

SEISMIC HAZARD ASSESSMENT IN NEW YORK STATE

Presented by

DONALD H. CADWELL

New York State Geological Survey
Albany, New York

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In May 1990, the New York State Disaster Preparedness Commission initiated a multi-year earthquake preparedness project for critical services and infrastructure (Lifelines). This project is being funded by the Federal Emergency Management Agency (FEMA), with New York State providing an in-kind services match to federal dollars. The main emphasis of the New York State Emergency Management Lifelines Program is to develop the ability to conduct earthquake loss estimates for scenario events. Specifically, they need to determine expected damages, casualties, shelter needs, and such secondary effects as fire and toxic releases, and then utilize this information for mitigation and response planning.

A major task of this project is the design, development, and implementation of a Geographic Information System (GIS) capable of facilitating vulnerability analysis, mitigation strategy, and response planning efforts. An integral part of this system is the development of GIS data sets that characterize the response of the State's soils, bedrocks, and stratigraphy to seismic disturbances. The preparation of earthquake hazard maps is based on these data sets.

The New York State Geological Survey (NYSGS) has begun a systematic Seismic Hazard Assessment Program with analyses for Columbia and Dutchess counties (1994, 1995), portions of Rensselaer, Green, and St. Lawrence counties (1996). The purpose of this county work is to develop a system for state-wide correlation for the Seismic Hazard Assessment of New York State. Onondaga County was selected for study in 1997 because of the types of surficial materials deposited within the County during retreat of the Wisconsinan Ice Sheet, 13,000 - 10,000 years ago, and because of the large urban population in the greater Syracuse region. Lacustrine sands, silts, and clays were deposited in Glacial Lake Oneida, a 1,036 square-kilometer lake that developed at the edge of the glacier front, during the waning stages of Woodfordian deglaciation. Glacial Lake Oneida included most of the lowland and swamp regions within 15 - 30 kilometers of the present 650 square-kilometer Oneida Lake. Major earthquake damage occurs from attenuation of shear-waves as they travel from bedrock into the surficial glacial sediments. As the shear-wave velocity decreases in the unconsolidated sediments (together with a shortened wavelength), there is a corresponding increase in wave amplitude. The increased amplitude produces greater ground shaking and, consequently, increased damage.

Don't forget! We will convene on Thursday, September 10, at the Glen Loch Restaurant. The evening will conclude with an open question and discussion period with Mr. Cadwell. See you then!

PRESIDENT'S PAGE

By Vita DeMarchi

CNYAPG 1998/1999 SEASON OVERVIEW

“Geology - The Next Generation” was phrased as this season’s general theme. CNYAPG will provide a forum for students to participate and become acquainted with the geologic profession and meet geologist researching and applying various disciplines. We hope to encourage and inspire students and remind others of the *excitement of science*. Consider your participation a professional tithing to the next generation. This year’s agenda will include the following student-oriented endeavors:

⇒ *Student Articles and Abstracts* will be featured in the newsletter. Local college geology departments (*you know who you are likely to be*) will be contacted to encourage students to participate in CNYAPG by providing a short article, abstract, or commentary on any geology and related science subject. If you have the opportunity, encourage one student to participate. Each participating student will be a guest at our monthly meeting and will receive a subscription to this year’s newsletter.

⇒ *February 1999 Student Poster Session* will provide college students the opportunity to present a poster and abstract at the monthly meeting. Participating students will benefit from discussion and interaction with professionals.

⇒ *High School Science Fairs:* CNYAPG members who are high school teachers are urged to assist in making the best use of the newsletter networking to bring geologists to your classroom or to assist with science fairs. We encourage geologists who are contributing professionally as science teachers to provide input during this season.

⇒ *MOST Science Fair Sponsor:* For the third year, CNYAPG will participate as sponsor and special judges. This science fair includes elementary and high school students from all over Onondaga County. Two students will receive a “rock” mounted commemorative award, a \$50 Savings Bond, and will be featured in the newsletter.

*As Always....*CNYAPG board members strive to provide interesting monthly speakers and topics that address applied and academic disciplines of geology. Input and leads on speakers are always welcome.

*Field Trips...*It has been a CNYAPG tradition to gather for a local field trip. Any ideas or interests on where to spend a day this coming Fall (or Spring)?

*Seminar...*We will again be looking to coordinate a short-course or seminar in the late Spring of 1999.

Please contact volunteer Board members with your input and ideas. On behalf of the Board members, we look forward to this season’s participation and agenda.

GEOLOGIC NEWS OF INTEREST

Compiled by
Vita DeMarchi

Natural Attenuation Short Course: A Productive Season Ending

The **CNYAPG** and **NYSCPG** sponsored **Natural Attenuation Short Course** was a strong ending to last season's agenda. The one-day seminar featured **Dr. R. Ryan Dupont** of Utah State University and the Utah Water Research Laboratory. **Don Ochs** from **Regenesis Corporation** provided an overview of applying oxygen release compound (ORC) to enhance aerobic bioremediation.

Dr. Dupont stressed the fact that natural attenuation is not an "*innovative technology*." It is most applicable to low-risk sites with low-level groundwater impacts, sites where achieving compliance in a short time frame is not a driving issue, and in cases where other alternatives are impracticable. Natural attenuation could be combined with other, more aggressive alternatives that remove or reduce contaminant mass to address remaining dissolved phase groundwater impacts.

Demonstrating natural attenuation (or assimilative capacity) at a site requires a rigorous site assessment, quantitative analysis of data, a detailed conceptual site model, and a commitment to conducting long-term monitoring. Although the appeal is there to promote this "low tech" approach, it may not be the most cost effective alternative in the long run. Determining the projected assimilation time of the contaminant mass is key in evaluating selection of this remedial alternative.

Methods to evaluate data for natural attenuation evidence and conduct qualitative analyses of data were overviewed. Dr. Dupont reviewed available support models. The Bioscreen model (available free and set up on Excel) and his own developed model, *Natural Attenuation Decision Support System (NADSS)*, were identified as straightforward models. He felt that, although MODFLOW could be applied, that level of complexity was generally not necessary to make the evaluations and decision regarding natural attenuation potential and status.

CNYAPG has a Web Page link to Dr. Dupont's NADSS Home Page. Regenesis provided attendees with a disk copy of ORC Application Software (Excel).

Members of the NYS Department of Environmental Conservation (NYSDEC) Spill Response Division from different regions attended the short course. UST Programs throughout the country are leaders in driving natural attenuation/ intrinsic remediation

as a viable alternative. Reported spill sites associated with NYS USTs implementing source removal and enhanced natural attenuation using ORC have been granted "no further action" by the NYSDEC.

Thanks to Sarah McCulloch and David Palmerton for volunteering their time to organize the Short Course.

NYS Council of Professional Geologist Licensure Bill Update

The bill was established in both legislature houses in 1998 and has gained the support of the Eastern Society of Land Surveyors. Support has been expressed by the local chapter of the American Society of Civil Engineers and Consulting Engineers Council of NYS, although a limited number of concerns were voiced. An official memorandum of opposition was distributed by the NYS Society of Professional Engineers on the occasion of *Engineers Lobby Day*; however, their objections are narrowed to three points focused on the types of services that geologists and engineers will be able to perform under the licensure program. Opposition by soil scientists is based on their position that the bill should be revised to include soil scientists as geologists under the general term, "Geoscientist."

No further action on the bill will occur until next session beginning in January 1999. For more information, contact the NYSCPG at P.O. Box 255, Dewitt NY, 13214 or link up through your CNYAPG Web Page.

Do Earthquakes Occur in New York State?

**An Interpretation of
Commentary by Isachson,
Y.W., E. Landing, J.M. Lauber,
et al., eds., and
Adapted from *Earthquake! What,
Where, When, Why* (Chapter 17);
Geology of New York: A
Simplified Account, Albany: New
York State Museum/Geological
Survey, 1991, pages 231-238, and
[http://nceer.eng.buffalo.edu/faqs/
eqlist.html](http://nceer.eng.buffalo.edu/faqs/eqlist.html)**

According to **plate tectonic theory**, we would expect to find most earthquakes along divergent margins (where plates separate), along transform margins (where plates grind sideways past each other), and along convergent margins (where two plates collide). Over 95 percent of earthquakes occur in these three kinds of areas. New York State is far from any plate margins. Nonetheless, between 1730 and 1986, more than 400 earthquakes for which location could be determined occurred in New York State, with a magnitude greater than 2.0. New York State has had the third highest earthquake activity of states east of the Mississippi River.

The historical record concludes that earthquakes have recurred in the same areas of New York since 1730. The largest known New York State earthquake happened in the Cornwall-Massena area along the US - Canadian border on September 5, 1944. It had a maximum intensity of VIII on the Modified Mercalli scale (Richter

magnitude about 6). It was strong enough to damage even well-constructed buildings. It knocked down chimneys and walls and overturned heavy furniture.

Seismic Vulnerability of New York State: Code Implications for Buildings, Bridges, and Municipal Facilities

**An Interpretation of
Commentary by Klaus Jacob
and
Adapted from a Reprint from
NCEER Bulletin, Volume 7,
Number 2, April 1993, pages 4-5,
and
[http://nceer.eng.buffalo.edu/faqs/
jacob.html](http://nceer.eng.buffalo.edu/faqs/jacob.html)**

In response to the earthquake risk to New York State, a variety of seismic hazard reduction measures are proposed. Seismic Building Codes have been drafted for both New York State and New York City. Both are quite similar and represent essentially partially modified versions of the Uniform Building Code (UBC). New York State is divided into four seismic zones: A, B, C, D, with seismic zone factors of $Z = 0.09, 0.12, 0.15,$ and 0.18 , respectively (measuring effective peak acceleration in fractions of g , where g equals the earth's gravity acceleration). Five seismic soil-type factors, $S_0 = 2/3, S_1 = 1.0, S_2 = 1.2, S_3 = 1.5,$ and $S_4 = 2.5$,

respectively, ranging from very hard rocks (S_0) to very soft soils (S_4). A soil liquefaction screening procedure is also included in the code.

The New York State Department of Transportation (NYSDOT) has issued an internal Engineering Instruction requiring all new highway bridges in New York State to be designed for seismic forces assuming a state-wide seismic zone factor of $Z = 0.19$. On October 9, 1991, the Federal EPA issued Revised Minimum Federal Criteria for Municipal Solid Waste Landfills (MSWLFs). Notably, among other site limitations, there are at least three geologic/earthquake-related guidelines included.

The introduction of these seismic provisions into land use planning, engineering, design, and construction practice will need the joint attention of the practicing engineer, geotechnical, and seismological community, and of regulatory bodies and decision makers, especially where site-specific studies are needed or may lead to more economic solutions.

Onondaga County lies within Seismic Zone B, considered to be a lower seismic hazard zone. The majority of New York State is characterized as a moderate level (Zones C and D) seismic hazard. A look at the New York State Seismic Zoning Map and other New York State earthquake information can be obtained at:

**[http://nceer.eng.buffalo.edu/
faqs/jacob.html](http://nceer.eng.buffalo.edu/faqs/jacob.html)**

September 10, 1998

CNYAPG @ Glen Loch Restaurant . A cash bar will open at 5:30 p.m. followed by dinner at 6:30. The presentation will begin at 7:30. Dinner is \$13 (if reserved 24 hours in advance) or \$15 at the door.

Make your reservations today by calling O'Brien & Gere Engineers at (315) 437-6100 ext. 2656. See you there!

September 11-13, 1998

27th Annual Conference on the Environment, sponsored by the *NYS Associations of Environmental Management Councils and Conservation Commissions*. Keynote speaker David Pimentel, Professor of Ecology and Agricultural Science at Cornell University, who will address the value of natural systems to society. For more information, contact Conference Coordinator Sandy Stein at (607) 274-5560 or by e-mail at sgs@cornell.edu.

October 5-6, 1998

Annual Fall Recycling and Vendor Exhibition, held by the *Federation of New York Solid Waste Associations*, at the Four Points Hotel in Liverpool, New York. The event is sponsored by the NYSDEC, Empire State Development, Cornell Waste Management Institute, and the Buy Recycled Alliance of New York (BRANY). For information, contact Eric Swenson at (516) 677-5790, or fax (516) 677-5875.

* THIS MONTH'S *
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George Kelley * Bill Gabriel
Georgia Popoff

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The Board Members would like to thank all of the corporate and individual supporters of CNYAPG throughout the past year. We would like to encourage you to continue your pledge of support throughout the upcoming year. Contact Steve Crook at (315) 437-1429 or (518) 827-5720 details.

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CNYAPG

PO Box 567

Dewitt, NY 13214

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