

Minnesota Ground Water Association

www.mgwa.org

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Presidents Column

Jim Lundy, MGWA President

Last winter I discussed ground water with my daughter's kindergarten class. Fifty kids gathered round to see pictures of oil spills and maps of the watery planet in all its blueness. We talked about the water cycle, and observed colored water rising in celery due to capillary action. Finally I unveiled the physical ground water flow model, a saturated sand tank with "geologic" layering. As I showed the kids the water levels in the "piezometers", they crowded closer. I pumped water from a "drinking water well", and the youthful mass drew closer still.

I carefully weighed my next move. "Shall I pour this green stuff (food coloring, representing contamination) into this well?" And the frenzied throng was upon me, egging me on. "Do it! Do it!" (their enthusiasm for ground water contamination made me wonder whether my emphasis needed adjustment).

More recently, my wife Sherryl and I visited our son Sean's third grade class. This was the oldest class our traveling ground water circus had encountered, and we needed extra ammo. We discussed ground water flow through sand, gravel and clay, and fired up the sand tank. We placed three "monitoring wells" around the room, which the kids measured with an e-tape and flow cell. At the end of class I helped them map the classroom's "ground water flow direction", perhaps a bit advanced for them. But they learned my mantra for the day: "Where does water flow? From high head to low head!"

Even kindergartners can learn about ground water; my experience shows it's true. And when children are learning, the excitement is invigorating and contagious. Long after I left the

school, my mind buzzed with the memory of excited questions, the kids jostling each other to look at the flow model, the sheer enthusiasm. There was no doubt they had learned some things about ground water and the environment. The only downside was the time spent preparing. What if MGWA members with an interest in elementary school ground water education assembled a collection of resources for use by those who want to visit the schools?

The collection might have three parts. One would outline age appropriate presentations for kindergarten through high school. This part might include slides, demonstrations, and activities. A second part would list equipment owned by MGWA members (or their workplaces) that is available for loan to those wishing to make a school presentation. For example, the ground water model that I borrowed for my school presentations is available for loan at DNR Waters (one of the DNR Waters models was donated to DNR by MGWA). A third section would list MGWA members available to help make presentations as part of a ground water education cooperative.

For example, asked to present to an eighth grade class, I check the collected material. I don't know what eighth graders can handle, but the notebook has a sample outline. Next, I line up equipment (sampling equipment, posters, videos, etc.) by checking the equipment list and calling the members of the educational cooperative whose equipment is available for loan. Perhaps an MGWA member from one of those offices would offer to help with the presentation.

Not only would the educational cooperative promote ground water science in elementary schools, it would also

—continued on page 2

MTBE and Minnesota's ground water: A complex, continuing story

Katherine Carlson, Public Information Officer, Minnesota Pollution Control

CBS's "60 Minutes" television magazine banks on strong responses to the show's hard-hitting investigative pieces. They got one in Minnesota. After "60 Minutes" aired a January 16 two-part overview about the impacts of the gasoline oxygenate methyl tertiary butyl ether (MTBE) on ground water, phones started ringing at the Minnesota Department of Health (MDH), Minnesota Pollution Control Agency (MPCA), and municipal water suppliers. The main question: Is my drinking water safe?

"If you don't know about (MTBE) yet, you will," said reporter Steve Kroft in his introduction to the piece. "It's a gasoline additive that is contaminating drinking water from Maine to California and has been called the biggest environmental crisis of the next decade."

Public response to the hyperbole made delivering the Minnesota

— continued on page 3

Table of Contents

<i>President's Column</i>	1
<i>MTBE</i>	1
<i>Transport in Clay-Rich Sediments</i>	4
<i>Hydrologist Helps in Africa</i>	6
<i>MGWA Scholarships</i>	10
<i>MGWA Foundation</i>	10
<i>MN Water Law Meeting</i>	13
<i>Obituaries</i>	14
<i>Water Levels Online</i>	15

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President's Column, cont.

foster cooperation between the public and private sector organizations involved in professional ground water activities. If you are interested in bringing ground water to the elementary schools, if you would like to work on developing outlines for presentations to different age groups, or if your office has materials that might help teach ground water to kids, please give me a call.

Some related announcements:

- In March, the MGWA board approved three scholarship requests totaling \$500 (related news item, page 10).
- Responses to last fall's membership survey indicated a desire to support student projects and field trips to a greater degree than MGWA currently does. In March I signed the paperwork to incorporate the MGWA Foundation (related news item, also on page 10). The MGWA Foundation is the non-profit corporation to which MGWA will transfer the scholarship and education functions that have until now been carried by the MGWA. To make the Foundation successful, please consider making a donation (it's tax-deductible and painless to do online at www.mgwa.org). Don't be shy! Even five or ten dollars helps. Small donations from many donors are great (although we'd accept donations of \$1 million or more too).

Please consider volunteering as a presenter or classroom guide at the Third Annual Children's Water Festival (September 27, 2000, in St. Paul). Contact Joe Enfield, Children's Water Festival Co-chair (952-361-1801, or jenfield@co.carver.mn.us) for information on volunteer opportunities and company sponsorships. If you have kids in grade school, please be sure their science teacher knows about the festival.

Note: The DNR Waters Ground Water Model seen below can be reserved by calling Dan Zwilling, DNR Waters, at (651)296-0427.



— MGWA President Jim Lundy demonstrates a ground-water flow model for budding hydrogeologists. Photo by Mark Sulzbach, Minnesota Pollution Control Agency

MTBE, cont.

message even more of a relief than usual. The picture here differs significantly from the national picture, in ways that make the state look downright prophetic.

- With few exceptions, fuel sold in Minnesota does not include MTBE. When the Clean Air Act Amendments of 1990 required gasoline manufacturers to add oxygenates for cleaner-burning fuel, the state's agricultural interests made ethanol the preferred choice. An active Minnesota Department of Agriculture ethanol program advocated strongly for the "home brewed" over MTBE.
- The MDH samples public water supplies for MTBE, and has since 1990. The "60 Minutes" report focused on drinking water in Santa Monica, California, where MTBE hadn't been sampled until March 1996 – and by then had affected 70 percent of the municipal wells. MDH has not detected MTBE in any municipal supply wells and low levels in only two community water supplies (one a state park).
- The MPCA samples ground water at all tank-leak sites for MTBE, and has since 1989. "60 Minutes" displayed a map of states having MTBE detections in ground water that highlighted Minnesota, a fact that disturbed many citizens. However, consensus among agency staff is clear: Any state that hasn't detected MTBE in ground water hasn't been looking for it.

So, on first glance, the state seemingly has dodged the drinking water woes MTBE has inflicted upon the east and west coasts. A closer second look shows that, while Minnesota's policies have forestalled MTBE contamination of public water supplies, they have not prevented the additive from becoming ubiquitous in the state's ground water.

An estimated 20 percent of all tank leak sites show MTBE in ground water, primarily because of its use in the 1980s as an octane-enhancer. MPCA hydrogeologist Mark Toso

reports levels as high as 37,400 ppb at large terminal leak sites.

"It's well known that MTBE was used in Minnesota before ethanol became preferred due to tax incentives," said Toso. "That does not mean that its use was stopped completely. There is no way to be sure about its usage because oil companies do not have to report this."

Other MTBE sources contribute their mite to the overall ground water picture:

- Koch Refining of Rosemount manufactured fuel oxygenated with MTBE as recently as 1997, which was sold primarily in other states. Amoco used MTBE in premium unleaded gasoline in Wisconsin as late as 1998. (Wisconsin also prefers ethanol, and now has a pump-labeling requirement for MTBE.)
- Gas at Minnesota's pumps may have traces of MTBE picked up as fuel moves through interstate pipelines.
- MTBE is an octane booster in unleaded racing fuels, of which about 300,000 gallons are sold in Minnesota each year.
- Air deposition from vehicle emissions may bring MTBE to state waters from surrounding users of MTBE. One U.S. Environmental Protection Agency paper estimated that in 1996, vehicle emissions were responsible for 40 million kg of MTBE in the nation's air.
- MTBE also may be used in other products that might affect ground water, such as the foams used by firefighters.

The "60 Minutes" report concluded with the suggestion that Congress eliminate the oxygenated gasoline requirement in the Clean Air Act Amendments. A look at the U.S. EPA's Cumulative Exposure Project data (<http://www.pca.state.mn.us/air/at-cep.html>) suggests that this may be a short-sighted response.

The U.S. EPA's response, announced by administrator Carol Browner on March 20, 2000, is a phase-out of

— continued on page 4

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The primary objectives of the MGWA are:

- Promote and encourage scientific and public policy aspects of ground water as information provider;
- Protect public health and safety through continuing education for ground water professionals
- 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.

Transport and Geochemical Processes in Clay-Rich Sediments

Contributed by Randy Bradt and Julie Ekman, Minnesota DNR Waters

Dr. M. James Hendry summarized his research on solute transport in clay-rich materials for the 2000 Henry Darcy Distinguished Lecture at the University of Minnesota on February 17. He is professor of geological sciences and Cameco Research Chair at the University of Saskatchewan at Saskatoon. His research is unique because studies on widespread aquitards have not been done at this level of detail. Dr. Hendry's research has clearly demonstrated that solute migration through homogeneous clay-rich aquitards is predictable and dominated by diffusion.

Although non-fractured, clay-rich deposits are common throughout the world, few detailed ground water studies have been conducted to define the mechanisms controlling solute transport and the geochemical reactions controlling solute concentrations in these aquitards. Common reasons for lack of research in this area are the high cost, technical difficulties and lengthy time-span. Existing wells are rarely found in these clay aquitards, and new wells must be installed in the clay deposits using precise and costly drilling methods in order to maintain the natural condition of the geologic environment. To ensure the integrity of water samples care must be taken to avoid the introduction of atmospheric oxygen or contamination from sampling equipment. In addition, several years of commitment are required from researchers due to the slow release of water into the well bores. Consequently, very limited research is available in this important area.

Many factors were considered during the site selection process. Requirements were that it be a thick, multi-layered aquitard, with good boundary definition between layers. The layers must be geologically simple with no sand inhomogeneities in the till or clay. Also, the deposit must be regionally extensive for one-dimensional analyses to be valid.

Dr. Hendry chose a site 140-km south of Saskatoon, Saskatchewan. The top 80-m consists of the clay-rich till of the Battleford Formation, a Late Wisconsinan deposit. The upper 4-m of this till is oxidized and fractured. Beneath the till is the Late Cretaceous Bearpaw Formation, which consists of two layers. The top layer is a 77-m thick clay, the Snakebite Member, that was deposited approximately 71 million years ago. Beneath the Snakebite Member is the 22 m thick Sandy Ardkenneth Member.

Approximately two dozen piezometers were drilled to depths ranging from 2 to 77 m following precise well construction methods to ensure quality samples. Care was taken to prevent extraneous geologic or soil material from falling into the boreholes. The wells were drilled using precleaned, sterilized, plastic wrapped construction materials to avoid introduction of bacteria, and no metallic materials were used in the construction. The piezometers were constructed of PVC pipe and plastic wound well screens 60 cm long. Although the water table was at 2-3 m below the land surface, no water seeped into the borings during drilling and well installation, a clear indication that there are no sand lenses in the unit. Boreholes were flushed with argon gas to minimize oxidation and the disturbance of downhole redox conditions. Sterilized beads of silica were emplaced around the well screen and 1.5 to 3 m up the borehole while pumping in argon gas. Sterilized bentonite pellets were tremmied on top of the silica bead pack to about 1 m below the ground surface while purging with argon continued. Argon gas provides an inert buffer between borehole water and the bentonite pellets. Bentonite chips were filled in around the top of the well. Downhole video showed clear water with no iron precipitation or biomass, indicating that the precise drilling techniques were successful in preserving natural conditions. Subsequent samples have shown consistent chemistry results—an increase in sodium or sulfate would be an indication that the water had come into contact with the bentonite. The integrity of these wells is expected to persist for 10-15 years.

MTBE, cont.

MTBE. The Minnesota Legislature passed a bill, signed by Governor Ventura in late April, that prohibits sale of gasoline with more than 0.3 percent MTBE, ethyl tertiary butyl ether (ETBE) or tertiary amyl methyl ether (TAME) after July 1, 2000. These oxygenates must be totally eliminated from gasoline after July 1, 2005.

Troubling issues about MTBE remain, however:

- No Maximum Concentration Limit (MCL) or Minnesota Health Risk Limit (HRL) has been set for MTBE in drinking water, although the MDH issued a health-based value of 70 ppb in February 2000. A health-based value (HBV) is the concentration of a ground-water contaminant, or a mixture of contaminants that can be safely consumed daily for a lifetime. HBVs are not enforceable by MDH.
- Ethanol is more expensive than MTBE, especially far from corn country.
- While public water supplies are tested for MTBE, they are not tested for ETBE or TAME yet. And private water supplies aren't tested at all.

This fast-evolving story's next chapter will be crucial: finding an oxygenate that allows gasoline to burn cleaner, but does not pose as serious

In his presentation, Dr. Hendry included information about the physical, hydrogeologic, chemical, isotopic, and biological data collected from the aquitard system. The three controls on solute transport in clays are advective flow, geochemical reactions and diffusive transport. Using a multidisciplinary approach, Dr. Hendry examined the contributions of each of these controls. Some of the key topics he discussed included a determination of the relative importance of advective and diffusive transport in the aquitard; the usefulness of the stable isotopes deuterium, oxygen-18, and sulfur-34

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Darcy Lecture, cont.

and the radioactive isotope carbon-14 in comparing solute transport modeling with the timing of geologic and climatic events of the past; and the geochemical controls on the dissolved ions and their implications for long-term solute migration in the aquitard system.

Analysis of slug tests and laboratory tests on cores of unoxidized till yielded geometric mean K values of 5.4×10^{-11} and 2.7×10^{-11} m/s, respectively. The underlying Cretaceous clay had an even lower K of 4.3×10^{-12} m/s. The current downward ground water velocity through the aquitard system was estimated to be between 0.5 and 0.8 m/10ka based on measured K values, measured hydraulic gradients, and measured porosities. These results suggest that much of the pore water in the till aquitard was introduced during or shortly after glaciation. Stable isotope information supports this suggestion. Oxygen-18 and deuterium sample data plot along the local meteoric water line, which indicates the water originated as precipitation and that evaporation and rock-water interactions have not significantly altered the original stable isotope ratios. Stable isotope data collected in a vertical sequence through the aquitard show decreasing (more negative) values with depth below the surface. The most negative values suggest the pore-water recharged in a much cooler climate. As the sample depths approach the till-clay boundary, deuterium values become less negative and reach a maximum below this boundary. Dr. Hendry assumed that stable isotopic values in the underlying clay (Snakebite Member) were uniform prior to deposition of the glacial till. Following glaciation, the stable isotopes began diffusing from less negative values in the clay into the more depleted pore water within the till. Best-fit simulations to the measured deuterium profile across the till-clay boundary yield a ground water velocity of 0.75 to 1.0 m per 10ka for a total transport time of 20ka to 30ka. The velocity estimate agrees well with that calculated from hydraulic data and the 20–30ka time frame required for the deuterium profile to

develop is consistent with the timing of till deposition. This is also supported by carbon-14 dates between 25ka and 31ka from ground water in the till. Numerical transport modeling of deuterium in the upper 30 meters of the till yielded a non-unique solution. Assuming a similar ground water velocity to that determined across the till-clay interface, a best-fit profile was obtained for a transport time of between 7.5–10ka in this uppermost portion. This range compared favorably with that reported for the start of the Holocene (10ka).

Dr. Hendry also profiled several dissolved ions including calcium, magnesium, sodium, sulfate, and bicarbonate. The potential geochemical controls on these ions were examined using isotopes, till mineralogy, geochemical and solute transport modeling, field parameters, and microbial analyses. Two key points to remember when reviewing a specific solute profile are that for diffusion to occur there has to be a change in concentration of that solute at some location within the till profile and that the change occurred at some time in the past.

Observed cation and anion profiles were matched to their respective diffusion modeled profiles. The modeled solute profile varies according to the length of time allowed for diffusion to occur. A best-fit match is made by visually comparing the observed solute profile with the modeled profile. The best fit between modeled and observed profiles can be used to estimate the time that a particular solute concentration changed. For example, the observed bicarbonate profile matches a modeled profile that took 7ka to 10ka to develop. Dr. Hendry suggests that increased bicarbonate values followed the development of a soil horizon. The timing of soil development closely follows deglaciation about 10 thousand years ago.

The best model fit for the measured sulfate profile suggests that diffusion of this anion did not begin until two to five thousand years after deglaciation. To explain the observed profile, Dr. Hendry first had to be sure that diffusion was the sole mechanism for describing the observed sulfate profile and that no other geochemical controls were affecting

sulfate concentrations. The redox profile showed more positive values in the oxidized zone decreasing to values close to conditions favorable for sulfate reduction. To check for evidence of sulfate reduction from a variety of biotic and abiotic mechanisms, water samples were sent to multiple labs and no evidence to support sulfate reduction was found. Sulfur-34 analysis showed that the increased sulfate observed in the upper portion of the profile is primarily the result of oxidation of pyrite (50–80% of total sulfate) in the till. Therefore, Dr. Hendry suggested that the 2 to 5 thousand year lag following deglaciation represents the time needed for the development of an oxidized zone and the release of sulfate into solution.

In conclusion, Dr. Hendry's results showed that modeling solute concentrations using diffusion rates can provide a good match to the timing of late Pleistocene and Holocene events. One of his significant conclusions was that clay aquitards similar to the one identified in this study might represent good sites for nuclear waste disposal. For Minnesota, with its extensive glacial deposits, these findings present a strong incentive for more research in till and its potential for safer siting of landfills and other waste storage areas.

For further reading:

Hendry, M.J. and L.I. Wassenaar, 1999. Implications of transport of *D in pore waters on groundwater flow and the timing of geologic events in a thick aquitard system. *Water Resources Research*, 35(6): 1751-1760.

Hendry, M.J. and L.I. Wasenaar, 2000. Mechanisms controlling the distribution and transport of ¹⁴C in a clay-rich till aquitard, *Ground Water*, 38(3): 343-349.

Shaw, J.R. and M.J. Hendry, 1998. Hydrogeology of a thick clay till and Cretaceous clay sequence, Saskatchewan, Canada. *Canadian Geotechnical Journal*, 35(6): 1041-1052.

Wassenaar, L.I. and M.J. Hendry, 1999. Improved piezometer construction and sampling techniques to determine aquitard porewater chemistry. *Ground Water* 37(4), 564-571.

Yan, X.P., Kerrich, R. and Hendry, M.J., 1998. Trace element geochemistry of a thick till and clay-rich aquitard sequence, Saskatchewan, Canada. *Chemical Geology*. (In press.)

Hydrologist uses job skills to help African villagers

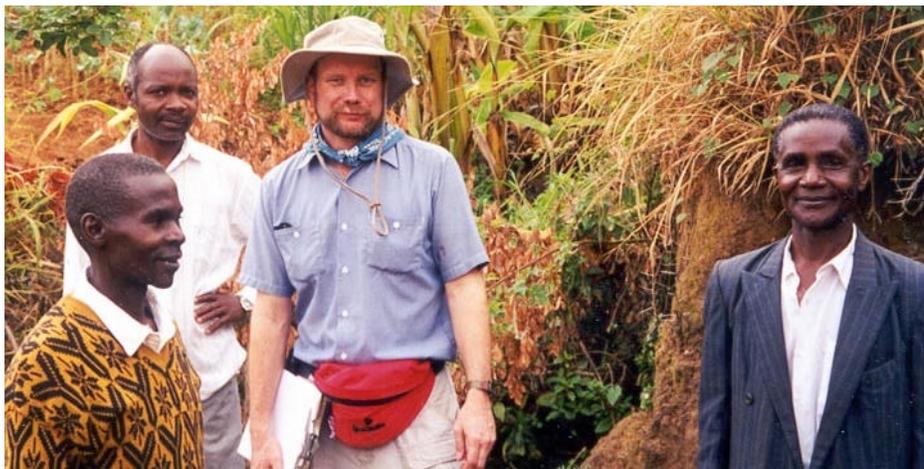
Children drank filthy water from discarded anti-freeze containers. Fights erupted over clean, plastic water bottles. Animal feces, mud and garbage clogged water supplies.

Talking of his time in rural Kenya brings tears to the eyes of Jeff Green, a DNR hydrologist. "The first few days were very emotional," said Green, who was doing missionary work through his church in Rochester. "It was truly a life changing experience."

Green spent nine days in a village 100 miles northeast of Nairobi, Kenya helping Kamba tribe members improve their drinking water with simple, inexpensive technology. Skills acquired as a DNR hydrologist helped Green come up with several ways to assist the tribe.

Although Africa is often thought of as an arid country, Green said the village he worked in had abundant water from springs. The problem was keeping the water clean enough to drink.

"Almost all the villagers grow up with parasites they caught from drinking water contaminated by human and animal waste," Green said. "One of their biggest challenges is getting clean drinking water."



— Minnesota Department of Natural Resources Hydrologist Jeff Green met with Kamba village officials during recent missionary work in Kenya. Green used his skills as a hydrologist to suggest ways the village could provide cleaner water to residents.

After spending several days with village officials and taking measurements, Green suggested protecting springs with concrete "spring boxes" which keep erosion and feces out of spring water but allow water to flow through. He also suggested some simple technology to help villagers capture cleaner rainwater in their cisterns.

In the coming year, he hopes to raise funds to help the village purchase concrete for the spring protection boxes. He also hopes to return to continue to help the villagers.

Green was accompanied by several members of the First Baptist Church of Rochester who have been helping Kamba villagers for about 10 years. So far, the congregation has helped build a school and several other public buildings. Many church members also sponsor Kamba children through monthly donations.

Reprinted with permission, DNR Review May 2000

The people and the area

The newsletter team asked Jeff for some additional thoughts and pictures on his Kenya experience.

The Kamba village is approximately 120 km east-northeast of Nairobi, Kenya's capitol city. The closest big city was Kitui (in fact, we were in the Kitui District); the closest settlement was Tulia, a small village of several

hundred. To reach the area we drove out of Nairobi on the highway to Mombasa (Kenya's Indian Ocean port) and then swung east on the road to Kitui. The road to Mombasa is a very dangerous highway; trucks take the right-of-way and we had one pass us that forced the oncoming traffic into the ditch! On our way back from Tulia we saw several fatal accident scenes. Traveling that stretch of highway was by far the most dangerous part of our trip.

The Kamba people we worked with were very warm and gracious. Several times I was invited into peoples' homes. I learned quickly that in Kenya when you ask someone how far away something is when you are walking to it that it is "not far, ten minutes". This meant that you were generally facing a twenty to sixty minute walk. One afternoon two of us walked into Tulia to check out the afternoon market. It was a very interesting feeling, being the only white people in town. Yes, every head turned and everyone stared. The Kitui district is not a tourist area so muzungus (Swahili for white skin) are a rarity.

The place I worked at was the Mutulu Hope Center. A hope center is a development started by Marilyn Newman, the missionary we worked with from an organization called Special Ministries. They are designed to meet people's physical and spiritual needs and consist of a church, school, and clinic. Once the school and clinic are completed the Kenyan government provides the teachers and nurses. In the school, the children are taught to be tri-lingual; they learn their language (Kikamba), Swahili (the trade language), and English.

Geographically, the area we were in is known as the Kitui Hills. It is one of the prime mango growing regions of Kenya and while we there the mango harvest was in full swing. As we drove there would be people standing next to the road with 150 lb bags of mangos that were destined for Nairobi. The going rate for one of these bags was 120 to 150 shillings (the exchange rate is approximately 70 shillings to the dollar).

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Kenya, cont.

I heard a wide range of numbers for the annual precipitation, anywhere from 24 to 41 inches per year. What the landscape reminded me of was the foothills of the Rocky Mountains. The highest point in the Kitui Hills is Mtunguni at 5383 ft. The Hope Center is actually on the flank of this "mountain" and I was able to hike to a point just below its summit. At its peak there is a eucalyptus forest. We had heard that there were monkeys there; we later found out that there had been monkeys there but they had been hunted out by the local tribesmen.

Geology

One of the things we tend to take for granted here in Minnesota is the availability of topographic and geologic maps, especially when we start working in a new area. It wasn't quite that easy in Kenya. Through the internet I was able to make contact with some people who had done geologic and hydrologic work in the Kitui District. From one of them I got an old Geological Survey of Kenya report. For topographic map coverage I was able to get a 1:50,000 map produced by the British in the 1950's. It was at the Borchert Map Library at the U of M. The Kenyan government has produced new topographic maps but they are unavailable as they have been classified by the Kenya military. As a side note, one of the rules was that you never took a picture of the machine gun-toting soldiers along the road unless you really wanted to find out what it was like to stare down the barrel of a gun!

Geologically, the area is underlain by Archaean metamorphic rock that has been uplifted and faulted. According to the geologic map the bedrock at the hope center is quartzite and muscovite-quartzite. There were no good exposures to look at, everything I saw was very weathered but I did definitely see some muscovite. The report I had, *Geology of the Kitui Area* by L.D. Sanders, described the region I was in as being "strongly influenced by the geology, and consists of a series

of parallel north-south trending ridges, rising to heights between 4800 and 5400 ft., which form the Kitui hills. The highest summits are those of Mtunguni (5383 ft.), Muttito (5205 ft.) And Kamitotia (4980 ft.). This belt of deeply dissected hill country displays a ribbed topography typical of that produced by the erosion of a para-gneiss succession, the more resistant rocks forming sharp ridge features, which alternate with parallel valleys eroded in the softer members of the series".

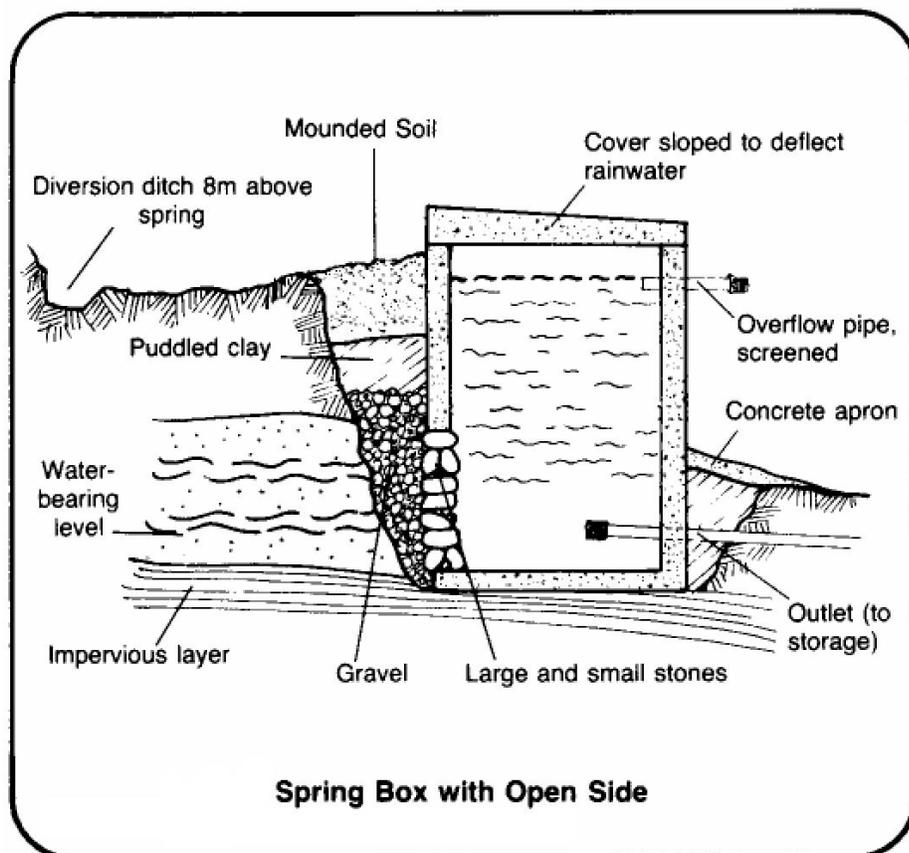
Water Supply

It was very difficult emotionally to see what people used for water supply. People used rivers, where in the same area they were washing clothes and getting drinking water; turbid little seeps that had the appearance of rainwater puddles; and springs with human and donkey feces around them. The house where we stayed used a rainwater

cistern which is a good supply but it still is not safe to drink without treatment.

About 300 meters from the Hope Center is Kilangali spring, a spring that Kenyan hydrologist Aloys Koveen Chekwony had identified as the best long-term water source. His idea was to build a spring box (see diagram) to protect the supply and then run a pipeline up the hill to a storage tank at the center. The water would be pumped to the tank by a kerosene powered pump. The spring wasn't large, about fifty gallons per minute as best I could estimate, but a local person said that it had been running continuously for at least seventy years. Idexx labs had donated some E. coli sampling material so I was able to sample the spring. Since I wasn't able to find a water bath that was easily transportable I incubated

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— Illustration modified from "Water for the World", 1982, *Constructing Structures for Springs*, Technical Note number RWS. 1.c.1, U.S. Agency for International Development, scanned document in PDF format is available to download on www.lifewater.org

Kenya, cont.

the sample for twenty-four hours in my pocket; it tested positive for total coliforms but negative for *E. coli*. Aloys had also tested the spring on an earlier visit; he took a drink and when he didn't get sick he pronounced it acceptable.

You may wonder why I didn't do flow measurements. Well, the best place to measure flow was in an area of thick underbrush. In Minnesota that might not be a big deal but I had already been warned that the best way to die in Kenya was to cross paths with the green mamba, an extremely poisonous snake. That underbrush sure looked like good snake habitat to me!

I was able to make some field measurements of the water and bring a sample back for analysis. The temperature was 22 deg. C and the conductivity was 247 microsiemens per centimeter. Its chemistry reflected that of an old, weathered landscape as it had 16.1 ppm Ca and 38.4 ppm Na. The water nitrate concentration was 2.05 ppm, which wasn't surprising since the area has been cultivated for hundreds of years.

It appeared that the spring emanated from a weathered zone in the metamorphic rock or from the contact between the quartzite and muscovite-quartzite map units. I had hoped to determine a springhead protection area but that wasn't nearly as straightforward a process as I had hoped. The rugged topography along with a lack of field equipment ended that endeavor. We did map out the area above the spring that needed to be protected from erosion. During his previous visit Aloys had gotten the landowner to agree to take the land out of production. We also spoke with the assistant chief for the area; he was very pleased to hear of our plans to help his people get a better water supply and he agreed to order his people to refrain from relieving themselves near the spring! I wish it were that easy here sometimes...

After looking the area over and getting to know the people a bit, we

— continued on next page



— Landscape photo- Panoramic view of the Kitui Hills



— Traditional Kamba dwellings, brick huts with thatch roofs.



— Primary school children in class at the Mutulu school.

Kenya, cont.

decided to modify Aloy's plan for the Hope Center's water supply. We will build a spring box around Kilangali but instead of piping the water to the Hope Center we will run a pipeline uphill about sixty meters. There, we will have a hand pump so people can use that instead of going downhill to the spring. This will make life easier for the people and will keep them away from the spring. Since the area around the spring had human and animal feces present it seemed like a good idea to reduce the activity there. If the pump breaks, the spring box will still provide some measure of protection for the water supply. The longer pipeline to the Hope Center with a kerosene pump seemed to be prone to failure; in a setting like this a low tech approach is better.

We are also going to use rainwater as part of the Hope Center's water supply. Most of our team spent their time roofing a mess hall. This building will produce about 150,000 to 200,000 liters of roof runoff per year. Some of this water will be stored in a cistern next to the building. Our plan is to build first flush boxes that will divert the first part of the roof runoff event to waste. This water has dirt and bird droppings in it that would otherwise go into the cistern. We also plan to teach the nurse how to chlorinate the cistern to make it potable and to teach some of the other people how to make more first flush boxes for other cisterns.

When will this all come to pass? Well, right now we are in the process of raising the necessary funds to pay for the spring box and cistern. Then, we need to work out arrangements with some Kenyan water specialists to have them help us with the spring box construction. I plan on experimenting with first flush box design here in Minnesota this summer. Finally, I am hoping and praying that I can go back next March when we send another team so I can see this project through to completion.

If you would like more information about the work at Mutulu you can contact me at 507-285-7429 (days) or 507-218-0105 (nights) or at greenboys3@uswest.net.



— James at pump. This is a hand-dug domestic well that is sixty feet deep and four to five feet wide.



— Kilangali, the spring that will be enclosed and protected.

Announcing a 3-day Workshop:

ADVANCES IN SITE CHARACTERIZATION FOR ENVIRONMENTAL AND ENGINEERING PROJECTS AT GLACIATED SITES

Minneapolis - Holiday Inn, Minneapolis West

October 5,6,7, 2000

Details on page 18!!!

midwest
GEOSCIENCES
group

MGWA

In Brief:

MGWA Grants Scholarships

At its March 2000 meeting, the MGWA Board approved three scholarship applications to the following schools: University of Minnesota-Duluth for \$100; University of Wisconsin-River Falls for \$200; and the University of Minnesota Hydrogeology Field Camp for \$200. These scholarships are supported with MGWA member dues and additional donations by members and are awarded to schools rather than individuals. Typically, the scholarships are used to help finance field trips and other ground water educational activities. The University of Minnesota Duluth Geology Club has already reported on their trip (see photo adjacent). Look for other news articles and photographs from the schools in future MGWA newsletters.



— An MGWA scholarship allowed the University of Minnesota Duluth Geology Club to offer a no cost geology trip to the North Shore. Students and faculty, including Professor Emeritus Dr. John Green and Dr. Christina Gallup, enjoyed their trip as the photos show.



— Dr. Green and students at the Caribou River

MGWA Establishes Foundation

contributed by Paula Berger

In 1993 the MGWA formally began soliciting its membership for funds to scholarships to promote the education of geology and hydrogeology in Minnesota. Since then, the MGWA has provided numerous scholarships, mostly to university groups for field trips, to assist in the education of future ground water professionals. Nearly every college or university in Minnesota, and some adjacent to Minnesota, with a geology or earth science department has benefited at one time or another from a scholarship provided by the MGWA. The funds donated by the MGWA membership have also been used to provide assistance to the University of Minnesota Hydrogeology Field Camp, the Children's Water Festival, the National Ground Water Education Foundation, the Metro Area Ground Water Alliance, and the Minnesota Water Line.

For the past several years, the requests for scholarships have exceeded the funds available. This has forced the MGWA board to reduce the number of scholarships provided and the amount of each

— *continued on next page*

In Brief, cont.

scholarship. This year, the number of requests far exceeded the designated scholarship money and the MGWA had to make some difficult decisions. The scholarship awards were further reduced for all recipients and some requests were turned down due to a lack of money.

One of the primary goals of the MGWA is to foster education of ground water professionals, including ground water professionals-to-be. However, as any of the current and past MGWA Board members can attest, organizing seminars and field trips as well as putting out a quarterly newsletter more than fill up the year. Therefore, this spring, the Minnesota Ground Water Association Foundation (MGWAF) was formed.

The goal of the MGWAF is to raise funds that can be used to assist in promoting public benefit aspects of the work that MGWA has been doing: primarily ground water related education. By focusing all of its efforts on fund raising and distribution, the MGWAF hopes to build upon the scholarship effort begun by the MGWA. Because the MGWA Foundation is a charitable 501(c)3 non-profit entity, all donations are tax deductible as charitable contributions.

The MGWAF currently consists of 3 board members: Paula Berger (President), Pat Bloomgren (Treasurer), and Jim Lundy (Secretary). Assistance will also be provided by Dr. Jeanette Leete of WRI. Over the next few months we hope to begin the process of raising money to promote ground water education in the region. The MGWAF is linked to the MGWA web page (www.mgwa.org) and donations can be made electronically or can be mailed to MGWAF, 4779 126th St. North, White Bear Lake, MN, 55110.

Many thanks to those people who have already donated toward the MGWAF. We urge everyone to consider donating some amount, no matter how small, to start the ball rolling. We hope we'll be in for a long and exciting ride.

AIPG National Meeting in Milwaukee

The Wisconsin section of AIPG is hosting the national meetings of the Association of Professional Geologists from October 10-14, 2000 in Milwaukee. The meeting features technical presentations on wide-ranging issues as well as meetings for various advisory groups and committees. For more information, contact Dr. C.W. Fetter (920-236-7012) or see www.aipgwis.org.

Executive Director of Licensing Board Addresses AIPG Chapter Meeting

Doreen Frost, the Executive Director of the AELSLAGID Board, which licenses geoscientists in Minnesota, gave the luncheon address to about 60 people at the May 2 meeting of the Minnesota Chapter of the American Institute of Professional Geologists. Her main topic was the continuing education requirements for the professionals licensed under the program, which became effective August 1, 1999. Licensees have until June 30, 2002 to accumulate and document at least 24 professional development hours (PDHs) from courses addressing subjects that are typically covered on the licensing exam. Courses may be technical, non-technical, regulatory, ethical, or covering business practice. A PDH is defined as 50 minutes of contact time through instruction or presentation.

The criteria for determining whether a course will qualify for PDHs are on the Board's web site at www.aelslagid.state.mn.us were all updated information is posted.

Although current licensees do not need to report PDHs this year, license renewals are due this June. Licensees among MGWA members should have received their renewal notices by the time this newsletter arrives. The license renewals will be mailed to your HOME address. If you have moved since your last renewal, please contact the board as soon as possible. The Board is not responsible for tracking you down...and there have been cases where licenses lapsed, the licensee never picked up on it, and then he or she ran into

enforcement difficulties later. Governor Ventura signed a bill that resulted from the 1999 legislative session which raises the next biennial license fee from \$70 to \$104.

The Board's Saint Paul office may be reached at 651-296-2388 for further questions not addressed by the web site.

Electronic Climate Newsletter

HydroClim is a monthly electronic newsletter summarizing Minnesota climate conditions and the resulting impact on water resources. It is distributed on the Wednesday following the first Monday of each month by the State Climatology Office - DNR Waters. Subscribe by sending an e-mail request to Greg Spoden at either: gspoden@soils.umn.edu or greg.spoden@dnr.state.mn.us. Or call him directly at (651)296-4214.

AIPG/MGWA Fall Field Trip

The annual fall field trip sponsored by MGWA and AIPG will be taking place September 23-24, 2000. The destination this year will be the lower Minnesota River Valley, and will focus on the geology and water-related issues in the region. Planning is still preliminary, but the organizers hope to have stops involving rocks, glacial geology, springs, drain-tile issues, fens, general hydrology, geologic history of the valley, agricultural issues involving surface and ground-water hydrology, and flooding. The overnight stay on Saturday will likely be in New Ulm (as is the Schell Brewery...) Look for details later in the summer.

First NGWA McElhiney Lecturer Announced

Dr. Hans-Olaf Pfannkuch has been selected as the inaugural William McElhiney Lecturer. Dr. Pfannkuch is a professor of hydrogeology at the University of Minnesota. His presentation "Pump Tests for Practical People" will debut at the 2000 NGWA National Convention and Exposition in December.

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In Brief, cont.

New from the Wisconsin Department of Natural Resources

The Wisconsin Department of Natural Resources has recently released its State of the Natural Resources report, designed to be an easily-read overview for the citizens of Wisconsin of the status and trends of the natural resource base of the state as we enter the new millennium. The attractive 44-page report has chapters addressing the protection of public health and safety, sustaining ecosystems, making people our strength, providing outdoor recreation, and a summary of "where we go from here." Copies of the report are available from the Wisconsin Department of Natural Resources, Box 7921, Madison, WI 53707-7921, phone: 608-266-2621.

The report is also available on Wisconsin DNR's web site, at <http://www.dnr.state.wi.us>.

Minnesota Water 2000

An enthusiastic crowd of over 300 water resource professionals attended this biennial conference held April 25-26 at the Minneapolis Convention Center. Plenary sessions the first day addressed the Minnesota Water Unification Plan (Dean Barkley, Minnesota Planning); National Trends in Water Quality, Policy and Management (Robert Hirsch, U. S. Geological Survey); Changes in Water Use in Minnesota (John Linc Stine, Minnesota DNR); Trends in Surface and Ground Water Quality in Minnesota (Mike Sandusky, Minnesota PCA); and Water Resource Management from an Agricultural Perspective (Gene Hugoson, Minnesota Department of Agriculture).

After a dynamic and interesting luncheon talk by Betsy Damon of Keeper of the Waters describing her efforts in helping the Chinese develop a "water park", the first concurrent session in the afternoon addressed Water Supply and Wastewater Issues, Toxic Substances, Lake Pepin Water Issues, and New Tools for Monitoring and Modeling. The second concurrent session covered Policy and Economics of Watershed Management, The

Changing Face of Agriculture, Ground Water Investigations, and Case Studies in Remediation.

The second day of the conference featured plenary sessions on Evolution of Water Policy and Management in Minnesota (Ron Nargang, The Nature Conservancy); A Historical Look at Water Resources Science in Minnesota (Pat Brezonik, University of Minnesota Water Resources Center); and a panel discussion on How to Respond to the Challenges of Future Water Resources Management, featuring Bob Sterner of the University of Minnesota Department of Ecology, Evolution and Behavior, Steve Morse of the Minnesota DNR, and Lee Padlock of the Minnesota Center for Environmental Advocacy. Afternoon concurrent sessions covered Drainage Issues in Water Management, Lakes and Wetlands, Rivers and Streams, and Ecological Indicators.

If you missed Minnesota Water 2000, your next chance to catch this biennial conference, sponsored by the University of Minnesota Water Resources Center in cooperation with water management and research agencies throughout Minnesota, will be Spring 2002.

Water Line Ceased Operation April 15

As of April 15 the Minnesota Water Line, an 800 number that could be called to obtain water information, was no longer available. It was established five years ago under the auspices of the Sea Grant Program in the University of Minnesota Extension Service. During the time it was active, support came from a variety of sources including the University, counties, and Board of Water and Soil Resources grants. At the end of its five years of operation, the Water Line has generally been superseded by information available via the Internet and from informational materials distributed by agencies.

The intent of the service was to save citizens time and frustration in getting answers to their questions on safe drinking water, wells, shoreland management, and regulations. Records kept by Water Line staff indicate that,

by far, the most common questions were related to water quality and where to get water tested.

New recommendations for public testimony

The Interprofessional Council on Environmental Design has issued a new publication: "Recommended Practices for Design Professionals and Scientists Engaged as Experts for the Technical Review of Others' Work and Providing Testimony in Public Forums). As noted in the preamble, "Expert professionals are needed to evaluate, clarify, and explain complex technical issues that are discussed or debated in public forums ... [these] experts often disagree with one another. And in all such instances, disagreement should stem only from objectively determined differences in professional judgement and opinion. The testimony rendered, be it oral or written, should be objective, factual and dispassionate. Sensational, exaggerated, or disparaging comments are, by their very nature, unprofessional."

The new document identifies 13 separate recommended practices. Each is discussed and amplified through several descriptive sentences.

1. Experts should serve the public interest.
2. Experts should conduct themselves in a professional manner.
3. Experts should serve only when qualified.
4. Experts should not be influenced by conflicts of interest.
5. Experts should actively seek information about the issue at hand and limit reliance on assumptions.
6. Experts should not use requests for additional information in order to delay proceedings.
7. Experts should discuss the standard of care employed by other experts only with knowledge of the standard of care that applies.

— continued on page 17

Full House at MGWA Spring 2000 Conference

Apparently, the topic of Minnesota Water Law was one of interest to a wide variety of Minnesota ground water professionals, because the annual spring conference at Earle Brown Center on the Saint Paul Campus of the University of Minnesota on May 5 filled early, with 100 attending. The emphasis was definitely on variety, with Professor Ken Salzberg of Hamline University Law School beginning by setting the Legal Framework for Water Law in Minnesota. He was followed by Ken Buzicky, Minnesota Department of Agriculture, discussing Agriculture Ten Years after the Ground Water Protection Act of 1989. Professor Mark Seeley of the University of Minnesota Department of Soil, Water and Climate then discussed the Climatic Outlook for Minnesota in light of developing drought conditions in portions of Minnesota. He was followed by Kent Lokkesmoe, Director of Minnesota DNR's Division of Waters, discussing Issues Related to the Diversion of Water from and into Minnesota and the Great Lakes. Jim Japs of Minnesota DNR Division of Waters described current Permitting Issues in Water Supply. Kurt Deter of Rinke Noonan law firm provided Insights into Minnesota Drainage Law, followed by Jack Henrich of the Minnesota Water Well Association talking about Rural Water Supplies—A Driller's Perspective. Janette Brimmer of the Minnesota Center for Environmental Advocacy described Gravel Pit and Mine Dewatering Issues as well as providing MCEA perspective on the range of water issues (drainage, protected waters, etc.) covered by other speakers, and the day concluded with Tibor Gallo of the Minnesota Attorney General's Office providing a Summary of Issues—Where Do We Go from Here? Tibor was joined by Ken Salzberg for an open discussion of issues raised during the day. Each of the speakers was "mugged" by Jim Lundy, MGWA President (i.e., presented with an MGWA coffee mug for their participation).



— Professor Ken Salzberg (right), Hamline Law School and Tibor Gallo (left), MN Attorney General's Office were two of the featured speakers at MGWA's Spring Conference on Minnesota Water Law. Photo by Sean Hunt, MN DNR.



— MGWA President Jim Lundy and MGWA Management and Publications Coordinator Jeanette Leete (foreground) discuss a point while presenters John Linc Stine (MN DNR Waters) and Janette Brimmer (MN Center for Environmental Advocacy) look on. Photo by Sean Hunt MN DNR.

Obituaries

Roman Koch

A long-time employee of the Minnesota Department of Health, Roman Koch died February 19, 2000 at the age of 76. Roman was born in Wisconsin and received a bachelors degree in geology from the University of Wisconsin, Madison. He served in Europe with the U.S. Army 27th Division during World War II. After working in a private laboratory, Roman came to work for the Local Health Administration Section of the Health Department. Roman was involved in a wide range of health services from food and water-supply investigations and elimination of environmental health hazards including garbage houses, to emergency response (Roman often commented that when he began working for the health department, employees were trained to provide emergency childbirth assistance!) Roman was instrumental in the early investigations of ground-water contamination at sites including Pine Bend and St. Louis Park. He retired as a senior hydrologist with the MDH well program in 1994.

Roman will be remembered for his compassion, sense of humor, and commitment to public health. Roman influenced a generation of coworkers with his sincerity and his philosophy that the public deserved safe food, air, and water. Roman is survived by his wife, Carol, 3 children, and numerous grandchildren.

excerpted from Minnesota Well Management News, v.20, No. 1, Spring 2000

New Publications

Injection Wells: An Introduction To Their Use, Operation And Regulation. A brochure published by the Ground Water Protection Council in cooperation with the US EPA. Available from GWPC 827 NW 63rd Street, Suite 103, Oklahoma City, OK 73116.

Ground Water Quality Under Unsewered Communities, February 2000, Factsheet available from MPCA (651-296-6300)
<http://www.pca.state.mn.us/>

Sandra J. Forrest

Sandra Forrest, a geologist active in water well, geotechnical, and environmental work in Minnesota and the upper Midwest for nearly 25 years, died on January 26, 2000, at the age of 47. She received her Bachelor of Science degree in geology from the University of Minnesota - Duluth and completed graduate work at Ohio University. She worked for Johnson Division UOP, the Minnesota Pollution Control Agency, GME Consultants, Inc., Maxim Technologies, Inc., and STS Consultants, Ltd. Sandra was the consummate professional, but will be best remembered for her commitment to the environment, her compassion, and her gracious character. She was one of the first women in Minnesota active in the professional practice of geology, helping to open the way for many other women to follow.

Sandra is survived by her daughter, Suzanna. A scholarship fund has been established to assist Suzanna with her college costs. Any donations to this fund can be made to:

Norwest Investment Services (to Account 11911591)
Attn. Sales Support
N 9303-086
608 2nd Avenue South
Minneapolis, Minnesota 55479

Questions regarding this fund can be directed to Mark Millsop of GME Consultants, Inc., at 218-546-6371.

excerpted from Minnesota Well Management News, v.20, No. 2, Summer 2000

[water/groundwaer/gwmap/gwpubs.html#factsheets](http://www.health.state.mn.us/divs/eh/dwp/pws/dwpreport99.html#factsheets) .

Safe Drinking Water in Minnesota :A Partnership with the People. A Summary of Drinking Water Protection Activities in Minnesota for 1999, issued May, 2000. See the following web site:
<http://www.health.state.mn.us/divs/eh/dwp/pws/dwpreport99.html>

Vegetative Buffers for Protecting and Improving Ground Water Quality February 2000, Factsheet available from MPCA (651-296-6300)

Emerging issues

Are you drinking drugs along with your coffee?

The May-June issue of Ground Water, page 405, features an informative paper titled "Caffeine and Pharmaceuticals as Indicators of Waste Water Contamination in Wells", by Seiler, Zaugg, Thomas, and Howcroft. Caffeine and drugs present in waste water are used to differentiate sources of nitrogen contamination. This concept has other implications.

Certain pharmaceuticals are showing up in waste streams. Treated municipal waste-water, septic tanks, and other effluent sources contain excreted drugs such as antibiotics, analgesics, chemotherapy drugs, cholesterol lowering drugs, and the host of other pharmaceutical compounds which are currently unregulated by primary and secondary drinking water standards. Since most of these compounds are unregulated, there is a potential for trace amounts of these compounds to be present in tap water.

Chemicals have been linked to another water quality issue. Male fish in certain effluent streams are producing an egg yolk protein normally made by reproducing females. Researchers have traced this change to human estrogens from the sewage plant nearby. The U.S. EPA is on the trail of this issue and has grouped compounds which are hormones or compounds which inhibit hormone activity as endocrine disrupting chemicals (EDCs). They can be pharmaceuticals such as prescribed estrogen replacements, birth control pills, and steroids, but also can be compounds found in pesticides such as organochlorines like PCBs and DDT. Typical concentrations of drugs and EDC's in streams have been nearly undetectable except when sewage loads are 50 percent of the flow.

European scientists are ahead of the curve on this issue. The Swiss Federal Institute of Technology and the Technical University of Berlin have

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MGWA Board Meeting Minutes

February 3, 2000

Egg & I, University and 280, St. Paul, MN, 7:30 a.m.

Attending: Jim Piegat, Past-President; Jim Lundy, President; Jim Stark, President-Elect; Lee Trotta, Treasurer; Jan Falteisek, Secretary; Sean Hunt, WRI; Tom Clark, Newsletter Editor; Leigh Harrod, Advertising Manager; Paula Berger, Scholarships; Jim Aitkin, Dan Kelleher, guests.

Approval of Minutes – Jim Lundy called the meeting to order at 7:35 am. Minutes for the regular Board meeting held January 6, 2000 were approved as corrected.

Treasurers Report – Lee Trotta will provide a financial summary to Tom Clark for the newsletter. Sean Hunt provided a cost summary of MGWA expenses, noting that the increase in expenses was largely due to increases in printing, postage, and supplies costs.

Newsletter – Tom noted that all items for the March newsletter should be ready about February 10. He noted the need for more cross-disciplinary articles. Member profiles are another possibility. Use of color in the newsletter was discussed.

Membership Committee – Jim Lundy, Jan Falteisek, Paula Berger, and Lee Trotta will work on membership. Paula said she was interested in student recruitment and Lee Trotta said he was interested in locating former members. The committee needs to address issues of recruitment, dues structure, and retention. Sean said he would bring a summary of membership to the next meeting.

Web Page and Advertising – Sean reviewed several web advertising models. Leigh Harrod, Jim Aitkin, and Sean Hunt will meet to discuss web issues and report back.

MGWA Foundation – Jim L. and Jennie are working on development of the idea. They will give an update at the next meeting. Proposed articles of incorporation will be presented to the Board for approval when available.

Scholarships – Paula reported four scholarship requests had been received.

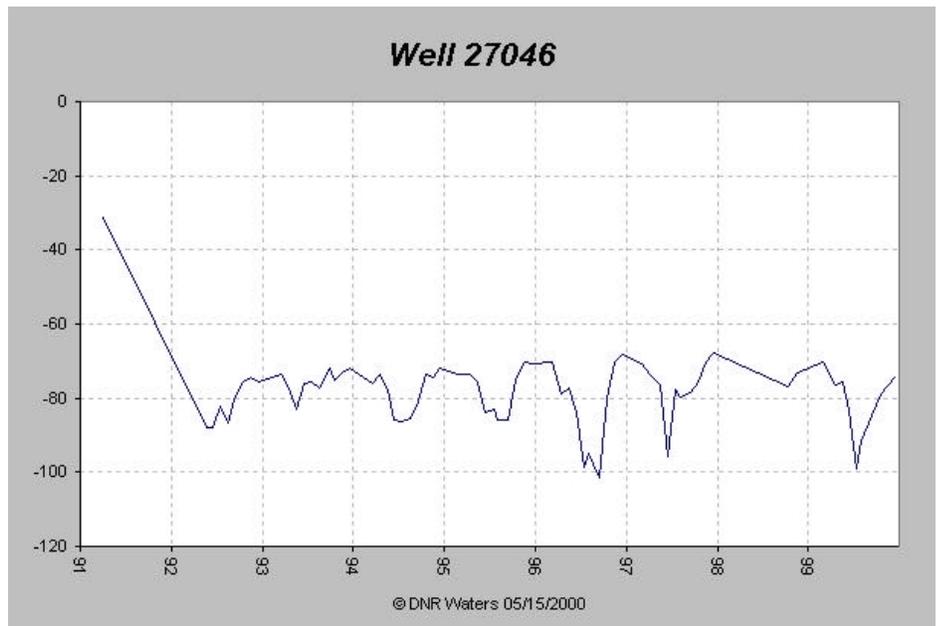
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Water Level Data On-Line

Ground water level data gathered through the Ground Water Level Observation Program (Obwell) of the Department of Natural Resources Waters Division is now available on-line through the DNR web page.

A brief description of the well, measurements with date, and a graph (example shown below) are available. The data are updated three times per year or as they become available. Instructions for access and assistance are found at:

http://www.dnr.state.mn.us/waters/programs/gw_section/obwell/watlevs.html



Emerging Issues, cont.

been studying drugs and EDC's in sewage for several years.

USGS is now sampling for pharmaceuticals and the U.S. EPA published a research plan for endocrine disrupters in February of 1998.

Pharmaceuticals and EDC's will be among the topics examined during the National Ground Water Association's Emerging Issues Conference to be held June 7th and 8th in Minneapolis, Minnesota.

For more information on this conference, call NGWA at (800)551-7379, or visit the NGWA web site at www.NGWA.org.

MGWA Board Minutes, cont.

She said the budget needs to be evaluated to determine funds available for scholarships. The Board will decide on scholarship awards at the March meeting.

Duties of Officers – Jim L. provided a list of officer duties compiled from a reference; the list will be discussed at a future meeting.

Spring Meeting – Several potential speakers were suggested. Potential facilities have been contacted, but no responses yet. Next Tuesday, Jim L. and Jan will exchange information on facilities and speakers provided by WRI.

Other Business – Jim Stark noted the 2001 AIH national meeting is scheduled in MN for October 2001. The AIH committee is interested in MGWA co-sponsorship and possibly a joint field trip. Jim S. also noted the new USGS publication on water resources sustainability. The Board approved sponsorship of the October 2000 Midwest Geosciences Group workshop and allowed them to use the MGWA logo on workshop announcements. Jim L. will send them a confirmation of the arrangement.

Next meeting – The next Board meeting will be Thursday March 2, 2000, 7:30 a.m. at Egg & I.

Meeting adjourned at 9:15 a.m.

March 2, 2000

Black Bear Crossing, 831 Como Ave., St. Paul, MN, 7:30 a.m.

Attending: Jim Lundy, President; Jim Stark, President-Elect; Lee Trotta, Treasurer; Jan Falteisek, Secretary; Jeanette Leete, Sean Hunt, WRI;

Approval of Minutes – Jim Lundy called the meeting to order at 7:35 a.m. Minutes for the regular Board meeting held February 3, 2000 were approved.

Treasurers Report – Lee Trotta reviewed the financial updates provided by WRI.

Newsletter – Jan noted that the newsletter had been delivered to the printer and was on schedule.

Membership Committee – Jennie noted that some former members had moved away. However, she said that some distant former members might still be interested in being a member. Therefore, there should be follow up. Sean will print a list of members with no second address for follow up to collect second addresses in

case of no action on a primary address. A list of members by company will be provided. Lee Trotta volunteered to help find missing members. Jim L. said the committee should meet and report back in April or May. Jan is to ask for the current list of licensed professional geologists from the board. Jan will also ask for the attendance list from the Midwest Ground Water Conference held last October. Lee Trotta will bring or circulate a membership invitation letter. A separate work meeting will be arranged for follow up.

Web Page – Sean noted that he had placed the membership survey results on the web page.

Advertising – Jennie reported that advertising revenue is down and that more work was needed to encourage company advertising. The possibility of company memberships was discussed briefly but it was clear more detailed evaluation was needed before a Board action could be taken.

WRI Contract – The draft 2000 contract was presented by Jennie. The contract was approved as presented.

Scholarships Committee – Of the four requests for scholarships, three were approved for the following amounts: University of Minnesota-Duluth for \$100, University of Wisconsin-River Falls for \$200, and the University of Minnesota Hydrogeology Field Camp for \$200. Jim Stark suggested the committee prepare a list of scholarship criteria for future requests and report back.

Fall Field Trip – Jim Stark noted that the trip contact for north-central Minnesota had told him he would not be available this year. Therefore a new trip destination needs to be identified. It was noted that the field trip needs to be announced in the June newsletter. Jim Stark will follow up.

MGWA Foundation – Jennie presented articles of incorporation and draft by-laws of the MGWA Foundations. The board approved and directed: 1) the Minnesota Ground Water Association form a 501(c)3 non-profit corporation to carry out the public benefit programs of the MGWA; 2) Jim Lundy and Pat Bloomgren to file the articles of incorporation; and 3) the MGWA treasurer provide a check for the incorporation fees. In addition, the Board approved the use of the name "Minnesota Ground Water Association" in the name of the Minnesota Ground Water Association Foundation and authorized the MGWA to pay the appropriate filing fee.

Spring Meeting – A separate working meeting will be held to further develop the spring meeting content.

Next meeting – The next Board meeting will be Thursday April 6, 2000, 7:30 a.m. at Black Bear Crossing.

Meeting adjourned at 9:15 a.m.

April 6, 2000

Black Bear Crossing, 831 Como Ave., St. Paul, MN, 7:30 a.m.

Attending: Jim Piegat, Past-President; Jim Lundy, President; Jim Stark, President-Elect; Lee Trotta, Treasurer; Jan Falteisek, Secretary; Jeanette Leete, Sean Hunt, WRI; Tom Clark, Newsletter Editor.

Approval of Minutes – Jim Lundy called the meeting to order at 7:35 a.m. Minutes for the regular Board meeting held March 2, 2000 were approved.

Treasurer's Report – Lee Trotta noted that checks to scholarship recipients had been mailed. Lee also noted the certificate of deposit was reinvested at a higher interest rate and comes due December 8, 2000. The updated financial statements provided by WRI (attached) were also reviewed.

Newsletter – Tom Clark said that Steve Robertson is the June issue coordinator. The issue will include scholarship award announcements and an article on the creation of the MGWA Foundation. The June issue will also need preliminary information on the 2000 Fall Field Trip.

Fall Field Trip – Jim Stark proposed the lower part of the Minnesota River Valley as the focus for the trip. He will have a suggested program for the next Board meeting. Suggested trip dates were discussed, possibly September 22-33.

Membership Committee – Strategies were discussed to 1) Cull inactive members from database, 2) Obtain second addresses for all members, 3) Obtain e-mail addresses for all members, 4) Solicit MGWA Foundation support. Sean Hunt said there is a loss and gain of about 40 members per year. Jim Piegat has the attendee list from the fall conference and will bring it to the next Board meeting. Jennie is to remind him by e-mail. The suggestion was made to publish the last 4 to 5 years of membership and scholarship amounts. Lee Trotta had distributed a draft of a student

— continued on page 17

MGWA Board Meeting Minutes, cont.

t recruitment poster. Jim Piegat suggested contacting Bruce Olsen for a picture for use on the recruitment poster. Jim Lundy will send an e-mail scheduling the next membership committee meeting.

Web Page – Sean announced the first e-mail registration had been received. He also noted he had developed an order web page. His next task is to develop the “members only” pages. Finally, he said the newsletter should announce the e-commerce capability of the MGWA web site.

Advertising – Jim Aitkin will be taking on advertising tasks from Leigh Harrod.

MGWA Foundation – The MGWA Foundation was formally established and the first Board will meet on April 12. As MGWA treasurer, Lee Trotta had drafted a contribution solicitation letter.

Spring Conference – Jennie said she is collecting speaker bios and detailed program information. The annual meeting, to be held as part of the spring conference, will include membership information such as financial and membership status, a program summary, and an introduction to the MGWA Foundation.

Fall Conference – Encouraging student participation was discussed as being a

priority for conferences. Strategies suggested included a student conference sponsored by the Foundation, designing the Spring Conference to include senior projects, and reversing the conferences so that the policy conference is held in the fall and the technical conference is held in the spring. Jim Piegat questioned the type of audience and market for any student conference. Further discussion is planned.

Next meeting – The next Board meeting will be Thursday May 11, 2000, 7:30 a.m. at Black Bear Crossing.

Meeting adjourned at 9:15 a.m.

MGWA - AIPG Fall Field Trip

This year's trip will focus on the lower Minnesota River Valley. Dates have been chosen with fall colors in mind: September 23rd and 24th, 2000.

Watch for more information in your e-mail and mail this summer.

To volunteer to help organize the trip or to ask about the details (as they are developed) contact Jim Stark, USGS (612)783-3230.

Guidelines for Public Testimony, cont.

8. Experts should insist on conducting the research they need to render informed opinions.

9. Experts should address other experts' opinions about the issues under consideration.

10. Experts should eliminate sensational, exaggerated, or disparaging statements from their opinions.

11. Experts should be compensated only for their service.

12. Experts should use graphic representations only to clarify an issue.

13. Experts should supply information to the news media only when authorized to do so.

The document is available at a cost of \$5.

It may be ordered from ASFE:
Professional Firms Practicing in the Geosciences
8811 Colesville Rd, Suite G 106
Silver Spring Maryland 20910
phone (301) 565-2733
fax (301) 589-2017
e-mail info@ASFE.org.

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 **2000**. Annual dues are \$20 for professional members and \$15 for students. Members are entitled to purchase a paper copy of the annual membership directory for \$7; an electronic version will be available on the website for paid members. 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 _____
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Work Telephone Number _____ E-mail _____
Fax Number _____
Home Address (optional) _____
City, State, Zip Code _____
Home Telephone Number _____
Which Address should we use for Mailings and for Directory Listing? _____
Which Telephone Number should we use for Directory Listing? _____

Site Characterization at Glaciated Sites

This three day workshop October 5-7, 2000 in Minneapolis updates procedures for modern geotechnical and hydrogeologic site characterizations in glaciated areas. It will include:

Short Course

Analysis of glacial depositional environments

Recognition of weathering zones and secondary features

- Effective sediment descriptions of glacial deposits
- Stratigraphic approach for site characterization
- Analysis of solute transport through glacial deposits
- Comparative analysis of remedial alternatives for soil and ground water
- Field-characterization of geotechnical properties
- Soils mechanics of glacial deposits
- New field and data analysis methods for slug tests

Field Exercises

- Improve stratigraphic concepts and understand glacial facies relationships
- Improving sediment descriptions for stratigraphic differentiation
- Field-development of cross-sections and geologic maps
- Discrete ground water sampling methods
- Accelerated site characterization techniques

Technology Demonstrations

- Rotary-Sonic (Rotasonic) drilling and sampling
- Directional drilling and Sampling
- New technology using direct push technologies
- Geophysical techniques for stratigraphic differentiation
- Core penetrometer testing (CPT)
- Mini-Sonic Drilling and Sampling

MGWA Calendar

The most complete version of the MGWA Calendar is available on our web page at www.mgwa.org.

Contact information for the major event-holders is listed at the end of the column. If you become aware of a relevant event which may not be widely publicized, please send the information to the attention of the editor. Thank you.

June 4-7, 2000 6th International In Situ and On-Site Bioremediation Symposium, San Diego, CA. Contact: Battelle Conference Office, 614-424-7604, biorecl@battelle.org

June 5-6, 2000 Risk Based Decision Making: an Advanced Quantitative Course, Minneapolis, MN. Contact: NGWA.

June 7-8, 2000 Emerging Issues Conference, Minneapolis, MN. Contact: NGWA.

June 12-13, 2000 Risk Based Decision Making: an Advanced Quantitative Course, Minneapolis, MN. Contact: NGWA.

June 13-15, 2000 Principles of Ground Water, Minneapolis, MN. Contact: NGWA.

June 21-23, 2000 Geostatistics and the Data Quality Objectives Process for Environmental Remediation, San Diego, CA. Contact: NGWA.

June 22-23, 2000 Surface Geophysics (tentative title), San Diego, CA. Contact: NGWA.

June 26-27, 2000 Principles and Practice of Forced Air Remediation, San Diego, CA. Contact: NGWA.

June 26-28, 2000 GIS and Data Management for Ground Water Modeling (tentative title), San Diego, CA. Contact: NGWA.

July 30-August 2, 2000 ASCE Minneapolis 2000 Joint Conference on Water Resources Engineering and Water Resources Planning and Management, Minneapolis, MN. Contact: <http://www.mpls2000.asce.org/>

September 6-8, 2000 Principles of Ground Water-Flow, Transport, and Remediation. Columbus, OH. Contact: NGWA.

September 19-20, 2000 Aquifer Tests: Operations and Parameter

Estimation. Milwaukee, WI. Contact: NGWA.

September 19-20, 2000 Water Well Rehabilitation. Milwaukee, WI. Contact: NGWA.

September 21-22, 2000 Design and Construction of Wells. Milwaukee, WI. Contact: NGWA.

September 23-24, 2000 AIPG/MGWA Fall Field Trip; Lower Minnesota River Valley. Contact Jim Stark, USGS, 612-783-3230.

October 6-8, 2000 Advances in Site Characterization for Environmental and Engineering Projects at Glaciated Sites, Twin Cities (venue TBA). Contact: Dan Kelleher, Midwest Geosciences Group, 612-551-2435, or info@midwestgeo.com

October 12-13, 2000 American Institute of Professional Geologists Annual Meeting-Learning from the Past, Directions for the Future, Milwaukee, WI. Contact: www.aipgwis.org, or by e-mail bernd.rehm@rmtinc.com

November 3, 2000 Minnesota Ground Water Association (MGWA) Fall Conference, Earle Brown Center, University of Minnesota (St. Paul Campus). Topic to be determined.

Contacts for the most frequent conference sponsors:

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