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October, 1994
Volume 31, Number 11

The Professional GEOLOGIST

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The CITIZENS' GUIDE to Geologic Hazards

Prepared by
The American Institute of Professional Geologists
Factors Affecting Bioremediation At Contaminated Sites

Kailash Bhatt, CPG-9201 and Gary Haag, CPG-7667

Due to increased environmental awareness, various remedial technologies have been developed in the United States over the past years. Bioremediation is a technique for treating contaminants by in-situ or induced microbial degradation. Due to increased understanding of microbial behavior in laboratory and field tests as well the physicochemical properties of contaminants, bioremediation appears to be a promising technology for remediation. Fundamentally, this technique breaks down harmful contaminants into simple compounds like carbon dioxide and water, which are less harmful to the environment. Bioremediation of a contaminant can be approached as enhancement of the in-situ microbial population by supplying nutrients and oxygen to the indigenous microbes to increase their population. The aerobic microbial process involves providing oxygen and nutrients to the subsurface contaminated zone through applicable means like injection wells, venting or infiltration galleries. Anaerobic microorganisms, like the methanogenic consortium group, are able to degrade low molecular weight halogenated contaminants (e.g. TCE and PCE) and pesticides. Anaerobic bioremediation is slow and remediates fewer groups of contaminants and thus is rarely used as a effective remediation method, so it will not be discussed in detail. Contaminant degradation through biological activity is dependent on various factors. The factors affecting the process must be first studied in a pilot or bench scale test before on-site implementation. Some of the most critical factors which affect bioremediation are discussed in this article.

Hydrogeology: Prior to implementation of bioremediation, a detailed understanding of site hydrogeology is essential. Site hydrogeology not only affects microbial activity but also the effectiveness and cost of remediation. Since contaminant fate and transport is a function of the medium where it has been residing, the geological setting and contaminant extent must be delineated with a high degree of certainty. The injection of nutrients or oxygen may sustain survivability of the microbial population, however, if microorganisms are not targeted to the right place, the remediation may not be successful.

The soil permeability of the contaminated aquifer plays a significant role in the bioremediation process. Due to the high permeability of sandy soils which can transmit water or injected solutions quicker, bioremediation is more effective in such medium than in clayey soils. Additionally, in clayey soils the effectiveness of microbial activity is harder to monitor due to low groundwater flow rates. Other important hydrogeological parameters to be considered before implementing bioremediation at a site are the depth and direction of groundwater flow. By increasing ground water gradient, either by injection or excessive pumping, the ambient contaminant transport time can be increased ten to a hundred times. This enhanced transport of contaminants in ground-water may reduce remediation time and thus be a cost-effective measure. A fluctuating water table can complicate the bioremediation process and possibly extend project completion time. A rise or fall in water levels may shift the contaminated zone to an unsaturated zone or below the saturated zone. This situation may require different strategies when groundwater flow has enhanced the mobility of available nutrients and oxygen.

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To ensure the efficient remediation of contaminants in the saturated zone, one must understand well hydraulics and aquifer characteristics. Some of the common properties of an aquifer are transmissivity, hydraulic conductivity, and porosity. These properties must be evaluated before implementation of active remediation in the saturated zone. A combined understanding of well hydraulics and aquifer properties will help the remediator to decide location of injection/extraction wells in the zone of contamination. Since the residual capacity of soil may greatly affect the success of bioremediation, a better understanding of sediment texture and chemical properties is essential to evaluate advection, adsorption and interaction of supplied nutrients. If the supplied nutrients are going to be adsorbed by the aquifer medium (as in clayey soils) or can be altered to other components, an additional nutrient supply may be needed. Thus, an understanding of contaminant phases is needed. Residual saturation is greater in the sandy wet-soil of the saturated zone as opposed to the vadose zone. This may be due to the presence of air, non-wetting phases, and larger buoyancy and capillary forces in the vadose zone (Wilson et al. 1988). Generally, the introduction of nutrients and oxygen is more difficult in the saturated zone than in the vadose zone. In most cases the oxygen and other required nutrients are supplied to the saturated zone through recirculation or rarely through the infiltration method. It has been noted that higher concentrations and a rapid flow of ozone (oxygen source) may decompose to oxygen quickly and thus not reach hot spots and also may cause degassing at the point of injection. Venting through a contaminated zone can reduce the volatile compounds by evaporation and at the same time supply oxygen to bacteria for biodegradation.

Venting of a contaminated vadose zone is more effective in removing volatile organic compounds (VOCs). However, controlled use of venting and microorganisms can effectively reduce volatile and non-volatile components of the contaminants. To verify if microorganisms are active, a soil sample should be collected and analyzed for oxygen and carbon dioxide. Increases in the carbon dioxide concentration is generally an indication of aerobic microbial activity (Greacen and Finkel, 1992). The excessive growth of microorganisms will require additional nutrients and oxygen supply. It should be noted that for optimal remediation, we should not encourage the excessive growth in one segment of the contaminated zone because this may exhaust the oxygen supply and nutrients for bacteria in other areas and may act as a barrier to flow.

**Physio-chemical Environment:**
Since the success in contaminant removal is greatly dependent on the physical and chemical property of the contaminant itself, these characteristics must be studied along with the hydrogeologic information. Many organic pollutants are not miscible in water and thus migrate in a separate phase. Sometimes these phases are trapped in pore spaces due to capillary forces and thus may become completely immobilized. However, these trapped residual contaminants may remain an active source of dissolved or vapor phase contamination for decades. Understanding these contaminant phases may help to locate monitoring points, recovery or injection wells. The contaminant can reside in condensed or vapor phase. The success of bioremediation in vapor phase is less documented, if any. However the condensed phase may be in the form of free product (saturated), dissolved phase, or sorbed phase and residual phase. Depending on which phase dominates the contaminated site, the strategies can be changed or modified. Residual phase, also known as non-aqueous phase liquids (NAPLs), can be lighter than water (known as light non-aqueous phase liquids, LNAPLs) or denser than water (known as dense non-aqueous phase liquids, DNAPLs). Most contaminated NAPLs include jet fuel, aviation fuel, gasoline; whereas, most DNAPLs include chlorobenzene, tetrachloroethylene and PCBs.

Generally, a higher BOD/COD ratio represents a higher biodegradability. Thus it should be anticipated that xylene and ethylbenzene will show up for a longer time in monitoring results when compared with toluene and benzene, if bioremediation was chosen as a sole remediation method. Due to differential polarity of contaminants, the compounds with higher aqueous solubility are generally more degradable than others. The temperature of the groundwater or soil may also affect the success of the system. It is estimated that for every 10 degree celsius decrease in temperature microbiological activity will be halved. In other words, sites contaminated with various hydrocarbons in South Dakota may take as much as three times longer to remediate than sites in Florida or California in a site with similar geological or contaminant characteristics. In general, the effectiveness of biodegradability is proportional to the soil/groundwater temperature and inversely proportional to the groundwater depth. For aerobic processes, an ample amount of oxygen must be supplied to sustain microbial activity. The oxygen can be supplied through various sources and means. The most commonly used oxygen sources include air, purified oxygen, hydrogen peroxide, ozone, and nitrates. On average, for efficient biodegradation, microorganisms may require 0.3-1.5 mg/l of dissolved oxygen. At average, oxygen has a solubility of 8 mg/l and can increase or decrease with soil/groundwater temperature. The oxygen may be supplied by air sparging, venting, percolation through artificial ponds, or injection of aerated water or nitrates into the contaminated zone. To effectively circulate oxygen in a contaminated zone, it is recommended that numerous wells be installed and
each well must be screened appropriately within the contaminated area. Due to high solubility and the electron acceptor nature of nitrates, it can be useful to supply significant quantities of oxygen to bacteria. However, nitrate injection to groundwater may exceed the EPA nitrate as N standard of 10 mg/L. The design of the remediation system and source of applied oxygen must accommodate constant supply to microorganisms and reach all parts of the contaminated zone. Groundwater flow patterns and thus microbial movements are dependent on textural properties of soils. For aerobic biodegradation in vadose or saturated contaminated zone, the optimal microbial activity occurs between the pH of 6.5-8.0. The ambient pH can be adjusted with the addition of slightly basic or acidic solutions for an effective remediation.

**Nutrients:** Sufficient amount of nutrients should be applied to degrading microorganisms at all stages of remediation. The most commonly applied nutrients include nitrogen, phosphorus, calcium, magnesium and potassium. The most commonly used compounds include NH₄Cl, KH₂PO₄, MgSO₄, CaCl₂, Na₂HPO₄ and Na₂CO₃, depending on type of nutrient to be supplied. The amount of nutrients required to be supplemented is based on the type of aquifer and extent of contamination. Few aquifers are rich in the above-mentioned nutrients. The availability of nutrients is also dependent on type of depositional environment of the aquifers, type of host rock they were derived from, and presence of organic material. Aquifers with high organic contents may not require supplemental carbon. It is expected that in fractured or hard rock aquifers, these elements may not be readily available for microbial consumption as compared to aquifers of a sedimentary nature. Thus a geochemical analysis must be performed to determine the availability of the nutrients from background constituents from soil or groundwater. At various sites it has been noted that application of nutrients may not enhance the degradation rate of the contaminants. On the contrary, the presence of some elements in soil or groundwater may act as a retarder to biodegradation, e.g. excessive calcium may cause precipitation of phosphorus and thus cause a nutrient deficient environment. In addition, metals like iron or magnesium may precipitate out causing a geochemical imbalance in the targeted zone.

In summary, the successful implementation of a bioremediation system at a contaminated site depends on a thorough knowledge of site geology, hydrogeology and contaminant extent and characteristics. Without having knowledge of the above site-specific information, it is not possible to target the contaminated area with oxygen and nutrients needed to enhance microbial activity with a great degree of certainty. This will eventually cause significant increases in the remediation cost and clean-up time set by the regulatory agencies.

**REFERENCES:**

Kailash Bhatt, CPG-9201, and Gary Haag, CPG-7667, are hydrogeologists with the South Dakota Department of Environment and Natural Resources and are involved various hydrogeological investigations pertaining to ground water and soil contamination studies.

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**Mission To China August - 1995**

Once again the American Institute of Professional Geologists and People to People have arranged to provide our membership international exposure designed to be informative, exciting, stimulating and professionally rewarding. During our sojourn to Guangzhou (Canton), Changsha, Beijing, Guilin and Hong Kong, we will have an opportunity to interact with our Chinese colleagues at the Geological Society of China, Institute of Geology, China Petroleum Engineering Corporation, and the Ministry of Geology and Mineral Resources. We will be discussing engineering and environmental geology, hydrogeology, mining geology, and petroleum geology. Additional topics will be added as the delegation is formed and the interests of the delegates are known. In addition to the professional meetings and site visits, special sightseeing programs will be planned for us in each city, such as visits to the Great Wall, Forbidden City, Temple of Heaven, the spectacular karst features of Guilin, etc.

Mark your calendars now and reserve two weeks in mid to late August, 1995. All AIPG members will receive full details pertaining to the mission shortly after the first of the year.
Geologists Are Naturals For Vapor Extraction

Terrence P. Brennan, CPG-7619

Abstract

Vapor extraction (VE) is a relatively old remediation technology which has become very popular in the last few years. It can treat contaminated soils in place at a reasonable cost and has found favor with regulators. Too often geologists have conceded this field to engineers. Yet much of the underlying principles governing the physical processes at work are very similar to those which geologists have successfully used for decades to analyze ground-water flow. By understanding these principles geologists can play a part in this new technology.

Introduction

In many aspects the underlying principles governing VE are similar to groundwater flow theory, both entail the movement of a fluid through a geologic medium. The basic mathematics for both rely on the Darcy Equation, and many of the familiar ground-water flow equations have been modified for vapor flow such as Thies, Jacob and Hanus. As with ground-water flow, the movement of vapor through the subsurface is both simple and complex. If you operate a pump in a well you will draw water out of the ground, but how much water, where will it come from, what will it be carrying? If you apply a vacuum to a VE well you will draw some vapors from the ground, but how much, where will it come from, how soon will the soil be "clean", how much vacuum is necessary?

There are many factors which have the potential to effect a VE system. These include the time period the VE system will operate, the contaminant concentration, moisture content of the soil, thickness of the vadose zone, soil permeability, physical and chemical properties of the contaminant, well screen placement and length and surface cover. The importance of each factor may change from site to site.

Pilot Testing

No good geologist would order a water pump, install piping, controls, etc. for a new municipal water supply well without first conducting aquifer tests to determine what the operating conditions will be. It is the same with VE; before you buy the equipment and start throwing it into the ground you should first conduct tests to determine what the realistic operating conditions will be. Pilot testing is essential to properly design and operate anything but the smallest VE systems. There are two main types of test: a geologic formation test and a step test.

The geologic formation test is used to quantify the ability of the soil to transmit vapor. Contrary to popular belief, the soil will not give up an infinite amount of vapor simply because you increase the vacuum. The vapor flow rate at the well head is recorded as the well-head vacuum is increased and then decreased in equal increments. This is analogous to water well step testing to determine the ability of the well to produce water. You are concerned with the performance at the extraction well itself rather than the response of the aquifer away from the well.

The step test measures the subsurface vacuum at varying distances from the extraction well under different operating conditions. The subsurface vacuum is measured at each monitoring point at each extraction well vacuum setting. This step test is more analogous to a series of aquifer pumping tests in that you record the response of the aquifer at varying distances from the extraction well at a constant flow rate. By analyzing the results of these tests, along with physical and chemical analyses of the soil and contaminant, a cost effective VE system can be designed which will clean up the site in an acceptable time frame. It is good practice to collect soil samples at varying distances from the extraction well before or during installation so that a direct comparison of contaminant concentrations can be made at some time after remediation begins.
Radius of Influence

Another concept common to both ground-water pumping and vapor extraction is radius of influence. In vapor extraction there is a critical difference between observed radius of influence (OROI) and effective radius of influence (EROI). The OROI is simply the distance at which there is some measurable change in the subsurface vacuum field and is analogous to a ground-water cone of depression. The EROI is based on having sufficient subsurface air flow to remove the contaminants from the soil. While it is not analogous to a ground-water capture zone, both are time dependent and determine the extent of remediation. The EROI can be thought of as the maximum distance from the extraction well at which sufficient air is moved to clean the soil in a given time. Less air is moved as you get further from the extraction well, meaning it will take longer to remove any given amount of contamination. Each unit of air can only carry a certain amount of contaminants, say one box. If you have 10 boxes of contaminants you will have to pass 10 units of air through that soil to clean it. If the system passes one unit of air per year through the soil at the furthest distance from the extraction well, cleanup will require 10 years! This is likely to be unacceptable to the regulators, as well as the responsible party who wants to close the site as soon as possible. This concept is akin to calculating how many volumes of ground water must be pulled through an aquifer to completely remove all the contaminant, although experience has shown the time frames to be very different.

Rules of Thumb for Design

While each site will be somewhat different, some rules of thumb can be used to guide a system designer. In general it is more efficient to install additional extraction wells than to try to pull more air through a fewer number of wells. There is a limit to how much air the soil can transmit. In a study recently conducted, the increase in effective radius of influence was minimal after the first year of operation. The EROI after six months was 14 feet, it was up to 34 feet after 12 months but increased only another nine feet during the second 12 months.

Having an impermeable cover such as asphalt or concrete will increase the EROI. At one site in the midwest, an extraction well in an area completely covered by asphalt or concrete had an EROI of 98 feet compared to another well at the site in an area of grass cover with an EROI of 33 feet.

Low moisture content is usually conducive to successful VE, and after operating a system for a time the moisture content will decline. An increase in the volatility of the contaminant, as measured by the Henry's Constant, will result in a larger EROI in a given time period. The well screen should be placed at the base of the soil contamination or the top of ground water, whichever is shallower.

Conclusion

In order to remain a good practitioner of any technical field you must make an effort to stay current. Environmental geology is no different. While the basic concepts are very similar, a geologist must take the time to read the new literature and become familiar with how those concepts are applied. Blind application of new technology is worse than ignoring the technology, but geologists should not concede any new field to engineers simply because there is some math involved.

Terrence P. Brennan, CPG-7619, Leggette, Brashears, & Graham, Shoreview, Minnesota.

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AIPG OFFICER ELECTION RESULTS!

Congratulations to:

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Thomas Fails, CPG-3174, 1994 Vice-President

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They will join the incumbent officers for 1995:

Richard C. Fountain, CPG-1750, President

Kathleen M. F. Benedetto, CPG-7853, Secretary

Lyle G. Bruce, CPG-7714, Editor

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UNITED STATES 30112
AGENCY: Department of Energy
TOPIC: ENERGY -- 7
SUMMARY: Amends the Department's regulations regarding the criteria and process used to review determinations of eligibility for access to classified matter or special nuclear material.
CITATION: 10 CFR 710
PROPOSAL DATE: 12/08/93
COMMENT DEADLINE: 02/07/94
ADOPTION DATE: 07/08/94

UNITED STATES 25956
AGENCY: Environmental Protection Agency
TOPIC: ENVIRON. PROTECTION AND POLLUTION CONTROL -- 8
SUMMARY: Adopts technical revisions to four sections of the National Oil and Hazardous Substances Pollution Contingency Plan. Also adopts conforming revisions to two sections of the administrative requirements for CERCLA-funded Cooperative Agreements and Superfund State Contracts for Superfund Reuse Actions.
CITATION: 40 CFR 35 and 300
PROPOSAL DATE: 10/18/93
COMMENT DEADLINE: 11/17/93
ADOPTION DATE: 07/14/94
EFFECTIVE DATE: 08/15/94

UNITED STATES S 2356
AUTHOR: Hatch
SUMMARY: Establishes the Commission on the Advancement of Women in the Science and Engineering Work Forces.
STATUS: 08/03/94 INTRODUCED

UNITED STATES SCR 72
AUTHOR: Gregg
SUMMARY: Expresses the sense of the Congress that the President should refrain from signing the Seabed Mining Agreement relating to the Convention on the Law of the Sea.
STATUS: 07/19/94 INTRODUCED

UNITED STATES H 4984
AUTHOR: Mezvinsky
SUMMARY: Amends the Solid Waste Disposal Act to regulate the use of hazardous waste as fuel for energy recovery, the operation of cement kilns that burn hazardous waste as fuel, the disposal of cement kiln dust waste, and related activities.
STATUS: 08/18/94 INTRODUCED

UNITED STATES S 2418
AUTHOR: Baucus
SUMMARY: Improves the management of floodplains, protects and restores the environment in floodplains.
STATUS: 08/24/94 INTRODUCED

CALIFORNIA 6525
AGENCY: Integrated Waste Management Board
TOPIC: ENVIRON. PROTECTION AND POLLUTION CONTROL -- 9
SUMMARY: Describes the required contents of the Countywide Siting Elements. Requires the counties to identify existing and proposed solid waste management facilities and alternatives to either expanding existing facilities or constructing new facilities. Also provides for the counties to identify criteria used in locating the preferred new facilities; to identify the socioeconomic and environmental impacts; and to assure that any expanded or new facilities are consistent with local general plans.
AGENCY CONTACT: Toni Gallaway, Office of Local Assistance, Governmental and Regulatory Affairs Division, California Integrated Waste Management Board, 6800 Cal Center Dr., Sacramento, CA 95826, (916)255-2309.
PROPOSAL DATE: 06/18/93
COMMENT DEADLINE: 08/02/93
ADOPTION DATE: 07/15/94
EFFECTIVE DATE: 08/14/94

CALIFORNIA 7429
AGENCY: Board of Registration for Geologists and Geophysicists
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Creates a specialty in "hydrogeology" as a division of the certification of registration as a geologist.
AGENCY CONTACT: Donis Pellelier B (916)445-1920
CITATION: 16 CCR 5042 AND 5003, Hydrogeology
ADOPTION DATE: 07/18/94
EFFECTIVE DATE: 08/17/94

COLORADO 3384
AGENCY: Department of Regulatory Agencies/ Board of Registration for Professional Engineers and Land Surveyors
TOPIC: POLITICS AND GOVERNMENT -- 15
SUMMARY: Revises the rules of procedure pertaining to applications and reapplication, applicants with degrees from foreign schools, retention of applications, references, educational credit for engineering and surveying applicants, sealing of documents, physical standards for monumentation, standards for property boundary surveys, minimum standards for improvement location certificates, and construction supervision. Revises the rules of professional conduct pertaining to registrants who shall perform services only in the areas of their competence.
AGENCY CONTACT: Susan Miller, Program Administrator, Board of Registration for Professional Engineers and Professional Land Surveyors, 1560 Broadway, Ste. 1370, Denver, CO 80202, (303)894-7798.
PROPOSAL DATE: 06/10/94
ADOPTION DATE: 07/11/94
EFFECTIVE DATE: 08/30/94

FLORIDA 14254
AGENCY: Department of Natural Resources/Division of Resource Management
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL -- 8
SUMMARY: Specifies injection well, well workers, and abandonment standards and procedure for oil and gas operation in Florida.
AGENCY CONTACT: Walter Schmidt, Bureau of Geology, 903 West Tennessee Street, Tallahassee, FL 32304, (904)486-4191.
CITATION: FAC 16V-29.001, .009 Injection Wells, Workers and Abandonments
PROPOSAL DATE: 07/22/94
COMMENT DEADLINE: 08/19/94
HEARING DATE: 08/23/94

IOWA 4677
AGENCY: Environmental Protection Commission
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL -- 8
SUMMARY: Concerns registration of groundwater professionals, gives the conditions under which the Department of Natural Resources may suspend, revoke, or deny registration and the disciplinary procedures that will be followed.
AGENCY CONTACT: Keith Bridson, Iowa Department of Natural Resources, Wallace State Office Building, 900 East Grand Avenue, Des Moines, Iowa 50319, FAX (515)281-8895.
CITATION: 567 IAC 134.4 Registration of Groundwater Professionals
PROPOSAL DATE: 03/16/94
COMMENT DEADLINE: 04/18/94
HEARING DATE: 04/05/94 - 04/07/94
ADOPTION DATE: 07/01/94
EFFECTIVE DATE: 08/24/94

ILLINOIS 5931
AGENCY: Department of Nuclear Safety
TOPIC: ENERGY -- 3
SUMMARY: Pertains to the collection of fees from persons who apply for or hold radioactive material licenses; clarifies how fees are assessed to educational institutions that seek or possess licenses authorizing human use or remunerated services to others.
AGENCY CONTACT: Valerie Puccini, Staff Attorney, Department of Nuclear Safety, 1035 Outer Park Drive, Springfield, IL 62704, (217)785-9881.
CITATION: 32 IAC 331.10 through .30, .110 through .130, .200, Appendix B, D Fees for Radioactive Material Licenses.
PROPOSAL DATE: 03/04/94
COMMENT DEADLINE: 04/14/94
ADOPTION DATE: 07/29/94
EFFECTIVE DATE: 08/01/94

ILLINOIS 6128
AGENCY: Department of Professional Regulation
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Concerns the Professional Engineering Practice Act of 1989; pertains to the examination for professional engineers, approved engineering programs and application requirements; establishes that a candidate who fails an examination may not review his/her examination booklet or the associated answer sheets. (Emphasis added by AIPG).
AGENCY CONTACT: Jean A. Courtney, Department of Professional Regulation, 320 West Washington, 3rd Floor, Springfield, IL 62786, (217)785-0800.
PROPOSAL DATE: 07/08/94
COMMENT DEADLINE: 08/07/94

KENTUCKY 9802
AGENCY: Natural Resources and Environmental Protection Cabinet/Department for Environmental Protection
TOPIC: ENERGY -- 7
SUMMARY: Concerns standards of performance for coal preparation plants.
STATE NET

AGENCY CONTACT: John E. Hornback, Director, Division for Air Quality, 803 Schenkel Lane, Frankfort, KY 40601, (502)573-5382.
CITATION: 401 KAR 60:250 Standards for Performance for Coal Preparation Plants.
PROPOSAL DATE: 07/01/94

KENTUCKY 9868
AGENCY: Natural Resources and Environment Protection
Cabinet/Environmental Protection/Waste Management
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL – 8
SUMMARY: Establishes the minimum technical standards for solid waste sites or facilities; sets forth the siting requirements for construction/demolition debris, contained, and residual landfill.
AGENCY CONTACT: James Hale, Division of Waste Management, 14 Reilly Road, Frankfort, KY 40601, (502)564-6716.
PROPOSAL DATE: 08/01/94
COMMENT DEADLINE: 08/20/94
HEARING DATE: 08/25/94

KENTUCKY 9870
AGENCY: Natural Resources and Environment Protection Cabinet/Environmental Protection/Waste Management
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL – 8
SUMMARY: Establishes the minimum technical standards for solid waste sites or facilities; sets forth the standards for groundwater monitoring and corrective action.
AGENCY CONTACT: James Hale, Division of Waste Management, 14 Reilly Road, Frankfort, KY 40601, (502)564-6716.
PROPOSAL DATE: 08/01/94
COMMENT DEADLINE: 08/20/94
HEARING DATE: 08/25/94

KENTUCKY 9875
AGENCY: Natural Resources and Environmental Protection Cabinet/Department for Surface Mining
TOPIC: RESOURCE MANAGEMENT
SUMMARY: Contains general performance standards for maximizing coal recovery, protection of underground mining, prevention and correction of landslides, temporary cessation of operations, permanent abandonment of operations, and protection of outcrop barrier pillars.
AGENCY CONTACT: Jim Villines, Kentucky Department for Surface Mining, 2 Hudson Hollow Road, Frankfort, KY 40601, (502)564-2377.
CITATION: 405 KAR 16:010 General Provisions
PROPOSAL DATE: 08/01/94
COMMENT DEADLINE: 08/30/94
HEARING DATE: 08/30/94

KENTUCKY 9961
AGENCY: Natural Resources and Environmental Protection Cabinet/Department for Air Quality
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION – 18
SUMMARY: Authorizes the Natural Resources and Environmental Protection Cabinet to promulgate administrative regulations pertaining to surface coal mining and reclamation operations and coal exploration operations.
AGENCY CONTACT: Barbara A. Foster, Chief Hearing Officer, Office of Administrative Hearings, 32036 Fountain Place, Frankfort, KY 40601, (502)564-7312
CITATION: 400 KAR 1:001, Definitions
PROPOSAL DATE: 08/01/94
COMMENT DEADLINE: 08/21/94
HEARING DATE: 08/26/94

KENTUCKY 9999
AGENCY: Natural Resources and Environmental Protection Cabinet/Department for Surface Mining
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION – 18
SUMMARY: Sets forth licensing provisions for mineral operators with regard to general criteria, license duration, and handling of outstanding violations.
AGENCY CONTACT: George Risk, Kentucky Department for Surface Mining, 2 Hudson Hollow Road, Frankfort, KY 40601, (502)564-2377.
CITATION: 405 KAR 5:026 Licensing Requirements
PROPOSAL DATE: 08/01/94
COMMENT DEADLINE: 08/29/94
HEARING DATE: 08/29/94

KENTUCKY 9970
AGENCY: Natural Resources and Environmental Protection Cabinet/Department for Surface Mining
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION – 18
SUMMARY: Specifies certain information to be submitted by the applicant relating to legal status, financial information, general site information, mine requirements, cultural and environmental resource information, and mining and reclamation plans; addresses the waivers and approvals necessary to conduct noncoal mineral operations, including those of other agencies.
AGENCY CONTACT: George Risk, Kentucky Department for Surface Mining, 2 Hudson Hollow Road, Frankfort, KY 40601, (502)564-2377.
CITATION: 405 KAR 5:025 Permit Requirements
PROPOSAL DATE: 08/01/94
COMMENT DEADLINE: 08/29/94
HEARING DATE: 08/29/94

MARYLAND 4807
AGENCY: Department of Natural Resources
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION – 18
SUMMARY: Concerns surface coal mining and reclamation performance bonds; revises the requirement to submit two bonds before a permit is issued to the submittal of one bond; revises the minimum amount of the bond to be submitted for the approved open-acre limit for all new permits and adjusts the amount of bond for the open-acre limit on all existing permits.
AGENCY CONTACT: Anthony Aba, Director, Bureau of Mines, Department of Natural Resources, 160 S. Water Street, Frostburg, MD 21532, (301)686-6104.
CITATION: COMAR 08.20.14.01, .03, .05, .06, .09, and .13, .10 Performance Bonds.
PROPOSAL DATE: 06/10/94
COMMENT DEADLINE: 07/14/94
ADOPTION DATE: 08/05/94
EFFECTIVE DATE: 08/15/94

MICHIGAN 1901
AGENCY: Department of Natural Resources
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL – 8
SUMMARY: Lists the definitions and regulations for aboveground tanks, containers, and contingency plans; defines hazardous waste.
AGENCY CONTACT: Department of Natural Resources, Waste Management Division, P.O. Box 30241, Lansing, MI 48909
CITATION: R 298.9101 through 298.11055 Hazardous Waste Management/ Tanks
PROPOSAL DATE: 03/31/93
COMMENT DEADLINE: 05/04/93
HEARING DATE: 06/03/93
ADOPTION DATE: 06/03/93
EFFECTIVE DATE: 06/18/94

MISSOURI 5572
AGENCY: Department of Natural Resources, Hazardous Waste Management Commission
TOPIC: ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL – 8
SUMMARY: Defines those persons who may apply to the Missouri Department of Natural Resources for oversight of an environmental remediation cleanup.
AGENCY CONTACT: Director, Hazardous Waste Program, P.O. Box 176, Jefferson City, MO 65102.
CITATION: 10 CSR 25-15.010
PROPOSAL DATE: 01/18/94
COMMENT DEADLINE: 02/18/94
ADOPTION DATE: 07/01/94
EFFECTIVE DATE: 07/01/94

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MISSOURI 5694
AGENCY: Department of Public Safety
TOPIC: LABOR AND EMPLOYMENT -- 13
SUMMARY: Establishes a plan to establish and administer an emergency volunteer program to be activated in the event of a catastrophic earthquake or other natural disasters whereby volunteer architects and professional engineers.
AIPG NOTE: Not Geologists?
AGENCY CONTACT: Emergency Management Agents, Paul D. Schiefer, Deputy Director, P.O. Box 115, Jefferson City, MO 65102, (514)506-2673.
CITATION: 11 CSR 10-11.120 Volunteer Inspectors Administrative Plan (State)
PROPOSAL DATE: 04/15/94
COMMENT DEADLINE: 05/15/94
ADOPTION DATE: 08/15/94
EFFECTIVE DATE:08/25/94

MISSOURI 6072
AGENCY: Department of Economic Development/Board for Architects, Professional Engineers and Land Surveyors
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Establishes professional development requirements for renewal of land surveyor certificate registration.
AGENCY CONTACT: Shirley Russell, Executive Director, 3605 Missouri Blvd., #380, Jefferson City, MO 65102
CITATION: 4 CSR 30-8-020 Professional Development Requirements for Land Surveyors.
PROPOSAL DATE: 08/01/94
COMMENT DEADLINE:09/01/94

MONTANA 2360
AGENCY: Department of State Lands/Boards of Land Commissioners
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION -- 18
SUMMARY: Pertains to the regulation of strip and underground mining for coal and uranium; includes definitions, legal financial, compliance, and related information, baseline information: environmental resources, plan for protection of the hydrologic balance, transportation facilities plan, review of application, findings and notice of decision, permit renewal, final grading requirements, burial and treatment of waste materials, thick overburden and excessive spoil, signs and markers, general requirements road and railroad loops, embankments, hydrologic impact of roads and railroad loops, blasting schedule, water quality performance standards, reclamation of drainage, sediment control measures.
AGENCY CONTACT: Bonnie Loveless, Chief, Coal and Uranium Bureau, Department of State Lands, P.O. Box 201891, Helena, MT 59620-1891.
CITATION: ARM 26.4.301 through 26.4.1212 Rules I through III Regulation of Strip and Underground Mining
PROPOSAL DATE: 09/11/94
COMMENT DEADLINE:09/13/94

NEW YORK 6550
AGENCY: Insurance Department
TOPIC: INSURANCE -- 12
SUMMARY: Allows architects and engineers practicing in New York to continue to be able to obtain liability insurance from insurers licensed in this state and that the availability of this market to be disrupted.
AGENCY CONTACT: Patricia Mann, Insurance Department, 160 W. Broadway, New York, NY 10013, (212)652-0374
CITATION: 11 NYCRR 107 Legal Defense Costs in Liability Policies
PROPOSAL DATE: 04/27/94
COMMENT DEADLINE: 06/02/94
ADOPTION DATE: 06/21/94
EFFECTIVE DATE:07/06/94

NORTH CAROLINA 2780
AGENCY: Occupational Licensing Boards/Board of Professional Engineers and Land Surveyors
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Sets forth procedures for Continuing Professional Competency requirements for professional engineers development, as a condition for annual renewal registration.
AGENCY CONTACT: Board of Professional Engineers and Land Surveyors, 3620 Six Forks Road, #300, Raleigh, NC 27609
CITATION: 21 NCAC 65.1701 -1712 Continuing Professional Competency
PROPOSAL DATE: 08/15/94
COMMENT DEADLINE: 09/15/94
HEARING DATE:09/09/94

NORTH DAKOTA 2568
AGENCY: Boards of Registration for Professional Engin. and Land Surveyors
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Relates to engineers and land surveyor registration; includes applications, kinds of applications, application from nonresidents, applications from applicants with degrees from foreign schools, disposal of applications, reconsideration of applications, retention of records of applications.
AGENCY CONTACT: Lavere L. Zink, Board of Registration for Professional Engineers and Land Surveyors, P.O. Box 1357, Bismarck, ND 58502.
CITATION: NDAC 28-02.1-01-01 through 28-02.1-01-07 Engineer and Land Surveyor Registration
ADOPOTION DATE: 08/01/94
EFFECTIVE DATE:10/01/94

OREGON 10369
AGENCY: Board of Geologists Examiners
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Aligns with approved fees collected by the Board of Geologists Examiners; reduces the annual geologist renewal fee from $30 to $20 and the annual engineering geologist specialty from $15 to $10.
AGENCY CONTACT: Ligea S. Humbert, Board of Geologists Examiners, 750 Front Street, N.E., Suite 240, Salem OR 97310, (503)378-4180.
CITATION: OAR 809-10-001 Licensure Fee
PROPOSAL DATE: 02/01/94
ADOPTION DATE: 06/03/94
EFFECTIVE DATE:07/01/94

PENNSYLVANIA 2139
AGENCY: Environmental Quality Board
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION -- 18
SUMMARY: Corrects an error in the definition of tangible net worth. Conforms the requirement of the amount of assets an applicant must have located in the United States to participate in the self-bonding program with modified definition.
AGENCY CONTACT: George Knoll, Manager, Financial Responsibility Mgmt. and Technical Services, P.O. Box 2063, Harrisburg, PA 17105, (717)783-4719.
CITATION: 25 PA Code Ch. 86
ADOPTION DATE: 08/02/94
EFFECTIVE DATE:08/02/94

TEXAS 13905
AGENCY: Board of Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Concerns educational requirements for registration for professional engineers; concerns responsibility to the engineering profession.
AGENCY CONTACT: Charles Nemir, Executive Director, Texas State Board of Registration for Professional Engineers, P.O. Box 18329, Austin, TX 78760, (512)440-7723.
CITATION: 22 TAC 131.91.156 Practice and Procedure
PROPOSAL DATE: 05/06/94
COMMENT DEADLINE: 06/05/94
ADOPTION DATE: 07/05/94
EFFECTIVE DATE:07/15/94

TEXAS 13943
AGENCY: Board for Registration for Professional Engineers
TOPIC: BUSINESS AND CORPORATIONS -- 2
SUMMARY: Concerns engineers' fees concerns complaints.
AGENCY CONTACT: Charles Nemir, Executive Director, Texas State Board of Registration for Professional Engineers, P.O. Box 18529, Austin, TX 78760, (512)440-7723.
CITATION: 22 TAC 131.138, .171 Practice and Procedure
PROPOSAL DATE: 05/10/94
COMMENT DEADLINE: 06/09/94
ADOPTION DATE: 07/05/94
EFFECTIVE DATE:07/15/94

UTAH 5832
AGENCY: Department of Natural Resources/Division of Oil, Gas and Mining
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION -- 18
SUMMARY: Relates to coal exploration permitting requirements in line with Federal requirements; includes scope.
AGENCY CONTACT: Ronald W. Daniele, Division of Oil, Gas, and Mining, Coal, Department of Natural Resources, #3503m #3 Triad Center, Salt Lake City, UT 84110, (801)359-3540.
CITATION: R 645-200-100 Coal Exploration: Introduction
PROPOSAL DATE: 08/01/94
COMMENT DEADLINE: 08/31/94
HEARING DATE:08/24/94

VIRGINIA 2505
AGENCY: Soil and Water Conservation Board
TOPIC: RESOURCE MANAGEMENT AND PRESERVATION -- 18
SUMMARY: Establishes minimum statewide standards for the control of soil erosion, sediment deposition and nonagricultural runoff from land-disturbing activities that must be met in local erosion and sediment control programs, and also by state agencies that conduct land disturbing activities.
AGENCY CONTACT: James P. Edmonds, Urban Conservation Engineer, Department of Conservation and Recreation, 203 Governor St., #206, Richmond, VA 23219, (804)786-3997.
CITATION: VR 625-02-00 Erosion and Sediment Control Regulations
PROPOSAL DATE: 07/25/94
COMMENT DEADLINE: 08/26/94
HEARING DATE:08/03/94 & 08/04/94
F. B. "Ted" Mullin, CPG-1716

At this writing, there are at least two new versions of proposals to revise the mining law in the Committee. Industry has helped Senator Reid (DNV), DeConcini (D-AZ), and Campbell (D-CO) write Version IV? About all that I know at this time is that this version calls for a 3% royalty. Unsuitability is gone and the states are given more power to work on the reclamation of the operations. The House however has not relented in their attempt to keep royalties high and increase disincentives for industry to mine in the U.S.

With all of the other "important" business at hand, I see no chance for any changes before the elections.

In case some of you haven't heard one of the methods being used to stop the extractive industries - Here's one for you.

I reported earlier that some species of the Pacific salmon have been declared endangered by the Fish and Wildlife Service. Ostensibly, this act is because timber, grazing, power generation, and mining are vitally harming the species. Other reasons frequently espoused are that the Native Americans and commercial fishermen are catching too many fish and that power dams are either inhibiting migration or are grinding up the smolts on their way back to the ocean.

So now come the environmental groups with all these "facts" at hand and help the FWS to list the fish as endangered. For you easterners who may not be familiar with the western varieties of anadromous fish -- they die after spawning -- not like the Atlantic salmon who return to spawn more than once.

Now that they are listed, the next step is to take the land managing agencies to court to stop all timber, grazing, road building, and mining on any lands within the drainages of the rivers where the salmon spawn. The National Wildlife Federation, Wilderness Society, Sierra Club, and the Pacific Rivers Council have done just that. If they get away with this action, then look out -- it could happen anywhere.

**Now To The Good News From The Federal Register.**


MMS is revising the regulations governing the training for drilling, well-completion, well-workover, well-servicing, or production in the OCS. Comments must be received by 9-19-94 to be considered. Sorry about the time frame, but I thought that some of you would be interested anyway.

For further information contact: Jerry Richard, Information and Training Branch, (703) 787-1575.

**Vol. 59, No. 152, 8-9-94, page 40772.** Department of Health and Human Services, Food and Drug Administration. To show you that your government is working hard to protect you -- International Conference on Harmonization; Draft Document on Good Clinical Practices; Guideline for the Investigator's Brochure.

Actually, "The ICH was organized to provide an opportunity for tripartite harmonization initiatives to be developed with input from both regulatory and industry representatives."

Whistle while you work, or Plop! Plop! Fizz! Fizz!

And in the same issue on page 40562, the Western Area Power Administration refers to Western using arbitration or mediation to resolve disputes under the Alternative Dispute Resolution Act. And the very next sentence (pun intended) states: "Be realistic about the "death penalty" loss of the allocation approach."

Now that's arbitration!!!


Sam Volume, page 43268, Part VI. DOL-OSHA. 29 CFR Parts 1910 and 1926. Hazardous Waste Operations and Emergency Response; Final Rule. For further information contact: The same Mr. Foster listed previously.

**Vol. 59, No. 163, 8-24-94, page 43588.** Geological Survey, BHP Minerals International Exploration Inc. Notice is given that the USGS has accepted from BHP Minerals International, a contribution of $200,000 to support rhenium-osmium studies of ore deposits in areas such as the Viburnum and Carlin Trends as well as several massive sulfide examples from Finland and Sweden. Information on the work is available upon request from USGS, Branch of Eastern Mineral Resources, 950 National Center, 12201 Sunrise Valley Drive, Reston, Virginia 22092.

**Vol. 59, No. 167, 8-30-94.** Part IV, Department of the Interior, Bureau of Land Management, 43 CFR Part 3720, et al. Mining Claims; Final Rule. This involves Mining claims, Maintenance and location fees, lands open to location, National Parks, King Range National Conservation Area, Indian Reservations, Surface management, removal of obsolete or expired regulations and consolidation of remaining sections. For further information contact: Frank Bruno or Roger Haskins at (202) 452-0350.

See you in Flagstaff!•

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OCTOBER 1994 • The Professional Geologist 19
Request For Input & Expressions Of Interest

Continuing Education

AIPG is currently working to develop a continuing education program that will focus on professional management skills for geologists (and related scientists and engineers). Discussions are ongoing with several academic institutions and other training providers to tailor a program to meet the needs of our Members. While there are many organizations providing educational opportunities in scientific and technical subjects in the geologic field, there is a dearth of managerial training focused for geologists. Many geologists have lamented that promotions won by their geologic skills have put them into project management and people management positions for which they have had no training - a classic example of the Peter Principle. A good program of focused managerial training for geologists should fill a gap and provide better trained professionals.

The course topics currently under consideration include: (1) Managing for the Long Run; (2) Managing People; (3) Quantitative Tools of Business; (4) Managerial Economics; (5) Accounting; (6) Financial Management; (7) Marketing; (8) Personnel Management; (9) Use of Information Technology; (10) Operations and Project Management; (11) Strategic Management; (12) International Business. Professionalism and Ethics are to be stressed throughout.

The principal objective is to develop a continuing education program for geologists, and related professionals, that will become increasingly recognized as a professional qualification on which employers can rely. The idea is to offer a series of courses which will provide a basic foundation in management. These most likely will be made available at the AIPG Section (local) level on week-ends throughout the year, as well as at our Annual Meeting. As presently conceived, the basic series would consist of a minimum total of thirty-six contact (class) hours of courses in twelve three-hour modules. They should leave the student with a basic understanding of the principles of the subjects presented, to prepare the student to move forward in management and take more advanced courses in a second tier. The basic series would be followed by a student paper ("final exam"), addressing one or more problem(s) with which the student has some familiarity, either by involvement or by observation. This would present an analysis of the problem and offer one or more solutions, demonstrating an understanding of the course material covered in the thirty-six hour program previously completed. It would not be an exhaustive treatment of the subject, but would be written for a thirty-minute (maximum) oral presentation plus questions. This would be presented at a gathering of peers and would be critiqued and graded by them. Continuing Education Units (CEUs) would be awarded, as well as an appropriate certificate.

Typically, the course modules would be presented in groups of four, i.e., two on Saturday and two on Sunday. This would minimize the disruption of work schedules and the loss of "billable" time.

Every effort is being made to keep the cost of the program within reason. Even so, class sizes will be limited in the interest of maintaining quality.

One or more Sections could sponsor the series in their geographic areas. They could draw attendees from their own membership, as well as the membership of various local geological and other societies.

As it continues working on this, the Executive Committee would like input from the Members. The target is to have the program in place for the 1995 Annual Meeting. However, prior to that, they wish to have one or more "trial runs" of at least a portion of the series. Two Sections have expressed interest in sponsoring these sometime during the next six months.

Comments and suggestions are solicited. They should focus on several questions, including: (1) Is such a program needed? (2) Is the time commitment reasonable? (3) Would you support such a program? (4) Would you encourage others to participate? (5) Is there any other particular subject that should be included?

Please send your comments and suggestions to the Professional Education Committee, AIPG, 7828 Vance Drive, Suite 103, Arvada, CO 80003-2124.
The "Wasting Resource"

William V. Knight, CPG-153

It has often been said that those who participate in the extractive industries are exploiting a "wasting resource", that is, one that is finite and not replaceable, therefore, "wasted."

Thus, some industries have been castigated for taking from the earth resources that, as a consequence of their taking, will not be available for the use of future generations. We are urged to devote all of our efforts to developing and fully utilizing "renewable resources" and conserving those which are finite.

What is the most valuable resource that we have? Isn't it the minds, talents and dedication of the individual scientists (read: geologists)? Is this resource being "conserved" or "renewed"? How much thought, concern and effort has been given to its conservation and renewal? Is it being fully utilized? Or, is it to be "wasted", too?

Historically, some companies have supported the technical and professional societies because they have perceived the value of the exchange of information, the continuing education, the ideas and the friendships that are nurtured in these organizations. This has resulted in a constant renewal of this valuable resource. Many companies continue to enthusiastically support this effort, although there are glaring exceptions. However, in some other companies employing geologists this foresight seems more the exception than the rule. The philosophy of the "disposable" society seems to have been adopted. They utilize only one facet of their individual employee's capabilities, ignoring, i.e., "wasting", the rest. Too often these companies seem to "use them up and throw them out", with no thought of full utilization, preservation and renewal of their most valuable resource. They plead lack of time and limited resources. But, we have always had lack of time and limited resources.

In my own career with large and small companies, consulting firms, private practice and, yes, in my present position, I have attended a multitude of technical and professional society meetings, short courses and social events. While some were certainly much more valuable than others, I find it difficult to recall one that was a total loss (though, I must confess, some came close). All yielded something, if only some interesting conversation with a colleague, a fresh or refreshed idea, some new professional or business contact, or a preview of some future event. I think that, on balance, the return on my investment of time, effort and money in these organizations has been exceptionally high, when compared with some of the other ways I have spent my time, talents and money.

Total preoccupation with "billable time" and this month's "bottom line" can yield very high short term benefits. But, this is a recipe for the ultimate extinction of a business. These concerns are critical, certainly. But, thinking only of the present, without looking beyond the next project or financial statement dooms one to isolation and obsolescence. Time and resources must be devoted to developing future capabilities and markets. Consider how many companies, both large and small, have come and

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**Executive Director's Itinerary**

(subject to change)

The Executive Director is visiting various Sections, agencies, campuses, and other organizations. He is talking, listening, and exchanging information and ideas. Members are encouraged to attend these meetings wherever and whenever possible. His itinerary for the next several months, as presently scheduled, is:

- **Sep. 30-Oct. 1:** Wisconsin Section, Madison, WI
- **Oct. 7:** Utah Section, Salt Lake City, UT (tentative)
- **Oct. 12:** Executive Committee, Flagstaff, AZ
- **Oct. 13-15:** AIGQ Annual Meeting, Flagstaff, AZ
- **Oct. 18:** Colorado Section, Denver, CO
- **Oct. 22-28:** Geological Soc. of Amer. Convention, Seattle, WA
- **Nov. 1-3:** Petroleum & Hydrocarbons Conf. & Exp., Houston, TX
- **Nov. 3:** Texas A&M niv., College Station, TX (tentative)
- **Nov. 9-14:** Assoc. of State Boards of Geology, Chapel Hill, NC
- **Nov. 18:** Colorado Section, Denver, CO
- **Nov. 30-Dec. 3:** North West Mining Assoc. Convention, Spokane, WA
- **Jan. 21, 1995:** Executive Committee, Arvada, CO (tentative date)
gone within the normal span of one person's lifetime. In fact, most companies have shorter lives than most people. They begin with a good product, ride it as long as possible, then pass away. They fail to give sufficient attention to their future.

All of this is as true of individuals' careers as it is of companies. Some of the most fertile ground for the individual or company to find and develop new knowledge and skills and to market professional services (thereby extending their productive and economic lives) exists in the professional and technical societies. There are many examples of a company's or individual's services being retained because the new client was impressed with the performance of that company's employee or that individual as a participant in the affairs of a professional or technical organization.

It has been said, with considerable truth, that most good business development and employment opportunities are found through contacts made in professional organizations. Participation in their affairs should not be thought of as a "perk", but as an opportunity. Indeed, it should not be "tolerated" by employers; it should be "expected". It is the most cost-effective ongoing opportunity for new business development and economic and technical advancement that is available to any company or individual. It is reasonable to expect employees periodically (perhaps every year or so) to be able to identify some of the ideas, information and new or enhanced contacts that have resulted from their participation in professional and technical organizations. Indeed, individuals should expect this of themselves. If they cannot, they should reexamine their mode of participation. The problem may lie within the individual and not the organization, for any such organization (or company) is only what the individual members or employees make of it.

Many companies know this and behave accordingly. But, those who confine themselves to their initial properties, prospects and clients shortly disappear. Those who encourage their employees to be active in professional and technical affairs are more likely to survive and to be among the leaders in their fields.

What is your company's practice? What is your personal practice? Are your firm's abilities and business contacts being confined to the present, without building for the future?

If you are an employer, are you building for your future by encouraging your employees in their professional and business development? Or do you expect to let tomorrow take care of itself? Do you expect to "waste" your present intellectual resources and hire fresher, cheaper replacements (again, for a single use, the rest to be "wasted") only when the need for them arises? Restricting your employees to "billable time" and discouraging or preventing them from participating in professional affairs is, in a way, a form of slavery. Like all forms of slavery, it eventually ruins its practitioners.

If you are an individual, are you building for your future by professional development and networking? Or do you, too, expect to let tomorrow take care of itself? Are you "wasting" yourself? What happens if and when your client or your employer no longer needs your services? Will your time and efforts have been so narrowly focused that you will be "out of the loop" and technically outdated? Will you have lost contact with your profession and thereby severely restricted your options? Your employer may not support these activities, and may even discourage them. But, it is your responsibility as a professional, not your employer's, to see that you stay "in the loop" and technically up to date. Whether your employer realizes it or not, it will make you a more valuable employee. And, for yourself, it will make you more valuable to both your present employer and your potential future employers.

The next good opportunity most of us will have to participate in a national professional activity will be the AIPG Annual Meeting in Flagstaff, Arizona, October 12 to 15. I hope we see you there. Meanwhile, remember your local Section of AIPG. It can be a valuable resource for both you and your employer. But, it can only be as valuable as you and your colleagues make it. Don't let yourself become a "wasting resource".

Short-Course Series
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Colorado School of Mines
November 17-19, 1993

The course, through lectures and computer sessions, will address the underlying principles and operation of WhAEM, and focus on the application of WhAEM to real world wellhead protection problems.

For more information contact the IGWMC.

Institute for Ground-Water Research and Education
Colorado School of Mines
Golden, Colorado 80401-1887
Phone: (303) 273-3103  FAX: (303) 273-3278
Personality Vs Issues

Lynn Graf, AIPG Legislative Affairs Advisor

I recently attended a panel discussion on "What's Hot With Voters in 1994?" at the Annual Meeting of the National Conference of State Legislators (NCSL). The panel gave a perspective on grassroots participation in elections additional to that which I discussed in the July and August issues of TPG.

The panelists were journalists and seemed to agree that issues like family values and crime were nation-wide concerns with voters. Environmental issues were listed toward the bottom and natural resources were not mentioned.

The panel felt personalities of candidates would receive more public attention than issues during campaign discussions and the media would reflect this emphasis because that is what people want to hear. The panel also saw declines in public esteem, trust of politicians and the political process as a national issue. Surveys show approval for government is at an all-time low and state legislatures are viewed as unresponsive and incapable.

This type of discussion catches my attention because I have a very different view of state legislators and generally find them to be professional, hardworking, committed, intelligent, well educated, concerned about the views of the people they represent and badly misunderstood by the public and media. I also wonder how many geologists have the opportunity to personally know that politicians are often different from the image portrayed in the popular media.

I would like to share research that describes the personality of state legislators and offer suggestions for use of this information. Communicating with state legislators on geologic policy will increase in effectiveness if you have information that is more factual than public opinion or media hype.

RESEARCH

The NCSL conducted an analysis of occupations of state legislators in 1993 and reported the following results:

- Attorney 16.5%
- Full-time Legislator 14.9%
- Business Owner 10.0%
- Agriculture 7.9%
- Retired 7.2%
- Business Exec./Mgs. 6.2%
- K-12 Educator 6.2%
- Business 5.1%
- Consultant/Professional 3.5%
- Real Estate 3.2%
- Insurance 3.2%
- Government Employee 2.5%
- Communication/Arts 2.4%
- Medical 2.4%
- College Educator 2.0%
- Homemaker 1.3%
- Engineer/Scientist/Architect 1.2%
- Accountant .7%
- Clergy .4%
- Labor Union .3%
- Student .3%
- No info 2.6%

Total 100.0%

Lillian C. Woo, author and political consultant from North Carolina, is currently writing a book about state legislators based on her survey of 900 legislators in 16 states who responded in a two year study. Some of the results of her study are as follows:

- Average age (Legislators) 50 yrs (Census) 34 yrs
- Marital status - Married 83% 42%
- Other 17% 58%
- Gender - Male 70% 49%
- Female 27% 51%
- no response 3% 5%
- Race - White 89% 80%
- Asian American 6% 3%
- African American 5% 12%
Political ideology

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<td>Conservative</td>
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<tr>
<td>Liberal</td>
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Education completed-post grad

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<tr>
<td>Some college</td>
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<tr>
<td>Other</td>
<td>8%</td>
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Annual family income

<table>
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<tr>
<td>125,000+</td>
<td>13%</td>
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<tr>
<td>No response</td>
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</tr>
</tbody>
</table>

Additional surveys include (1) NCSL analysis in 1993 of all 50 state legislatures showing a total of 7,424 state legislators nation-wide, including 1,500 (20%) women and 700 (9%) minority members. (2) Bureau of census figures for 1989 showing the average household income at $28,906, and college graduates at $49,180. (3) NCSL surveys show that the average legislative salary in 1990 was around $22,600.

**ANALYSIS**

The NCSL occupational survey shows that there are not many geologists among the group. Roughly, at least one out of every 100 legislators will have a scientific background. This means that the majority of legislators must rely on professionals such as AIPG members for geologic expertise.

The profiles show an average legislator is married, middle aged, white, well educated, upper income male who tends to be a moderate to conservative attorney, full-time legislator, or business owner. The challenge is to relate geology to the background and experience of state legislators. Geology needs to be understood at a personal level before legislators can really understand how it impacts public policy. There should be at least one example to relate to each legislator. Geologists who staff the AIPG booth at the NCSL Annual Meeting are able to relate geology to the environment and economy (jobs) of the legislative district for nearly every legislator who stops to visit.

Legislators are generally interested in successful economic development enterprises, especially for their district and their state, and this includes projected revenue and employment from exploration and resulting resource development. Also, legislators appreciate the often significant economic benefits from mitigation of geologic and environmental hazards. Attorneys and real estate professionals appreciate information on soils and environmental hazards. Teachers use current geologic information in their classroom. The health and agriculture communities use information on ground water to monitor the quality of local water resources.

Members should listen carefully to legislators and help them determine what they need to know about geologic issues. You will be most effective when addressing concerns of legislators instead of asking legislators to address your concerns. The goal is to find a way to show legislators how you have mutual issues you can effectively address as a team.

It is impossible for legislators to remember everything about the hundreds to thousands of bills they are expected to review each year. Information that is given to them should be brief, to the point and professional in presentation because legislators already have plenty of information to process on tax policy, prison expansion, economic development, environment, highways and transportation systems, or low income assistance programs.

Many legislators are hard-working, dedicated public servants trying to make decisions in the best interests of their district. Lillian Woo discovered that "more than 64% of legislators work seven-hour work days and 78% percent work six to seven days a week." Ms. Woo reported that "legislators say they chose to run for public office because of a fundamental belief in the value of our political system and its constituent institution. They feel they have something to offer; they care about the future of their states; and they believe that through the legislative process they can make a difference."

**Legislators As Representatives For Geologists**

Through understanding personalities of elected officials, respecting them, and working with lawmakers on their own familiar ground, AIPG Members can raise the awareness of issues and greater understanding for the expertise of the geologic profession. As mutual understanding increases, communications with state legislators on policy will become more effective.

In August my article for TPG encouraged Members to become involved in the 1994 elections because this is the time to have an impact on who will serve in the state legislature and be in positions to make decisions that impact geologists. Members need to support candidates whose philosophy of government is compatible with strong scientific principles and effective and reasonable management of natural resources and environmental issues.

Lynn Graf is a government relations consultant with over 20 years of experience in community and government relations. She has served as lobbyist for the AIPG Colorado Section since 1990 and worked on a variety of issues including oil and gas, mining, geologic hazards, water, financial planning, water/mineral appraisals, land use planning, economic development, and professional licensing/registration.
Certification Examinations And The Nature Of The Industry

Dear Editor:

As a geologist who is concerned about licensing and registration issues, I was concerned by the direction in William Knight's column entitled, "Licensing ("registration") Examination - Results Show A Disturbing Trend" (TPG, July 1994, Vol. 31(8)). I strongly agree with Mr. Knight's emphasis that geologists must be well founded in the fundamentals of the core subjects of science. However, it seems that the disturbing trend that Mr. Knight references is the tail wagging the dog.

The Nature of The Exam

I see a fundamental problem with the National Association of State Boards of Geology (ASBOG) examination. In an attempt to encompass all the domains in the field of geology, the examination does not respect the fact of specialization. The downward trend of the number of geologists passing the exam was linked to the tendency for geologists to specialize in a narrow field of expertise. This tendency to specialize was thus alluded to as the problem to be corrected. It seems most productive, however, to use the trend as a tool to modify the examination process, not by lowering our standards of professional practice, but by respecting the nature of our profession.

The Nature of Specialization

Whether we want to admit it or not, specialization is a fact of our profession and our society. In the field of geology, there are at least two factors that promote specialization. The first factor is geography. With the advent of RCRA and the EPA, environmental consulting firms, as well as engineering and geotechnical firms, have popped up all over. The majority of these are small, localized firms that do not have a geographically broad project base. Consequently, most of their projects are done in a geographically similar region. I spent three years in the field monitoring drilling for environmental work before I ever had the opportunity to log a core hole. This was not because I lacked the knowledge, but because the state I worked in was covered with up to 450 feet of glacial till. To a petroleum geologist 450 feet of glacial sediments is a nuisance; to me it's my job.

We have met the enemy and he is us! The second factor influencing specialization is the geological industry itself. I learned the core fundamentals during my B.S. During my M.S. program I concentrated on geological remote sensing, geophysics, and environmental geology (in the broad sense, including ground water, landslides, earthquakes, etc). When I began applying for jobs, I had to choose a direction to pursue because prospective employers did not want an individual who was well founded in remote sensing, geophysics, and environmental geology. When I finally chose environmental geology, the employer was only interested in the narrower sense of environmental geology as it pertains to contamination of the environment. Due to industry pressure, I was forced to specialize in order to obtain employment as a geologist.

Even if an individual is employed by a company offering a wide spectrum of services, the company itself promotes specialization through two means. First, within the structure of a single company, there may be the "bugs and bunnies group" (environmental studies) the geotechnical group, and the engineering geology group. Each group focuses on slightly different things. Secondly, experience begets like experience. Once an individual gets experience with a certain type project, he is the likely candidate to head up the next similar project. This repeats itself until the individual comes to be known as the in-house "expert". This is also true in the public sector as well. Even at our universities and colleges, those professors who taught us specialize themselves. Every professor teaches a basic course, such as physical or historical geology, and then they teach the rest of their courses in their own specialty, whether that be geological remote sensing, geophysics, geochemistry, etc.

The Solution

If we are our own enemy, and I believe we are, then the solution lies, at least in part, with us. There are two things that can be done. The first solution is for the geological industry to break the trend. Walt Disney's approach to developing employees was to rotate each employee to experience every aspect of the entire operation. Managers can do the same thing by rotating employees to the various groups in order to utilize their "fundamental core subjects of science". Different groups of specialization draw on different domains of the core subjects of geology.

The second thing to be done is to create an examination that respects the trends of the industry. The examination's thirteen "domains" is too broad and extends beyond the core fundamentals of geology. Mr. Knight inadvertently acknowledges this when he admits "practicing Engineering Geologists and Hydrogeologists should have the advantage". If a registration/certification examination favors any one specialization, then it has gone beyond the core of the fundamentals of geology. The solution is to pare down the "domains" into a basic geology certification examination, and then to develop additional examinations that apply to the various specializations.

Kurt A. Bogner, CFC-0017

AUTHOR'S REPLY ON NEXT PAGE
Author’s Reply

It appears that I failed to make myself clear on some points in the column to which Mr. Bogner refers. We seem to be seeing an increase in specializations coming too early in one’s training and career, while basic fundamentals are slighted. Specialization has long been a fact in all fields of geologic practice. But, any good geologist must have a broad background in all the sciences especially geology. For, while a geologic project may be site-specific, the principles are not.

A second problem is the specialization emphasis within the examination, itself. This gets into the philosophy of state regulation and the nature of regulatory examinations, which were outside the scope of that column. The examination concentrates on things that present a risk to the public. So, particularly in the “practice” examination, greater emphasis is placed on that aspect. (My acknowledgement that certain specialists should have an advantage was not inadvertent.) If narrow specialty questions are included, perhaps examinees should select from among several, with at least one in each field. This is done in some other professions.

Mr. Bogner suggests that additional examinations be developed for specialties. In other professions, this often has led progressively to further complications, i.e., specialty certification, licensing, specialty fencing and turf protection.

The appropriate answer to both problems would seem to be for geologists to accept their professional responsibility to be properly educated and currently informed in their science. This is the responsibility of the individual professional, not their employer or anyone else.

William V. Knight, CPG-153


Dear Editor:

There is no question in my mind that the JOIDES and ODP programs have revealed significant contributions to our knowledge of the geology of the oceans and, consequently, to our understanding of the earth itself. But I am in awe of the summary of findings cited in the referenced article.

Confirmed seafloor spreading! To fully evaluate this conclusion we need to separate those facts relating to seafloor spreading vs. plate tectonics. Plate tectonics is a given (with all known facts); seafloor spreading remains a theory.

The Great Barrier Reef, off northeastern Australia, is less than 1 million years old, substantially younger than was previously believed! Hallelujah! Australia is a sinking land. Paleontological data on atolls in the Coral sea suggests the area may have been sinking since Cretaceous. If coral material is taken from bedrock in the near-shore area of subsiding islands off the eastern coast of Australia, one might confirm that the Great Barrier Reef is less than 1 million years old—or even less than one thousand years old. But one needs to dig deeper. In the Gulf of Papua, for example, Miocene reefs, on trend with the Great Barrier Reef, were encountered in hydrocarbon exploration activities. These reefs were killed by the influx of sediments from the Fly River, during the Plio/Pleistocene uplift of the Central Range.

Please don’t be a party to filling the literature with unfounded “facts”.

William E. Kennett, CPG-0332

Author’s Reply

I thank Bill Kennett for responding to my article on the Ocean Drilling Program in the June issue of The Professional Geologist.

Perhaps Mr. Kennett’s objection to the term seafloor spreading is a matter of semantics. In late 1968 and early 1969 several holes were drilled across the axis of the Mid-Atlantic Ridge near lat. 30°S during Leg 3 of the Deep Sea Drilling Project. The results confirmed the hypothesis of seafloor spreading by showing that the sediments and rocks are successively older away from the axis of the ridge on either side by an approximately equal distance (see Maxwell et al., 1970). Subsequent investigations of the Mid-Atlantic Ridge and other spreading centers where new crust is being formed have resulted in similar findings.

With regard to the Great Barrier reef off the northeastern coast of Australia, results of investigations during ODP Leg 133 in 1990 indicated an age for the reef of no more than 0.9 m.y. (see Davies and McKenzie, 1993). Seismic data obtained in the late 1980s indicated that certain reflectors could be traced beneath the Great Barrier Reef; these
reflectors were thought to be early Pliocene. Paleontological dating of these reflectors from core samples, however, indicated an age of 0.5 to 0.9 m.y. Post-cruise oxygen isotope analysis of samples from the reef, and matching of stages with deep-sea data, suggested an age of 0.5 m.y. or younger (Peerdeman et al., 1993).

References Cited

William D. Rose, CPG-783

Missouri Geologist Registration Act

The livelihood of geology in the State of Missouri has raised its status. On July 6th, 1994 the Governor of the State of Missouri, Mel Carnahan, signed into law Missouri Senate Bill 649 now referred to as the Geologist Registration Act (GRA). The GRA, which came into effect on August 28, 1994, creates a formal Board of Geologist Registration. The GRA requires geologic work performed, which concerns public health, safety and welfare to be done by a geologist registered with Missouri. The registration process will not begin until the Board of Geologist Registration is appointed by the Governor and only after the board formulates policy and decides upon the many issues including potential reciprocity with other states.

The GRA sponsored by State Senators Jerry Howard and Mike Lybyer and Representative Jerry McBride,
proceeded through both houses without amendment. The bill passed the Senate with overwhelming majority and was passed to the House of Representatives with a single dissenting vote.

AIPG - Missouri Section worked closely with State Senator Howard's office to market the bill to the legislature. Senator Howard coached AIPG on the mechanics of lobbying and suggested whom to write letters and make personal visits. AIPG - Missouri Section is proud to have been instrumental through this entire effort. AIPG was there, drafting the bill, revising the bill, testifying at the Senate and House of Representatives committee hearings, lobbying in the state capital, writing letters to legislators and finally, AIPG was there at the bill signing in the Governor's office. AIPG Missouri Section is equally proud to have collected additional private funds from the section membership in order to finance the lobbying effort.

AIPG's role in the GRA is not complete. The AIPG Missouri Section will take an active role to identify candidates to establish the Board of Geologist Registration. AIPG will make recommendations to the Governor, who is likely to accept that direction.

A Brief History and Key Concepts

In September of 1992 at the annual meeting of the Association of Missouri Geologists an informal survey was conducted which determined that a strong majority of geologists would be in favor of registration in the state. That was followed up with a formal written survey of all known geologists in the state. The result of that survey also showed an exceedingly pro toward registration.

The AIPG working in concert with other professional geologic organizations began a series of work sessions to discuss and draft the raw legislation. The work groups included members of the mining, environmental consulting, academic, and the federal and state government geologic communities. This diversified group provided many perspectives and unique concerns from which to draft the bill. To gain the perspective of anyone potentially opposed to the bill, a well-publicized meeting was held to hear those views. The major professional engineering societies were invited.

The GRA contains meaningful professional and political courtesy. It specifically mentions that related work, but not involving geologic interpretation, to be done by professionals such as soil scientists, chemists, archaeologists, geographers and others is not required to be performed by a registered geologist. Also, the GRA exempts engineering work involving soil, rock, groundwater and other earth materials for the purpose of gathering data for engineering purposes. There is a "Grandfather Clause" in the bill which allows persons meeting all other requirements to waive the examination, as long as the application is made before October 1, 1995. These political and professional considerations may have served to minimize opposition from other professional groups.

After the final draft of the bill was completed, AIPG - Missouri Section obtained the backing of Senator Howard. His research staff put the bill into official format and introduced it to the Senate Committee on Commerce, Consumer Protection and Environment. The committee recommended "do pass" and the bill went to the Senate floor for debate. At this juncture, AIPG - Missouri membership began an offensive of letter writing and personal visits to the State Senators. The Senate passed the bill because it provides protection to the citizens of Missouri, but it may have not been passed without the influence of Senator Howard and the grass roots lobbying effort of the AIPG.

Once through the Senate, SB 649 went to the House of Representatives Committee on Professional Registration and Licensing. AIPG - Missouri contacted members of the committee to urge support and, with the help of Representative Jerry McBride's prompting, the bill was passed to the House of Representatives floor for debate and vote. It is interesting to note that a group of professional geologists did testify in opposition to the bill at the hearing, but the engineers' opposition was not sustained by the House Committee. The House of Representatives voted for the bill nearly unanimously, and the Governor signed it into law.

Legislators and lobbyists informed us that a bill such as this one can take several years to pass, if at all. Many legislators view registration as an attempt to protect turf. The reason passage was attained so rapidly is the professional geologic people in Missouri collaborated as a single steadfast professional assembly whose interest is to protect the public by obtaining the best viable legislation. This was readily apparent to the Missouri Senate and House of Representatives members, as well as the Governor.

This commentary would be remiss if the Association of Engineering Geologists (AEG) were not acknowledged. Like AIPG, AEG was very active and very key to the success of this endeavor. Thank you AEG.

John L. Bogner, CPG-8341,
President-Elect Missouri Section

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Members are represented by qualified geological professionals. Congress, Legislatures, and Federal and State agencies are lobbied on specific mining, petroleum, water, environmental and other issues of special interest to geologists.

A portion of AIPG's monthly magazine The Professional Geologist (TPG) is devoted to reporting developments at all government levels. Thirty-six sections of AIPG provide group representation on a state or regional level and offer opportunities to meet, work and exchange ideas and information with colleagues.

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At the national and section level, AIPG provides materials designed to enhance the professional knowledge and skills of its members. Educational opportunities range from seminars and short courses to sectional and national meetings. To encourage high standards of educational programs, the Institute recently established a program of Accreditation of Continuing Education opportunities offered by other organizations.

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