

March, 2000

Volume 26
Number 1

The President's Message

As many of you know I was elected last year as Vice-Chair of the Northeast Section of the Geological Society of America (NEGSA). I had a very brief introduction to the duties of this position at the Management Board Meeting in Providence last year. I will assume the office of Chair of NEGSA on March 20, 2000, one week after the first day of the Annual Meeting in Brunswick, N.J. The 2000-01 Management Board will consist of: Walter A. Anderson, Chair; David C. Roy, Vice-Chair; Kenneth N. Weaver, Secretary-Treasurer; Robert D. Jacobi, Past-Chair; George C. Stevens, Member-at-Large; and Jo Laird, Member-at-Large. I am frantically trying to follow and catch up with the rapid changes now taking place on the national level. A new dynamic GSA CEO, Sara Foland, is swiftly implementing the recent GSA Strategic Plan and modifying GSA governance in general. Stay tuned in GSA Today and GSA Web (www.geoscience.org). I must agree with the present Chair, Robert Jacobi, who at the Management Board in Providence, suggested that a one-year term as Section Chair is insufficient to accomplish much, and recommended a two-year term for Chair. No action was taken, but maybe I'll put it back on the agenda for the N.J. Management Board meeting(?).

The Secretary-Treasurer position has been ably carried out by Ken Weaver over the years, the only real institutional continuity for NEGSA. Secretary-Treasurer is the most important (critical) position for all GSA Sections and requires a lot of work! (GSA picks up expenses and travel). Ken has mentioned that he may be retiring soon (hope not!). If he does it sure would be nice (great!) if someone from Maine would take it on (remember it's work and requires lots of attention and time)! If you all have been aware of the above mentioned GSA Strategic Plan with Proposed Strategies, and the national reorganization (GSA Today, WEB), it follows that Section governance will be impacted. It is my understanding that the GSA Council, over a three year period, will be reconfigured to include representation by Sections, Divisions, and Associated Societies, but retain the current Council size. Also National has informed us that that each GSA Section is entitled to provide a representative to the National Geology and Public Policy Committee (G&PPC). It would be nice (great!) if interested

and motivated GSM members would consider representing NEGSA in this emerging reorganization!! Stay tuned! Also, as NEGSA Chair I have been thinking of my legacy (groan) during this short one-term of office — any suggestions?! I will exclude all references to repent! Many thanks to Liz Champeon and Kitty Breskin who suggested and organized our first event for 2000, the joint ASCE/ GSM meeting (a first!) in Waterville this January. Dan Walters, Director, Maine Office of Geographic Information presented an informative program of mutual interest (see following pages). Also thanks to Mike Moreau, Pres. and Kitty Breskin, V.P of the Maine Section of the American Society of Civil Engineers for their invitation to join them. Let's do it again! Stay tuned on WEB (www.gsmmaine.org) and Newsletter for 2000 events.

Walt Anderson, President
<WAAGEO@aol.com>

The Editor's Message:

WARNING ABOUT UNPAID DUES

On the outside of this newsletter you should find an address label with a date. That date is the last time we have a record of your paying dues. We have carried a large number of unpaid subscriptions for a number of years now. However, as decided at the last meeting, the new policy will be to drop members who are more than three years in arrears. Therefore, if your label reads 1997, please pay up to date to remain in good standing. Anyone with dates older than 1997, this will be your last newsletter unless we hear from you immediately. Thanks for your cooperation.

Dan Belknap, Newsletter Editor
<belknap@maine.edu>

GSM Web Site

www.gsmmaine.org

Wayne A. Power, Webmaster, UMF
<wpower@maine.maine.edu>

and as a special bonus:

**GSM SPRING MEETING
Friday, April 7, 2000**

The Spring Meeting of the GSM will be held at Bowdoin College, in Brunswick on Friday, April 7th. Continuing in the same tradition, student presentations and posters will take place in the afternoon, and a key-note speaker will highlight the evening. Please encourage students to participate in either the verbal or poster presentations, and submit abstracts as soon as possible by mail or e-mail to:

Edward P. Laine
c/o Midj Walter <mwalter@bowdoin.edu>
Dept. of Geology, Bowdoin College
6800 College Station
Brunswick, ME 04011

Abstracts will be compiled and handed out as a Program and Abstracts supplement to the newsletter at the meeting. Please submit abstracts for both posters and oral presentation. Abstracts should be in GSA style, identifying author and affiliation, and no more than 300 words in length. Student presenters will be judged for the Anderson Award in both categories.

For those needing directions:

From the South: Take the Maine Turnpike to Exit 9 (95 to Coastal Route 1). Continue on 95 to Exit 22 (Brunswick, Route 1). Keep going straight until you reach Maine Street. Turn right onto Maine Street.

From the North: Take the Maine Turnpike to Exit 14, then I-95 to Exit 22 (Topsham, Brunswick Route 1 North). Proceed as above.

The Bowdoin College campus begins at the intersection of Maine Street and Bath Road. Parking is available on North and South Campus Drives, and the Coffin Street parking lot. Brunswick is also served by both Greyhound and Concord/Trailways Bus Lines.

AGENDA

- 1:00 - 4:30 PM Student talks and posters,
Druckenmiller Hall (New Science Center)**
- 4:30 - 5:30 PM Social Hour and Business
Meeting (Druckenmiller Hall Atrium)**
- 5:30 - 6:45 PM Dinner**
- 7:00 - 8:00 PM Keynote Speech by
Allan Ludman, Queens College, CUNY**

**SYMPOSIUM IN HONOR OF
ART HUSSEY
Saturday, April 8, 2000
Bowdoin College**

We are pleased to announce an Appalachian Symposium in honor of Prof. Art Hussey on Saturday, April 8, 2000 at Bowdoin College. Art will be retiring at the end of this semester, and we wished to create an event that would gather his many friends and colleagues. The day-long symposium, sponsored by Dr. and Mrs. Frank W. Kibbe, will feature five lectures on Appalachian and Maine geology, and conclude with a dinner. We will be privileged to hear lectures from Dyk Eusden (Bates College), Jim Hibbard (North Carolina State University), Philip Osberg (University of Maine, Orono), David Stewart (USGS) and Hank Williams (Memorial University).

The talks are tentatively scheduled from 10am until 5:30pm with breaks for lunch and socializing.

Many of you may want to share your remembrances of Art. Walter Anderson is helping to coordinate this aspect of the event, get in touch with him at <waageo@maine.rr.com>. As noted in a previous e-mail announcement, registration for the meals was request by February 23. Any onther questions may be addressed to: Midj Walter <mwalter@bowdoin.edu>. A complete schedule with lecture titles, and additional details also will be forthcoming. As available, information will be posted at: <http://academicbowdoin.edu/geology/announcements/html/kibbe.shtml>

Message from the State Geologist

- “Earthquake rumbles through region”
Kennebec Journal 2/27/99
- “Pair of earthquakes just coincidental”
Portland Press Herald 1/5/00
- “Finding faults” Sun-Journal 1/30/00
- “Experts differ on recent quakes”
Kennebec Journal 2/1/00
- “Recent quakes seen as typical”
Bangor Daily News 2/1/00

Recent newspaper headlines such as these and the events they report have piqued an interest in geology by many a Mainer. Unfortunately what began as an excellent opportunity to educate the public about the nature of geology and seismicity in Maine rapidly degenerated into speculative mis-information.

The geological community knows that Maine is a seismically stable area, that the likelihood of a damaging earthquake is small (but not zero), and that the faults geologists have mapped in the State are without exception hundreds of millions of years old. We have an imperfect record of seismic activity for the State, but we know that small earthquakes of the type we have experienced in the last few months are common and broadly distributed. It is statistically quite probable to have several events in a year. Furthermore, Maine experienced a similar suite of magnitude 3 earthquakes in 1983-84, so the 1999-2000 group is not unusual.

But the general public (and reporters) are not predisposed to the concepts of geologic time nor statistics and have been overexposed to certain geological generalities, such as "fault = earthquake." Try as I might to dissuade the reporter of the concept that Maine earthquakes are related to mapped faults, the Sun-Journal front page included a half-page graphic of epicenters and "ancient" faults, which to the casual reader presents an obvious connection. Driven more by the desire to make a scoop than to educate readers, the reporter emphasized differences in what the "experts" said and played down similarities. One expert looked at the 2% chance in 50 years of a damaging New England earthquake and said one could happen. Another looked at the 98% probability that we would not have such a quake and said one was unlikely. Both used the same information, but the report emphasized the difference, leading to confusion and mistrust by the public.

While this episode points out that care is needed in how we present geology, it more importantly identifies the need for better earth science education for the public. Earth science education is not just the responsibility of the University or the State Geologist and his staff, but of all of us. Opportunities abound for education (scouts, planning boards, school presentations, boards of education, etc.) and others can be developed (Earth Science Week, field trips, etc.). I hope every GSM member will commit to doing one thing this year to further earth science education in their community.

Robert G. Marvinney, State Geologist
<Robert.G.Marvinney@state.me.us>

GSM Member News

Peter Garrett (Emery and Garrett) was interviewed on the January 16'th *60 Minutes* show on MTBE contamination of groundwater.

Charlie Fitts (USM) has been writing "Groundwater Science", a textbook for use in undergraduate groundwater courses. Charlie hopes it will be done by summer 2000 - his contract with Academic Press/Harcourt says it will be!

Congratulations to the University of Maine at Presque Isle for having ten student members of GSM. **Kevin McCartney** also reports that the Northern Maine Museum of Science (Kevin is Director of the Museum) is establishing a museum advisory board composed of regional community leaders and teachers.

Andy Tolman is the new Director of Source Water Protection Section in the Maine Drinking Water Program, Department of Human Services. Andy's new telephone number is 287-6196.

Due to the difficulties in Kosovo, **Irwin Novak** (USM) had to cancel last summer's Field Studies in Environmental Geology course in Greece. The course has been held every other year since 1993 on the island of Lesbos in conjunction with the University of the Aegean. Irwin plans to offer the course again in 2001.

Alex Pugh (Maine DEP) is a new dad. His wife, Lili, gave birth to a baby girl, Phoebe Ann, in November.

This past August, **Stewart Sandburg** (USM) was part of the research team that collected a wide variety of geophysical data on the Cerro Negro volcano in Nicaragua, which had recently erupted. Of particular interest was the successful application of transient electromagnetic (TEM) data to determine the geometry of basalt greater than 600 degrees Celsius in the subsurface. Below that temperature, basalt is an electrical insulator, above it a conductor. Stewart presented his results at the December 1999 AGU meeting in San Francisco.

Woody Thompson (Maine Geological Survey) is working on the Maine Mineral Symposium to be held May 12-14 at the Senator Inn in Augusta. A link will be set up between the Symposium and GSM web sites. Call/email Woody for details and registration forms. Woody is also first editor of the Journal of Canadian Quaternary Association's special issue on the Quaternary Geology of the White Mountains. Visit the Mount Washington Observatory's web site for more information: <www.mountwashington.org>.

Please send member news to:

Carolyn Lepage
<clepagegeo@aol.com> or
PO Box 1195, Auburn, ME 04211-1195 or
by fax to 207-777-1370 or just call 207-777-1049

Report of the GSM Fall Meeting

November 5, 1999

Poland Spring, ME

Kristin Tardif, Natural Resources Manager for the Nestle/Perrier Group, organized the afternoon

session on November 5, 1999. Starting with a brief history of Poland Spring, it was followed by a walking tour of the original spring and plant. The discussion focused on the renovation of the facility to its original condition. Plans for the buildings will incorporate an interactive display within an historical museum setting.

The evening presentation by Kristin and David Mostoller of Atlantic Geoscience, targeted the myriad studies surrounding the siting of Poland Spring's new facility in Hollis, Maine. A multitude of agencies were involved including, but not limited to DHS, MGS, OGIS, USGS, NRCS and SCS, CMP, NOAA, FDA and USDA; as well as local government, realtors, and legal assistance for property ownership, deed research, and boundary surveys. An incredible amount of work was conducted to determine the competing uses of groundwater in the area, and what would be the withdrawal impacts from Poland Spring pumping.

The Hollis site was chosen for its capacity and water chemistry that closely matched that at the original Poland Spring. Located on a series of glaciomarine deltas, the springs to be developed are contact springs between the Presumpscot Formation and significant sand and gravel aquifers in the area.

To qualify for use as spring water under FDA Spring Water Standard of Identity, through aquifer testing, the company must show hydrologic connection and similar water chemistry between the production well and the spring.

Per Nestle/Perrier and FDA specifications, all materials used for monitoring, production, storage, and processing the water must meet "food grade" standards. Stainless steel was referenced on several occasions throughout the presentation.

To meet all the requirements there will be a groundwater and surface water monitoring plan with monitoring wells, domestic wells, and staff gages to determine the impacts to the area and to the finished product. There will also be stringent QA/QC testing of the water, equipment, and distribution.

The philosophy of Nestle/Perrier/Poland Spring is to be a good neighbor, working in an environmentally friendly way; as well as participating in teacher education programs through their museum, and the Project WET Water Festival.

Poland Spring has also partnered with The Nature Conservancy with a million-dollar contribution for the St. John River corridor.

by: Pat Seaward, Patricia, Secretary
<Pat.O.Seaward@STATE.ME.US>

An aside: There is an article on Poland Spring in the January 27 - February 2, 2000 (VOL.32 NO.37) issue of the Maine Times. Interesting reading that may tell "the rest of the story."

Report of the Fall Business Meeting

November 5, 1999

Poland Spring, ME

The business meeting was called to order by President Walter Anderson at 4:10 p.m. on Friday, November 5, 1999.

Minutes: As appear in the Newsletter

Treasurer's report: No update since Newsletter

Introduction of Officers: Including Arthur Hussey as Historian, a position that needs to be formalized in the by-laws.

Old Business:

The GSM/MGS "The Geology of Maine" workshop on October 14th netted GSM more new members. Walter noted that teachers are interested in field trips. Bob Marvinney added, there are publicly accessible field trips, many from the CREST project, on the MGS website. Bob also interjected that, while past workshops have focused on general geology, it would be good to consider the future focus of workshops. i.e. Should there be a committee formed to put together options for discussion at the spring meeting?

Discussion ensued regarding the memorial poster being planned for NEGSA in March, 2000, showcasing Ollie Gates' latest work on Vinalhaven, another MGS/GSM joint effort. Walter called for a moment of silence in memory of Ollie, and all he had done for the geological community.

Dan Belknap brought up the subject of unpaid dues. With approximately 325 members, about half have not paid dues since 1997. Bob Gerber said that he used to give a 3-year grace period to members. Dan continues to send Newsletters to everyone having a valid forwarding address. We discussed having a cut-off date with a warning that the Newsletter is about to be discontinued. Walter instructed Dan to do this.

Dan Belknap thanked all contributors to the October newsletter.

The summer field trip (see October newsletter) was a great success.

Bob Marvinney reports that the legislature has re-authorized the State's share of the National Geologic Mapping Program.

Doug Reusch's "Field Trip Guide to the Northern Appalachians — Quebec City to the Gulf of Maine" is being reviewed by Bob Marvinney, Spike Berry, and Art Hussey to become an official Jubilee GSM publication.

Andy Tolman reported that NH is in the process of trying to register geologists, proposing ASBOG; now in the hands of their legislature (see related item

below: **News from the NH Council of Professional Geologists).**

On the home front, the State (Bureau of Financial Regulation) is contemplating restructuring many of its licensing boards as fees alone do not cover overhead. Under consideration is the grouping of several allied boards to lower costs; would be OK, depending on who we are grouped with. Rob Peale asked whether these changes would lower the cost (annual fee) to the user. Andy mentioned Board is working on other ways to raise money/restructure.

Discussion brought up by Don Newberg regarding reciprocity. That's why Maine went with a national exam; in some states, ASBOG certification is reciprocal on case-by-case basis, if professional has worked long enough and can prove own merits. Maine is currently negotiating with California (also has local knowledge exam) for reciprocity.

New Business

Art Hussey has volunteered Bowdoin College to host the Spring 2000 meeting for student presentations, papers and posters. It was decided to have it on April 7th, after NEGSA (March 13-15, 2000 in New Brunswick, NJ) and Bowdoin's spring break. (Note: Walter had dual plaques purchased, one for the presenter and one for the college he/she represents, in each category).

Wayne Power reported that a few problems with the GSM website are being resolved. Website maintained by students under work initiative, different from work/study, pays \$1200 per semester.

Discussed including works-in-progress on the website. Not voted.

Please send membership news to Carolyn Lepage.

Joe Kelley announced that NEIGC 2000 will be held in Orono on the first weekend in October. Does anyone wish to lead a field trip? Contact Joe.

Bob Marvinney informed us that the 2000 summer field trip will be hosted from Bigelow Lodge at Flagstaff Lake on the last weekend in July. Bedrock trip will focus on pre-Silurian rocks. Tom Weddle is to describe the surficial geology. All pertinent information will soon be on our website.

Joe Kelley motioned to adjourn for cocktails. Many seconds.

Respectfully submitted,

Patricia O. Seaward, Secretary
<Pat.O.Seaward@STATE.ME.US>

GSM Treasurer's Report

The Society currently has 352 members: They are distributed as follows:

Associates: 30
Institutions: 11
Regular: 272
Students: 39

Unfortunately it is easy to let your dues lapse. The dues date is shown on your mailing label.

Balance on Hand 10/18/99	\$ 12,305.03
Anderson Fund (Total)	\$ 4,423.23
Education Fund (Total)	\$ 719.70
Receipts	
Dues	\$ 1,086.00
Anderson fund (intr. + contr.)	\$ 173.60
Education fund	\$ 20.00
Publications	\$ 10.00
UMA Short Course (addtn'l)	\$ 275.00
Subtotal	<u>\$ 1564.60</u>

Expenses	
Printing, mailing, stamps	\$ 303.90
Anderson Awards (Plaques etc.)	\$ 200.00
Bank Charges	\$ 14.33
Conference Catering	\$ 654.10
Fall Meeting Expenses	\$ 47.67
NSF Trip	\$ 208.75
Website	\$ 0.00
Expended to retain tax-exempt status	\$ 20.00
Subtotal	<u>\$ 1448.75</u>

Balance on Hand 01/31/00 **\$ 12,420.88**

Respectfully submitted,
Elizabeth A. Champeon, Treasurer
<Lchampeon@aol.com>

**Report of the Joint Meeting:
GSM and Maine ASCE
January 20, 2000
Waterville, ME**

The first ever joint meeting between GSM and the Maine Section of the ASCE (American Society of Civil Engineers) was held at the Holiday Inn in Waterville on Thursday, January 20, 2000. More than forty geologists and engineers shared congenial conversation over cocktails and dinner before the evening presentation on geographical information systems.

Dan Walters, Manager, presented "Geo-spatial Information and Services from the Maine Office of GIS." Dan talked of the numerous types of information and layers of data that are and will be available through the Maine Office of GIS. After a

concise Powerpoint presentation, he took us on-line to the website to demonstrate what is already available for data. For more information, contact Dan at: (207)624-9435; fax (207)287-3842; Email: <dan.walters@state.me.us>. Website: <http://apollo.ogis.state.me.us>.

News from the NH Council of Professional Geologists

As some of you may know, a group formed in neighboring New Hampshire (the New Hampshire Council of Professional Geologists, or NHCPG) to establish the licensing of geologists in New Hampshire. This effort has been underway since the NHCPG was organized in the fall of 1998. This article is to bring Maine geologists up-to-date with events in New Hampshire.

The initial bill was drafted in late 1998 and introduced into the NH Senate in February 1999. The Bill was based largely upon the existing statute for professional engineers in NH and on geologist bills from other states. Because there had not been enough time for a thorough review by interested parties in other professions, the draft bill was "re-referred" to committee in March 1999 for further review and dialogue between interested parties.

Between March and October 1999, a "Joint Working Group," composed of members of the NHCPG, NH Geological Society, Consulting Engineers of NH, NH section of ASCE, and the NH Department of Environmental Services (DES) met to review aspects of the bill and to resolve potential issues and misunderstandings. The efforts of the Joint Working Group culminated in a Memorandum of Understanding, signed by all members, in September 1999. These discussions led to suggested amendments to the draft bill that resolved potential conflicts between the professions.

The NH Senate committee with oversight passed the amended bill on to the full Senate in October 1999. The full Senate voted to approve the bill in January 2000. Expressions of support for the bill were received from many different sectors: NH DES, NH DOT, Society for the Preservation of New Hampshire Forests, Society of NH Conservation Commissions, and the membership, which includes about 35 corporate sponsors (many of which employ geologists and engineers), and more than 140 individual members. The bill will now proceed to the NH House, where we expect the bill to come up for vote during the late spring of 2000.

Continued support is needed to maintain our momentum. Please join us; support the NHCPG with your membership. Visit our website at: <<http://www.nhcpg.org>>. Stay tuned, NHCPG will notify GSM when the bill is passed and becomes law.

Submitted by: Ken Milender
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HOME HEATING OIL TANKS, A CONTINUING PROBLEM FOR THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION-Part II

Excerpted from:

ABOVE GROUND HOME HEATING OIL TANK AND PIPING UPGRADE PILOT PROJECT: A REPORT TO THE MAINE FUND INSURANCE REVIEW BOARD, by David Maxwell and George Seel, Bureau of Remediation of Remediation & Waste Management, Maine Department of Environmental Protection, September 30, 1999. *

Why do heating oil tank and piping discharges contaminate drinking water supplies?

One reason is that we routinely store heating oil in close proximity to water supply wells. This project found that not only did most tank owners rely on a ground water well for their drinking water, but their neighbors did as well. Seventy-two (72) percent of the homes or other sites where tanks were replaced relied on a private water supply well for drinking water. Within close proximity to these tanks, 300 feet or less, 1009 water supply wells are located. Any well within 300 feet of an oil discharge should be considered at risk of contamination. In coastal areas of the State, where bedrock is near the surface, heating oil contaminated ground water commonly travels distances far greater than 300 feet.

The cost to remediate the public health threats contaminated soil; groundwater, drinking water supplies, and indoor air are substantial, and increasing. Since 1995 the Department has expended \$3, 032,799 from the Groundwater Fund to Cleanup home heating oil tanks spills, an average of approximately \$54, 000 per month. 1998 has been the most expensive year to date, averaging over \$90, 000 per month. As the figure below of these costs broken down by year shows, they are increasing each year. 1999 appears to continue this trend. In 1999, as of mid-September, \$684, 234 has been spent, an average of \$85,529 per month.

What was the condition of the above ground home heating oil supply tanks and piping that were replaced in the course of this project?

- Most tanks (68 percent) were located out of doors.
- 43 percent were nonconforming storage vessels, such as 55 gallon drums, and not tanks meeting the standards contained in the regulations of the Maine Oil and Solid Fuel Board.

- Regardless whether located indoors or out, 619 or 71% of tanks had unstable bases.
- In the case of 465 tanks (53%), the tank was actually found leaning.
- Corrosion of tanks was also found to be a common occurrence regardless of location. 73% of tanks had corrosion pitting.
- With regard to the piping, pre-replacement inspections found 376 piping installations, or 43%, underground or installed under the basement floor. Of these installations only 16% had secondary containment of the piping to prevent corrosion and to contain and detect leaks.

Since the focus of this project was to replace home heating oil tank and piping installations most at risk of causing an oil spill, the figures in the paragraph above are somewhat skewed. Looking at just the inspection findings from the municipalities of Long Island and Monhegan Island Plantation may be more representative since these towns attempted to replace almost all home heating oil tanks, and were primarily limited by the willingness and cooperation of homeowners. A total of 106 home heating oil supply tank systems were inspected and replaced by the Town of Long Island and Monhegan Island Plantation.

Most of these tanks were located out-of-doors (85%) with the remaining tanks located in a basement or other shelter.

The bottom-line statistic really is: how many of these tanks were found to have had a discharge of heating oil? Slightly fewer oil discharges were found in these two communities than within the entire tank population of this project. Sixteen (16) percent of the systems were found to have visual evidence of an oil spill or leak, vs. 20 percent of the total number of tank systems inspected in the course of the project.

The following were found to be major problems much like the project's overall population:

- 81% of tanks were on unstable bases.
- As a result 49% of tanks were found leaning.
- 65% of tanks had corrosion pits.
- 31% of piping was buried underground without corrosion protection or leak detection.

One difference between this subgroup and all the tanks involved in the project was in the number of oil storage vessels that were drums or other containers not conforming with the regulations of the Maine Oil and Solid Fuel Board, 76 percent, versus 43 percent of the project total.

Although the tanks selected for this project were not done so to provide a statistically valid random sample of home heating oil supply tanks and piping in Maine, they do indicate that many of these systems have had oil discharges or are currently leaking heating oil in numbers that should be a concern. If 16 to 20 percent of Maine's heating oil

supply tanks and piping are leaking, that would mean that there are in the order of magnitude of 40,000 to 50,000 such cases statewide. As existing home heating oil tank systems age, the number of leaks will only increase unless upgraded or replaced.

* The entire report may be found under Bureau of Remediation and Waste Management at <http://janus.state.me.us/dep/home.htm>

REPORT ON RESIDENTIAL SEPTIC SYSTEM IMPACTS ON GROUNDWATER QUALITY AVAILABLE FROM ME-DEP

The Maine Department of Environmental Protection offers copies of the 2-volume report at no charge by contacting at (207)-287-2111, or directly to William T. Noble at 287-7748. The Executive Summary is reprinted below.

William T. Noble, C.G.
Environmental Geology Section
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State of Maine RESIDENTIAL SEPTIC SYSTEM IMPACTS ON GROUNDWATER QUALITY IN MAINE PART I: CHARACTERIZATION OF NITRATE CONCENTRATIONS IN DOMESTIC WELLS AT 18 SUBDIVISIONS

By:
Steven R. Pinette and William T. Noble
Maine Department of Environmental Protection
Daniel B. Locke and Marc C. Loiselle
Maine Geological Survey

This study was funded in part by a nonpoint source pollution grant from the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act

June 1999

Maine Department of Environmental Protection
Bureau of Land and Water Quality
Division of Environmental Assessment
Environmental Geology Section

Document No. DEPLW 1999-7

Executive summary

The Maine Department of Environmental Protection and the Maine Geological Survey examined nitrate-nitrogen (NO₃-N) concentrations in domestic wells at 18 unsewered subdivisions

(using individual septic systems instead of a public sewer system) to determine the possible impact of on-site septic systems on ground water quality. Samples from 470 wells were analyzed to provide a one-time "snapshot" of $\text{NO}_3\text{-N}$ levels in the ground water. In addition, samples from 59 wells at four of the subdivisions were tested quarterly to evaluate any changes in $\text{NO}_3\text{-N}$ concentration over time.

The subdivisions selected for well water sampling represented several development ages, geologic settings, and housing densities, and had at least 20 or 30 existing homes. In addition, subdivisions were selected where ground water beneath the developments was not affected by other $\text{NO}_3\text{-N}$ -contributing activities, such as fertilized cropland, or land used for manure disposal or spreading.

Nitrate-nitrogen concentrations in the wells were reviewed in relation to site geology (or soil type), development density, and well characteristics, such as type, depth, location, and yield. The broad goals of the study were to assess the effectiveness of the Maine Subsurface Wastewater Disposal Rules (DHS-HE, 1974 and later versions) in protecting domestic well water quality, and to identify site factors that exert the greatest influence on groundwater quality.

Non-parametric statistical testing was applied to the $\text{NO}_3\text{-N}$ analysis results. Findings of the study are summarized as follows:

"Snapshot" domestic well nitrate concentrations -- Analysis results from 470 wells were non-normally distributed, and skewed toward the lower concentrations. Levels of $\text{NO}_3\text{-N}$ measured during this one-time sampling event ranged from 0.00 to 26.52 mg/L. Two wells (< 0.5 percent) had concentrations in excess of the 10 mg/L national primary drinking water standard (PDWS) for $\text{NO}_3\text{-N}$. The concentration at 22 percent of the wells was recorded at 0.00 mg/L (laboratory minimum detection limit of 0.01 mg/L), and these wells were considered to be tapping ground water unaffected by any sources of $\text{NO}_3\text{-N}$. Statistical testing revealed that there were significant differences in $\text{NO}_3\text{-N}$ concentrations among the study subdivisions.

Nitrate concentration and well type -- Four well types were identified at the study subdivisions: drilled into bedrock, drilled into overburden (soil), driven wellpoints, and dug wells. Statistical analysis showed that there was no significant difference in $\text{NO}_3\text{-N}$ concentration among the four well types.

Nitrate concentration and well depth -- Well depths for 265 wells reporting this information ranged from 9 to 700 feet. Wells with depths of less than 100 feet had higher average $\text{NO}_3\text{-N}$ concentrations than deeper wells. Statistical testing

revealed that wells in the depth range of 76 to 100 feet had statistically greater $\text{NO}_3\text{-N}$ concentrations compared to those wells deeper than 100 feet.

Nitrate concentration and length of well casing -- Casing lengths for 73 reporting wells ranged from 0 to 180 feet. Statistical analysis showed a significant negative correlation between casing length and the $\text{NO}_3\text{-N}$ concentration (i.e., longer well casing was associated with a lower $\text{NO}_3\text{-N}$ concentration).

Nitrate concentration and well yield -- Well yields for 126 reporting wells of all types were in the range of 1 to 100 gallons-per-minute (gpm). A statistically significant correlation between well yield and $\text{NO}_3\text{-N}$ concentration was not found.

Nitrate concentration and soil type -- Twenty-eight different soil series were identified at the study subdivisions. These were placed into four general soil groups: thick glacial till, thin till over bedrock (less than 4 feet deep), marine/lacustrine (silt and clay) deposits, and stratified drift (sand and gravel) deposits. Statistical testing revealed that $\text{NO}_3\text{-N}$ concentrations were statistically greater in wells surrounded by thick glacial till compared to those in thin glacial till and stratified drift deposits. While results are consistent with expected $\text{NO}_3\text{-N}$ concentrations according to soil type and associated recharge rates, the researchers suggest that other hydrogeologic factors, particularly position of the subdivision in the regional watershed, may be masking the real effect of soil type on $\text{NO}_3\text{-N}$ concentration. Other suggested factors include faulty well or septic system installations.

Nitrate concentration and well proximity to septic systems -- The number of septic system leachfields within 300 feet of each well tested during the snapshot phase, and the topographic position of each leachfield relative to those wells (i.e., upslope, level, and downslope), was determined. Statistical testing showed a low, but significant correlation between $\text{NO}_3\text{-N}$ concentration and the following (in decreasing order of significance): number of leachfields within 300 feet in the upslope direction from a well; number of leachfields within 100 feet in the downslope direction from a well; and number of leachfields within a 300-foot radius from a well.

Nitrate concentration and septic system age -- Ages reported for 407 septic systems on the same lot as the tested snapshot wells ranged from 1 to 26 years (at the time the study was conducted). Eighty-five percent (348 systems) were 15 years old or younger, and were considered to have been constructed according to the Maine Subsurface Wastewater Disposal Rules (1974 and later versions). Statistical results generally showed that

wells paired with septic systems 15 years old or younger had lower NO₃-N concentrations compared to wells paired with older systems installed according to pre-1974 siting, design, and construction standards.

Nitrate concentration and fertilizer use -- Lawn fertilizer application information was reported for 405 lots in the study subdivisions. Questionnaire results showed that 214 homeowners fertilized their lawns and 191 did not. Statistical analysis found no significant difference in the NO₃-N concentration between wells located on lots that were fertilized and those that were not.

Nitrate concentration and temporal variations -
- No apparent seasonal pattern of low or high NO₃-N concentrations was noted in the monitoring results from the 59 wells tested quarterly at four of the study subdivisions. Statistical testing detected no significant differences in concentrations among the monitoring rounds.

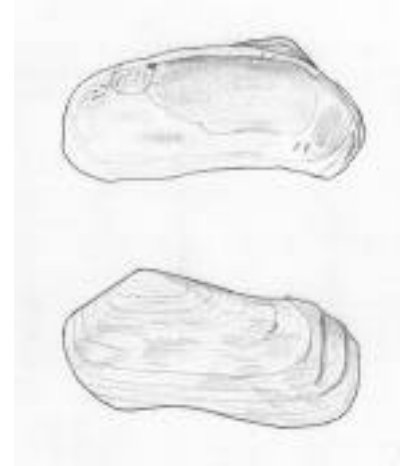
Conclusions/recommendations -- The study concludes that the Maine Subsurface Wastewater Disposal Rules are adequately protecting residential wells from NO₃-N contamination caused by conventional septic systems. To further protect well water quality from potential septic system contamination, the following are recommended:

- Bedrock wells should be drilled relatively deep (to depths of more than 100 feet) and be installed with long casings set and grouted into the bedrock, particularly in areas where bedrock is relatively shallow.
- Wells should be located as far upgradient from septic systems as is practicable (and from other sources of NO₃-N).
- A licensing program for septic system installers should be established by the State of Maine.

Recommendations for further study of NO₃-N impacts to ground water quality at residential subdivisions include a more-detailed hydrogeologic analysis of a subset of the study subdivisions, including installation of long-term monitoring wells. Additional work should focus on how ground water flow systems within the regional watershed affect ground water quality in the subdivisions, especially considering the effect of subdivision position on the landscape with respect to local and regional ground water recharge/discharge boundaries.

This study is presented in two parts, as separate volumes. Part I includes background information on environmental and health concerns of NO₃-N, a summary of selected related research papers by others, and discussion of the analytical methods,

results, and conclusions of this study. Part II presents site-specific information and well data for each of the 18 subdivisions studied, and is intended to provide environmental and groundwater professionals with sufficiently detailed data on the subdivisions so they can develop their own insights about site hydrogeological settings and factors that potentially affect groundwater quality.



Hiatella arctica (Linn.)
Whitney Corners, ME
Presumpscot Fm. ca. 11,700 ybp
DFB 1975



Macoma balthica (Linn.)
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THE GEOLOGICAL SOCIETY OF MAINE
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THE MAINE GEOLOGIST is published three times a year, in mid-winter, summer, and early fall, for members of the Geological Society of Maine.

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