GUIDELINES FOR THE PREPARATION OF WHITE PAPER

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Geoenvironmental Research Experience (list projects in progress or completed within the past 5 years)**:**

- Suitability of Fly Ash Stabilized Soils as Highway Base Materials
- Environmental Suitability of Stabilized Petroleum Contaminated Soils
- High Carbon Content Fly Ash in Remediation of Contaminated Soils
- Image Analysis in Determination of Strain Distribution During Geosynthetic Tensile Testing
- Filtration Performance of Geotextiles with High Water Content Geomaterials
- Remediation of PCB Contaminated Sludges
- Dewatering of Dredged Sediments and Slurries using Geotextile Containers
- Modeling the Permeability of Asphalt Pavements

Geoenvironmental Teaching Experience (list related courses, including short courses, taught within the past 5 years)**:**

- Geoenvironmental Site Remediation
- Geotechnics of Waste Disposal
- Slope Stability and Seepage
- Geosynthetics Engineering

Geoenvironmental Consulting Experience (list major projects only)**:**

- Analysis of Soil Erosion on MD 6, Charles County, Maryland State Highway Administration, 2002.

- Evaluation of High Strength Geotextiles for their Use in the Woodrow Wilson Bridge Rehabilitation Project, Maryland State Highway Administration, 2001.

- Assessment of Hydraulic Conductivity and Geosynthetic Interface Properties in a Landfill Cap, K.I. Sawyer Air Force Base, Marquette County, Michigan, 2000.

- Determination of Soil Erosion and Geotextile Clogging in an Exposed Slope, K.I. Sawyer Air Force Base, Marquette County, Michigan, 2000.

- Design of Geogrid Reinforced Unpaved Roads on a Very Soft and Organic Waste, Madison Metropolitan Sewerage District, Madison, Wisconsin, 1997.

Appraisal of Geoenvironmental Research, Education and Practice (limit to 1-2 pages)**:**

I am actively involved in geoenvironmental and geosynthetics engineering research. During the last four years, I have conducted more than 8 research and 10 consulting projects for industry and government. The sources of the research funds have been broad, ranging from state and local agencies to federal agencies, such as Maryland State Highway Administration, Maryland Department of Natural Resources, and Federal Highway Administration. These projects have served to support two Ph.D. students, three M.S. students and six undergraduate students.

My research is on solidification/stabilization of contaminated soils and high water content geomaterials, beneficial reuse of industrial by-products, and image analysis applications in geotechnical and geosynthetics engineering. My remediation work emphasizes the analysis of the behavior of geomaterials, field performance and assessment, and quality control. I am currently involved in a study to investigate possible uses of petroleum contaminated soils in geotechnical construction. In another study, we are investigating the effect of fines and various activators on the fly ash stabilized soils. Laboratory studies are undertaken to investigate the geomechanical characteristics of the mixes and the leaching performance of contaminants. As part of a separate research program, we are looking for alternative ways of handling the dredged sediments. The work includes the proper selection of geotextile containers for dewatering the sediments, remediation of the contaminated sediments using stabilization technologies, and beneficial reuse of these sediments in cut-off wall applications. I conduct experimental work in the laboratory and field. My contributions as a researcher and engineer in the remediation of a superfund site have been recognized by the Engineering Achievement Award from ASCE Wisconsin Section. Additionally, I have received the Graduate Research Board Award from the University of Maryland and Norman Severson Geotechnical Award from the University of Wisconsin.

In an ongoing study, I have developed image-based methodologies to determine the pore structure parameters of geotextiles. This involves the measurement of pore sizes and porosities of woven and nonwoven geotextiles in their as-received form as well when they are subjected to compression and tension forces. As part of this study, I have developed a Markov-chain based stochastic approach to measure the pore size distribution of three-dimensional nonwoven geotextiles. Presently, we are involved in a study with the University of Washington to compare the image-based pore sizes with the measurements obtained from laboratory bubble point tests.

I teach courses in the area of waste containment, geoenvironmental site remediation, and geosynthetics engineering. My teaching is interwined with my research, to the benefit both. I have introduced three different courses since coming to the University of Maryland and have received student evaluations consistently close to the top of department. I use web pages as an instructional tool and as a means of disseminating materials in all of my courses. As evidence of the interest and value of these web pages, I have received questions, requests, and positive feedback from students and researchers on numerous occasions.

My teaching innovation and effectiveness has recently been recognized by the University of Maryland. In 2002, only one year after joining the University, I was recognized for my outstanding teaching by being named as a Lilly-Center for Teaching Excellence fellow. I was one of the ten faculty members selected from across the campus community and the only member from the College of Engineering.

I strongly believe in the integration of research and practice; therefore I have made development in the applications of image analysis to geosynthetic engineering. I have ongoing projects supported by the geosynthetic manufacturers. As part of that work, we have developed an image-based particle tracking software to define the strain distribution in geosynthetics during tensile testing. The method is based on a rapid automated technique to determine the strains without requiring significant user effort and judgment. Furthermore, the method is capable of studying deformations occurring at different locations within the specimen as well at weak zones and seams, which are not possible to measure with the aid of extensometers or strain gages. Currently, the manufacturers are highly interested in the projects as the techniques may provide useful quality control tools during the manufacturing of their products.

Perspective on Emerging Geoenvironmental Issues and Technologies (limit to 1-2 pages)**:**

The application of two emerging technologies, beneficial re-use of recycled material, and remediation of high water content geomaterials, is growing in geoenvironmental engineering. Legislation has been promulgated in many states to remove barriers to large-scale beneficial reuse of recycled materials. As a result, there is a renewed emphasis on incorporating suitable recycled products, such as petroleum contaminated soils, coal combustion by-products, scrap tires, processed silica, recycled glass, concrete, asphalt or plastics, into civil engineering applications. The lack of regulations from the authorities addressing beneficial re-use is most likely directly related to the general lack of knowledge concerning these materials. Various studies have been conducted in the past by many institutions such as the University of Wisconsin, Purdue University, and the University of New Hampshire. Research studies, particularly field studies, should be conducted to prove the beneficial re-use of those products. Conducting further research studies will facilitate the reuse of these soils, because designers and engineers are more amenable to using these by-products if their engineering properties and environmental suitability have previously been characterized.

More than a billion cubic meters of high water content geomaterials are produced annually worldwide. Typical ones could be listed as mine tailings, paper mill sludge, dredged sediments, wastewater treatment sludge, flue gas desulfurization sludge, gypsum tailings, and fly ash. Due to its cost-effectiveness, the most commonly used remediation alternative is to deposit these waste materials hydraulically in diked impoundments. The problems emanating from this disposal method are the difficulty in dewatering the wastes, their large volume and heterogeneity, low strength and hydraulic conductivity, leaching of the contaminants present in the waste, the stability of surrounding structures, and reclamation of the disturbed land. Various remediation methods have been developed in the last two decades, and their applicability to these high water content materials should be investigated.

Recently ASTM has organized two conferences, and special technical publications published as a result of these conferences (Geotechnics of High Water Content Geomaterials STP 1374, and Contaminated Sediments STP 1442) provide excellent information about current research in high water content materials. Studies conducted at institutions such as Northwestern University, Lehigh University, and the University of Maryland have indicated that more research is needed in the area. Research efforts should be made to investigate alternative remediation methods (other than deposition on impoundments and landfilling) through laboratory and field studies. Moreover, beneficial re-use of these products after remediation or dewatering should be investigated since this may cause substantial cost savings and help engineers to protect the environment.