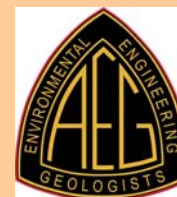




GeoNews



Newsletter of the Association of Environmental & Engineering Geologists and
American Institute of Professional Geologists, Carolinas Sections

Fall 2007

Articles

Fall Meeting – Lake Townsend Dam	1
Geohazards Symposium Wrap-up – Jennifer Bauer	6
AEG 50 th Anniversary in LA	8
Call for AGI Toolkit Donations – Rick Kolb	7

Columns and Regular Features

Letter to the Editor – Letter from Laos	9
About our Members – Rick Kolb	11
GeoRamblings - Charles W. Welby	15

Education Section

Environmental Mentors Needed for High School Students – Lisa Tolley, NCSU	12
--	----

Technical Section

Slope Stabilization Utilizing High Performance Steel Wire Mesh in Combination with Soil Nailing and Anchoring – Steve Mumma	21
---	----

Upcoming Events

October Field Trip to Eno State Park	13
Calendar of Upcoming Events	26

Section Stuff

Message from the Chair	4
AEG-AIPG Section Officers	5
Deadlines	5
Job Opportunities	19
Announcements	20
Sponsorship Application	30
Sponsors	31

MARK YOUR CALENDAR! “LAKE TOWNSEND DAM GEOLOGIC AND GEOTECHNICAL CHARACTERIZATION”

Date – October 18, 2007
Place – Natty Greene’s Pub,
Greensboro, NC

“GEOLOGY FIELD TRIP TO ENO RIVER STATE PARK”

Date – October 27 2007
Contact – Rick Kolb,
rakolb@MACTEC.com

Calendar of upcoming events is on our website
- <http://www.AEGCarolinas.org>

Issue date 21 September 2007

LAKE TOWNSEND DAM GEOLOGIC AND GEOTECHNICAL CHARACTERIZATION

AEG Carolinas is pleased to present Jerry Robblee of Schnabel Engineering at our fall meeting. Jerry will describe a review of the site investigation and a summary of the preliminary findings for a geologic and geotechnical characterization for potential repairs to be done on the Lake Townsend Dam in Greensboro.

The meeting will be held at Nattie Green’s in Greensboro, on Thursday, October 18, 2007. Detailed information, directions, a meeting registration form, contact information, and a map may be found on pages 2 and 3 of this newsletter (look for the blue box). Sign up early!!

Abstract: In 1966, the City of Greensboro had the Lake Townsend Dam constructed to augment the City’s available water supply. Lake Townsend Dam consists of a gated concrete spillway and integral intake/pump station flanked by earth embankments. Prior to 1980, major concrete elements of the dam, particularly the concrete spillway piers, began exhibiting cracking. The City attempted repairs of these areas to prevent further cracking and concrete deterioration without success. An investigation completed in 2006 by Jewel Engineering revealed that the cracking distress was caused by alkali-silica reactivity (ASR) in the concrete of the spillway and that dam rehabilitation and/or replacement was needed. Schnabel Engineering South, P.C. (Schnabel) was retained by the City in 2006 to

develop rehabilitation or replacement alternatives and design the selected alternative.

This presentation discusses the geologic and geotechnical characterization of the dam and site performed by Schnabel. Field explorations were performed to evaluate the performance of the existing dam as a hydraulic barrier, develop an understanding of the subsurface conditions, and to evaluate how the site development, grading, and operations may impact dam rehabilitation. Field exploration techniques used for the dam included:

- Test Borings in soil and rock
- Six-inch diameter concrete cores through the concrete spillway
- Vibrating wire piezometers to measure water pressure upstream and downstream of seepage cut-offs
- Cone Penetration Testing
- Seismic Refraction
- Ground Penetrating Radar (GPR), and
- Test pits

About the Speaker: Gerald Robblee, P.E., has extensive experience as a geotechnical Project Manager and Project Engineer. He is an Associate Engineer with Schnabel Engineering in Greensboro, NC and concentrates on geotechnical aspects of infrastructure projects.

Since receiving his master's degree in civil engineering in 1988 from Worcester Polytechnic Institute, he has provided geotechnical services for a wide range of projects including dams, levees, tunnels, pipelines, building foundations, earth retaining structures, seismic studies, and landfills. Mr. Robblee has worked in the northeast, southeast, and southwest and is a registered professional civil engineer in four states and a registered geotechnical engineer in California.

Place: Natty Greene's Pub & Brewing Co.,
345 S. Elm St, Greensboro, NC
(see directions below)

Date: Thursday, October 18, 2007

Time: 6pm social, 7pm dinner, 8pm speaker

Program: Lake Townsend Dam Geologic and Geotechnical Characterization

Speaker: Gerald Robblee, P.E

Cost: Member/Non-member \$25,
Student: \$10

Reservations: Please make reservations with Raymond Knox by October 16, 2007.

Phone: 336-274-9456

E-mail: rknox@schnabel-eng.com

Or you may also email your reservations to: Rick Kolb, RAKOLB@mactec.com.

Directions:

Natty Greene's Pub & Brewing Co., 345 S. Elm Street, Greensboro, NC 27401

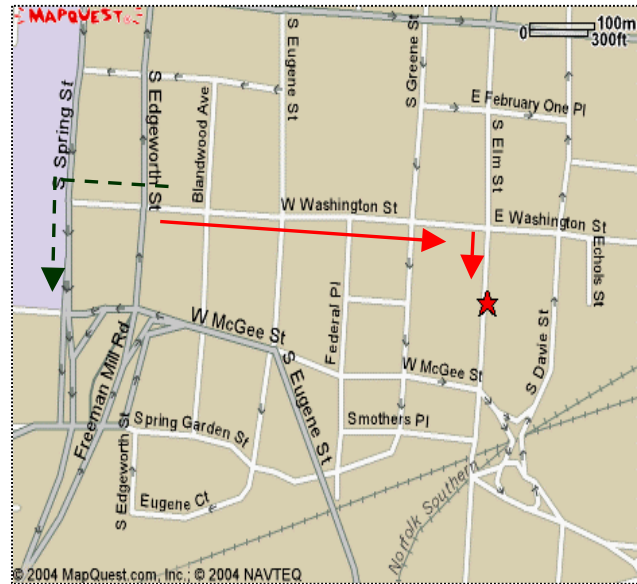
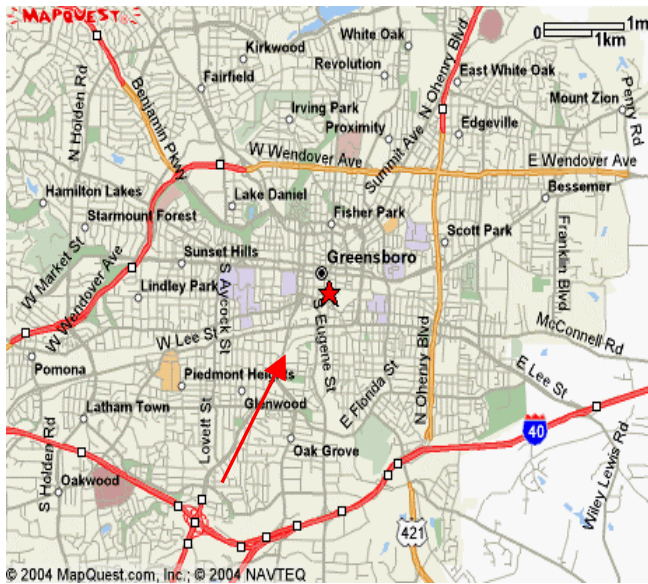
From the East or West:

Take I-40 to Exit 218B, Freeman Mill Road North (also labeled as Coliseum Area). Go about 2-1/2 miles on Freeman Mill Road (the name will change to Edgeworth as you travel north) to Washington St., Turn right on Washington and go 5 blocks to S. Elm St. Turn right onto S. Elm, go about 1/2 block and park in the free public parking lot on the right. The meeting will be in a private room on the third floor.

From the South:

Take I-85 North and exit onto Business I-85 (about mile marker 120), then take Exit 122 (US 220, Future I-74). This will turn into Freeman Mill Road North, then to Edgeworth as you travel north. Go about 4 miles to Washington St., Turn right on Washington and follow the directions above.

To return to the interstate, go back the way you came on Elm and Washington St, passing over S. Edgeworth to S. Spring St. (dashed black arrows on detail map). Turn left on S. Spring St. which will merge back into Freeman Mill Road and take you back to the Interstate.



geotech

*Ground Water Sampling, Monitoring
& Remediation Equipment*

Lisa Austin - Office Manager

Lisaa@geotechenv.com

Cell 919-757-9144

1-800-293-5325

Geotech Environmental Equipment, Inc.

10404 Chapel Hill Road, Suite 111

Morrisville, North Carolina 27560

Phone 919-460-0604 FAX 919-460-0984

Corporate Headquarters

2650 East 40th Avenue
Denver, Colorado 80205

1-800-833-7958

Phone 303-320-4764

FAX 303-322-7242

www.geotechenv.com

MESSAGE FROM THE CHAIR*Rick Kolb, Chair, AEG Carolinas*

Though the summer is traditionally a slow time for AEG, your board has been busy. Our section recently co-sponsored the Geohazards in Transportation Symposium that was held in Asheville. Jennifer Bauer spent a lot of her own time helping to organize this highly successful meeting, which was attended by over 100 geologists from all over the country. Past section chair Gary Rogers and I are planning an October 27 field trip featuring the geology of Eno River State Park in Chapel Hill. See the articles about these events elsewhere in this newsletter. Two board members -- Rich Lovett and Carin Kromm - have made career changes, as is announced in the *Announcements* column. As hot as the weather's been, we've not been only hanging out in the A/C; we still have to go out and buy beer.

Your chairman has also spent time this summer working on two strategies to increase the visibility of both geologists and AEG. First, I am organizing presentations by practicing geologists to geology students at NCSU and UNC to publicize the profession and let the students know of career opportunities. We made the first presentation to 30 geology majors at UNC on September 11, and will present to geology students at NCSU on November 7. We had presentations by an engineering geologist, an economic geologist, a public-sector geologist, and an environmental geologist on what he or she does and about prospects and opportunities for future employment, after which we open the floor for questions. From my discussions with faculty at UNC and NCSU, it seems one of our profession's shortcomings is the lack of communication on what we do and how many jobs are out there. I believe this is a worthy effort we should make on a regular basis. Bringing new blood to the profession is incumbent on all geologists. Every year, new students enter college without career plans. Exposing them to practicing geologists will help them decide if geology is a career they should explore.

Personally, I feel the opportunities are greater than the number of students majoring in geology. As part of my commitment to furthering the profession and its/our future, I have joined the Advocacy Committee of the national organization. I hope that other AEG members will organize similar presentations at others schools that offer geology as a major in North and South Carolina, and am encouraging other board members to "adopt" a college and connect with those students.

My second tactic to increase AEG visibility is to once again host the Jahns lecturer in 2008. Recall that one of the objectives of the Jahns lecture is to interact with students. As we did last April, we plan to present at NCSU and at the University Club in April 2008. This time, we will also have the Jahns lecturer take a trip up I-40 to beautiful Chapel Hill (nah, I didn't go to school there) and present to UNC students. I have already exchanged emails with the Jahns lecturer, Dr. John Clague of Simon Fraser University in British Columbia (he got his Master's at Berkeley, so I bet his talks will be entertaining), and he has agreed to present at both schools as well as our spring meeting. I recall the spring meeting this year with the Jahns lecturer, John Moylan, was quite successful in exposing NCSU geology majors to AEG.

As far as advocating for our profession, don't forget that large segments of the meetings of the NC Board for Licensing of Geologists are open to the public. I have been to a few, and I found them interesting (I always wondered what they did at these meetings). Go for yourself and find out. You can spend a couple hours at a meeting and get the flavor of the issues they tackle. And my experience is they'd love to have you. Our calendar editor, Carin Kromm, has begun putting the geology board meetings on the calendar at the end of the newsletter.

Taking advocacy of geology one step further, the annual meeting of the North Carolina Science Teachers Association is coming up. Once again, the section board has agreed to donate \$1000, to purchase earth science packets to assist teachers teaching earth science to future geologists. We

welcome individual donations as well. Please see the article elsewhere in the newsletter on this topic. (Ed: See page 7)

Elections will be in September. All the current officers -- Secretary Rich Lovett, Treasurer Raymond Knox, Vice Chair Carin Kromm and yours truly -- have agreed to run for reelection, and no other candidates have been nominated (or drafted). We still must have an election per our bylaws, so expect to receive a ballot in the mail in the next week or two. Please return your ballot by the date noted on the ballot.

Last note, as announced elsewhere in the bulletin (Ed: See page 7), don't forget the annual meeting of AEG will be held in Los Angeles on September 24-29. Jennifer Bauer and I plan to attend (Jennifer is presenting a paper), and we know that Dr. Briget Doyle and Gary Rogers, past board members, will also attend. I hope to see others from our section there. The Carolinas Section made a \$750 donation to sponsor one of the field trips, all of which sound interesting. The AEG website has details of the meeting (www.aegweb.org).

Rich Kolb

Chair, AEG Carolinas

GeoNews is a publication of the Carolinas Section of AEG. There are four issues per year, with deadlines and issue publication dates listed below. We publish news of the profession, job openings, and positions wanted.

Deadlines can be flexible depending on events

Spring – deadline March 1, issue date March 21

Summer – deadline June 1, issue date June 21

Fall – deadline September 1, issue date September 21

Winter – deadline December 1, issue date December 21

Deadlines for submittals for the National AEG News:

March issue – January 21, 2006

June issue – April 30, 2006

September issue – July 31, 2006

December issue – October 31, 2006

AEG Carolinas Section – Current Officers and Contacts

ChairRick Kolb, Chair@aegcarolinas.org

Vice-Chair Carin Kromm Vicechair@aegcarolinas.org

Treasurer Raymond Knox treasurer@aegcarolinas.org

Secretary Richard P. Lovett, secretary@aegcarolinas.org

Membership Chair OPEN

Past Section Chair Tyler Clark

Advisor Gary Rogers, advisor@aegcarolinas.org

AEG Carolinas Section Website aegcarolinas.org

Webmaster Tami Idol, webmaster@aegcarolinas.org

AEG National Website aegweb.org

AIPG Carolinas Section – Officers and Contacts

President John M. Stewart, 336-668-0093

..... jstewart@trigoneng.com

Secretary/Treasurer Russ Patterson, (919) 774-3770

..... russ@patternexploration.com

Membership Chair Macklin M. Armstrong, (919) 838-9933

..... armgeoeng@mindspring.com

GeoNews Newsletter Editor Jane Gill-Shaler (336) 883-0170

..... janehgill@stanfordalumni.org

Emeritus Newsletter Editor Phil Winchester, Jr.

GARCO, Inc.

Environmental, Industrial & Recycling Services

Al King
Sales Representative
Project Manager

alk@egarco.com
Mbl: 919-451-3960

P.O. Box 1907
Asheboro, NC 27204
2503 N. Fayetteville St.
Asheboro, NC 27203

Phone: 336-683-0911
Fax: 336-683-0811
www.egarco.com



Scott Pearce
Vice President

P.O. Box 484
High Point, NC 27261
336.434.7750
336.434.7752 fax
336.803.1783 mobile
www.adenviro.com
spearce@adenviro.com

GEOHAZARDS SYMPOSIUM WRAP-UP

Jennifer Bauer, LG, NC Geological Survey

On August 1st and 2nd, geologists, engineers, and a variety of other professionals descended upon Asheville, NC for the 7th Annual Technical Forum on Geohazards in Transportation in the Appalachian Region. One hundred nineteen attendees came from as far as Colorado to present their work on topics ranging from the Cost Benefits of Geoscience Information to Karst and Mine subsidence to Landslides. The forum is annually sponsored by the Nick J. Rahall, II Appalachian Transportation Institute and Marshall University's Center for Environmental, Geotechnical and Applied Sciences. This year, the Carolinas Section of AEG, the NC Department of Transportation, and the NC Geological Survey hosted the Forum. Dr. Tony Szwilski and Kirk Beach from the Appalachian Coalition, and Jody Kuhne from the NCDOT office did a great job of organizing



AEG's booth at the Forum.

this day-and-a-half seminar in the Haywood Park Hotel in downtown Asheville.

Highlights of the Forum included eight technical sessions, fourteen exhibitor booths, and a keynote speech given by Dr. Chester "Skip" Watts from Radford University. Dr.

Watts spoke to us about rock falls in Yosemite National Park while we enjoyed a delicious catered lunch. Now we know where not to sleep in Yosemite Valley!

The technical sessions gave public- and private-sector professionals the opportunity to explain problems they are working on and solutions they have come up with. Such solutions include a

nationwide data-management system to help ease the exchange of information among various organizations across the country; an

online, interactive, geohazards map the Kentucky Geological Survey has created; and a landslide-management system designed by the Ohio Department of Transportation. For a full list and copies of the PowerPoint presentations from the forum, visit Marshall University's Geohazards site

Overall, the attendees were pleased with the forum and found it very informative and a great venue for exchanging ideas and information. Next year's forum is planned for August 6th and 7th in Charleston, WV. If you weren't able to make it this year, or even if you were, I would recommend attending next year if you have any interest in Geohazards in the Appalachian Region.

Special thanks go to Rick Kolb and Gary Rogers with AEG for soliciting the exhibitors who helped make this forum a success.

Jennifer Bauer is with the North Carolina Geological Survey in Asheville, and is a former AEG Carolinas Section Chair.



Attendees Ken Gillon and John Stanton discussing important geologic issues during a break.

REQUEST FOR DONATIONS - AGI GEOSCIENCE TOOLKITS FOR NC TEACHERS

By Rick Kolb, AEG Carolinas Chair

Last year, the Carolinas Section of AEG donated \$500 for the purchase of toolkits published by the American Geological Institute. We distributed these toolkits at the annual meeting of the North Carolina Science Teachers Association (NCSTA) in Greensboro, which is held in November at the Koury Center. These toolkits are teachers' aids for earth science, and they were a big hit at the meeting. Through donations by AEG, the Ground Water Professionals of North Carolina, the American Institute of Professional Geologists, engineering and geological companies, and individuals, we collected enough donations to purchase 470 of these toolkits (and we could have given away more). We feel this purchase helps fulfill one of AEG's missions of educating the public and future geologists about the earth sciences.

This year's annual meeting of the NCSTA is coming up on November 15 and 16 at the Koury Center. Randy Bechtel, the Education/Public Outreach Geologist for the NC Geological Survey, has asked for our support again through the purchase of these toolkits, which AGI will release next month (these kits change yearly). Last week, the board of the Carolinas Section of AEG voted to make another \$500 donation to purchase toolkits for the science teachers. Below is AGI's description of this year's toolkit:

The 2007 Toolkit includes a wide array of resources, including a new edition of its popular Earth Science Calendar filled with activities and important geoscientific dates. These activities, supplied by AGI member societies and other organizations, engage students in learning about the earth sciences. The U.S. Geological Survey (USGS) has provided both "Facts on Disc," a CD-ROM

which includes all of the USGS fact sheets from the last twelve years and the brochure "USGS Education Resources for Teachers." The Toolkits also contain materials from NASA including the CD-ROM "Exploring Ice" and an "Earth and Space Explorers Series" poster. ESRI has provided a copy of its "GIS Solutions for Education" CD-ROM. NOAA is also providing information on student opportunities and careers within the earth sciences.

In collaboration with the National Park Service, AGI has published the "Volcanoes in the National Parks" poster. This poster, which is included in the 2007 Toolkit, describes with stunning visuals the volcanoes one can visit while touring the National Parks of America. On the reverse side of the poster, a classroom activity on society and volcanisms is provided.

The Toolkit can be ordered now. Individual kits are available for the cost of shipping and handling (\$6.95 in the United States). Bulk pricing is available. Visit <http://www.earthsciweek.org/> web site to order the 2007 Earth Science Week Toolkit.

Continued on page 8

Parratt-Wolff, Inc. Groundwater Monitoring, Subsurface Exploration

East Syracuse, NY 13057

Fisher Road, Box 56

Phone 800-782-7260 or 315 437-1429

Fax 315-437-1770, e-mail pwolff@pwinc.com

Hillsborough, North Carolina 27278

501 Millstone Drive

Phone 800 627-7920 or 919-644-2814

Fax 919-644-2817

Groundwater Monitoring Wells

Recovery Wells

Sparging Wells

Rock Coring

Geotechnical Test Borings

Direct Push/Geoprobe

Earth Science Week is an annual event held the second week of October to promote an understanding and appreciation of the earth sciences. It is coordinated by the American Geological Institute with generous support from the U.S. Geological Survey, the AAPG Foundation, and the National Park Service. To learn more about this event, please visit <http://www.earthsciweek.org/>.


The American Geological Institute is a nonprofit federation of 44 geoscientific and professional associations (including AEG) that represents more than 120,000 geologists, geophysicists and other earth scientists. Founded in 1948, AGI provides information services to geoscientists, serves as a voice of shared interests in the profession, plays a major role in strengthening geoscience education, and strives to increase public awareness of the vital role the geosciences play in society's use of resources and interaction with the environment.

I invite Carolinas Section members and their employers to make tax-deductible donations to support the purchase of these toolkits. This is a highly worthy cause in support of our profession and its future. You can send you check to Raymond Knox, our section treasurer, at Schnabel Engineering, South, LLC, 104 Corporate Blvd. Suite 420, section treasurer, at Schnabel Engineering South, LLC, 104 Corporate Blvd. Suite 420, West Columbia, SC 29169. rknox@schnabel-eng.com. Thank you for your support of our profession.

Rick Kolb, Chair, AEG Carolinas

AEG 50TH ANNIVERSARY CELEBRATION – “GOLDEN ANNIVERSARY IN THE GOLDEN STATE”

Be sure to join AEG for our 50th Anniversary Celebration at the AEG-2007 Annual Meeting "*Golden Anniversary in the Golden State*" in Los Angeles, CA, September 24 - 29, 2007. In the plans are a wide selection of technical sessions, events, and field trips, including the Geology of Catalina Island and the San Andreas Fault, Geology of Palos Verdes Peninsula, and the Geology of the Wine Country of Santa Barbara. This year, we are proud to be able to sponsor one of the field trips, Rick Kolb will attend, and Gary Rogers, Briget Doyle and Jennifer Bauer of our Carolinas Section are presenting papers there.

 <p>Environmental Conservation Laboratories</p>	<p>Cary, NC Lab: ENCOCRY@encolabs.com Tel: 919-677-1669 Fax: 919-677-9846</p>	<p>Orlando, FL Lab: ENCOORL@encolabs.com Tel: 407-826-5314 Fax: 407-850-6945</p>
	<p>Jacksonville, FL Lab: ENCOJAX@encolabs.com Tel: 904-296-3007 Fax: 904-296-6210</p>	<p>Corporate Office: 10775 Central Port Drive, Orlando, FL 32824</p>

LETTER TO THE EDITOR

*Letter from Laos, by Elizabeth Zbinden
July, 2007*

Hello from the Lao People's Democratic Republic! I have been working at Sepon Copper and Gold Mine since early March 2007. Working in an active mine has so much that is familiar, that I tend to think that there is nothing new to write about. Of course that is not true, but it took me a while to get this written. Check us out on Google Earth: 16° 57'29.66"N, 105° 59'57.74"E is my office location. We look out onto the copper processing plant: rectangular ponds for the leach solution, the electrowinning plant beyond

the ponds; row of circular CCD (counter-current decantation) tanks just to the north. The gold processing plant is north of those circular tanks; it spills off the top of the picture. The block of rectangular roofs a few tens of meters north of my office (upper left part of the picture) is one of two camps where people live while working at the mine. This one is Padan; the other, a kilometer or so to the west, is Namkok where I stay. All expatriate (around 200) and most Lao (around 3000) employees and contractors stay



Photo 1. Bomb craters in the rice fields.

"inside the fence" in one of these two camps. Folks who live in the local villages get busses back and forth to home every day; I'm not sure how many but there are fewer "commuters"

Schnabel Engineering

- ▼ Dams
- ▼ Geophysics
- ▼ Geotechnical
- ▼ Geosciences

www.schnabel-eng.com

11 A Oak Branch Drive ▼ Greensboro, NC 27407 ▼ 336.274.9456



Mark Lassiter, P.G.
President

Two United Way
Greenville, South Carolina 29607
Phone: (864) 288-1986
Fax: (864) 288-2272
E-mail: mlassiter@aedrilling.com

than on-site residents.

If you zoom out you can see that the mine consists of a number of small pits rather than one big pit. You can also see the airstrip; charter flights between the mine and the capital city (Vientiane) run 5 days a week on 12-seater Cessna Caravans. You can also see some of the areas we hope to develop into active pits in the next few months to years.

Sepon Mine is near the town of Sepon (spelled Xepon in some transliterations) in Savannakhet Province in eastern Laos. The closer village is called Vilabouly (or Vilaboury on some maps). We are located about 13 km from the Vietnam border, directly on top of what once was the Ho Chi Minh trail. As you may know, our boys dropped a lot of bombs to try to sever the supply line represented by that trail. Most of the bombs exploded as intended at the time, and left their marks behind.

Photo 1 shows a view of rice fields near the mine, taken from the air. Bomb craters still show up loud and clear, 40 years later. However, many other bombs did *not* explode, and this brings us to two very important acronyms in the day-to-day language of the mine. UXO = unexploded ordnance; EOD = explosive ordnance demolition. I have learned some subtleties of language. What we have are not land mines, because they were dropped from airplanes and were intended to go off at the time even if they did not. There is a great abundance of UXO everywhere; every square meter of ground has to be cleared via multiple shallow and deep sweeps before we can do anything on that ground. The cleared and uncleared areas are marked by red and white paint on bamboo posts. There are signs to

remind us how the cleared vs. uncleared areas are marked: "red you're dead, white you're right."

Nearly every day the blasting notice tells us of the time, location, and safety clearance radius for ordnance demolition. An interesting aside is that it's only every couple weeks or so that the daily blasting notice includes what I'd normally expect to see every day, which is blasting to break up rock so we can dig it up and process it. Here's the reason: as

you can imagine, here in the tropics a lot of the rock we mine is so heavily weathered you'd hardly call it "rock". Much of it is free-digging, meaning it doesn't have to be broken up first – just dig!

Well, I don't spend all my time thinking about UXO and EOD. There is fashion to think about too. Photo 2 is of one geologist and six geotechnicians taking samples at a grade-control drill rig in one of the



Photo 2 – Taking samples at the pit.

pits. (seven guys to take a sample developing-world wage scales but wages like that make Vilabouly one of the most prosperous villages in the country). For visibility, the mine issues bright orange shirts with reflective trim. Three of the guys, you will notice, are wearing what looks like a veil. They are staying well-covered for protection from the sun, to avoid getting a suntan.

The mine is owned by Oxiana, an Australian company. The Lao subsidiary company is LXML, Lane Xang Minerals Limited. Lane Xang means "million elephants" and is one of the old names for this country. Most of the foreigners are Australians, and my first linguistic challenge here – before learning Lao – has been learning Australian. The next largest group of foreigners is Indonesians. Americans are way down the list in terms of numbers.

Well that is about all for now!

Elizabeth Zbinden

Send letters to the editor to editor@aegcarolinas.org. We reserve the right to edit for length. Please restrict letters to subjects of potential interest to AEG and AIPG members. Elizabeth is an old friend of your Editor from the SF branch of AWG.

ABOUT OUR MEMBERS

Rick Kolb is President of the Carolinas Section. This bio is the third in this series.

I was born and raised in Columbus, Ohio by two teachers. One summer I spent two months at my uncle's house in southern California and returned from California to Ohio by a circuitous route on a Greyhound bus, which was a real learning experience and opened my eyes to the world around me. After one year at Marietta College in Ohio (my first encounter with geology), I dropped out due to lack of funds and moved to Florida, where I worked as a construction laborer for four months before escaping the U.S. by migrating to Sydney, Australia in 1970. Those of you raised in the 60's know that a 19-year-old not in college was guaranteed a free travel opportunity courtesy of the Federal government. However, I had other travel plans. I lived in Sydney for two years, working in accounting (yes, I am pretty good with numbers; no, I did not decide to become an engineer). After two years, I decided that Australia was not the place I wanted to spend the rest of my life and departed in 1972. I spent almost a year travelling back to the United States, over land through Asia and Europe.

I worked as a construction laborer in Miami for several months before beginning work as a flight attendant for Eastern Airlines in April 1973. I was laid off from January to July 1974 as a result of the Arab oil embargo, during which period I collected unemployment and, when that ran out, I worked as a travel agent in Hollywood, Florida. I was recalled by Eastern to Atlanta, where I was based for nearly two years. In 1975, I married my first Yankee, from Forest Hills, New York.

At the urging of my more-responsible wife, I returned to college in 1976 at the University of Montana in Missoula. I attended school year 'round, taking geology and associated courses during the standard school

year and education courses during the summer term. I student-taught in the fall of 1978, after which I decided not to become a teacher (teach yes; babysit no). I graduated in 1979, and decided to continue on for a Master's degree at the University of Texas at Austin. After graduation in 1981, my wife and I decided to turn down job offers for employment in Texas, Oklahoma, and Mississippi, and instead I was a househusband until I began work for Mobil Oil in New Orleans in 1982, staying for eight years. I was happy and well compensated in the Oil Patch, and felt secure in my future there, but New Orleans, Dallas and Houston were not where my family wanted to spend the rest of my career.

In 1990 I accepted a job with Law Engineering in the more moderate climate of Raleigh (halfway between the coast for my wife and the mountains for me). I've done mainly environmental work there, though for a couple years I worked on LAW's geotechnical contract with NCDOT. At the moment, I am the principal in MACTEC's environmental group in Raleigh. In my career, I have been through multiple office and group managers, and three accounting systems, the changes to which were far more traumatic than the merger with MACTEC.

Other traumas in my life include losing my first wife to cancer in 1992, three months after it was diagnosed, and subsequently raising my son and daughter. I compounded the errors of my ways by marrying another Yankee, this one from Brooklyn, in 1995, and became a stepfather to her children. However, almost from the beginning we had troubles merging the two families, including my daughter running away from home three times. Oh, yeah, merging families is real easy. I have survived, but with a severely warped sense of humor. The passion for travel remains (regular trips to New Orleans are a priority), along with playing soccer and, most importantly, riding motorcycles.

EDUCATION SECTION:**ENVIRONMENTAL MENTORS
NEEDED FOR HIGH SCHOOL
STUDENTS***By Lisa Tolley, NCSU*

The NCSU College of Natural Resources is looking for environmental professionals to serve as mentors for high school students as part of their EnvironMentors program.

The EnvironMentors program was created to "mentor and motivate high school students from under-resourced communities as they conduct scientific research and acquire skills that will allow them to build careers and become active stewards of their communities and the environment."

Mentors will assist a high school students through the development of an environmental science research project. Students receive credit for their participation, and they can also use these projects to fulfill the high school graduation project requirement. The research topics cover many areas of environmental science (see list of past research topics below).

The program is looking for mentors who are highly motivated, enjoy working with students and have experience doing scientific research.

The time commitment varies depending on the mentor and student, but it entails approximately 6 to 8 hours per month for approximately 6 months. This past year, several students from Garner High School participated in the program and received awards and scholarships for their research projects.

Last year the program matched high school students with university faculty. Of the nine students who completed the program, 3 to 4 are still working in some area of natural resources. This year the program is working with Garner High School and Southeast Raleigh High School to pair high school students with college faculty and environmental professionals (scientists). The program is small with a staff of two so they will only be working with students from these two high schools.

Some past research topics include:

- "How do the harmful effects of mercury in fish affect human eating habits?"
- "The dangers of radon"
- "Does the amount of N15 change in trees when exposed to human wastewater?"
- "Knowledge of gas mileage and emissions among high school students"

If you are interested in serving as a mentor for a high school student, please contact Thomas Easley, Director of Community Diversity by phone at 919-513-0534 or email Thomas at thomas.easley@ncsu.edu



Ground Engineering & Environmental Services
4900 Koger Boulevard, Suite 140, Greensboro, NC 27407 - 336 852 4903

GEO

Geology Executive Online

An Electronic Helping Hand

Project Management	Editing
Scheduling	Report writing
Website Management	Formatting

Jane H Gill-Shaler, R.G., (CA & NC)

JaneHGill@aol.com

Cell (336) 687-6144



*Carolinas Section of the
Association of Environmental & Engineering Geologists*

announces

**Geology Field Trip
Eno River State Park
Orange County, North Carolina**

Led by Phil Bradley of the North Carolina Geological Survey

**10:00 AM, Saturday,
October 27, 2007**

We invite you to get outside to celebrate the end of summer by attending a field trip of the Cox Mountain Trail at the Few's Ford Access area of Eno River State Park near Hillsborough, North Carolina. Phil Bradley of the NCGS will lead the trip and will use his recently published NCGS Information Circular 35, "A Geologic Adventure Along the Eno River". We will see the highly variable geology typical of the Piedmont; rocks of all ages and types. Phil promises a moderately strenuous hike of about four miles, and expects the field trip will last approximately five hours. Each person will receive a copy of the NCGS guide book. See next page for a sample. Field Trip:

- Place:** Meet at the *picnic area parking* in the Few's Ford Access area. Go to the end of the road in the park. The parking area is large enough for plenty of cars, but please carpool.
- Date:** Saturday October 27, 2007
- Time:** 10:00 AM
- Program:** Geology of the Cox Mountain Trail
- Cost:** \$15 (the cost of the guide book)
- Bring:** Lunch, water, sturdy shoes or hiking boots
No hammers; rock collection not permitted in state parks
- Reservations:** Field trip is limited to 20 people. Please email Rick Kolb at rakolb@mactec.com to reserve your spot. Please mail a check made out to AEG Carolinas Section for \$15 to Rick Kolb by Monday, October 22 so we know how many guide books to order.

Link to directions to the Few's Ford Access area of Eno River State Park:
<http://www.ils.unc.edu/parkproject/visit/enri/directions.html>

Geologic Trail Guide to the Cox Mountain and Fanny's Ford Trails

Eno River State Park – Few's Ford Access

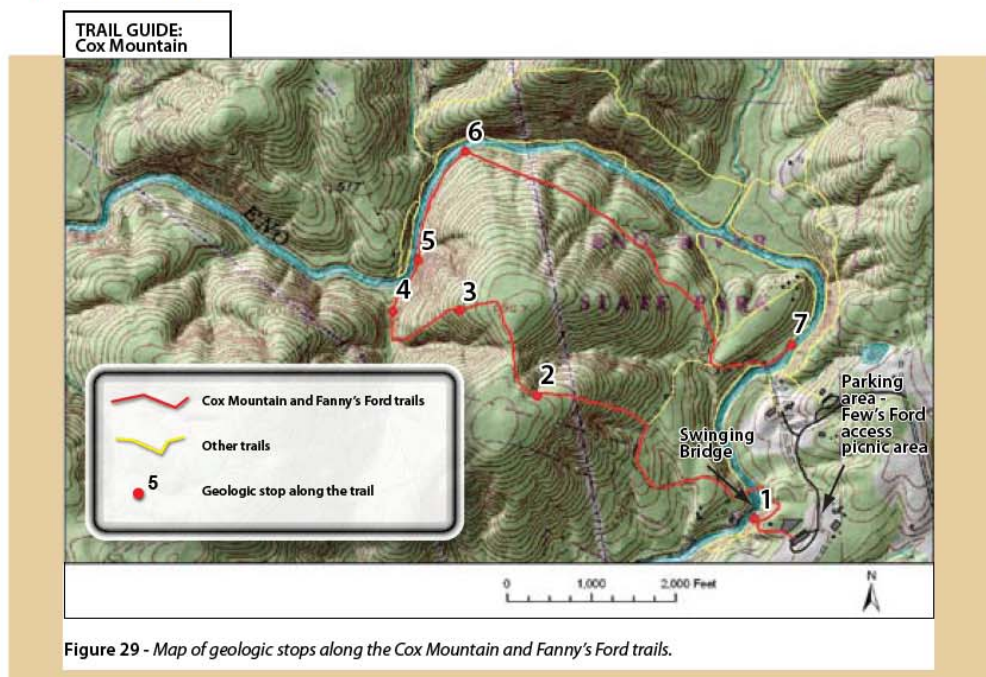
Distance and difficulty of hike: Approximately 4 miles of relatively strenuous hiking.

What you will see:

- Outcrops of volcanic tuffs near the swinging bridge crossing the Eno River
- A geologic contact separating volcanic tuffs from intrusive granodiorite
- Boulders and cobbles of quartz associated with a Triassic-age brittle fault
- Outcrop of jointed granodiorite
- Outcrops of granodiorite with examples of fine- and medium-grained textures
- Outcrop of xenolith of volcanic rock within granodiorite pluton
- Outcrops of tuff breccia formed from a lahar

Introduction

The geologic trail guide of the Cox Mountain and Fanny's Ford trails begins at the parking lot for the picnic area associated with the Few's Ford access area of Eno River State Park. As you follow this trail guide, you will traverse from a topographic low of about 400 feet above sea level at the Eno River to a topographic high at about 680 feet near the top of Cox Mountain. A topographic map with stop locations is provided in Figure 29. It is recommended that you acquire a park map indicating the locations and names of the trails before starting your trip. To avoid becoming lost or disoriented it is recommended that the companion map (fig. 29) and the park map be referenced frequently during the hike.



GEORAMBLINGS

By Charles W. Welby

Late last July my wife and I set forth on the “requisite” cruise for those of us who are “gainfully supported” by the Social Security program in the U.S. We headed from Raleigh to Vancouver, BC to catch the m.s. Volendam for a two-week scenic adventure up the Inside Passage from Vancouver to Seward, Alaska and back.

I had collected some satellite images from Google Earth in order to attempt some “remote sensing” geologic interpretation. Because of some other matters that needed to be resolved before we left, I was unable to obtain a sufficiently detailed geologic map to be able to say, “Ah ha! There are outcrops of greenstone schist on that island or landmass.” So in Ketchikan, AK, which has a natural

history museum, I visited the book department and found two books, one published in 1989, in the famed “Roadside Geology” series, and another, published in 2006 and authored by an acquaintance, Harold H. Stowell, who teaches at the University of Alabama. The book, “Geology of Southeast Alaska, Rock and Ice in Motion,” describes the various “Suspect Terranes” that comprise much of southeastern Alaska as well as the glacial features that may be found in that part of the world. It is an interesting book. However, neither publication provides the details of the rocks that one may observe while in various ports or while sailing through the various channels and passages.

In Ketchikan I took advantage of one of the tours offered “Mariners” and had a chance to observe some rocks in cuts and buildings. I asked the driver of the horse-drawn wagon what rocks were there in the vicinity. The answer came back, “granodiorite.” So much for relying

Rentals



Enviro-Equipment, Inc.

Leading Supplier of Quality Environmental
Equipment and Supplies
1-888-274-8929

Sales

Remediation

Professionals Helping Professionals!

Providing Superior Quality and Exceptional Service for Over 14 Years!
Staffed by Environmental Professionals with Over 50 Years of Industry Experience!

DISTRIBUTORS FOR:

Horiba Instruments • RAE Systems, Inc. • Casella CEL • CES-Landtec • Heron Instruments
Proactive Environmental Products • Scott Instruments • HF Scientific, Inc. • Testo • Grundfos
Testwell Instruments • Bacharach • Protimeter MMS • Photovac, Inc. • Solinst • Vulcain
Ecobailer • Aquabailer • Clearview Bailleurs • Voss • Spec Air Specialty Gases

SPECIALTY PRODUCTS FOR:

Water Quality Analysis • Organic Vapor Analysis • Noise Monitoring • Indoor/Outdoor Air Quality
Particulate Monitoring • Gas Detection • Ground-Water Pumps • Sampling Supplies • Tubing
Disposable Bailleurs • Disposable Nitrile & Latex Gloves • Health & Safety Supplies
Storm Water Sampling • Remediation Pilot Test Systems • Soil & Ground-Water Remediation

Call us toll free at:

888-274-8929

Send us an e-mail at:

info@enviroequipment.com

Visit our on-line catalog at:

www.enviroequipment.com



on the locals as the rock was clearly metamorphic and probably slate derived from some volcanics. However, there are granodiorite outcrops to the north of the main part of the city, according to maps in the two books referenced above.

Now the story goes back to the early Ordovician, or thereabouts, when I was a student in a graduate structural geology class. During that class I was given an assignment to report on what I recall as a USGS Professional Paper on the geology of Alaska. The paper was written in the first one-quarter of the 20th Century as I remember. Time has dimmed the name of the then reasonably well-known USGS geologist and the

exact details of the paper. However, I do remember that the author wrote the report based on what he observed from the ship as he sailed along the Inside Passage. In one particular paragraph he described much of the geology around a particular stop based on his observations through the porthole of the ship. An outcrop of schist or slate provided the basis for conclusions about that part of southeast Alaska.

Equipped with the two books, a portion of the *Tectonic Map of North America* by William R. Muehlberger (AAPG, 1996) covering southeast Alaska, and the satellite images, I was ready to “understand” the geology of the “Suspect



Toe of the Hubbard Glacier, Glacier Bay National Park and Reserve.



A&D Environmental

Scott Pearce
Vice President

P.O. Box 484
High Point, NC 27261
336.434.7750
336.434.7752 fax
336.803.1783 mobile
www.adenviro.com
speerce@adenviro.com



PRISM
LABORATORIES, INC.

Full Service Analytical & Environmental Solutions

Analytical for RCRA, CERCLA, CWA, SDWA, NPDES and more!
NELAC Accredited - US ACE Certified - SWBE

1-800-529-6364 www.prismlabs.com



AMERICAN
Environmental
Drilling, Inc.

800-779-8854 / ContactUs@aedi.biz
NC, SC and VA Licensed and Certified
WWW.AEDI.BIZ

For All Your Drilling Needs

Environmental - Geotechnical
Auger, Mud Rotary, Air Rotary, Geoprobe

Certified NC DOT "DBE" Women Owned Business
and HUB Corporation

Terranes.” At least my understanding of the area improved a bit, and there were places where I actually saw some rocks that might have been collectable if the suitcase had not been so full of a dress suit and other “essentials” required for dinner on board ship at least two evenings on each leg of the cruise.

The stop at Skagway on the way south brought a chance to wander up the main street and to visit several of the “tourist traps.” (Note: The various ports of call have their abundance of jewelry shops; so buy in Alaska a diamond from South Africa or some similar place! Some pretty sleazy looking characters seemed to be standing in the doorways trying to entice the tourists in. Something about them reminded me of a character from the children’s story, Pinocchio).

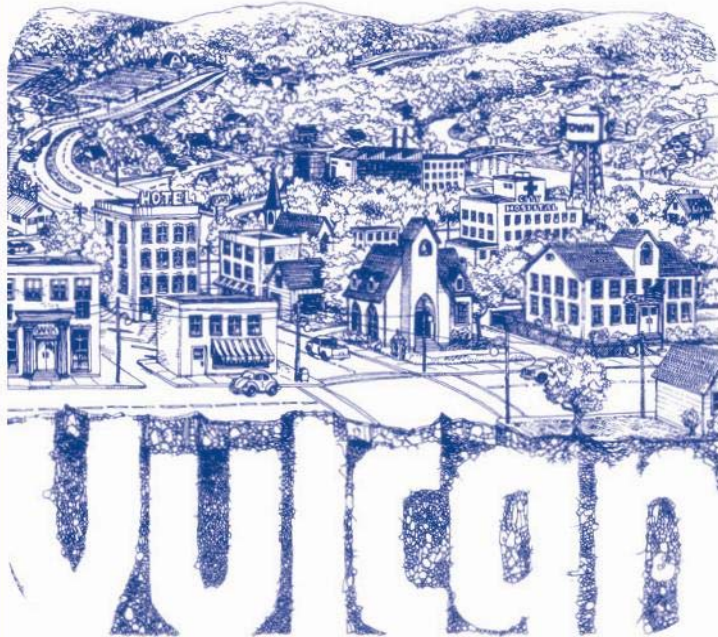
Hidden on a side street behind some of the more “touristy” places was a rock and mineral shop. What was interesting there were the goniatites and orthocerae from Morocco at greatly inflated prices. I guess one might find an interesting mineral specimen in the collection, and perhaps even some from Alaska if one

looked hard enough. Some obvious amateurs were investigating of the mineral specimens.

Out in the backyard there was a rhubarb plant with a sign in front of it listing the plant’s age as 100 years, a leftover from the “thrilling days” of the Yukon gold rush. I was hoping to find (not for purchase) an ammonite about 3 feet in diameter similar to one that a friend of mine had brought home from the North Slope and had gracing his front hall for a number of years. No luck! But my camera was at the “ready” nonetheless.

Since the Volendam had its current position and course displayed on a large TV screen in one of the lounges, I was able to plot the cruise path on the satellite imagery which I had with me, an interesting thing to do while sitting in a lounge and listening to some nice music of an evening. Although the imagery was small scale, it was possible to pick out the traces of some of the major faults shown on the geologic maps in the two books. Some of the channels and straits are defined geologically by faults. The vegetation cover on the land areas makes geologic interpretations from the

Foundations of the community.



Vulcan
Materials Company

*The nation's leading producer
of crushed stone.*

Mideast Division

4401 Patterson Avenue
Winston-Salem, NC 27105

336.767.4600

www.vulcanmaterials.com

imagery nigh impossible.

In the photo, the dark layers of rock debris emphasize some of the folding in the ice mass. Absorption of the red and yellow wave lengths in the ice and the transmission of the blue wave lengths through ice give the glacial ice its blue color. Be on the lookout for whales and porpoises in the bay.

What I have described above, I guess, is another's attempt to understand the geology of southeastern Alaska during a cruise. It is impossible to do so, and one can imagine how accurate (or inaccurate) the description of the bedrock geology of Alaska as seen through a porthole of a ship might have been. Glacial sculpturing has, of course, the predominant visual impact. The distribution of islands and peninsulas reflects the complexity of the tectonic history, and their distribution reminds one of the broken edge of a pavement with its collection of disarranged blocks of asphalt.

Changing themes and attempting to provide some insight on an opportunity that avails the members of the Carolinas Section of AEG and the Carolinas Section of AIPG, I would be remiss at this point in time if I did not urge each individual who reads this column to make a small contribution to the two sections' efforts to provide AGI Earth Science Kits to the Earth Science Teachers. The project developed

last year in conjunction with the N.C. Science Teacher's meeting and the accompanying "Rock Give Away" merits strong support from among our members.

Among the rising generations there are those who will eventually achieve positions of importance locally, regionally, and nationally, and whose interest in things environmental and especially things related to the earth sciences will have been first piqued somewhere in their schooling years. What better way to support the efforts of today's teachers than to provide them with materials that can arouse the interest of some child and lead him or her into following a path into earth sciences, or at least to have in later life an understanding grown from the seeds planted during an encounter with earth science during school years of how geologic processes work and how some political decisions can be or should be affected by earth processes.

Elsewhere in this edition of GEONEWS are directions of how contributions may be made. (See page 7)

Charles W. Welby

Dr. Charles W. Welby is a former section chair for AEG and a regular contributor to this newsletter. He may be reached at cww_ral@hotmail.com.

Stop Guessing . . . Know What's Down Inside Your Well

**Water well
video,
analysis, and
repair**

**Geophysical
Surveys**

EGIS, PA

Mike L. Vaught, PG, CWC

(919)929-8363
441 Northside Dr.
Chapel Hill, NC 27516
gwinvest@juno.com

Mobile Labs • MIP Services



Mobile Laboratory
Services

**GCMS/GC (8260, 8021) Volatiles
Pesticides/PCBs**

Membrane Interface Probe (MIP)

**NCDENR, SCDHEC, NELAC
Certified Mobile Labs
WMBE Certified**

Phone: 352-367-0073

www.kbmobilelabs.com

JOB OPPORTUNITIES

VULCAN MATERIALS COMPANY

Geologist, III, Senior and Principal in Geologic Services Department, Birmingham AL

Job Description: As a Corporate Staff Geologist, this position requires providing geologic expertise, advice, and assistance on various division and corporate projects, as typically related to construction aggregate resource exploration or production. The position also requires the ability to demonstrate creative and innovative thought. It includes, as the project demands, travel, field assessments, development of computer databases from raw data and the generation of appropriate interpretive products to assess various geologic issues and parameters.

Required Skills: Undergraduate and graduate degrees in geology (Master's Degree must be with a thesis). A thorough grounding in a wide

including microscope techniques for mineral identification. A thorough knowledge of mineralogy, petrology, structural geology, and petrography is required. Advanced computer knowledge with the ability to use computer software to analyze geologic problems as well as develop and maintain internally consistent and accurate computer databases from raw data. A working knowledge of ESRI's ArcGIS software is a big plus. Certification as a professional geologist is a plus.

For more information, contact Vulcan Materials - Corporate Office, 1200 Urban Center Drive, Birmingham, AL 35242 at (205) 298-3000. Vulcan Materials Company provides infrastructure materials that are required by the American economy. We are the nation's largest producer of construction aggregates and a leader in the production of other construction materials.



Trigon Engineering Consultants, Inc.

Since 1983

*Geotechnical, Civil/Site Design, Construction Materials Testing & Inspection,
Drilling, Environmental, Industrial, Air Quality, Hydrology/Hydrogeology*

313 Gallimore Dairy Road • Greensboro, NC 27409 • 336.668.0093

6200 Harris Technology Boulevard • Charlotte, NC 28269 • 704.598.1049

700 Blue Ridge Road, Suite 101 • Raleigh, NC 27606 • 919.755.5011

107 Stokley Drive, Suite 204 • Wilmington, NC 28403 • 910.256.9300

153 Brozzini Court, Suite C • Greenville, SC 29615 • 864.297.3557

www.trigoneng.com

range of geologic topics and techniques,

ANNOUNCEMENTS

Carin Kromm has left ECS and joined MACTEC in Greensboro. Carin is Vice-President of the AEG Carolinas Section. Her email is Vicechair@aegcarolinas.org

Rich Lovett, AEG Carolinas Secretary, has left MACTEC in Greensboro and joined Golder Associates, Inc., also in Greensboro. His email is secretary@aegcarolinas.org.

AEG Fall Field Trip

**Cox Mountain Trail of the Eno River State Park near Hillsborough, North Carolina
Saturday, October 27, 2007**

Fall is almost here, and with hopes that the weather will be more tolerable for outdoor activities, we invite you to come on a field trip to see the geology of the Cox Mountain Trail at the Eno River State Park. The North Carolina Geological Survey just published "A Geologic Adventure Along the Eno River", and our field trip leader will be Phil Bradley, the author of that publication.

The geology is highly variable; we will see sedimentary, metamorphic and igneous rocks ranging in age from Paleozoic to Quaternary. Phil promises a moderately strenuous hike (there is some topography along the trail) of about four miles, and expects the field trip will last approximately five hours. The guide book will be included in the modest cost of the field trip. Please see details of the field trip on page 13 in this newsletter.

Geobrugg protects people and infra-structures from the forces of nature.

Our tested static and dynamic protection systems protect against rockfall (up to 10.6 ton block impacting at 56 mph) and unstable slopes, as well as debris and mud flows.

Discuss your natural hazard problems with Frank Amend, your local Geobrugg sales engineer, at the contact information provided below.



**Geobrugg
North America, LLC**
PO Box 7453
Rocky Mount, NC 27804-0453
(T) 252-937-2552
(C) 252-904-6986
frank.amend@geobrugg.com
www.geobrugg.com



TECHNICAL SECTION

Slope Stabilization Utilizing High Performance Steel Wire Mesh in Combination with Soil Nailing and Anchoring

By Steve Mumma, Geobrugg NA

Abstract

One popular and effective approach to achieving long-term slope stabilization is covering the slope with flexible steel mesh facing. In North America these systems are typically anchored only at the top, allowing the mesh material to drape freely down the slope. The weight and friction of the mesh material provides stability, and allows controlled downward movement of material. Typical European installations provide deeper stabilization by holding the mesh to the surface with anchors or soil nails throughout. These designs are largely dependent on the ability of the system to transfer forces from the facing material to the anchor points. The low tensile strength of conventional wire mesh has led to the use of steel wire rope nets, but these nets tend to be relatively expensive.

These limitations have been overcome by the development of a cost-effective diagonal wire mesh manufactured from high tensile strength, highly corrosion-resistant wire. In extensive testing this mesh has demonstrated a strength approaching that of wire rope nets. Additional development has produced an anchor plate that optimizes force transfer from mesh to anchors. These factors allow the mesh to be pre-tensioned against the slope, which restricts deformations in critical surface sections and prevents movement along planes of weakness. Newly developed dimensioning models yield an engineered design of these systems, including anchor design. Numerous such systems have been installed throughout Europe and the U.S. A review of material properties and system performance will be presented in addition to a brief case history of a United States installation.

Introduction

Anywhere a highway, railroad, or other infrastructure encroaches upon a slope, instability is bound to be a significant and recurring problem. Limited right of way frequently mandates the creation of over-steepened or truncated slopes. Other contributing factors can include groundwater conditions, the structural geology of the slope, or environmental factors such as heavy rainfall or erosion. These factors lead to two main types of instability: surficial degradation of the slope, and deeper instability along discontinuities.

Before selecting what type of mitigation is most appropriate for a particular slope, it is necessary to distinguish between surficial problems and deeper instability. Surface instability is characterized by material moving down the slope under the influence of gravity. Depending upon the site conditions, this material can include soil, mud and debris, or rocks and boulders. Deeper instability consists of the movement of a mass of material along planes of weakness.

A wide variety of mitigation measures are available to address stability concerns. Surficial problems can be addressed by use of a slope matting material (jute mesh, wire mesh, wire rope nets, etc), shotcrete facing, catchment barriers, re-vegetation of the slope, and other methods. Deeper instability typically necessitates more extensive mitigation measures such as pattern anchoring both with and without a facing material (meshes, shotcrete, concrete panels, etc.), retaining walls, or excavation of the unstable material.

High Tensile Strength Wire Mesh as Slope Protection

The use of wire mesh and wire rope nets is an effective and widely accepted method of providing protection to the surface of slopes. These materials are typically draped freely on a slope in order to control downward movement of material. To provide protection against deeper instabilities, these flexible materials must be pinned throughout the slope with a pattern of anchors. Until recently, the wire meshes used in these types of applications have been manufactured from wire with a tensile strength of approximately 500 N/mm^2 . These relatively low-strength meshes do not have the high tensile strength that is required to retain an unstable slope and they ultimately require an anchor spacing that does not prove to be economical. Wire rope nets provide the strength necessary to maintain a cost-effective anchor spacing, but they are comparatively expensive and require anchor points to be installed in specific locations.

The development of a high-tensile strength wire mesh manufactured from steel wire with a strength of more than $1,800 \text{ N/mm}^2$ offers the possibility of anchored constructions that provide an effective and economical solution to unstable slopes. This mesh has the high strength necessary to enable greater spacing between anchors, leading to a lower overall installed cost. Additionally, research and testing has resulted in a dimensioning model designed to

optimize the high strength of the mesh. This enables the design and construction of an engineered system that takes full advantage of the capabilities of the high strength mesh.

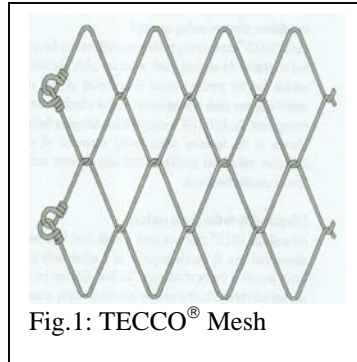


Fig. 1: TECCO® Mesh

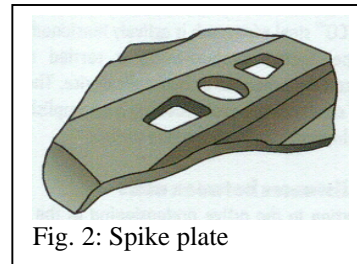


Fig. 2: Spike plate

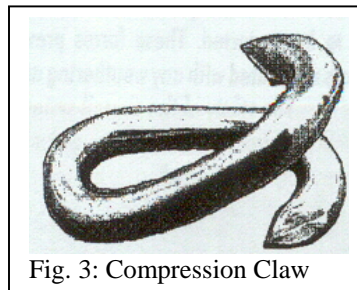


Fig. 3: Compression Claw

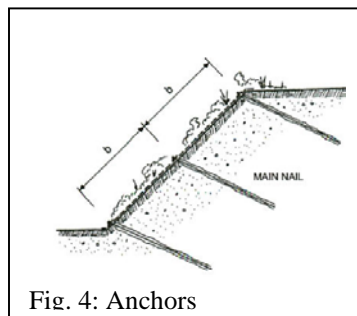


Fig. 4: Anchors

Components of the System

High tensile strength wire mesh: (Fig. 1). The mesh is produced in rolls measuring 3.5 m (11.5 ft.) wide by 30 m (98.4 ft.) long. The gentle deflection of the wire created by the bending process used to form the individual meshes results in a three-dimensionality in the mesh which improves the connection to the subsoil and aids in re-vegetation of the slope.

Spike Plates To insure optimal transfer of forces from the mesh to the anchors, a special spike plate has been developed (Fig. 2). These plates are placed over the anchor heads and tightened in order to pre-tension the mesh onto the slope.

Compression Claws In order to take full advantage of the high tensile strength of the mesh, a special fastener is required to connect the individual mesh panels together. These claws are hot dip galvanized and consist of 6 mm (0.25 in.) thick steel spiral.

Anchors The main anchors of the system are installed in a grid typically ranging from 2.0 m to 4.0 m (6.6 ft. to 13.1 ft.) horizontal and vertical spacing. Actual spacing depends upon the results of site analysis and modeling. Anchors consist of commercially available steel bars ranging from 25 to 32 mm. (1.0 to 1.25 in.). Self-drilling grout injection anchors are also permitted. Additional anchors may

also be used to provide added support at boundaries and in low points and hollows.

System Dimensioning

The Ruvolum[®] dimensioning concept has been developed specifically for these types of systems. Using the material properties of the mesh along with the characteristics of a given slope as input, this model determines the optimum anchor spacing and dimensioning as well as the optimum mesh tensioning required to provide stability to the slope.

The dimensioning concept consists of two parts: (1) investigation of global instabilities parallel to the slope and (2) investigation of local instabilities between the nails.

System Concept The anchors and mesh act together as a system to provide stability to the slope, preventing deformations in the top layers and restricting movement along planes of weakness. As a result of the high strength of the mesh, it is possible to pre-tension the system against the slope. This pre-tensioning enables the mesh to provide active pressure against the slope, preventing break-outs between the nails.

Compared to other alternatives (particularly hard facings such as shotcrete or large retaining structures), this system offers the following advantages:

- Very effective
- More economically feasible
- Allows greening of the slope, resulting in a natural, aesthetically pleasing

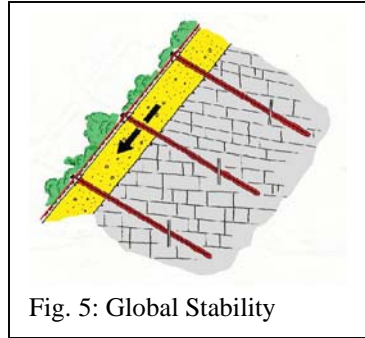


Fig. 5: Global Stability

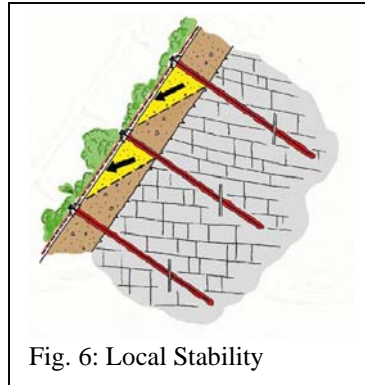


Fig. 6: Local Stability

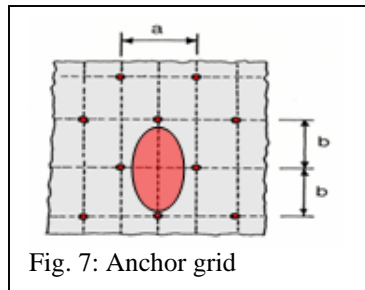


Fig. 7: Anchor grid

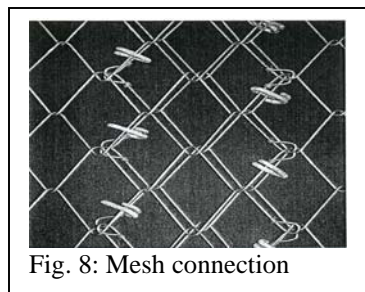


Fig. 8: Mesh connection

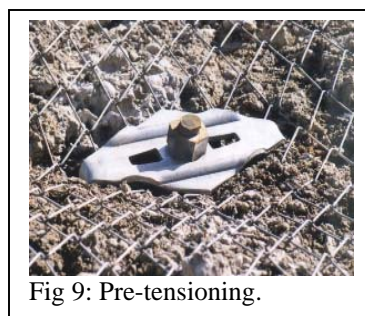


Fig 9: Pre-tensioning.

appearance

- Very long useful life (components have a 100 year design life)

System Installation The slope is first prepared by cleaning loose debris, leveling as much as possible, and shaping as needed.

The anchors are then installed in a defined grid (Fig. 7). The mesh does not require the anchors to be placed in specific locations so it is possible to adjust anchor locations (while staying within the design spacing) to compensate for irregularities in the terrain. Additional, short anchors may be installed between the grid anchors to insure a tight fit of the mesh against the slope.

After the anchors have been installed, small depressions are created around each anchor in order to accommodate the installation of the spike plates. The mesh is then laid on the slope, and cut to size as needed. Adjacent panels of mesh are connected with the compression claws (Fig. 8). The mesh is then pre-tensioned with a defined force against the anchors by tightening the spike plates down into the depressions (Fig. 9).

This pre-tensioning firmly presses the mesh against the slope, preventing deformations, slippage, and pop-outs of the slope material.

Depending upon site conditions, it may be advantageous to lay the mesh on the slope prior to anchor installation. After the mesh is installed and tensioned, the slope is ready for hydro-seeding or other re-vegetation measures.

Case History – Boulder Creek, CA

In late 2000 the California Department of Transportation (Caltrans) turned to an anchored high strength steel mesh system to stabilize a chronically failing slope. The high levels of seasonal rainfall in the region resulted



Fig. 10: Spike plate installation

in this cut slope having a history of shallow slope failures that produced mud and debris flows, creating a hazard for motorists and a maintenance nuisance. The project site is at mile 13.5 of Santa Cruz County Route 9 in Boulder Creek, CA (between Santa Cruz and San Jose). Installation of the system was begun in late 2000 to mitigate the problem before the winter rains began for the year. Other options were considered but rejected due to a variety of reasons, including: cost, length of time to install, the desire to save as many trees as possible, and visual impact. As a result of the aesthetically sensitive nature of this area, the desire for a visually pleasing solution was a key consideration.

The system was installed at the top areas of the head and lateral scarp faces. The head scarp is approximately 35.6 m. x 10 m. (117 ft. x 33 ft.) and the lateral scarp is approximately 25 m. x 8 m. (82 ft. x 26 ft.), resulting in a total coverage area of approximately 556 m² (5,985 ft²). Moving down the slope, the inclination varies from 60 degrees to 45 degrees. Because some of the

lower portions of the site are not as steep, these areas were covered only by jute matting and traditional wire mesh.

Modeling of the slope using the Ruvolum dimensioning concept indicated an anchor spacing of 3.3 m x 3.3 m. (10.8 ft. x 10.8 ft.) on center both horizontally and vertically, resulting in a total of 104 anchors. As installation progressed, it became evident that a total of 180 anchors would be necessary. The additional anchors were located at the direction of the project engineer in order to insure a tight fit of the mesh to the irregular terrain.

The slope was prepared by removing loose debris and mud. The excavating equipment was re-fitted with a drilling attachment to drill the 76 mm. (3 in.) diameter anchor holes. The 28 mm. (1.1 in.) diameter threaded anchor bolts were then inserted and grouted into the holes to a depth of 4 m. (13.1 ft.). The anchor specifications indicated by the dimensioning model were a tensile strength of 500 N/mm² (72.5 p.s.i) with a breaking strength of 370 kN (42 tons) and a tensile load

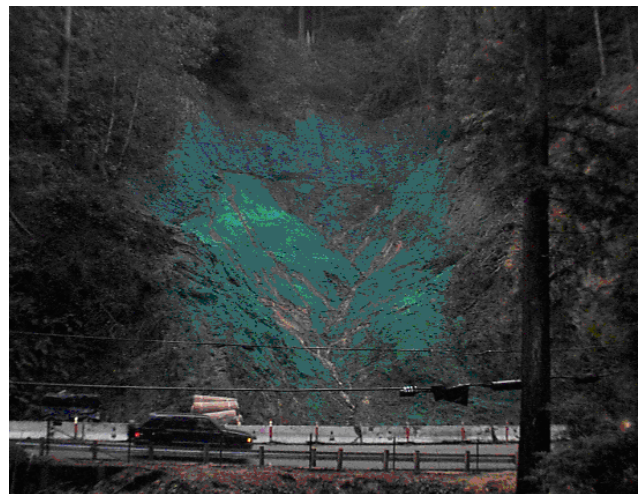


Fig. 11: View of slope after hydroseeding

of 308 kN (35 tons). After installation of the anchors, small depressions were created around the anchors to allow for the spike plates.

Prior to installation of the mesh, the slope was seeded and covered with jute

matting. The mesh was then rolled onto the slope, and tensioned against the surface by tightening the spike plates down into the depressions (Fig. 10). Fig. 11 shows the slope after hydro-seeding was completed.

This system has now been in place through two full winters, and the slope has remained stable. Without the stabilization system, the extreme rainfall events that occurred within this period would likely have resulted in the loss of the head scarp, along with many trees. Re-vegetation has been successful, adding to the surficial protection and providing an aesthetically pleasing slope. Fig. 12 shows the site 16 months after installation.

CONCLUSION

Anchored slope stabilization systems using high strength steel wire mesh as a facing material are an effective and economical means of protecting unstable slopes. These systems have demonstrated effectiveness in both rock and soil slopes. The high strength allows an economical spacing of anchor points; and the open mesh structure eliminates the need for

drainage, and facilitates greening of the slope. As a result, this mesh offers the advantages of both rigid constructions and traditional meshes. This concept is only just beginning to gain acceptance in North America, but it has been successfully applied in Europe for several years.

REFERENCES

- Ruegger, R., Flum, D., Haller, B., 2001. "Slope Stabilization with High-Performance Steel Wire Meshes in Combination with Nails and Anchors." UEF- Landslide – Conference, Davos, Switzerland, June 17-21, 2001.
- Rorem, E., 2001. "Slope Stabilization with Nailed or Anchored High Strength Steel Wire Mesh." AEG-AIPG Joint Annual Meeting, St. Louis, MO, September 30 – October 7, 2001.

Steve Mumma is Regional Manager, Western North America, of Geobrugg North America, LLC. He may be reached at steve.mumma@us.geobrugg.com or at (503) 534-9020.



Fig. 12: Mesh is almost completely overgrown 16 months after installation.




CALENDAR OF EVENTS - 2007

Geological Events in the Carolinas

Courtesy of AEG Carolinas Section – www.aegcarolinas.org

Send updates/corrections to Carin Kromm at clkromm@mactec.com. Last Updated September 17, 2007

Meeting Date/Time/Location are Subject to Change – Please Verify Prior to the Meeting

<i>Date</i> (TBA = To be announced)	<i>Event</i>	<i>Location</i>	<i>Time</i>	<i>Additional Information</i>	<i>Estimated PDH's</i>
October 18, 2007 	AEG dinner meeting, talk by Jerry Robblee, Schnabel Engineering (p.1 of this issue)	Natty Greene's Pub and Brewing Co. 345 S. Elm Street, Greensboro, NC	6:00-9:00	For reservations, contact Rick Kolb (919) 831-8054 rakolb@MACTEC.com or Raymond Knox rknox@schnabel-eng.com . The talk is about the geological and geotechnical characterization of Lake Townsend Dam. See page 1 of this issue for further information	
October 27, 2007	AEG Field trip	Eno State Park near Hillsborough	TBA	For reservations, contact Rick Kolb (see above) Cox Mountain Trail of the Eno River State Park near Hillsborough, North Carolina (see flyer in this newsletter)	
September 20, 2007 	Quarterly meeting, Ground Water Professionals of North Carolina www.gwpnc.org	Hickory Tavern 9010 Harris Corners, Charlotte, NC 704-921-4466	6:00-9:00	Meeting speaker will be Mr. Craig Neil, PG, of Trigon Engineering. The topic will be Steep Slope Development Project, Boone, North Carolina For reservations, contact Kelly Dillor at 919 618 1498 or Kelly.dillor@pacelabs.com	
October 25, 2007 	Dinner Meeting www.ncaep.org	Charlotte, NC Establishment TBA	TBA	For more information, contact John Jamison john.jamison@hdrinc.com	




CALENDAR OF EVENTS - 2007

Geological Events in the Carolinas

Courtesy of AEG Carolinas Section – www.aegcarolinas.org

Send updates/corrections to Carin Kromm at clkromm@mactec.com . Last Updated September 17, 2007

Meeting Date/Time/Location are Subject to Change – Please Verify Prior to the Meeting

<i>Date</i> (TBA = To be announced)	<i>Event</i>	<i>Location</i>	<i>Time</i>	<i>Additional Information</i>	<i>Estimated PDH's</i>
November 1, 2007 	Quarterly Board Meeting	Upton & Associates Raleigh, NC	9:00 am	Open to the Public	N/A
November 7, 2007 	NCSU Career Fair	Physical & Mathematical Council TBA	All day	The career fair is an opportunity to meet potential new hires in the geosciences and engineering sciences. For more information, contact D.R. Ingram, Jr., University Career Center, North Carolina State University, Campus Box 7303, 2100 Pullen Hall, Raleigh, N.C. 27695. Phone, (919) 515-2396 – Fax (919) 515-4210 Email - dr_ingram@ncsu.edu	N/A
<p align="center"><i>Recurring meetings in the region and other information</i></p>					
	Water Research Seminar Series and other events	Various, but generally in Jordan Hall on NCSU Campus	Varies	http://www.ncsu.edu/wrri/events.html#wrriseminars Email: water_resources@ncsu.edu	




CALENDAR OF EVENTS - 2007

Geological Events in the Carolinas

Courtesy of AEG Carolinas Section – www.aegcarolinas.org




Send updates/corrections to Carin Kromm at clkromm@mactec.com. Last Updated September 17, 2007

Meeting Date/Time/Location are Subject to Change – Please Verify Prior to the Meeting

<i>Date</i> (TBA = To be announced)	<i>Event</i>	<i>Location</i>	<i>Time</i>	<i>Additional Information</i>	<i>Estimated PDH's</i>
3rd Thurs. of the Month 	Forsyth Gem and Mineral Club Monthly Meeting	Vulcan Materials, 4401 N. Patterson Ave., Winston-Salem,	7:30 PM	Forsyth Gem and Mineral Club The Club holds monthly meetings and has an annual gem and mineral show in September. Phone: Jim Stroud at (336) 744-2940 Email: stroudj@vmcmail.com or Website: http://www.forsythgemclub.com/	N/A
Generally on the last Thursday of the month 	AGS Monthly Meeting	Atlanta, Fernbank Museum	6:30 PM	The Atlanta Geological Society holds monthly meetings, generally on the third Thursday of the month, and quarterly field trips. President: john_costello@mail.dnr.state.ga.us Website: http://www.atlantageologists.org/	
 First Monday of each month except January	Southern Appalachian Mineral Society	Murphy-Oakley Community Center, Asheville, NC	7:00 PM	Southern Appalachian Mineral Society Field Trips to limited access and historic collecting sites take place from April to October. Information on the website and from (828) 298-4237. Website: http://www.main.nc.us/sams/	N/A
November 9, 10, 11 Carolina Geological Society	2007 Annual Meeting and Field Trip	Lee Creek Phosphate Mine	TBA	Carolina Geological Society Buck Ward will lead the field trip http://carolinageologicalsociety.org	N/A
Various Dates	Listing of National Geo Events of Various Groups	Various Locations		Geological Society of America Geoscience Calendar http://www.geosociety.org/calendar/	

CALENDAR OF EVENTS - 2007**Geological Events in the Carolinas**Courtesy of AEG Carolinas Section – www.aegcarolinas.orgSend updates/corrections to Carin Kromm at clkromm@mactec.com. Last Updated September 17, 2007

Meeting Date/Time/Location are Subject to Change – Please Verify Prior to the Meeting

<i>Date</i> (TBA = To be announced)	<i>Event</i>	<i>Location</i>	<i>Time</i>	<i>Additional Information</i>	<i>Estimated PDH's</i>
2008 TBA 	GSA Southeastern Section Conference	Charlotte, NC	All day	Geological Society of America – Southeastern Section George Stephens - Email: geoice@gwu.edu http://www.geosociety.org/sectdiv/southe/index.htm 2008 annual meeting in Charlotte	8+
	ASCE GeoInstitute Conferences and Links	Your Choice		American Society of Civil Engineers GeoInstitute http://www.geoinstitute.org/events/events.cfm	
TBA 	ACEC National Convention	TBA	TBA	http://www.acecnc.org Phone: (919) 781-7934	



AEG CAROLINAS SECTION – SPONSOR INFORMATION

The Carolinas Section of AEG supports many of its activities with financial assistance provided by our sponsors. Our activities include quarterly meetings, periodic field trips and seminars, a quarterly newsletter, and email announcements about our meetings and geoscience related activities. In addition, we donate educational resources to science teachers.

We offer several levels of sponsorship, but they all have one goal: to keep the sponsor's name in front of our members and to bring you business. We have a real commitment to connecting our sponsors to potential buyers and will do all we can to help you build your business. Most of our members are practicing professionals with responsibility for selecting subcontractors, so our group is a great place to find new customers and to catch up with existing customers in an informal setting.

Our sponsors provide financial support that allows us to have reasonably priced dinner meetings, host seminars, provide discounted dinner meeting costs for students, underwrites the cost of newsletters and our web site, and supports science education in our schools. All costs listed below are per year and begin on the date that your payment is received.

Silver Sponsor (\$250):

GeoNews Newsletter: Business card size ad (2" high x 3-1/2" wide), four times per year.

Meetings: Listing on a Sponsor Poster, located at sign-in table. Name, contact information and a paragraph about services listed on the back of meeting abstracts handed out at each meeting. Verbal acknowledgement by name in Chairman's introductory comments. Meeting Exhibits: Space for tabletop display at one meeting. Cost of meeting waived for one person on the exhibit date.

Email Announcements: Listing of your company name on each AEG Carolinas Section email announcement (our email list is currently over 1,000 people)

Web Page: Acknowledgement on the AEG Carolinas Section Web Page, www.aegcarolinas.org.

Gold Sponsor (\$375):

GeoNews Newsletter: Quarter-Page ad (4-1/2" high x 3-1/2" wide), four times per year.

Meetings: Listing on a Sponsor Poster, located at sign in table. Name, contact information and a paragraph about services listed on the back of meeting abstracts handed out at each meeting. Verbal acknowledgement by name in Chairman's introductory comments. Meeting Exhibits: Space for tabletop display at two meetings. Cost of meeting waived for one person on the exhibit date.

Email Announcements: Listing of your company name on each AEG Carolinas Section email announcement

Web Page: Acknowledgement on the AEG Carolinas Section Web Page, www.aegcarolinas.org.

Platinum Sponsor (\$500):

GeoNews Newsletter: Half-page ad (4-1/2" high x 7" wide), four times per year.

Meetings: Listing on a Sponsor Poster, located at sign in table. Name, contact information and a paragraph about services listed on the back of meeting abstracts handed out at each meeting. Verbal acknowledgement by name in Chairman's introductory comments. Meeting Exhibit: Space for tabletop display at three meetings. Cost of meeting waived for one person on the exhibit date.

Email Announcements: Listing of your company name on each AEG - Carolinas Section email announcement

Web Page: Acknowledgement on the AEG Carolinas Section Web Page, www.aegcarolinas.org.

GeoNews Newsletter Sponsorship Only

Businesses or individuals can also advertise in GeoNews without being a full sponsor. The annual rates for advertising only in GeoNews are:

Business Card	\$ 40
Quarter Page	\$ 60
Half Page	\$100
Full Page	\$200

Please complete the form below and mail to Raymond Knox, AEG Carolinas Treasurer. Please call if you have any questions (contact information below).

AEG Carolinas Section Sponsorship Form

Please begin our sponsorship of the Carolina Section of the Association of Engineering Geologists. Our level of sponsorship is:

_____ Platinum Section Sponsorship, \$500/year

_____ Gold Section Sponsorship, \$375/year

_____ Silver Section Sponsorship, \$250/year

_____ GeoNews Newsletter Sponsor Only (see above)

Name: _____

Address: _____

Phone: _____ Fax: _____

Contact Person: _____

Email: _____

Website URL: _____

Date of Payment: _____

Please enclose a business card or camera-ready ad. If digital files of the ads are available please provide them in jpg, pdf, or doc

MAKE CHECK OUT TO AEG CAROLINAS

Send form and payment to: Ray Knox, AEG Carolinas treasurer, Raymond L. Knox, P.G., AEG Carolinas treasurer, Schnabel Engineering South, LLC, 104 Corporate Blvd. Suite 420, West Columbia, SC 29169. rknox@schnabel-eng.com

Thank You, AEG-AIPG GeoNews Sponsors!!

PLATINUM

Enviro-Equipment, Inc., 888-274-8929 Denise Chew, President
Denisechew@enviro-equipment.com, www.enviro-equipment.com
Enviro-Equipment is a leading supplier of environmental monitoring equipment and disposable sampling products.

Trigon Engineering, Inc. 336 668 0093 www.trigoneng.com
Geotechnical and Environmental Services.

Vulcan Materials Company, Mideast Division 336 767 4600
www.vulcanmaterials.com Vulcan is the nation's leading producer of crushed stone.

Geobruigg North America. Phone 252-937-2552 – Fax 252-451-1254
www.geobruigg.com Geobruigg protects people and structures from the forces of nature.

Geotech Environmental Equipment, Inc.-1-800-833-7958. Lisa Austin, Lisa@geotechenv.com. <http://www.geotechenv.com/>.
Geotech manufactures and distributes sampling, filtration, analytical and remediation products for the ground and surface water industry. We also rent, sell, and service environmental sampling and monitoring equipment.

GOLD

American Environmental Drilling, Inc. 800 779 8854
ContactUs@aedi.biz. NC, SC, and VA Licensed and Certified Drillers. Environmental and geotechnical. Certified NC DOT "DBE" Woman Owned Business and HUB Corporation.

If you would like to be a sponsor for AEG Carolinas, or to place an ad, please contact Jane Gill-Shaler at (336) 883-0170 or by email at janehgill@stanfordalumni.org. The sponsorship form is in this newsletter. Check the index on the front page. Thank you!

SILVER

A & D Environmental Services. 336 434-7750 Scott Pearce, Vice President, spearce@adenviro.com. <http://adenviro.com/index.html>.
A&D Environmental Services, Inc. provides turn-key solutions to our client's environmental and industrial concerns.

AE Drilling Services, Inc. 864 288 1986 www.aedrilling.com
Environmental, Geotechnical and mineral exploration drilling since 1969. Well installations and abandonments, auger drilling, and split spoon sampling.

ENCO Laboratories, Inc. 919-677-1669 <http://www.encolabs.com>. A network of environmental laboratories that has been providing analytical testing services since 1988

Garco, Inc., 336 683-0911. Al King, alk@egarco.com.
<http://www.egarco.com/> GARCO, Inc. provides environmental, industrial, waste transportation, disposal and recycling services to industrial and consulting clientele throughout the Southeast.

Golder Associates 336 852 4903 rachel_kirkman@golder.com,
<http://www.golder.com> Golder provides ground engineering and environmental services worldwide to various industries, natural resource providers and government.

KB Labs 352 367 0073. Todd Romero. toddr@kbmobilelabs.com. We provide SCDHEC, NCDENR, and NELAP certified mobile laboratory services and membrane interface probe (MIP) direct-sensing technology. Our mobile labs can analyze water, soil, and soil gas samples onsite for volatiles, pesticides, or PCBs.

Parratt-Wolff, Inc. 800 627-7920 Robert Stevens,
bstevens@pwinc.com. Groundwater Monitoring and Subsurface Exploration Services.

Schnabel Engineering 336 274 9456 Robert Cannon
rcannon@schnabel-eng.com, <http://www.schnabel-eng.com>.
Schnabel provides geophysical surveys, dam design and rehabilitation, geotechnical engineering, and environmental services.

AEG-AIPG GeoNews
c/o Jim Stroud
Vulcan Materials
4401 Patterson Avenue
Winston-Salem, NC 27105

