Final

Source Water Assessment

for the

McHenry Water System

Garrett County, Maryland

Prepared for:

Maryland Department of the Environment
Water Management Administration
Water Supply Program
1800 Washington Boulevard, Suite 625
Baltimore, Maryland 21230-1719

Prepared by:

EA Engineering, Science, Technology, Inc.
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

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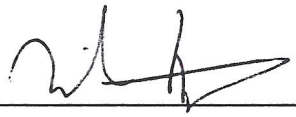

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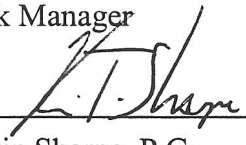

Kevin Sharpe, P.G.
Project Manager

February 2004

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LIST OF ACRONYMS AND ABBREVIATIONS

CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Act Information System
CHS	Controlled Hazardous Substances
COMAR	Code of Maryland Regulations
DWEL	Drinking Water Equivalent Level
ft	Foot/Feet
gpd	Gallon(s) Per Day
gpm	Gallon(s) Per Minute
GPS	Global Positioning System
GWUDI	Ground Water Under the Direct Influence
in.	Inch(es)
IOC	Inorganic Compound
LUST	Leaking Underground Storage Tank
MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
mg/L	Milligram(s) Per Liter
MGS	Maryland Geological Survey
NPL	National Priorities List
PCBs	Polychlorinated Biphenyls
pCi/L	Picocurie(s) Per Liter
PWSID	Public Water System Identification
SDWA	Safe Drinking Water Act
SDWR	Secondary Drinking Water Regulations
SOC	Synthetic Organic Compound
SWAP	Source Water Assessment Plan
SWPA	Source Water Protection Area
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WHPA	Well Head Protection Area

EXECUTIVE SUMMARY

EA Engineering, Science, and Technology was tasked to perform a Source Water Assessment for the McHenry Water System in Garrett County, Maryland. The Maryland Department of the Environment (MDE) identifies this water system as Public Water System Identification (PWSID) 1111096. EA has performed this study under Purchase Order No. U00P9200205, as authorized by MDE.

The required components of this report, as described in Maryland's Source Water Assessment Plan (SWAP), are:

- Delineation of the area that contributes water to the source
- Identification of potential sources of contamination
- Determination of the susceptibility of the water supply to contamination
- Recommendations for protecting the drinking water supply

The sources of the McHenry Water System water supply are the Pocono Group and Greenbrier Formation, which are unconfined, sandstone and shale aquifers. The Source Water Protection Area (SWPA) for the seven ground-water supply wells was delineated using the watershed delineation method for fractured bedrock wells. The SWPA is based on land topography, nearby streams, and a calculation of the total ground-water contributing area during a drought. The SWPA is approximately 456 acres and is irregular in shape.

Potential point and non-point sources of contamination within the assessment area were identified based on site visits, a review of MDE databases, and a review of sewer service area and land use maps. Immediately adjacent to the SWPA, a large golf course and an electrical transformer were observed that can be point sources for pollutants. Commercial areas, forests, and increasing residential development were observed within the SWPA. Commercial areas account for 40 percent of the SWPA and can be considered non-point sources of contaminants. Well information and water quality data were also reviewed.

The susceptibility analysis for the McHenry Water System water supply is based on a review of the water quality data, potential sources of contamination, aquifer characteristics, and well integrity. It was determined that the McHenry Water System water supply is moderately susceptible to radon-222 and nitrate. This system has a low susceptibility to volatile organic compounds, synthetic organic compounds, other inorganic compounds, other radionuclides, and microbiological contamination.

Recommendations to protect the ground-water supply include creating a SWPA team, resident and employee awareness, required ground-water monitoring, and communication with County officials about future planning and land use.

1. INTRODUCTION

EA Engineering, Science, and Technology was tasked to perform a Source Water Assessment for the McHenry Water System in Garrett County, Maryland. EA has performed this study under Purchase Order No. U00P3200205, as authorized by the Maryland Department of the Environment (MDE).

The McHenry Water System serves the residents of McHenry in central Garrett County. The water treatment plant and seven supply wells for the system (Figure 1) are located near Deep Creek Lake and within the premises of Deep Creek Village. The McHenry Water System serves a population of 125 with 300 connections.

1.1 GROUND-WATER SUPPLY SYSTEM INFORMATION

A review of the well data and sanitary surveys of the system indicates that the seven supply wells were drilled between 21 March 1986 and 16 July 1988, in accordance with the State's current well construction standards, which were implemented in 1973. The seven active production wells have an average yield of 93,400 gallons per day (gpd). The maximum pumping rate for Wells 1 and 5 is 120 gallons per minute (gpm), and 50 gpm for Deep Creek Village Wells 1 and 2. All wellheads were observed to be in good condition with tightly sealed caps. Table 1 contains a summary of the well construction data.

TABLE 1. WELL INFORMATION

Source ID	Source Name	Permit No.	Total Depth (ft)	Casing Depth (ft)	Aquifer
01	Well 1	GA810719	309	58	Greenbrier Formation
05	Well 5	GA810776	210	60	Greenbrier Formation
06	Test Well 2	GA810720	399	57	Greenbrier Formation
09	Deep Creek Village Well 1	GA811500	90	21	Pocono Formation
10	Deep Creek Village Well 2	GA811501	132	21	Pocono Formation
11	Highline Drive Well 1	GA941141	742	168	Greenbrier Formation
12	Highline Drive Well 2	GA941155	405	168	Greenbrier Formation

Presently, Wells 1 and 5, and Test Well 2 are the only active wells that supply water for this system. Deep Creek Village Wells 1 and 2 are used by the residents of Deep Creek Village and as backup supply wells for the McHenry Water System. Highland Drive Wells 1 and 2 were recently added to the McHenry Water System and are expected to go on-line before 2004. However, Wells 1 and 5, Test Well 2, the Deep Creek Village wells and Highland Drive wells are all interconnected but utilize three separate water treatment plants.

According to MDE's Public Water System Identification (PWSID) database, there are two additional wells, Test Wells 3 and 4. These wells were not found during the site visit. According to the chief engineer, operators, and superintendent, the only wells presently in the system are those listed in Table 1.

According to MDE, the contact responsible for this system is Mark Tonkovich of the Garrett County Public Utilities. The direct superintendent for the McHenry Water System is Allen Festerman of the Garrett County Sanitary District (OT-4, ST-4).

Currently, Wells 1 and 5, and Test Well 2 use gaseous chlorine for disinfection. The Deep Creek Village wells use an ion exchange system for iron removal and sodium hypochlorite (bleach) for disinfection. Currently, there is no treatment at the Highline Drive wells; however, plans have been approved by MDE to construct a hypochlorite booster facility adjacent to the Highline Drive water treatment plant.

1.2 HYDROGEOLOGY

Garrett County lies entirely within the Appalachian Plateau physiographic province, and is the westernmost county in Maryland. Pleistocene terraces and recent flood plains found along the larger streams and consolidated sedimentary rocks of the mid-Paleozoic (Devonian, Mississippian, and Pennsylvanian age) dominate the surface and subsurface geology. The Mid-Paleozoic units are folded into broad anticlines and synclines that trend northeast-southwest. The anticlinal structures are underlain by Devonian rocks and contain three distinct gas fields. The synclinal structures form the coal basins of the region and are underlain by Pennsylvanian rocks.

The rocks of the Mississippian age consist of red and green shale, thin-bedded sandstone, calcareous shale, argillaceous limestone, and massive conglomeratic sandstone.

The ground water used by the McHenry Water System's Wells 1 and 5; Test Wells 3, 4 and 5; and Highline Drive Wells 1 and 2 is from wells drilled in the Paleozoic (Mississippian age) Greenbrier Formation. This formation is a "red and green shale with lenticular limestone and limy sandstone." This is a moderately important water-bearing unit along the flanks of the anticlinal structures [Maryland Geological Survey (MGS) 1980].

The ground water used by the Deep Creek Village wells is from the Paleozoic (Lower Mississippian age) Pocono Formation. This formation is composed of "coarse-grained sandstone (locally conglomeritic), shale and sandy shale." This is an important aquifer in the Deer Park and Accident anticlines. Many wells and springs in the Pocono Formation are fairly high-yielding water sources.

The source of ground water in Garrett County is from infiltration of rainfall or snowmelt. The availability of ground water in the predominantly sedimentary bedrock depends on the lithology of the rock, the permeability of the substrate, and the presence or absence of secondary openings from fracturing and weathering. The well yields of the Greenbrier Formation, from 48 wells, are 1 to 300 gpm, with an average yield of 13.3 gpm. Well yield from the Pocono Formation, from 132 wells, is 13.1 gpm with a range of 0.8 to 130 gpm (MGS 1980).

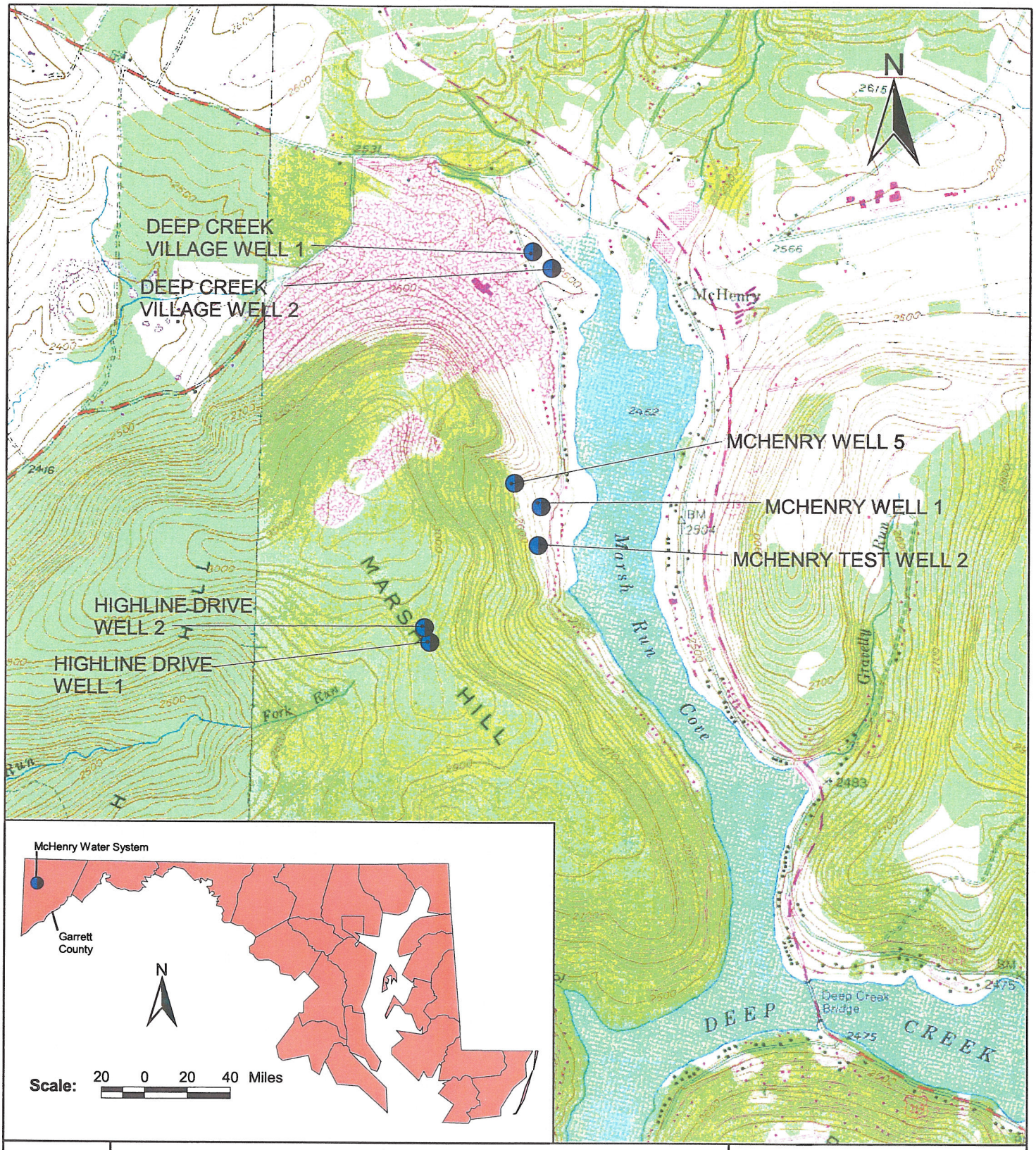


Figure 1. McHenry Water System
Location Map of Supply Wells

Source Water Assessment Program
2003

Legend:

Supply Well

Source: United States Geologic Survey. 1947 (photorevised 1981). *7.5-minute Series Topographic Map for McHenry, Maryland.*

United States Geologic Survey. 1947 (photorevised 1974). *7.5-minute Series Topographic Map for Sang Run, Maryland- West Virginia.*

Scale:

1000 0 1000 2000 Feet

2. DELINEATION OF THE AREA CONTRIBUTING WATER TO SOURCE

For ground-water systems, a wellhead protection area (WHPA) is considered to be the source water protection area (SWPA) for the system. Consistent with the recommended delineation in the Maryland Source Water Assessment Plan (SWAP) (MDE 1999), the watershed drainage area that contributes ground water to the supply wells was used.

This original delineation shape was modified by accounting for surface water bodies, topography, significant land features, and by using a conservative calculation of total ground-water recharge during a drought. For conservative purposes, a drought condition recharge value of 400 gpd per acre (or approximately 5.4 in. per year) was used to estimate the total ground-water contribution area required to supply the wells.

The current Water Appropriation Permit issued by the MDE Water Rights Division for the McHenry Water System is for an average withdrawal of 93,400 gpd. To determine the total ground-water contribution area during a drought, the following equation was used:

Recharge Area (acre) = Average Use (gpd)/Drought Condition Recharge (gpd/acre)

From the equation above, the total ground-water contributing area during a drought is approximately 234 acres. The delineated SWPA is approximately 456 acres (Figure 2), and is therefore adequate to meet the average daily ground-water usage during a drought.

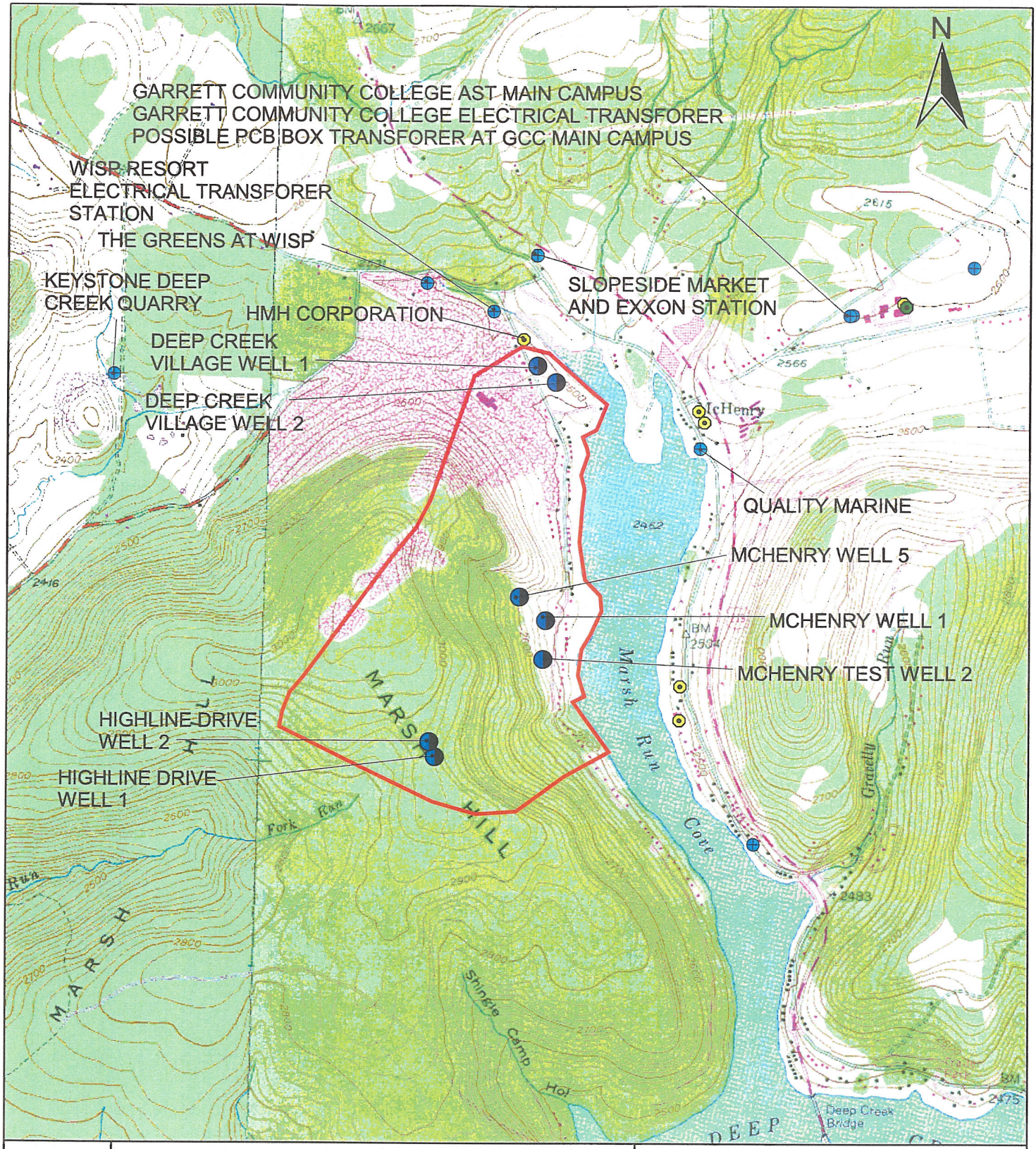


Figure 2. McHenry Water System Source Water Protection Area Map with Potential Sources of Contamination

Source Water Assessment Program
2003

Legend:

- Supply Well
- SWPA Boundary
- LUST
- Miscellaneous
- UST

Source: United States Geologic Survey. 1947 (photorevised 1981). *7.5-minute Series Topographic Map for McHenry, Maryland.*

United States Geologic Survey. 1947 (photorevised 1974). *7.5-minute Series Topographic Map for Sang Run, Maryland- West Virginia.*

Scale:

1000 0 1000 2000 Feet

3. INVENTORY OF POTENTIAL CONTAMINANTS WITHIN THE DELINEATED AREA

A field survey was performed on 18 December 2002 to confirm potential sources of contamination identified in MDE databases around the ground-water wells. These databases include the Comprehensive Environmental Response, Compensation, and Liability Act Information System (CERCLIS), which includes National Priorities List (Superfund) sites, Maryland Registered Underground Storage Tank (UST) sites, Maryland Leaking Underground Storage Tank (LUST) sites, landfills, pesticide dealers, ground-water discharge permits, and Controlled Hazardous Substances (CHS) generator sites.

During the field survey, other sources of potential contamination not in the MDE databases were noted and the location was surveyed using a global positioning system (GPS) receiver for mapping purposes (Figure 2).

3.1 POINT SOURCES

To the northwest of the SWPA is a golf course belonging to the Wisp Resort Hotel. Nitrogen-based fertilizers are often used on golf courses, and over-application of fertilizers could impact ground water with nitrates. Also, herbicides are often used on golf courses and ski slopes during the spring and summer months.

The Wisp Resort has a large electrical transformer adjacent to the McHenry SWPA. Prior to 1977, many transformers and electrical equipment contained polychlorinated biphenyls (PCBs) as an insulator. It is possible that the equipment may contain PCBs. If the equipment leaks, the PCB oil could eventually leach through the soil overburden into the aquifer.

HMH Corporations has a UST that is adjacent to the SWPA. This UST contains gasoline and could potentially leak and release petroleum hydrocarbons into the ground water if the tank were to be compromised.

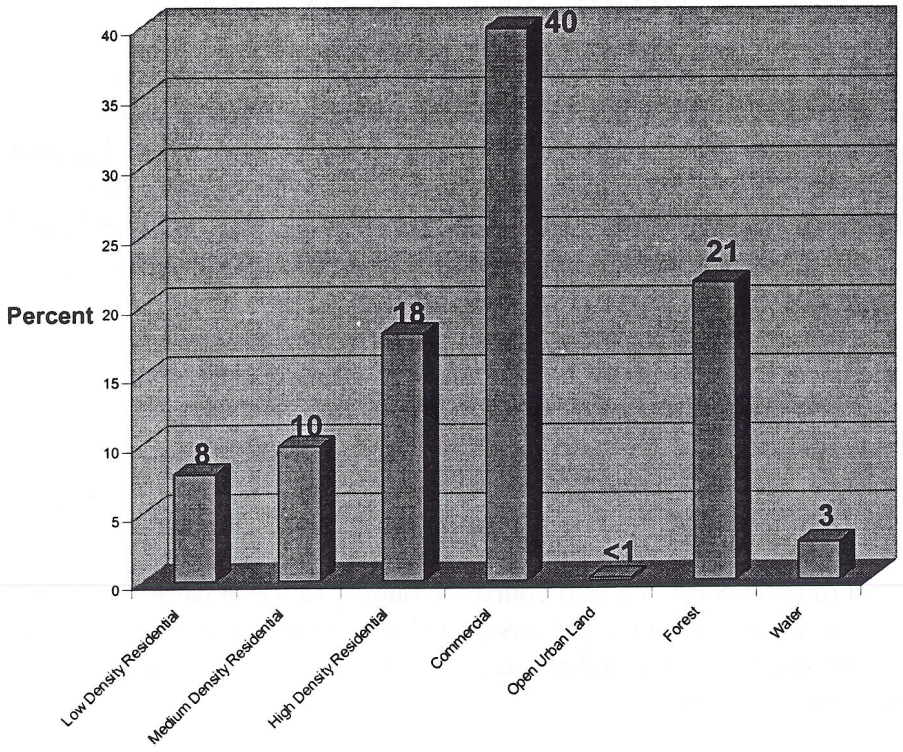
Currently, there are several potential sources for contamination to the east of the SWPA, across Marsh Run Cove (the northern branch of Deep Creek Lake). Due to the presence of this water body, these sources should not impact the McHenry water supply.

3.2 NON-POINT SOURCES

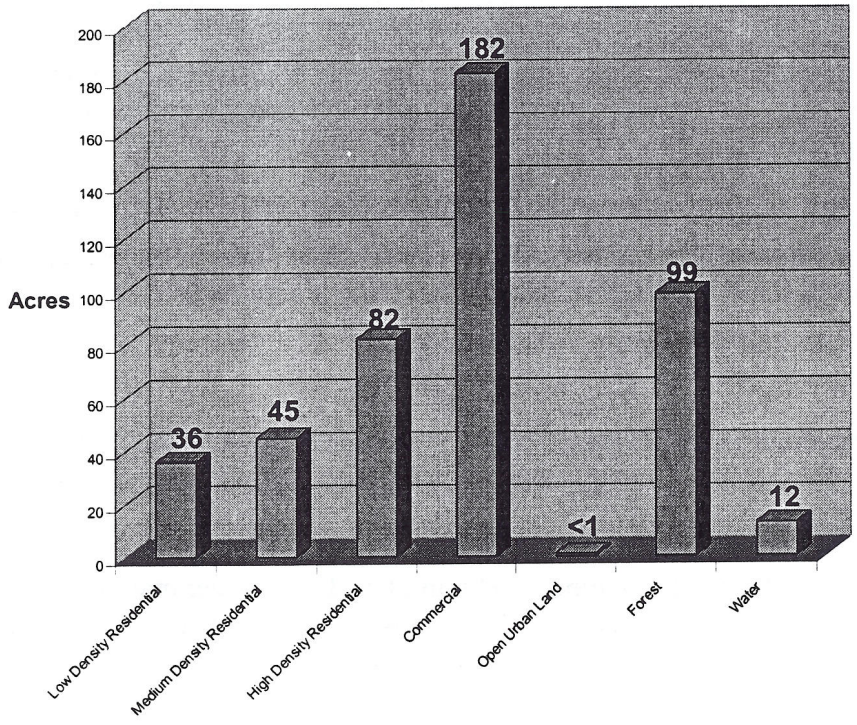
In addition to the above point sources, non-point source commercial and high-, medium-, and low-density residential areas were observed within the SWPA and adjacent to the delineated area.

Using the Maryland Office of Planning 2000 Land Use/Land Cover map for Garrett County, potential non-point sources within the SWPA area were also evaluated by land use designation (Figure 3). A summary of the percent and acreage of each type of land use is presented in the graphs on the following page.

PERCENTAGE OF EACH LAND USE TYPE



ACREAGE OF EACH LAND USE TYPE



From an interpretation of the graphs, commercial (182 acres), forest (99 acres), and high-density residential (82 acres) areas account for the majority of the SWPA (456 acres). Commercial areas can be a non-point source for contamination from volatile organic compounds (VOCs), synthetic organic compounds (SOCs), and inorganic compounds (IOCs), primarily from industrial discharge or leakage.

Residential areas that utilize septic systems can be sources of IOCs, primarily nitrates, from wastewater discharge. Improper disposal of solvents and waste into septic systems can be a pathway to ground water for VOCs and SOCs. Also, many residential areas have home heating fuel tanks that can leak or discharge VOCs and petroleum hydrocarbons to the ground water.

Using the 1993 Maryland Office of Planning's Garrett County sewerage coverage, potential non-point sources from other septic system users in the SWPA were assessed (Figure 4). By overlaying the SWPA on the sewerage coverage layer in Arc View GIS, it was determined that approximately 55 percent of the SWPA does not have public sewer service. The majority of the SWPA without sewerage coverage is in the area around Highline Drive in the southern portion of the delineation.

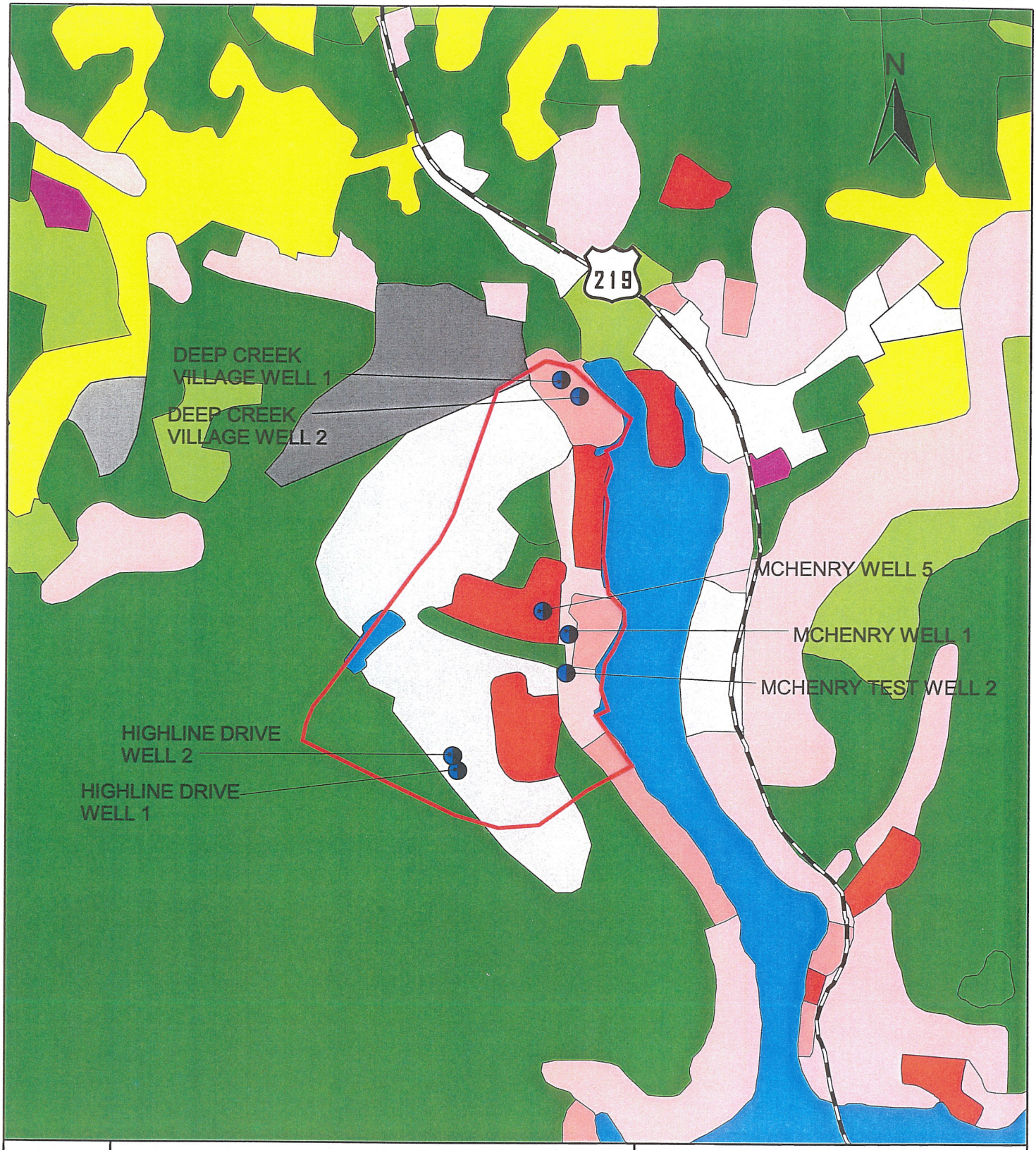


Figure 3. McHenry Water System Land Use Map of the Source Water Protection Area

Source Water Assessment Program
2003

Scale: 2000 0 2000 Feet

Source: Maryland Office of Planning, 2000.

Legend:

- Supply Well
- SWPA Boundary
- Major Roads

Land Use

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Extractive
- Open Urban Land
- Cropland
- Pasture
- Forest
- Water
- Feeding Operations

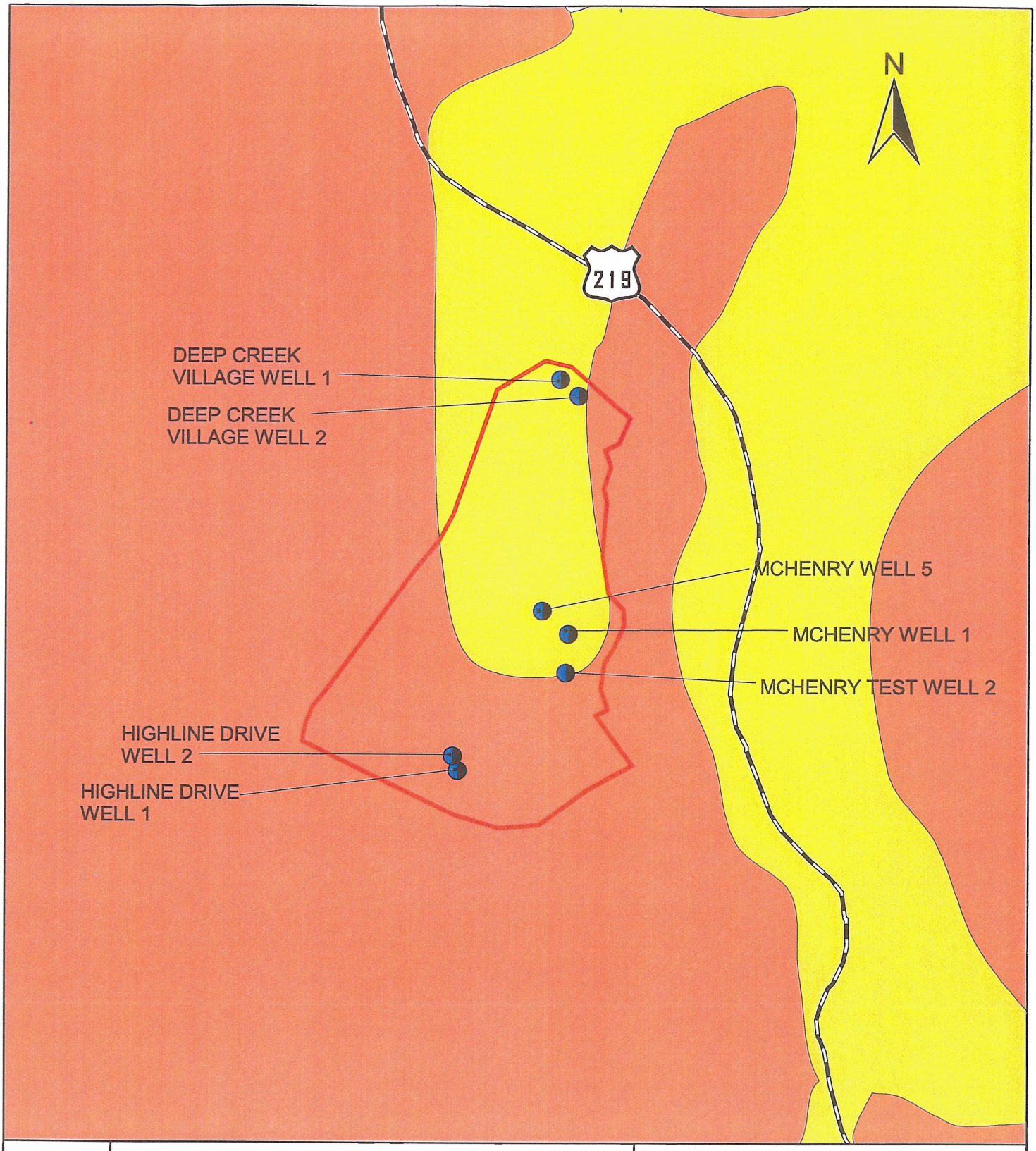


Figure 4. McHenry Water System Sewer Service Map of the Source Water Protection Area

Source Water Assessment Program
2003

Legend:

- Supply Well
- Major Roads
- SWPA Boundary

Sewer

- No planned service area
- Existing service area

Source: Maryland Office of Planning, 1993.

Scale: 1000 0 1000 2000 Feet

4. REVIEW OF WATER QUALITY DATA

Water quality data were obtained from the MDE Water Supply Program database of Safe Drinking Water Act (SDWA) contaminants. The results reported are for finished (treated) ground water (unless noted).

A review of the water quality data from 1993-2002 has been performed with McHenry Water System finished water samples. The results of the ground-water sample analysis are shown in Appendix A.

Ground-water analytical results were compared to 50 percent of the USEPA Maximum Contaminant Levels (MCLs) or the USEPA Secondary Drinking Water Regulations (SDWR). If no MCL of SDWR was available, the Drinking Water Equivalent Level (DWEL) was substituted as recommended by the USEPA Office of Water.

4.1 GENERAL WATER QUALITY PARAMETERS

No general water quality parameters were reported in the ground-water samples greater than 50 percent of the comparison criteria.

A sample collected on 27 June 2000 had a pH of 7.2, which is within the acceptable SDWR range of pH values (6.5 to 8.5).

4.2 VOLATILE ORGANIC COMPOUNDS

No VOCs were reported in the ground-water samples.

4.3 SYNTHETIC ORGANIC COMPOUNDS

No SOCs were reported in the ground-water samples.

4.4 INORGANIC COMPOUNDS

Manganese was detected in one sample collected on 27 June 2000 at a concentration equal to the SDWR (0.05 mg/L). SDWR rankings are non-enforceable Federal guidelines for aesthetic effects. No other samples were submitted for laboratory analysis of manganese. A summary of the manganese analysis for the ground-water sample is shown in Table 2.

TABLE 2. SUMMARY OF MANGANESE ANALYSIS

Plt.	Sample	Contaminant	Result	Unit
01	6/27/00	Manganese	0.05	mg/L

Note: Shaded value is equal to the SDWR.

Low-level concentrations of nitrate were reported in ground-water samples collected between 8 February 1993 and 29 January 2002, and ranged from 1.1 to 3.26 mg/L, which are below the MCL of 10 mg/L.

Sodium (3.34 mg/L) was detected in a ground-water sample collected on 17 February 2000 below the USEPA advisory range for sodium (for taste) between 30 and 60 mg/L.

A concentration of sulfate (39.8 mg/L) was detected in a ground-water sample collected on 27 June 2000 that is less than the SDWR for sulfate of 250 mg/L.

Additionally, chloride was detected (68 mg/L) in a ground-water sample collected on 27 June 2000 below the SDWR of 250 mg/L.

4.5 MICROBIOLOGICAL CONTAMINANTS

No total or fecal coliform has been detected in samples of the water system finished water from March 1999 to July 2002.

4.5.1 Ground Water Under the Direct Influence (GWUDI)

Surface water that directly recharges the aquifer through major fractures in rock does not pass through the soil overburden that both filters and contains beneficial microorganisms along with oxygen that break down contaminants. If significant variances in the ground-water results from dry and storm conditions are observed, it is possible that the ground water is under the direct influence of surface water.

To assess the potential of Ground Water Under the Direct Influence (GWUDI) of surface water, ground-water sampling records (during dry and storm conditions) in MDE databases were assessed and information from Public Water Reports was reviewed. However, it was found that no GWUDI samples have been collected to date.

4.6 RADIONUCLIDES

The MCL used for comparing detection of radon-222 was 300 pCi/L. This MCL is a proposed value established by USEPA since there is no current MCL for this contaminant (USEPA 1999). However, if a state has a program to address the more significant risk from radon in indoor air, then 4,000 pCi/L can be used as an alternate MCL. For the purpose of this investigation, the more conservative number was utilized.

Radon-222, was detected at a concentration greater than 50 percent of the more conservative proposed MCL [300 picocuries per liter (pCi/L)] in one ground-water sample collected on 23 April 2001. No other ground-water samples have been submitted for laboratory analysis of radon-222. A summary of radon-222 analysis is shown in Table 3.

TABLE 3. SUMMARY OF RADON-222 ANALYSIS

Plt.	Sample	Contaminant	Result	Unit
01	4/23/01	Radon-222	175	pCi/L

Note: Shaded values are greater than 50 percent of the more conservative proposed MCL.

Gross alpha and gross beta were also reported in water samples. The reported gross alpha concentrations from three water samples (1, 2, and 4 pCi/L) are less than the MCL of 15 pCi/L. Gross beta was detected in one water sample with a concentration of 1 pCi/L, which is less than the MCL of 50 pCi/L.

5. SUSCEPTIBILITY ANALYSIS

To evaluate the integrity of the ground-water source, the following criteria were used to conduct the susceptibility analysis:

1. Available water quality data
2. Presence of potential contaminant sources in the SWPA
3. Aquifer characteristics
4. Well integrity
5. Likelihood of change to the natural conditions

The aquifers that supply the McHenry Water System drinking water are unconfined. In general, unconfined aquifers are more susceptible to contamination from surface activities than confined aquifers, which are naturally protected by a layer of generally impermeable material such as clay. However, the unconfined aquifers utilized by these systems are overlain by relatively thick soil overburden, which serves as a natural microbiological and chemical filter for contaminants. According to the Soil Survey of Garrett County, Maryland [U.S. Department of Agriculture (USDA) 1974], the soils in Garrett County are generally stoney to silty loams, which both generally have a high organic carbon content. Depending on the physical properties of the contaminant, the depth of the overburden, and the size of the spill, contaminants could partition to the organic carbon in the soil before reaching the ground-water aquifer.

For the Susceptibility Analysis in this report, rankings of "high," "moderate," and "low" susceptibility to contamination were utilized after a review of current information. However, other SWAP reports for the State of Maryland also utilized rankings of "is," "may be," and "is not" susceptible to contamination. For consistency between the ranking systems, the following details their equivalence. The ranking of "highly susceptible" is equivalent to "is susceptible," "moderately susceptible" is equivalent to "may be susceptible," and "low susceptible" is equivalent to "is not susceptible."

5.1 VOLATILE ORGANIC COMPOUNDS

No VOC concentrations were reported in any of the water samples analyzed.

HMH Corporation, which is reported to have a UST, is located just north of the SWPA and could impact the ground water with VOCs if there is a spill or release. However, based on the available water quality data reviewed, the water supply at the McHenry Water System has a low susceptibility to VOCs.

5.2 SYNTHETIC ORGANIC COMPOUNDS

No SOCs were reported in the ground-water samples.

The possible use of herbicides on the golf course and ski slopes at the Wisp Ski Resort can be considered a potential non-point source for SOCs. However, no SOCs have been reported in the water samples. Most SOCs have a high affinity to sorb to soil and are not likely to reach the

ground water. Based on an assessment of the well construction information for Deep Creek Village Wells 1 and 2, which are the wells closest to the golf course, there is approximately 20 ft of overburden between the surface and the consolidated rock of the local aquifer.

Based on the water quality data reviewed and the thickness of the overburden, the water supply at the McHenry Water System has a low susceptibility to SOCs.

5.3 INORGANIC COMPOUNDS

Manganese (0.05 mg/L) was detected in a single water sample at a concentration that equaled the SDWR (0.05 mg/L). Manganese is a naturally occurring substance found in many types of rock and soil; it is ubiquitous in the environment and found at low levels in water and soil. The manganese detected is likely a natural occurrence.

Since 55 percent of the SWPA is not serviced by local sewerage, septic systems are utilized, primarily in the developments near the Highline Drive wells. Wastewater from septic systems generally has high concentrations of nitrate. Concentrations of nitrate have been generally reported between 1.1 and 2.36 mg/L, which is less than the MCL. These low concentrations indicate that the septic systems are not introducing substantial amounts of nitrate to the ground water. However, a slight increasing trend in nitrate concentrations has been observed since 1993, which may-be due to observed increases in residential home development that use septic systems upgradient of the wells or the over-application of nitrogen-based fertilizers on the adjacent golf course.

Sodium, sulfate, and chloride were all detected at low concentrations in ground-water samples collected and are all well below the SDWR levels for each compound.

Based on the water quality data reviewed and the increasing upgradient residential development that utilizes septic systems for wastewater discharge, the observed the water supply at the McHenry Water System has a moderate susceptibility to nitrate and a low susceptibility to other IOCs.

5.4 RADIONUCLIDES

Radon-222 (175 pCi/L) was reported at greater than 50 percent of the more conservative proposed MCL of 300 pCi/L in the only water sample submitted for analysis of radon.

Radon-222 is typically a byproduct of the radioactive decay of minerals such as uranium in the subsurface rock aquifer. The more conservative proposed MCL of 300 pCi/L is currently not enforceable and MDE is waiting for USEPA's final rule to determine how radon will be regulated for public water systems (USEPA 1999). However, samples from other systems that utilize the Greenbrier Formation as an aquifer have detected levels of radon-222 that exceed the more conservative proposed MCL of 300 pCi/L.

Also, gross beta and gross alpha were reported in concentrations substantially less than the more conservative proposed MCL for those compounds.

Based on the water quality data reviewed and the high levels of radon detected in other system that use the Greenbrier Formation aquifer, the water supply for the McHenry Water System is moderately susceptible to radon-222 and has a low susceptibility to other radionuclides.

5.5 MICROBIOLOGICAL CONTAMINANTS

No microbiological contaminants, either total or fecal coliforms, have been detected in water samples from the McHenry Water System. No GWUDI assessment has been conducted for the wells in this system to determine any possible impacts from surface water.

From the documentation reviewed, the supply wells were constructed after 1973, the year that current well construction standards were required. All wellheads were observed to be in good repair.

Test Wells 3 and 4 were not found during the site visit. In addition, the operators of the system are not aware of their existence. If these wells exist and are not maintained, they could fall into disrepair and become a potential pathway for microbiological contaminants into the aquifer.

However, based on the water quality review, and the construction of the observed supply wells, the water supply for the McHenry Water System has a low susceptibility to microbiological contaminants.

6. RECOMMENDATIONS FOR PROTECTING THE WATER SUPPLY

With the information contained in this report, the McHenry Water System has a basis for better understanding of the risks to its drinking water supply. Being aware of the SWPA, knowing potential contaminant sources, evaluating current and future development, working with soil conservation agencies, and effective outreach and education are examples of management practices that will help protect the water supply.

Recommendations for the protection of the ground-water supply are intended for the water supplier and its residents. Specific management recommendations for consideration are listed below.

6.1 PROTECTION TEAM

The team should represent all the interests in the community, such as water suppliers, community associations officers, the County Health Department, local planning agencies, local businesses, developers, property owners, and residents within and near the SWPAs. The team should work to reach a consensus on how to protect the water supply.

6.2 PUBLIC AWARENESS AND OUTREACH

The water supplier should consider discussing with property owners and businesses located within the SWPA the activities that could have impacts to the ground water and its quality. The water supplier should discuss source water protection issues with the Wisp Resort as their SWPA's overlap.

The water supplier should also consider sending pamphlets, flyers, or bill stuffers to its employees and residents to educate them about the SWPA. An example pamphlet, "Gardening in a Wellhead Protection Area," is available from MDE. Residents and employees should also be encouraged to notify the water supplier of any significant spills from gasoline or any other potentially hazardous substances.

Placing signs at the SWPA boundaries is an effective way to make the public aware of protecting their source of water supply, and to help in the event of spill notification and response.

The Executive Summary of this report should be listed in the Consumer Confidence Report for the water system, and should also indicate that the report is available to the general public by contacting the water supplier, the local library, or MDE.

6.3 PLANNING/NEW DEVELOPMENT

The water supplier should be aware of the SWPA limits and evaluate the possible effects to the quality of the ground water prior to building or making any changes.

The water supplier should also inform the Garrett County Health and Planning Departments of any concerns about future development or zoning changes for properties that are within the SWPA.

Golf courses require a significant amount of fertilizers, pesticides, and herbicides. The water supplier should contact the Wisp Resort Hotel golf course management to discuss that overuse of fertilizers and herbicides may impact ground-water quality.

6.4 MONITORING

The water supplier should continue to monitor the ground water for all SWDA contaminants as required by MDE. Nitrate concentrations should be monitored closely for an upward trend as there has been a slight increase over the past couple of years.

Annual raw water sampling at each well for microbiological contaminants is a good way to check the integrity of each well.

GWUDI samples are required to be collected and submitted for analysis so that MDE may determine whether the system is directly influenced by surface water runoff.

Additional ground-water samples should be collected and submitted for laboratory analysis of radon-222 to document levels until the USEPA determines how to regulate the radionuclides in public water supplies.

6.5 CONTINGENCY PLAN

As required by the Code of Maryland Regulations (COMAR) 26.04.01.22, all water system owners are required to prepare and submit for approval a plan to provide safe drinking water under emergency conditions.

The water supplier should develop a Spill Contingency Plan. Quick and effective spill response in the event of accidental spills or leaks is an important element in the water supplier's SWPP. This plan should identify the procedures and resources to be used to mitigate any discharge of oil or hazardous substances in the SWPA. It should also establish responsibilities, duties, procedures, and resource containment, mitigation, and cleanup of accidental discharges of oil and hazardous substances that may occur within the SWPA. In all cases when spills may present a significant risk of contamination to ground water within the SWPA the local fire department should be notified of the incident.

6.6 CHANGES IN USES

The water supplier is required to inform the Water Supply Program at MDE of any changes to pumping rates and when a change in the number of wells used is anticipated. Any changes to the pumping rate and/or the number of supply wells will affect the size and shape of the SWPA.

6.7 CONTAMINANT SOURCE INVENTORY UPDATES/INSPECTIONS

The water supplier should conduct its own survey of the SWPA to ensure that there are no additional potential sources of contamination.

A regular inspection and maintenance program of the supply wells should be considered to prevent a failure in well integrity, which could provide a pathway for contaminants to the aquifer.

Any depressions around the wellheads should be filled and graded to prevent surface water ponding that could occur during rain events. This will help to prevent surface water infiltration into the well.

Test Well 3 and 4 are reported active in the MDE's PWSID database. According to MDE PWSID files, these wells are not abandoned and still in place. These wells should be located and abandoned if there are no plans to utilize them in the future. The water supplier should inform MDE of the status of these wells as soon as possible.

6.8 PURCHASE CONSERVATION EASEMENTS OR PROPERTY

Loans are available for the purchase of property or for the purchase of easements for protection of the water supply. Eligible property must lie within the designated SWPA. Loans are currently offered at zero percent interest and zero points. Please contact the Water Supply Program of the MDE for more information.

7. REFERENCES

The following sources of information were consulted as a part of this investigation:

1. United States Department of Agriculture Soil Conservation Service. 1974. Soil Survey of Garrett County, Maryland. Washington, D.C.

2. Maryland Department of the Environment (MDE), Water Supply Program. 1999. Maryland's Source Water Assessment Plan. 36 pp.

3. United States Environmental Protection Agency (USEPA). 1999. *Proposed Radon in Drinking Water Rule*. EPA 815-F-99-006. USEPA Office of Water.

4. Maryland Geological Survey (MGS). 1980. *Garrett County Water-Well Records, Chemical-Quality Data, Ground-Water Use, Coal Test-Hole Data and Surface-Water Data*. 102 pp.

SOURCES OF DATA

Water Appropriation and Use Database
Public Water Supply Inspection Reports
Monitoring Reports
MDE Water Supply Program Oracle Database
MDE Waste Management Sites Database
Maryland Office of Planning 2000 Garrett County Land Use Map
Maryland Office of Planning 1993 Garrett County Sewer Service Map
USGS Topographic 7.5-minute Quadrangle Map – 1947 Sang Run, Maryland Quad
USGS Topographic 7.5-minute Quadrangle Map – 1947 McHenry, Maryland Quad

Appendix A

Results of Ground-Water Sample Analysis

RESULTS OF GROUND-WATER SAMPLE ANALYSIS FOR THE MCHENRY WATER SYSTEM

Plant ID	Sample Date	Contaminant Name	Result	MCL
Volatile Organic Compounds			µg/L	µg/L
01	2/17/2000	1,1,1,2-TETRACHLOROETHANE	--	
01	6/21/2000	1,1,1,2-TETRACHLOROETHANE	--	
01	9/29/2000	1,1,1,2-TETRACHLOROETHANE	--	
01	11/29/2000	1,1,1,2-TETRACHLOROETHANE	--	
01	10/29/2001	1,1,1,2-TETRACHLOROETHANE	--	
01	2/17/2000	1,1,1-TRICHLOROETHANE	--	
01	6/21/2000	1,1,1-TRICHLOROETHANE	--	
01	9/29/2000	1,1,1-TRICHLOROETHANE	--	
01	11/29/2000	1,1,1-TRICHLOROETHANE	--	
01	10/29/2001	1,1,1-TRICHLOROETHANE	--	
01	2/17/2000	1,1,2,2-TETRACHLOROETHANE	--	
01	6/21/2000	1,1,2,2-TETRACHLOROETHANE	--	
01	9/29/2000	1,1,2,2-TETRACHLOROETHANE	--	
01	11/29/2000	1,1,2,2-TETRACHLOROETHANE	--	
01	10/29/2001	1,1,2,2-TETRACHLOROETHANE	--	
01	2/17/2000	1,1,2-TRICHLOROETHANE	--	
01	6/21/2000	1,1,2-TRICHLOROETHANE	--	
01	9/29/2000	1,1,2-TRICHLOROETHANE	--	
01	11/29/2000	1,1,2-TRICHLOROETHANE	--	
01	10/29/2001	1,1,2-TRICHLOROETHANE	--	
01	2/17/2000	1,1-DICHLOROETHANE	--	
01	6/21/2000	1,1-DICHLOROETHANE	--	
01	9/29/2000	1,1-DICHLOROETHANE	--	
01	11/29/2000	1,1-DICHLOROETHANE	--	
01	10/29/2001	1,1-DICHLOROETHANE	--	
01	2/17/2000	1,1-DICHLOROETHYLENE	--	
01	6/21/2000	1,1-DICHLOROETHYLENE	--	
01	9/29/2000	1,1-DICHLOROETHYLENE	--	
01	11/29/2000	1,1-DICHLOROETHYLENE	--	
01	10/29/2001	1,1-DICHLOROETHYLENE	--	
01	2/17/2000	1,1-DICHLOROPROPENE	--	
01	6/21/2000	1,1-DICHLOROPROPENE	--	
01	9/29/2000	1,1-DICHLOROPROPENE	--	
01	11/29/2000	1,1-DICHLOROPROPENE	--	
01	10/29/2001	1,1-DICHLOROPROPENE	--	
01	2/17/2000	1,2,3-TRICHLOROBENZENE	--	
01	6/21/2000	1,2,3-TRICHLOROBENZENE	--	
01	9/29/2000	1,2,3-TRICHLOROBENZENE	--	
01	11/29/2000	1,2,3-TRICHLOROBENZENE	--	
01	10/29/2001	1,2,3-TRICHLOROBENZENE	--	
01	2/17/2000	1,2,3-TRICHLOROPROPANE	--	
01	6/21/2000	1,2,3-TRICHLOROPROPANE	--	
01	9/29/2000	1,2,3-TRICHLOROPROPANE	--	
01	11/29/2000	1,2,3-TRICHLOROPROPANE	--	
01	10/29/2001	1,2,3-TRICHLOROPROPANE	--	
01	2/17/2000	1,2,4-TRICHLOROBENZENE	--	
01	6/21/2000	1,2,4-TRICHLOROBENZENE	--	

-- = Not Detected
* = Secondary Drinking Water Regulations
^ = Drinking Water Equivalence Level
+ = Drinking Water Advisory Level

RESULTS OF GROUND-WATER SAMPLE ANALYSIS FOR THE MCHENRY WATER SYSTEM

Plant ID	Sample Date	Contaminant Name	Result	MCL
Volatile Organic Compounds			µg/L	µg/L
01	9/29/2000	1,2,4-TRICHLOROBENZENE	--	
01	11/29/2000	1,2,4-TRICHLOROBENZENE	--	
01	10/29/2001	1,2,4-TRICHLOROBENZENE	--	
01	2/17/2000	1,2,4-TRIMETHYLBENZENE	--	
01	6/21/2000	1,2,4-TRIMETHYLBENZENE	--	
01	9/29/2000	1,2,4-TRIMETHYLBENZENE	--	
01	11/29/2000	1,2,4-TRIMETHYLBENZENE	--	
01	10/29/2001	1,2,4-TRIMETHYLBENZENE	--	
01	2/17/2000	1,2-DICHLOROETHANE	--	
01	6/21/2000	1,2-DICHLOROETHANE	--	
01	9/29/2000	1,2-DICHLOROETHANE	--	
01	11/29/2000	1,2-DICHLOROETHANE	--	
01	10/29/2001	1,2-DICHLOROETHANE	--	
01	2/17/2000	1,2-DICHLOROPROPANE	--	
01	6/21/2000	1,2-DICHLOROPROPANE	--	
01	9/29/2000	1,2-DICHLOROPROPANE	--	
01	11/29/2000	1,2-DICHLOROPROPANE	--	
01	10/29/2001	1,2-DICHLOROPROPANE	--	
01	2/17/2000	1,3,5-TRIMETHYLBENZENE	--	
01	6/21/2000	1,3,5-TRIMETHYLBENZENE	--	
01	9/29/2000	1,3,5-TRIMETHYLBENZENE	--	
01	11/29/2000	1,3,5-TRIMETHYLBENZENE	--	
01	10/29/2001	1,3,5-TRIMETHYLBENZENE	--	
01	2/17/2000	1,3-DICHLOROPROPANE	--	
01	6/21/2000	1,3-DICHLOROPROPANE	--	
01	9/29/2000	1,3-DICHLOROPROPANE	--	
01	11/29/2000	1,3-DICHLOROPROPANE	--	
01	10/29/2001	1,3-DICHLOROPROPANE	--	
01	2/17/2000	1,3-DICHLOROPROPENE	--	
01	6/21/2000	1,3-DICHLOROPROPENE	--	
01	9/29/2000	1,3-DICHLOROPROPENE	--	
01	11/29/2000	1,3-DICHLOROPROPENE	--	
01	10/29/2001	1,3-DICHLOROPROPENE	--	
01	2/17/2000	2,2-DICHLOROPROPANE	--	
01	6/21/2000	2,2-DICHLOROPROPANE	--	
01	9/29/2000	2,2-DICHLOROPROPANE	--	
01	11/29/2000	2,2-DICHLOROPROPANE	--	
01	10/29/2001	2,2-DICHLOROPROPANE	--	
01	2/17/2000	BENZENE	--	
01	6/21/2000	BENZENE	--	
01	9/29/2000	BENZENE	--	
01	11/29/2000	BENZENE	--	
01	10/29/2001	BENZENE	--	
01	2/17/2000	BROMOBENZENE	--	
01	6/21/2000	BROMOBENZENE	--	
01	9/29/2000	BROMOBENZENE	--	
01	11/29/2000	BROMOBENZENE	--	

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^ = Drinking Water Equivalence Level
+ = Drinking Water Advisory Level

RESULTS OF GROUND-WATER SAMPLE ANALYSIS FOR THE MCHENRY WATER SYSTEM

Plant ID	Sample Date	Contaminant Name	Result	MCL
Volatile Organic Compounds			µg/L	µg/L
01	10/29/2001	BROMOBENZENE	--	
01	2/17/2000	BROMOCHLOROMETHANE	--	
01	6/21/2000	BROMOCHLOROMETHANE	--	
01	9/29/2000	BROMOCHLOROMETHANE	--	
01	11/29/2000	BROMOCHLOROMETHANE	--	
01	10/29/2001	BROMOCHLOROMETHANE	--	
01	2/17/2000	BROMODICHLOROMETHANE	--	
01	6/21/2000	BROMODICHLOROMETHANE	--	
01	9/29/2000	BROMODICHLOROMETHANE	--	
01	11/29/2000	BROMODICHLOROMETHANE	--	
01	10/29/2001	BROMODICHLOROMETHANE	--	
01	2/17/2000	BROMOFORM	--	
01	6/21/2000	BROMOFORM	--	
01	9/29/2000	BROMOFORM	--	
01	11/29/2000	BROMOFORM	--	
01	10/29/2001	BROMOFORM	--	
01	2/17/2000	BROMOMETHANE	--	
01	6/21/2000	BROMOMETHANE	--	
01	9/29/2000	BROMOMETHANE	--	
01	11/29/2000	BROMOMETHANE	--	
01	10/29/2001	BROMOMETHANE	--	
01	2/17/2000	CARBON TETRACHLORIDE	--	
01	6/21/2000	CARBON TETRACHLORIDE	--	
01	9/29/2000	CARBON TETRACHLORIDE	--	
01	11/29/2000	CARBON TETRACHLORIDE	--	
01	10/29/2001	CARBON TETRACHLORIDE	--	
01	2/17/2000	CHLOROETHANE	--	
01	6/21/2000	CHLOROETHANE	--	
01	9/29/2000	CHLOROETHANE	--	
01	11/29/2000	CHLOROETHANE	--	
01	10/29/2001	CHLOROETHANE	--	
01	2/17/2000	CHLOROFORM	--	
01	6/21/2000	CHLOROFORM	--	
01	9/29/2000	CHLOROFORM	--	
01	11/29/2000	CHLOROFORM	--	
01	10/29/2001	CHLOROFORM	--	
01	2/17/2000	CHLOROMETHANE	--	
01	6/21/2000	CHLOROMETHANE	--	
01	9/29/2000	CHLOROMETHANE	--	
01	11/29/2000	CHLOROMETHANE	--	
01	10/29/2001	CHLOROMETHANE	--	
01	2/17/2000	cis-1,2-DICHLOROETHYLENE	--	
01	6/21/2000	cis-1,2-DICHLOROETHYLENE	--	
01	9/29/2000	cis-1,2-DICHLOROETHYLENE	--	
01	11/29/2000	cis-1,2-DICHLOROETHYLENE	--	
01	10/29/2001	cis-1,2-DICHLOROETHYLENE	--	
01	2/17/2000	DIBROMOCHLOROMETHANE	--	

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RESULTS OF GROUND-WATER SAMPLE ANALYSIS FOR THE MCHENRY WATER SYSTEM

Plant ID	Sample Date	Contaminant Name	Result	MCL
Volatile Organic Compounds			µg/L	µg/L
01	6/21/2000	DIBROMOCHLOROMETHANE	--	
01	9/29/2000	DIBROMOCHLOROMETHANE	--	
01	11/29/2000	DIBROMOCHLOROMETHANE	--	
01	10/29/2001	DIBROMOCHLOROMETHANE	--	
01	2/17/2000	DIBROMOMETHANE	--	
01	6/21/2000	DIBROMOMETHANE	--	
01	9/29/2000	DIBROMOMETHANE	--	
01	11/29/2000	DIBROMOMETHANE	--	
01	10/29/2001	DIBROMOMETHANE	--	
01	2/17/2000	DICHLORODIFLUOROMETHANE	--	
01	6/21/2000	DICHLORODIFLUOROMETHANE	--	
01	9/29/2000	DICHLORODIFLUOROMETHANE	--	
01	11/29/2000	DICHLORODIFLUOROMETHANE	--	
01	10/29/2001	DICHLORODIFLUOROMETHANE	--	
01	2/17/2000	ETHYLBENZENE	--	
01	6/21/2000	ETHYLBENZENE	--	
01	9/29/2000	ETHYLBENZENE	--	
01	11/29/2000	ETHYLBENZENE	--	
01	10/29/2001	ETHYLBENZENE	--	
01	2/17/2000	HEXACHLOROBUTADIENE	--	
01	6/21/2000	HEXACHLOROBUTADIENE	--	
01	9/29/2000	HEXACHLOROBUTADIENE	--	
01	11/29/2000	HEXACHLOROBUTADIENE	--	
01	10/29/2001	HEXACHLOROBUTADIENE	--	
01	2/17/2000	ISOPROPYLBENZENE	--	
01	6/21/2000	ISOPROPYLBENZENE	--	
01	9/29/2000	ISOPROPYLBENZENE	--	
01	11/29/2000	ISOPROPYLBENZENE	--	
01	10/29/2001	ISOPROPYLBENZENE	--	
01	2/17/2000	m-DICHLOROBENZENE	--	
01	6/21/2000	m-DICHLOROBENZENE	--	
01	9/29/2000	m-DICHLOROBENZENE	--	
01	11/29/2000	m-DICHLOROBENZENE	--	
01	10/29/2001	m-DICHLOROBENZENE	--	
01	2/17/2000	METHYLENE CHLORIDE	--	
01	6/21/2000	METHYLENE CHLORIDE	--	
01	9/29/2000	METHYLENE CHLORIDE	--	
01	11/29/2000	METHYLENE CHLORIDE	--	
01	10/29/2001	METHYLENE CHLORIDE	--	
01	2/17/2000	METHYL-TERT-BUTYL-ETHER	--	
01	2/17/2000	METHYL-TERT-BUTYL-ETHER	--	
01	6/21/2000	METHYL-TERT-BUTYL-ETHER	--	
01	6/21/2000	METHYL-TERT-BUTYL-ETHER	--	
01	9/29/2000	METHYL-TERT-BUTYL-ETHER	--	
01	9/29/2000	METHYL-TERT-BUTYL-ETHER	--	
01	11/29/2000	METHYL-TERT-BUTYL-ETHER	--	
01	11/29/2000	METHYL-TERT-BUTYL-ETHER	--	

-- = Not Detected
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^ = Drinking Water Equivalence Level
+ = Drinking Water Advisory Level

RESULTS OF GROUND-WATER SAMPLE ANALYSIS FOR THE MCHENRY WATER SYSTEM

Plant ID	Sample Date	Contaminant Name	Result	MCL
Volatile Organic Compounds			µg/L	µg/L
01	10/29/2001	METHYL-TERT-BUTYL-ETHER	--	
01	10/29/2001	METHYL-TERT-BUTYL-ETHER	--	
01	2/17/2000	MONOCHLOROBENZENE	--	
01	6/21/2000	MONOCHLOROBENZENE	--	
01	9/29/2000	MONOCHLOROBENZENE	--	
01	11/29/2000	MONOCHLOROBENZENE	--	
01	10/29/2001	MONOCHLOROBENZENE	--	
01	2/17/2000	m-XYLENE	--	
01	6/21/2000	m-XYLENE	--	
01	9/29/2000	m-XYLENE	--	
01	11/29/2000	m-XYLENE	--	
01	10/29/2001	m-XYLENE	--	
01	2/17/2000	NAPHTHALENE	--	
01	6/21/2000	NAPHTHALENE	--	
01	9/29/2000	NAPHTHALENE	--	
01	11/29/2000	NAPHTHALENE	--	
01	10/29/2001	NAPHTHALENE	--	
01	2/17/2000	N-BUTYLBENZENE	--	
01	6/21/2000	N-BUTYLBENZENE	--	
01	9/29/2000	N-BUTYLBENZENE	--	
01	11/29/2000	N-BUTYLBENZENE	--	
01	10/29/2001	N-BUTYLBENZENE	--	
01	2/17/2000	n-PROPYLBENZENE	--	
01	6/21/2000	n-PROPYLBENZENE	--	
01	9/29/2000	n-PROPYLBENZENE	--	
01	11/29/2000	n-PROPYLBENZENE	--	
01	10/29/2001	n-PROPYLBENZENE	--	
01	2/17/2000	o-CHLOROTOLUENE	--	
01	6/21/2000	o-CHLOROTOLUENE	--	
01	9/29/2000	o-CHLOROTOLUENE	--	
01	11/29/2000	o-CHLOROTOLUENE	--	
01	10/29/2001	o-CHLOROTOLUENE	--	
01	2/17/2000	o-DICHLOROBENZENE	--	
01	6/21/2000	o-DICHLOROBENZENE	--	
01	9/29/2000	o-DICHLOROBENZENE	--	
01	11/29/2000	o-DICHLOROBENZENE	--	
01	10/29/2001	o-DICHLOROBENZENE	--	
01	2/17/2000	o-XYLENE	--	
01	6/21/2000	o-XYLENE	--	
01	9/29/2000	o-XYLENE	--	
01	11/29/2000	o-XYLENE	--	
01	10/29/2001	o-XYLENE	--	
01	2/17/2000	p-CHLOROTOLUENE	--	
01	6/21/2000	p-CHLOROTOLUENE	--	
01	9/29/2000	p-CHLOROTOLUENE	--	
01	11/29/2000	p-CHLOROTOLUENE	--	
01	10/29/2001	p-CHLOROTOLUENE	--	

-- = Not Detected
* = Secondary Drinking Water Regulations
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RESULTS OF GROUND-WATER SAMPLE ANALYSIS FOR THE MCHENRY WATER SYSTEM

Plant ID	Sample Date	Contaminant Name	Result	MCL
Volatile Organic Compounds			µg/L	µg/L
01	2/17/2000	p-DICHLOROBENZENE	--	
01	6/21/2000	p-DICHLOROBENZENE	--	
01	9/29/2000	p-DICHLOROBENZENE	--	
01	11/29/2000	p-DICHLOROBENZENE	--	
01	10/29/2001	p-DICHLOROBENZENE	--	
01	2/17/2000	P-ISOPROPYLTOLUENE	--	
01	6/21/2000	P-ISOPROPYLTOLUENE	--	
01	9/29/2000	P-ISOPROPYLTOLUENE	--	
01	11/29/2000	P-ISOPROPYLTOLUENE	--	
01	10/29/2001	P-ISOPROPYLTOLUENE	--	
01	2/17/2000	p-XYLENE	--	
01	6/21/2000	p-XYLENE	--	
01	9/29/2000	p-XYLENE	--	
01	11/29/2000	p-XYLENE	--	
01	10/29/2001	p-XYLENE	--	
01	2/17/2000	SEC-BUTYLBENZENE	--	
01	6/21/2000	SEC-BUTYLBENZENE	--	
01	9/29/2000	SEC-BUTYLBENZENE	--	
01	11/29/2000	SEC-BUTYLBENZENE	--	
01	10/29/2001	SEC-BUTYLBENZENE	--	
01	2/17/2000	STYRENE	--	
01	6/21/2000	STYRENE	--	
01	9/29/2000	STYRENE	--	
01	11/29/2000	STYRENE	--	
01	10/29/2001	STYRENE	--	
01	2/17/2000	TERT-BUTYLBENZENE	--	
01	6/21/2000	TERT-BUTYLBENZENE	--	
01	9/29/2000	TERT-BUTYLBENZENE	--	
01	11/29/2000	TERT-BUTYLBENZENE	--	
01	10/29/2001	TERT-BUTYLBENZENE	--	
01	2/17/2000	TETRACHLOROETHYLENE	--	
01	6/21/2000	TETRACHLOROETHYLENE	--	
01	9/29/2000	TETRACHLOROETHYLENE	--	
01	11/29/2000	TETRACHLOROETHYLENE	--	
01	10/29/2001	TETRACHLOROETHYLENE	--	
01	2/17/2000	TOLUENE	--	
01	6/21/2000	TOLUENE	--	
01	9/29/2000	TOLUENE	--	
01	11/29/2000	TOLUENE	--	
01	10/29/2001	TOLUENE	--	
01	2/17/2000	trans-1,2-DICHLOROETHYLENE	--	
01	6/21/2000	trans-1,2-DICHLOROETHYLENE	--	
01	9/29/2000	trans-1,2-DICHLOROETHYLENE	--	
01	11/29/2000	trans-1,2-DICHLOROETHYLENE	--	
01	10/29/2001	trans-1,2-DICHLOROETHYLENE	--	
01	2/17/2000	TRICHLOROETHYLENE	--	
01	6/21/2000	TRICHLOROETHYLENE	--	

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RESULTS OF GROUND-WATER SAMPLE ANALYSIS FOR THE MCHENRY WATER SYSTEM

Plant ID	Sample Date	Contaminant Name	Result	MCL
Volatile Organic Compounds			µg/L	µg/L
01	9/29/2000	TRICHLOROETHYLENE	--	
01	11/29/2000	TRICHLOROETHYLENE	--	
01	10/29/2001	TRICHLOROETHYLENE	--	
01	2/17/2000	TRICHLOROFLUOROMETHANE	--	
01	6/21/2000	TRICHLOROFLUOROMETHANE	--	
01	9/29/2000	TRICHLOROFLUOROMETHANE	--	
01	11/29/2000	TRICHLOROFLUOROMETHANE	--	
01	10/29/2001	TRICHLOROFLUOROMETHANE	--	
01	2/17/2000	VINYL CHLORIDE	--	
01	6/21/2000	VINYL CHLORIDE	--	
01	9/29/2000	VINYL CHLORIDE	--	
01	11/29/2000	VINYL CHLORIDE	--	
01	10/29/2001	VINYL CHLORIDE	--	
01	2/17/2000	XYLENES, TOTAL	--	
01	6/21/2000	XYLENES, TOTAL	--	
01	9/29/2000	XYLENES, TOTAL	--	
01	11/29/2000	XYLENES, TOTAL	--	
01	10/29/2001	XYLENES, TOTAL	--	
Synthetic Organic Compounds			µg/L	µg/L
01	2/17/2000	1,2-DIBROMO-3-CHLOROPROPANE	--	
01	2/17/2000	2,4,5-T	--	
01	2/17/2000	2,4,5-TP (SILVEX)	--	
01	2/17/2000	2,4-D	--	
01	2/17/2000	3-HYDROXYCARBOFURAN	--	
01	2/17/2000	ALACHLOR (LASSO)	--	
01	2/17/2000	ALDICARB	--	
01	2/17/2000	ALDICARB SULFONE	--	
01	2/17/2000	ALDICARB SULFOXIDE	--	
01	2/17/2000	ALDRIN	--	
01	2/17/2000	ATRAZINE	--	
01	2/17/2000	BENZO(a)PYRENE	--	
01	2/17/2000	BHC-GAMMA(LINDANE)	--	
01	2/17/2000	BUTACHLOR (MACHETE)	--	
01	2/17/2000	CARBARYL	--	
01	2/17/2000	CARBOFURAN	--	
01	2/17/2000	CHLORDANE	--	
01	2/17/2000	DALAPON	--	
01	2/17/2000	DI(2-ETHYLHEXYL) ADIPATE	--	
01	2/17/2000	DI(2-ETHYLHEXYL) PHTHALATE	--	
01	2/17/2000	DICAMBA	--	
01	2/17/2000	DIELDRIN	--	
01	2/17/2000	DINOSEB	--	
01	2/17/2000	ENDRIN	--	
01	2/17/2000	ETHYLENE DIBROMIDE (EDB)	--	
01	2/17/2000	HEPTACHLOR	--	
01	2/17/2000	HEPTACHLOR EPOXIDE	--	
01	2/17/2000	HEXACHLOROBENZENE (HCB)	--	

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RESULTS OF GROUND-WATER SAMPLE ANALYSIS FOR THE MCHENRY WATER SYSTEM

Plant ID	Sample Date	Contaminant Name	Result	MCL
Synthetic Organic Compounds			µg/L	µg/L
01	2/17/2000	HEXACHLOROCYCLOPENTADIENE	--	
01	2/17/2000	METHOMYL	--	
01	2/17/2000	METHOXYCHLOR	--	
01	2/17/2000	METOLACHLOR	--	
01	2/17/2000	METRIBUZIN (SENCOR)	--	
01	2/17/2000	OXAMYL (VYDATE)	--	
01	2/17/2000	PENTACHLOROPHENOL	--	
01	2/17/2000	PICLORAM	--	
01	2/17/2000	PROPACHLOR (RAMROD)	--	
01	2/17/2000	SIMAZINE	--	
Radionuclides			pCi/L	pCi/L
01	10/29/2001	COMBINED RADIUM (226 & 228)	--	
01	2/28/2001	GROSS ALPHA	--	
01	4/23/2001	GROSS ALPHA	1	15
01	9/28/2001	GROSS ALPHA	4	15
01	10/29/2001	GROSS ALPHA	2	15
01	2/28/2001	GROSS ALPHA (SHORT TERM)	--	
01	4/23/2001	GROSS ALPHA (SHORT TERM)	--	
01	9/28/2001	GROSS ALPHA (SHORT TERM)	--	
01	10/29/2001	GROSS ALPHA (SHORT TERM)	--	
01	2/28/2001	GROSS BETA	1	50
01	4/23/2001	GROSS BETA	--	
01	9/28/2001	GROSS BETA	--	
01	10/29/2001	GROSS BETA	--	
01	2/28/2001	GROSS BETA (SHORT TERM)	--	
01	4/23/2001	GROSS BETA (SHORT TERM)	--	
01	9/28/2001	GROSS BETA (SHORT TERM)	--	
01	10/29/2001	GROSS BETA (SHORT TERM)	--	
01	10/29/2001	RADIUM-226	--	
01	10/29/2001	RADIUM-228	--	
01	4/23/2001	RADON-222	175	300
Inorganic Compounds			mg/L	mg/L
01	2/17/2000	ANTIMONY	--	
01	2/17/2000	ARSENIC	--	
01	2/17/2000	BARIUM	--	
01	2/17/2000	BERYLLIUM	--	
01	2/17/2000	CADMIUM	--	
01	6/27/2000	CHLORIDE	68	250 *
01	2/17/2000	CHROMIUM	--	
01	2/28/2001	FLUORIDE	--	
01	6/27/2000	IRON	--	
01	6/27/2000	MANGANESE	0.05	0.05 *
01	2/17/2000	MERCURY	--	
01	2/17/2000	NICKEL	--	
01	2/8/1993	NITRATE	1.1	10
01	5/26/1999	NITRATE	1.6	10
01	12/21/1999	NITRATE	1.5	10

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RESULTS OF GROUND-WATER SAMPLE ANALYSIS FOR THE MCHENRY WATER SYSTEM

Plant ID	Sample Date	Contaminant Name	Result	MCL
Inorganic Compounds			**mg/L**	**mg/L**
03	12/21/1999	NITRATE	1.5	10
01	2/17/2000	NITRATE	1.6	10
01	3/28/2000	NITRATE	1.6	10
01	6/27/2000	NITRATE	--	
01	8/28/2000	NITRATE	1.8	10
02	8/30/2000	NITRATE	--	
01	8/29/2001	NITRATE	2.36	10
01	1/29/2002	NITRATE	2.2	10
01	2/8/1993	NITRITE	--	
01	6/27/2000	NITRITE	--	
02	8/30/2000	NITRITE	--	
01	2/17/2000	SELENIUM	--	
01	2/17/2000	SODIUM	3.34	60 +
01	6/27/2000	SULFATE	39.8	250 *
01	2/17/2000	THALLIUM	--	
General Water Quality Parameters				
01	6/27/2000	ALKALINITY, TOTAL	71	
01	6/27/2000	pH	7.2	6.5-8.5 *
01	6/27/2000	TURBIDITY	0.3	5

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SUMMARY OF MICROBIOLOGICAL CONTAMINANT ANALYSIS FOR MCHENRY WATER SYSTEM WATER SAMPLES

Sample Date	Samples Taken	Total Coliform	Total Fecal	Total Indeterminate	Sample Repeats	Repeat Coliforms	Repeat Fecal	Repeat Indeterminate
3/1/99	1	0	0	0	--	--	--	--
5/1/99	1	0	0	0	--	--	--	--
8/1/99	1	0	0	0	--	--	--	--
11/1/99	1	0	0	0	--	--	--	--
2/1/00	1	0	0	0	--	--	--	--
3/1/00	1	0	0	0	--	--	--	--
4/1/00	1	0	0	0	--	--	--	--
5/1/00	1	0	0	0	--	--	--	--
6/1/00	1	0	0	0	--	--	--	--
7/1/00	1	0	0	0	--	--	--	--
8/1/00	1	0	0	0	--	--	--	--
9/1/00	1	0	0	0	--	--	--	--
10/1/00	1	0	0	0	--	--	--	--
11/1/00	1	0	0	0	--	--	--	--
12/1/00	1	0	0	0	--	--	--	--
1/1/01	1	0	0	0	--	--	--	--
2/1/01	1	0	0	0	--	--	--	--
3/1/01	1	0	0	0	--	--	--	--
4/1/01	1	0	0	0	--	--	--	--
5/1/01	1	0	0	0	--	--	--	--
6/1/01	1	0	0	0	--	--	--	--
7/1/01	1	0	0	0	--	--	--	--
8/1/01	1	0	0	0	--	--	--	--
9/1/01	1	0	0	0	--	--	--	--
10/1/01	1	0	0	0	--	--	--	--
11/1/01	1	0	0	0	--	--	--	--
12/1/01	1	0	0	0	--	--	--	--
1/1/02	1	0	0	0	--	--	--	--
2/1/02	1	0	0	0	--	--	--	--
3/1/02	1	0	0	0	--	--	--	--
4/1/02	1	0	0	0	--	--	--	--
5/1/02	1	0	0	0	--	--	--	--
6/1/02	1	0	0	0	--	--	--	--
7/1/02	1	0	0	0	--	--	--	--

-- = not applicable