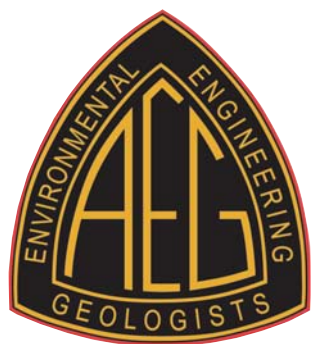


Vol. 59, No. 2 – June 2016



News



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KONA, HI**

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AEG 59th Annual Meeting – September 18–24, 2016

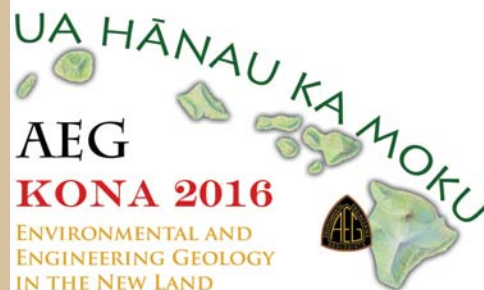
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Up to 24 sessions covering most environmental and engineering geology topics will be offered, allowing a broad range of geo-professionals to share projects and knowledge.

INVITED SYMPOSIA

Dam and Dam Foundation Design, Repair and Rehabilitation Symposium ♦ Archeology and Engineering Geology Symposium ♦ Rock Engineering-Rock Mechanics Symposium ♦ Reaching the Last Mile: Our Responsibility to effectively Communicate to those in Harms Way what Geohazards they Face and Implement Disaster Mitigation Strategies Symposium ♦ Landslides and Society: Economics, Social Impacts, and Emergency Management Symposium ♦ Coastal and Harbor Projects Symposium ♦ Engineering Geology for Tunnels and Underground Construction Symposium ♦ Transportation and Infrastructure Project: Rebuilding our Pipelines, Tunnels, Bridges, Highways and Railways Symposium

FIELD TRIPS

We have an outstanding selection of Field Trips and Guest Tours planned. Complete details start on page 16.

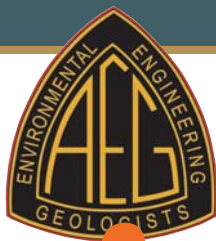
GUEST TOURS

Volcanoes National Park & S. Island Tour ♦ Traditional Hawaiian Culture & Gourd Art ♦ Macadamia Nut Co & Parker Ranch ♦ Downtown Kona Historic Walking Tour



SPECIAL EVENT - TRADITIONAL HAWAIIAN LUAU

Join us as the sun sets over beautiful 'Anaeho'omalu Bay for live authentic hawaiian music, dances and hawaiian fare. Full open bar included.



News

Vol. 59, No. 2 – June 2016

AEG News (ISSN 0899-5788; USPS 954-380) is published six times a year by the Association of Environmental & Engineering Geologists (AEG), with the quarterly issues Nos. 1–4, published in March, June, September and December, respectively. The *Annual Report and Directory* issue is published in January. The *Annual Meeting Program with Abstracts* issue is published in September. Print copies are distributed at the meeting. Subscriptions for Association members, which includes all six issues of the AEG News, is \$30 in addition to annual membership dues. Nonmember annual subscription is \$40.00, and includes only the four regular issues (#1–4) of the News. The *Annual Report and Directory* issue and the *Annual Meeting Program with Abstracts* issue are priced separately. Back issues of the AEG News are \$10 each. Inquiries should be sent to AEG Headquarters: Yolanda Natividad, Association Manager, 1100 Brandywine Blvd. Suite H, Zanesville, Ohio 43701 844-331-7867.

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SUBMISSION INFORMATION

In order of preference:

1. Send files via email, preferably as attachments, to both email addresses above. Optimum file format is MSWord 2004. Users of other software programs should convert their file to ASCII or text only.
2. Images should be sent as high-resolution jpeg or tiff files. **Questions?** Contact Andrea Ptak at 206-725-9169/andrealeighptak@me.com.
3. The policy of AEG News editorial staff is to limit the credentials of an individual to two. For example, if John Smith has a MS, a PhD and a PG plus a CEG and a CGWP, his credentials would be limited to John Smith PhD, PG, the two principal credentials. BS/BA and MS degrees will not be recognized. No effort will be made by the AEG News editorial staff to determine if individuals whose credentials are missing from the submitted copy actually have academic or professional credentials, nor will the staff verify the existence or correctness of the credentials submitted.

For detailed guidelines visit:

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Contact AEG Headquarters at advertising@aegweb.org.

NEXT SUBMISSION DEADLINE

July 31, 2016, for the September Issue

Canada Agreement number: PM40063731; Return Undeliverable Canadian Addresses to: Station A, PO Box 54; Windsor, ON N9A 6J5; Email: returnsil@imex.pb.com

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ON THE COVER

Mauna Kea, the tallest shield volcano on earth, is just one of the sights you'll see at the 59th AEG Annual Meeting on the Big Island of Hawai'i. See details of the entire event, on page 14.

THE ASSOCIATION

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What We Offer of Value!

PAUL SANTI, AEG 2015–16 PRESIDENT

Some of you may recall that in 2012–13 AEG conducted a “Needs Assessment” (NA) research program that involved an extensive survey completed by 419 professionals and 86 students. We also surveyed lapsed members, prospective members, and industry partners (another 251 individuals). This produced a wealth of data that has and continues to help us strategize our future efforts for years to come.

One of the most pressing items extracted from the data was the need to modify our governance, and that has been the main focus of our response for the last couple of years. In fact, you will be voting on your new Regional Directors this summer, so make sure you do so before the closing date of August 5. The results will be compiled by August 10th.

Now it is time for us to pick up the Needs Assessment program where we left off, and there are a couple of specific actions that I want you to be aware of. First, the Board of Directors completed a workshop at their mid-year meeting to brainstorm how to better help student members transition to professional members. The second action will be a full-day workshop this summer with the Executive Council (your national officers) and several leaders from the Strategic Planning Committee (both past and present). We intend to review, prioritize, and set action items to address the other important points that came from the NA survey. There is a huge need for local response, and a summary of some of the NA findings will help you both understand what people value about AEG and what you can do at the local level to provide these things. I've highlighted some of these findings to get you thinking:

The reasons for joining AEG are driven by networking and information offerings for professionals, but students join for scholarships and job opportunities. Local efforts should try to maximize these things.

Students really like the idea of reduced dues for new members, they want help with their job searches, they appreciate when we articulate all of the member benefits, and they need funds to attend national meetings. What can you and your Chapter do to help students find jobs and attend meetings?

When classified as “loyal,” “neutral,” and “vulnerable,” the NA showed that a high percentage of the volunteer work of the Association is done by neutral or vulnerable members, groups that are particularly at risk for burnout. Can you step up so we expand our base of volunteers?

The highest rated AEG offerings for Overall Performance are technical conferences, AEG Foundation, field trips, and Annual Meetings. Closely following that group are AEG News, section experiences, and overall value. Continuing education was identified as an important driver in the future, and we need more online opportunities, more geographic diversity, better communication about opportunities, and more offerings in general. Can you lead a field trip or offer a short course for your Chapter?



As the Annual Meeting is an important driver of AEG involvement and loyalty, it is important to recognize the aspects valued by members. The quality of speakers is the strongest driver, followed by social events, and offering a variety of interesting and practical topics. Do you have a project you can tell us about? Would you be willing to travel to

Hawaii, Colorado, or San Francisco to do so (our next three meeting venues)?

The *E&EG* journal is well regarded, and its most important attributes are timeliness and originality of the content. A number of respondents wanted to see more environmental and more practical/applied topics in the journal. For periodic newsletters, it is important for members to see original content, topics of interest, and some aspect of conveying the benefits of membership. Your colleagues are interested in your work, and your professional reputation will be advanced by publishing articles.

For individuals whose membership has lapsed, the main reason for non-renewal was “cost/bad economy,” followed by “time ran out/forgot/too busy.” Ask your colleagues about membership, and tell them about our networking and informational offerings.

Hopefully, this list has sparked some ideas for you as you think about your involvement in AEG. Please feel free to send me your thoughts, and let me know if you would like to see the original Needs Assessment report.



Paul Santi continues the AEG presidential duty of visiting Sections. In April, he visited the St. Louis Section meeting to discuss the West Salt Creek Landslide in Colorado. (See story on page 43.)

Looking Both Ways

Treasurer's Report for 2015 and the 1st Quarter of 2016

KATHY TROOST, AEG 2015–16 TREASURER

2015 Was a Good Year

AEG ended 2015 with a surplus of \$80,429—by all accounts a good year. The surplus allowed us to: make a \$20,000 deposit into the Treasurer's Reserve fund, set aside \$5,000 for Regional Director (RD) intra-regional travel, set aside \$5,500 for RD travel to the next Annual Meeting, and leave a buffer in our Operations Account. Past treasurer Dale Andrews and Jessica Hostetter at Offinger Management Co. (OMC) worked very hard in 2014 and 2015 to get our financial reporting and accounting aligned with our operations. Thankfully, the financial reporting in 2015–16 is much easier to follow and use than in previous years.



Treasurer's Reserve Performance

Our Treasurer's Reserve (TR) account was established a decade ago to provide a buffer for lean years. The account, with Fidelity Investments, is conservatively invested and fluctuates with the market. In 2015, after a drop and then partial rise, our investment ultimately decreased 2.2%, or -\$5,597.81. We made a deposit of \$2,693 into the account in mid-2015. The account ended at \$254,099.13 on December 31st, 2015 and by March 31st, 2016, it has increased to \$279,566.40, including a \$20,000 deposit from our successful meetings in 2015, and \$5,467.27 in unrealized gains. We are watching our TR closely for necessary adjustments (see graph below).



Our 2015 Accounts

The accompanying table shows our accounts from 2013–15. The totals for the Operations and Annual Meeting checking accounts reflect the culmination of various activities and we cannot directly compare 2013, 2014, and 2015 due to the financial realignment. The Legislative Fund shows the expected upward trend, since money is added to the account from members' annual dues and no draws had been made from the account before the end of 2015. The trend in the Accounts Receivable is positive and indicates that we are doing a much better job of collecting from those entities that owe us money, such as sponsors and exhibitors.

AEG Account Summary, Year End Values

Accounts	2015	2014	2013
Operations (checking)	\$195,046	\$130,727	\$178,088
Annual Meeting (checking)	71,071	26,582	17,063
Legislative Fund	56,545	41,389	25,979
Treasurer's Reserve	254,099	257,004	213,959
Accounts Receivable	4,268	26,163	60,981
Accounts Payable	31,294	30,830	67,515

2015 Revenue and Expense Summary

We ended 2015 with association administration expenses \$10,633 less than our budget. Administrative expenses include the costs to run AEG, averaging about \$17,000 per month.

In 2015 membership revenue was \$10,699 above our budget, and related expenses were \$4,056 under budget.

Publications are a member benefit that comes at a net financial loss to AEG. In 2015, this cost was under budget by \$13,429, due to efforts by volunteers to keep the cost down. Our publications are expensive, in part because we use quality paper, professional editing and layout, color printing, and we order a relatively small amount of hard copies. We see tremendous benefit and are proud of our publications, and therefore are hesitant to make significant changes.

The Annual Meeting (AM) income is now included in our budget, as voted by the BOD in 2015. The Meeting Chairs of the 2015 AM (Dale Andrews and Paul Hale) budgeted the meeting to provide a surplus at \$27,000, but the meeting actually made a surplus of \$44,662. The BOD also adopted a minimum surplus expectation for future AMs of \$25,000.

In 2015, our website revenues were down and our expenses were up compared to our budget. The net loss of \$22,241 in 2015 is due to several factors: 1) we changed web-site vendors with the expectation of lower cost and improved member experience in the future, 2) reduced level of effort to seek out sponsors and advertisers as we geared up with OMC, and 3) a drop in our Multiview/Multibrief and Job Board income. In 2016 we are working on increasing our level of effort at obtaining sponsors and advertisers and seeking reasons why the other revenue categories are down.

2016 Forecast and 1st Quarter Summary

We are fairly close to our budget for 2016. We are behind our budget goals for income from the job board on the website, and our publication expenses are over budget. We are making adjustments to minimize financial impacts from increasing publication costs in 2017.

The following table provides a summary of our account balances at the end of the first quarter. The balance in the Operations Account is similar to last year at the same time. The Meetings Account has more money because of the surplus from 2015. The Legislative Account is growing as expected; most of its increase comes in the beginning of the year because of the timing of membership renewal. And finally, the Treasurer's Reserve account shows an increase due to our \$20,000 deposit and a positive market.

AEG Account Summary, 1st Quarter 2016, in thousands

Item	3/31/2016
Operations Account	\$166
Meetings Account	\$62
Legislative Account	\$66
TR Account	\$280

The Annual Meeting in Kona is budgeted to generate a \$25,000 surplus, and the meeting appears to be on budget. We also expect to have a Professional Forum in December on

Naturally Occurring Asbestos. The value of hosting a second Association-sponsored meeting per year cannot be ignored. Not only do these additional meetings help AEG maintain a sound financial footing, they also help further our profession. The EC has recognized this and is planning for Spring Professional Forum meetings for the coming years to continue the model set in 2015.

Closing Remarks

The trends for 2016 generally look good. I look forward to carrying out the 2016 budget and putting together the 2017 budget. If you have any questions or concerns about AEG's financial status, feel free to contact me at ktroostaeg@gmail.com.

After difficult years following the 2008 recession, 2015 was a watershed year for AEG. Financially successful years let us build our financial strength, allowing us to continue to improve member benefits and to affect positive changes for our profession. We owe our success to our dedicated members, thank you for all you do!

I am honored to be serving as AEG's Treasurer. Thank you for putting your trust in me, and the rest of the EC.

Poised for Continued Success

YOLANDA NATIVIDAD, AEG ASSOCIATION MANAGER

As of June 2016, the hard work accomplished toward a governance restructure for AEG is culminating in the Regional Director elections. With this reorganization, the Association is setting itself up to provide more opportunity for new Chapters to form around the country as well as internationally. Your AEG Headquarters is here to provide the day-to-day professional support needed to make that growth possible.



A continued focus will be placed on membership retention and growth, as well as a refocus on AEG's Strategic Plan. We will be working on a number of member recruitment communications to grow AEG's membership and therefore further enhancing your networking opportunities as an existing member.

AEG will be concentrating on providing members and potential members quality Annual Meetings and professional forums to reinforce AEG's position as a leader in applied environmental and engineering geology. For 2016, your AEG headquarters will be providing the support services needed to make the online and onsite meeting registration a seamless experience for all attendees.

Lastly, please recognize AEG's Corporate Sponsors and Advertisers thus far for 2016. The companies who are supporting your AEG are listed in each issue of AEG News. If you

do not see your company listed and you believe they would be in support of applied geology, please have them contact us at advertising@aegweb.org.

We intend to support and honor the 59-year history of the association by helping AEG move toward providing an increasingly valuable membership experience. As dedicated members of AEG, we will look to you to provide feedback regarding the services and benefits of the association.

I look forward to seeing you at the Annual Meeting in Kona!

AEG Insider is your resource for weekly news!

AEG Committees – Utilize this valuable resource to update members on committee projects and to garner interest from potential new committee members.

Technical Working Groups – Update AEG membership with recent activities and future meetings.

Articles can be abbreviated in length. Send in your committee updates, calls to action, etc. to enews@aegweb.org.

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Where Are They Now?

JANE GILL-SHALER, SECRETARY, AEG FOUNDATION

*W*hat has happened to students since receiving their AEG Foundation scholarships? Where are they now? We wondered too, so, last year, we started contacting our former AEG Foundation scholars and wrote articles on several of them from the 2013 and 2014 seasons. These were published in a small newsletter, *The AEG Foundation Scholar*, which was disseminated to the AEG mailing list. Our expanding AEG Foundation offerings currently include nearly a dozen student scholarships, three of which were added in the last two years alone. As we follow up on our latest scholar-awardees to keep up with their careers, we thought readers of *AEG News* would like to learn about them, too.

Our featured scholar for the June 2016 issue of *AEG News* was the awardee of the 2014 Norman R. Tilford Field Studies Scholarship—Undergraduate Division, Julia Howe. Julia is currently in the Geological Engineering Masters program at the University of Utah in Salt Lake City. Utah, of course, is one of the premier ski destinations in the world, and when Julia wrote me to tell of her recent activities, she had to say that she had not gotten back to me sooner, as she had broken her leg in a skiing accident. We wish her a speedy recovery! Julia Howe writes, “Thank you for the e-mail! I always appreciate being able to stay in touch with the AEG community, especially because the field scholarship I received has helped lead me to my current studies.



Julia Howe (left) and her colleagues, Kirstyn Cataldo and Dominic Delgado, in front of the Rio Grande Rift Valley, NM.

“I used the Norman R. Tilford Field Studies Scholarship in 2014 to partially fund the required field camp program in Taos, NM, for my undergraduate degree in geology. At the time I received the scholarship I was a junior undergraduate, interning at a geotechnical engineering firm and going to school full time at Florida State University for geology and Spanish. The FSU

field camp program is where I first had the opportunity to develop hands-on fieldwork and geologic mapping skills, in an area that was vastly geologically different from Florida. I am very grateful to the AEG Foundation for facilitating my field camp experience!”

On the drive out to field camp from Florida, Julia and her friends stopped in some geologically interesting locations. Those of us who have a hankering to see this beautiful country will know the opportunity this afforded these young people! Their stops included Carlsbad Caverns, the Guadalupe Mountains, White Sands National Monument, and the Valley of Fires Basalt Flow. This was a wonderful introduction to some of the National Parks, whose 100th anniversary is this year.

The field camp projects were interesting, too. They included a stratigraphic column at the John Dunn Bridge at the confluence of the Rio Grande and Rio Hondo Rivers; a geologic map at San Ysidro, NM, which featured a collapsed anticline with mainly Jurassic sedimentary rocks, a gravity and magnetic geophysics project (from the Rio Grande Rift Valley into the Cuesta Caldera), a geologic map at Box Canyon, including gently folded sedimentary rocks and well preserved fossils, and a geologic map at Copper Hill (metamorphic rock, more complex structures). During Julia’s field trip summer, she and her friends also drove through Colorado—visiting Silverton, Durango, and Ouray—then Great Sand Dunes National Park, the Black Canyon of the Gunnison National Park, and a large caldera. They also stopped at several hydroelectric dams along the way and an old gold mine.

Julia continues, “My new-found love of field work in combination with a long-held interest in geologic hazards led me to apply to graduate programs in geological engineering. In the fall of 2015, I began a Geological Engineering Masters program at the University of Utah in Salt Lake City. I am currently working under Professor Paul Jewell on a NEHRP [National Earthquake Hazards Reduction Program] funded project, investigating Pleistocene fault dynamics along the central segments of the Wasatch Fault Zone. I am looking forward to warm weather and the field oriented component of the project this (2016) summer, where I hope to utilize skills I learned at field camp in 2014.”

So, dear AEG Foundation supporters, you see that your donations go a long way in helping our future geologists learn a lot about geology, which you can’t always learn from textbooks or classrooms. The AEG Foundation is a non-profit organization separate from, but associated with, AEG. We provide funding for scholarships and support for professional education. We have our own Board, and are a 501(C)3 non-profit organization; donations to support our programs are entirely tax-deductible. All of our scholarships and practitioner programs are funded by your donations and the income generated by investment of those donations. For more information, or to donate any amount to help us continue our programs, please go to www.aegfoundation.org. THANK YOU!

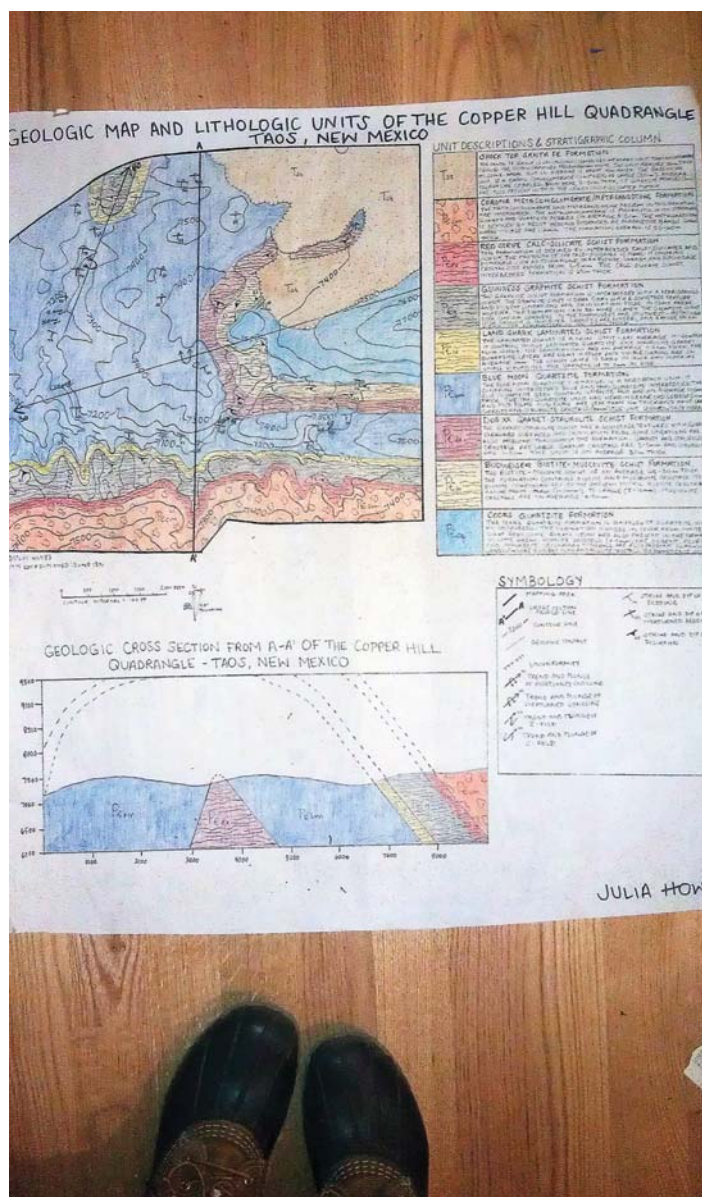
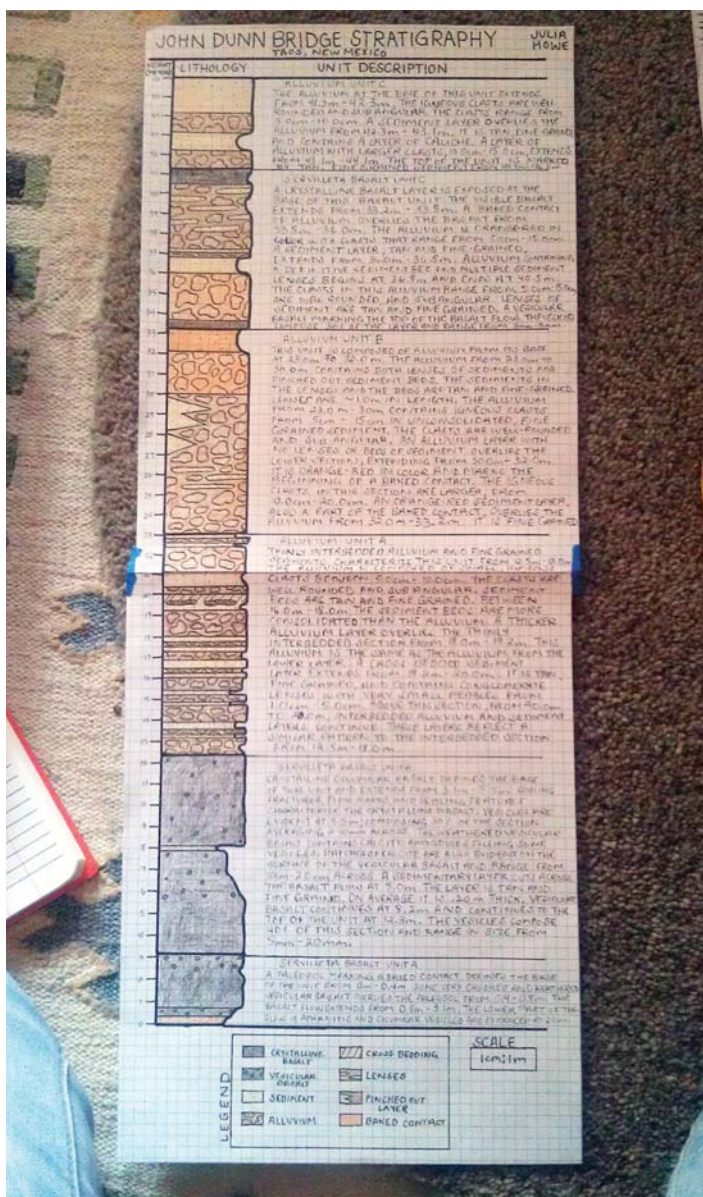


TOP LEFT: John Dunne Bridge at the confluence of the Rio Grande and Rio Hondo Rivers.

© 2013 RON HAGG.

BOTTOM LEFT: Stratigraphic Column at the John Dunne Bridge, by Julia Howe as part of her Field Studies requirements.

BELOW: Geologic map of Copper Hill Quadrangle, Taos, NM, by Julia Howe, as part of her Field Studies requirements.



Texas Section Check to AEG Foundation

STEPHANIE COFFMAN, TEXAS SECTION CHAIR

At the recent spring meeting of the Texas Section of AEG, Section Chair Stephanie Coffman presented an honorary \$5,000 check to the AEG Foundation on behalf of the Christopher C. Mathewson Texas Section Scholarship Fund. Bill Flanigan, a director of the AEG Foundation, was present to accept the check on the AEG Foundation's behalf, and thank Dr. Mathewson for his work in establishing this popular scholarship.

Since the inception of the Texas Section Scholarship and the re-naming of the scholarship to honor long time mentor Christopher C. Mathewson, the Texas Section has sought to find ways to keep the fund self-sustaining. To that end, the Section has bi-annual events whose net proceeds are dedicated to the fund. In addition, the Texas Section dedicates a portion of Section dues and a portion of its net proceeds from quarterly meetings to assist in the funding. The AEG Foundation sincerely appreciates the ongoing efforts of the Texas Section.

The Texas Section is proud to hold scholarship fundraisers in conjunction with quarterly meetings where Texas geoscience students can present their current studies either by poster or presentation. Fundraisers have included several successful golf tournaments with silent auctions, each followed by a Section meeting the day after the event. One year's event featured the energy educational film "Switch Energy Project."



L to R: Stephanie Coffman (Chair, Texas Section), Christopher C. Mathewson (AEG Past President), and Bill Flanigan (AEG Foundation Director and Texas Section Past Chair) PHOTO BY CHRISTINA DANCE

The Texas Section's next combined fundraiser and quarterly meeting will be hosted by Stephen F. Austin State University on January 20 and 21, 2017. Stay tuned for more details!

Visit the AEG E-Store...



Show your AEG pride—whether you're in the field, on the golf course, or on a run—with this vented baseball cap. There are a wide variety of items available to purchase now at AEG's E-Store, including a classic black ceramic coffee mug with the AEG logo, past issues of *AEG News*, *Environmental & Engineering Geoscience* journal, AEG special publications and more!

AEG has worked in conjunction with the AEG Foundation to put together some quality AEG logo items to make available for sale to members who want to show their AEG pride anytime—in the field, at the office, at professional events, or at play. Shown here are some examples of the items that are now available for purchase. Half of the proceeds collected from the sale of the items that are offered under the AEGF/AEG E-Store category will go to the AEG Foundation.

You can find AEG's E-Store online at www.aegweb.org under E-Store located in the main menu on the left.



Governance Committee

Sarah Kalika, Chair

For those members who are unfamiliar with the Governance Committee (GC), the GC was enacted to serve as an advisory committee and is one of two committees that report directly to the Board of Directors (BOD).

The GC is made up of current and past BOD members, who are elected to a three-year term by secret ballots cast by the BOD. Following the restructure this fall, the GC plans to continue to recruit committee members from the BOD. As you might expect, with the reduction of BOD members from 25+ to 16, long-term recruitment of GC members might be a challenge. However, the GC believes that the experience gained by serving as a BOD member is essential to establish the background necessary to assist with advising the BOD on AEG structure, policy, bylaws, and protocol.

Our current committee membership is comprised of Sarah Kalika (San Francisco), Chair; David Perry (Southern California), Vice-Chair; Alex Rutledge (Carolinas); Maddie German (Carolinas); Renee Wawczak (North Central); and Jason Hinkle (Oregon).

The GC is charged with acting as an advisor to the BOD in the following respects:

1. Review and summarize options for BOD and Executive Council (EC) structure, policy, by-laws and protocol
2. Provide training to and monitor the performance of the BOD & EC, and advise the EC and BOD when there appears to be a violation of AEG's Articles of Incorporation, by-laws, or policies
3. Interact at regular intervals with the BOD, EC and associated committees including, but not necessarily limited to, the Strategic Planning and Finance Committees

The GC's orientation and new BOD member training session is presented in person at the Annual Meeting and as needed by webinar prior to the mid-year BOD meeting. The GC orientation at the Annual Meeting usually includes a presentation by the Section/Chapter Support Committee and other guests.

The GC has spearheaded several efforts this year, including compilation of a list of BOD members spanning the past five years, partly for use by the GC in recruiting committee members and partly because such a list had not been previously maintained. GC member Alex Rutledge prepared this list by going through old AEG Member Directories and has included names and contact information. Thank you Alex for your hard work!

Additionally, the GC is working on a review of existing AEG Operating Policies to ensure compliance with the Restated Bylaws and Articles of Incorporation. This review includes participation by the members of the GC, EC, and operational committee chairs and is aimed at fixing typographical issues (changing Section to Chapter, for example) and proposing policy changes or new policies, as necessary. Proposed changes to policies, as well as proposed new policies, will be presented to the BOD during the September 2016 BOD Meeting.

If you're a past BOD member and would like to join us, or if you have any comments for the Governance Committee, please send Sarah Kalika an email at sarah@georx.net.

Strategic Planning Committee

Cynthia Palomares and Nathan Saraceno, Co-chairs

The Strategic Planning Committee (SPC), with the assistance of Dale Andrews, conducted a recent survey of the AEG operational committees and solicited responses from committee co-chairs. The survey revealed that over half of our volunteers are willing to take on more diverse, cross-committee, action items and also believe that their committees would benefit from more interaction and direction from the Executive Council, directors and headquarters. As a result, AEG is going to make some modifications to how our committees operate. The three primary goals of these changes are to:

1. Improve volunteer engagement
2. Prioritize opportunities with AEG's strategic plan
3. Provide our volunteers additional support

More information will come as we develop these initiatives!

The SPC would like to thank each committee member and co-chair for your passion and commitment to AEG!

AEG Operational Committees Co-Chairs include:

Advocacy–Phyllis Steckel, Communications–Matt Brunengo and Kami Deputy (outgoing), Section/Chapter Support–Cynthia Palomares and Steve Bruer, Student & Young Professional Support–Velita Cardenas, Licensure–Ken Neal and Charles Nestle, and, Meetings Advisory Committee–Sarah Kalika.

ALL committees welcome new volunteer members! Please contact Cynthia Palomares – cpalomar@tceq.state.tx.us or Nathan Saraceno – nsaraceno@gmail.com if you would like to be more involved with one of the operational committees!

Student and Young Professional Support Committee

Kevin Miner

Top Ten Technical References

Here is a new "Top Ten" list from the members of the Student and Young Professional Support Committee (SYSPSC); however, this one is a little different. We would like this one to evolve into a (nearly) comprehensive list of technical references recommended by professionals currently working in the environmental and engineering geology fields. If there is a reference that you use frequently or you couldn't do your job without, we want it on this list. We realize this list is lacking in environmental geology references. If you work in the environmental geology field, please help us make the list more complete. Ideally, we will receive enough recommendations to create separate lists for engineering geology, environmental geology and possibly some sub-disciplines. Please send us your top three, five, or ten references and what they are most useful for. Even if your recommended references are listed below, please send us your list so we can gauge which references are most popular. The updated list(s) will be posted on the website and accessible to all.

The following recommended references are listed in no particular order:

1. The National Geologic Map Database, U.S. Geological Survey (<http://ngmdb.usgs.gov>)
This is a great tool to find published geologic maps for your project area. A digital version of many of the maps can be downloaded for free including a file that is easily displayed in Google Earth.
2. *Engineering Geology Field Manual, Volumes 1 and 2*, U.S. Bureau of Reclamation
These books are valuable references at a very affordable price.
3. *Geotechnical Engineering Investigation Handbook*, Second Edition, Hunt
This is a great reference for field investigations and for common material properties for conceptual level design.
4. *Geology in the Field*, Compton
If you work, or plan to work, in the field this book will be valuable.
5. *Soil Mechanics*, Lambe and Whitman
One of the classics
6. *Foundation Design*, Cuduto
If you are going to build something on the ground, this would be a good place to start.
7. *Rock Slope Engineering*, Fourth Edition, Wyllie & Mah
This book is an updated edition of the classic *Rock Slope Engineering*, by Hoek and Bray.
8. *Engineering Geology: Rock in Engineering Construction*, Goodman
A great reference by a great author
9. *Seepage, Drainage, and Flow Nets*, Cedergren
Groundwater impacts almost all projects. This reference will help you understand how, why, and what you can do about it.
10. *Groundwater*, Freeze and Cherry
Another classic reference

Please send your suggestions to Velita.Cardenas@freese.com with "Recommended References" in the subject line. Or, send us a message on any of our social media sites: Facebook.com (AEGweb), Twitter (@AEGweb), or LinkedIn (Association of Environmental & Engineering Geologists – AEG).

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Your Section CAN Do Conferences and Continuing Education Courses

RICK KOLB, CAROLINAS SECTION

The Carolinas Section has hosted two conferences and two continuing-education courses since 2012. Your Section/Chapter can do this, too. This article will outline how we did it and what we learned about putting on successful conferences and courses.

Developing a Successful Conference

Our first effort was a topic of great interest to North Carolina. Our state may have some shale gas resources, and in 2012 fracking was a big national topic. Our Section thought that a conference to bring together and present all sides of shale gas and fracking would be of great interest to all walks of life, not only geologists. However, we had never attempted to put on a big conference. I met Andrew Stone of the American Ground Water Trust (AGWT) at a groundwater conference, and approached him with our idea for a two-day conference on shale gas.

AGWT agreed to take the lead for our conference, held August 2012. Our Section provided the local resources: we found the venue (a DoubleTree Hotel in Raleigh), invited 10 of the 17 speakers (including both keynote speakers), handled the publicity, solicited sponsors, and provided the floor workers. In our attempt to provide all sides of the topic, speakers were wide-ranging and included attorneys, scientists, and members of the Federal and State public sector and the Sierra Club.

The cost for the two-day event including a lunch and reception was \$235 for AEG members and \$275 for non-members. We offered CEUs for geologists, engineers, and water-well drillers. We had told Andrew we expected at least 100 attendees

and thought we'd have more. Our optimism was justified—nearly 200 registered for the conference including: geologists, regulators, business owners, interested citizens, and community representatives. AGWT paid us \$30 for each attendee, so we made a nice “profit.” However, of more value than the profit was what we learned—how to put on a big conference.

Publication of the draft guidance for vapor intrusion (VI) in 2013 by the EPA raised the already high interest in this topic among environmental professionals. We had thought (naively) that the EPA could finalize their guidance in 2014, so our Section decided to hold a conference on this topic in January 2014. We believed we had learned enough through our experience with the shale gas conference to enable us to do it on our own and make even more “profit.” We established a committee of eight planners and gave the event a title—Vapor Intrusion: The Conference.

We did everything in-house, except handle the registrations. Our Section had no ability to process credit cards and we knew the last week would be hectic with late registrations. Therefore, we turned that task over to AEG Headquarters. We invited speakers from all over the U.S., found the venue (an Embassy Suites in a Raleigh suburb), handled the publicity, found multiple sponsors, and arranged for the CEUs. The planners met regularly at different microbreweries in the Raleigh/Durham area, meeting more frequently as the conference approached.

The registration fee for AEG members was \$249, for non-members \$299, and \$149 for government employees. Support by sponsors was critical in helping to keep down the costs, and the state regulatory agency was very pleased with the nominal cost for their employees. Our conference was a



great success, with over 200 attendees from all over the southeastern U.S. Our income exceeded expenses by nearly \$20,000. From this profit, we made a \$5,000 donation to AEG and seeded our newly established Carolinas Section college scholarship fund with \$10,000. Feedback from the attendees was all positive. Many asked us enthusiastically when we were going to do another VI conference.

Presenting Short Courses

After these conferences, our Section took a different track and offered one-day courses in Basic and Intermediate Groundwater Geochemistry presented by Bill Deutsch of Port Townsend, WA, at The Frontier in Durham on October 5 and 6, 2015. Bill had presented these courses at the AEG Annual Meeting in Charleston in 2010, and we thought there was a need for them to be presented again. The courses were a success and were well attended. We had 50 registrants for the Basic course and 45 for the Intermediate course. We offered seven hours of continuing education credit for each class for geologists registered in South Carolina and engineers registered in North and South Carolina.

The course planners were Section Chair Maddie German of Smith Gardner, Jessica Stearns and Brian Smith of ECS Carolinas, Rick Kolb of Duncklee & Dunham, Adam Phillips of Prism Labs, and Walt Plekan of AECOM. We started planning these courses in January 2015. To keep the cost down, Maddie found a venue that offered free drop-in space in Durham. There was no monetary cost to use the venue, however, the course planners had to arrange all the catering and set up the tables, chairs, and sponsor spaces. We provided fruit, pastries, yogurt, and granola bars for the breakfasts and morning/afternoon breaks, and provided a catered barbecue lunch during the Basic course and box lunches from Panera during the Intermediate course. In true geologist fashion, the networking social Monday evening after the class provided opportunities for students, regulators, and consultants to discuss the day's topics over microbrews and hors d'oeuvres. Yes, there was a little extra work doing all the setup, cleanup, and food/beverage purchases ourselves, but it was worth it to keep the overall costs down. The cost for each course for AEG members was \$175 for one or \$300 for both. Non-members were \$195/\$350.

The Basics offering was framed as an introductory geochemistry course for scientists and engineers working in the field of groundwater site characterization, contamination, and remediation. It provided the basic information on geochemistry that is necessary to understand natural and contaminated systems and how the composition of groundwater evolves along its flow path in the subsurface. Attendees gained a better understanding of the types of geochemical processes that affect groundwater composition, the importance of collecting sufficient data to understand site-specific geochemical systems, and what the data they have collected means from the standpoint of contaminant occurrence and mobility.

The Intermediate course was also framed for scientists and engineers working in the field of groundwater site characterization, contamination, and remediation. It provided information

regarding the importance of geochemistry in the evaluation of contaminant fate and transport and in the design of applied remediation methods. Attendees gained an appreciation for the importance of geochemistry in predicting inorganic/organic contaminant fate and transport and the application of geochemistry to in-situ active remediation methods.

We had a glitch in copying the notebooks for the courses, and learned a big lesson to never assume anything when ordering copies from Kinkos. Thus, we only broke even on these courses, instead of a "profit" of a few thousand dollars.

However, this incident has not dampened our enthusiasm. Our Section/Chapter is about to begin planning another VI conference, probably for early 2017. We are still learning how to do these events, but each gets easier and easier. The primary need is energetic volunteers for the planning committee—hence, one of the reasons for regular planning meetings at microbreweries (we have over 130 in North Carolina). If only they had meeting space...

Bill Deutsch has expressed much interest in presenting these courses in other parts of the country for AEG. The Meetings Advisory and Section and Chapter Support committees have discussed this topic on recent committee calls. If you would like further information on Bill's courses, you can contact Rick Kolb of the Carolinas Section at rick.kolb1@gmail.com. Cynthia Palomares of the SCSC at Cynthia.palomares@tcep.texas.gov and Sarah Kalika of the MAC at sarah@georx.net can also provide assistance to sections/chapters in setting up these events.



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Special Section

PREVIEW

AEG 2016 • 59th Annual Meeting Kona, HI • September 18–24

AEG cordially invites you to the Big Island of Hawai'i

GEOLOGY OF THE BIG ISLAND OF HAWAII

A Brief Overview

WILLIAM GATES, STEVE MARTEL, KEVIN GOODING
AND TIM SHEVLIN

This year the AEG Annual Meeting will be at Waikoloa just north of Kona on the Kohala Coast of the Big Island of Hawai'i. On the island, active processes of volcanism, seismicity, mass wasting, and structural geology pose varied challenges for engineering geologists. The Big Island is about the same size as Connecticut—about 4,050 sq. miles—extending 90 miles north to south and 80 miles east to west. It is the largest island in the Hawai'i Archipelago, hence its Big Island moniker. In addition, the Big Island is the youngest of the chain and is still growing as lavas from the world's most active volcano, Kīlauea Volcano flow to the ocean on the eastern flank of the island. Mauna Loa has erupted 33 times since 1843 with the most recent eruption in 1984.

The following is a brief overview of the geology and geography of the Big Island of Hawai'i. For additional information on the volcanic geology for the island, the U.S. Geological Survey (USGS), Hawai'i Volcano Observatory (HVO) provides numerous professional papers, fact sheets and daily bulletins, including a concise summary of the Volcanoes of the Big Island (1995). In addition, Hazlett and Hyndman (1996) provide an overview of the Roadside Geology of Hawai'i. Neal and Lockwood (2003) provide a good geologic map of the Volcano and associated rift zones.

The Big Island exhibits extreme climates ranging from arid desert, to wet tropical, to snowy alpine. On the lava plains of the west coast around Kona the climate is arid, with an annual average precipitation locally as low as ten inches a year. Conversely, on the verdant east coast, orographic lifting of the moisture-laden trade winds leads to rainfall averages of more than 150 inches annually near Hilo. In contrast, the alpine summit of Maunakea sometimes dons a mantle of skiable and boardable snow. According to the Maunakea Observatory (<http://www.weatherbase.com>), on the summit annual temperatures range between from 25°–40° F with an average temperature of about 38° F and precipitation averages about 7.5 inches.

Volcano National Park



PHOTO BY ANDREA LEIGH PTAK

The Hawai'i island chain has formed as the Pacific plate moved northwest across the Hawai'i volcanic hot spot. Of the eight largest islands, the oldest and northwestern most is Kaua'i, and the youngest and southeastern most is the Big Island of Hawai'i. Five coalesced subaerial Quaternary volcanoes provide the geologic foundation of the Big Island: Kohala, Maunakea, Hualālai, Mauna Loa, and Kīlauea. In addition, the island is flanked to the southeast by Loihi Seamount, which is still below sea level and growing; and to the northwest, by an old dormant submarine volcano, Māhukona.

Starting in the northwest, Kohala Volcano rises above the town of Waimea to an elevation of 5,480 feet; it is the oldest volcano on the island. Kohala Volcano is extinct and consists of Pololu shield lavas, including the oldest lavas on the Big Island, dated at about 460,000 years, and the Hawai postshield-stage lavas as young as 60,000 years (USGS, 1995). Younger volcanic ash that mantles these lavas apparently originated from neighboring Maunakea Volcano (USGS, 1995). The lavas and ash deposits have been intensely weathered and eroded. Northwest of HI-250, Kohala's northwest rift zone extends through an elongate summit depression, which has been interpreted as an extensional basin at the headwall of the Kohala or Pololu landslide. This landslide was about 12 miles wide and traveled about 80 miles offshore. Waipi'o and Pololu valleys formed along faults that bounded this landslide. The Waipi'o valley is

*Papakōlea – the Green Sands Beach*

PHOTO BY DIANE MURBACH

the scene of ancient and recent landslide activity. The Kohala (or Pololu) landslide and debris avalanche extends from Waipi'o to Pololu, about 12 miles to the north. Scars of the Kohala landslide, which occurred about 120,000 years ago, are visible in the flanks of the valley. The landslide exposed deeply buried, altered rock that was more susceptible to erosion. After the landslide, fluvial erosion and mass wasting formed the deep valley of Waipi'o. The northeast Kohala coast continues to be a site of landslide activity, with multiple slope failures occurring during the 2006 earthquake.

Maunakea Volcano abuts the southeast flank of the Kohala volcano. Maunakea is the tallest sea mountain in the world; with a summit elevation of 13,796 feet above sea level, it rises over 32,000 feet from its base on the ocean floor, making it taller than Mt. Everest. Maunakea is dormant; the most recent lava flows include hawaiites and mugearites that are part of the post-shield Laupahoehoe Volcanic series that erupted between 65,000 and 4,000 years ago (USGS, 1995; Hazlett and Hyndman, 1996). The summit caldera has since been buried with these younger lavas and pockmarked with many cinder cones. These volcanics cover the oldest lava flows, Hāmākua Volcanics (basalts), which have been dated at 250,000 years old. The summit and upper flanks of Maunakea exhibit at least three episodes of Pleistocene glaciation during the last 180,000 years: the Pōhakuloa (180,000–130,000), Wāihu (80,000–60,000) and Mākanaka (40,000–13,000) series (Cannon and Bürgmann, 2009). The glaciers have extensively chiseled the summit leaving moraine deposits and a ring of till and gravel that circles the upper flanks of Maunakea. Many of the eruptions from Maunakea were explosive, producing widespread ash deposits. The USGS (1995) suggested these explosive eruptions might reflect the interaction of summit lavas with the ice of the summit glaciers.

Hualālai Volcano is located east and upslope from the city of Kona at an elevation of 8271 feet. The volcano is still active in the postshield volcanic phase; erupting approximately every couple of hundred years. The youngest shield lavas that have erupted from the volcano have been dated at approximately

128,000. The last eruption was around 1800–01. Recent lava fresh flows composed of a'a and pahoehoe are very evident where they cross HI-19 south of Waikoloa. Lava exposed in road cuts along HI-190 from the Pu'u Wa'awa'a, a trachyte and pumice cinder cone are the oldest lavas on the flanks of the Hualālai volcano. The trachyte flow has been dated at about 106,000 years old (Moore, et al., 1987; Seaman, C, no date). It is the largest known trachyte flow in Hawai'i. The USGS (1995) considers Hualālai volcano potentially dangerous because of its recent activity, relative steepness and location above the populated area of Kona.

Mauna Loa Volcano shares the saddle south of Maunakea Volcano and rises to an elevation of 13,679 feet. Mauna Loa is an active shield volcano and is considered one of the largest volcanos on earth and the largest subaerial volcano in both mass and volume on the Big Island (USGS, 1995, 2012). The volcano is potentially one of the most threatening volcanoes on the Big Island; flows have threatened the city of Hilo about 40 miles to the east. Two prominent rift zones radiate from the summit caldera; curving to the northeast and extending southwest, respectively. Lava flows composed of a'a and pahoehoe in various states of weathering are evident along the access road to the Mauna Loa Observatory on the northern flank of the volcano. The southeastern and western flanks of Mauna Loa are areas of giant historic landslides; at least six have been recognized in the geologic record as evidenced by blocky debris on the sea floor adjacent to the island. On the southeastern flank, rock units slide along a decollement (flat-lying fault) that dips towards the ocean. Slip along the fault generates large earthquakes. The Alika landslide on the western flank of the volcano failed about 105,000 years ago, and left a large eroded scarp above Kealahou Bay. A green sand beach (Papakōlea Beach) is located about two miles northeast of South Point where the southwest rift zone of Mauna Loa intersects the coast. The sand grains are composed of olivine which gives it its distinct green color. The olivine erodes from Pu'u Mahana, a cinder cone that partially encloses the beach.

Kīlauea Volcano is the youngest volcano on the Big Island and flanks Mauna Loa on the southeast. Kīlauea rises to an elevation of about 4,190 feet at its northwest crater rim. Kīlauea is the most active volcano on Earth and has been erupting on a continuous basis since 1983. It is in the explosive substage of the shield stage of volcanic activity and has had 61 recorded eruptions in the current volcanic cycle, according to the USGS (1995, 2011, 2013). The summit caldera contains a fluctuating lake of crusted lava that flows from a pit crater known as Halema'uma'u; latest overflow from the crater occurred in April 2015. According to traditions of Hawai'ian mythology, Halema'uma'u is the home of the Hawai'ian volcano goddess, Pele. Pit craters, eruptive fissures, faults, and fault-related fissures are the dominant structures along the upper East Rift zone. From Kīlauea's caldera a chain of pit craters follows the curving East Rift zone to the active Pu'u 'Ō'ō crater. According to the USGS (2011), Kīlauea's ongoing Pu'u 'Ō'ō eruption, which began in January 1983, ranks as the most voluminous outpouring of lava from the volcano's East Rift Zone in the last 500 years. Lavas from crater have flowed toward the sea ultimately creating new land. The ongoing eruptions from Halema'uma'u and Pu'u 'Ō'ō have destroyed more than 200 structures, including the Hawai'i Volcanoes National Park visitor center, the Royal Gardens subdivision, and many homes and buildings in the town of Kalapana.

The Big Island is seismically active in addition to being volcanically active. The south flank of Kīlauea bounded by its active rift zones and is slipping towards the ocean on a flat lying décollement (fault) about 6 miles below the surface. Slip along this flat fault generated a magnitude Mw 7.7 earthquake in 1975. A series of En echelon faults that step down towards

the ocean create staircase topography above this flat fault. The south flank of Kīlauea also was the site of an earthquake with an estimated magnitude ML of 7.9 in 1868. Both the 1868 and 1975 earthquakes generated locally destructive tsunamis. In 2006, a magnitude Mw 6.7 earthquake occurred 13 miles north of Kailua-Kona and a depth of 18 miles. Shaking from this quake damaged buildings, triggered numerous rockfalls, and caused more than \$200 million dollars in damage throughout the state.

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Your Stay in Hawai'i

Why Hawai'i?

It's easy to feel awed on Hawai'i Island. From the molten magma flowing from Hawai'i Volcanoes National Park to the snow-capped heights of Maunakea and from the green rain-forests of the Hāmākua Coast to the jet-black sands of Punalu'u Beach, Hawai'i Island is an unrivaled expression of the power of nature. To avoid confusion with the name of the entire state, the Island of Hawai'i is often called the "Big Island," and what an appropriate name it is. Nearly twice as big as all of the other Hawai'ian Islands combined, its sheer size can be inspiring. You'll find all but two of the world's climatic zones within this island's shores. The dramatic size and scope of the largest Hawai'ian Island create a microcosm of environments and activities. On this island's vast tableau, you'll find everything from extravagant resorts and incredible golf courses to modest local towns and sacred Hawai'ian historical sites, from the birthplace of King Kamehameha I to Hawai'i's first missionary church in Historic Kailua Village (Kailua-Kona). With so much to see, it's best to experience the island in small pieces. There's plenty of room on Hawai'i Island for your return. (from goHawaii.com)

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Weather/Climature

The terrain on Hawai'i's Big Island changes quickly, as does the island's weather. No other Hawai'ian island has the same climatic diversity. In some parts of the island, there's almost no rainfall for the entire year, and the terrain reflects that fact. However, in other locations like Puna or Hilo, it rains almost every day, creating the lush tropical growth that Hawai'i is known for. In order to take advantage of everything the Big Island has to offer without getting shut out by torrential tropical rains, it's helpful to research the island's micro-climates and stay in a place where you will have a better chance of enjoying blue skies (spoiler alert: one of those places is Kailua-Kona, where we are located). The Big Island has a tropical and warm climate year-round. The average temperature in Kailua-Kona ranges from the mid-70s in the winter, to the mid-80s during the summer. In higher elevations, such as Waimea, temperatures are often cooler, especially at night. Hilo can also be cooler, depending on your inland location, and Mauna Loa & Mauna Kea can be quite chilly.



Tourists at South Point

PHOTO BY DIANE MURRACH

2016 Field Trips

FIELD TRIP 1

The Big Island: Volcanoes, Geohazards & Active Structural Geology

Date: Sunday & Monday, Sept. 18–19

Time: Departs at 8:00 am on 9/18 and returns at 4:00 pm on 9/19

Location: Departs from the Waikoloa Beach Marriott Lobby

Cost: \$525 before 8/1/16, \$575 after 8/1/16
(Includes double occupancy lodging near Volcano National Park, two breakfasts, two lunches, one dinner, snacks, and guidebook of trip)

Leaders: Bill Gates, McMillen Jacobs Associates; Stephen Martel, University of Hawai'i; Tim Shevlin, Geobruigg NA, LLC; Kevin Gooding, Oceanit

Min/Max: Minimum 17/Maximum 35



Fig. 1



Fig. 2



Fig. 3

PHOTOS BY BILL GATES

The Big Island of Hawai'i is founded on five Quaternary volcanoes: Kohala, Mauna Kea, Hualālai, Mauna Loa, and Kīlauea. Active processes of volcanism, seismicity, mass wasting, and structural geology pose varied challenges for engineering geologists. For example, in 2006 a magnitude 6.7 earthquake off the northwest edge of the island caused widespread damage to buildings and triggered ground cracking, landslides, and rockfall. Rockfall and landslide hazards are exacerbated along twisting narrow two-lane roads with dangerous blind corners. Two Federal-Aid Rockfall Mitigation projects were funded to correct damage caused by the 2006 earthquake, one along Māmalahoa Highway (SR-190) in the Kona area, and another along SR-19 in the Three Gulches area of the Hāmākua Coast. Active fault and fracture systems at Kīlauea are unusually well exposed. These processes occur on many other volcanic islands as well. On day one we will explore the northern portion of the island, learn about the geology of Hualālai, Kohala, and Maunakea and observe examples of engineering geology and landslide problems.

Stops will include the Waipi'o Valley lookout (Fig. 1) to view landslide scars resulting from the 2006 earthquake and the headwall of the massive Pololu slump/debris avalanche, which occurred about 120,000 years ago. In addition we will visit rockfall mitigation sites along the Māmalahoa Highway, including the Three Gulches area near Laupahoehoe (Fig. 2). Rockfall mitigation includes rockfall barriers and various draped meshes and net systems. Day two will focus on spectacular structures in the southern part of the island along the Upper East Rift and Koa'e Fault System of Kīlauea Volcano. Pit craters and eruptive fissures are the dominant structures along the upper East Rift. The deep steep-walled pit craters are collapse features, not eruptive craters, even where bordered by eruptive fissures. Normal faults, grabens, and associated fissures and folds are spectacularly exposed within the Koa'e fault system. The faults are as long as 13 miles (20km), and some slipped in the 1975 magnitude 7.2 Kalapana earthquake. Fault scarps as tall as ~100 feet (30m) have developed in lavas ~800 years old.

The fissures have apertures as great as several feet (meters) and are reminiscent of large glacial crevasses (Fig. 3, left); they play a key role in development of the fault scarps and must influence the hydraulic conductivity of the basalt profoundly. Monoclinical folds also are associated with the faults (Fig. 3, right). The outstanding exposures and proximity of structures in different stages of development illuminate their systematic architecture, evolution, and mechanics.

FIELD TRIP 2 – SOLD OUT!*

Mauna Kea Stargazing

Date: Monday, Sept. 19

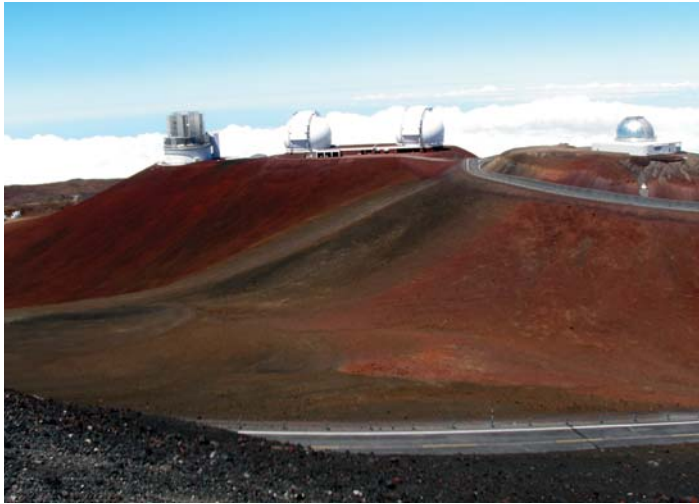
Time: Departs at 4:00 pm and returns at 11:00 pm

Location: Departs from the Waikoloa Beach Marriott Lobby

Cost: \$300 before 8/1/16, \$325 after 8/1/16

Leaders: Tiana Rasmussen, Amec Foster Wheeler

Min/Max: Maximum 11 – *waitlist is forming



PHOTOS BY DIANE MURBACH

Mauna Kea is the tallest shield volcano on earth, measuring at 13,796 feet above sea level, and about 19,700 feet below the ocean surface, for a total height of 33,500 feet. Due to the elevation of Mauna Kea above sea level, favorable trade winds, and its location in the Pacific Basin, it is a unique and prime spot to view the universe beyond Earth. The field trip will include a discussion of the geology of Mauna Kea and its neighbor, Mauna Loa, along with the history of lava flow events in the areas we will traverse on the way to the summit of Mauna Kea. A stop will be made at Pōhakuloa before travelling to the summit, where we will have a brief discussion and enjoy a boxed dinner. Once at the summit, we will discuss the unique geology and glaciation of the summit with a remarkable view of

the sunset (weather permitting). After the sun has set, we will travel down the summit to the elevation of 9,200 feet above sea level to the Onizuka Center for International Astronomy.

FIELD TRIP 3

Green Sand Beach and South Point

Date: Tuesday, Sept. 20

Time: Departs at 8:00am and returns at 4:00pm

Location: Departs from the Waikoloa Beach Marriott Lobby

Cost: \$225 before 8/1/16, \$250 after 8/1/16

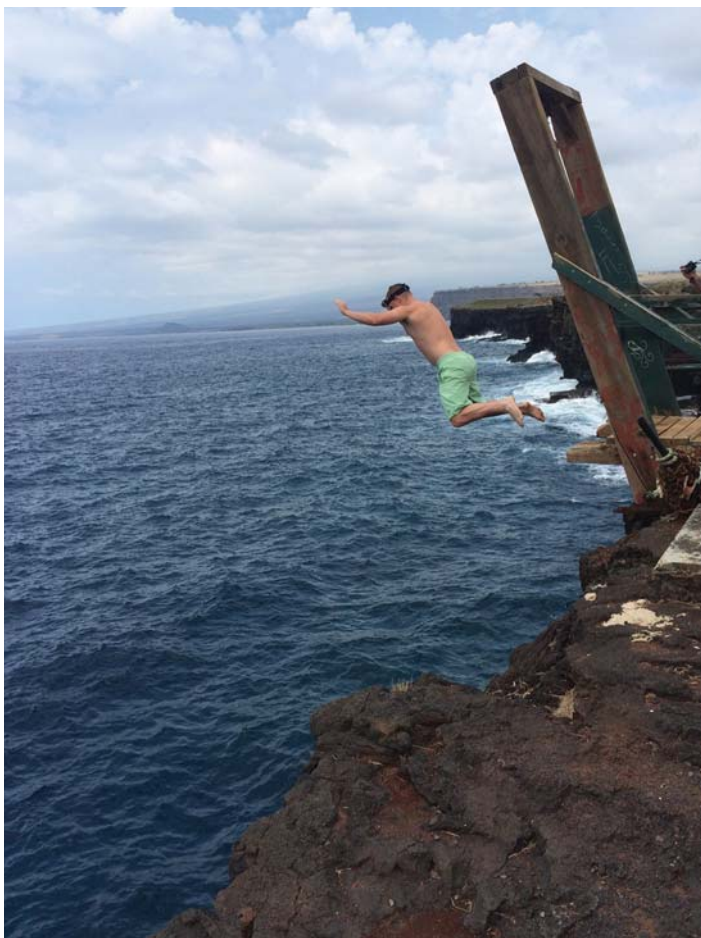
Leader: Chuck T. Blay, TEOK Investigations

Min/Max: Minimum 15/Maximum 17

The Big Island of Hawai'i displays the coalesced tops of five shield volcanoes, including the Earth's largest (Mauna Loa), tallest (Mauna Kea), and most active (Kīlauea). Above sea level, the volume of the island comprises less than 6 percent of the total volume of the merged volcanic mountain complex, extending to the surrounding North Pacific Ocean sea floor, with depths approaching 18,000 feet. The island's land area of over 4,000 square miles represents over 60 percent of the eight, main high islands of the Hawai'ian Archipelago, including Maui, Moloka'i, Oah'u and Kaua'i. However, Big Island sandy beaches comprise less than 5 percent of the beaches of the archipelago's main islands. They occupy only about 6.5 percent



PHOTO BY DIANE MURBACH



of its 320-mile (5,000 km) perimeter, but are distinctive, displaying great diversity in sand composition, from volcanic to carbonate.

Big Island beaches reflect the island's geologic youthfulness and its trade wind-dominated climatic setting. The portion of the island above sea level ranges in age from Kohala's oldest lavas at only 460,000 years to Kīlauea's current eruptive phase, now ongoing for over 33 years. Island climate varies from extremely wet along its eastern windward margins and mountain slopes—ranging locally to well over 200 inches annually—to its dry western leeward portions with less than 10 inches. Beaches of the island's northeastern, Hāmākua coast, although sparse, are composed predominately of greenish-gray to black detrital crystalline volcanics contributed by the numerous streams draining portions of the eastern slopes of Kohala and Mauna Kea. Beaches of the island's southeastern coasts are dominated by lavas of Kīlauea Volcano, many composed predominately of jet-black, hyaloclastite (glassy) sand generated by the violent, fragmenting coastal encounter of molten magma with sea water. Locally, the volcanic products of both Kīlauea and Mauna Loa are olivine rich, giving rise to beaches with a wide range in content to over 95 percent, such as Papakōlea Beach near the southern most point of the island. The dry, leeward Kona side island setting dominated by the western slopes of Mauna Loa and Hualai volcanoes, lacks the terrigenous input of detrital volcanic detritus. Variably developed near shore marine reefs contribute an abundance of the

carbonate skeletal detritus, providing for the development of the island's Kona side, alluring white sand beaches.

The field excursion begins at the beach fronting the Marriott Waikoloa Resort to examine and discuss the origin of a typical Kona side carbonate sand beach. A subsequent two-hour road trip to the southern-most point of the island, Ka Lae, provides for the examination of classic Big Island black and green sand beaches. Punalu'u Beach, perhaps the island's best known "black sand" beach is composed of jet-black hyaloclastite sand, the product of a Mauna Loa flow dating to greater than 3,000 years before present. At South Point, a 2.5-mile coastal hike is required to access world famous Papakōlea "Green Sand" Beach, the result of a unique combination of relatively common geologic processes. Today, green sand is being produced by the coastal erosion and surf winnowing of olivine-rich (20–25%) pumaceous deposits of 65–80-ft-high Mahana cinder cone. The 50,000-year-old cinder cone is the product of the explosive eruption of picric cinder and ash on Mauna Loa's southern slope, originally located over 400 feet above sea level. With subsidence of the southern portion of the Big Island, at a rate of approximately 2.6 mm/yr, the cinder cone was slowly brought down to sea level. Over the past few thousand years, its seaward flank has mostly been removed by wave erosion, resulting in a sediment-trapping landward indentation of the shoreline. At present a remaining portion of the cinder cone can be observed being reworked to provide for the greenest sand beach in the world, composed of 90–95 percent of the heavy mineral olivine.

FIELD TRIP 4

Kona Coast Landslides

Date: Tuesday, Sept. 20

Time: Departs at 6:30 am and returns at 5:00 pm

Location: Departs from the Waikoloa Beach Marriott Lobby

Cost: \$275 before 8/1/16, \$300 after 8/1/16

Leader: Kim Bishop, California State University, Los Angeles

Min/Max: Minimum 17/Maximum 20



PHOTO BY FLICKR/AFASCIUTO

PHOTO BY ERIC CANNON



The western and southern flanks of the Hawai'i Island volcanic edifices are the sites of some of the largest landslides on Earth. Eight massive submarine landslides have been identified in the area. One of these, the Hilina Slump, is the most active giant landslide on Earth. At least a couple of the landslides were emplaced catastrophically and created mega-tsunamis that washed coral fragments as much as 1,000 feet above sea level on slopes of neighboring islands. The giant submarine landslides along the Kona and south coasts have been studied in considerable detail, however, there is still much to learn about these features.

This field trip will travel along the scenic Kona (western) and southern coasts of the island to view geomorphic features created by massive landslides, including the Kealahakua and Kahuku scarps, Pali Kaholo (a 16-km-long, lava-buried headwall scarp), and the Hilina fault system, which defines the head of the active Hilina landslide in Volcanoes National Park. At various stops we will consider the timing, morphology, and mechanics of these colossal features. Also considered along the trip will be the evolution of the island's shield volcanoes and how the structure and dynamics of these volcanoes contributes to the development of giant landslides. Other related topics to be discussed include earthquakes, especially the 1868 M7.9 Great Ka'u and 1975 M7.2 Kalapana earthquakes, along with mega-tsunami caused by landslides.

FIELD TRIP 5

Tsunami and Landslide Hazards of the Northern Portion of the Big Island and Hāmākua Coast

Date: Saturday, Sept. 24

Time: Departs at 7:30 am and returns at 7:00 pm

Location: Departs from the Waikoloa Beach Marriott Lobby

Cost: \$275 before 8/1/16, \$300 after 8/1/16

Leaders: Kim Bishop, California State University, Los Angeles;
Tiana Rasmussen, Amec Foster Wheeler

Min/Max: Minimum 17/Maximum 44



PHOTO BY ERIC CANNON



WAIPIO VALLEY BY COLD CARDINAL - FLICKR

This one-day trip will traverse the northern portion of the Big Island by bus leading north from the hotel through Kawaihae with a stop to discuss liquefaction at Kawaihae Harbor. From Kawaihae, the trip will continue along the northwest side of the island for a stop near Māhukona to observe tsunami deposits. The trip will then backtrack through Kawaihae turning east toward Waimea with discussion of the Kohala range. The next stop will be at Waipi'o Valley Overlook, which is the southern extent of a massive landslide. From there the trip will continue south along the Hāmākua coast with discussion of historic tsunami deposits and a stop at Lap hoehoe Beach Park. The trip will then continue south

through Hilo, returning to the hotel via Saddle Road. A stop at the Tsunami Museum in Hilo is planned.

During the driving portions of the trip, discussions will include seismic history of Hawai'i along with a discussion of historic tsunamis that have impacted the island, particularly the Hilo coast. Discussion will also include seismic history of the Big Island including the 1868 M7.9 Great Ka'u and 1975 M7.2 Kalapana earthquakes, along with mega-tsunami caused by landslides.

FIELD TRIP 6

Hawai'i Volcano National Park

Date: Saturday, Sept. 24

Time: Departs at 7:30 am and returns at 7:30 pm

Location: Departs from the Waikoloa Beach Marriott Lobby

Cost: \$225 before 8/1/16, \$250 after 8/1/16

Leader: Rachel Teasdale, California State University, Chico

Min/Max: Minimum 31/Maximum 50



PHOTO BY ANDREA LEIGH PTAK



PHOTO BY DIANE MURBACH



PHOTO BY DIANE MURBACH

This one-day trip will explore Hawai'i Volcanoes National Park (HVPN). Starting in Waikoloa, participants will travel by bus over the "Saddle Road" between Mauna Loa and Mauna Kea. A quick stop at Pu'u Huluhulu will allow us to examine the interior of a cinder cone on the flank of Mauna Loa and see the cooling effects of lava flows. At HVPN, the trip will include stops along the caldera rim of Kīlauea, an introduction to volcano monitoring at the USGS Hawai'i Volcano Observatory and a sneak peek at some of Kīlauea's explosive deposits, which have been connected to important events in the cultural history of native Hawai'ians. Following a boxed lunch at the Jaggar Museum and park visitor center, we will stop along Crater Rim Drive at Kīlauea Iki to see the collapse crater from its 1959 eruption. A short walk through the tropical tree fern forest will bring us to the entrance of Thurston Lava Tube (Nāhuku), which we can walk through (0.3 mile/0.5 kilometer, paved and lighted). A short drive on Chain of Craters Road will allow views of pāhoehoe and a'a lava flow morphologies, which we'll also see at the Mauna Ulu trailhead where we can examine spatter ramparts and remnants of the fissure eruption (1969–74).

Short Courses

(CEUs will be offered for each Short Course)

SHORT COURSE 1

Drilling, Sampling, and Testing at Dams

Date: Tuesday, Sept 20

Time: 8:00 am–5:00 pm

Fee: \$275 Professional, \$105 Student

Credits: 8 PDHs and .8 CEUs

This one-day course is presented in a two-part format. Part A focuses on the importance of site characterization and the minimization of the use of invasive methods at existing dams from the engineer's and owner's perspectives. Part B presents current drilling capabilities, equipment, and best practices that are available for site characterization work, which includes invasive and non-invasive methods at dams from the Driller's and Consultant's perspectives.

Part A focuses on Potential Dam Safety Concerns and the Necessary Procedures or Policies to mitigate risk, and begins with an examination of the importance of exercising caution during site investigations at embankment dams, followed by a discussion of Dam Owner's Drilling Policies including Drilling Controls and Incident Reporting. The current policies for drilling controls and incident reporting used by the US Army Corps of Engineers (USACE) is explored, specifically Engineer Regulations (ER) 1110-2-1807.

Part B begins with a discussion of scoping for drilling at dams, and the advantages and limitations of each of the various drilling methods, including rotary, auger, hammer, horizontal drilling, CPT, and sonic drilling, and a discussion of proper back-filling procedures. This course will focus on the quality of samples and how samples are collected affect potential lab testing, and design considerations. Special ancillary controls and equipment and methods used when drilling at dams will be presented along with safety limitations and lessons learned. This course will include a discussion of the use of drilling mud and its physical properties, additives, tests and limitations. Case histories that detail successful drilling will be presented along with lessons learned. Additional material will be presented that focuses on contracting and contract oversight for drilling at dams, including a discussion of vetting contractors. Best practices for logging and field methods along with emergency/contingency planning for invasive work with the minimum of risk will conclude the course.

Who Should Attend

This course is designed to bring together drilling experts, dam safety managers, government and private sector engineers responsible for preparation and review of drilling plans and scopes of work, to discuss the current best practices for drilling at dams.

Instructor

Ethan Weikel, PG, Senior Geologist, USACE Baltimore District

SHORT COURSE 2

Geotechnical Site Characterization for Engineering Geologists

Date: Saturday, Sept. 24

Time: 8:00 am–5:00 pm

Fee: \$275 Professional, \$105 Student

Credits: 8 PDHs and .8 CEUs

This course was developed from the "Advanced Geotechnical Site Characterization for Geotechnical Engineers," a two-day USACE workshop, which was in turn developed from a three-hour graduate class that Dr. Olsen has taught many times.

Who Should Attend

Practicing engineering geologists and geotechnical engineers, consultants, and others responsible for development or evaluation of geotechnical site characterization techniques that would benefit from a deeper understanding of geotechnical site characterization methods.

Instructor

Dr. Richard S. Olsen, PE, Senior Geotechnical Engineer for USACE Headquarters, Washington D.C.

SHORT COURSE 3

Improving Hydrogeologic Investigations: Step One, Making Soil Borings that Are Accurate and Complete

Date: Saturday, Sept. 24

Time: 8:00 am–5:00 pm

Fee: \$295 Professional, \$105 Student

Credits: 8 PDHs and .8 CEUs

There is more to logging soils than just classifying dirt. The course begins with a brief self-assessment and a review of boring log basics. It progresses into an incremental series of sessions about correlating boring logs, building the hydrogeologic framework, and taking the mystery out of the subsurface. Sedimentary sequences from different depositional environments will be covered during the course. Experience shows that the best hydrogeologic investigations occur when field staff have up-to-date field analysis skills coupled with the ability to recognize and manage geologic uncertainties as they arise in the field, rather than waiting to evaluate site conditions in the office once the field work is complete. During this course, professionals will gain an advantage by improving the reliability, accuracy, and defensibility of hydrogeologic site characterizations. Complicated sites with

complex sedimentology can be particularly difficult, however, a basic understanding about how sediments apply to our hydrogeologic projects can radically help unravel the complexities. Knowing the key observations and developing habits allow us to build a meaningful geologic framework, not simply check a box differentiating clay from sand.

Who Should Attend

Any consultant, regulator or manager who works on ground water projects. This course is considered a mid- to advanced-level course based on past attendee feedback.

Instructor

Dan Kelleher, PG, CIPM, President–Midwest GeoSciences Group

Special Event

Traditional Hawai‘ian Luau Wednesday, September 21

6:00–9:00 pm – \$100 per person

Gather as the sun sets over beautiful ‘Anaeho‘omalu Bay and delight in classic Polynesian entertainment featuring live music, traditional dances of the South Pacific and a delectable selection of contemporary and Hawai‘ian fare with a full open bar.

You cannot come to Hawai‘i without experiencing this quintessential event!



Guest Opportunities

Be sure to sign up for one of these exciting Guest Tours when you register for the AEG Annual Meeting in Hawai'i.

GUEST REGISTRATION

We are offering just one Guest Registration option this year. Included with every Guest Registration:

- Ability to sign up for our four amazing **Guest Tours**
- Access to the **Exhibit Hall** with coffee/tea offered every day (Wednesday–Friday)
- **Icebreaker Reception** – Tuesday, 9/20 from 6:30–8:30 pm (one drink ticket included)

GUEST TOUR 1

Volcanoes National Park & South Island Tour

Date: Tuesday, Sept. 20

Time: 8:30 am – 5:00 pm

Location: Departs from Hotel Lobby

Cost: \$125 before 8/1/16, \$150 after 8/1/16

Join us for a once in a lifetime tour to Hawai'i Volcanoes National Park to see an active volcano! Your bus drive will tour the southern half of the island. First you will cross the saddle road between two volcanoes, Mauna Kea rising to 13,796 feet, and Mauna Loa rising to 13,677 feet. Then you will drive thru the City of Hilo, and uphill to the historic - Volcano House on the edge of Kīlauea Crater for lunch. After lunch you will visit the Jaggar Museum to view the active Halema'uma'u Crater in Kīlauea Caldera. The eruptions of Kīlauea produce molten lava adding land to the island of Hawai'i. Departing Volcanoes National Park you will drive south near the tip of the island, passing the southern most point in the United States. As you head north up the western coast you will pass thru the quaint town of Captain Cook. This final leg of the bus tour loop offers incredible views of the ocean as you pass thru the City of Kona and return to the Hotel.



PHOTO BY DIANE MURBACH

GUEST TOUR 2

Traditional Hawai'i Culture & Gourd Art

Date: Wednesday, Sept. 21

Time: 9:00 am – 3:00 pm

Location: Departs from Hotel Lobby

Cost: \$195 before 8/1/16, \$220 after 8/1/16



PHOTO COURTESY OF CONSERVATIONNATION.COM

Join us for a tour back in time and history of the Hawaiian culture. You will head south of Kona with your first stop at Pu'uhonua o Honaunau National Historical Park at Honaunau Bay. The park is also known as the City of Refuge and was a sanctuary for people that had broken the sacred laws, the kapu, and served as a home for those that were otherwise sentenced to death, as well as for defeated warriors, and civilians in times of war. We will then head back up the road to the IpuLani Farm and enjoy lunch. Then, you will learn the rediscovered technique of decorating your own historic Hawaiian gourd (*ipu*) from an expert *ipu* artist. Your completed *ipu* will be shipped to you after the decorating process is complete (about 3 months).

GUEST TOUR 3

Macadamia Nut Co & Parker Ranch

Date: Thursday, Sept. 22

Time: 9:30 am – 3:00 pm

Location: Departs from Hotel Lobby

Cost: \$115 before 8/1/16, \$140 after 8/1/16

Join us for a visit and sampling of macadamia nuts at the Hāmākua Macadamia Nut Company, followed by lunch at the Paniolo Restaurant in the country town of Waimea.

PHOTO COURTESY OF HAWAIIANRANCHERS.COM



After lunch we will visit the estate of the legendary Parker family, where you will be able to tour two historic homes on the property: Pu'uopelu and Mana Hale. Stroll through the great room and dining room at the Pu'uopelu home, and see the koa wood interior of the Mana Hale home that was milled by John Parker I.

GUEST TOUR 4

Downtown Kona Historic Walking Tour

Date: Friday, Sept. 23

Time: 9:00 am – 2:30 pm

Location: Departs from Hotel Lobby

Cost: \$95 before 8/1/16, \$120 after 8/1/16

Join us for a historic, half-mile walking tour from Ahu'ena Heiau, to the Mokuaukaia Church and Hulihe'e Palace along the coast-line in downtown Kona. You will tour inside the historic 1820 Church and the 1838 Palace. After your scenic and flat, half-mile walking tour, you will stop for lunch at Bubba Gump's Shrimp Company. Enjoy ocean views and a fun time at this water front restaurant in downtown Kona.

PHOTO BY AARON BROWN



Technical Program

A complete schedule and abstracts will be included in both the Program with Abstracts and Annual Meeting App.

Technical Sessions

- Volcanic and Seismic Hazards of the Circum-Pacific Region
- Application of Geophysics to Geotechnical Investigations
- Geophysics and Remote Sensing in Engineering Geology: Case Studies and Advances Using Geophysics, Drones and Satellites
- Groundwater and Hydrogeologic Projects
- Naturally Occurring Geohazards
- Geologic Hazards, Communication and Mitigation of Volcanic, Seismic, Liquefaction and Tsunami Hazards
- Environmental Remediation Projects
- Challenges for the Geotechnical Practice
- Climate Change and Engineering Geology: Coast Line Effects and Mitigation Projects
- Slope Movements: Landslides and Rockfall Hazard Remediation and Mitigation Projects
- Subsidence/Sinkhole Hazards in Karst and Other Terrains
- Unique Engineering Geology Projects

Symposia

- Dam and Dam Foundation Design, Repair and Rehabilitation
- Archeology and Engineering Geology
- Rock Engineering–Rock Mechanics
- Reaching the Last Mile: Our Responsibility to Effectively Communicate to Those in Harms Way What Geohazards They Face and Implement Disaster Mitigation Strategies
- Landslides and Society: Economics, Social Impacts, and Emergency Management
- Coastal and Harbor Projects
- Engineering Geology for Tunnels and Underground Construction
- Transportation and Infrastructure Project: Rebuilding Our Pipelines, Tunnels, Bridges, Highways and Railways

Registration Rates & Deadlines

Rate	By 8/1/16	After 8/1/16
AEG Member – Full Registration	\$445.00	\$495.00
Non-Member – Full Registration*	\$545.00	\$595.00
*BECOME AN AEG MEMBER and save \$100 on your registration fee.		
Field Trip ONLY – Limited Registration	\$75.00	\$100.00
AEG Student Member – Full Registration	\$95.00	\$120.00
<i>Full-time student with proof of current enrollment</i>		
Not a member—student membership is FREE!		
Student Volunteer	\$0.00	\$0.00
<i>Volunteer 8 hrs (2 in Registration) and receive a complimentary meeting registration. Contact heather@aegweb.org to register.</i>		
Guest Registration	\$100.00	\$125.00
<i>(Includes Icebreaker, Exhibit Hall, Guest Giveaway and ability to sign up for Guest Tours)</i>		
Daily – AEG Member	\$245.00	\$275.00
Daily – Non-Member	\$345.00	\$375.00
Daily – Student Member	\$55.00	\$55.00

Field Trips and Guest Tours

Rates and Deadlines are listed within the description on their corresponding pages beginning on page 18 in this issue.

SPECIAL EVENT –

Traditional Hawai'ian Luau

\$100/person

REGISTER EARLY!

Field trips and special events can sell out. Be sure to secure your spot for these exceptional events. Go to www.aegannualmeeting.org to register online.

Travel Discounts

Hawai'ian Airlines

Visit the homepage of www.aegannualmeeting.org for instructions to receive your discount code.

Airport Shuttle

Visit www.aegannualmeeting.org for details and registration link.

Student Opportunities



Student/Professional Networking Reception

Tuesday, September 20 – 5:15 pm

The Student and Young Professional Support Committee (SYPSC) invites you to attend this great event and have the opportunity to meet other students from across the country, as well as professionals.

Volunteer Opportunities

Students, if you are interested in volunteering 8 hours in exchange for a FULL Meeting Registration, please contact Heather Clark, heather@aegweb.org.

Sharing Science with the Users—Walking the Talk

JENNIFER BAUER, AEG PAST PRESIDENT

It is a recognized reality that we, as scientists, often don't communicate our research or findings to those who could be most affected by the results. In February 2015, AEG held a Professional Forum in Seattle, WA, *Time to Face the Landslide Hazard Dilemma: Bridging Science, Policy, Public Safety, and Potential Loss* to discuss ways to build these communication bridges. AEG followed that up with a symposium on the same topic at the 2015 Annual Meeting in Pittsburgh, and, is hosting similar presentations at the 2016 Annual Meeting in Kona. The purpose of all of this talking is to motivate us to actually start doing the walking.

I've participated in all of these forums and symposia because "walking the talk" of communicating what I know about landslides to those who can use it to protect themselves is something I feel very passionately about. Fortunately, the partners that my firm, Appalachian Landslide Consultants, has had on our landslide mapping projects have put an emphasis on sharing what we know with those that can really use the information.

To give you the short version of the back story, in 2004, western North Carolina experienced back to back hurricanes that triggered hundreds of landslides that caused millions of dollars worth of damage, destroyed homes, and killed several people. After these tragedies, the State authorized funding for the NC Geological Survey (NCGS) to start a landslide hazard mapping program. I, my current business partner Stephen Fuemmeler, and five other great geologists and geological engineers—Rick Wooten, Anne Witt, Ken Gillon, Tommy Douglas, and Rebecca Latham—mapped four WNC counties until June 2011. At that time, the state eliminated funding for the NCGS program.

There are many theories that surround the elimination of landslide mapping funding, but one factor that stands out to me is the amount of misunderstanding of what the maps represent. When Stephen and I started Appalachian Landslide Consultants, we knew we needed to approach things differently in order for user groups to understand how the maps can help. We are very fortunate to partner with non-profit organizations that are willing to work with us to find funding for landslide mapping projects. One thing that we all agreed on from the start was the importance of including the end users in the stakeholders meeting from the very beginning. We knew that we would have to break down misconceptions about the maps, and educate people step by step. Two main groups we wanted to form relationships with included the local Board of REALTORS® and the local Homebuilders Association.

During the first meeting with these groups, they had multiple questions about the maps, how they might impact property values, would they influence mortgage lenders or insurance agencies, would they change tax rates, would people

Landslide Map Workshop for Real Estate Industry Professionals in Haywood County

What Learn how to use the new landslide susceptibility maps to educate your clients and help them make a wise investment in mountain property. Hands-on demonstrations will show you how to quickly and easily interpret the maps for the property you are interested in.


When Wednesday April 20th 10:30 AM to 12:00 PM
*** Free Lunch Following Workshop ***

Where Regional High Technology Center, Room 3022
112 Industrial Park Dr, Waynesville, NC 28786


Bring Laptop for hands on demonstrations

RSVP Space is limited! RSVP by April 13 to
Jennifer Bauer at 828-329-3640
or jennifer@appalachianlandslide.com

RC&D
Southwestern NC Resource
Conservation & Development Council



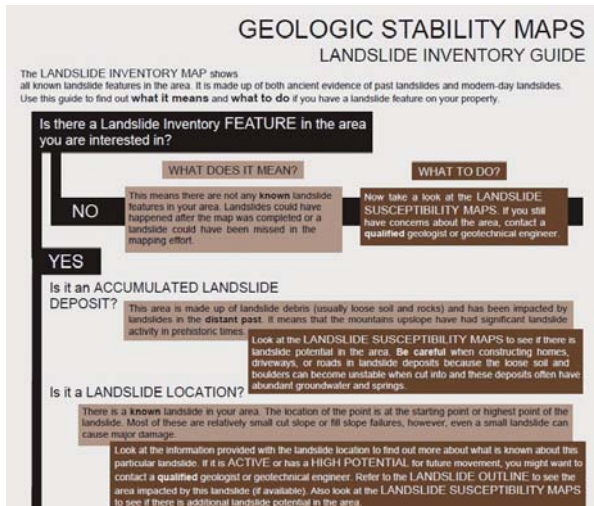
HAYWOOD
WATERWAYS
ASSOCIATION



ALC
APPALACHIAN LANDSLIDE
CONSULTANTS, PLLC

be afraid to look at property in western NC. All of these are valid questions, especially from those in the real estate industry. Fortunately, we had four years of data in the counties that had been mapped by the NCGS that we could present back to the group. We found that the maps had not affected property values; influenced mortgages, insurance, or tax rates; or scared people off from living in the mountains. In fact, some buyers said they prefer to look for properties in counties that had been mapped, so they knew more about the properties they were interested in.

As the projects continued and the stakeholder meetings continued educating the group, we formed relationships with the leadership of the Board of REALTORS® and the Homebuilders Association. The grantor organizations recognized the importance of these maps for them to make a difference. At our suggestion, they requested that we include an outreach and education component to our projects before they awarded the grant. To show the support of the most recent mapping project, several members of different user groups (real estate agents, mortgage lenders, appraisers, home builders) wrote letters to accompany the grant application.



The education component of this grant was a workshop aimed at real estate industry professionals on how to use the online landslide map viewer. This workshop is where I feel we at ALC are “walking the talk” for sharing our science. We held our workshop on April 20, 2016. Twenty-four people from the real estate industry attended, including real estate agents, attorneys, and construction managers. The workshop, which lasted 90 minutes, began with us educating them using pictures and stories about the types of landslides we found in their county. We showed them the different layers of the susceptibility maps and what each layer means. We then spent the rest of the workshop walking them through different scenarios on how to use the maps. The attendees brought their laptops or mobile devices and learned how to access information about features on the map, how to use the layers, and most importantly, what to do if a property is within these layers. The User’s Guide that we created for these maps was presented as a flow chart to walk everyone through the process. Throughout the workshop, we emphasized that the susceptibility maps indicate where a site-specific evaluation is needed to better determine potential landslide impacts.

After the workshop, we asked attendees for their feedback via an online survey. The attendees rated the landslide map workshop “Very Good” to “Excellent” overall. They thought it was “Extremely Helpful” to “Very Helpful.” We asked if their perception of the maps has changed after the workshop and 60 percent of the respondents said yes, following up with related comments. One attendee said, “The scope of the maps and the issues was an eye opener! The degree of variation for certain areas was also interesting. I can now guide my clients toward more serious due diligence before they purchase. Thank you to all involved.” Another said, “In looking at the maps it reflects a ‘cause and effect style’ which was not understood until now. One has to understand what types there are out there and then be aware of the areas they can impact. The landslide maps show that.”

We asked the attendees to tell us things they took away from the workshop. One attendee said, “How to navigate and advise interested clients on how to use this tool.” Another said, “Where the maps can be found, how to use the maps, technical information about landslides (types, causes, etc.)” A third said, “Different types of landslides and what they look like, what a landslide map is, how to use the landslide map as a tool in my profession, signs of landslide issues to point out to a client, and how much an evaluation from a professional would cost.”

One of the biggest takeaways from the survey, for me, was the attendees’ responses to the question “How important do you think it is for the remainder of Haywood County to have similar landslide maps?” Seventy-three percent believe it is “Extremely Important,” with the remainder of respondents saying it is “Somewhat Important.” The answer to this question represents the vast change in perception that has occurred over the past four years since beginning this project. Back then, many were skeptical about the maps. Now, through education and relationship building, we have one of the main user groups saying that it is important for the rest of the county to be mapped. This is evidence of how sharing science with the users, and “walking the talk,” takes science from being research to being applied to people’s lives. And that feels good.

Author’s Info

Jennifer Bauer is Past President of AEG and co-owner of Appalachian Landslide Consultants. You can hear more about this project and workshop during her presentation at the 2016 Annual Meeting in Kona during the Symposium *Landslides and Society: Economics, Social Impacts, and Emergency Management*. jennifer@appalachianlandslide.com

Not That Kind of Doctor: A Story of Natural Disaster Prevention in Indonesia

RON HARRIS

It was one of those rare, shining moments of feeling instrumental—of making a connection between what we love doing and the needs of others. Such was the case on a lazy Sunday afternoon, after church, in the village of Gelala, Ambon Island, Indonesia (Fig. 1). Many centuries ago, Gelala was one of the most important places in the world because it was where nutmeg, cloves and other spices, only known from eastern Indonesia, were loaded onto ships bound for Europe. If the ships made it back, the spices were worth more than their weight in gold.

Gelala is also famous for the number of times it has been destroyed by earthquakes and tsunamis. The most recent event was on Sunday afternoon, the 8th of October 1950, after church.

A call for help came from Ambon Island because of a strong earthquake magnitude 7.3 and a gigantic tidal wave. A large number of victims is feared. The existence of this great wave (according to press accounts, it had a height of 200 m) could not be confirmed from the tide gauge records. (Soloviev and Go, 1974)

In November of 2013, I visited Gelala with others from WAVES, my tsunami disaster mitigation research team, to investigate this account of a 200m-high tsunami. At the same time we also received permission to inform the people there about



Fig. 1. 17th century map of Ambon Island and the Dutch Colony established for the spice trade. Gelala is located at the narrowest part of the bay to the right of the fort (from *spiceislandblog*).

this event and others from the past, and to help them prepare for the next time a tsunami strikes. This moment, of not only investigating natural hazards, but also communicating directly with those in harms way, and helping them implement protective measures, was a cathartic experience. The locations of most hazardous geological events are known in advance, but due diligence in preparedness is commonly lacking, which causes a crisis to become a disaster.

Our initial approach in investigating the Gelala tsunami was to seek out survivors that may have witnessed the event—people that were old enough at the time to remember what happened, people who were born in the 1930s.

We found two men and a woman (Fig. 2) still living in the village that remembered the event. They all gave a similar story even though we interviewed them separately. They said that after a minute or so of strong shaking, cries were heard throughout the village to run. A large wave was approaching and the people only had a few minutes to escape to the nearby hills. From the vantage point of the hill they watched multiple waves nearly to the tops of trees wipe out the village, leaving only one home standing. A metal Japanese ship was washed 200 meters inland and rested on the hill next to the only surviving home. Another survivor, who did not hear the cry to run because she was deaf, was swept by the tsunami into a tree. The tree is eight meters tall; the base is two meters above sea level.

The account had mistakenly mixed up the distance the wave had inundated (200 meters) with the height of the wave (8–10 meters). Eyewitness Esther Pung showed us the ruins of the home she had lived in at time. It, like all of the other homes in the city, was sheared from its foundations by the wave.

The WAVES team also examined the geological record in the village for evidence of not only the 1950 tsunami but also others that we have historical records of, and possibly even earlier events known as paleo-tsunamis. While I was interviewing eyewitnesses, volunteer geologists Rachel Dunn and Professor Nicole Cox, were excavating and logging a trench dug in the heart of the village next to where the ruins of homes are visible (Figs. 3–4). About 10 cm below the clayey village floor they found a layer of broken pieces of coral and shells mixed with coarse sand. Rachel asked the villagers, who had congregated around the excavation site, “When was the last time you dumped a layer of coral and shells over the floor of your village?” It was obvious to all that this material had been carried onshore and deposited by large waves.



Fig. 2. My interview of Oma Esther Pung (behind window), who was 15 when she witnessed the 1950 earthquake and tsunami, about what happened. The village leader or Raja (stripped shirt) and many others helped me with the translation of the local language.



Fig. 3. Volunteer geologists Rachel Dunn (red shirt) and Professor Nicole Cox (green shirt) logging a trench dug in the heart of Gelala Village. Several tsunami deposits were found from previous events.



Fig. 4. A reporter from the Ambon Ekspres (white shirt) observes the trenching investigation for tsunami deposits in Gelala. The article he published a few days later resulted in an emergency meeting of the Governor and his staff, and made the national news. Most of the people in Gelala and the Ambon region were unaware of the earthquake and tsunami hazards they face. Now they know, and they are actively preparing for the worst nature may bring.

We interrupted the investigation for a few hours in order to give a presentation about tsunami hazards at one of the local churches to a standing room only crowd. The word was spreading about our forecast of future earthquakes and tsunamis; many wanted to hear it for themselves. I know Indonesian well enough to give the talk in the national language—Bahasa. After the presentation, we were inundated with people asking when these things would happen. Even though we explained clearly that “when” is unknowable, they still pressed us for some kind of prediction.

One of those in crowd was a reporter for the Ambon Ekspres, the newspaper for the region. I apologized that we did not have time at that moment for a full interview, but if he came with us to Gelala he could hear the accounts of eyewitnesses and see for himself the layers of destruction Rachel and Nicole were excavating. On the way back to the excavation site, I showed him the catalog of natural disasters we had compiled for the region from 400 years of Dutch colonist records (Harris and Major, in press). One of my former Indonesian students had translated it into the Indonesian language. The catalog documents how Ambon was flattened four times by earthquakes and inundated five times by tsunamis.

Those who gathered at the excavation site and many others were able to see first hand—from historical records kept by colonists, the memories of forgotten citizens and deposits of shells and coral fragments that the threat of earthquakes and tsunamis in the region is real. Most importantly, those who most needed to hear the warning, those actually in harms way, were there at the site of the research. And many who were not there read about what we found in the headlines of the regional and national news.

Why Indonesia?

This rare moment of communicating directly and effectively with those in harms way is beauty from ashes. The people of the Indonesian region have suffered huge losses from natural hazards, as much or more than any other place on Earth. Yet, only recently have they been able to understand these hazards in a way that helps them prepare in advance for the worst nature can bring.

My role to educate and empower those in harms way of natural hazards in Indonesia started without me knowing. During my first scientific expedition to Indonesia (1987) I was able to learn the language and live among the local people for several months. I trained many of the locals to recognize geological hazards and show them how to build a resilient community. This approach has become known as liberation science (Emerman et al., 2012). Although most of my expeditions to Indonesia focused on academic questions (i.e. Harris, 1991 and 2011) it was obvious that the local people were in harms way of many natural hazards, and did not know it or what to do about it.

Most of Indonesia is an active tectonic maelstrom, and presents one of the most diverse natural laboratories of active tectonic processes on the planet. It is also one of the most densely populated places on the planet. This dangerous combination is amplified by an overall lack of awareness of natural hazards in the region. Year after year of observing the plight of those in harms way motivated me to make natural disaster mitigation the focus of my research.

This transition was hastened by a comment I overheard my son make to one of his friends. He explained that his dad “is a ‘doctor,’ but not the kind that helps people.”

Although my first reaction was one of, “if he only knew,” the comment caused me to reflect upon the underlying intent of my passion for what I did. In my son’s mind there was an obvious disconnect between my research and the basic needs of others, which I eventually came to realize for myself. Within a few months I crafted a proposal to the U.S. Department of State identifying a new direction of geological research that still has few practitioners; it is called natural hazards.

Finding a way to connect my passion for geological research more directly with the needs of others was not a difficult stretch. Geology influences everyone on the planet everyday, especially in Indonesia, where more than one hundred million people live in harms way of explosive volcanoes, gigantic earthquakes and tsunamis.

Because of Indonesia's unique setting, it is the ideal testing ground to see if hazardous geophysical events can be forecast in order to save lives. At the time I wrote the proposal I fully accepted this illusion that successful forecasting is all that is needed to save lives, and all I am responsible for as a geoscientist.

My proposal was funded by the U.S. Department of State through a Fulbright Research Fellowship to Indonesia. This fellowship also provided funds for my family to travel with me and see for themselves how the geological sciences may directly help those in harms way.

A Year of Living Dangerously

My first glimpse of the scale of the problem of natural disasters in Indonesia came as I teamed with Indonesian colleagues and many students to conduct geological investigations and compile historical records of past natural disasters. Over the past 25 years we have completed 18 expeditions to various parts of Indonesia and translated hundreds of records kept mostly by Dutch colonists of the major earthquakes and tsunamis in Indonesia as far back as the 16th century.

We found evidence of more than 1,000 earthquakes—130 of which were destructive, and at least 95 tsunamis between 1600 and 2010. The records indicate that earthquakes left many cities in “rubble heaps” multiple times. Several tsunamis are recorded with run-up heights greater than 15 meters, which engulfed and washed away many coastal communities. One new problem is that the population has increased ten times what it was the last time most of these natural disasters happened.

Our geohazards research resulted in two publications that warned of reoccurring geophysical events and identified some of the most vulnerable places. The first paper was published in Indonesian (Harris et al., 1997) and the second in English (Harris and Prasetyadi, 2002).

The Sumatran region was identified as one of the most likely places for the next large (magnitude 8+) earthquake and tsunami. Our papers warned of hazardous regions in central Java where smaller, more frequent earthquakes occur and are commonly followed by devastating volcanic eruptions. We specifically warned of the dire consequences of a major eruption of Merapi volcano near Yogyakarta, based on data from nearby archeological sites.

When major earthquakes and tsunamis, and even major eruptions, will happen is unknowable. However, historical and geological records provide details over a large enough time window to recognize where these events are likely to reoccur. In other words, we thought we could address the question of “Who’s Next” in a paper published in 2002 forecasting the likely recurrence of major earthquakes and tsunami in Sumatra and other parts of Indonesia. Carolus Prasetyadi, who is one of my former graduate students and now a professor, is the co-author. An earlier version of the paper was published in Indonesian in 1997.

The Beginning of the Earthquake Storm

Two years after the November 2004 publication, I was presenting about our earthquake and tsunami forecasts at a university in Dili, the capital city of Timor Leste. Timor is one the places we warned could be next to experience a large earthquake and tsunami.

During the talk, I presented our research indicating that enough tectonic strain energy had already accumulated in the Timor region to produce a magnitude 7 earthquake. I mentioned that because most of the active faults in the region are underwater, the earthquake would likely produce a tsunami. To demonstrate this, I flicked a glass of water with my finger and noted that the earthquake would cause the ocean to slosh onto the land just like the water in the glass sloshed onto the podium. Few, if any, of those in attendance appeared to take me seriously.

The next morning after the talk, a magnitude 7.6 earthquake struck near Dili and caused a tsunami that flooded parts of the city including the university where I spoke just hours before. I was bathing at the time the earthquake hit. Suddenly water began sloshing out of the container I was using. At the same time the unreinforced masonry walls of the bathroom started moving in a wave-like motion. Fortunately, the building held and I survived the awkward situation.

This earthquake, however, was the beginning of a “seismic storm” that is still raging today in Indonesia. Within a few weeks of the earthquake near Dili, a gigantic segment of the boundary between the Asian and Australian plates ruptured off the northwest coast of Sumatra. Pressure had been building along the plate boundary for hundreds of years without any large earthquakes, which is why we drew attention to it in our article.

The most dangerous seismic gaps in Indonesia exist in populated regions of western Sumatra, south-central Java, and Timor... The entire sixteen hundred kilometer length of the Sumatra fault system has not slipped significantly for 130–150 years. Since this time, seven to eight meters of potential slip have accumulated and will most likely be released suddenly to produce a magnitude 8.0 + event... (Harris and Prasetyadi, 2002)

We were not the only scientists to forecast this event, so it was not a surprise to the geological community. Unfortunately, it was a surprise to those in harms way. The entire northern Sumatran and Andaman Islands, part of the Asian Plate which had been pushed eastward for hundreds of years, lurched back to the west more than 20 meters at nearly the speed of sound. The sudden release of this much pent-up energy ruptured a 1,600 km section of the plate boundary producing a magnitude 9.3 earthquake. This earthquake is the second largest ever recorded, and much larger than what we forecast. The rupture started near the northwest part of Sumatra and propagated northward at around 3 km/sec to the western shores of Burma. Even at this speed it took nine minutes for the rupture to make the 1,600 km journey. The nine minutes of shaking was so intense in the region that no one could stand.

The earthquake itself caused several buildings to collapse and killed hundreds of people. However, because the plate rupture occurred at an ocean depth of more than 3,000 meters, huge amounts of water was displaced, which produced the largest earthquake-generated tsunami in recorded history. The tsunami waves carried some of the immense forces released by the earthquake to nearly every shoreline on the globe—the closer the shoreline to the epicenter, the higher the waves (Fig. 5). There were at least 286,000 fatalities.

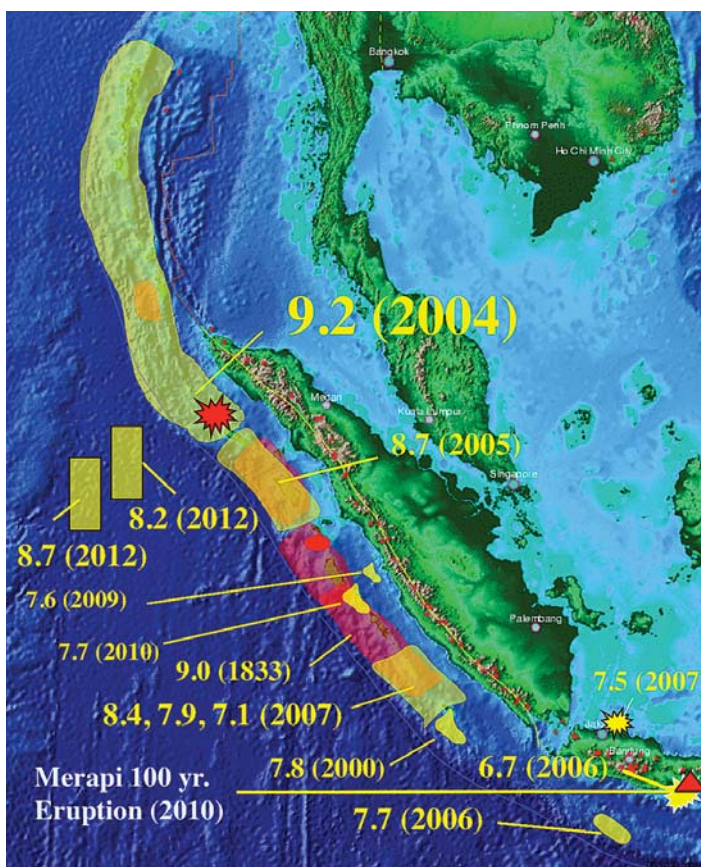
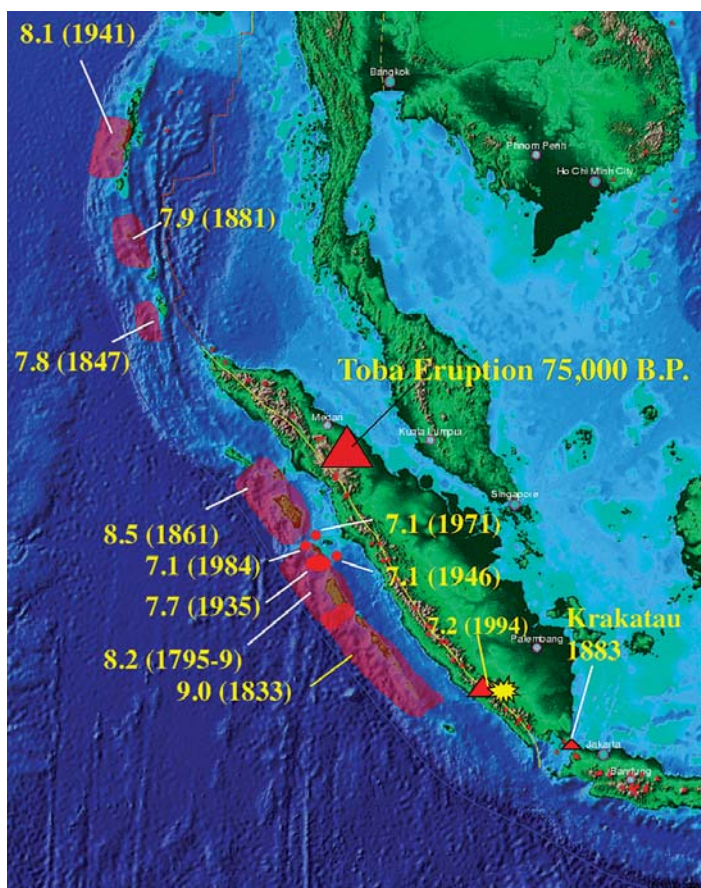


Fig. 5. Left-top: Map of Sumatra and part of Java with the estimated areas that ruptured to form giant earthquakes between 1795 and 1994. Fig. 5 Left-bottom: Same map with the major earthquakes and volcanic eruptions that have happened since we published our paper in 1997. Nearly 50 years had passed without an earthquake > magnitude 8.2 anywhere on Earth. Since the end of 2004 there have been 5 earthquakes > magnitude 8.2 in western Indonesian alone. A similar scenario occurred in the mid 1800s throughout Indonesia.

Lessons Learned from the 2004 Event

It is difficult to try to express my feelings as I watched video footage of the 2004 earthquake and tsunami event, and received updates from friends and colleagues in Indonesia who were impacted by the destruction. My son was right—I was still a “doctor” that did not help anyone. Even though we had successfully forecast this event, it made no difference to those actually in harms way. Most did not even know what a tsunami is or how to protect themselves from it. What adds to the tragedy is that it took an event of this scale to finally convince us of the uselessness of forecasting if those in harms way are not aware of the hazard or have no way of protecting themselves.

Immediately after the epic 2004 event, the press crafted a story that scientists had “predicted” the event and no one had listened to the warnings. Someone was to blame and it had to be the people of Indonesia. I was interviewed several times on television, radio, and for newspaper articles. One time, cameras and reporters from NBC, ABC, and FOX News were all set up at the same time in the conference room of the Geology Department at BYU. Instead of the story they were hoping to broadcast about how clever I was, what they got was a teary-eyed confession of the truth—that it did not matter how good our forecast was or where it was published. Those in harms way had no idea what was going to happen or how to respond. I left the communication and implementation to “someone else.” Now I realize that I am the “someone else”!

AGU Statement

Within two weeks of the epic Sumatran earthquake and tsunami the American Geophysical Union (AGU) published a statement addressing the need for broadening the responsibility of the geoscience community for all aspects of natural disaster prevention. The statement makes the following points:

- Make fundamental research and monitoring of natural hazards a higher funding priority
- Disseminate the relevant results to the public, especially vulnerable communities
- Implement effective multidisciplinary mitigation strategies worldwide

This statement, the first to my knowledge made by a major geologic organization, articulated what I was already feeling—that I had to do more than just better forecasting and monitoring. It does not help that few, if any, funding agencies have adopted the AGU statement into their request for proposal descriptions. What agency is supposed to communicate which natural hazards are likely to happen to those in harms way and help them implement disaster prevention strategies? Most agencies that have anything

to do with natural disasters are dedicated to relief with a focus on helping versus minimizing victims.

Currently, funding that includes the full spectrum of natural disaster prevention activities has to come from non-conventional sources, which translates into setting up non-profit organizations or some other non-governmental organization funded by mostly private money. To address this problem I set up a non-profit organization called "In Harms Way."

The purpose of In Harms Way is simple in concept—to focus on the second and third parts of the AGU statement, the parts few scientists have traditionally considered their responsibility. Most important is to learn from the mistakes and experience of the past—to do what was not done before the 2004 Indian Ocean tsunami disaster—tell those in harms way what is likely to happen and help them get ready. Through this approach hazards forecasting research joins with hazards education and preparedness, with the ultimate goal of saving lives and resources.

Recurring Earthquake Storm

One of the most interesting discoveries of our research of historical earthquakes and tsunamis in the Indonesian region is how these events commonly cluster in time and place. In other words, the rate of these events is not constant and the locations are not random. Various plate boundary segments of the Indonesian region experience several large earthquakes, tsunamis and volcanic eruptions, then set quietly for 30–50 years before another burst of intense activity.

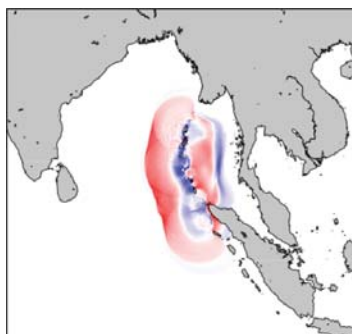


Fig. 6. Computer simulation of the 2004 South Asian Tsunami about one hour after the magnitude 9.3 earthquake. The red areas are positive waves and the blue areas are negative waves (sea withdrawal). The first positive waves struck Banda Aceh within 20 minutes of the earthquake. Whereas, it took three hours for the waves to reach Thailand to the east and four hours to reach India to the west. Still, no warnings were issued.

The gigantic 2004 Sumatran earthquake released so much energy that it initiated another mega-cluster of events throughout the whole region. Three months after the 9.3 earthquake, the plate boundary segment immediately to the south of it ruptured to produce a magnitude 8.7 earthquake and large tsunami that claimed thousands of lives (Fig. 6).

In 2006, a mid-sized earthquake ($M = 6.3$) struck central Java, killing around 6000 and displaced nearly a half a million people. Immediately after the event, nearby Merapi volcano erupted killing many people. The string of events is nearly identical to

what we found in historical records and warned would likely reoccur in central Java (Fig. 7).

The collisional plate boundary near densely populated Java has some of the highest strain rates in the world... which is manifest by more frequent moderate earthquake events (M 5.5–7.5)... Although these moderate



Fig. 7. Ruins around the only home standing after a 10-meter-high tsunami struck the coast of Java. The tsunami reached the upper floor of the three-story home in the distance.

events are of lesser magnitude...they pose a greater threat due to the more frequent devastation and disruption they inflict...Poorly regulated development in these zones of high seismic flux poses a significant threat not only to the many cities with unfavorable site characteristics, but also densely populated rural regions that have rapidly expanded into seismically unstable hillsides and cities along shorelines vulnerable to tsunami destruction. Most buildings in these regions are incapable of withstanding even mild horizontal ground motions...As witnessed in recent moderate seismic events ... a magnitude 6.4 quake near densely-populated regions with weak dwellings can cause thousands of deaths, billions of dollars of damage, sever gas and water lines, damage critical facilities ... and cause sudden economic collapse. These types of damage initiate new disasters. (Harris and Prasetyadi, 2002)

Two months after the seismic and volcanic disaster in densely populated Yogyakarta, a magnitude 7.7 earthquake struck offshore to the south of the city causing a large tsunami that killed hundreds of people.

In 2007 a magnitude 7.5 earthquake struck near Jakarta, a city of around 15 million people. Fortunately, the earthquake was 280 km deep and resulted in little damage. Two months later a series of earthquakes of magnitudes 8.5, 7.9 and 7.1 struck the SW coast of Sumatra causing more fatalities. In 2008, three aftershocks between magnitude 7.0–7.5 caused fatalities. In 2009, there were four destructive earthquakes between magnitude 7.0 and 7.9 that accounted for more than 2500 fatalities in Sumatra.

In 2010 there were three more earthquakes between magnitude 7.2 and 7.9 that accounted for hundreds of fatalities. A few hours before the 7.9 event, Merapi, a volcano in central Java, exploded with an intensity that had not happened since 1870. Hundreds of fatalities resulted, but it could have been much worse as close to 350,000 people were evacuated immediately before the eruption.

In 2012, a magnitude 8.6 earthquake struck off the coast of northern Sumatra, which was followed two hours later by a magnitude 8.2 earthquake near the same location.

Before the 2004 earthquake, there had not been a seismic event greater than magnitude 8.5 for nearly 39 years. Within

the next seven years after the 2004 event, four earthquakes larger than 8.5 happened in western Indonesia alone. It has been a decade of utter seismic terror, and more is likely to happen before the seismic mega-cluster ends.

More troubling, is the greater rate of fatalities than in the past. Indonesia has had earthquake fatalities in 25 of the past 26 years. The previous record was only two consecutive years.

Prevention Pays Off

If the earthquake storm in Indonesia was not enough, on March 3, 2011, there was a replay of the 2004 Sumatra event, only this time it happened in prevention-minded Japan. Even though the size of the earthquake and tsunami in Japan was comparable to the 2004 event in Indonesia, and the population density nearly the same, one person died in Japan for every ten who died in Indonesia. Japan's preparedness saved thousands of lives. Tsunami is a Japanese word, and the people of Japan are well aware of what it is and how to respond. Tsunami evacuation sites are common, and most people in coastal communities had participated in tsunami evacuation drills before the 2011 event. Preparedness works!

Indonesia's Next Generation

Indonesia does not have the capital resources to build resiliency like Japan, but has the human resources. A mandatory scouting program in Indonesia, known as Pramuka, involves boys and girls ages 12–19 in activities dedicated to *Siap dan Waspata*, which translates to “readiness and awareness.” In 2008, Carolus Prasetyadi and I were successful in linking our disaster mitigation activities with Pramuka. Since then we have led disaster prevention training seminars to groups of boy and girl scouts and their leaders in many of the islands of Indonesia. On some islands, special scout jamborees were held for the purpose of helping the scouts make a hazard map of their island, identify the most vulnerable areas and evacuation sites (Fig. 8).



Fig. 8. Pramuka scouts making geological hazards map of their island

The goal for working with Pramuka and government leaders is to help them build the capacity to conduct their own natural disaster prevention jamborees and activities throughout Indonesia. In 2012, one of the Indonesian geologists of the WAVES Team, Nova Roosmawati, and I worked with government disaster management leaders on densely populated Ambon



Fig. 9. Auditorium filled to capacity with Pramuka in uniform at one of the natural disaster prevention training jamborees held in Ambon, Indonesia. Volunteer geologist Rachel Dunn and I stand next to the head master of the school.

Island to try to mitigate the hazards of landslides threatening many neighborhoods in the city. Two days before we arrived an earthquake had caused a landslide that killed several people. Many families abandoned their homes and were living as refugees in local schools. We were able to train one of the government workers, Julian Fretha, how to identify unstable slopes and other hazards to prevent the disasters from happening.

After we left, Julian shared with us many success stories about how she had trained others in her office to make prevention presentations at schools, churches and other public meetings. She gave more than 40 presentations herself, including 10 seminars at various universities in Ambon and other islands (Fig. 9).

Julian Fretha Saves Thousands of Lives

When we met Julian in Ambon during our 2013 expedition, she was with the disaster prevention team she had assembled for Ambon. The team consists of the resident geophysicist from the Geophysical Survey of Indonesia (forecasting), the head of the Office for Social and Cultural Affairs for the island (communication), the head of the Red Cross, and the regional head of the Civil Defense Agency (Implementation).

Julian told an amazing account about a disaster averted due to her vigilance with implementing disaster prevention strategies. Here is her story.

Heavy rains during July 2013 caused unprecedented landslides and flooding (Fig. 10–12). One landslide was so large that it dammed a major river on the island above the city of Negri Lima. A lake formed behind the landslide that threatened to break the natural dam and flood the city downstream. Expecting the worst, Julian helped the citizens of Negri Lima to establish evacuation routes and conduct evacuation drills. She designed evacuation signs herself and hired local craftsmen to build and post the signs. A few days after the drills, the dam broke suddenly and sent a 15-meter-high wall of water down the valley. The people of Negri Lima only had seven minutes to evacuate before 425 homes in the city were completely washed away. Because the people of Negri Lima



Fig. 10. The flood destruction zone where homes in the city of Negri Lima were washed away by the 30 July 2013 flood.

knew what was happening, and had practiced where to go, nearly all of those in harms way were able to evacuate to safety. Approximately 2,500 lives were saved.

We visited the site of the disaster and the large refuge camps adjacent to where the Negri Lima used to be. Several of the people in the refuge camp commented that the people of Negri Lima owed their lives to Julian and her commitment to disaster prevention.

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Fig. 11. ABOVE: Dead jungle high-water mark from the lake that formed behind the landslide and (inset) one of several evacuation signs designed by Julian that guided the successful evacuation of more than 2,500 people

Fig. 12. Aerial view of landslide—the lake eventually spilled over the dam causing it to catastrophically fail. The flood reached the city below in ten minutes and swept away 258 homes.



Folsom Dam Auxiliary Spillway Project

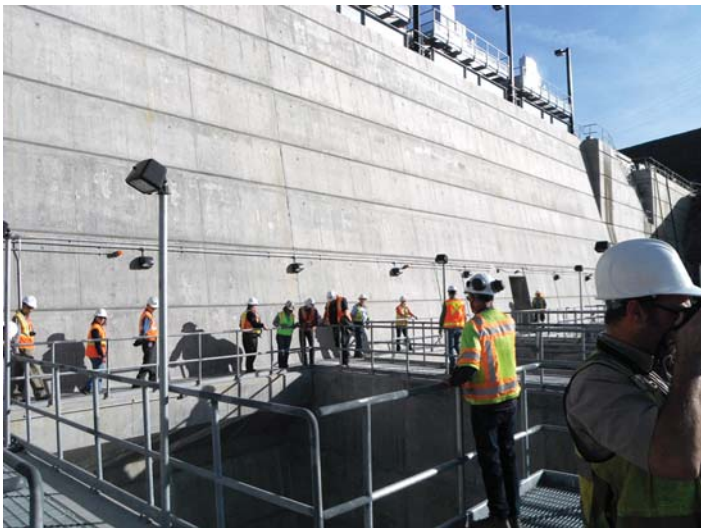
SACRAMENTO SECTION

Our Section undertook a highly anticipated field trip and tour of the Folsom Dam Auxiliary Spillway project on February 5, 2016. While the event was advertised and would be undertaken in “conditions either rain or shine,” we managed to hit a home run with a beautiful, late-winter, warm and sunny day for the special Friday afternoon event.



As summarized by the U.S. Army Corps of Engineers (USACE) at <http://www.spk.usace.army.mil/Missions/CivilWorks/FolsomDamAuxiliarySpillway.aspx>, the Folsom Dam Auxiliary Spillway project is an approximately \$900-million cooperative effort between the USACE and the U.S. Department of the Interior, Bureau of Reclamation (Bureau) that will help the Sacramento region achieve a 200-year level of flood protection. The joint federal project will construct an auxiliary spillway to compliment the functions of the main Folsom Dam that creates Folsom Lake on the American River. It will allow water to be released earlier and more safely from Folsom

Lake during a high-water event than can be from Folsom Dam itself. The spillway will include an 1,100-foot-long approach

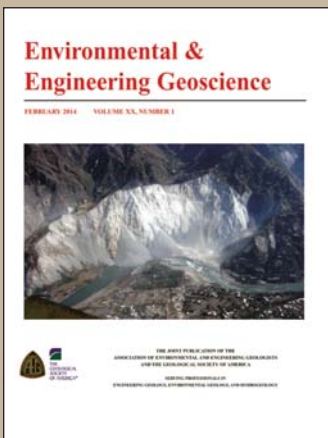


channel that will funnel the water from the lake into the spillway; a concrete control structure with six submerged gates that will be controlled in coordination with the gates on the main dam to control water releases, a 3,027-foot-long, concrete-lined spillway chute that transports the water from the control structure to the American River below the main dam; and a stilling basin that will slow the racing water back to normal flow levels that the river channel will be able to withstand. The entire spillway structure will operate in conjunction with the existing operations of the Folsom Dam and is not

intended to replace any of the dam's current functions or increase the height of the reservoir. The auxiliary spillway is scheduled to be fully completed in late 2017.

At the time of our field trip, the temporary cofferdam that held back the rising waters of Folsom Lake from the auxiliary spillway control structure had been removed the week prior, allowing water to inundate the approach channel and load the control structure and gates for the first time. Prior to visiting the site itself, the two-dozen field trip participants were treated to an overview of the project scope, site geology, and the engineering and geologic design and construction history of the project.

Several USACE staff volunteered their time to help lead the field trip and make the introductory presentations, including Coralie Wilhite, Tatia Taylor, James Martin, and Ken Patterman. After the introductory presentations and briefings on site safety and security rules, the field trip crew donned the required safety gear and was taken to the spillway control structure itself for the tour. We were shown the ongoing spillway construction activities and were taken "into the belly of the beast" of the control structure gallery, descending the multiple levels of stairways to the bottom-most gallery. After the tour of the control structure, the group moved to an overview of the stilling basin section of the spillway chute with additional views of the American River channel and main Folsom Dam. We want to express our gratitude and appreciation again for the efforts of the USACE personnel who planned and led the fantastic tour and who special-ordered the perfect weather for the day!



CALL FOR PAPERS:

AEG Members are encouraged to submit papers on interesting case histories, original research or other projects to its journal on the following topics:

- Environmental geology • Engineering geology
- Feasibility studies • Geotechnical engineering
- Geomorphology • Low-temperature geochemistry
- Applied hydrogeology • Near-surface processes
- Review papers in applied geosciences and technical notes (< 6 pages)

Benefits Include:

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Instructions for Authors: <http://eeg.allentrack.net/>

In this series, we present the opinions of the author as he explores the issues that are important in the implementation and operation of statutory licensure for geologists. The author's opinions are not necessarily those of the Association of Environmental & Engineering Geologists or any other organization or entity.

ISSUE LXXVII

Science Denialism: A Potential Challenge Unique to Licensure for Geologists

ROBERT E. TEPEL, PG, CEG, AND PAST PRESIDENT AEG

Introduction

Geologists face all the usual anti-licensure arguments, plus one that no other profession faces. You guessed it: geologists work with the Theory of Evolution and the concept of deep geologic time. These concepts are among the “first principles” of geology, and they draw the attention of people who can be grouped with so-called “science denialists.” Bentley (2013) provides an account of personal interactions with science denialists.

Working Hypothesis and Research

One can imagine, given the general nature of science denialist activities noted by Bentley (2013) that a legislator who is a science denialist, or is supported by them, would tend to question the validity of geological thinking and theory that is not in accord with their beliefs. And, one might hypothesize, questioning the validity of geological thinking and theory would lead the legislator to question the value of geological licensure. With the assistance of Kenneth Neal, Chair of AEG's Licensure Committee, I polled his committee members to ask if they were aware of any legislative initiative attacking licensure for geologists authored on the basis of science denialistic thinking. As opportunities arose, I also brought up the topic with colleagues on the ASBOG Council of Examiners. Their answers indicate that, to date, licensure for geologists has not

seen any direct threats from science denialist legislators. Clearly, this is limited and casual research, so readers are invited to provide additional information from their experience.

Discussion

The lack of direct and open challenges to licensure for geologists, challenges based on science denialism, is not surprising. It would not be realistic in a legislative body unless a majority of legislators were in strong alignment with that thinking, and that situation does not seem to be extant. Still, one can consider the possibility that science denialist legislators would quickly climb on the bandwagon of any anti-licensure bill aimed at geology licensure for their own reasons.

Conclusion

Legislative challenges to licensure for geologists might draw ancillary support from science denialists. Among the licensed design professions, only geology is likely to be challenged on the basis of science denialism.

Reference

Bentley, Cullan, 2013, Science Denialism: The Problem That Just Won't Go Away. *Earth Magazine*, American Geosciences Institute, vol. 58, no. 12, pp. 35–36.

The Homefront

Carolinas Chapter

Maddie German, Chair

The Carolinas Chapter began 2016 full steam ahead. Our first section meeting of the year was held in downtown Charlotte on January 21, where AEG President Paul Santi presented *Cultural and Economic Aspects of Hazard Mitigation: Debris Flow and Landslide Examples*. Despite an impending ice storm, about 40 members, sponsors, and students attended for great networking, excellent food and

drink, and a fantastic talk from Paul, who was ultimately stranded in Chapel Hill for the weekend. Also at this meeting, \$80 was raised in the 50/50 raffle for the Carolinas Scholarship Fund.

The spring Section meeting was held in Raleigh at 1705 Prime on April 7. The Carolinas Chapter presented *Two Speakers, Two Topics, One Meeting—Natural Gas Resources in North Carolina, and An Overview of the Coal Ash Issue*. This meeting had a great turnout with 70 professionals and 25 students from across the state. Matt Hanchey, Associated General Council at Duke Energy, presented his firm's efforts

regarding the excavation and management of 110 million tons of coal ash stored in impoundments in North Carolina. He focused specifically on their response to agency and citizen enforcement and energies to obtain necessary permits to keep the projects on schedule. Next was Dr. Kenneth Taylor, the NC State Geologist, who spoke about North Carolina's approach to further studying the potential for future resources, including details on the new boring plan to acquire more stratigraphic data. Both Matt and Kenneth stayed well past the scheduled end of the meeting to speak with attendees and answer their questions.

Also in attendance at the spring meeting was NCSTA (North Carolina Science Teacher Association) Outstanding Earth Science Educator (OESE) award winner Jo Wallace, an elementary teacher at J.Y. Joyner Elementary Magnet School in Wake County. She, along with Randy Bechtel of the State Geologic Survey, discussed the importance and appreciation for these awards from the teachers who receive them and sincerely thanked AEG for their continuing support and promotion of earth science education.

We held another 50/50 raffle at the Raleigh Section meeting and raised just under \$100 for the Carolinas Scholarship.

Sue Buchanan has already begun planning the fall field trip to Boone, NC, where we will learn about the ongoing ten-year urban stream study in Boone Creek, which runs through the Appalachian State Campus. This field trip will offer 8 continuing education credits. More details are coming soon!

Despite a packed schedule, the Carolinas Scholarship Committee reviewed applications from 10 students applying to be the first recipient of the Carolinas Scholarship. We are anxiously awaiting the final decision from the AEG Foundation and are looking forward reviewing many more applications in the coming years.

As of April 1, the Carolinas Section has 169 members, including 83 student members that we hope will transition into full members following graduation. We have made a concerted effort to increase and hold membership this year. The work of Russ Molyneux, our Membership Chair, and others in our Section has resulted in 3 new full members and 43 new student members since January.

We currently have 24 sponsors for the Carolinas Chapter for 2016. Sponsorship Chair Walt Plekan has been busy getting our existing sponsors renewed and recruiting new ones. The generosity of our sponsors allows AEG Carolinas to fund education outreach programs for students, our profession, and the general public.

Jennifer Thomas is producing our quarterly section newsletter, *GeoNews*. The latest issue was published in April 2016, and provides section members with section and national AEG news updates, a summary of our section financials, geology-related articles, and a place to advertise for our Section sponsors.

The Social Committee, led by Adam Phillips, is planning more baseball related networking events and a few brewpub socials for the spring and summer.

North Central Section

Stephanie Scilingo, Secretary

To start off 2016, we jointly met with the local Geotechnical section of the American Society of Civil Engineers (ASCE) at Pazzo's in downtown Chicago. Shane Cuplin PG, an environmental consultant from Huff & Huff, gave a talk about his experience overseeing the fast track redevelopment of a former dry cleaning site into an athletic recreation center in a suburb of Chicago. It was the perfect topic for our joint meeting, as evidenced by the many questions asked by both AEG and ASCE members in attendance.

In February, another local environmental consultant, David Heidlauf PG, of Ramboll Environ, gave a presentation on the remediation of a 62-acre, former lead smelter bankruptcy trust site in the St. Louis area. The project involved close cooperation with the Illinois Environmental Protection Agency to take the site through Remedial Investigation, Feasibility Study, Remedial Design, and three-year Remedial Action phases. A unique challenge encountered was the presence of nesting bald eagles in the vicinity of the site, which needed to be monitored regularly throughout the project.

At our March meeting, Doug Wolfinger, of Blue Water Satellite, Inc., gave a talk on salinity monitoring in the San Francisco Bay area. Wolfinger discussed how salinity—a measure of the total dissolved solids in seawater—can be analyzed using satellite imagery, thanks to the extensive coverage provided by the Landsat satellites.

April's meeting featured Dr. Jorge Rabassa, director of CADIC-CONICET and Universidad Nacional de Tierra del Fuego. Dr. Rabassa traveled from Argentina to present a talk on climate change and its impact on the glaciers of Patagonia and Tierra del Fuego. Dr. Rabassa's research included investigation of glacier recession, ice thinning, and permafrost reduction that has occurred in Patagonia and Tierra del Fuego since 1978.

A sincere thanks to all of the speakers who have presented interesting topics so far during 2016!

New York–Philadelphia Section

Brionna O'Connor, Newsletter Editor

This spring, our Section held its Second Annual Student Night, bringing together both new and longstanding members. The event allowed for the Section to engage with the student members on their academic research with a poster session and several oral presentations following dinner. Dr. Chad Freed, Associate Professor of Environmental Science at Widener University, led the night with a discussion on how professors use and navigate the internet as a resource in the modern geology classroom.

Oral presentations varied, starting with a talk led by Bowen Liu of the University of Pennsylvania on Comparing Surface Interpolation Techniques for Accurate Location using an Electromagnetic Survey over Buried Steel Drums. Bowen discussed the various interpolations created in a Geographic Information System (GIS) to compare the techniques and ultimately laid out



FRONT ROW: NY-P board members & student presenters Amanda Forsburg (Langan), Rose DeLorenzo (Matrix New World), Kendra Decker (West Chester), Britney Vazquez (Penn), Janelle Jesikiewicz (Penn), Dr. Chad Freed (Widener), and Curt Schmidt (H2M); BACK ROW: Student presenters (back row): Zach Zukowski (Villanova), Pablo R. Garza (Villanova), Brooke Dumin (Widener), Bowen Liu (Penn), Taylor Mantey (Penn), and William Akin (Penn)



NY-P section members Joe Torlucci (Maser Consulting) and Dr. James Brown (William Patterson University) both current and former committee members for NY-P get caught up at student night during social hour.



NY-P student presenter Britney Vazquez (Penn)

a compelling argument and clear conclusion of his study. Britney Vazquez, also a student from the University of Pennsylvania, presented the effects of land use change on watersheds in Chester County, PA. She utilized GIS, Arc Hydro tools, and a collection of water quality data in order to assess changes to runoff generation from 1992, 2001, and 2011. Following Britney, Villanova graduate students Zach Zukowski and Pablo R. Garza discussed various methods for measuring the hydraulic conductivity in the unsaturated zone where storm water control measures (SCM) are in place. The presenters artfully navigated through many variables including soil conditions, infiltrometers, and field and laboratory measurements. The presenters were awarded small gifts made possible by personal and corporate sponsorships.

On May 12, guest speakers Max Perlow of Pennoni Associates, Inc and Josh Wagner of DiGioia, Gray & Associates discussed their involvement with unmanned vehicles (UMVs or drones) applications in geo-environmental hazard assessment and potential environmental data acquisition. The drones, GeoBot and GeoCopter, developed by Engineering Knowledge Management, LLC (EKMLLC), have been used for the assessment of sinkhole collapse, subsidence, and slope failures. The company has developed a unique process for implementing these UMVs on sites. Max and Josh worked with EKMLLC while studying at University of Pittsburgh and are now making efforts to find applications for UMVs within their companies as employed geologists.

Oregon Section

Chris Humphrey, Secretary

For the second year in a row, the Oregon Section is leading the BOD Membership Challenge to encourage all Sections to add more Full Members between December 31, 2015 and March 30, 2016. The final numbers are in and the Oregon Section will

be providing a prize to the Section that added the most Full Members at the Mid-Year Board Meeting.

Our February meeting featured guest speakers Robert Web and Paul Fuglevand of Dalton, Olmsted, & Fuglevand, Inc., presenting Sediment Remediation – Current Practices with Examples from Puget Sounds; Residuals & Releases Reduction & Activated Carbon. They reviewed the current industry practices with particular focus on recent developments, including methods to reduce or eliminate residuals and the use of activated carbon. February's meeting had over 70 attendees and during Robert and Paul's presentation, sediment specimens and remediation products were passed around to allow the entire audience to actively engage in the presentation and the topic.

In March, we continued our annual tradition of holding a joint meeting with the Association for Women Geoscientists (AWG). Geoarchaeologist Brandy Rinch treated Oregon members to her talk entitled, *Hidden Landforms and Buried History – Alluvial Geoarchaeology in the South Puget Lowland*. Using geoarchaeological examples from the Puyallup River delta and the Chehalis River basin, Brandy's presentation introduced the audience to the field of Geoarchaeology. Brandy has worked as a Geoarchaeologist at Northwest Archaeological Associates (NWAA) and SWCA Environmental Consultants (SWCA). We thank Brandy for a great, informative talk and AWG for co-hosting this meeting.

At our April meeting, AEG's very own 2016 President, Paul Santi, continued our great series of talks with Debris Flows Following Wildfires in the Western U.S. Paul is also the Head of the Department of Geology and Geological Engineering at the Colorado School of Mines. In his presentation, Paul illustrated the changes imposed on watersheds during and after wildfires, resulting in a dramatic increase in debris-flow occurrence and magnitude. It was also great to hear about some of the work that AEG has been up to recently.

Portland State University (PSU) Student Chapter

Bryan Allen, Student Chair

PSU's Student Chapter is having a great year so far! We're looking forward to exciting and informative events coming up for this spring term. We are pleased to see an increase in the number of students attending the Oregon Section monthly meetings, as well as their involvement in AEG PSU activities. With such an increase in student involvement, we have added additional leadership to assist with event planning and execution. This year's AEG Student Chapter officers are Bryan Allen, President; Jessie Meziere, Vice-President; Eric Adams, Treasurer; Bryce Nelson, Outreach Coordinator; and Eli Ahern, Secretary; along with Dr. Scott Burns, RG, CEG, our Faculty Advisor.

Past Events:

In December 2015, the AEG Student Chapter sponsored travel and registration costs for three students to attend and participate in the Fall AGU Conference in San Francisco. After the event, they presented a short lecture and Q&A about their experiences for students unable to attend the AGU meeting.

In February, we hosted a CV/Resume workshop, led by Assistant Professor, Max Rudolph. Twelve students attended and were able to receive feedback on their resumes. March saw 20 students attend our first in a series of Brown Bag Lunch Lectures featuring Scott Burns' talk on the Missoula Floods.

On April 2, the Chapter coordinated a field trip to the Bull Run Reservoir, hosted by the Portland Water Bureau. A combination of 25 students and faculty joined us to see the source of Portland's drinking water supply and to learn about the local geology from Scott Burns. Later that month, we partnered with Cascade Drilling, Inc. and AEG Oregon Section to host an interactive workshop led by industry experts that explored advances in environmental drilling, investigation, and remediation.

We held our annual *Terroir* Night, May 6, led by wine and terroir expert Scott Burns who regaled us with his unique insights into how vineyard soils influence the flavors and aromas of varietals from around the region.

Rocky Mountain Section

Denise Garcia, Secretary

The Rocky Mountain Section Annual Student Night was held in March 2015. Eight students from Colorado School of Mines (CSM), Metropolitan State University of Denver, and Western State Colorado University presented their research: Emma Bradford, Sean Cowie, Jessica Davey, Robert Duran, Jacquelyn Negri, Caroline Scheevel, Stephen Semmens, and Matthew Tello. We continued to use the format of both poster and oral presentations, which worked out well again this year. All of the presenters were impressive and the Section enjoyed learning about their ongoing research. Sean Cowie took home the grand prize for his poster and research presentation Geological Controls on Rock Strength. The CSM AEG Student Chair organized a silent auction to raise money for the student chapter. Due to the generosity of our members and affiliate companies, we raised significant funds to support students at our monthly meetings throughout the year. A big thanks to all those generous sponsors!

At our April meeting, the world-renowned geotechnical expert Dr. Donald Bruce gave a presentation entitled *The Evolution of Specialty Geotechnical Construction Techniques: The "Great Leap" Theory*. The talk was highly entertaining and informative, and discussed how in the branch of specialty geotechnical construction, technological advances occur principally through "Great Leaps" as opposed to steady and progressive evolution. Dr. Bruce gave examples regarding developments in cutoffs for dams. We had a great turnout for this event and everyone really enjoyed the presentation.

Our May meeting featured another great presentation, this time from Dr. Eric Bilderback, a geomorphologist with the National Park Service Geologic Resources Division. His talk, *Rockfall, Landslides, and Quantitative Risk Estimates in the National Parks*, covered recent efforts to assess the risk imposed by rockfall and landslides at various National Park units using a quantitative risk estimation method that evaluates

risk to individuals and visitor populations in a societal context. We had a good turnout for this meeting also.

The Rocky Mountain Section will take a break from meetings for June through August and will return this September as the Mile High Chapter of AEG!

Sacramento Section

Chase White, Secretary

The Sacramento Section has had a very busy and exciting end to winter and start to spring in Northern California. While the return of rain to the Central Valley and snow to the mountains has been great to help alleviate some of the ongoing drought, it has not put a damper on our Section activities!

Our Section Legislative Committee, Garry Maurath and Bill Fraser, have reported that this legislative year is starting off without major legislative issues facing the AEG membership. Although all the bills for the year have already been introduced, we are watching to see what amendments may show up. Two bills of interest that were introduced at the beginning of the legislative session are SB1165 and SB1085. SB1165 just passed the Senate Floor 37-0 and is now headed to the Assembly for consideration. This bill provides a better definition of the pre-licensing education requirements for professional licensing. Members of the Sacramento Section participated in discussions and a public workshop with the Board of Professional Engineers, Land Surveyors, and Geologists (BPELSG) to clarify the bill's language. This bill will also extend the renewal period from three years to five for folks who participate in the EIT/GIT program. SB1085 has generated a considerable amount of interest among AEG members, and there have been many discussions with BPELSG and a number of other professional societies, such as ASCE, AIME, and Cal Geo. This bill, as originally written, called for implementing an "examination" every time one would renew their professional license. The bill generated extensive opposition from engineering groups, primarily because the language of the bill and the intent of BPELSG were difficult to reconcile. The bill was read in committee a second time and has been amended. It has been re-referred to the Committee on Appropriations and has a scheduled hearing date of May 9, 2016. The Sacramento Section is continuing to watch this bill closely.

On February 17, we partnered with the Geology Department of California State University, Sacramento (CSU Sacramento), known colloquially around the region as "Sac State" to undertake the first Geology Department Career Day. Many AEG members and fellow professionals in the engineering geology community volunteered their time to speak with geology students, conduct mock job interviews, provide coaching for interviews, and offer career guidance to future professional geologists.

The Old Spaghetti Factory restaurant in Sacramento was the site of our February meeting. We were honored and pleased to host the 2016 Richard H. Jahns Distinguished Lecturer, Jerome (Jerry) De Graff who gave a presentation entitled *Effectively Monitoring Environmental and Engineering Geology Projects*.

We held our March Section meeting on a different day of the week than our typical last Tuesday of the month, and gave a try at a Friday night in order to accommodate the schedule of the current AEG President and our featured guest speaker, Paul Santi. We hosted the meeting at Wicked West Pizza & BBQ in West Sacramento, and in addition to Paul's presentation *Debris Flows Following Wildfires in the Western U.S.*, we were pleased to have Laurie Racca of the California BPELSG give an update and summary of Board activities of interest to the AEG membership in California.

St. Louis Section

Stefanie Voss, Editor

At our February meeting, Randy Cook and Kerry Nikolaisen from AMEC Foster Wheeler discussed the Southwest Illinois Levees Geology & Engineering Improvement. This project came to fruition after Hurricane Katrina in 2005, when FEMA reviewed all the nation's levees for deficiencies and discredited the 74-mile American Bottom levee system. The levee district needed improvements made, and quickly. The American Bottom lies in the Mississippi flood plain with fluvial deposits over 100 feet deep. The levee improvements included construction challenges from environmental spills, wetlands, and historic landfills. The improvements also involve adding new seepage control measures and cleaning or converting old relief wells, some of which are still old wooden construction. Cutoff walls are currently being constructed to protect the town of Alton, IL, from future flood and through-seepage.

We held our March meeting on the 10th at Pietro's in St. Louis, MO. Dr. Martin Appold from the University of Missouri-Columbia was our speaker. He discussed Numerical Model of CO₂ Injection in Farnsworth, TX Hydrocarbon Field—A Carbon Sequestration outlining new ways to store CO₂ due to carbon emissions increasing in the past 200 years. The concept is to "sink" more than what comes in, storing CO₂ in the Morrow Group sandstone in the Anadarko Basin. The unit would sequester the CO₂ approximately 750 meters below the ground surface in a less soluble, saline aquifer. His team studied how this affects groundwater mineralization and the geochemistry of the aquifer. At the meeting, we also put out the word out for officer nominations and Regional Director nominations for the new board position.

In April, we held a joint meeting with the Society of Mining and Metallurgy Exploration that featured AEG President, Dr. Paul Santi, who discussed the West Salt Creek Landslide in Colorado, which was four times larger than the one at Oso, WA. The mass from the progressive block failures off the Grand Mesa traveled in three surges at nearly 43 miles per hour and killed three people. It nearly destroyed nearby petroleum wells. The landslide is still unstable, undergoing vertical settlement with little lateral movement. Stability models were performed by back calculating from the failure surface and estimating the soil and rock parameters. Unfortunately, more accurate data cannot be collected at this time, since the slide is too sensitive at present to work on.

We also held our elections and would like to introduce our new and returning officers: Phyllis Steckel – Chair, John Carrow – Vice Chair, Jon Truesdale – Treasurer, and Stephanie Kline-Tissi – Secretary. They began their term in April 2016.

San Francisco Section

Maggie Parks, Secretary

In February, we kicked off our year at Spice Monkey in Oakland, with a talk by Laurie Racca, PG, Senior Registrar, Geology & Geophysics, California Board for Professional Engineers, Land Surveyors & Geologists, where she discussed *Understanding Geology Licensure In California: Historical Perspective, Today's Purpose, Planning for Tomorrow*. She led an engrossing discussion covering the history of California licensure, the changes to representation of geologists on California licensure boards, and upcoming issues that may impact the profession.

In March, we hosted AEG/GSA 2015–16 Jahns Lecturer, Jerome De Graff, at Spice Monkey in Berkeley, where he presented, *What Does It Take to Effectively Monitor for Environmental and Engineering Geology Projects?* He led an engaging talk covering several of his projects and lessons learned over the course of his career.

In April, we held our annual Student Night at Spice Monkey in Oakland. We heard fascinating talks covering a range of topics from Orhun Aydin of Stanford University, Robert Lanzafame of UC Berkeley, and Michael Murphy of San Jose State University. We also hosted a poster session with research posters from Ian McGregor of San Francisco State University, Holly Young of Stanford University, and Millie Levin of UC Davis.

In May, we heard a talk from Brian Collins, PhD, PE, of the USGS, entitled *Processes of Exfoliation-Induced Rock Falls: Recent Studies from California's Sierra Nevada*. We got to hear about his ongoing research in the Sierra Nevada Mountains, including Yosemite, and some of his recent findings about the triggers of rockfalls.

June is a busy month for us, with a short course on soil stratigraphy taught by Dr. Glenn Borchardt and a field trip to the Calaveras Dam Replacement Project near Sunol.

We're still looking for a new meeting venue to replace Sinbad's and Pyramid Brewing, which have both recently closed. If anyone has a great idea, please forward it along! We'd also like to thank our Corporate Sponsor Fugro for their support of our Section! As always, check our Section website for a copy of our latest newsletter, up to the minute news, meeting information, local job postings, and events.

www.aegsf.org.

Don't see YOUR Section?

Ask your Chair or Secretary to submit a report for the September issue.

Southern California Section

Inland Empire Chapter

(Riverside and San Bernardino Counties)

Shaun Wilkins, Secretary

The first quarter of 2016 provided an array of interesting discussions for the members of the AEG IE Chapter. Unique and interesting topics coupled with dynamic and well-informed speakers continue to keep monthly attendance high. Most meetings boast more than 30 attendees, including students and professionals from across the region. All meetings continue to be held at the Pinnacle Peak Steakhouse in Colton.

February's meeting featured a presentation by Dr. Sally McGill, chair of the Geological Sciences department at California State University, San Bernardino. Her discussion was entitled *Distribution of Fault Slip across the Pacific-North American Plate Boundary in Southern California: Recent Results from Geologic and Geodetic Studies*. In the discussion, Dr. McGill detailed how she and several of her students have been monitoring several geodetic sites along the San Bernardino and San Geronio pass sections of the San Andreas Fault. They have been comparing the observed rates to published slip rates for the southern San Andreas fault. The emerging picture suggests that much of the slip on the Mojave section of the San Andreas fault transfers to the San Jacinto fault, and that much of the slip on the Coachella Valley section of the San Andreas fault transfers to the Eastern California Shear Zone, leaving low slip rates on the San Andreas fault between the Cajon Pass and Indio.

The AEG IE chapter met on March 16, with Dr. David Oglesby, chair of Earth Sciences at University of California, Riverside leading the discussion with his talk *Chasing Rainbows—or—What Can Surface Slip Tell Us about Fault Connectivity at Depth*. Dr. Oglesby explained how nature has shown us that it is quite possible for earthquakes to jump across fault step-overs and gaps to produce larger earthquakes than would have been anticipated purely from the apparent lengths of mapped faults on the Earth's surface. This is likely in part to some faults that appear to be discontinuous on the surface may in fact be connected at depth. If so, this connection would likely increase the ability of earthquake rupture propagating across the fault system. Therefore, it would be very helpful if there were some way to determine whether faults are connected at depth by analyzing their slip patterns at the surface.

Dr. Oglesby performed a series of numerical models of earthquakes on partially disconnected fault segments to investigate whether any aspects of the surface slip pattern are indicative of connection (or lack thereof) at depth. The results indicate that faults that are connected up to a very shallow (1 km or so) depth may produce distinct slip patterns that may be detectable in the field; faults that are connected only deeply may not be distinguishable from completely disconnected segments. Dr. Oglesby then provided a discussion on these results in the context of their ability to predict rupture behavior prior to

earthquakes, which can have wide-ranging applications to emergency planning and hazard abatement.

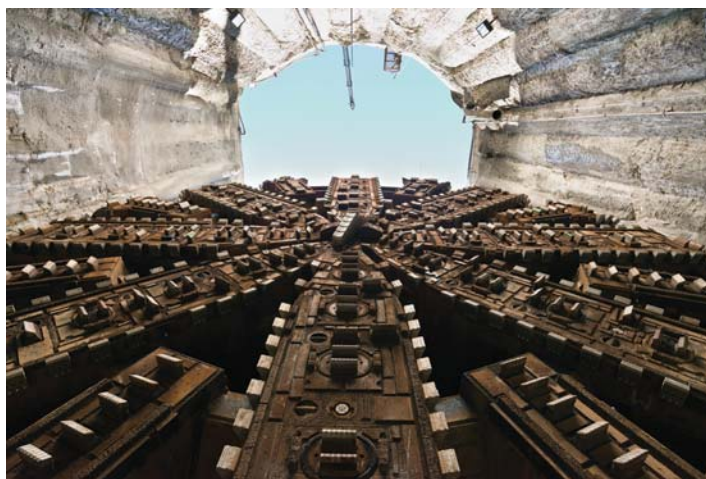
The annual Richard H. Jahns Distinguished Lecture in Applied Geology this year was provided by Jerome De Graff, who boasts 36 years of experience as an environmental and engineering geologist in the U.S. Forest Service in national forests in Utah and California. His discussion of *Fire, Earth and Rain: Emergency Response for Wildfire-Induced Landslide Hazards* presented how wildfire is a unique natural hazard because it poses immediate threats to life and property as well as creating conditions that can lead to subsequent debris flows and accelerated rock fall. This is a significant problem in the western U.S. where large wildfires have become more frequent since the mid-1980s. Limiting the impact of these post-fire geologic hazards requires determining their likelihood and location within the burned area. A rapid assessment is needed to ensure measures can be implemented prior to significant rainfall and mass wasting events. De Graff provided examples of the types of assessments and mitigation measures that have been implemented to help reduce the potential additional loss of life and property due to these subsequent events.

The AEG IE chapter is ready for a strong second quarter to take us into summer including our annual field trip entitled *San Jacinto Fault Zone, Parks and Faults, Including Massacre Canyon* and two meetings presented by representatives of the CGS and USGS. It looks to be an exciting quarter!

Washington Section

Sevin Bilir, Secretary

Seattle Area News



A close-up view of Bertha's cutter heads.

PHOTO COURTESY WSDOT

Bertha, the world's largest tunneling machine, which was stalled while digging the Alaskan Way Tunnel under downtown Seattle (since December 2013), was recently returned back to the drilling path after STP and manufacturer Hitachi Zosen completed repairs to the machine. On Friday, April 29, the

Washington State Department of Transportation closed the viaduct between South Spokane Street and the south end of the Battery Street Tunnel to begin the push to drill beneath and past the SR 99 Alaskan Way Viaduct. Seattle-area roadways underwent a major challenge when the Alaskan Way Viaduct was closed for 10 days. This time gave drivers a reminder of what it is like to live without one of three, major north-south highways through Seattle.

Bertha's passage beneath the Alaskan Way Viaduct has officially come to an end, but Seattle Tunnel Partners has decided to continue mining a bit farther before taking a short break. By early Wednesday morning, crews had tunneled 385 feet since the underground maintenance stop near Yesler Way. That put them clear of the fourth and final viaduct column the machine had to pass to complete its journey under the elevated structure. STP decided to mine beyond 385 feet in order to reach a better location for the machine to stop while crews take a few days to rest after mining around the clock since April 29. Monitoring of the structure and ground will continue throughout the remainder of the tunnel drive.

You can follow Bertha here:

www.wsdot.wa.gov/Projects/Viaduct/About/FollowBertha

Cascadia Rising is an exercise to address the most complex disaster scenario that emergency management and public safety officials in the Pacific Northwest could face. The triggering event is to be a 9.0 magnitude earthquake along the Cascadia Subduction Zone and the resulting tsunami. One of the primary goals of this exercise is to train and test this whole community approach to complex disaster operations together as a joint team. Conducting successful life-saving and life-sustaining response operations in the aftermath of such a disaster will hinge on the effective coordination and integration of governments at all levels: cities, counties, state agencies, federal officials, the military, and tribal nations.

Recent subduction zone earthquakes around the world underscore the catastrophic impacts the Pacific Northwest will face when the next Cascadia Subduction Zone earthquake and tsunami occurs in our region: Indonesia (2004): M9.1–228,000 fatalities, Chile (2010): M8.8–500 fatalities, and Japan (2011): M9.0–18,000 fatalities. Scientific evidence indicates that a magnitude 8.0–9.0 earthquake occurs along the 800-mile long fault (off the coast of North America) on average once every 200 to 500 years. The last major earthquake and tsunami along the fault occurred over 300 years ago in 170 (FEMA webpages, 2016).

You can find more information here at the Department of Homeland Security: <https://www.fema.gov/cascadia-rising-2016>

WA Section Meetings

In January, we held a joint meeting with the Association for Women Geoscientists in Seattle that featured Brandy A. Rinck, MA, RPA, from SWCA Environmental Consultants. She gave a well-attended talk, *Hidden Landforms and Buried History—Alluvial Geoarchaeology in the South Puget Lowland*. This presentation was an expansion of a TED-like talk she gave last December, and we liked it so much, we wanted to hear more!

In February, Donald West with Golder Associates presented *Probabilistic Fault Displacement Hazard Analysis (PFDHA) for Hazard and Risk Assessment of Natural Gas Pipelines—Case Study and Possible Applications in the Pacific Northwest*.

Our gracious sponsor, Golder Associates, has made it possible for the AEG Washington Section to provide free attendance/meals to a limited number of AEG Student Members with advanced approval. Thanks to all!

Annaliese Eipert, LG, with Aspect Consulting, LLC, and Giacomo Falorni with TRE-Altamira presented *Using Satellite Interferometry (InSAR) to Measure Millimeter-Scale Surface Deformation in the Puget Lowland* at our March 2016 meeting in Seattle. The talk stimulated lots of interest. Thank you Aspect Consulting, LLC and TRE-Altamira!

In April, our most recent speaker was AEG President Paul Santi. He spoke about AEG membership and gave a professional talk on *Debris Flows Following Wildfire in the Western U.S.* Holocene Drilling Inc. was our gracious sponsor. Thank you Paul and Holocene Drilling!

Member News

Patrick Pringle, Professor of Earth Science at Centralia College in Centralia, WA, was given the 2016 Faculty Member Award for demonstrated excellence in teaching in the community and technical college system. Patrick uses integrated field trips as labs and incorporates research exercises and projects into his classes and independent research projects. Patrick is a leader in regional geosciences, providing professional guidance and insight into the exploration and interpretive understanding of the region's most beloved resources, including Mount St. Helens, Mount Hood, and Mount Rainier. His expertise on these geologic matters is widely sought by other experts and government agencies. Patrick wrote the definitive guidebook to the geology of Mount Rainier National Park, *Roadside Geology of Mount Rainier National Park and Vicinity*, which includes details of the geologic history, lahar patterns, glaciers, lava domes and flows, caves, lakes, and more. Congratulations to Patrick!

Changes Coming to The HomeFront...

We will be adapting the formatting of our HomeFront section of AEG News to accommodate the changes to our governance structure. But please continue to submit your news and field trips as you normally would.



Landslides: Putting Experience, Knowledge and Emerging Technologies into Practice

The objective of the symposium is a stimulating forum for geoscientists, engineers, planners, economists, program managers, and others concerned with landslide hazards and their impact on society. Papers will be related to landslide investigation, classification, monitoring, analysis and mitigation, as well as case studies on innovative techniques and solutions.

June 30, 2016 Abstract submission deadline
July 31, 2016 Abstract acceptance notification
October 31, 2016 Manuscript submission deadline
January 2, 2017 Manuscript returned for revision
February 13, 2017 Manuscript final submission

250-word abstracts and written papers for both oral and poster presentations will be peer-reviewed. All submissions will follow *Environmental & Engineering Geoscience Journal* standards and be included in the Electronic Conference Proceedings.

www.aegweb.org/landslideroanoke2017/

TECHNICAL PROGRAM FRAMEWORK

- Sunday Workshops
- Sunday Evening "Ice-Breaker" Reception
- Technical Presentations Morning Plenary Sessions and Afternoon Concurrent Sessions (M, T, and Th)
- Exhibition Space
- Included Luncheons & Refreshment Breaks
- Full-day Field Trips (W)
- Poster Sessions
- Electronic Proceedings

Historic *Hotel Roanoke & Conference Center* is in central Roanoke, the largest city, shopping, and dining destination in the "Virginia Mountains Region." Roanoke is an entry point for the Blue Ridge Parkway – "America's Most Scenic Drive."

Visit www.aegweb.org/landslideroanoke2017/ or contact Jeff Keaton (jeff.keaton@amecfw.com) for more information

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