www.waterresources.umd.edu

Fall 2007 Dr. Allen P. Davis, Director Dr. Phil Kearney, Assoc Director

## Maryland Water Issues in 2030

Global climate change, swelling populations, and increasing technological advances all continue to affect water availability, distribution, and quality. The future will bring many new challenges and may exacerbate existing challenges that have not been met. As we look back over the past 25 years, our water knowledge and water management technologies are much more advanced. Our problems, however, are not solved. Within this one-day symposium, we dare to look to the future to anticipate upcoming water resources challenges globally, and with a specific focus to Maryland.

This one day Conference will take place on Wednesday, October 31st, in the Benjamin Banneker Room, Stamp Student Union, University of Maryland, College Park, MD. See page 3 for details.

### Inside the Newsletter



## Request for Proposals – 2008 Funding

Proposals for the 2008 *Maryland Water Resources Research Center* funds are now being solicited. The Center is seeking requests for three types of proposals this year (with their estimated funding levels): regular research projects ($15k to $30k), summer graduate fellowships ($5k) and seed research projects ($2k to $5k). Requirements for the 2008 summer fellowship program are presented below. The seed project program solicits proposals aimed at developing exploratory projects, with the deliverable being a major proposal for submission to another agency such as the National Competitive Grants program. The PI would be the team leader in developing a broad-based project on a high priority subject.

For information on proposal preparation, go to our web site at: *www.waterresources.umd.edu.* Specific questions may be addressed to the Associate Director at (301-405-6829) or e-mail *kearneyp@umd.edu. Proposals are due in the WRRC office (1147 Martin Hall, University of Maryland, College Park, 20742) by close of business (4:30 PM) on* ***Friday, November 9, 2007****. Proposals must be signed by an authorized University Representative****.***

## 2008 Summer Fellowship Program

The Center will offer $5000 summer assistantships to selected outstanding graduate students. Selection of awardees will be made in late November based on: a) evaluations of student's records, b) strength of advisor's recommendation, and c) prospects that the research will benefit our understanding and management of Maryland's water resources. Advisor matching funds may be required. Interested applicants should contact Dr. P. C. Kearney for details at *kearneyp@umd.edu****.*** *Summer Fellowship proposals must be submitted to our office by November 9, 2007. Guidelines can be found at the Center website.*

## Maryland Water Resources Research Center/Agricultural Research Service Cooperation

Dr. Laura McConnell is a Research Chemist in the Environmental Management and Byproduct Utilization lab with strong collaborations with faculty and students at the Department of Civil and Environmental Engineering and a member of the Graduate Faculty. She has served as co-advisor for MS and PhD students, Co-PI on research projects and co-chair for international symposiums with UMCP students and faculty. Her work centers in the

investigation of the processes controlling the movement of pesticides and other persistent organic pollutants from agricultural operations into the atmosphere or surface waters with the ultimate goal of designing more sustainable farming systems that will minimize negative impacts on surrounding ecosystems. Currently she is the co-PI of a project to determine the fate of endocrine disruptor chemicals upon the land application of biosolids. A second cooperative study was conducted between Clifford Rice (Agricultural Research Service) and Alba Torrents (Civil and Environmental Engineering), They investigated the impact of three wastewater treatment plants on derivatives of endocrine disruptors. These metabolites include nonylphenols (NPEO) and octylphenol (OPEO) ethoxylates. Both compounds were rapidly destroyed in the wastwater treatment plants. The amount removed depend on the treatment plant; 42%, 12% and 59% of the phenols were biodegraded in the respective plants. There were 39%, 24% and 20% total reduction in the effluent solutions when compared to the influent solution.

## Featured Scientist

### Lewis E. "Ed" Link

### Hurricane Katrina Forensic Analysis and Engineering Risk Assessment

Shortly after Hurricane Katrina struck New Orleans, The Chief of Engineers, LTG Carl Strock, established the Interagency Performance Evaluation Task Force (IPET). Their job was to find the facts about the performance of the hurricane protection system and to develop a forward looking assessment of risk to guide repairs and rebuilding of the protection system. The Task Force was led by


Dr. Ed Link, currently a faculty member in Civil and Environmental Engineering and formerly the Director of Research and Development for the Corps. The Task Force was comprised of over 250 national experts from 25 universities, 23 companies and 20 government agencies. A number of other faculty in CEE were instrumental in the conduct of the work of the task force including Dr. Greg Baecher, Dr. Gerry Galloway, and Dr. Bilal Ayyub. The reports of the IPET are available in 9 volumes on the web site https://IPET.WES.army.mil.

The IPET conducted a broad range of research that included re-establishing the geodetic datum and local mean sea level for the region which suffers from rapid and variable subsidence. They used high performance computing and high resolution

# *Water Issues in 2030*

**Sponsored by:**
**Maryland Water Resources Research Center**
**Maryland Sea Grant College**

## October 31, 2007

**Benjamin Banneker Room**
**Stamp Student Union Building**
**University of Maryland**
**College Park, MD 20742**

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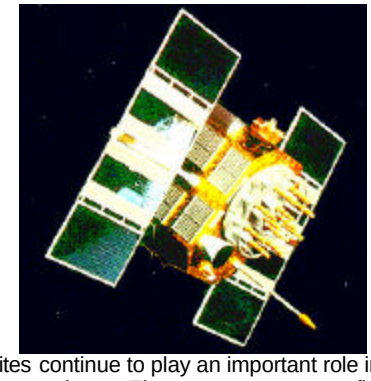
|---|---|
| 8:50 – 9:00 | Welcome + Opening Remarks |
| 9:00 – 9:40 | *"Oceans, Climate, and Human Health: The Cholera Paradigm"*, Rita Colwell, Distinguished Professor, University of Maryland, College Park, and Johns Hopkins University Bloomberg School of Public Health, Senior Advisor and Chairman, Canon US Life Sciences, Inc. |
| 9:40 – 10:10 | *"Maryland Commission on Climate Change: Assessing the Impacts of Climate Change on Maryland"*, Donald Boesch, President, University of Maryland Center for Environmental Sciences and Professor of Marine Science, Cambridge, MD. |
| 10:10 – 10:25 | Break |
| 10:25 – 10:55 | *"Water Supply Reliability in 2030 for the Washington Metropolitan Area"*, Erik Hagen,Director of Operations for the Section for Cooperative Water Supply Operations (CO-OP) at the Interstate Commission on the Potomac River Basin (ICPRB), Rockville, MD. |
| 10:55 – 11:25 | *"Emerging Contaminants"*, Yvette M. Selby–Mohamadu, Office of Groundwater and Drinking Water, U.S. Environmental Protection Agency, Washington, DC. |
| 11:25 – 11:55 | Robert Summers, Deputy Secretary, Maryland Department of the Environment, Baltimore, MD. |
| 11:55 – 1:15 | Lunch |
| 1:15 – 1:45 | *"The Impact of Sprawl on Water Quality in the Chesapeake Bay Watershed"*, Steven Prince, Professor of Geography, University of Maryland, College Park and Director of the Regional Earth Sciences Application Center. |
| 1:45 – 2:15 | *"The Status of Bay Restoration Efforts in 2010 and Predictions for 2030"*, Frank Dawson, Director Aquatic Resources, Maryland Department of Natural Resources, Annapolis, MD. |

Contact persons:
Dr. Phil Kearney
Associate Director, MWRRC
kearneyp@umd.edu
*301-405-6829*

Dr. Allen P. Davis
Director, MWRRC
apdavis@umd.edu
*301-405-1958*

hydrodynamic models to re-create the surge and wave environment created by Katrina and define the forces that the Hurricane Protection System (HPS) structures experienced during the storm. The performance of individual reaches of levees and floodwalls were analyzed to understand the mechanisms that caused breaching. This included detailed field surveys, analytical modeling of seepage and stability, and physical modeling using two of the largest centrifuges in the world. The entire drainage and pumping system (over 70 large pump stations) of New Orleans was modeled to understand the distribution of flooding that occurred and to study the degree of flooding that would have resulted if pump stations had operated and breaching had not occurred. The consequences of flooding were documented to include loss of life, direct property losses, environmental losses and social and cultural losses. These data provided the fundamental information to generate elevation – loss relationships for the many sub-basins that make up New Orleans.

The risk assessment was a unique application of current risk concepts to a distributed and complex system of structures. The HPS consisted of over 350 miles of levees and floodwalls, more than 70 major pump stations and almost 300 gate closures and transitions between different structure types and conditions. Each component of this complex system was characterized in terms of its fragility, the probability of failure in relation to water levels (surge and waves). This formed the basis for analysis of the reliability of the system. The future hazard was defined using 152 hypothetical hurricanes that varied greatly in character and strength. Each hurricane was modeled in a high performance computing environment to define the surge and wave conditions it would create at many locations around the region. These data were used to drive the reliability model and determine the probability of breaching and overtopping from the storms. This allowed computation of the probability of flooding at different depths in each sub-basin. Coupling the probability of flooding with the previously mentioned elevation-loss relationships allowed determination of risk. Risk maps are being provided to the public for pre-Katrina, current and proposed future conditions on the public web site www.NOLArisk.usace.army.mil. This work, one of the most comprehensive analyses of its kind, was recognized by Engineering-News Record with its Award of Excellence for 2006.



Satellites continue to play an important role in monitoring water science projects. They can measure flood damage, soil moisture, observe changes in land use (urban vs. rural), determine the amount of impervious surfaces in urban areas.

## 2007 Water Conference

The Fall 2007 Conference has proven to be the most challenging undertaking we have attempted to date. Our goal was to predict the major water issues that will occur in the year 2030. There were two options i.e., hire a local campus wizard or recruit the best available water scientists to share their wisdom on the future direction of water science. We have opted for the second choice. If you plan to attend, please register.

## Engineers Without Borders

Engineers Without Borders has captured the attention of engineering students, and, increasingly, non-engineering students, turning their attention to the adventure and the challenge of international development engineering. Basic potable water and sanitation -- linked to each other -- remain at the center of the needs for the developing world, and form an important portion of Engineers Without Borders projects. The UMD chapter of the national organization was initiated in 2004. It has grown dramatically, now with an annual student membership of roughly 100 a year, and it has attracted engineering faculty who assist in leading EWB projects -- in Civil Engineering: Dr. Deborah Goodings (overall chapter advisor, and Thailand specialist), Dr. Peter Chang concentrating on projects in Brazil), and Dr. Dave Lovell; and in Mechanical Engineering Dr. Jungho Kim (concentrating on solar energy for lighting and pumping water in Burkina Faso), Dr. Elias Balarus, and Dr. Elisabeth Smela. The appeal of EWB

exists on many levels, but most fundamentally it is an organization that doesn't just discuss engineering projects; it does them.

Projects begin with a small team of students, a faculty member and a practicing engineer who travel to a small community that has identified a simple infrastructure project it wants and that is central to its health and advancement. The assessment trip involves collecting the key information that extends far beyond recording engineering data. The team must evaluate the support for the project in all sectors of the community; the capacity of the community to participate fully in its construction, and in its subsequent sustainability; and the environmental and direct health impacts of the project. On their return to the University, students, faculty, and practicing engineers begin design of the project. They raise funds for the project materials, and for the implementation team to travel to the community. And they begin the complex logistics for constructing a project thousand's of kilometers away in a foreign culture. These projects are not experiments: they are "appropriate technology" designed to last, and our practitioners play a key role in bringing that about.

In three years the chapter has completed several impressive projects -- in northern Thailand: a health clinic for a cluster of Lisu hill tribe villages, and a 2 km water delivery system for a refugee Lahu hill tribe village and orphanage; in Andean Ecuador: a water supply and storage system in one village and a sanitation system in another; in a fishing village in southern Brazil: a water supply and storage system, and then and a constructed wetland sanitation system; in a hub of villages in southern Burkina Faso in west Africa, a solar powered lighting system for adult literacy centers. Two of these projects were recognized with prizes.

The chapter's ambitions and the attention it is receiving across the University and among the local community of practicing engineers fuels its continued growth, and the University considers it a model for its emphasis on international experience and global responsibility as it relates to students' areas of studies. For the students, it transforms not only the way they view themselves and their comfort with cultures outside the United States, but also their view of the engineering profession. The key role of water and sanitation to world health, to poverty reduction, and to dignity in one's life, is made abundantly clear. This manifests itself in what they are choosing to study in combination with their remaining engineering studies: languages, and peace studies and conflict resolution. It shows in what they decide to study after -- sustainability engineering at Cambridge University; alternative energy engineering at Stanford University, and public health engineering at Emory University. And it influences career choices of both the students and the practicing engineers who work with them, including working in international relief in post-earthquake Pakistan, in the refugee camps of Darfur, and in tsunami redevelopment in Indonesia.

EWB has become a model partnership of students, faculty, and practicing engineers, with extraordinary outcomes. Learn more at www.eng.umd.edu/ewb about EWB and how you can join our students in the challenge.

Lahu hill tribe orphans, refugees from Burma, enjoying clean, dependable water, delivered by a 2.5 km pipeline installed in partnership with the village of Baan Bo Mai and the University of Maryland chapter of Engineers Without Borders
Photo credit: Deborah Goodings, EWB-UMCP

## Maryland Water Resources Research Center

**Advisory Committee**

Dr. Margaret Palmer
*Director, UMCES Chesapeake Biological Laboratory*

Dr. Glenn Moglen
*Civil and Environmental Engineering*

Dr. Adel Shirmohammadi
*Bioengineering*

**External Advisory Committee**

Dr. Robert Summers
*Maryland Dept. of the Environment*

Mr. Robert Shedlock
*U.S. Geological Survey*

**Center Staff**

Dr. Allen Davis, Director
apdavis@umd.edu
301-405-1958

Dr. Phillip Kearney, Assoc. Director
kearneyp@umd.edu
301-405-6829

Aditya Antao, Administrative Staff
aditya@umd.edu

**Maryland Water Resources Research Center**
**Civil and Environmental Engineering**
**University of Maryland**
**College Park, MD 20742**