US EPA SWMM APPROACH FOR STORMWATER LOW-IMPACT DESIGNS

For San Diego and Imperial Counties, California

Presented by

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To be held at the National University, 9388 Lightwave Avenue, Room 124
San Diego, CA 92123 on Tuesday, June 23, 2015

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Urban land developments result in increases of storm runoff flows and volumes. Due to the basic concern of public safety, the conventional stormwater design was developed to focus on how to quickly remove storm water from streets and neighborhoods. Such a man-made hydro-modification to the drainage system has led to more concentrated flows. From 1970 to 1980, the major task in stormwater management had been the reduction of peak flows using flow detention. Under an efficient drainage system developed for extreme events, urban metro areas have experienced that many public health problems are directly related to the increased runoff volumes from frequent, small events. Since the year of 2000, several new concepts were developed to better the management of storm water quality and quantity controls by combining flood mitigation facilities with Low-Impact-Development (LID) devices together. In doing so, an urban drainage system provides a full spectrum management to reduce both runoff volumes and flows from micro (3- to 6-month flows) to minor (2- to 10-yr floods) to major events (25 to 100-yr floods).

Under the latest concept, an urban storm water drainage system shall be designed or renewed to have three layers of cascading flows. Storm runoff generated from impervious areas shall be firstly drained into a micro flow system for water filtering and infiltration. A micro flow system consists of porous pavers, grass swales, bio-retention basins that are designed to treat the water quality capture volume up to 3- to 6-month events (Guo and Urbonas 1996). Overflows from a micro flow facility will be drained into the minor system that consists of street inlets and storm drains. After the underground storm sewers become full, the excessive storm water will be carried on the street which is considered the major flow system. A micro drainage system is also termed low-impact-development (LID) facility. In practice, a LID facility is composed of surface basin, subsurface filtering media, water storage layer, and sub-drain system. The ultimate goal for the 3-layer cascading system is to acheive the preservation of the pre-project watershed regime.

This seminar is prepared to cover how to apply the EPA SWMM computer model and methodology to numerically simulate the performance of 3-layer cascading drainage system, and evaluate the efficiency of the proposed system when comparing with the pre-development watershed condition. The class notes and workshops were developed to provide a practical and hands-on learning experience, including:

(1) *Review of Basic Principles used in EPA SWMM for Stormwater Modeling*
(2) Review of Input and output Parameters
(3) Stormwater Models for pre- and post-project conditions
(4) Numerical Model for Urban Drainage Features

(5) Detention for Peak Flow Control
(6) LID for Runoff Volume Reduction
(7) Evaluation of DETENTION using Event-based Model
(8) Evaluation of LID using Continuous Model for Statistical Analyses
(9) CASE Study – flow and volume mitigation of a new roof
(10) FIELD Study – Calibration of Rain Garden

These class notes document the latest developments in hydrologic methods and criteria recommended for storm water detention system designs. Examples and workshop sessions were developed using San Diego's watersheds under the local 24-hr SCS Type I Rainfall curve. These class notes are presented as power-point outlines and example photos. Details can be found in the technical book: "*Urban Hydrology and Hydraulic Design*", published by Water Resources Publication or visit Dr. James Guo's webpage: WWW.UCDENVER.edu for free download of more references. To assist classroom learning , an EXCEL spreadsheet, *SD BASIC Hydro-2015* was programmed to automate the design procedures. It assists students to practice using the design examples and to conduct sensitivity tests during intense workshop periods.

INTRO TO INSTRUCTOR

Dr. James C.Y. Guo, P.E. is a professor and director at the University of Colorado Denver. Dr Guo's specialty includes surface and subsurface runoff modeling and predictions, watershed management, urban drainage design, flood prediction and forecasting etc. Since 1982, after he joined the U of Colorado Denver, he has been active in applied research and hands-on engineering practices. In addition to teaching graduate hydrology and hydraulics, Dr. Guo has published 80 some journal articles, techincal reports, and books. His research work and computer models have been referenced in several drainage manuals in the United States. Dr. Guo also brings to the class cutting edge technology in stormwater management and urban watershed modeling techniques.

CLASS SCHEDULE

7:30 to 8:00 Welcome and Registration
8:00 - 9:00 Review of EPA SWMM for Storm Water Modeling
9:00 - 10:00 Design Rainfall
10:00-10:15 Break
10:15-11:00 Event-based Run-off Flows – pre- and post-project models
11:00-12:00 Stormwater Detention for Extreme Events
12:00-13:00 Lunch Break
13:00-14:00 Long-term Continuous Simulation and Statistical Analyses
14:00-15:00 Cascading Run-on Flows
15:00-15:15 Break
15:15-16:00 EPA SWMM LID Basics
16:00-17:00 Case Study and Calibration