Minnesota Ground Water Association

Volume 15, Number 3: September, 1996

President's Letter

August 3 was the MGWA Birthday Bash, held at Bruce Bloomgren's farm in rural Stillwater. We roasted a pig, played volleyball, jumped on the trampoline and visited friends and colleagues. Those who were there had fun, those of you who missed it, too bad! Thanks to Bruce for hosting; he and assistant Jim Jacques did a wonderful job.

Fifteen years and rolling. Part of what we do as an organization is to help support worthy causes which help to further the mission of MGWA. This is exemplified by a $250 donation recently granted to the Minnesota Water Line, a project sponsored in part by the University of Minnesota Extension Service and various supporting counties. The board is also contacting colleges and universities with field camps, letting them know that we do give limited scholarships. The Water Line project serves to educate citizens of Minnesota on dealing with water issues (quite frequently ground water), while the colleges and universities are creating the professionals of the future.

Another part of what we do is provide educational opportunities to our members. Case in point is our upcoming fall field trip, co-sponsored with the American Institute of Professional Geologists and the U.S. Geological Survey. This year we will be staying here in town and learning more about the geology and hydrogeology of the Twin Cities on September 13 and 14. Tour stops (naming just a few) will include the Twin Cities Army Ammunition Plant, where improper disposal of solvents and other materials years ago lead to very widespread ground water contamination; the St. Croix Research Station of the Science Museum of Minnesota; the infamous fens of the Minnesota River Valley;

—continued on page 2

Operation of Minnesota's Statewide Baseline Ground Water Monitoring Program Using a GIS/GPS Database

by Yuan-Ming Hsu, Jennifer Schlotthauer, and Tom Clark, Minnesota Pollution Control Agency

This paper was originally presented at the Air and Waste Management Association Conference, ***Geographic Information Systems in Environmental Resources Management*** *held in Reno, NV, March 13-15, 1996.*

Abstract

Although Minnesota is known for its 10,000 lakes, its citizens rely heavily on ground water for their water supply, especially in rural areas. Since 1992, the statewide Ground Water Monitoring and Assessment Program (GWMAP) has relied on conjunctive use of Geographic Information System (GIS) and Global Positioning System (GPS) technologies to operate a major program of aquifer monitoring and assessment. When completed in 1997, the statewide baseline monitoring network will consist of a statistical selection of about 1,200 water wells representing Minnesota's 14 principal aquifers. GWMAP uses a systematic sampling design to maintain uniform distribution of randomly selected monitoring stations for ground water sampling and data analysis. In the statewide baseline network, Minnesota is divided into over 700, 121-square mile grid cells, each with a centralized, nine-square mile sampling region. Within each sampling region, single-aquifer cased and grouted wells are selected and sampled for about 125 parameters, including trace metals, organic compounds, and major cations and anions. Combined use of GIS and GPS automates the selection of wells using the statewide County Well Index (CWI) and allows the precise field determination of well locations. By the end of the 1995 field season, 957 baseline network stations had been sampled from 80 counties and field located using GPS. In 1996, a data logger and barcoder will be implemented to replace use of paper field forms and the need to manually label and track sample bottles. GWMAP has used GIS extensively to analyze sampling results and evaluate Minnesota's ground water quality on a regional basis. GIS and GPS have allowed GWMAP to optimize use of available funding and staff time, while eliminating the degree of uncertainty which could compromise statistical evaluation of the hydrogeologic data obtained from the sampling program.

Introduction

Background

Quantitative assessment of ground water quality conditions requires a highly organized data collection program that includes statistical evaluation of monitoring results (Nelson and Ward, 1981; Ward, 1989). It is difficult for states to provide the staff and financial resources necessary to generate

—continued on page 2

Table of Contents

The primary objectives of the MGWA are:

- Promote and encourage scientific and public policy aspects of ground water;
- Establish a common forum for scientists, engineers, planners, educators, attorneys, and other persons concerned with ground water;
- Educate the general public regarding ground water resources; and
- Disseminate information on ground water.

President's letter, cont.

and reconstructed wetlands at Cedar Lake in Minneapolis. We will travel in motor coaches, with catered box lunches provided each day. Friday night will feature socializing on board a tour boat out of Stillwater.

All members will be getting a flyer with more detail on the trip. I am looking forward to seeing many of you then!

A national ground water event upcoming this fall is the Ground Water Protection Council's annual forum in St. Paul September 22-25 (see page 6 for a reprint of their registration form). It will feature talks on ground water and watershed protection, wellhead and source water protection and underground injection control. It's a good place to network with people from around the country and learn more about many aspects of ground water protection and regulation.

Also this fall, Hennepin County and the Metro Area Ground Water Alliance are sponsoring a day-long workshop specific to metro area ground water issues. Minnesota Ground Water Association members are specifically invited. It will be held on October 21 at the Minneapolis Convention Center. More information on this conference is provided on page 10 of this issue.

— Gretchen Sabel, MGWA President, Minnesota Pollution Control Agency

PCA's GWMAP, cont.

quantitative statewide ground water information. However, with the use of GIS and GPS technologies, states have the potential to improve the quality of environmental monitoring programs and reduce the amount of staff time necessary to collect and evaluate data. The degree to which these potential benefits are realized depends largely on how effectively the technology can be incorporated into the monitoring design. This paper describes how GIS and GPS technologies have been integrated into the design of Minnesota's Ground Water Monitoring and Assessment Program (GWMAP) to improve overall effectiveness and reduce costs.

Hydrogeologic Setting

Minnesota, the twelfth largest state, obtains its ground water from 14 principal aquifers (Adolphson, Ruhl, and Wolf, 1981) which span over four billion years of geologic history. Nearly all the rural population of the state depends on water from these aquifers. Buried and surficial sand and gravel aquifers left by several glacial advances over the state in the last million years are composed of outwash, beach ridge, and ice contact deposits. Sandstone and carbonate rocks of Paleozoic and late Precambrian age comprise the aquifers which support the population of the southeast part of the state, including the metropolitan areas of the Twin Cities and Rochester. Aquifers of early Precambrian age, consisting of a variety of rock types including granite, basalt and quartzite are important in scattered areas of the state from Minnesota's Iron Range in the northeast, to the southwest corner where quartzite outcrops occur.

To compare water quality of different aquifers and assess trends over time, GWMAP uses standardized aquifer classifications for each of the stations in the program using the hydrogeologic units of the U. S. Geological Survey (Adolphson, Ruhl and Wolf, 1981) and the four-letter identifying codes used by the Minnesota Geological Survey in classifying aquifers (Wahl and Tipping, 1991). This system recognizes hydrogeologic subunits within each of the principal aquifers and has the flexibility to allow subunits to be split out individually or grouped together for data analysis. For example, the Prairie du Chien and Jordan aquifers are known or suspected to be hydraulically connected in much of southeast Minnesota. However, it is useful to be able to analyze the Prairie du Chien (OPDC) and Jordan (CJDN) sub-units separately as well as having a way to designate wells which are known to be open to both (OPCJ).

Well Selection Using GIS

Monitoring Program Description

The methods chosen to select wells for sampling are a key to the interpretation of data gained from a ground water quality monitoring program (Nelson and Ward, 1981; Gilbert, 1987; Ward, 1989). In Minnesota, there are over 200,000 active water wells, with approximately 10,000 new installations annually. For each candidate well chosen for monitoring by GWMAP, many well construction records must be individually reviewed by a hydrogeologist. Therefore, it is imperative to have an automated prescreening mechanism in place to facilitate well selection. GWMAP chose GIS as the best tool for this task. GIS enables the program to combine a systematic sampling technique with hydrogeologic criteria to ensure an efficient and cost-effective selection process for designating wells that are useful for evaluating baseline ground water quality conditions.

In general, systematic sampling techniques use a randomly generated uniform grid to determine sampling locations in space and/or time (Gilbert, 1987). Systematic sampling was first implemented in GWMAP in 1991 using a manually generated spatial grid defined by the Public Land Survey (PLS) (Myers et al., 1992). Although the PLS is not 100 percent geographically uniform, it was selected for the grid to expedite well selection from existing digital databases in which wells are located by PLS section. In 1992, GWMAP developed a GIS coverage to create a new sampling grid (Hsu et al., 1993).

Generating the Sampling Grid

The statewide sampling grid was generated from a randomly selected ori-

—continued on facing page

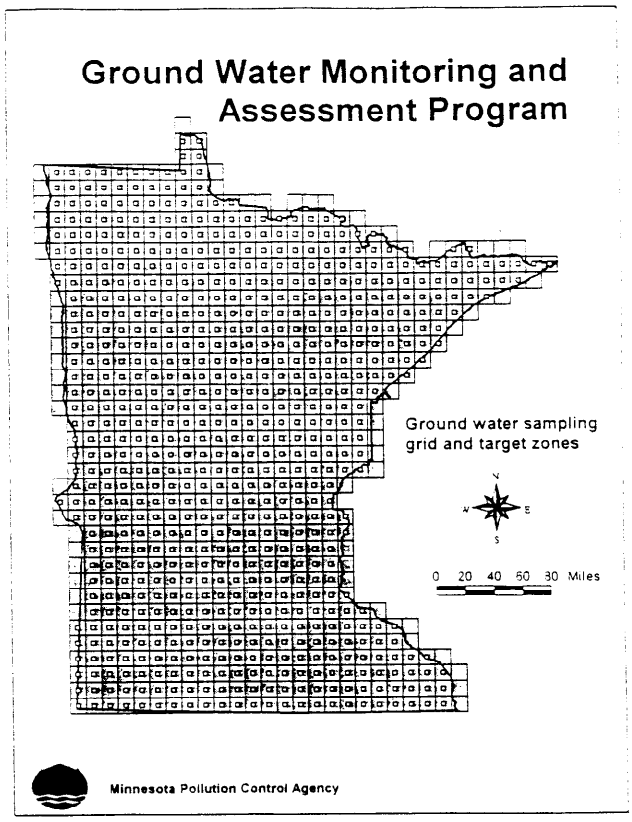


Figure 1. Ground water sampling grid and target zones.

gin (ESRI, 1993). This grid consists of approximately 700 square cells (Figure 1). Each cell is comprised of an 11-by-11 mile square, or 121 square miles. The centroid of each cell is consecutively numbered and was extracted to produce the origin of the sampling zone. Each sampling zone is a three-by-three mile square from which monitoring points are selected. It is generated by computing the coordinates of the four corners of the square using the grid cell's centroid as the origin. To link the sampling zone and grid cell, each is identified with the same numerical code. These sampling zones, a series of regularly spaced nine square-mile boxes, are then made into a GIS coverage and overlaid on the PLS coverage to associate sections with each of the sampling zones. Ideally, the sampling zone should cover exactly nine PLS sections (Myers et al., 1992). However, portions of 16 to 25 sections usually fall within the sampling zone of each cell (Figure 2).

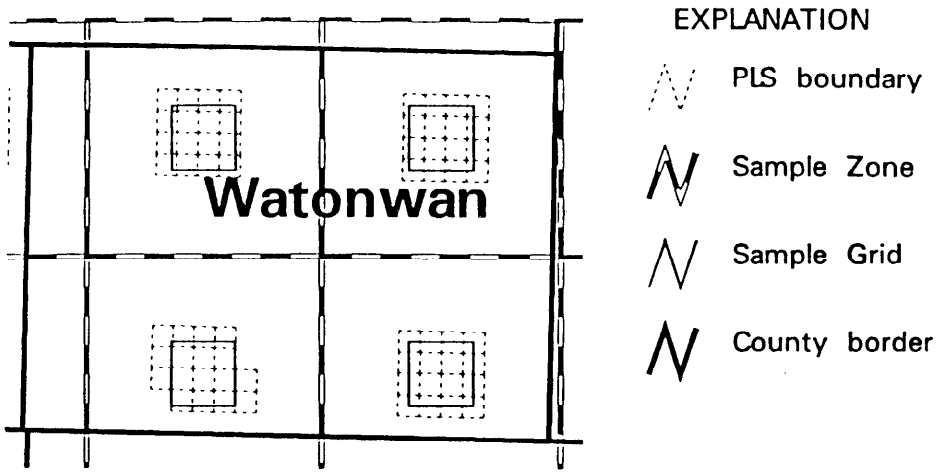


Figure 2. PLS and the sampling grid.

1996 Board of Directors

Well Selection

After the PLS sections within the sampling grid have been identified, the statewide well database is imported as a point coverage and overlaid with the selected PLS section coverage. Thus, all wells that fall within the 16 to 25 sections are selected as potential candidates. The statewide coverage contains approximately 154,000 well sites of the estimated 200,000 active wells in Minnesota. It was developed based on the County Well Index of the Minnesota Geological Survey (Wahl and Tipping, 1991). The accuracy of the well locations in CWI varies; most of the point locations are approximated to four quarters of a section (2 1/2 acres). Although most of the well selection process can be automated, not all of the well construction information required on drillers' logs is contained in CWI, meaning a manual file search of well records is still necessary.

The final well selection is done after applying the nine square-mile sampling zone over the potential candidates. For wells that fall within the zone, the well construction records are pulled and submitted for individual review by hydrogeologists. Typically, five to ten percent of all selected wells that meet the location criteria are sampled. This accounts for both the hydrogeologic and well construction criteria and the cooperation by well owners participating in the program.

The implementation of GIS in well selection has helped GWMAP excel in two major areas. First, the development of the statewide GIS grid has eliminated previously uncontrolled variables by removing the spatial inconsistencies of the PLS system from the grid. Second, use of a GIS has reduced the manual workload by up to 90 percent with the automation of two important steps in the well selection process: the generation of PLS section information in order to facilitate the database search, and the identification of wells that meet the geographic location criteria.

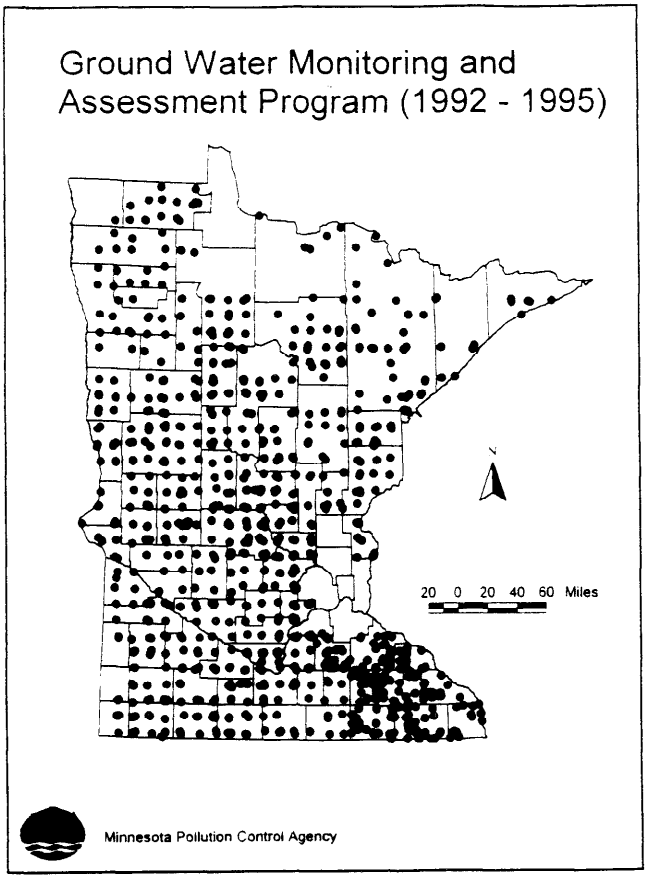


Figure 3. GWMAP sampling points, 1992-1995.

Application Of GPS In Ground Water Sampling

Introduction

In 1991, the U. S. Environmental Protection Agency (EPA) established a policy that all new data collected after 1992 should meet an accuracy goal of 25 meters or better (EPA, 1992). The purpose of EPA's Locational Data Policy (LDP) is to establish principles for collecting and documenting consistent location coordinates to facilitate cross-programmatic, multi-media analyses. Accurate geographic information is important to the spatial analysis of well sampling results. Any uncertainly in sample location could compromise a hydrogeologic analysis (Mitchell, 1993). GPS provides an easy and cost-effective solution.

GPS Field Application

GWMAP began employing GPS in the field in October 1992 to assist in locating wells to be sampled. By the end of the 1995 field season, 957 wells in 80 counties had been located using GPS and sampled (Figure 3). The program uses a multi-channel receiver with internal data logging capability. Typically, the receiver is placed directly on top of the wellhead and continually logs 100 to 150 GPS readings into the receiver's internal memory in approximately five minutes.

The GPS is also used occasionally for navigation in the field to search for the sampling site. Since the sampling sites are pre-determined, their location can be extracted from a topographic map. The approximate coordinates can then be loaded into a GPS receiver. In most cases, the receiver has successfully led the field operators within visual range of the wellhead.

Data Management and Processing

Because of the inherent Selective Availability (SA) of the GPS system, raw field data must be differentially corrected (EPA, 1992; Trimble, 1993). Once the GPS receiver is brought back from the field, data are downloaded to a personal computer and differentially corrected (Trimble, 1993). The average or mean of the 100 or more readings collected on-site is calculated and reported as the location of the site. GWMAP obtains data for differential correction through the Internet from the Minnesota Department of Health base station in Minneapolis. In the field experience of GWMAP, a nominal accuracy of 5 meters has been consistently achieved after post-differential correction and averaging have been applied to the data.

The use of GPS to locate GWMAP's wells has increased the efficiency and accuracy of the monitoring program, while cutting costs. This technology is very suitable for any program that is designed to conduct either large-area or intensive monitoring activities. Data collected by GWMAP are used not only in regional studies of hydrogeology and ground water chemistry, but can be

—continued on page 5

PCA's GWMAP, cont..

used as valuable sources of background information in site-specific investigations as well. Efficiency should further increase in 1996 as GWMAP implements use of a data logger and bar-coder to replace the need for paper field forms and the need to manually label and track sample bottles.

Ground Water Chemistry Data

Introduction

The conjunctive use of GIS and GPS facilitates the presentation of large amounts of ground water chemistry data on a statewide basis. GWMAP well samples are analyzed for about 125 parameters, including trace metals, organic compounds, and major cations and anions. Ambient monitoring data of the type GWMAP collects is of paramount importance in helping decision-makers begin to answer such "big picture" questions as:

What is the average or expected water quality in my area? Is ground water quality improving or degrading? In which areas is ground water quality worse, and are the causes natural or anthropogenic?

Arsenic and Nitrate

As an example of the difference in distribution of a naturally-occurring parameter versus the distribution of a parameter caused largely by human activity, we compare the statewide distribution of arsenic (Figure 4) with nitrate (Figure 5). Although small amounts of arsenic may have been contributed to Minnesota ground water through improper use and storage of arsenic for pest control in the 1920s and 30s, the distribution pattern shown in Figure 4 is largely due to geologic factors. The north-south trending band of higher arsenic concentrations in well water in west-central Minnesota coincides closely with the edge of one of the last advances of glacial ice over this part of the state.

It is believed that the mineral arsenopyrite in these glacial deposits contributes small amounts of arsenic to the ground water in buried drift aquifers. The drillers' logs for the affected wells show remarkably similar geology and the wells are generally over 100 feet deep with at least one protective clay layer which would inhibit any downward movement of arsenic sources from the surface.

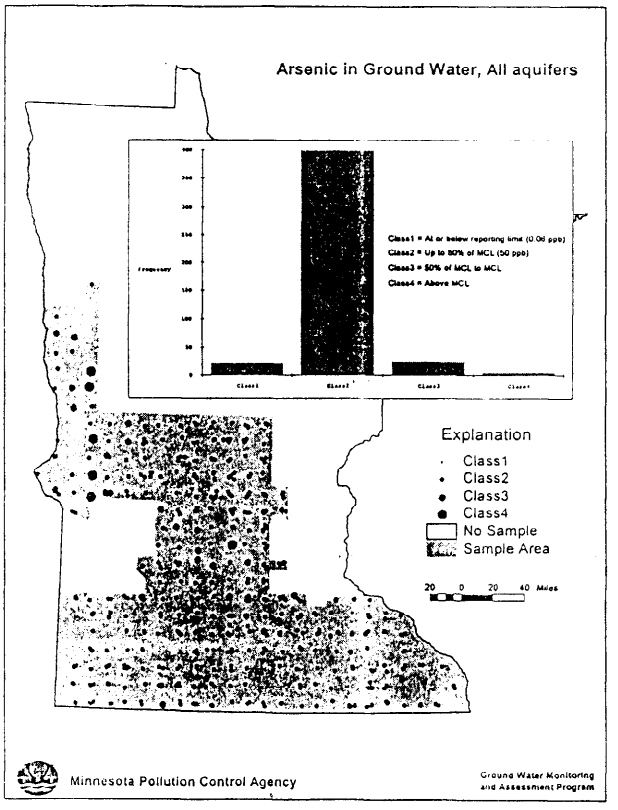


Figure 4. Arsenic in ground water, all aquifers

This is in contrast to the distribution shown for nitrate (Figure 5). There are many possible sources of nitrate in ground water which result from human activity, including use of fertilizer, poorly-designed or improperly maintained septic systems, and contribution from animal feedlots. All these sources probably contribute in some way to the pockets of elevated nitrates shown in Figure 5. The elevated areas correspond well with land use and geology, such as the large farms and feedlots of southwest Minnesota and the sensitive karst geology of southeast Minnesota where the principal bedrock aquifers are at or near the surface.

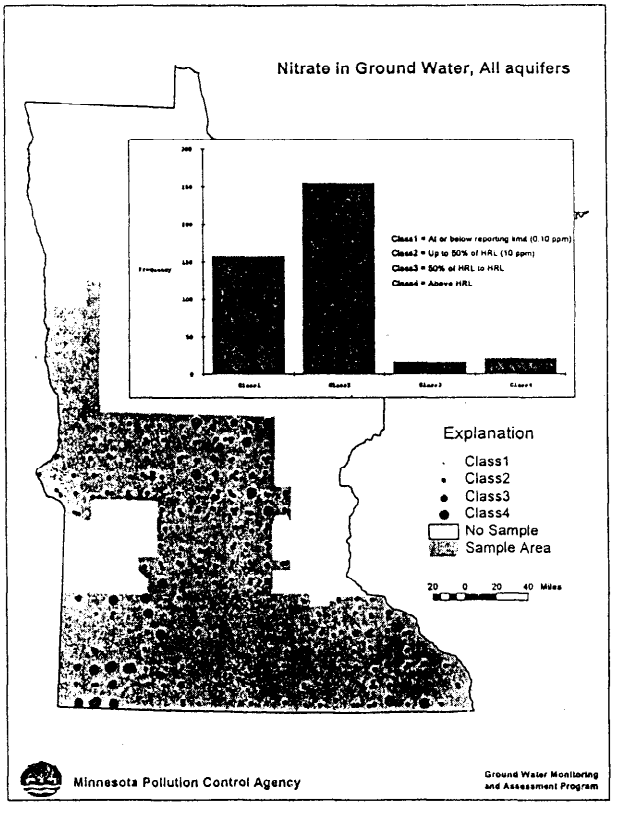


Figure 5. Nitrate in ground water, all aquifers.

Trilinear Diagrams

When concentrations of major cations and anions are converted to milliequivalents and plotted as a percentage, the composition of aquifers can be compared by a trilinear plotting technique (Piper, 1944). The trilinear signatures (Figure 6) are an excellent tool to show how the natural chemistry of aquifers differs and even how chemistry changes

— *to page 7*

Registration Form

1996 Ground Water Protection Council Annual Forum

September 22 - 25, 1996 ♦ St. Paul, MN

Fax: (405)848-0690 Mail: GWPC, 827 NW 63rd, Suite 103, Oklahoma City, OK 73116
Internet: *gwpc.site.net* (meetings and events link)

Registration Form

Name: _____

Title: _____

Organization: _____

Address: _____

City _____ State _____ Zip _____

Phone:(_____) _____ Fax:(_____) _____

Registration Fees

	received on or before 9/6	*after 9/6*
❑ Member	$300	$325
❑ Non Member*	$375	$425
❑ Speaker	$150	$150
❑ One Day	$100	$125
❑ Student	$50	$70
❑ Field Trip	$30	$30
❑ Football Game	$10	$10
Exhibitors & Vendors (includes one registration)		
❑ Government agency/non-profit		$500
❑ Corporate		$800
TOTAL	$_____	$_____

*Includes one years membership dues

50% refund on cancellations before 9/18. None thereafter

Method of Payment:

❑ Payment enclosed ❑ MasterCard ❑ Visa ❑ Invoice me

Please make checks payable to: GWPC

Credit Card # _____ Exp. Date _____

Signature _____

Are environmental regulations and best management practices catching up with ground water science and technology? Is there a gap? What do we know technically about ground water, watershed management and underground injection control regulation and what do we need to know more about? What effect will EPA's Office of Ground Water and Drinking Water reorganization have on future ground water regulatory program management? How are the state programs adapting to all the change in Washington, DC? How will the current interest in "source water or watershed" protection affect you?

If you would like answers to these questions, plan to attend this conference. Through technical exchange and peer group discussions you can be a part of the answer.

The forum and accompanying proceedings will comprise a mix of invited presentations, papers, presentations in concurrent sessions, and special poster sessions relating to the following topics:

- Wellhead and Source Water Protection
- Delineation techniques
- Ground water management and agricultural chemicals
- Ground water and surface water interaction
- Practical application of GIS and Use of the Internet in Ground Water Management
- Local Government Role in Ground Water Protection
- Streamlining the Comprehensive State Ground Water Protection Program Process
- Ground Water and Educational Approaches to Protecting It
- The effects of Underground Injection on Ground Water and Drinking water
  - Agricultural drain wells
  - Industrial disposal well closure
  - Large septic system guidance
  - Stormwater drainage well guidance
- Deep injection well issues

Proceedings of this forum are included with registration and will be included in your registration packet.

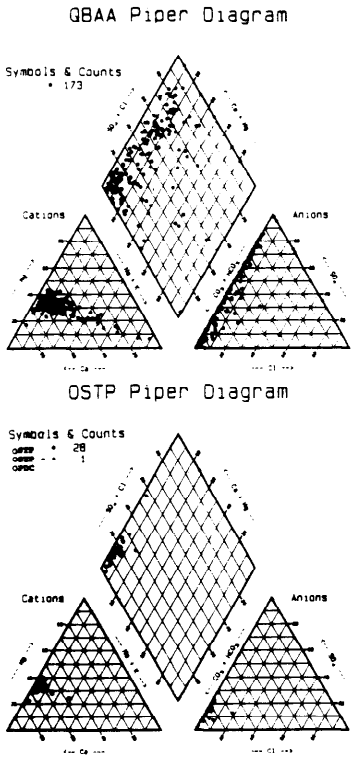


Figure 6. Trilinear (Piper) diagrams, Buried Sands vs. St. Peter aquifers.

within aquifers of broad regional extent. In Figure 6, the buried drift aquifer (QBAA) shows considerable variability in chemistry across the state. A protected bedrock aquifer of relatively limited aerial extent like the St. Peter Sandstone (OSTP) shows tighter clustering of the data suggesting the chemistry of ground water in this aquifer is less variable and likely to be more predictable than the chemistry of the ground water in the buried drift aquifers.

Because each of the data points in the trilinear plots has been located using GPS, it becomes possible to study how chemistry of an aquifer varies from point to point across the state. Once the statewide baseline network shown in Figure 3 is completed, GWMAP will begin a more intensive study of variability within aquifers and how chemistry might be predicted for a well in a given aquifer and depth at any location in the state.

Conclusions

The conjunctive use of GIS and GPS technologies in a statewide ground water monitoring program has allowed GWMAP to optimize available funding and staff time. GIS has greatly increased staff efficiency in identifying sampling areas, manipulating the sampling grid and selecting wells for monitoring. In addition, GIS has enabled GWMAP to integrate a variety of maps and coverages in various map scales.

Using GPS to locate sampling sites has enabled GWMAP to obtain very accurate geographic location data with relative ease. This virtually eliminates a major degree of uncertainty which previously might have compromised the statistical evaluation of the hydrogeologic data.

GWMAP's success in integrating existing digital data to automate the well selection process has clearly demonstrated the importance of having the ability to acquire information from others and the great need for a broadly applied standard for data conversion and transfer.

Cited References

1) Nelson, J. D.; Ward, R. C.; *Statistical considerations and sampling techniques for ground water quality monitoring;* Ground Water, 1981, 19(6), p. 617-625.

2) Ward, R. C.; "Water quality monitoring—a systems approach to design," in *Proceedings of the International Symposium on the Design of Water Quality Information Systems;* Colorado State University, Fort Collins, June 7-9, 1989.

3) Adolphson, D. G.; Ruhl, J. F.; Wolf, R. J.; *Designation of principal water supply aquifers in Minnesota;* U. S. Geological Survey Report of Investigations 81-51, St. Paul, 1981, 19p.

4) Wahl, T. E.; Tipping, R. G.; *Ground water data management: the County Well Index;* Minnesota Geological Survey, University of Minnesota, St. Paul, 1991.

5) Gilbert, R. O.; *Statistical methods for environmental pollution monitoring;* Van Nostrand-Reinhold: New York, 1987, 312p.

6) Myers, G.; Magdalene, S.; Jakes, D.; et al.; *The redesign of the ambient ground water monitoring program;* Minnesota Pollution Control Agency, St. Paul, 1992, 151p.

7) Hsu, Y.; Myers, G.; Clark, T.; et al.; "Integrating GIS/GPS into Minnesota's Ground Water Monitoring and Assessment Program," in *Proceedings of the GIS/LIS Annual Conference and Exposition;* Minneapolis, 1993, v. 1, p. 323-330.

8) ESRI; *ARC/INFO version 6.1, ARCPLOT command references;* Environmental Systems Research Institute, Redlands, CA, 1993.

9) EPA; *Global positioning systems technology and its application in environmental programs;* U. S. Environmental Protection Agency, GIS Technical Memorandum No. 3, 600-R-92-036, February 1992.

10) Mitchell, J. E.; "A characterization of the influence of (x,y) uncertainty on predicting the form of three-dimensional surfaces," in *Proceedings of GIS and Water Resources, AWRA Spring Symposium;* Mobile, March 1993, p. 559-567.

11) Trimble Navigation, Ltd.; *General reference, GPS Pathfinder system;* Sunnyvale, CA, 1993.

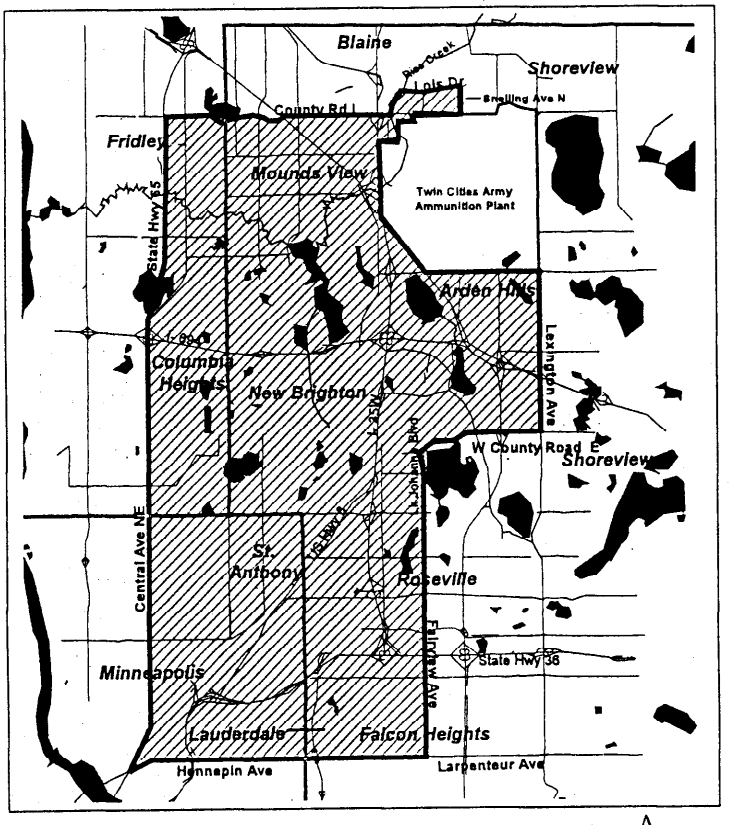
12) Piper, A. M.; *A graphical procedure in the geochemical interpretation of water analyses;* American Geophysical Union Transactions, 1944, Vol. 25, p. 914-923.

New Special Well Construction Area Designated for Wells in the Vicinity of TCAAP

The Minnesota Department of Health (MDH) is designating a new SPECIAL WELL CONSTRUCTION AREA which includes all of the cities of New Brighton and St. Anthony, and portions of the cities of Fridley, Mounds View, Arden Hills, Shoreview, Columbia Heights, Minneapolis, Falcon Heights, Lauderdale, and Roseville which are located in Hennepin, Ramsey, and Anoka Counties. The Special Well Construction Area designation becomes effective on July 1, 1996, and will remain in effect until further notice. The area boundary is shown on the accompanying map.

The designated Special Well Construction Area has an extensive history of ground water contamination, investigation, and remedial activity. Ground water in portions of the designated area has been contaminated with volatile organic chemicals (VOCs) from solvents used and disposed of at the Twin Cities Army Ammunition Plant (TCAAP) in Arden Hills. There are two areas of contamination. The largest area of contamination extends several miles to the south and west of TCAAP, to a depth of several hundred feet. Here, portions of the buried sand formation (Hillside Sand formation) and the Prairie du Chien dolomite and Jordan sandstone bedrock formations have been contaminated with VOCs. A second, much smaller area of VOC contamination exists in the surficial sand and silt deposits (Fridley formation) to the north and west of TCAAP, to a depth of approximately 45 feet.

Special Well Construction Area
Twin Cities Army Ammunition Plant



Minnesota Department of Health
Geographic Information System

Efforts to control and clean up the contamination at the TCAAP facility and to the south of TCAAP have been underway for many years. The MDH and the Minnesota Pollution Control Agency (MPCA) are concerned that the construction of new wells or modification of existing wells within the Special Well Construction Area may interfere with cleanup efforts, or may cause further spread of the contamination. The MDH and MPCA are also concerned about the public health effects that could result from the use of water-supply wells in the contaminated aquifers. The designation of the Special Well Construction Area is intended to address these concerns.

Within the designated area, the following restrictions apply:

1. Wells may not be constructed or modified until the MDH has reviewed and approved plans for the proposed activity.

2. Wells completed in or below the Prairie du Chien Group (Shakopee and Oneota formations) may not be sealed until the MDH has reviewed and approved plans.

Plans are required for all regulated wells, including potable water-supply wells, irrigation wells, commercial and industrial water-supply wells, wells for heating and cooling, remedial wells, monitoring wells, and dewatering wells. In reviewing well construction plans, the MDH will consider the proposed well location, construction methods and materials, depth, pumping capacity, and the presence and concentration of ground water contaminants near the well. The MDH may require that wells be sampled for VOCs prior to placing in service or prior to permanent sealing.

For additional information regarding Special Well Construction Areas, contact your local MDH Well Management Unit hydrologist. Plans for new well construction, well reconstruction, or well sealing within the TCAAP Special Well Construction Area may be submitted to Patrick Sarafolean at PO Box 64975, St. Paul MN 55164-0975, (612)215-0826.

— Reprinted from the Summer 1996 Well Management Newsletter of the MN Department of Health.

15th Birthday Bash a Success

About 50 MGWA members, including a number of the organization's charter members from 1981-82 (see complete charter member list on page 11), enjoyed a sunny summer afternoon picnic at Bruce Bloomgren's Bar Nothing Ranch near Stillwater in honor of MGWA's fifteenth birthday. A good selection of best-quality, sky-blue (the advertising brochure called the color "stone-washed denim") T-shirts in sizes M, L, & XL with a special anniversary logo is still available from Jennie Leete (296-0433) for $13.00 each. If you are a charter member and you weren't there to pick up your certificate, it will be mailed to you.

MGWA Board Meetings and Minutes

The volunteer board of the Association meets monthly for business discussions at 7:30 a.m. the first Thursday of the month at the Egg and I Restaurant, University and 280, in the Midway area. MGWA members are welcome to attend these meetings. If you are interested, call a few days ahead to Gretchen Sabel, MGWA President (297-7574) to confirm that a meeting is being held and reserve a space. Recently, the board voted to publish minutes of board meetings in the newsletter. Copies of meeting minutes are also available from MGWA Secretary Jan Falteisek (297-3877).

MGWA Board Meeting Minutes

June 6, 1996

Attending: Cathy O'Dell, Past- President; Ray Wuolo, President- Elect; Jan Falteisek, Secretary; Jeanette Leete, WRI; Sean Hunt, WRI; Tom Clark, Newsletter Editor; Jim Almendinger, advertising; Bill Johnsen, AIPG (Wenck).

- Cathy O'Dell called the meeting to order at 7:45 a.m. May Board minutes were approved. The Board discussed the Spring Meeting. About 50 to 60 people attended. Comments from attendees indicated the presentation was well-received with some suggestions for improvements.
- Cathy O'Dell will be sending out scholarship letters for Gretchen.
- Preparations for the MGWA 15th Anniversary Picnic were discussed. Jennie will check with Bruce Bloomgren to finalize a date (probably August 3rd) and bring to the next meeting proposals for commemorative items to be produced in recognition of the 15th Anniversary. Suggested were mugs and T-shirts. The charter members would be invited to the picnic and also highlighted in the September newsletter. Jan will work with Jennie and Sean on the proposal.
- Tom Clark reported that the layout for the directory was in review. The Board asked that a tan cover be used. Tom also said that most of the material for the next newsletter had been submitted and was looking at layout in about two weeks. Alternate papers for both the directory and newsletter were discussed. It was suggested that next year the directory be printed on 8 1/2 x 11 paper and 3-hole punched. Jim is following up on ad renewals.
- Preparations for the Fall Field Trip on September 13-14 were discussed. The field trip will focus on the Metro Area. A subcommittee of Cathy O'Dell, Tom Clark, and Jim Almendinger will coordinate with AIPG (Bill Johnsen) to choose sites, itinerary, and stop "experts", develop a budget, and work out logistics. They plan to meet Thursday, June 27th for breakfast at the Egg & I.
- Lynn Kelly, AIPG, informed the Board about the development of a statewide umbrella organization of earth scientists to provide education outreach. A meeting early in July has been proposed. Lynn will be sending a letter to Gretchen describing the organization.
- Next meeting is July 11th, 7:30 a.m. at Egg & 1.
- Meeting adjourned 9:00 a.m.

—continued on next page

Newsletter Advertising Policy for 1996

Advertising space is available in this newsletter to businesses and organizations. Display ads are charged by fractional page:

Quarterly Newsletter

Size	inches H x V	Annual Rate
Business Card	3.5 x 2.3	$60
Quarter Page	3.5 x 4.8	$110
Half Page	7.5 x 4.8	$205
Full Page	7.5 x 9.75	$385

1996 Membership Directory

Size	inches H x V	Annual Rate
Business Card	3.5 x 2.3	$45
Quarter Page	3.5 x 4.8	$90
Half Page	7.5 x 4.8	$170
Full Page	7.5 x 9.75	$325
Inside Cover	7.5 x 9.75	$360

The Advertising Manager has final determination on the acceptance of materials submitted. There are no commissions on ads. Advertising copy must be received by the publications deadlines: February 15, May 15, August 11, or November 10. Since we do not do any art or camera work ourselves, and we reuse copy from issue to issue, your copy should be a photostat of your art work at the exact insertion size. Photostats give the highest quality print reproduction. MGWA will have the photostat made for a one-time extra charge of $30 for ads submitted on plain paper unless 4 high-quality copies of the ad (one for each issue) are supplied.

Please send your copy, accompanied by a check payable to the Minnesota Ground Water Association, to the Advertising Manager (address below).

For questions on advertising orders, rates, and policy, please call Jim Almendinger, Advertising Manager, MGWA Publications, PO Box 65362, St. Paul, MN 55165-0362, Phone: (612)433-5953, Fax: (612)433-5924.

MGWA Board Meeting Minutes, cont.

Minutes recorded by Jan Falteisek, MGWA Secretary.

July 11, 1996

Attending: Cathy O'Dell, Past President; Jennie Leete, WRI; Jim Almendinger, advertising; Ray Wuolo, President-Elect; Gretchen Sabel, President; John Seaberg, AIPG.

- Gretchen Sabel called the meeting to order at 7:40 a.m. Gretchen served as recorder in Jan Falteisek's absence.
- Minutes from last meeting were OK'd (Ray Wuolo moved, general acclaim).
- Charitable giving decision— request from the Water Line for $250 was OK'd (motion Cathy O'Dell, second Ray Wuolo). Cathy is sending out letters to colleges and universities in MN that run field camps, to solicit interest in scholarships.
- Summer Picnic— Bruce Bloomgren needs $700 now to secure provisions. Gretchen agreed to contact MGWA Treasurer Paul Putzier and request that he send Bruce a check. Jennie Leete presented several options for items of MGWA memorabilia to sell; the Board decided on T-shirts and mugs. Interest orders will be taken on nice polo shirts, and the shirts ordered only if there is sufficient interest to fill a full order (24 shirts). Leete has a list of charter members which she will circulate to all Board members in an attempt to locate them and invite them to attend (still must pay the $7 per adult).
- Fall Field Trip— Cathy O'Dell recounted her June meeting with Bill Johnsen (representing AIPG) and Jim Almendinger, where a preliminary outline of the field trip was developed. John Seaberg (MPCA) also offered his help in planning. Jim Stark from USGS can also assist and should be called upon. Day one of the trip will focus on north metro locations and is shaping up well, Day two is south metro and still needs work. The following items remain to be accomplished: 1. Finalize agenda, 2. Make arrangements for busses, banquet location (Gretchen volunteered to help with this), 3. Set dates (Sept. 13-14), 4. All needs to be finalized by next Board meeting so notices can be sent.
- Fall Meeting: Jennie Leete suggested a technical meeting on the hows and whys of electronic data logging. All present supported this, agreed to explore further. Sabel will write letters soliciting interest from equipment vendors, Wuolo will work on getting a venue.
- Meeting adjourned at 8:45 AM. Next meeting August 1.

Ground Water Protection Conference

The Hennepin County Board of Commissioners, in cooperation with the Metro Area Ground Water Alliance, is sponsoring a Ground Water Protection conference on **October 21, 1996** at the Minneapolis Convention Center. The purpose of the conference is to provide information regarding state requirements, sources of ground water data, and related information to assist local governments in identifying and implementing practices for ground water protection.

Public works directors and staff, city managers, and planning staff from municipalities, counties and other local agencies in the Metropolitan Area are encouraged to attend. Members of the Minnesota Ground Water Association and American Water Works Association are also encouraged to attend.

The registration fee is $20. The registration fee includes conference materials, lunch, refreshments, and parking in the Minneapolis Convention Center Parking Ramp. Registration is limited to 100 participants.

For additional information regarding the Ground Water Protection Conference or to request registration materials, please contact Joel Settles, (612)348-6157, at the Hennepin County Environmental Management Division, Department of Public Works.

MPCA Example Sampling Protocol

A template entitled the "Minnesota Pollution Control Agency Superfund and Voluntary Investigation and Cleanup Programs Example Sampling Protocol for Monitoring Wells" (Example Sampling Protocol) has been created from Appendix A of the "MPCA Ground Water Sampling Guidance Document, Development of Sampling Plans, Protocols and Reports, 1995". It's an example protocol that can be used as a template to create a site-specific protocol. Modifications should be made in consultation with MPCA staff oversight. Copies of this Example Sampling Protocol are available for copying on diskette in the MPCA library to facilitate modification with word processing software. It is also available on diskette for site-specific application. Forward the request to MPCA, Ground Water and Solid Waste Division, Site Response Section support staff by calling (612)296-7291. The requester shall provide a PC-formatted 3.5" disk with a self-addressed, stamped disk envelope for duplication of the protocol. At this time, there will be no charge for copying the protocol to diskette. Initially, a copy will be provided in Microsoft Word for Windows 6.0. In the future, copies may be available in other formats or available for electronic transfer via modem.

Training on use of the Example Sampling Protocol template will be available in late September. Please call Paul Estuesta at 296-7997 after September 1, 1996 for further information.

Reminder of 1996 Newsletter Editorial and Publication Submittal Deadlines:

Volume 15, Number 4; December 1996

Submission of articles to the editor—11/8/96

Submission of copy to the publisher—11/15/95

MGWA Charter Members

Dr. E. Calvin Alexander, Jr., Dr. James E. Almendinger, Henry W. Anderson, Jr., Kevin Baker, Kelton Barr, Dan Bigalke, Patricia A. Bloomgren, Paul R. Book, Linda Bruemmer, Shelley Burman, Thomas P. Clark, Mark A. Collins, Janet Dalgleish, Douglas N. Day, Geoffrey Delin, John G. Fax, G. R. (Rudy) Ford, Sandra Forrest, Gilbert Gabanski, John H. Gilbertson, Sheila Grow, Rudy Hoagberg, John N. Holck, Charles R. Howe, Don Jakes, Larry L. Johnson, Michael A. Jost, Roman Kanivetsky, Robert M. Karls, Dr. Kerry L. Keen, David L. Kill, Stephen J. Lee, Dr. Jeanette H. Leete, Capt. Patricia Leonard-Mayer, Amy J. Loiselle, Gail Lowry Haglund, Eric Madsen, Joe Magner, Kristin Kennedy Moeller, Eric Mohring, Martin M. Moran, Kenneth P. Olson, Terry S. Olson, Joseph M. Oschwald, Robert E. Pendergast, Dr. Hans-Olaf Pfannkuch, Laurel Reeves, Joe Renier, Jerry R. Rick, Brian Rongitsch, Janet Rowe, Gretchen Sabel, Dr. Mary E. Savina, Brad Sielaff, Mark Simonett, Albert J. Smith, Ronald C. Spong, James R. Stark, Mark Storck, Dr. Otto D.L. Strack, Stephen J. Terhaar, Ronald D. Thompson, Dale B. Thompson, Tim Thurnblad, Dale Trippler, Sarah P. Tufford, Dr. Timothy Vick, James L. Warner.

New Approaches To Rural Nonpoint Source Pollution: What Makes Them Work

A follow-up to a 1993 conference exploring how people, process, science, and technology can share responsibility for achieving water quality goals in the Midwest will be held September 16-18 at the Holiday Inn in La Crosse, Wisconsin.

This conference will provide an in-depth look at effective initiatives and partnerships and provide attendees with:

- Indepth studies of how new initiatives, partnerships and research are exploring effective ways to address nonpoint source pollution.
- A "three-years-later look" at new developments, results and directions of selected presentations and posters from the 1993 conference.
- Practical do's and don'ts, including the whys and hows of successful efforts, as well as challenges faced and lessons learned.
- An understanding of the changing roles and responsibilities of agencies, farmers, agribusinesses and rural communities in effectively protecting water quality.
- An expanded network of people and organizations committed to learning from one another and working together to achieve common goals.

The conference will feature keynote sessions, concurrent one-hour and two-hour discussions of new initiatives, partnerships and research, and extensive poster sessions.

To receive a conference program and registration information mail, fax or e-mail your name and mailing address to Nonpoint Source Conference, c/o Linda Schroeder, 282 77th St. S.E., Delano, MN 55328. Phone: (612) 972 -3908. Fax: (612)912-3904. e-mail: schroecomm@aol.com

New Publications

Minnesota Geological Survey

Text Supplement to the Geologic Atlas, Stearns County, Minnesota. County Atlas Series C-10, Part C. G. N. Meyer and Lynn Swanson, Editors

U.S. Geological Survey

Conversion of the Twin Cities metropolitan area numerical ground-water-flow model from the Trescott-Larson computer code to the McDonald-Harbaugh computer code. U.S.G.S. Open-File Report 96-133. R. J. Lindgren.

Availability and quality of water from drift aquifers in Marshall, Pennington, Polk, and Red Lake Counties, northwestern Minnesota. U.S.G.S. Water-Resources Investigations Report 95-4201. R. J. Lindgren

MGWA-AIPG Fall Field Trip Close at Hand

By the time this newsletter reaches you, the annual fall field trip will be just around the corner. A separate flyer has been mailed giving details and registration information. Jointly-sponsored by the Minnesota Ground Water Association and the Minnesota Chapter of the American Institute of Professional Geologists, the trip this year will be held in and close to the Twin Cities metropolitan area on September 13th and 14th, 1996. Featured will be the work of several major ground water research organizations, including the Upper Mississippi NAWQA of the U.S. Geological Survey, the Twin Cities Area Ground Water Model, several ground water monitoring programs of state and local agencies, and a tour of the St. Croix Watershed Research Station. Watch the December MGWA newsletter for pictures and an article!

Newsletter Management Team News

Interested in being a part of the production of your newsletter? There's more room for volunteers who would like to be part of a Newsletter Management Team as described in the June issue. We're piloting the concept for the December issue and hope to have the team fully operational in 1997. Remember, this is your organization and your newsletter. We always need articles and ideas on how to spread the word about ground water issues to our membership. The Newsletter Management Team will be an important part of assuring this continues to happen as MGWA enters its sixteenth year and beyond.

The first meeting of the Team was held August 20th and the results were quite promising. For more information, call or e-mail your editor, Tom Clark, at (612)296-8580 or tom.clark@pca.state.mn.us.

Lookout Mountain Well Contaminated with TCE

Lookout Mountain Village is a small community with a population of approximately 60 residents near Silver Bay, in northeastern Minnesota. The village is located on the site of a former U.S. Air Force radar station that closed in 1982.

A new water-supply well was constructed for the village in the summer of 1995. The well was drilled to a depth of 1015 feet. It was cased with 17 feet of 6-inch diameter steel casing and has an open bore hole in rock from 17 feet to 1015 feet. The well was placed into service in the fall of 1995. Shortly thereafter, the Minnesota Department of Health (MDH) received complaints from several residents that the water had a strange odor. In response to the complaints the MDH sampled the water in September 1995 and found that the well was contaminated with trichloroethylene (TCE), a chemical solvent often used to remove grease from metal parts.

Testing of water from the village well revealed that the well was contaminated with TCE at a level of 74 parts per billion (ppb). The maximum contaminant level (MCL) for TCE in public water supplies, set by the U.S. Environmental Protection Agency (EPA), is 5 ppb. The MDH issued a drinking water advisory and recommended that residents avoid using the water for drinking or cooking. In response to the confirmed contamination, bottled water was immediately provided to the residents. Clean water was subsequently trucked in from the city of Silver Bay.

The MDH also conducted a health risk assessment, and determined that the residents of Lookout Mountain Village did not face any significant health risks during the brief period before the drinking water advisory went into effect. The federal MCLs are calculated to keep health risks extremely low, and the MCL for TCE assumes that people will be drinking the water on a regular basis over an entire 70-year lifetime. The new well at Lookout Mountain Village was only in use for a few weeks.

The federal government agreed to construct a replacement well for the village. It was completed on January 26, 1996, and is located approximately one mile away from the contaminated well. The replacement well is 150 feet deep and is constructed with 50 feet of 6-inch diameter steel casing, cement grouted in an oversized bore hole, with open uncased bore hole to 150 feet. The new replacement well has a surprisingly high yield of close to 90 gallons of water per minute, a yield that is not often found in a well finished in the granitic and basaltic bedrock of northeastern Minnesota.

To date, TCE has not been detected in water samples collected from the replacement well. Monitoring of the replacement well will continue. The village is currently using the new well for their water supply. As a part of the drinking water emergency issued by the Minnesota Pollution Control Agency (MPCA), the contaminated well has been ordered to be sealed. Before the well is sealed, different zones of the well will be isolated with inflatable packers and tested to determine at what depth the contamination is entering the well. Plans for further investigation will be developed from the packer test data.

— Reprinted from the Summer 1996 Well Management Newsletter of the MN Department of Health.

Join the Minnesota Ground Water Association!

If you are reading this newsletter second-hand, we'd like to take this opportunity to invite you to become a member of **MGWA** for 1996. Annual dues are $20 for professional members and $15 for students. Members are entitled to purchase the annual membership directory for $7. Additional donations toward our scholarships and/or the use of recycled paper will be gratefully accepted.

Dues paid to MGWA are not deductible as charitable contributions for federal income tax purposes. However, dues payments are deductible as ordinary and necessary business expenses to the extent allowed by law.

Just complete the form below and mail to: MGWA, c/o WRI, 4779 126th St. N, White Bear Lake, MN 55110-5910.

Name ____________________
Affiliation/Employer ____________________
Work Address ____________________
City, State, Zip Code ____________________
Work Telephone Number ____________________ E-mail ____________________
Fax Number ____________________
Home Address (optional) ____________________
City, State, Zip Code ____________________
Home Telephone Number ____________________
Which Address should we use for Directory Listing? ____________________
Which Telephone Number should we use for Directory Listing? ____________________

Minnesota Ground Water Association
P. O. Box 65362
St. Paul, MN 55165

Made from over 50% Recycled Fiber
including 20% Post-Consumer Waste

First Class
US Postage
PAID
St. Paul, MN
Permit # 7122

D

MGWA

15 Years