

**Tuesday, August 3, 8:00 – 9:30 a.m.**

## **BMP CASE STUDIES**

Room Cibolo 8

B11 8:00 – 8:30 a.m.

### **Upper Lake Lafayette Nutrient Reduction Facility**

Jeff Herr, Brown and Caldwell, Atlanta, GA

Florida's Lake Lafayette is impaired for nutrients. Water enters the lake from a 13-acre wet pond that is not large enough to adequately treat stormwater from the contributing watershed and provides minimal pollutant removal. The city of Tallahassee plans to build an off-line chemically enhanced stormwater treatment system to remove total phosphorus and total nitrogen from runoff entering the treatment system without increasing the size of the pond. This presentation describes the project from initial evaluation through comparison of treatment systems to final design and permitting.

B12 8:30 – 9:00 a.m.

### **Ultraviolet Disinfection for Stormwater Treatment in Coastal Carolina**

Ronald Geiger, HDR Engineering, Charlotte, NC

Tom Garigen, Horry County, Conway, SC

Beach closures due to high bacteria counts impact Horry County, SC, environmentally and economically, as well as many other areas of the US. The county investigated the benefits of stormwater treatment using ultraviolet disinfection to fight bacterial contamination by treating runoff into a stormwater pond. The project and its engineering, environmental, and operational challenges are described. One project goal is to generate enough testing data so that this strategy can be replicated and scaled up or down for other areas experiencing similar water-quality degradation.

B13 9:00 – 9:30 a.m.

### **Trick or "Treat": Why BMP Performance Is Irrelevant for Industrial Stormwater and What We Can Do to Make Clean Water That Matters**

Daniel Scarpine, Aquarius Environmental, Portland, OR

This presentation focuses on the disparity between treatment BMP performance claims and real-world performance at industrial sites. Using case studies, it explores common design and implementation issues, industrial stormwater monitoring data, and BMP performance expectations.

## **LOW-IMPACT DEVELOPMENT**

Room Cibolo 3

L11 8:00 – 8:30 a.m.

### **Denser Is Greener: Higher Density as a Stormwater BMP**

John Jacob, Texas A&M University, Houston, TX

Town-centered, walkable development is emerging as a real development alternative around the country. This presentation looks at the reasons more people are opting for this type of development and examines what its implications are for stormwater management. With its proximity of different types of land uses and higher percentage of impervious cover, this higher-density development produces a higher pollutant load per acre but a lower pollutant load per capita. A model is presented evaluating the potential water-quality benefits of higher-density development compared to typical suburban densities.

L12 8:30 – 9:00 a.m.

### **Low-Impact Development vs. Light Imprint: What Is the Difference?**

Thomas Low, Duany Plater-Zyberk & Co., Charlotte, NC

Paul Crabtree, Crabtree Group Inc., Salida, CO

Guy Pearlman, Duany Plater-Zyberk & Co., Charlotte, NC

Monica Carney Holmes, Duany Plater-Zyberk & Co., Charlotte, NC

Low-impact development and Light Imprint both advocate for greener, more environmentally friendly stormwater infrastructure. However, LID adopted through standard ordinances can promote sprawl; many LID practices involve lot-based rather than block- or neighborhood-based solutions, increasing the need for large residential lots and fragmented commercial development. Light Imprint addresses these issues through a transect-based stormwater management system that works on the community level, looking at variables such as soil hydrology, slope condition, climate, urban-to-rural transect zones, and long-term maintenance.

L13 9:00 – 9:30 a.m.

### **LID or Sprawl? A Counterproposal to a Sprawl-Based Low-Impact Development Competition**

Paul Crabtree, Crabtree Group Inc., Salida, CO

Martin Dreiling, Dreiling Terrones Architecture, Burlingame, CA

John Jacob, Texas A&M University, Houston, TX

This presentation offers a counterproposal to an actual low-impact-development competition that was recently held in Houston, TX. It argues that the fundamental rules of the competition—involving the building of 1,200 large-lot single-family homes on a 640-acre parcel of previously undeveloped agricultural land—were counterintuitive to true low-impact development, and presents instead a proposal to fit all the elements, including residences and schools, into a 160-acre site.

## **STORMWATER PROGRAM MANAGEMENT**

Level 3 Room 3

P11 8:00 – 8:30 a.m.

### **Clean Watersheds Needs Survey: A Tool for Informing Decisions About Stormwater Management Programs**

Karen Fligger, US Environmental Protection Agency, Washington, DC

Every four years, states and the US EPA conduct the Clean Watersheds Needs Survey, a comprehensive assessment of needs to meet the goals of the Clean Water Act. The most recent assessment, conducted in 2008 and 2009, collected information in four broad areas: wastewater, stormwater management, nonpoint-source pollution control, and decentralized wastewater management. More stormwater subcategories were included. This presentation summarizes the results and discusses how CWNS data can be used to inform decisions.

P12 8:30 – 9:00 a.m.

### **Deconstructing the Construction Effluent Limitation Guidelines**

Adrienne Boer, PBS&J, Austin, TX

EPA has issued the final rule for Effluent Limitations Guidelines and Standards for the Construction Point Source Category. This presentation reviews the technical and economic basis for the rule, the timeline for implementation, and the changes required at construction sites.

P13 9:00 – 9:30 a.m.

### **Implications of the National Research Council's "Urban Stormwater Management in the United States"**

Michael Bloom, PBS&J, Houston, TX

In 2008, the National Research Council released its report summarizing and discussing the current stormwater regulatory framework, the challenges associated with the program, the impact of urbanization on receiving waters, monitoring and modeling stormwater, stormwater management approaches, and innovative management and permitting concepts. This presentation summarizes the key elements of the report and highlights subsequent comments and EPA response.

## **WATER-QUALITY MONITORING**

Level 3 Room 4

Q11 8:00 – 8:30 a.m.

### **Considerations for Designing an Automated Regional Water-Quality Monitoring System**

Oliver Galang, Los Angeles County Flood Control District, Alhambra, CA

Lisa Skutecki, Brown and Caldwell, San Diego, CA

Nancy Gardiner, Brown and Caldwell, San Diego, CA

The Los Angeles County Flood Control District is expanding its monitoring system, increasing from 13 automatic water samplers (seven mass emissions stations and six tributary monitoring stations) by adding additional tributary stations. An automated data-collection system will be used, consisting of multi-parameter water-quality sensors and telemetry for data transmission. This presentation looks at the considerations for designing an automated system, including sensor selection, integration of all station functions, connectivity to Internet-based communications, flexible sampler configuration and control, sensor accessibility for servicing and calibration, and more.

Q12 8:30 – 9:00 a.m.

### **Advancements in Real-Time, Continuous Sensor Technologies and Applications to Stormwater Monitoring**

Stephen McCord, Larry Walker Associates, Davis, CA

Continuous sensor units deployed in several tributaries in Sacramento County, CA, demonstrate the use of recent technological advancements for stormwater monitoring. Sensors measuring pH, turbidity, temperature, water depth, dissolved oxygen, and specific conductivity took measurements every 15 minutes, providing a better characterization of water quality than grab samples. Real-time remote data acquisition was possible via a secure Internet site.

Q13 9:00 – 9:30 a.m.

### **Continuous Monitoring of the Reedy River Watershed**

James Riddle, Woolpert Inc., Columbia, SC

Judy Wortkoetter, Greenville County, SC

Ben Hammond, Woolpert Inc., Columbia, SC

Greenville County, a Phase I MS4 community in South Carolina, implemented a continuous monitoring program in 2008 to characterize water quality in the Reedy Creek watershed. This presentation details the monitoring setup; the county now has a dataset that is comparable to or better than that from the local regulatory sampling program for the measured pollutants. The monitoring program is ongoing and will soon have permanent stations with cellular telemetry for uploading data.

## **TEXAS A&M**

Level 3 Room 9

T11 8:00 – 8:30 a.m.

**Roadside Sediment Control Device Evaluation Program**

Jett McFalls, Texas Transportation Institute, College Station, TX

T12 8:30 – 9:00 a.m.

**Adopting Roadside Filtration Media BMP for Dissolved Metals Removal at the End of Pipe**

Alan D. Black, HNTB Corporation, Bellevue, WA

Robert P. Armstrong, Huitt-Zollars Inc., Seattle, WA

Angela Deardorff, Washington State Department of Transportation, Bellevue, WA

In Washington state, there are several sections of I-405 where standard approved BMPs are not feasible because of physical constraints in the highly urban setting of the corridor. The compact size of the media filter drain, which provides effective solids and metals removal, has inspired engineers to create a functionally equivalent BMP that will work along the corridor constrained by retaining walls or steep slopes. This presentation highlights the development and implementation of this BMP—the modified media filter drain—through design, construction, and monitoring.

T13 9:00 – 9:30 a.m.

**Development of a Vertically Rotating Sample Arm to Improve Representation of Solid-Phase Material in Urban Stormwater**

William R. Selbig, US Geological Survey, Middleton, WI

**Tuesday, August 3, 2:00 – 3:00 p.m.**

**BMP CASE STUDIES**

Room Cibolo 8

B21 2:00 – 2:30 p.m.

**Capturing Dissolved Phosphorus With Iron-Enhanced Sand Filtration**

Andy Erickson, St. Anthony Falls Laboratory, University of Minnesota, Minneapolis, MN

Most treatment practices for urban runoff use settling or filtration to remove pollutants associated with solids, but dissolved pollutants are typically not captured. To capture dissolved phosphorus, an iron-enhanced sand filter was installed in Maplewood, MN, using approximately 5% iron filings by weight mixed with standard concrete sand. To evaluate performance, various mix design of iron filings and sand were tested and found to capture between 35% and 93% of dissolved phosphorus.

B22 2:30 – 3:00 p.m.

**Improved Design for Phosphorus and Nitrogen Retention in Bioretention Systems**

William Lucas, ILM Inc., Malvern, PA

Findings are presented from a study in which bioretention media were amended with water treatment residuals, a byproduct of water treatment processing. To accelerate phosphate loads, the bioretention systems were loaded weekly with secondary treated effluent over 80 weeks, or the equivalent of about three decades of runoff loads of phosphorus. Cumulative phosphorus retention in the TR treatments ranged from 95% to 99%.

**LOW-IMPACT DEVELOPMENT**

Room Cibolo 3

L21 2:00 – 2:30 p.m.

**Implementing the Runoff Reduction Method as a Regulatory Compliance Tool: Part 1**

Joseph Battista, Center for Watershed Protection, Mechanicsville, VA

The Runoff Reduction Method was developed for the state of Virginia to credit the total performance of stormwater BMPs in achieving pollutant load reduction in runoff and to document volume reduction for meeting flood control requirements. Performance studies of various BMPs were evaluated; the Runoff Reduction Method tracks the implementation of these BMPs and credits the appropriate runoff volume reduction, pollutant concentration reduction, or both toward compliance with stormwater requirements.

L22 2:30 – 3:00 p.m.

**Implementing the Runoff Reduction Method as a Regulatory Compliance Tool: Part 2**

Doug Beisch, Williamsburg Environmental Group, Williamsburg, VA

Part 2 of the presentation discusses the Runoff Reduction Method in more detail, including design approaches, simplified stormwater planning approaches, quantification of hydrologic and water-quality benefits and costs, and evaluation of alternative approaches with respect to economics and achievability.

**STORMWATER PROGRAM MANAGEMENT**

Level 3 Room 3

P21 2:00 – 2:30 p.m.

**Targeting Small-Quantity Polluters**

Debbie Shoffner, City of Greensboro, NC

Beginning in 2003, Greensboro began concentrating efforts on small polluters that make up a large portion of improper discharges and disposals. The goal is to identify and eliminate illegal connections and disposals by educating small-quantity generators including the local business community. Target groups are identified, educational materials created, business information gathered, and inspections performed. More than 700 businesses have been contacted. The presentation shows how such a program might be implemented in other communities, including determining who should be inspected, how to inspect, what educational materials should include, and program costs.

P22 2:30 – 3:00 p.m.

**Successful Stormwater Management Projects Consider Stormwater Treatment and Stream Restoration**

Kristin Kasper Pipkin, Environmental Resource Management Division, Austin, TX

Austin, TX, developed a mission integration process as part of a citywide watershed master planning effort in 2001. The process considers benefits related to stormwater treatment, stream restoration, and flood control for each project. Three multi-mission projects are presented: Big Stacey Park, Taffy Court Park, and Spring Meadows.

*(Note: This is a different presentation than listed for P22 in the original program.)*

**ADVANCED RESEARCH TOPICS**

Level 3 Room 4

R21 2:00 – 2:30 p.m.

**The Porous Pavement Curve Number Conundrum**

Thomas Ballestero, University of New Hampshire Stormwater Center, Durham, NH

The curve number used to model porous pavement depends on the objective, such as to demonstrate a reduction in peak flow or no net increase in site runoff. Based on five years of continuous flow monitoring at a porous asphalt site and three years of monitoring at a pervious concrete site, the curve number is calculated by three methods, depth of runoff, reduction in peak flow, and lag. The variability of CN values is demonstrated, along with how site-specific and design-specific conditions affect them.

R22 2:30 – 3:00 p.m.

**Development and Application of a Screening Tool for Evaluating the Sustainability of Watershed Management Practices**

Clifton Bell, Malcolm Pirnie, Newport News, VA

The Virginia Association of Municipal Wastewater Agencies sponsored the development of the Model for Evaluating the Sustainability of Watershed Management Practices (SUST-WAT), an Excel-based tool for comparing watershed implementation plans with regard to environmental sustainability and cost-effectiveness. A literature review was performed to identify default cost, energy usage, greenhouse gas emissions, and carbon sequestration for use in SUST-WAT—benefits other than direct water-quality improvement. This presentation demonstrates how these benefits can be used in the BMP planning process.

**TEXAS A&M**

Level 3 Room 9

T21 2:00 – 2:30 p.m.

**Permeable Friction Course: Using the Road as a BMP**

Brad Eck, University of Texas at Austin, TX

An overlay of porous asphalt known as a permeable friction course, placed in a 50-mm layer on top of regular impermeable pavement, allows rainfall to drain within the porous layer rather than on top of the pavement. This improves visibility by reducing vehicle spray and lowers the risk of hydroplaning. In addition to the safety benefits, monitoring near Austin, TX, shows that the runoff from the permeable friction course is cleaner than that from conventional pavement, with a reduction of 90% for total suspended solids as well as reductions in copper, lead, and zinc. Monitoring is ongoing to identify the rate at which the pavement becomes clogged with accumulated pollutants and to determine when replacement or rehabilitation is required.

T22 2:30 – 3:00 p.m.

**Drainage Property Measurements of Permeable Friction Course**

J. Brandon Klenzendorf, Center for Research in Water Resources, University of Texas, Austin, TX

**Tuesday, August 3, 3:30 – 5:00 p.m.**

**BMP CASE STUDIES I**

Room Cibolo 8

B31 3:30 – 4:00 p.m.

**Southern California Watershed BMP Retrofit Study for TMDL Compliance**

Daniel Apt, RBF Consulting, Irvine, CA

Anna Lantin, RBF Consulting, Irvine, CA

Regional structural treatment controls are an important tool in TMDL compliance, but retrofit locations are often hard to identify. A study was performed in a coastal southern California watershed to find locations to site BMPs to help meet compliance with a bacteria TMDL. The approach is outlined, including desktop survey, field evaluation, environmental analysis, prioritization of sites, data analysis, BMP sizing, water-quality benefit analysis, implementation strategies, and conceptual designs.

B32 4:00 – 4:30 p.m.

**Stormwater Retrofitting Case Studies in Delaware**

Bethany Krumrine, Delaware Department of Natural Resources and Environmental Control, Dover, DE

Eli Mortazavi, New Castle County Department of Special Services, New Castle, DE

In Delaware, stormwater BMPs constructed over the past 30 years are in need of upgrades and repairs. Using specific examples, this presentation looks at what's required to upgrade or retrofit different types of BMPs, including site selection, cost analysis, funding, engineering surveying, planning, and construction.

B33 4:30 – 5:00 p.m.

**Updating Parcels in an Urban City to be More Stormwater Friendly**

Kathryn Edwards, Malcolm Pirnie, Wakefield, MA

Jennifer Lachmayr, Malcolm Pirnie, Wakefield, MA

Case studies of three parcels in Cambridge, MA, are presented; the cold-climate city is facing TMDLs for pathogens and nutrients. Redevelopment of the parcels was considered for water-quality and –quantity improvements, long-term sustainability, and affordability. Selection of BMPs is covered for each site, including capital costs, operation and maintenance costs, site layouts, water-quality improvements, and ability to provide flow attenuation.

**LOW-IMPACT DEVELOPMENT**

Room Cibolo 3

L31 3:30 – 4:00 p.m.

**The Waters of the River Walk: How Clear Do You Want Them?**

Alberto Passos, City of San Antonio, TX

Richard Mendoza, City of San Antonio, TX

Every year millions come to San Antonio to visit the historic Alamo and to experience the River Walk. The Department of Public Works currently implements a three-phase program to improve water clarity and quality: the partial removal of sediments along channels; the selection, calibration, and application of water-quality models to identify measures to improve quality; and, depending on the analysis of the previous phase, the construction of a water treatment plant. The segment of the Upper San Antonio River receiving the most visitors is impaired for bacteria, and efforts underway to correct the situation are described, with a focus on the initial data analysis from an ongoing water-quality monitoring program, including seasonal variation and the effect of rain events.

L32 4:00 – 4:30 p.m.

**Technically Rigorous and Easy-to-Apply Methods for Sizing LID to Meet Regulatory Requirements**

Tony Dubin, Brown and Caldwell, Seattle, WA

Stormwater managers are increasingly encouraged or required to emphasize low-impact-development controls to supplement or replace traditional BMPs like detention ponds. At the same time, stormwater rules for new and redevelopment projects are becoming more stringent. The engineering community, municipal plan reviewers, and regulators need clear design standards and analysis tools for the application of LID. Brown and Caldwell has worked with several communities to simplify sizing and implementation of LID techniques for stormwater flow duration control, or hydromodification, as well as to evaluate the use of LID retrofits to offset large capital project needs, to create a credit system for LID measures on private property, and to quantify likely pollutant-removal levels on TMDL-regulated water bodies. This presentation reviews the technical approach to sizing LID.

L33 4:30 – 5:00 p.m.

**Green Infrastructure and Low-Impact Development in Semi-Arid Environments: The Albuquerque Experience**

Steven Glass, Bernalillo County Public Works Division, Albuquerque, NM

EPA Region 6 has emphasized green infrastructure and low-impact-development mechanisms to improve compliance with NPDES stormwater permits. Responding to perceived practical and institutional obstacles to widespread adoption of green infrastructure and LID in the semi-arid Southwest environment, several agencies responsible for NPDES permit compliance in the Albuquerque area organized a workshop to examine ways to address and overcome these obstacles. The outcomes are presented here.

## **STORMWATER PROGRAM MANAGEMENT**

Level 3 Room 3

P31 3:30 – 4:00 p.m.

### **Calgary Stormwater Quality Retrofit Program**

Bernie Amell, AECOM Ltd., Calgary, AB

Alberta Environmental has stipulated that new communities must have stormwater management systems that remove 85% of total suspended solids. However, about three-quarters of communities in Calgary developed before these requirements existed have no facilities to treat stormwater before discharge to the river. The city is identifying retrofit opportunities for implementing end-of-pipe practices such as wet ponds, wetlands, and infiltration systems that can help meet water-quality goals. The presentation includes examples of built and in-design projects.

P32 4:00 – 4:30 p.m.

### **An Adaptable Process for Identifying and Qualifying Stormwater Retrofits**

Jennifer Zielinski, Biohabitats Inc., Cleveland, OH

The process for identifying stormwater retrofit opportunities starts with understanding larger community or watershed goals and objectives, then translating them into specific retrofitting objectives, minimum performance criteria, and preferred treatment options. Historically, many communities have implemented retrofits as large capital improvement projects on public lands, but greater community coverage can be achieved through creative combinations of funding, education, and permitting. Through a series of case studies, this presentation examines adaptations and enhancements to the stormwater retrofit process.

P33 4:30 – 5:00 p.m.

### **Public Perception of LIDs: An Urban Stormwater Retrofit Project**

Krista Vopicka, City of Calgary, AB

In 2008, the city of Calgary presented the proposed Sustainable Streetscape project to citizens. After extensive consultation with the community, the project was not constructed, but it prompted the city to conduct research to gauge citizen awareness and understanding of LID best management practices, understand concerns about them, and gauge the public's willingness to accept public maintenance of such practices. This led to a stormwater outreach program; the goals of the program are outlined here and were successfully incorporated into a revised Sustainable Streetscape program.

## **ADVANCED RESEARCH TOPICS**

Level 3 Room 4

R31 3:30 – 4:00 p.m.

### **Sizing BMPs: How Big Is Big Enough?**

Marty Spongberg, AMEC Geomatrix, Fresno, CA

Dischargers sometimes face pressure from regulatory agencies or environmental groups to install BMPs designed to treat runoff from extreme recurrence interval rainfall events. This may be based in part on the misperception that large BMPs treat significantly more runoff than relatively small BMPs. However, hydrologic and hydraulic analysis of BMP treatment capacity demonstrates that even relatively small BMPs treat most runoff. Comparison data are presented for treatment capacities and costs of different sizes of BMPs. Based on this analysis, there is little benefit from implementing BMPs designed for storm events exceeding the two-year recurrence interval.

R32 4:00 – 4:30 p.m.

### **Hydrodynamic Sizing Issues**

Graham Bryant, Hydroworks LLC, Kenilworth, NJ

Because of the variables involved in field testing, laboratory testing has often been used to provide interim verification of the performance for hydrodynamic separators. The best-known verification program is the New Jersey Center for Advanced Technology. The key determinants of total suspended solids removal performance are flow, TSS particle size distribution, and size of the hydrodynamic separator. The protocol used by NJCAT prescribes TSS particle size distribution but allows the vendor to determine the testing flow rates and size of the separator to be tested, making it difficult to compare the results for different technologies.

R33 4:30 – 5:00 p.m.

### **A Review of CFD Techniques as Applied to Water Management Challenges**

Jeremy Fink, Hydro International, Portland, ME

As computing power becomes more available and user interfaces have improved, computational fluid dynamics, once perceived as complicated and expensive, has become an important design tool for the wastewater and stormwater industries. This presentation outlines CFD techniques that address water industry challenges, including flow field modeling, particle tracking, and residence time prediction. CFD can provide insightful data if the appropriate techniques and procedures are used; but without thorough understanding of CFD principles, the user may unintentionally create false results that are meaningless or potentially misleading.

**TEXAS A&M**  
Level 3 Room 9

T31 3:30 – 4:00 p.m.

**Baffle Box Effectiveness Monitoring Project**  
Gordon England, Stormwater Solutions, Cocoa Beach, FL

T32 4:00 – 4:30 p.m.

**Water-Quality Monitoring Evaluations in Semi-Arid South Texas (Arroyo Colorado Watershed) and Dataset Development Applications**  
Xubin Pan, Texas A&M University, Kingsville, TX

T33 4:30 – 5:00 p.m.

**The Kensico Action Plan: An Innovative Integration of Watershed Modeling and BMP Design**  
Sumant Mallavaram, HDR Engineering, Austin, TX  
Laura Csoboth, HDR Engineering, Pearl River, NY

The Kensico Reservoir in Westchester County, NY, is a key element in New York City's water supply system. Flows from the Catskill and Delaware Aqueducts pass through the reservoir and account for 90% of the total flow to city drinking water taps. As part of a continuing commitment to protect and enhance the city's water supply system, the New York City Department of Environmental Protection developed the Kensico Action Plan to design new and enhance existing BMPs in the Kensico watershed. This presentation consists of two parts: the modeling and analysis to develop the KAP, and a detailed overview of the Whippoowill Stream Stabilization BMP, one of four BMPs outlined in the KAP.

**Wednesday, August 4, 8:00 – 9:30 a.m.**

**BMP CASE STUDIES**

Room Cibolo 8

B41 8:00 – 8:30 a.m.

**Hydrologic and Water-Quality Performance of Porous Pavers on Easy Street in Ann Arbor, Michigan**

Scott Dierks, JFNew, Ann Arbor, MI  
Sarah McIlroy, Stantec, Sacramento, CA

In Ann Arbor, 3.5 feet of the outer edges of the existing asphalt surface of a street were replaced with porous pavers, and vegetated swales were added to the right of way. This presentation describes the monitoring efforts and results; peak flow reductions ranged from 49% to 85%, street hydrologic performance was consistently high for rainfall events of 0.7 inch or less, and there were significant reductions in phosphorus, copper, and zinc.

B42 8:30 – 9:00 a.m.

**A Greener Rain Garden and a Better Permeable Pavement System**

Holly Piza, Urban Drainage and Flood Control District, Denver, CO

UDFCD and the University of Colorado explored the use of waste stream materials in rain garden growing media, including materials mixed with compost and sand. Each mixture was evaluated for filtering ability, clogging, and establishment of vegetation. Results and recommended mixtures are presented.

B43 9:00 – 9:30 a.m.

**Deaderick Green: Tennessee's First Green Street**

Kim Hawkins, Hawkins Partners, Landscape Architects, Nashville, TN  
Jim Snyder, Metro Nashville Public Works, Nashville, TN

Deaderick Street sits within one of Nashville's combined storm sewer basins that has historically been subject to overflows. In Nashville's first implementation of LID features in the public right of way, pervious surface within the right of way was increased by 700% through the use of rain gardens, and pervious concrete and bioswales were added in pedestrian bulbs and intersections. The design worked within the existing street and storm drainage system, retrofitting existing storm drains to serve as overflow only. It is estimated that 1.2 million gallons will be removed from the CSO system annually.

**LOW-IMPACT DEVELOPMENT**

Room Cibolo 3

L41 8:00 – 8:30 a.m.

**Green Infrastructure for CSO Abatement: Columbus, Ohio**

Ted Blahnik, Williams Creek Consulting, Indianapolis, IN  
Mary Whitehead, Brown and Caldwell, Columbus, OH

As part of its long-term control plan for addressing combined sewer overflows, Columbus, OH, conducted a comprehensive analysis of green infrastructure BMPs for reducing stormwater volumes and peak storm flows. The evaluation considered the costs and benefits of applying green infrastructure BMPs. Their ability to meet or exceed stormwater quantity and quality requirements were considered for three land use types—highly urban, single-family residential, and mixed use—based on total volume reduction, CSO activation volume and frequency reduction, and peak flow reduction. Green infrastructure opportunities were identified for five pilot sewersheds.

L42 8:30 – 9:00 a.m.

**Integrating Green Infrastructure Into a Sewer Separation Project in Lansing, Michigan**

Dan Christian, Tetra Tech, Lansing, MI

Lansing, MI, is incorporating green infrastructure into various municipal projects. It is also in the midst of a comprehensive 30-year combined sewer overflow control program, scheduled to be completed in 2020, that will eliminate 1.65 billion gallons per year of CSO from area lakes and rivers. The CSO project offers the city the opportunity to improve aging infrastructure such as roads, curbs, water mains, and other utilities with in the public right of way, including improving water quality through bioretention areas, porous pavement, and engineered tree boxes.

L43 9:00 – 9:30 a.m.

**A Tale of Two Streams: Removing Two Ephemeral Streams from MSDGC's Combined Sewer System**

*Speaker TBD*

The Metropolitan Sewer District of Greater Cincinnati is working to reduce combined sewer overflows throughout its collection system. A project on the west side involves preventing or delaying flows from two ephemeral streams, which collect runoff from approximately 200 acres, from entering the combined sewer system. MSDGC is evaluating technologies; criteria include suitability of soils, potential impact on the community, adherence to the city's master plan, and each alternative's life-cycle costs.

*(Note: This is a different presentation than listed for L43 in the original program.)*

## **STORMWATER PROGRAM MANAGEMENT**

Level 3 Room 3

P41 8:00 – 8:30 a.m.

### **Addressing an Impervious Cover TMDL Through the Use of LID**

Lori Lilly, Center for Watershed Protection, Ellicott City, MD

Kelly Collins, Center for Watershed Protection, Ellicott City, MD

In 2006, the Connecticut Department of Environmental Protection issued an impervious cover TMDL for the Eagleville Brook watershed—the first TMDL of its kind in the nation. The state determined that the brook's biological impairment could not be attributed to any specific pollutant, but rather to an array of pollutants transported by stormwater and linked to urbanization. As 5% of 303(d)-listed waters are listed for "cause unknown – impaired biota," this could set a national precedent for using impervious cover in a regulatory framework for implementing LID practices on a watershed scale. Although impervious cover is the "yardstick" to measure progress in the TMDL, the ultimate test will be restoration of biological communities.

P42 8:30 – 9:00 a.m.

### **Driving Toward LID: Lessons in Building a Program for a Transportation Agency**

Ronan Igloria, HDR Engineering, Portland, OR

Oregon's DOT began a collaborative relationship with state and federal resource and regulatory agencies to develop stormwater treatment goals and techniques. Seeking to expand its use of low-impact development, ODOT is adding to its menu of stormwater BMPs LID techniques applicable to linear transportation projects, a selection process to guide designers to the best-performing BMPs, and guidance for the application of soil amendments in stormwater BMPs. Lessons learned in the process are presented here, including the need for unique LID practices for linear transportation projects, not transfers of typical LID concepts from municipal or development-based designs.

P43 9:00 – 9:30 a.m.

### **Rethinking the State-Local Stormwater Management Partnership: Looking at New Ways State Regulators Can Work With MS4s**

Brenda Zollitsch, Bangor Area Storm Water Group, Portland, ME

David Ladd, Maine Department of Environmental Protection, Augusta, ME

The regulator-regulated relationship has long been one of carrot-and-stick approaches. Some regulators have begun to work with local stormwater coordinators to help MS4s meet requirements and also to facilitate their participation in the development of the regulations with which they must comply. This presentation shares a number of models for working together, using as a case study the Maine Department of Environmental Protection working in partnership with local MS4s to improve compliance with Phase II regulations.

## **ADVANCED RESEARCH TOPICS**

Level 3 Room 4

R41 8:00 – 8:30 a.m.

### **New User Interface Features for the International Stormwater BMP Database**

Chad Richards, PBS&J, Houston, TX

Catherine Elliott, Harris County Flood Control District, Houston, TX

Carolyn White, Harris County Flood Control District, Houston, TX

Michael Bloom, PBS&J, Houston, TX

In 1996 under a cooperative agreement between the American Society of Civil Engineers and US EPA, Wright Water Engineers and Geosyntec Consultants initiated the development and population of the National Stormwater Best Management Practices Database. Now known as the International Stormwater BMP Database, it receives support and funding from a broad coalition of partners and is a widely cited and referenced resource for stormwater managers and decision-makers. A new user interface for the database is being developed to allow users to produce reports and plots in real time via an Internet browser. This presentation provides an overview of the database and the planned user interface functions.

R42 8:30 – 9:00 a.m.

### **The Role of Sediment Supply in Hydromodification Response**

Richard Lucera, RBF Consulting, San Diego, CA

Hydromodification, resulting from accelerated stream erosion in developed watersheds, can cause eutrophication and high levels of suspended solids. Recent changes in water-quality regulations require land developers to identify and manage changes in flow rate that can contribute to the effects of hydromodification. However, many agree that hydromodification response is governed by a range of variables besides flow rate, such as sediment supply. A case study is presented in which sediment supply from first- and second-order streams is eliminated as a result of development and the long-term response of the receiving stream is ascertained through continuous simulation modeling.

R43 9:00 – 9:30 a.m.

### **Soil Rating System for Soil-Based Stormwater Management Practices: The West Virginia Experience**

Amir Hass, West Virginia State University, Institute, WV; USDA-ARS-AFSRC, Beaver, WV

Robert R. Dobos, USDA-NRCS-NSSC, Lincoln, NE

Charles H. Delp, USDA-NRCS-WV, Summersville, WV

To ensure successful performance of soil-based BMPs, such as bioinfiltration, swales, pervious pavements, and pocket wetlands, it is essential to assess site-limiting characteristics for each practice. The spatial distribution of soils of various attributes is highly variable in the landscape. A soil interpretation framework that defines the compatibility of an area for a given soil-based BMP has been developed for West Virginia; the intent is that it will become part of a nationwide interpretation using the NRCS National Soil Information System and soil survey database.

**TEXAS A&M**

Level 3 Room 9

T41 8:00 – 8:30 a.m.

**The Lower Rio Grande Valley TPDES Storm Water Task Force: A Regional Coalition of Local Governments Organized in 2001 to Address Stormwater Management in South Texas**

Jose Hinojosa, City of Brownsville, TX

T42 8:30 – 9:00 a.m.

**Balancing Compliance With Science: The Ups and Downs of a Regional Approach to Stormwater Monitoring**

Keith Kennedy, North Central Texas Council of Governments, Arlington, TX

Albert Lawrence, City of Garland, TX

Sue Alvarez, City of Dallas, TX

Jason Maldonado, PBS&J, Houston, TX

The nine Phase I entities in the Dallas-Fort Worth Metroplex have been working to cooperatively manage aspects of their stormwater permits for almost 20 years. They participate in a regional monitoring program, negotiated with the EPA and incorporated into each entity's permit. The evolution of the program is presented. Benefits of the cooperative program include cost-savings and presenting a unified front to regulators; trade-offs include loss of autonomy and justifying internal staff resources.

T43 9:00 – 9:30 a.m.

**City of Austin Green Stormwater Infrastructure Initiative**

Michael Kelly, City of Austin, TX

Austin, TX, has updated its technical criteria manuals that govern both permanent and temporary stormwater quality controls. The changes focus on design criteria for stormwater treatment devices that rely on natural processes like infiltration to remove pollutants and on design criteria, permit review, inspection, and enforcement for construction-phase erosion and sediment controls.

**Wednesday, August 4, 10:00 – 11:00 a.m.**

**BMP CASE STUDIES**

Room Cibolo 8

B51 10:00 – 10:30 a.m.

**Adapting Stormwater BMPs for Tropical Watersheds and Coral Reef Protection**

Kelly Collins, Center for Watershed Protection, Ellicott City, MD

As part of the US military's base realignment and closure activities, the Island of Guam is expecting an additional 40,000 military personnel and their families and an additional 20,000 civilians over the next few years. Impacts of existing development on coral reefs are already apparent, and more development will occur rapidly. Several groups are providing island-specific guidance on BMPs, including multi-cell ponding basins, island bioretention, permeable parking areas, and rainwater harvesting.

B52 10:30 – 11:00 a.m.

**Designing BMPs for Drought: A Study of the Southeast**

Rich Keagy, Stantec, Charlotte, NC

In 2007 and 2008, the southeastern US suffered severe drought. Developers and municipalities had begun to focus on sustainable stormwater practices like rain gardens and constructed wetlands, which did not fare well in drought conditions, becoming blights as the plantings died and sometimes posing flood and water-quality problems when the rains returned. This presentation focuses on BMPs that are more effective in both wet and dry conditions, considering tailored combinations of infiltration trenches, wet ponds, constructed wetlands, rain gardens, and other features.

**LOW-IMPACT DEVELOPMENT**

Room Cibolo 3

L51 10:00 – 10:30 a.m.

**LID Application and Concern Over Pollutants Generated From Pavement Materials**

Masoud Kayhanian, University of California, Davis, CA

As low-impact-development practices become more widely used, some have questioned the contribution of pollutants generated from various pavement (asphalt and concrete) materials. Leachate from specimens of several pavement materials—including rubberized open-graded and gap-graded asphalt concrete, conventional open-graded and dense-graded AC, polymer-modified open-graded AC, and others—was tested at different temperatures representing different climate conditions. The general conclusion was that the concentrations of organic and inorganic chemical constituents generated solely from paving materials is below existing water-quality standards, and pollutants of concern in roadway runoff mostly relate to other road use and land use sources.

L52 10:30 – 11:00 a.m.

**The State of the Practice and Common Pitfalls for Porous Asphalt for Stormwater Management and Transportation Systems in Northern Climates**

Robert Roseen, University of New Hampshire Stormwater Center, Durham, NH

Thomas Ballestero, University of New Hampshire Stormwater Center, Durham, NH

James Houle, University of New Hampshire Stormwater Center, Durham, NH

This presentation reviews the state of the practice on the functionality, application, design, and installation of porous asphalt pavements. Durability and performance specifications for various mix design are reviewed. The presentation also examines the hydrologic, hydraulic, and water-quality benefits of porous asphalt; discusses current design, construction, and maintenance practices; and highlights two projects involving residential and high-use roads.

**STORMWATER PROGRAM MANAGEMENT**

Level 3 Room 3

P51 10:00 – 10:30 a.m.

**Stormwater Pollutant Model for the City of Pensacola**

Gordon England, Stormwater Solutions, Cocoa Beach, FL

In 2002, Pensacola, FL, set goals of 50% stormwater sediment reduction by 2012 and 80% reduction by 2020. Structural retrofit and nonstructural programs are being used to meet those goals. To determine the city's progress, a GIS-based spreadsheet model was developed, and mass annual sediment, total nitrogen, and total phosphorus loadings and removals were calculated. Combining predicted BMP removals, actual BMP cleanings, and actual street sweeping masses shows that the city is meeting its 2012 goal.

P52 10:30 – 11:00 a.m.

**Lower Limit Effluent Concentrations Incorporated Into a Site-Level Pollutant Load Assessment Tool**

Jonathan Smith, Tetra Tech, Research Triangle Park, NC

Scott Job, Tetra Tech, Research Triangle Park, NC

Although existing conditions at Lake Maumelle are good, anticipated land use changes in the watershed threaten water quality in the lake. A watershed management plan and surface runoff loading performance standards for new development have been adopted. A Site Evaluation Tool was developed to test site designs and verify compliance with the standards, including BMP performance. The SET focuses on assessing annual pollutant loads and hydrology

using loading rates based on watershed modeling in the watershed. The influence of BMPs on pollutant loading includes a combination of median percent removal and lower limit average annual effluent concentrations.

## **WATER-QUALITY MONITORING**

Level 3 Room 4

Q51 10:00 – 10:30 a.m.

### **Field Measurement of Particle Settling Velocity**

Eric Hettler, St. Anthony Falls Laboratory, Minneapolis, MN

John S. Gulliver, University of Minnesota, Minneapolis, MN

Many stormwater practices depend on sedimentation and ultimately settling velocity as their primary removal mechanism, but the settling velocity distribution at a specific site is rarely known. A simple method to characterize it is needed to improve the design and performance investigations of stormwater management practices. An elutriation device, used for river sediments and CSOs, has been modified and tested to determine its effectiveness in measuring settling velocity distribution of particles in urban runoff, and a device to make measurements in the field has been developed.

Q52 10:30 – 11:00 a.m.

### **Stormwater Sample Collection Methods: Flow-Weighted Composites and Pollutograph**

Sean Porter, SCS Engineering, San Diego, CA

Jay Shrake, MACTEC, San Diego, CA

Ruth Colb, City of San Diego Storm Water Department, San Diego, CA

Andre Sonksen, City of San Diego Storm Water Department, San Diego, CA

Monitoring programs use a variety of sampling approaches. The Event Mean Concentration for a runoff event is often used in reporting results for selected constituents. Flow-weighted composite sampling is a strategy many stormwater agencies use, resulting in a storm EMC by compositing individual sample aliquots into a large sample container. Another measure is pollutograph sampling, a more intensive approach consisting of collecting and analyzing large discrete samples throughout a storm. When coupled with the instantaneous flow data, pollutograph samples can be used to calculate the EMC. This presentation compares flow-weighted composite sample results EMCs with calculated EMCs from pollutograph samples from studies in the San Diego area.

## **TEXAS A&M**

Level 3 Room 9

T51 10:00 – 10:30 a.m.

### **Trees and Stormwater**

Mark Kroeze, City of McAllen, TX

Trees play a unique role in stormwater mitigation. This presentation covers the tree crown effect on individual rain droplets, stemflow, and soil compaction; parameters of trees for stormwater (for example, trees that lose their leaves versus broadleaf evergreens); and software programs and survey instruments available to assess trees and stormwater savings.

T52 10:30 – 11:00 a.m.

### **Rainwater Capture**

Patricia M. Watson, NASA, Washington, DC

Rainwater capture can reduce the load on water sources by providing water directly to users; can prevent capture of contaminants into the flow matrix and deposition in undesirable locations; can be a source of aquifer recharge; and can prevent erosion. This presentation examines techniques and technology for rainwater capture and the advantages in a variety of applications.

**Wednesday, August 4, 3:00 – 4:30 p.m.**

## **BMP CASE STUDIES**

Room Cibolo 8

B61 3:00 – 3:30 p.m.

### **An Innovative Approach to BMP Site Selection and Conceptual Design in Richmond, California**

Ryan Fleming, Malcolm Pirnie, White Plains, NY

Chadd Hodkinson, Malcolm Pirnie, Lansing, MI

The industrialized city of Richmond, CA, is aggressively exploring approaches to managing legacy pollutants like PCBs and mercury, as well as trash in its priority watersheds. The presentation covers identifying and prioritizing pollutants of concern, watersheds, and BMP types and locations, as well as gathering institutional information from multiple sources and integrating it with GIS-based modeling tools.

B62 3:30 – 4:00 p.m.

### **Conversion of Standard Bioswale to Bioretention to Meet Port's Water-Quality Goals**

Matt Graves, Port of Vancouver, Vancouver, WA

The presentation describes the Port of Vancouver's conversion of a bioswale system to a bioretention system to provide stormwater treatment at the Terminal 2 marine facility. Bioretention offered hydrologic and water-quality benefits through retention of runoff, evapotranspiration, and plant uptake of metals prevalent in runoff from industrial facilities.

B63 4:00 – 4:30 p.m.

### **A Multi-Objective Approach to Watershed Management in Austin, TX**

Eric Stewart, HDR Engineering, Austin, TX

Using the example of Fort Branch Creek in Austin, TX, this presentation illustrates the application of a tiered approach to watershed management, one that protects lives and property through flood mitigation, but also strives to protect and rehabilitate the natural functions of the watershed. Prioritization strategies and representative stream rehabilitation projects are presented.

## **LOW-IMPACT DEVELOPMENT**

Room Cibolo 3

L61 3:00 – 3:30 p.m.

### **Low-Impact Development: Practical Approaches in a High-Impact World**

Lisa Nisenon, Sarasota County, FL

Sarasota County was one of the first Florida jurisdictions to integrate LID into land development regulations. This presentation looks at the challenges in launching a new regulatory framework for stormwater management. Florida is in some ways a "worst-case scenario" for LID approaches, with its frequent downpours, varied microclimates, extreme weather events like hurricanes, and sensitive coastal habitats. The county met the challenges by focusing on a treatment-train approach, expanding the network of stakeholders, focusing on redevelopment, and concentrating on a small set of well-defined practices that work well in multiple settings.

L62 3:30 – 4:00 p.m.

### **Satisficing LID: Real-Life Experiences With Local Government Ordinances That Incorporate Low-Impact Development**

Henrietta Locklear, AMEC Earth and Environmental, Morrisville, NC

Trina Ozer, AMEC Earth and Environmental, Morrisville, NC

Four local governments in North Carolina recently completed a collaborative, multi-jurisdictional post-construction ordinance that incorporates incentives for LID. This presentation highlights the ways competing interests influence what "LID" looks like in development ordinances and describes the challenges and competing interests local governments face as regulators, developers, and engineers embrace LID. It also looks at how LID principles are translated into real-world standards.

L63 4:00 – 4:30 p.m.

### **The Link Between Development Codes and Stormwater: An Updated Codes and Ordinances Worksheet**

Julie Schneider, Center for Watershed Protection, Ellicott City, MD

David Hirschman, Center for Watershed Protection, Charlottesville, VA

Development codes and ordinances serve as a cookbook for how development will be put on the ground, including the amount of impervious cover and runoff generated. Increasingly, regulations require municipalities to review their development codes as part of state or federal stormwater programs. The Center for Watershed Protection recently updated the Better Site Design Codes and Ordinances Worksheet to incorporate new research. The COW provides a systematic approach for evaluating development codes; this presentation introduces the updated tool and shows how it can be used at the municipal level to promote better development.

## **STORMWATER PROGRAM MANAGEMENT**

Level 3 Room 3

P61 3:00 – 3:30 p.m.

**Pope Branch: Comprehensive Anacostia River Watershed Restoration Initiatives**

Michael Thorstenson, Greeley and Hansen, Washington, DC  
Bary Lucas, District of Columbia Department of Engineering and Technical Services, Washington, DC  
Kenneth Eyre, Greeley and Hansen, Springfield, VA

Green infrastructure initiatives integrated into a comprehensive project approach maximize use of available funding, minimize habitat disturbance, and allow application of restoration measures to meet recent regional watershed improvement goals. For the District of Columbia's Pope Branch watershed restoration project, such innovation includes a series of projected improvements including a regenerative stormwater conveyance approach and natural channel restoration, while incorporating enhancements to the stormwater outlets discharging from the developed upland areas.

P62 3:30 – 4:00 p.m.

**Balancing Economic and Environmental Interests in Crafting Stream Corridor Protection Regulations Within a 42-Jurisdiction Stormwater District**

John Aldrich, CDM, Cleveland, OH

The Hamilton County Storm Water District in the greater Cincinnati area is Ohio's largest NPDES Phase II permittee and is responsible for maintaining permit compliance for its 42 member jurisdictions. HCSWD developed a Sensitive Areas Protection Plan in 2006 that recommends a multi-objective strategy to protecting the streams and other water resources of Hamilton County. This strategy incorporates education and outreach to existing owners of riparian land, regulations requiring that a stream corridor protection zone be established whenever riparian land is part of a land development or construction project, and initiatives to acquire conservation easements or right of way along particularly sensitive stream reaches. This presentation discusses progress made to date with implementing the plan.

P63 4:00 – 4:30 p.m.

**Domestic Scan: Best Practices in Addressing Water-Quality Issues in Highway System Management**

Scott Taylor, RBF Consulting, Carlsbad, CA  
Scott McGowen, Caltrans, Sacramento, CA

The Domestic Scan Program was developed to highlight innovative practices of high-performing transportation agencies that could be beneficially adopted by other interested agencies. The program provides opportunity for economical technology transfer, with benefits on a national scale. Findings of one particular Scan are presented, with recommendations in four areas: TMDL compliance, BMP implementation, O&M practices, and communication with regulatory agencies.

**ADVANCED RESEARCH TOPICS**

Level 3 Room 4

R61 3:00 – 3:30 p.m.

**Field Testing of Total Phosphorus Removal in Stormwater Runoff Using Adsorptive Filtration Media**

Jia Ma, Contech Construction Products, Portland, OR

This presentation demonstrates the effectiveness of adsorptive filtration media to remove total phosphorus in runoff, as compared to control media, and helps design a filter with the data collected. A spreadsheet model has been developed to guide the selection of either flow-based or volume-based media deployment in response to different stormwater treatment requirements.

R62 3:30 – 4:00 p.m.

**Methods of Quantifying the Performance of Nutrient Removal Media**

Gregory Williams, Monteco Corporate Research and Development Centre, Mississauga, ON  
Christopher Murray, Monteco Corporate Research and Development Centre, Mississauga, ON

Several products to remove dissolved nutrients in stormwater are available. Different media rely on different mechanisms for removing dissolved nutrients, so a comparison of their effectiveness requires a set of well-defined standardized tests and associated measured quantities that can be related to expected performance in realistic situations. This presentation examines different methods by which the performance of nutrient removal media is typically evaluated, as well as how the interpretation of experimental results can lead to different predictions of performance in the field. Performance of nutrient removal media can be strongly affected by the length and frequency of dry periods between storm events, and some common evaluation methods can be insensitive to this dependence.

R63 4:00 – 4:30 p.m.

**Characterization of Metal Accumulation in Bioretention Media**

Philip Jones, Biohabitats Inc., Baltimore, MD

Long-term management issues for bioretention cells include accumulated metals' environmental fate, oral bioavailability, relation to regulatory cleanup thresholds, and spatial distribution within the cell. Media samples from a four-year-old bioretention cell in Maryland were examined, with samples from across the cell surface and to a depth of 90 cm to assess the spatial distribution of accumulated lead, copper, and zinc. Results indicate concentrations substantially higher than original levels and higher than background estimates for the region, but below EPA and state residential cleanup standards. All three metals were found to be tightly bound to the media, indicating that captured metals should remain immobile and be sequestered indefinitely. Practices such as mulch replenishment, removal of particle deposits, and maintenance of dispersed flows to forestall the need for media replacement are discussed.

**TEXAS A&M**  
Level 3 Room 9

T61 3:00 – 3:30 p.m.

**Performance Comparison of Biofiltration Designs**

Michael Barrett, Center for Research in Water Resources, University of Texas, Austin, TX

T62 3:30 – 4:00 p.m.

**Investigation of *E. coli* Sources in Storm Sewers**

Dan Olsen, University of Nebraska, Lincoln, NE

As part of its NPDES permit, the University of Nebraska – Lincoln is required to conduct periodic sampling of storm sewers at three outfalls for parameters that include *E. coli*. One of the outfalls is located in a stream segment that has a TMDL for *E. coli*. Sampling has been conducted up and downstream for suspected contributing sources, and spatially and temporally during precipitation events. IDDE investigations have been conducted. This presentation covers the findings and possible explanations for the results.

T63 4:00 – 4:30 p.m.

**The Dallas Green Building Ordinance “Leads” the Way Toward Sustainable Design**

Peter Blanchette, City of Dallas, TX

Dallas, TX, a high-density, ultra-urban city, has adopted a green building ordinance based on the US Green Building Council’s Leadership in Energy and Environmental Design (LEED) certification program. Since 2003, all new city-owned facilities have been required to be designed to at least LEED silver certification level. In 2008, the city passed an ordinance expanding this certification to apply to all new construction.

**Thursday, August 5, 8:00 – 9:00 a.m.**

**BMP CASE STUDIES**

Room Cibolo 8

B71 8:00 – 8:30 a.m.

**Separation and Handling of Gross Solids and Other Pollutants With Minimal Maintenance**

Steve Esmond, Coanda Inc., Irvine, CA

Robert K. Weir, Hydroscreen, Denver, CO

Tilted wedgewire technology has been used for decades by the hydropower and agricultural industries but has only recently been used to remove debris, gross solids, and other pollutants from stormwater. Two case studies are presented illustrating the use of tilted wedgewire applications as a stormwater BMP, including discussion of when and where the technology is applicable, performance expectations, and how to manage captured solids.

B72 8:30 – 9:00 a.m.

**Filterra System Performance Monitoring in Washington State: Expanding Our Toolbox for Enhanced Treatment and Reducing Irreducible Pollutant Concentrations**

Rebecca Dugopolski, Herrera Environmental Consultants, Seattle, WA

John Lenth, Herrera Environmental Consultants, Seattle, WA

In 2008 – 2009, 27 storm events were sampled to characterize the stormwater treatment performance of two Filterra test systems at the Port of Tacoma. The systems demonstrated significant reductions in total suspended solids, dissolved zinc, dissolved copper, and total petroleum hydrocarbons. The presentation includes a discussion of the Washington TAPE (Technology Assessment Protocol—Ecology) guidelines and other stormwater monitoring protocols.

**STORMWATER PROGRAM MANAGEMENT**

Level 3 Room 3

P71 8:00 – 8:30 a.m.

**Chattanooga Stormwater Unique User Fee Credits**

Don Green, City of Chattanooga Water Quality Program, Chattanooga, TN

Mounir Minkara, City of Chattanooga Water Quality Program, Chattanooga, TN

Chattanooga was the first city in Tennessee to obtain an NPDES Phase I permit, and the first to implement a stormwater user fee, in 1993. When it increased the fee for the first time, the city changed the method of determining the fee by using the equivalent residential unit system; it also initiated a credit system for non-residential properties to encourage installation of stormwater practices that will relieve the city's stormwater burden, as well as an appeals process. Items that earn credits are covered, including retrofits, tree plantings, water-quality education, and more.

P72 8:30 – 9:00 a.m.

**Death of a Stormwater Enterprise?**

Michelle Troy, AMEC Earth and Environmental, Lakewood, CO

Kenneth C. Sampley, City of Colorado Springs, CO

Jon Sorensen, AMEC Earth and Environmental, Lakewood, CO

In 2009, Colorado Springs voters approved an initiative that was used to dismantle the city's stormwater enterprise, which had been established in 2005; the enterprise will be phased out by the end of 2011. Although the establishment of a stormwater fee has been legally upheld by courts throughout Colorado and the US, opponents have labeled the fee a tax. Analysis of the situation in Colorado Springs illustrates the risks to other stormwater utilities and what can be done to protect them.

**WATER-QUALITY MONITORING**

Room Cibolo 3

Q71 8:00 – 8:30 a.m.

**Incorporating Human Health Risk Into Stormwater and CSO Management: Implications of a New WERF-Funded Study of Pathogen Discharges**

Dustin Bambic, AMEC Earth and Environmental, Nashville, TN

In many combined sewer overflow management plans, although the goal is to reduce bacteria or pathogen discharges to recreational waters, the corresponding reduction of human health risk due to water contact is not quantified, and therefore the risk-based benefits of CSO management plans are unknown. The results of an ongoing project funded by the Water Environment Research Federation are intended to help public agencies consider human health risks when developing CSO plans. The project uses a quantitative microbial risk assessment, which can potentially be used to quantify human health risks under a variety of scenarios.

Q72 8:30 – 9:00 a.m.

**Did Phasing Out Leaded Gasoline Improve Highway Runoff Quality?**

Masoud Kayhanian, University of California, Davis, CA

After studies showed that urban populations, particularly children, were overexposed to lead from a variety of sources, the EPA in 1973 announced the phasing out of lead in gasoline. Although it can be expected that this would substantially reduce the amount of lead in dust and soil along highway rights of way, the direct relationship of pre- and post-phasing out of lead on the quality of highway runoff is not well established. This literature review examines the amount of lead accumulated along highway sites and compares lead concentrations in highway runoff during the 1980s, 1990s, and 2000s. An analysis shows the water-quality benefits expected from this historic environmental regulation.

#### **TEXAS A&M**

Level 3 Room 9

T71 8:00 – 8:30 a.m.

##### **A Unique Water-Quality Retrofit Project in Austin, Texas**

Scott Muchard, HDR Engineering, Austin, TX

D. Lauren Ross, Glenrose Engineering, Austin, TX

The Lundelius-McDaniel Water Quality Retrofit Project integrates three stormwater treatment technologies with natural site topography to achieve an effective pollutant removal system in a watershed characterized by karst geology. To meet water-quality objectives while working within site topographic constraints, a design combining a sedimentation basin, a biofilter, and three vegetative filter strips was developed.

T72 8:30 – 9:00 a.m.

##### **Stormwater and the Big Picture: Results From the North Central Texas Regional Stormwater Monitoring Program**

Jason Maldonado, PBS&J, Houston, TX

Keith Kennedy, North Central Texas Council of Governments, Arlington, TX

Members of the NCTCOG have established a Regional Storm Water Management Coordinating Council, composed of MS4 operators, to oversee cooperatively funded regional activities to support MS4 programs. A task force oversees the regional monitoring program for large MS4s in the region, which differs markedly from traditional MS4 monitoring requirements. Rather than characterizing runoff from samples taken at outfalls of single-land-use watersheds, the program aims to characterize wet-weather flows from in-stream monitoring sites of larger, mixed-land-use watersheds.

**Thursday, August 5, 9:30 – 11:00 a.m.**

**BMP CASE STUDIES**

Room Cibolo 8

B81 9:30 – 10:00 a.m.

**Stormwater BMP Performance Effectiveness and Cost-Benefit Analysis**

Mark Doneux, Capitol Region Watershed District, Saint Paul, MN

From 2005 – 2997, the Capitol Region Watershed District constructed BMPs to alleviate flooding and reduce nutrients and sediment reaching Como Lake. BMPs included a 2-acre underground infiltration facility, eight infiltration trenches beneath city streets, seven rain gardens within road rights of way, and a rain garden and regional pond in Como Park. Results of pollutant removal effectiveness are presented, as well as construction and maintenance costs; analyzing life-cycle costs of BMPs along with pollutant removal effectiveness has provided a good method to develop a cost-per-pound-of-pollutant-removal comparison.

B82 10:00 – 10:30 a.m.

**Long-Term Subsurface Monitoring Beneath Infill BMPs: Findings of the Los Angeles Basin Water Augmentation Study**

Marty Spongberg, AMEC Geomatrix, Fresno, CA

This presentation is essentially a case study on how to design and implement an effective subsurface monitoring network to monitor the impacts of stormwater infiltration. A long-term research project led by the Los Angeles and San Gabriel Rivers Watershed Council assessed the potential for increasing local groundwater supply via capture and infiltration of urban stormwater runoff, without degrading groundwater quality. Infiltration BMPs were designed and installed at six sites representing different land uses, soil types, and groundwater occurrence, along with comprehensive monitoring systems. Sampling procedures and results are presented,

B83 10:30 – 11:00 a.m.

**Understanding the Extensive Tools of the International Stormwater BMP Database**

Shannon Tillack, Wright Water Engineers, Denver, CO

This presentation provides an overview of various facets of International Stormwater BMP Database. It includes guidance on setting up BMP performance monitoring programs; using the database data entry spreadsheets to track BMP performance and submit studies; an overview of the BMP performance analysis approaches for evaluating hydrologic and water-quality performance of BMP sites and LID sites; an overview of key findings from the database to date; and examples of how the database can be used to support local decision making.

**LOW-IMPACT DEVELOPMENT**

Room Cibolo 3

L81 9:30 – 10:00 a.m.

**Infiltration Gallery Design and Construction: A Case Study in Ontario, Canada**

Mike Gregory, AECOM, Kitchener, ON

The Alton Mill in Caledon, ON, located by a coldwater fishery that discharges into the Credit River and ultimately into Lake Ontario, is being turned into a tourism destination. The stormwater management plan was designed to reduce the impacts of the development on adjacent properties and receiving waters. The design, featuring a low-impact infiltration gallery combined with storm sewer and swale collection, is presented, along with modeling results and lessons learned from all phases of the project.

L82 10:00 – 10:30 a.m.

**Green Infrastructure and the 95% Storm**

Andrew Reese, AMEC Earth and Environmental, Nashville, TN

Curt Jawdy, AMEC Earth and Environmental, Knoxville, TN

The shift in stormwater management from a peak control approach to a more holistic look at natural (LID or green infrastructure) approaches carries with it the need to establish changed design criteria. The current combination of local peak flow control criteria coupled with percent removal requirements for NPDES permit compliance is giving way to a framework that looks at the control of volumes of runoff. EPA's criterion to hold the "95% storm" onsite is gaining traction across the US; this presentation looks at some of the implications of this criterion and, through continuous simulation modeling, offers potential changes that may better reflect the goals of simulating predevelopment hydrology.

L83 10:30 – 11:00 a.m.

**Full-Spectrum Detention: Utilizing Regional Detention to Achieve the Goals of Low-Impact Development**

Shea Thomas, Urban Drainage and Flood Control District, Denver, CO

Melanie Chenard, Muller Engineering Company, Lakewood, CO

The Urban Drainage and Flood Control District in Colorado assists local governments in the Denver area with multi-jurisdictional drainage and flood control issues. UDFCD's manual promotes the concept of Water Quality Capture Volume to reduce runoff volumes and flow rates. In 2007, a new concept, Full Spectrum Detention, was added to the manual, reducing stormwater runoff flow rates for larger design storms as well as smaller, more frequent storms. Full Spectrum Detention involves capturing a volume of runoff—the difference between urban and predevelopment volumes—

and releasing it over 72 hours. This presentation compares the concepts of Full Spectrum Detention and Water Quality Capture Volume, including a case study.

## **STORMWATER PROGRAM MANAGEMENT**

Level 3 Room 3

L84 9:30 – 10:00 a.m.

### **Catching Rain in Your Community: Growing Your Residential Rain Garden Program**

Anne Marie Smrchek, Fort Wayne City Utilities, Fort Wayne, IN

Mary Jane Slaton, Fort Wayne City Utilities, Fort Wayne, IN

Fort Wayne, IN, developed a marketing plan to promote voluntary rain gardens and to educate homeowners in sizing and creating them. The plan included an incentive program, which required homeowners to attend a workshop, register their rain gardens with the city, and maintain the gardens for three years in order to obtain either a cash payment or a matching amount of plants. The project has now become the stepping stone to addressing other stormwater concerns in the community, becoming the basis for future green initiatives.

L85 10:00 – 10:30 a.m.

### **When Do We Need to Replace a Bioretention Practice?**

Joel Morgan, University of Minnesota, Minneapolis, MN

Bioretention practices or rain gardens are an established strategy for maintaining site hydrology and capturing pollutants. They can remove oils and grease, nutrients, and heavy metals from runoff, but the long-term capacity for heavy metals and nutrients capture, and the need for media replacement, has not been well documented. Studies were conducted to investigate the capture and capacity of these pollutants by adsorption to different combinations of soils typically used in rain gardens.

L86 10:30 – 11:00 a.m.

### **Stormwater Harvesting in Australia: The Last Resource?**

Steve Frost, Australian Stormwater Industry Association, Canberra, ACT

Water is one of the most important issues facing Australia today. Water restrictions are in place in most major cities and recurrent droughts are affecting the agriculture industry. The Australian Stormwater Industry Association promotes the need for a range of strategies to effectively address water issues, including sourcing, harvesting, managing, and reusing stormwater. This presentation focuses on stormwater harvesting and integrated water management as it is being applied in Australia, including case studies. Lessons learned in Australia could be applied to locations in the US with similar climatic conditions.

## **TEXAS A&M**

Level 3 Room 9

T81 9:30 – 10:00 a.m.

### **Developing a Stormwater Master Plan for the City of Fort Worth**

Steven Eubanks, City of Fort Worth Transportation and Public Works Department, Fort Worth, TX

After extensive flooding in 2004, Fort Worth adopted a stormwater utility with emphasis on identifying and correcting drainage deficiencies. The city has developed several programs to map and analyze drainage facilities and to develop electronic hydraulic models that can be updated to address future projects, changes in land use, and system characteristics. The city's stormwater master plan is the basis for developing a long-term capital project strategy.

T82 10:00 – 10:30 a.m.

### **Overview of the North Central Texas Council of Governments iSWM Manual**

Alan Greer, Freese and Nichols, Dallas, TX

Lesley Brooks, Freese and Nichols, Dallas, TX

Audra Valamidas, North Central Texas Council of Governments, Arlington, TX

The integrated Storm Water Management Manual is a comprehensive effort by the NCTCOG and surrounding communities to create a drainage design manual for the entire region, with flexibility to allow for individualization. The first version was released in 2006; the second, revised with feedback from communities that had adopted it, in 2010. The presentation covers activities that have taken place since the 2006 release, a summary of how municipalities are using the manual, and future plans.

T83 10:30 – 11:00 a.m.

### **Bexar County Flood Control Program**

Arturo Villarreal Jr., Bexar County Flood Control Division, San Antonio, TX

In 1998 and 2002, the San Antonio area experienced severe flooding, leading to a united effort by several governments and agencies to provide improved flood control. Realizing that water knows no boundaries, the Bexar Regional Watershed management partnership also includes 22 suburban cities in Bexar County to manage not only flood control but also water quality.