

Minnesota Ground Water Association

www.mgwa.org

Volume 20, Number 2: June, 2001

President's Column

Jim Stark, MGWA President

Water has been in the news a lot this spring. If you looked at the front page of either of our local papers, or turned to the local evening news, you were likely to see a story, or two, about floods and the personal hardships created by rising waters in our rivers. Many of the flood peaks were among the top two or three greatest discharge volumes on record. Our office was "flooded" with questions about where and when the rivers would peak, and why there have been so many "100-year floods" this decade. The media love stories about floods — they are very visual. They peak quickly and have immediate human consequences. There also is something, or someone, to blame—the weather, or the way we have manipulated the landscape.

Water may be a single resource, as a recent publication attests. However, we no longer see many ground-water stories "Live at Five". The good news is that most of the nation's large toxic-waste issues that involve groundwater seem to have been addressed. Reports about non-point contamination and ubiquitous low-level concentrations of nitrate, pesticides and industrial chemicals in our shallow groundwater are not likely to make the evening news. As Tom Meersman, from the Star Tribune, told us at our spring conference, there's a difference between news and information. News needs to be immediate, needs to have a villain, and needs a party that has been wronged. It seems as though we've moved past that with respect to ground-water issues. Today's ground-water issues affect us all and we all share, to some degree, in the blame for contributing to non-point sources of contamination. Groundwater remains as an important resource in our state, and in

the nation. As professional resource managers our work remains important to society. But don't expect to see many ground-water stories on the evening news. Keep up the good work, think long term, and continue to find good ways to bring our message to the public.

An interesting issue has recently come before the board of the Association. Pending cuts in State and Federal funding threaten to reduce several programs that focus on groundwater. These have raised the issue about how the Association should be involved. We represent a diverse group of professionals and concerned citizens. Some of you may not feel inclined to support governmental programs. Should we lobby and advocate against cuts in these governmental programs? The Association's mission statement is vague in this area. The board continues to struggle with the issue of our mission as we move the organization into the 21st century. Should we be more than an organization that concentrates on education and information? We need to know how you feel about this issue.

The fall conference was a great success. Thanks to everyone who participated or attended. We had record attendance and feedback generally was positive. We value all input and suggestions. There were many good suggestions for topics for future meetings. There seems to be wide variation in what is considered appropriate for registration fees for conferences. Our philosophy generally is to cover our costs and to generate a little income for the Association and for the Foundation. Our dues alone do not cover the expenses of our Association. We rely on some of the income generated by our conferences.

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MGWA is 20 Years Old in September

New MGWA Mug Design Being Sought

The Minnesota Ground Water Association was organized 20 years ago this September! Volume 1, Number 1 of the MGWA newsletter was published in October 1982. Watch the September issue of the newsletter for a year-by-year retrospective on how we've grown since then, plus a colorful look back from MGWA's first president, Gil Gabanski. For the 20th anniversary, we'd like to redesign the current cobalt blue MGWA coffee mug design with something fresh and attractive. We sell the mugs throughout the year to help raise funds for the association and also provide them as gifts to speakers who volunteer their time at our conferences. We'd like the tradition of "mugging the speaker" to continue with an updated design and encourage members (or anyone else) with ideas to submit them by mail or e-mail to the MGWA office. The board will select a winner and the prize will be—what else?—a mug of your own design and the satisfaction of having the design reproduced on MGWA mugs for the next five years! There may be some other surprises in store, so stay tuned.

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2001 Newsletter Deadlines

Issue	Copy to Editor	Copy to Publisher
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Sept. (v20/3)	8/10/01	8/17/01
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reprinted if appropriate credit is
given. Views expressed in this publi-
cation do not reflect official MGWA
policy unless expressly stated as
such.

President's Column, cont.

Our annual field trip is scheduled for
the Brainerd area on October 12 and
13. The trip is a joint venture of the
MGWA and the AIPG. This year the
trip is also being held in conjunction
with the national meeting of the Amer-
ican Institute of Hydrology
(www.aihydro.org).

The board continues to make prog-
ress on long-range planning. We want
to organize an ad-hoc group that will
focus on long-term directions for the
Association, outside of the day-to-day
business that occupies most of the
time at our board meetings. We also
want to explore the possibility of an
annual award to honor people who
have added to ground-water science
or issues, even if these issues don't
make the evening news. Let me know
if you are willing to help out. You can
reach me by e-mail at
stark@usgs.gov or by calling (763)
783-3230.

Capillary Fringe

MGWA President-Elect Rob Caho Goes Down Under!

Thank you to everyone who voted for
me this last election. I'm looking for-
ward to serving this organization.

This past February my wife Cathy
and I were fortunate to travel to
South Australia for two weeks. We
went there to represent the United
States in a racing-car driver
exchange program. Last summer we
hosted here in Minnesota a race car
driver from Australia and now it was
our turn to reciprocate. It was a won-
derful opportunity to see the differ-
ence in auto racing and the difference
in our cultures. Some of these differ-
ences really hit home because of my
work in the environmental water well
industry for the past twenty-one
years. Good water in Australia is very
hard to find. Inland Australia is a
harsh environment where droughts
are common. Unpredictable rainfall,
high evaporation, and even
brushfires all contribute to the chal-
lenges the Aussies face. In the U.S.
we often take our natural resources
such as water for granted. When we
turn on the faucet—water runs

out—and life is good. In contrast,
Aussies need to focus on getting the
maximum benefit from the limited and
sometimes fragile natural resource of
water. Their tap carries salty bore and
is utilized for showers and laundry.
It's not very good for drinking. So they
collect rainwater off the roofs of
houses in rainwater tanks for drink-
ing. I also experienced the latest in
toilet technology. When I went to
flush the toilet it had two options, a
half flush to conserve water and a full
flush when needed. You only need to
look on the internet to see there are
over 56,000 sites that refer to water
conservation in Australia to realize
that the Aussies take water conserva-
tion very seriously. Maybe it's time we
learned a lesson from our friends out-
back and down under when it comes
to water conservation.

Good-day Mate!

— Rob Caho, MGWA President-Elect

Southwest Minnesota Water Planners Annual Conference—"A Region's Thirst For Water"

A large and diverse group of speak-
ers and attendees were present
March 21 in Marshall, MN at the first
ground water conference sponsored
by the Southwest Minnesota Water
Planners. The group consisted of pro-
fessionals from state agencies such
as the Department of Natural
Resources (DNR), Minnesota Depart-
ment of Health (MDH), Minnesota
Pollution Control Agency (MPCA) as
well as county representatives, water-
shed groups, well drilling companies,
rural water associations, and municip-
al water utilities.

The session opener by Joseph and
Anthony Amato from the Center for
Rural and Regional Studies at South-
west State University included anec-
dotal illustrations of the interde-
pendence of water and culture. Also
illustrated was the often-simultaneous
overabundance and lack of water. As
this article was written, rivers and
streams are bank-full and flooding

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SW Water Planners, cont.

continues along the Minnesota River and its tributaries, yet ground-water resources in southwest Minnesota are not so abundant. And, where available, the quantity and quality of that water can be problematic for domestic as well as industrial uses.

The first technical session by Jim Berg, DNR Waters, introduced several important aquifers in the region including the Rock River Valley aquifer (Quaternary surficial) in Luverne, the Wood Lake Aquifer (sub-Quaternary), and the Dakota Sandstone (Cretaceous) south of Worthington. Surficial and buried quaternary aquifers are utilized throughout the region. Cretaceous sandstone is often used in the southern and eastern portion of the region (see DNR's new ground water provinces map, page 8).

The second session addressed managing the water supplies that we have and finding new sources. Dave Leuthe, DNR Regional Hydrologist, discussed sustainable yield and water conservation. Dominic Jones, Red Rock Rural Water System, presented information on this extensive system originating from an alluvial aquifer located along the Des Moines River south of Windom. A representative from the water supply consulting firm B.A. Liesch discussed the process involved in water-supply exploration and development.

The third session of the morning addressed exploration. Mike Steffl, Steffl Well Drilling, stressed the wealth of knowledge that well drillers have as well as the importance of communication when ground-water resources are being sought. Greg Sherman, Marshall Municipal Utilities, discussed the City of Marshall's current search for water north of Cottonwood, roughly 15 miles from town. Red Arndt, City of Luverne, discussed the Lewis & Clark Rural Water System and how it will impact southwestern Minnesota. And, finally, Dennis Healy of Lincoln-Pipestone Rural Water discussed wellhead protection strategies for surficial aquifers in agricultural areas.

The keynote address "Water and Economic Growth: What are the

Challenges?" was given by David Southwick, Director of the Minnesota Geological Survey. Dr. Southwick identified the need to better use the information that we already have and the need for more resources for exploration. He discussed a list of "things to do" including: better characterization of the quality, quantity, and location of water supply sources; applying political pressure for increased resources for exploration; and increasing information sharing among private and governmental units. The take-home message from the talk surrounded sustainability and sustainable development. While acknowledging this nebulous concept, he challenged the audience to seek better definition of these terms.

The afternoon sessions started with Terry Bovee, MDH, giving an overview of regulations and challenges associated with source water and wellhead protection. The second session addressed economic growth stories. Tom Vermeersh, Plant Manager at Minnesota Corn Processors (MCP) located in Marshall, discussed the measures taken to reuse and recycle water in their operations as an ethanol and corn syrup manufacturer. At 2.5 million gallons per day, MCP uses 40% less water at their Marshall plant than at their Columbia, Nebraska plant.

Economic growth is tied to the availability of water for industry. Don Habicht, City of Worthington, stressed the need for more regionalized rural water and municipal water supply systems. He also stressed the importance of pricing water to encourage conservation. Jim Naumann, City Administrator for Brewster, gave a presentation on the challenges associated with luring and retaining a new soybean processing facility. He said that issues remain regarding water availability for the project.

The remainder of the afternoon included question and answer sessions and a panel discussion with the following local and regional water planners: Wayne Smith, Nobles County; Red Arndt, City of Luverne; Mark Lindquist, DNR; and Annette

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The primary objectives of the MGWA are:

- Promote and encourage scientific and public policy aspects of ground water as an 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.

SW Water Planners, cont.

Bair, Southwest Regional Development Commission.

Overall, this conference provided good discussion about what is being done to address water-supply quantity and quality in the region as well as presenting the problems and challenges that are being faced. Discussions of short-term solutions were also presented.

The long-term status of water availability for this region is uncertain. Water supply costs increase with distance from the water source. If economic growth is linked to water availability, that water has to be relatively inexpensive as well. DNR Planner Mark Lindquist made a very valid point. He suggested that where water supply is a concern, luring less water-intensive industry that produces higher value products might be the most responsible course for economic development. At some point, as the southwest Minnesota population and industrial use of water continues to increase, there will be a breaking point where it is no longer feasible to increase the supply of water to this area at anywhere near comparable cost. Before that happens (or to prevent that from happening), paradigm shifts in many facets of this issue including domestic and industrial water conservation, pricing, and economic development will need to occur.

Historically, surface-water issues are on the annual water planners' conference agenda. This year's forum for dialogue and information sharing increases everyone's awareness of the ground-water issues that face this region. Increased communication among local governments and state agencies, the well-drilling community, rural water associations, other ground-water professionals, and the general public is necessary. Ground water discussions must continue in this region to effectively accomplish the goals of water conservation, water availability, and "sustainable" economic development.

— John Vigna, Hydrologist, MPCA Marshall Office

MGWA Spring 2001 Conference

Title: Emerging Science and Technology Issues

Plenary

The 250+ attendees of the largest conference offered by the MGWA had an excellent opportunity to learn about some of the latest issues in ground water science and technology. The attendees included ground water professionals, technicians, drillers, and others from throughout Minnesota and beyond Minnesota's borders. The morning's keynote speakers provided an overview of ground-water issues from several points of view.

Laurel Reeves, DNR Waters, reviewed water supply sources in Minnesota and related issues of sustainability as described in a recently published DNR Waters information paper. The state is experiencing increasing demands on existing water resources, which in some areas of the state are very limited. The documented effects of this demand on ground water resources include reduction of surface water resources in high-priority areas, such as trout streams. The information paper is available on the DNR web

site at http://www.dnr.state.mn.us/waters/publications/mn_water_supply.pdf.

Kelton Barr, Kelton Barr Consulting, Inc., focused on the history of data available to Minnesota ground water professionals. He noted the grim situation in the pre-1970's period and compared it to the much-improved data sources now. He looked into the future and proposed that current databases needed to be refined and expanded to make the most use of the data already in a file... somewhere.

Pat Bloomgren, Minnesota Department of Health, provided a historical perspective on changes to ground water legislation, beginning by noting that early legislation was usually preceded by a disaster or perceived disaster of some kind. She noted the very important 1989 Groundwater Act establishing policy and goals. Attendees were encouraged to think about the connection between water and energy, that future energy production facilities will need careful siting to avoid adverse impacts on water supply.

Tom Meersman, Minneapolis Star Tribune, admitted to the audience that, while ground water is a significant issue, ground water is a hard

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Spring Conference, cont.

story: it's not visible, not urgent, not easy to understand, and victims may be indirect. He reminded the audience that news is not the same as information, but that reporters can build in general information if it is available.

Following the plenary session were concurrent sessions on technology and science. Your editors had the same problem as the conference attendees — they couldn't be in two sessions at once, thus we can't report on the talks we missed.

Morning Technology Session

HO Pfannkuch, University of Minnesota, delivered the McElhiney Distinguished Lecture sponsored by the National Ground Water Association. He provided a wealth of information on pump tests for professionals and reviewed what a pump test can reveal about an aquifer.

Steve Adamek, Dakota Technologies, described a relatively new technology, laser induced fluorescence, that is used with a Geoprobe to detect petroleum in soil. Nearly continuous subsurface data collection for petroleum presence is possible with this technology.

Mike Liljegen, DNR Waters, described the use of vibrating wire piezometers in wells that must be sealed. This technology is particularly useful when it is important to continue collecting piezometric data from a well after it is sealed.

Morning Science Session

Don Rosenberry, U.S. Geological Survey, presented a clear and interesting overview of the current status of investigations of ground water and surface water interactions, especially those related to lake systems. His presentation referenced many people's work and the techniques and instrumentation that they are employing.

Cindy Paul, U.S. EPA, reported on advances in ground water sampling techniques.

Jeff Stoner, U.S. Geological Survey, described the design and implementation of the national program to monitor water quality trends.

Afternoon Technology Session

Ed Schneider, MDH, presented a summary of Well Management program activities for the year 2000, with interesting statistics showing recent trends in drilling and sealing activities. He also discussed pertinent pending legislation as well as agency plans to revise Minnesota Well Code Rules.

Norm Mofjeld and Tom Alvarez, MDH gave updates on the Health Department's well disclosure process and on new techniques being used to locate and seal wells that are no longer in use.

Tim Berquam, Bergerson-Caswell, Inc., began by categorizing causes of decline in well performance. Tim then focused on problems of Flow Path Blockage, especially those resulting from mineral precipitation and biofilms. The presentation provided good coverage of chemical treatment techniques and cleanup.

Leigh Harrod, Metropolitan Council, reported on the implementation of remote collection of real-time hydrologic field data.

Karla Peterson, MDH, brought us up-to-date on new EPA rules and regulations.

Afternoon Science Session

Todd Petersen, DNR Waters, described how he uses resistivity imaging to look at depth without the expense of borings. He compared successful results in two very different sites, one at a sand and gravel site and the other in a karst area.

Pete McMahon, U.S. Geological Survey, discussed his work studying recharge and nitrate in irrigated and non-irrigated settings in the semi-arid central high plains. In irrigated areas, the downward potential from irrigation plus additional nitrate applied results in higher nitrate throughout the unsaturated sediment profile.

Tim Cowdery, U.S. Geological Survey, described age dating of young waters. CFC's and SF₆ can give age dates on the order of ±3 years. Using CFC's and SF₆ requires specialized sampling, analysis, and interpretation.

Mark Ferrey, MPCA, described the use of hydrogen gas for monitoring

natural attenuation sites. He noted that redox can indicate whether ground water is aerobic or anaerobic but it provides few clues to actual processes. Measuring hydrogen concentrations can provide some process clues.

Jim Ruhl, U.S. Geological Survey, reviewed work to date to estimate recharge in the Twin Cities metro area. He showed how several methods are being used to estimate recharge, which averages 5-10 inches per year in the metro area.

Jim Stockinger, MPCA, described the results of a study of the water quality impacts of different types of manure storage structures. He noted that ground water is only protected when structures have concrete or synthetic liners. The study also indicated that setbacks are protective for receptors, but not for ground water.

As is MGWA's policy, we formally asked conference attendees to provide feedback to help us improve our conferences. These comments are especially valuable to the organizers as we strive to deal with the increased interest in MGWA conferences due to the excellent presentations we have come to expect (not to mention continuing education requirements!). The following is a sampling from the comments received:

On appropriateness of content:

Best GW conference in the Midwest
Good mix of topics
Emerging issues are interesting, but not what I deal with day-to-day
Go further on well code issues and make it interesting

On appropriateness of format

Hard to attend all the topics I would have liked
Missed a session because they were concurrent
Not enough time for Q & A
I think people enjoyed going back and forth between science and technology

On the conference location

Good food, good location
Lunch pretty good for a conference
Still too cramped

Did the talks hold your interest?

— continued on next page

MGWA/AIPG Fall Field Trip to Brainerd Area, October 12-13, 2001

The Minnesota Chapter of the American Institute of Professional Geologists (AIPG) has the lead this year for the annual fall field trip, co-hosted by MGWA. This year's trip is October 12-13 and will feature the Brainerd area. It is being held in conjunction with the national meeting of the American Institute of Hydrology (AIH), which will be held in Bloomington, October 14-17 (see www.aihydro.org). Proposed field trip stops include several on the Cuyuna Iron Range east of Brainerd, including DNR's new Cuyuna Range Recreation Area. A stop is also planned for the U. S. Geological Survey's Hydrology Research Center at Williams Lake. The glacial geology of central Minnesota will also be highlighted, including the Baxter Sand Dunes and the famous Ripley Esker. It promises to be a trip of great variety during a wonderful time of year to be outside. Watch the MGWA website for registration details later this summer. E-mail notice will also be sent to association members.

Spring Conference, cont.

A few were too short for the subject
Some presentations were way too basic

I didn't even snooze after lunch!

A majority of attendees thought that the conference was worth a day away from work and that they had learned something that would apply in normal work. When asked what they thought the conference was worth in dollars, responses ranged from \$50 (3 responses) to \$300 (also 3 responses) with a mode of \$100 (18 responses).

Many suggestions were received for future conference topics – mark your calendar for the fall conference on **November 6th** at the Earle Brown Center on the University of Minnesota St. Paul Campus.

Global International Water Assessment Underway

On March 14, 2001 the University of Minnesota Water Resource Sciences program sponsored a presentation by Dag Daler, project manager of the Global International Water Assessment (GIWA;). Mr. Daler, of the University of Kalmar, Sweden, outlined the primary concerns of GIWA, an initiative led by the United Nations Environment Program (UNEP;) and funded by the Global Environment Facility (GEF; www.gefweb.org).

GIWA is the most objective, comprehensive assessment of transboundary water issues, and their societal root causes, conducted so far. GIWA assesses freshwater, rivers, ground water, coastal waters, all treated as an integrated system representative of the hydrologic cycle. The aim is to resolve transboundary water issues cost-effectively and sustainably by linking them to socio-economic issues. GIWA focuses on five categories of global water problems: fresh water shortage; pollution; habitat loss and community proliferation (development); unsustainable exploit of living resources (fisheries); and global climate change.

According to Mr. Daler, conventional methods of solving global water problems focus on immediate causes. GIWA focuses on root causes of environmental problems. GIWA's transboundary approach is unique by recognizing the place where a problem occurs may not be where the problem was caused. Mr. Daler noted that nations commonly effectively manage their internal issues, whereas transboundary issues are more difficult, e.g., an upgradient country takes all the clean water.

GIWA will assess each of 66 global sub-regions, defined by watershed, in three phases:

Scoping/scaling phase, to identify priority water issues, especially transboundary issues, in terms of socio-economic and environmental impacts.

Detailed impact assessment phase for priority issues identified during scoping phase. The de-

tailed impact assessment phase may include an environmental impact assessment (EIA), and a socio-economic impact assessment.

Causal chain analysis, in which the most significant causes of environmental degradation are assessed, stressing societal causes. Sectors evaluated include agriculture, urbanization, industry, fisheries, tourism/leisure, transport, and energy.

The GIWA project was announced in 1999, and is scheduled for completion within four years. For more information see www.gefweb.org or contact Mr. Daler at dag.daler@giwa.org.

South-Central MN Water Festival a Success

Brown, Nicollet, and Cottonwood counties held their third annual Children's Water Festival on Wednesday, March 14, 2001, at the South Central Technical College in North Mankato, MN. Approximately 900 fourth graders from 17 schools attended.

"Hands on" presentations and exhibits provided water related information. Staff from the Science Museum explained the water cycle and other water concepts. Students also learned about recycling, watersheds connecting land use to water, and the importance of keeping water clean. Students were invited to bring in water samples from private wells to be tested for nitrate-nitrogen. Of the 280 samples analyzed, two were over the federal drinking water standard of 10 parts per million. Sample results ranged from 0 to 20 parts per million.

Students and teachers left with a better understanding of water, its importance to the environment, and how to keep it clean. This event was a result of over two years of planning.

— reprinted from *Minnesota River Weekly Update*, March 19, 2001

Minnesota Ground Water Provinces

The Minnesota Department of Natural Resources, Division of Waters, has prepared a map (found on the following page) describing the general ground-water resources of the state and posted it on their web site at www.dnr.state.mn.us/waters. This map's ArcView shapefiles can also be downloaded for use in GIS.

The occurrence of ground water in Minnesota is related primarily to local geologic conditions that determine the type and properties of aquifers. The map shows ground water provinces based on bedrock and glacial geology. The aquifers within these provinces occur in two general geologic settings: bedrock comprising a wide range of rock types and ages, and unconsolidated sediments deposited by glaciers, streams, and lakes.

Aquifers in the bedrock setting typically consist of sandstone, limestone, and dolostone but may also be fractured igneous or metamorphic rocks. Bedrock aquifers with karst characteristics are common in extreme southeastern Minnesota where glacial drift is thin over limestone and dolostone.

Aquifers in the unconsolidated sediments setting are surficial or buried sand and gravel.

The combined physical aquifer attributes (thickness, lateral extent, permeability, and porosity type) of the two settings differentiate among the six ground water provinces within the state. Within each province, ground-water sources and availability of ground water for drinking water, industrial, and agricultural uses are similar.

**Support Your
Association
— Invite a
Student
to Join**

MGWA Speaker's Bureau

MGWA, upon recommendation of the MGWA ground water education subcommittee, is establishing a speaker's bureau to respond to requests by citizens groups, schools, etc. We are looking for member volunteers to be listed as available to speak to such groups on the following topics, or others you suggest:

- water supply
- water quality
- contamination/cleanup
- ambient ground-water quality
- general ground-water concepts

Please let us know what audience you are most comfortable with (i.e., school age, citizens groups, county commissioners, etc.), and any restrictions in the locations you would be willing to travel to. To volunteer or for more information contact Jim Lundy, MGWA Past-President, at (651) 296-7822 or e-mail at jim.lundy@pca.state.mn.us. Thanks!

2001 MGWA Membership Directory

The 2001 Membership Directory is now available for current MGWA members to download on the MGWA web site at www.mgwa.org. Members recently received instructions on how they can access the directory from the Member's Only page of the MGWA web site. Paper copies will be mailed to those members that requested and paid for a paper copy with their dues renewal.

Members should review their listing and send any corrections or changes by email to office@mgwa.org.

MGWAF Sponsors UMD Field Trip to Death Valley

This spring, the MGWAF provided funds to University of Minnesota - Duluth students for a geology field trip to Death Valley, CA. Here's their thank-you and a picture.

Dear Mr. Lundy,

I apologize for the delay in writing this thank you letter. We were delighted to learn that your organization had awarded us the \$300 grant to support our field trip to the Death Valley area. Those who survived the trip are very grateful for your contribution. The best way to learn geology is to get outside in the field and look at it. Unfortunately, taking trips out of the local area can be very expensive for students. Your foundation helps make these trips possible by making them less cost-prohibitive. Your generosity is greatly appreciated.

Sincerely,

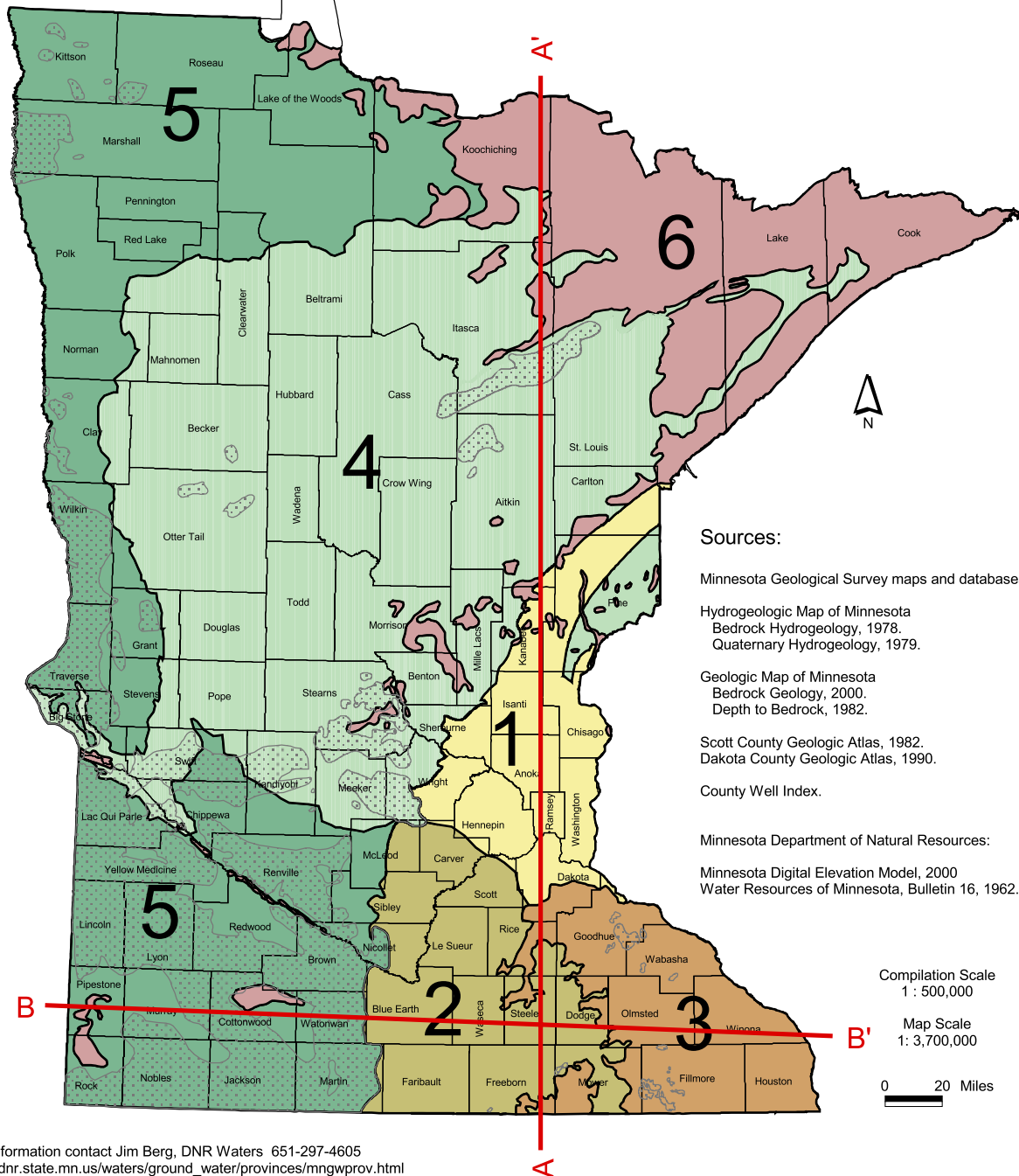
Keri Hager
UMD Geology
Club Vice
President

Sue
Hattenberger
UMD Geology
Club Activities
Director



— UMD students on MGWAF-sponsored field trip to Death Valley.

Figure 1. Minnesota Ground Water Provinces



Province Characteristics

- 1 Metro Province**
Sand aquifers in generally thick (greater than 100 feet) sandy and clayey glacial drift overlying Precambrian sandstone and Paleozoic sandstone, limestone, and dolostone aquifers.
- 2 South-Central Province**
Thick clayey glacial drift with limited extent sand aquifers overlying Paleozoic sandstone, limestone, and dolostone aquifers
- 3 Southeastern Province**
Thin (less than 100 feet) clayey glacial drift overlying Paleozoic sandstone, limestone, and dolostone aquifers. Karst characteristics are common in limestone and dolostone bedrock.
- 4 Central Province**
Sand aquifers in generally thick sandy and clayey glacial drift overlying Precambrian and Cretaceous bedrock. Fractured and weathered Precambrian bedrock is used locally as a water source. The Biwabik Formation, an iron ore deposit found in Itasca and St. Louis counties, can have good aquifer properties.
- 5 Western Province**
Clayey glacial drift overlying Cretaceous and Precambrian bedrock. Glacial drift and Cretaceous bedrock contain limited extent sand and sandstone aquifers, respectively.
- 6 Arrowhead Province**
Precambrian rocks are exposed at the surface or drift overlying Precambrian rocks is very thin (less than 30 feet). Ground water typically found locally in faults and fractures. Areas with similar aquifer characteristics exist in Provinces 4 and 5.
- 6 (Patterned)** **Cretaceous Bedrock**
Sandstone layers that are interbedded with thick layers of shale are used locally as water sources. Occurs beneath glacial drift but above older bedrock.

Sources:

Minnesota Geological Survey maps and databases:
 Hydrogeologic Map of Minnesota Bedrock Hydrogeology, 1978. Quaternary Hydrogeology, 1979.
 Geologic Map of Minnesota Bedrock Geology, 2000. Depth to Bedrock, 1982.
 Scott County Geologic Atlas, 1982. Dakota County Geologic Atlas, 1990.
 County Well Index.
 Minnesota Department of Natural Resources:
 Minnesota Digital Elevation Model, 2000. Water Resources of Minnesota, Bulletin 16, 1962.

Compilation Scale
1 : 500,000

Map Scale
1: 3,700,000

0 20 Miles

Cross Section



Minnesota DNR Waters
Helping People Ensure the Future of Our Water Resources

August 2001

Arsenic: 5, 10, 15, 20 or more?

The status of the rule establishing a new arsenic standard is in turmoil. On March 23, EPA administrator Christine Todd Whitman formally delayed the effective date of the arsenic rule for 60 days (from March 23 to May 22, 2001). Then, on April 23, Whitman announced that EPA was initiating an additional 9-month extension, until February 22, 2002, the purpose of which is to conduct an additional review of: 1) scientific analysis of the health effects and 2) economic analysis of the cost of compliance. According to the EPA release in the Federal Register, the EPA will prepare a proposal for comment on a variety of arsenic MCL levels from 3 to 20 ppb, which compare to the current standard of 50 ppb, which was established in the early 1940s.

The scientific analysis will be conducted by a panel of experts convened by the National Academy of Sciences. This panel will first review EPA's interpretation and application of arsenic research summarized in its 1999 report on the original version of the arsenic rule. Secondly, the panel will evaluate and review new research that has become available since the National Academy of Sciences presented its first report in 1999.

A specially convened subgroup of the National Drinking Water Advisory Council will advise EPA on cost of compliance issues.

After these two groups have completed their review, EPA will prepare formal proposals for public comment on prospective arsenic standards over a certain range, probably in the 3 to 20 ppb range. The following web site will have announcements on the current status of the rulemaking efforts: www.epa.gov/safewater/arsenic.html

Interestingly enough, EPA does not plan to alter the compliance date as proposed in the original rule published back in January 2001. By maintaining January 22, 2006 as the compliance date, the five-year period over which compliance was to have been achieved has been effectively shortened to about four years.

MPCA Receives Karst Education Project Grant

The Minnesota Pollution Control Agency received \$21,725 from the U. S. Environmental Protection Agency's National Environmental Education Act Funding for an education project centering on southeastern Minnesota's karst region.

MPCA will host four, two-day workshops for elected state and local officials, educators, citizens and the regulated community. The workshops will enhance understanding of the vulnerability of water resources in this sensitive geologic setting. The project will promote and facilitate the adoption of decisions and practices at the local government and community levels, aiming to protect the environment and human health in these vulnerable areas. The project will start a self-sustaining process of collaboration, information sharing and decision making.

Included in the workshop will be a half-day field trip to nearby sites where karst geology and hydrogeology are apparent, as well as sites where karst problems are occurring and sites where problems have been remedied. For further information about the project, contact Sandeep Burman, MPCA Rochester District, at 507-280-2996, email: sandeep.burman@pca.state.mn.us.

MGWA Board Votes to Approve Corporate Membership

At its May meeting, the MGWA Board voted to approve a Corporate Membership option with a pricing structure that includes added benefits, such as newsletter advertising. The Corporate Membership provides savings compared to multiple individual memberships in the same firm.

Final details are being worked out. Watch the September newsletter under the Advertising Information section for all the latest. Thanks to Jim Aiken, MGWA Advertising Manager, and members of the Membership Committee for putting this together.

Jon Pollock Joins MGWA Newsletter Team

Your newsletter team is pleased to announce that Jon Pollock, President of Frontline Environmental, Lakeville, MN, has joined the MGWA newsletter team. Jon is a licensed Professional Geologist with a hydrology background who will help round out the newsletter team with his private-sector perspective. Before starting his own firm, John was a hydrologist with the Minnesota Pollution Control Agency. John can be reached at (952) 892-0367 or by e-mail at: frontline@uscorp.net.

Metro Children's Water Festival Receives Grant

Joe Enfield, Assistant Director of Carver County Environmental Services, is pleased to announce that the Metro Children's Water Festival has received \$10,000 in funding from the Metropolitan Council to help with operation of this year's festival, scheduled for September 26 at the State Fairgrounds.

Hundreds of fifth graders from selected schools in the metro area that apply in advance are treated to a day of "classroom beyond the walls", visiting a variety of learning stations on water-resource education and protection—real hands-on learning.

The festival is supported by a core group of water-resource scientists and educators from the Metropolitan Area Ground Water Alliance (MAGWA) and a host of other volunteer professionals from state and local government, as well as private industry. Each year, the MGWA provides a small grant to the festival and reports on it in the MGWA newsletter. If you are interested in volunteering for this year's festival, please contact Joe Enfield at (952) 361-1801, e-mail: jenfield@co.carver.mn.us.

New USGS publications

Water Quality in the Upper Mississippi River Basin, Minnesota, Wisconsin, South Dakota, Iowa, and North Dakota, 1995—98. J.R. Stark, P.E. Hanson, R.M. Goldstein, J.D. Fallon, A.L. Fong, K.E. Lee, S.E. Kroening, and W.J. Andrews. USGS Circular 1211. One of the NAWQA program reports. The web site is <http://mn.water.usgs.gov/umis>.

Water Quality in the Eastern Iowa Basins, Iowa and Minnesota, 1996—98. Stephen J. Kalkhoff, Kimberlee K. Barnes, Kent D. Becher, Mark E. Savoca, Douglas J. Schnoebelen, Eric M. Sadorf, Stephen D. Porter, and Daniel J. Sullivan. U.S. Geological Survey Circular 1210. One of the NAWQA program reports. The basin project web site is <http://www.diaiw.c.usgs.gov/nawqa/>.

The NAWQA program web site is <http://water.usgs.gov/nawqa>.

MGWA Ground Water Education Committee Meeting Notes

February 27, 2001

On February 27, 2001 the MGWA GW education committee met at the MPCA offices in St. Paul. Those present: Jim Lundy, Cathy Villas-Horns, Mike Trojan, Mike Schoenberg, Sean Hunt, Chris Elvrum.

Earth Day. Chris Elvrum has lined up this event. Chris, Mike S. and Mike T. will run the booth. DNR and MPCA are to check with their offices to see if we can gather some freebies to hand out. Sean is going to see if he can supply some MGWA cards with the MGWA logo and web address.

Speaker's bureau. We need to decide whether this will be an "active" or "passive" effort (will we promote?). We will submit a blurb in the June '01 newsletter.

Links. We discussed adding a ground water education links page to the GW Education portion of the MGWA web page (which we are building right now). Sean thought this would be no problem to do. Cathy

Villas-Horns is the keeper of the new links we discover.

Next meeting. Chris Elvrum suggested the next meeting should be held at Met Council so we can view the CD-ROMs and videotapes he has been telling us about. The next meeting is scheduled for Wednesday March 28, 2001, 11:30-12:30.

MGWA Foundation Meeting Minutes

February 22, 2001

The board of the Minnesota Ground Water Association Foundation met at the Day by Day Cafe in St. Paul on Thursday February 22, 2001. Those present: Paula Berger (president), Jim Lundy (secretary), and Jennie Leete (executive director/WRI).

Mailing to geology departments. MGWA recently mailed a packet to geology departments around Minnesota and surrounding areas. The packet included a poster encouraging students to join MGWA, a field trip funding request form, and a student research contest entry form. As a result of the mailing to geology departments in Minnesota, the MGWA gained one student member and one regular member. No entries were received for the student research competition (deadline was February 15, 2001). One request for field trip funding was received from the University of Minnesota-Duluth Geology Club. The board approved a motion to fund this request to the amount of \$300. Jim Lundy will write the check and Paula Berger will write a letter of transmittal, asking the UMD Geology club to supply the MGWA newsletter with photographs and a summary of the trip after its completion.

MGWA Foundation finances. The MGWAF balance includes \$10,614.66 (endowment; restricted funds), \$3,041.18 (unrestricted funds), and \$32.71 in interest. Jennie Leete proposed a no-load mortgage-backed bond investment option that would earn more interest (9.25% to 9.5%) than our current certificates of deposit (which earn about 4%). This will be discussed at a future meeting when the treasurer is present.

Corporate fund raising. Jennie will contact specific firms with a proposal to permanently fund a field camp donation (e.g., \$1500 per year). Part of the arrangement could be that the student who benefits could (after field camp completion) serve as an intern at the company for some short time.

Other fund raising. We have no fund raising goal (agenda item for next meeting). The American Ground Water Trust (AGWT) helps groups like MGWAF find donations for their educational work. Jim Lundy will contact Andrew Stone of AGWT to begin a discussion.

Ground Water Education Committee. This committee is currently under the MGWA umbrella, but there is overlap with MGWA Foundation. The committee consists of eight members, and is currently working on: educational materials for grade school presentations on ground water by MGWA members; an appearance at an Earth Day celebration (April 19, 2001) at a local school; and a MGWA speakers' bureau. Would some of these committee members be interested in serving a more formal position on the MGWA Foundation board (e.g., to replace Paula upon completion of her term), or perhaps as Vice President in charge of programs or development (Jim Lundy will ask the committee members)? The board briefly discussed the possibility of the MGWA Foundation funding the speakers' bureau (travel expenses, etc.). This committee may eventually also begin work on a larger project such as a video that educates non-experts on Minnesota's ground water. DNR has some in-house expertise on video projects, and could be approached as a partner, as could the Minnesota Environment Journal (funded by the lottery) and the American Ground Water Trust (for copy and/or funding).

Other projects. Jennie Leete proposed funding an educational placemat which could be circulated to all the cafes and restaurants in small towns throughout the state. This could be a low cost project with a high probability of "reaching and teaching" citizens about the

— *continued on next page*

fundamental issues concerning ground water.

Next meeting. The next meeting is scheduled for Friday April 20, 2001, 7:30 am, at the Day by Day Cafe.

April 20, 2001

The Minnesota Ground Water Association Foundation (MGWAF) board met on Friday April 20, 2001 at the Day by Day Cafe in St. Paul. Those present: Paula Berger (president), Jim Lundy (secretary).

Endowment funds. Soon we need to finalize plans for long term investment of the MGWAF endowment. The MGWAF treasurer needs to be present for this discussion.

Scholarship flyer. The scholarship request flyer might not have worked as well as individual letters to school representatives. The scholarship distribution to University of Minnesota-Duluth was supposed to have been sent, although there has been no response by UMD. We need to verify that it was in fact sent out.

Thank you to MGWAF contributors. Paula wrote brief thank you notes to those who contributed to MGWAF at MGWA membership renewal time.

MGWA Spring Conference. There was a significant expected profit from the recent MGWA spring conference. At the next MGWA board meeting, Jim Lundy (MGWA past president) will move to transfer a portion of the profit to MGWAF.

Future Fund Recipients. The Children's Water Festival and the University of Minnesota Hydrology Field Camp will probably solicit funds from MGWAF.

Board member replacement. We need to start looking for a volunteer to take Paula's place as MGWAF board president. She is willing to overlap terms for a couple of months until the new president learns the job. Jim Lundy will call two potential candidates for president.

Next meeting. Next MGWAF board meeting is scheduled for Friday May 18, 7:30 am at the Day by Day Cafe.

Minnesota Ground Water Association Board Meeting Minutes

February 1, 2001

Como Park Pavilion, St. Paul, MN
7:30 a.m.

Attending: Jim Lundy, Past-President; Jim Stark, President; Rob Caho, President-Elect; Eric Hansen, Treasurer; Eric Hansen, Treasurer-Elect; Jan Falteisek, Secretary; Jeanette Leete, Sean Hunt, WRI; Tom Clark, Newsletter Editor.

Approval of Minutes – Jim Stark called the meeting to order at 7:35 a.m. Minutes for the regular Board meeting held January 4, 2001 were approved.

Treasurer's Report – Eric Hansen reported that he had talked with Lee Trotta about the bank accounts and costs. The transfer of \$10,000 to the MGWAF endowment was accomplished. Updated financial summaries were provided. The Treasurer's report was approved unanimously.

Membership Committee – *Student Poster:* The poster was sent out with information on the student poster competition at the spring conference. February 15 is the deadline for student poster and student scholarship applications. *Corporate Membership and Advertising:* Jan will call a membership committee meeting to discuss for 2002.

MGWA Foundation – Jim Lundy explained the MGWA Foundation to the new Board members. The next meeting of the MGWAF is February 16th.

Ground Water Education Committee – Jim Lundy reported the committee is finishing off the list of curricula and is looking at future activities. Chris Elvrum will coordinate Earth Day. It was noted the USGS has a web page on teacher's resources.

Newsletter – Tom Clark noted the newsletter team meets next Tuesday. He is also working on a 20-year retrospective for the September issue. Tom would like a list of charter members. With the increase in paper/printing costs members should expect to see an electronic version in the future

with an additional cost for paper copies, similar to how the directory is currently distributed. Jim S. will contact Jim Aikin to arrange a discussion on broadening the advertising base.

Membership renewals – Sean Hunt provided an update on renewals. He said final notices would be sent shortly. He said he also has the results of the membership questionnaire for the newsletter.

House Ground-Water Subcommittee – Jim L. said he had finalized the text of the summary of the fall conference and asked for ideas for a final look. The two-page summary will be sent to the committee and a somewhat broader select distribution list.

Spring Conference – Jim L. reported that he had called Jim Heimerman at EPA regarding technology and found that they had many web-based resources. Jim S. will contact MDH about what they want to present. The Board agreed the title of the spring conference should be "Emerging Issues in Ground Water Science and Technology." Jim S. will set up a conference call on Monday Feb 5 to discuss conference content and arrangements.

Water Well Video – Rob Caho pointed out a new video on water well basics for K-12. The MWWA helped to pay for its production.

Next meeting – The next Board meeting will be Thursday March 1, 2001, 7:30 a.m., at the Como Park Pavilion, St. Paul.

March 1, 2001

Como Park Pavilion, St. Paul, MN,
7:30 a.m.

Attending: Jim Lundy, Past-President; Jim Stark, President; Rob Caho, President-Elect; Eric Hansen, Treasurer; Jan Falteisek, Secretary; Jeanette Leete, Sean Hunt, WRI; Tom Clark, Newsletter Editor.

Approval of Minutes – Jim Stark called the meeting to order at 7:35 a.m. The agenda was approved. Minutes for the regular Board meeting held February 1, 2001 were approved.

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MGWA Board Meeting Minutes, cont.

Treasurer's Report – Eric Hansen noted routine activity. The Treasurer's report was approved unanimously.

Ground Water Education Committee – A speaker as been requested by Peter Whelan, UM-Morris for a class. Erin Eid will contact and let the Board know. Tom Clark will follow up. The Education Committee welcomes Michael Trojan to the committee. Committee activities include Earth Day at Olsen Middle School, developing the speakers, and updating the web page. Educational materials from other sources were discussed. The Board approved purchase of a ground water video and teacher's guide up to \$50 from the Water Environment Federation. The video would be filed with the DNR Waters' ground water education library and could be checked out by the public. The video will be publicized in the newsletter.

Membership Committee – Sean provided an updated membership report.

Web Page – Sean reported on web updates. Sean will provide details on web use at next meeting.

MGWA Foundation – Jim Lundy reported that there have been no student entries for the poster competition. Only one request for the field trip scholarship has been received. The Board approved UMD's request of \$300 for their field trip. The next MGWAF meeting is April 20th.

Newsletter – Tom Clark reported that the newsletter is at the printer's. The development of an e-zine version of the current paper newsletter was discussed. The electronic version of the newsletter could start with the 1-02 issue. Old versions of the newsletter will need to be posted on the web site.

House Ground-Water Subcommittee – Jim L. said the text of the summary of the fall conference was on the MGWA web site and was forwarded to the committee. Jim S. and Jim L. plan to work together on distribution of the summary.

Spring Conference – The board discussed the program for the

conference. The conference brochure needs to be mailed next week. Abstracts and handouts from speakers need to be submitted by April 1st.

Corporate Membership – The Board discussed a lengthy memo from Jim Aiken regarding membership and advertising issues as it relates to membership. It was reported that H.R.Green has joined as the first corporate member. Referred to the membership committee for further discussion and recommendation to the April Board meeting.

Next meeting – The next Board meeting will be Thursday April 5, 2001, 7:30 a.m., at the Como Park Pavilion, St. Paul.

Meeting adjourned at 8:55 a.m.

April 5, 2001

USGS WRD Offices, Mounds View, MN, 7:30 a.m.

Attending: Jim Lundy, Past-President; Jim Stark, President; Rob Caho, President-Elect; Eric Hansen, Treasurer; Jan Falteisek, Secretary; Jeanette Leete, Sean Hunt, WRI; Tom Clark, Newsletter Editor; Jim Aiken, Advertising (by phone).

Approval of Minutes – Jim Stark called the meeting to order at 7:35 a.m. The agenda was approved. Minutes for the regular Board meeting held March 1, 2001 were approved with corrections.

Membership Committee – Jan reported on the membership meeting March 30. A corporate membership proposal will be brought to the board at the May meeting. Jim Aiken suggested ways to streamline advertising invoicing. A new form for corporate membership will also need to be designed. He also suggested that corporate membership would be for new members only, and would be on a calendar year basis. Any corporate members joining in 2001 could have their membership fee prorated for the remaining portion of the year. Jim A. also suggested developing an advertising revenue goal statement. The board agreed with the concepts proposed and directed Jim A. to forward to the board an updated corporate membership rates and features page.

Sean provided an updated membership report (attached). It was noted that there has been limited response to the student recruitment posters that were sent out.

Spring Conference – Jennie reported a strong registration so far for the program. The board reviewed the conference arrangements. It was noted that 6 CEU's for drillers will be awarded. Sean provided an updated conference program. Looking forward to the fall conference, Jennie noted that no Fridays are available at EBC in November; she will check whether any Tuesdays are available in November.

[Jennie and Jan left at this point; Tom Clark took minutes]

Treasurer's Report – There was no Treasurer's report.

MGWA Foundation – The next MGWAF meeting is April 20th.

Newsletter – The next newsletter meeting is April 17. The June issue editorial deadline is May 11. The publication deadline is May 18.

House Ground-Water Subcommittee – Jim L. reported that he had met with Marilyn Brick of Rep. Ozment's staff and distributed MGWA newsletters. The Fall conference will be an opportunity to educate members on legislative ground water initiatives.

Fall Field Trip – AIPG is the lead in 2001 and will be chaired by Brian Ross in Brainerd. A proposal to share a field trip at the AIH conference Oct. 14-17 may have a conflict.

Ground Water Education Committee – Jim Lundy reported on committee activities. He will discuss with Sean developing a presence on the MGWA web site. Jim also reported a notebook of ground water demonstrations, exercises, etc., has been developed that needs to be finalized, publicized, and distributed. The committee is checking on ground-water videos that may be available for review or purchase. A subgroup of the committee will participate at Earth Day activities at Olson Middle School on April 19.

Next meeting – The next Board meeting will be Thursday May 3, 2001, 7:30 a.m., at the USGS WRD office in Mounds View.

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 2001. Annual dues are \$25 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 _____

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 Mailings and for Directory Listing? _____

Which Telephone Number should we use for Directory Listing? _____

2001 Minnesota Ground Water Association Newsletter Advertising Policy

Display ads:

Size	Inches Hor. x Vert.	Quarterly Newsletter Annual Rate; 4 issues	2001 Membership Directory Annual Rate; 1 issue
Business Card	3.5 x 2.3	\$66	\$50
Quarter Page	3.5 x 4.8	\$121	\$99
Half Page	7.5 x 4.8	\$225	\$190
Full Page	7.5 x 9.75	\$425	\$360
Inside Cover	7.5 x 9.75	not available	\$395

Classified ads: Classified ads in the newsletter are charged at the rate of \$3 per 45 characters (including spaces and punctuation) per newsletter issue.

E-mail notices: A one-time e-mailing to the membership costs \$10 for an individual (e.g., seeking a job), and \$50 for an organization (e.g., announcing a new product, job opening etc.). A 200 word limit is imposed. The advantage of e-mail is the speed of dissemination.

The Advertising Manager has final determination on the acceptance of materials submitted. There are no commissions on ads. Copy must be received by the publication deadlines: 1 February, 1 May, 1 August, or 1 November. Advertisers should submit their material as a digital file in TIFF, JPEG or PCX format at 300 to 600 dpi. A set-up charge will be applied to non-digital ad material.

Please make checks payable to "Minnesota Ground Water Association" or "MGWA." Direct your orders and questions concerning advertising rates and policy to the Advertising Manager: Jim Aiken, Advertising Manager, c/o MGWA, 4779 126th Street, White Bear Lake MN 55110-5910; Phone (612) 375-1909; 612-361-4944 ; jaiken@northjacksonco.com.

MGWA Membership Committee Meeting Minutes

March 30, 2001

The Membership Committee of the Minnesota Ground Water Association met at the DNR offices in St. Paul on Friday March 30, 2001. Attending were Jim Lundy, MGWA Past-President, Jim Aiken, Advertising Manager, Jim Stark, MGWA President, and Jan Falteisek, Secretary/Membership.

Advertising on the web site -

There was discussion on purchasing advertising on the web site and providing links for businesses. Follow up is needed with Sean.

Corporate Membership - Jim

Aiken reported that he has contacted 14 companies and has gotten a good response to the corporate membership proposal.

Options on how to indicate corporate members on the web site were discussed, such as thumbnails at the bottom of the home page or a separate page. It was noted that the home page would need to be redesigned.

Rate structure and features for the basic level discussed included:

Newsletter business card ad

Directory business card ad

Web page sidebar/thumb-nail/logo

4 individual newsletters (each person would get a paper copy) (4 names must be provided)

One copy of a "Lobby Directory". A paper copy of the directory that would go to the first person on the membership application. The company name would show up in the first half of the directory, same as an individual.

Membership certificate, only if requested, and for a nominal additional fee.

A number of issues were discussed related to advertising copy. Advertising would need to be in a useable digital format. If not, there would be a setup charge. It was noted that corporate members and other

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Remaining MGWA Newsletter Deadlines for 2001

Issue	Copy to Editor	Copy to Publisher
September (Vol. 20, No. 3)	08/10/01	08/17/01
December (Vol. 20 No. 4)	11/09/01	11/16/01

Minnesota Ground Water Association

Membership Information

Membership	1992	4/93	4/94	5/95	5/96	5/97	5/98	7/99	5/00	5/01
Members in database list	644	682	708	762	798	808	818	842	874	902
Total Paid Members	541	537	541	524	475	489	467	476	526	504

Paid Members by category

Student	16	28	16	8	4	4	3	4	2	4
Professional	525	509	524	508	462	475	464	472	524	500
Publication Exchange				8	9	10	11	13	13	13

Recycled Paper

Number paying	49	55	59	51	41	40	23	37	33	n/a
Total money paid	\$267	\$333	\$435	\$336	\$278	\$257	\$134	\$233	\$219	

Student Scholarship

Number paying					32	34	29	41	37	n/a
Total money paid					\$340	\$398	\$392	\$501	\$494	

Recycled Paper Donation no longer on membership forms

Student Scholarship Donations now go to the MGWA Foundation

advertisers need to be notified that only digital copy would be accepted.

It was noted that a corporate membership application form needs to be developed.

MGWA membership and revenue goals (including advertising) should be defined, possibly as part of MGWA overall strategic or long-range planning.

The rates proposed by Jim Aiken were reviewed and no changes were identified. Some minor changes to the membership features were suggested.

The committee will bring the results of the meeting discussion to the next board meeting for discussion and approval.

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