochure available for public use.
	c. News Releases	• Issue early in program implementation, and reinforce annually, as necessary.	• City of Madison	1. 2011, then annually	1. **Madison Water Utility** will provide a news release to the local newspaper, about the WHPP for Unit Well 19.
	d. Informational Materials Distributed To Residents in WHPA	• Hazardous Waste Collection (Clean Sweep) Program • Materials describing proper use and application of fertilizers and pesticides.	• City of Madison • Wisconsin DNR • University Extension Office	1. 2011, then ongoing 2. 2011	1. **Madison Water Utility** 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. Wellhead protection planning d. Annual Consumer Confidence Report (CCR) containing information about WHP planning. 2. **Madison Water Utility** update information in website (http://www.madisonwater.org) 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	• Notify and offer guidance to owners of potential high risk land uses in WHPA.	• City of Madison	1. 2011	1. Madison Water Utility provide information to owners of property with existing or potential contamination sources located within the WHPA to emphasize the importance of awareness of the WHPA, the owner's location with respect to the WHPA, and potential contamination source(s) of concern. Specific information to be provided includes: a. Leaking underground and above ground storage tanks. b. Materials describing the proper use and application of lawn fertilizers and pesticides.
	f. School Programs	• Participate in school programs.	• City of Madison • University Extension Office • Madison Public Schools	1. 2011 2. 2011	1. Madison Water Utility inform schools about the availability of tours at water supply facilities. 2. Madison Water Utility prepare a water/groundwater fact sheet for school education.

tipping fees collected at local landfills and support from the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP). Additional information about the Clean Sweep Collection Program is in Appendix 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. To encourage participation in the program, Madison Water Utility will send information about the Clean Sweep Collection Program to property owners in the WHPA.

5.1.1.2 On-Site Waste Disposal System Maintenance

A search of the available records indicates that no private on-site waste disposal (septic) systems are present in the Well 19 WHPA or 100-year TOT ZOC. The nearest private sewage disposal systems are located approximately 1.9 miles north-northwest of Unit Well 19 and are located well beyond the 100-year TOT ZOC, and are therefore considered low risk to Unit Well 19.

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

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

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

1. Request that Dane County provide information to owners of private sewage disposal systems located within the ultimate well capture zones, about sewage system maintenance, and the types of waste that should not be disposed of in a septic system.

2. Prepare an article for the newspaper about private sewage disposal systems do's and don'ts.

5.1.1.3 Well Abandonment

The proposed strategies under this category for WHP include public education and private well inventory maintenance. Public education should improve awareness on the part of private well owners of the importance of proper well abandonment. A search of the DNR, Dane County, and City of Madison private well records and private well data bases indicates that there are not any active private wells located in the WHPA or within the 100-year TOT ZOC for Unit Well 19.

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 PHMDC administers a county reimbursement program for abandoning these categories of wells.

The following will be completed for this management activity:

1. Madison Water Utility will request that the PHMDC provide them the names and addresses of owners of private wells located in the Unit Well 19 WHPA.

2. Madison Water Utility will determine the location of other private water supply wells that may be located within the WHPA and which are not recorded in the County database.

3. Madison Water Utility will provide information in the Consumer Confidence Report about proper abandonment procedures in the event the property owners have an unused well on their property.

4. Every five years, Madison Water Utility will update the private well inventory for wells located in the WHPA.

5. The City of Madison and Dane County will enforce the existing City and Dane County well abandonment ordinances, to ensure that all private wells are permitted or properly abandoned if unused.

6. Madison Water Utility will request that Dane County consider proximity and depth of proposed private wells relative to Unit Well 19 prior to issuing permits for construction of new private water supply wells.

7. Madison Water Utility will direct residents to the DNR private well code (Chapter NR 812), to the Wisconsin DNR private well section (608-266-0821) and to licensed well drillers or pump installers, as necessary, when questions arise about private water supply wells.

8. The Madison Water Utility will provide information in the Consumer Confidence Report about proper abandonment of unused private wells.

5.1.1.4 Land Application of Sludge and Septage

The newest permitted septage application site to Unit Well 19 is located approximately 5 to 6 miles west of Unit Well 19. This site is considered low risk to Unit Well 19. The site is permitted under Wisconsin DNR authority.

The following will be completed for this management activity:

1. Madison Water Utility will provide a copy of the WHPA and recharge area maps to the MMSD and request that sludge and septage not be spread in the Unit Well 19 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 19 recharge area equivalent to the 50-year TOT capture zone.

3. Madison Water Utility will encourage development of additional authorized septage discharge points in the City of Madison wastewater treatment system.

5.1.1.5 Spill Notification and Awareness of Remedial Investigation and Cleanup

Review of the available potential contaminant source data bases indicates that one closed LUST site is present within the WHPA of Unit Well 19. Due to detected concentrations of benzene on-site at levels that exceed the WAC Ch. NR 140 ES, the site was closed by DNR with a groundwater use restriction. To monitor the status of this site and any potential future sites, the following activities will be completed:

1. Madison Water Utility will request that the City Police, DNR, and the Dane County Emergency Management Office inform the Utility about future events (spills, leaks, investigations, etc.) that occur in the Unit Well 19 WHPA or in upgradient recharge areas.

2. Madison Water Utility will monitor the status of existing and potential contamination sources in the WHPA and upgradient recharge areas, investigations regarding nature and extent of releases, and the status of cleanup activities.

5.1.2 Category 2 - Land Use Controls

5.1.2.1 Existing Zoning/Wellhead Protection Overlay Zoning and Ordinance

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

The City of Madison has adopted a WHP ordinance to help protect the Utility's source of supply. The ordinance prohibits incompatible development with the establishment of an overlay district for the 5-year TOT ZOC (Zone A) and the 1,200-foot radius ZOC (Zone B). The WHP ordinance helps ensure that future potential contamination sources are not located in the Unit Well 19 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 provide Dane County with a copy of the WHP ordinance and Unit Well 19 WHPA map.

5.1.3 Category 3 - Intergovernmental Cooperation

5.1.3.1 Land Use Planning and Site Plan Review

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

1. The City of Madison will provide Dane County, with a copy of:

    a. The WHPP and maps showing the Unit Well 19 WHPA and ZOCs.

    b. A summary of separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.16(4)(d)).

    c. A list of potential contamination sources that can threaten groundwater.

    d. A list of high-risk land uses that should be prohibited from WHPAs.

2. The City of Madison Planning and Development Department will ensure that development complies with separation distances required between municipal water supply wells and potential contamination sources.

3. The City of Madison will review all proposed development activities and projects in the Unit Well 19 WHPA.

4. The City of Madison Planning and Development Department will develop an Environmental Permits Checklist for site plan review. The checklist will help ensure compliance with local, county, and state permits; and will raise awareness about groundwater protection.

5. The City of Madison Planning and Development Department will provide a copy of the WHPA map and Site Plan Review Environmental Permits Checklist to developers and property owners and require that the developer indicate on the environmental permits checklist and hazardous substances reporting form whether the proposed development is in a WHPA.

5.1.4 Category 4 - Monitoring

5.1.4.1 CSI Maintenance

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

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

5.1.4.2 Water Quality Monitoring

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

The following will be completed for this management activity:

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

5.1.5 Category 5 - Public Education and Awareness

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

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

5.1.5.1 Availability of WHPP

The following will be completed for this management activity:

1. The City of Madison will provide copies of the WHPP for review by the public at the Water Utility Office, Madison Public Library, and City Hall.

2. The City of Madison will provide copies of the WHPP to the Village of Shorewood Hills and Dane County.

3. Madison Water Utility will communicate the availability of the plan through a newspaper article.

5.1.5.2 Public Informational Meeting

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

The following will be completed for this management activity:

1. The City of Madison will conduct a public informational meeting as part of a City committee meeting or the Common Council meeting during the review phase of the WHPP.

2. The City of Madison will provide WHPA maps available for public review and an information sheet or brochure available for public use.

5.1.5.3 News Releases

The purposes of news releases are to elevate public awareness, educate the public on the need for WHP, and provide examples of prudent WHP measures. Initially, a news release will inform the public that a WHPP has been developed for Unit Well 19 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 19, 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 19, it is important to inform property owners about existing and potential contaminant sources on their properties. An initial mailing will be made at the beginning of the WHP program. In this mailing, property owners will be advised to contact the City if they have questions, or require additional information.

The following will be completed for this management activity:

1. Madison Water Utility will provide information to owners of property with existing or potential contaminant sources located within the WHPA to emphasize the importance of awareness of the WHPA, the owner's location with respect to the WHPA, and potential contaminant source(s) of concern. Specific information to be provided includes:

    a. Leaking underground and aboveground storage tanks

    b. Materials describing the proper use and application of lawn fertilizers and pesticides

5.1.5.6 School Programs

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

1. Madison Water Utility will inform schools about the availability of tours at water supply facilities. During tours, students will be exposed to important concepts related to groundwater and WHP.

2. Madison Water Utility will prepare a water/groundwater fact sheet for school education programs.

5.2 WATER CONSERVATION PROGRAM

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

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

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

The Madison Water Utility also has information about water conservation at its website (http://www.madisonwater.org). Water conservation information is in Appendix 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 19 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 19, 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 19 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 19, other wells in Zone 6, such as Wells 6 and 14, or Wells in Zone 7 or 8 could be used to serve the area.

Additionally, the City's wells are widely spaced and generally have different recharge areas, thereby making them less vulnerable to potential localized contamination. Unit Well 19 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 19 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 19 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 19 ZOCs include property in the City of Madison 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.

TABLE 5-2
EMERGENCY CONTACT NUMBERS
WELLHEAD PROTECTION PLAN, UNIT WELL 19
MADISON, WISCONSIN

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

Local governmental agencies (city, township, and county) recognize the need for planning to protect WHPAs. Intergovernmental cooperation is an important part of the plan as agencies work together to consider the needs for WHP during planning and permitting processes. The City will provide Dane County and the Village of Shorewood Hills with a copy of the WHPP and maps showing the Unit Well 19 WHPA, the separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.16(4)(d)), and a list of potential contamination sources that can threaten groundwater. The City will encourage county, and other city and village, boards to help protect the WHPA and ZOCs, and upgradient recharge areas when evaluating proposed development.

The City of Madison has a WHP ordinance and overlay zoning district. This WHP ordinance helps ensure that no future potential contamination sources or activities are located or permitted in the WHPA of Unit Well 19.