Hands-On Training Workshop

Introduction

ICPR3 was released in 2002 and although it has been extremely popular, it is showing its age. It will be discontinued on July 1, 2016 and no longer sold or supported after that date.

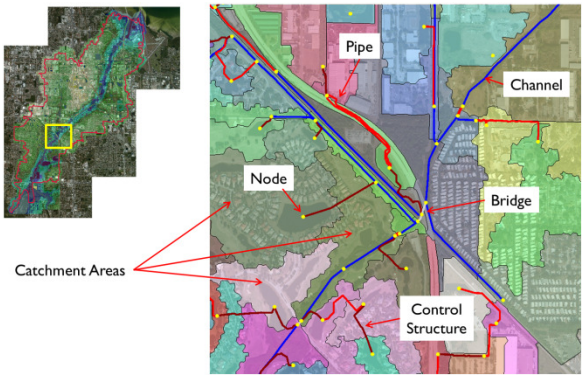
This workshop is focused on the use and application of our next generation of ICPR, (ICPR4, released in 2014).

ICPR has been completely overhauled and modernized. A few of the improvements include:

- ✓ Run times 5 to 20 times faster for medium and large projects
- ✓ Unlimited number of nodes, links, basins and cross sections
- ✓ More stable solution algorithms
- ✓ Spatially referenced graphical model construction
- ✓ Tools to automate data takeoff
- ✓ Although CAD and GIS programs are not required for ICPR4, there are many ways to import and export data to and from them
- ✓ Customizable reports that combine input data and results

Like ICPR3, traditional hydrologic and hydraulic (H&H) techniques (e.g. NRCS unit hydrograph method, curve number method, pond and channel routing) are included in ICPR4. Single event (design storm) modeling and the design of stormwater management systems continue to be the primary applications of ICPR4.

However, the modeling capabilities have been significantly expanded. ICPR4 includes fully integrated 1D/2D surface flow and 2D groundwater. In addition to the curve number method, soil moisture accounting algorithms are available that



track evapotranspiration, irrigation and groundwater recharge. Consequently, true continuous simulation is now possible in addition to single event modeling.

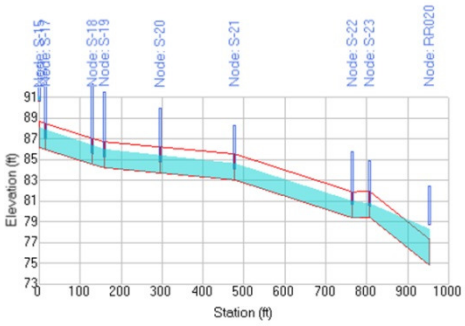
Some of the new automated data takeoff tools in ICPR4 include:

- ✓ Import Raster Digital Elevation Model (DEM)
- ✓ Extract Stage-Area Tables from a DEM
- ✓ Extract Cross Sections from a DEM
- ✓ Assign Cross Sections to Channel and Weir Links
- ✓ Set Channel and Weir Link Invert Elevations from Cross Sections
- ✓ Extract Basin – Soil – Land Use Breakdowns from Map Layers
- ✓ Extract Profiles along any Polyline from DEM

What You Will Learn

Computational Overview: The fundamental modeling concepts and mathematical framework of ICPR4 are described, including hydrology, 1D and 2D surface flow, and 2D groundwater flow.

Drawing Basics: You will learn how to add, delete and edit point, polyline and polygon data – the three fundenmental drawing elements of ICPR4. Once these are mastered, you will learn how to create graphical model elements such as nodes (points), links (polylines) and basins (polygons).



Migrating from ICPR3 to ICPR4: A schematic-based ICPR3 model will be imported to ICPR4 and then spatially referenced to a real-world coordinate system. Aerial imagery and a drainage basin polygon map layer will be added. Comparisons of results and run times between ICPR3 and ICPR4 will be discussed.

Preparing Base Data: You will learn how to import background images (e.g. aerials), thematic polygon map layers (e.g. soils, land use), and raster DEMs (e.g. LiDAR-based terrain data). You will also learn how to manually create and draw map layers in ICPR4.

1D Model Construction: You will work through numerous 1D H&H examples including pond routing, storm sewer hydraulics, channel hydraulics, bridge hydraulics, and a pump station. The workshop examples include graphical model construction and reviewing and analyzing the results.

2D Overland Flow: Most of the key graphical elements used to construct a 2D overland flow model will be applied in a single example. These include modeling obstructions, accounting for storage, capturing flow paths, interfacing with 1D hydraulic components and establishing boundary conditions. You will also learn about computational mesh construction, parameterization, and analyzing results via animations. Other examples include 2D flow downstream of a dam break, 2D overland flow combined with underground storm sewer flow, and determining flow patterns in a wetland system.

2D Groundwater Flow: You will learn about the interaction between surface water and groundwater including flow through the unsaturated vadose zone, groundwater recharge, groundwater seepage, and leakage through a confining layer. A commercial site with dual ponds in close proximity will be modeled. Retention pond recovery, groundwater interactions between the two ponds, slug loads and retaining walls will be examined. Other examples include French drains, injection (drain) wells and groundwater seepage in an urbanized riverine setting.

Continuous Simulation: You will learn about continuous simulation concepts such as evapotranspiration, irrigation, leakage, and multi-year rainfall data. The

workshop exercise includes a land-locked lake system with only ET and leakage through the bottom of the lake as its outlet. Results will be compared with historical records.

Benefits

- ✓ Shorten your learning curve
- ✓ Increase your modeling IQ
- ✓ Expand your marketability
- ✓ Work directly with experts including the original developer of ICPR
- ✓ Extensive step-by-step course material is included

Course Instructors

Peter J. Singhofen, P.E. and F. Warren McKinnie, P.E., C.F.M. will serve as the course instructors. Mr. Singhofen is the original developer of ICPR and has taught approximately 200 workshops on the use and application of ICPR. Mr. McKinnie has more than 12 years of experience in Water Resources Engineering including extensive experience with ICPR3 and ICPR4.

Course Fee & Cancellation Policy

Fee: $1,795

Attendance is on a first come, first served basis and prepayment is required to confirm your registration. *No refunds to those who cancel less than 14 calendar days prior to the workshop.* If insufficient enrollment necessitates canceling the workshop, full tuition will be refunded. Streamline Technologies is not responsible for non-refundable travel expenses.

Continuing Education

Streamline Technologies is an approved Florida Board of Professional Engineers Continuing Education Provider (CE Provider #0003714, License #134 for the period beginning June 1, 2015 and ending May 31, 2017). This workshop has been approved for 21.5 Professional Development Hours (PDHs) in the "area of practice" category.

To register, contact:

workshops@icpr4.com

General Itinerary

Day 1 – 1D H&H Modeling

Computational Overview

Drawing Tutorial

Migrating from ICPR3 to ICPR4

Preparing Base Data
- Background Images and Aerials
- Surfaces (DEMs)
- Thematic Map Layers
- Lookup Tables

Examples Including Analyzing Results
- Residential
- Commercial
- Pump Station
- Bridge Including HEC-RAS Analysis
- Riverine System

Day 2 – 1D H&H (cont'd) and 2D Overland Flow

Continue 1D Examples

Detailed 2D Overland Flow Example
- Base Data
- 2D Graphical Elements
- Mesh Construction
- Parametrization
- Simulation Control
- Analyzing Results

Other Examples
- Dam Break
- Commercial Site Plan

Day 3 – Integrated Surface and Groundwater Flow

Basic 2D Groundwater Modeling Concepts
- Finite Element Method
- Triangles, Honeycombs
- Auto-Parameterization
- Interaction with Vadose Zone
- Interaction with Surface Hydraulics
- Leakage Through a Confining Layer

Other Examples
- Commercial Site Plan
  - Pond Recovery
  - Slug Load Analysis
  - Retaining Walls
- French Drains and Injection Wells
- Continuous Simulation