2013 Floodplain Management Conference

September 3-6, Anaheim, California

Creating a Safer Tomorrow

Building Resilience through Integrated Flood Risk Management

Creating a Safer Tomorrow

FLOODPLAIN MANAGEMENT CONFERENCE

September 3-6, 2013 • Anaheim, California

CONTENTS

Thursday, September 5, 2013

Room/ Time	Workshop / Event
7:30 - 5:00	REGISTRATION
7:30 - 8:30	CONTINENTAL BREAKFAST
7:30-9:30	INNOVATION SESSION: DWR and USACE California Interactive Roundtable: Crafting California's Flood Future – Moving Forward in Managing the State's Flood Risk. Agenda and details posted on the FMA conference web page.
7:30 - 11:30	CRS One-on-One Sessions – By appointment only. If you are a currently a CRS community or a community interested in the CRS program please contact ISO/CRS Specialist Dave Arkens at DMArkens@verisk.com or 702-485-3345 for an appointment. Dave will discuss the upcoming CRS Manual changes with you or general CRS questions and concerns. Appointments are available each half hour. Contact Dave as soon as possible to reserve your time slot.
8:00 - 9:30	CONCURRENT SESSIONS
8:00 - 9:30	2D MODELING BEST PRACTICES: THINGS TO CONSIDER Session Chair: Wen Chen, PhD, Water Group Director, Nolte Associates (NV5) • Benchmarking and Guidelines for 2D Modeling: An International Perspective. Bill Syme, Associate, BMT WBM Pty Ltd. • High Performance Speed-up Strategies for the Computation of 2-D Inundation Models. Reinaldo Garcia, 2Hydronia, LLC • The effect of 2D Grid Element Shape on Possible Hydraulic Bias in Multiple-Direction Flow Hydraulic Models. Ted Hromadka, PhD, PhD, PhD, PE, PH, D.WRE, Department of Mathematical Science, United States Military Academy, West Point and Neil M. Jordan, PE, D.WRE, Consultant, Hromadka & Associates
8:00 - 9:30	COMBINING 1D AND 2D MODELING & OTHER APPLICATIONS Session Chair: Zhida Song-James, PhD, Senior Technical Consultant, Michael Baker, Inc. • 2-Dimensional Overland Flow for Storm Drain Infrastructure Design. Jay Sullivan, PE, RBF Consulting, a Baker Corporation • Lower San Joaquin River Embedding in FLO-2D Model: A Comparative Study with Unsteady HEC-RAS Model. Om Prakash, Ph.D., Senior Engineer, WEST Consultants, Inc. • 2D Hydraulic Modeling of Innovative Streambank Protection Measures. Venkat Gummadi, PE, Engineer, Geosyntec Consultants and Trevor Alsop, PE, Senior Engineer, Geosyntec Consultants
8:00 - 9:30	RESTORING RIVERS, STREAMS AND WATERSHEDS Session Chair: Zully Smith, Riverside County Flood Control and Water Conservation District • Effects of Native Establishment in Late Summer. Joseph Paternoster, DriWater, Santa Rosa, CA • Lower Squaw Creek Design – A Case Study Of Hydro-Geomorphic Restoration. Mike Liquori, Arnie Thompson and Pam Boyle, Sound Watershed • Interagency Collaboration: Working Together Towards Watershed Restoration in Northern California. Ryan Teubert, Flood Risk Coordinator, Western Shasta Resource Conservation District
8:00 - 9:30	LEVEE HAZARD AND BREACH ANALYSES Session Chair: Byron Woltersdorf, PE, District Engineer, Multnomah County Drainage District • A New and Innovative Methodology for Determining the Integrity of Levee/ Bank Slope and Toe Protection. Chris Bowles, PhD, cbec eco engineering • Hidden Erosion Hazards on the Lower Sacramento River Levees. Thomas W. Smith, PE, GE, President, RiverSmith Engineering, Inc. • Review of Existing San Francisco Bay Restoration Levee Breaches: Breach Width Progression, Channel Depth, and Average Annual Rate of Widening. Rohin Saleh, PE, Alameda County Flood Control and Water Conservation District and Matthew Powers, PE, GEI Consultants, Inc.

continued next page

FLOODPLAIN MANAGEMENT ANNUAL CONFERENCE &
2-D MODELING SYMPOSIUM
September 3-6, Marriott Hotel, Anaheim, California

September 3rd 2-D Modeling Symposium
Exploring "Best Practices" for 2-D Flood Modeling and Mapping
•
Engineering Method Selection and Application

The effect of 2D grid element shape on possible hydraulic bias in multiple-direction flow hydraulic models.

T.V. Hromadka II, Presenter (1); and N. Jordan (2)

Abstract:

Multiple directional flow models, such as occasionally used and developed for modeling of unsteady flow in two dimensions, are governed by the well-known flow equations of continuity and momentum. Some of these models use quasi one-dimensional flow rate estimates of flows as applied in the four principal directions along Cartesian coordinate axes and then budget the source and receiving modeling control volumes or cells in order to track mass balance or mass conservation. In this paper is presented the results of research into this topic that are presented in detail and published in the Journal of the American Institute of Hydrology. This paper concludes that the standard four direction flow model with tiled square grid elements satisfies the governing flow equations, but non-square grid elements (e.g. triangle, hexagon) slightly underestimate flow depth. The magnitude of underestimation (computed depth / normal depth) for example, is 81% for the triangle and 89% for the hexagon. The bias is about the same as or less than the magnitude of other uncertainties in hydraulic models, and would be compensated for during customary model calibration.

(1) Department of Mathematical Science, United States Military Academy, West Point, NY.
29809 Santa Margarita Pkwy, Rancho Santa Margarita, CA 92688
(949) 709-4314
Ted Hromadka tedhromadka@yahoo.com

(2) Consultant, Hromadka & Associates, Rancho Santa Margarita, CA.
Neil M. Jordan, P.E., D.WRE
1 Buckeye
Irvine CA 92604-1909
Mobile 714-270-8422
Fax 949-857-2184
mailto:neiljordan@cox.net

THE EFFECT OF 2D GRID ELEMENT SHAPE ON POSSIBLE HYDRAULIC BIAS IN MULTIPLE-DIRECTION FLOW HYDRAULIC MODELS

T.V. HROMADKA and N. M. JORDAN

FLOODPLAIN MANAGEMENT
ANNUAL CONFERENCE & 2-D
MODELING SYMPOSIUM

SEPTEMBER 5, 2013

A REPORT OF FINDINGS FROM RESEARCH PUBLISHED IN THE JOURNAL OF THE AMERICAN INSTITUTE OF HYDROLOGY

MULTI-DIRECTIONAL ANALOGS OF TWO-DIMENSIONAL FLOW

T. V. HROMADKA, II
Department of Mathematical Sciences, United States Military Academy, West Point, NY
Professor Emeritus, California State University, CA, USA
Phone: 714-241-0099 Fax: 714-241-0092
Email: ted@phdphdphd.com

R. J. WHITLEY
Department of Mathematics, University of California, Irvine, CA, USA
Phone: 206-780-3092
Email: rwhitley@math.uci.edu

N. JORDAN
Exponent Failure Analysis
Irvine, CA, USA
Phone: 949-341-6012 Fax: 949-341-6059
Email: njordan@exponent.com

Hydrological Science and Technology, Volume 22, No. 1-4
Journal of the American Institute of Hydrology

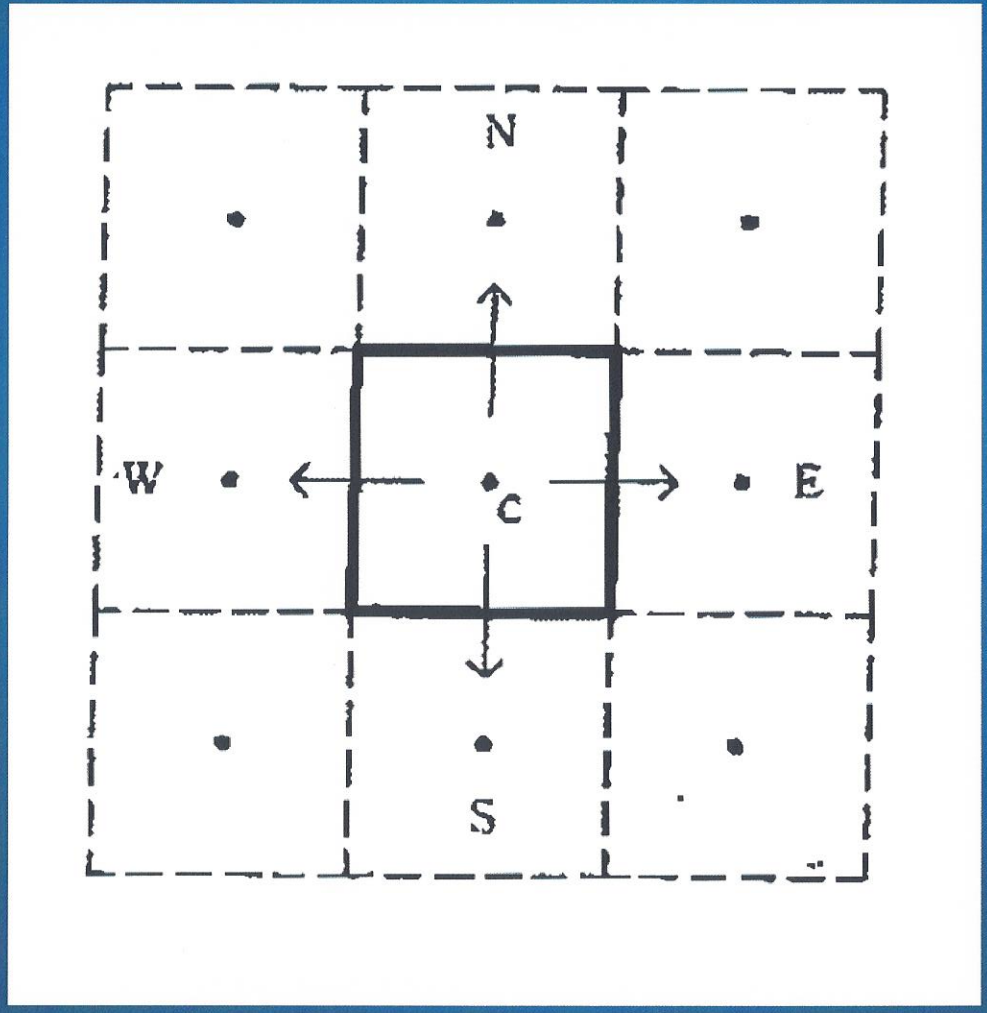
JANUARY 2007

RESEARCH TO ANSWER FIRST OF TWO QUESTIONS RAISED IN APPLICATION OF US GEOLOGICAL SURVEY 2-D MODEL DEVELOPED BY HROMADKA & YEN IN 1987, WHICH USED MANUAL GRIDDING OF SQUARE GRID ELEMENTS OVER TOPOGRAPHIC SURFACE.

WHAT IF TOPOGRAPHIC SURFACE WERE TILED WITH NON-SQUARE GRID ELEMENTS?

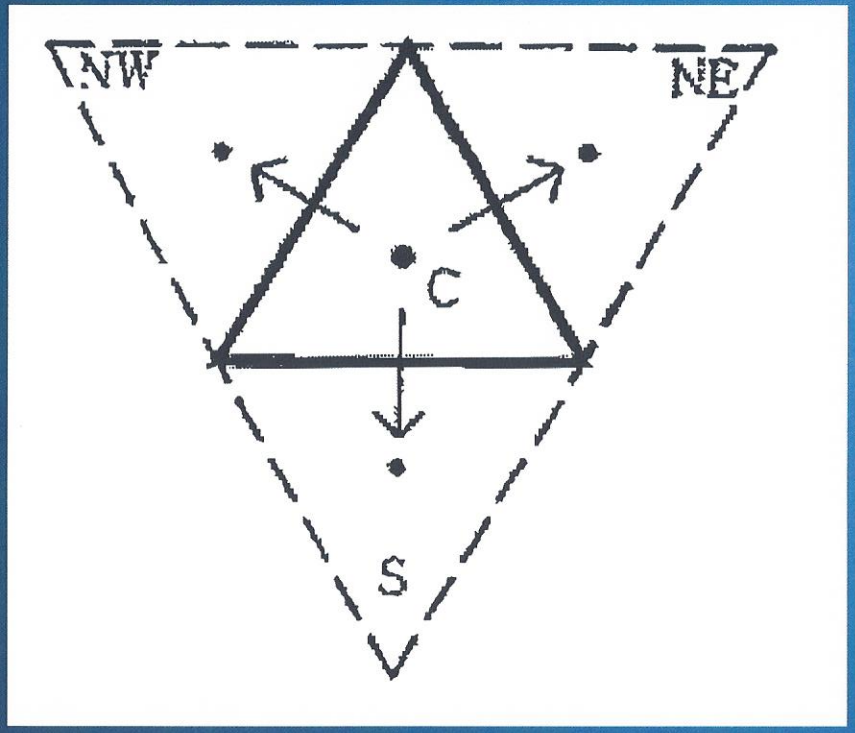
PAPER REPRINT AND SUPPORT DOCUMENTS AVAILABLE AT
http://www.diffusionhydrodynamicmodel.com/index2.html

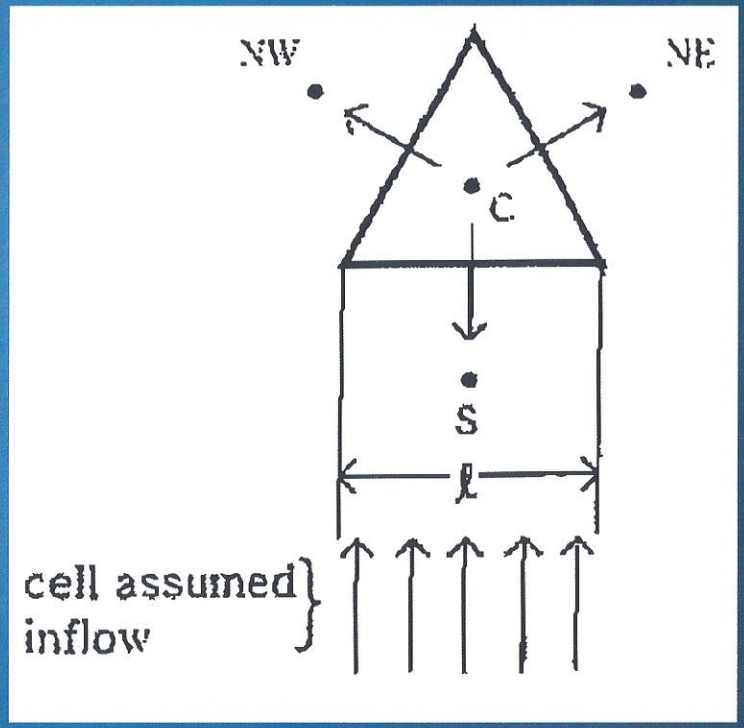
USGS DIFFUSION HYDRODYNAMIC MODEL TILES A TOPOGRAPHIC SURFACE WITH SQUARE GRID ELEMENTS



INTENT IN 1987 WAS TO ALIGN THE GRID ELEMENTS WITH FLOW STREAMLINES

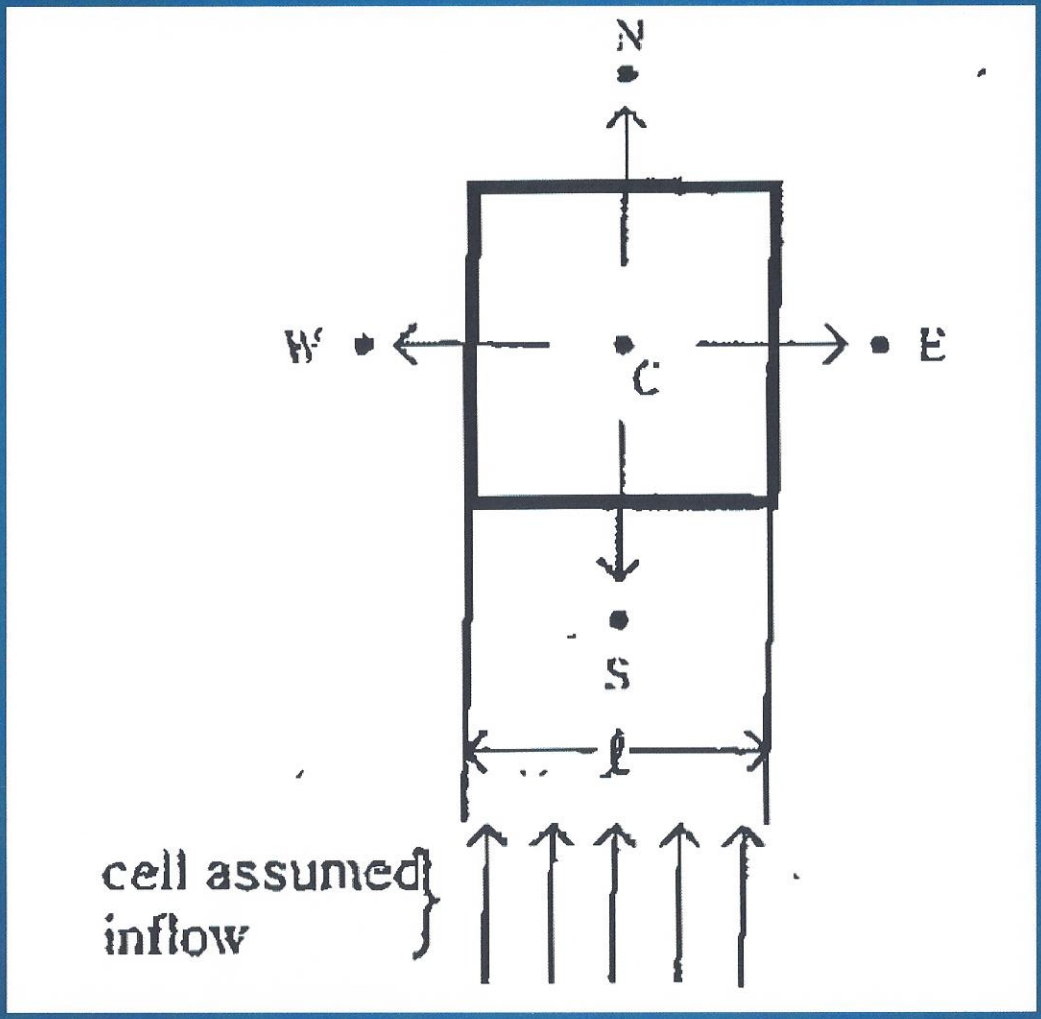
HROMADKA ET AL. (2007) INVESTIGATED TILING WITH N-SIDED GRID ELEMENTS ASSUMING STEADY UNIFORM FLOW, COMPARING COMPUTED DEPTH WITH NORMAL DEPTH. FOR THE 3-SIDED TEST. . .:





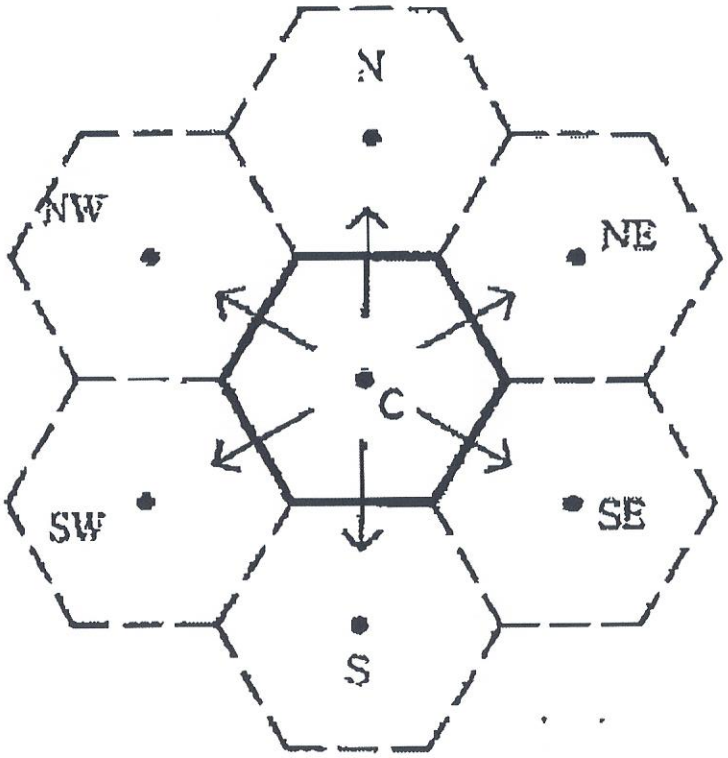
$$h_3 = \left(\frac{\sqrt{2}}{2}\right)^{3/5} y_n = 0.81 y_n$$

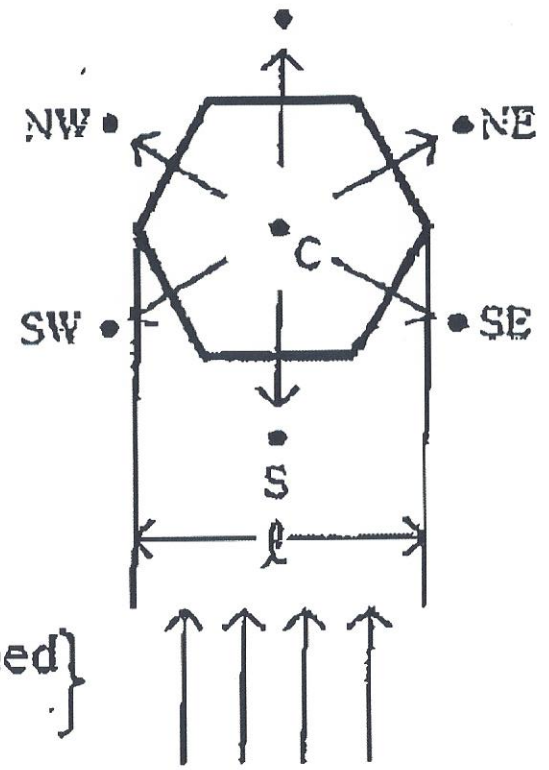
4-SIDED TEST . . .



$$h_4 = y_n$$

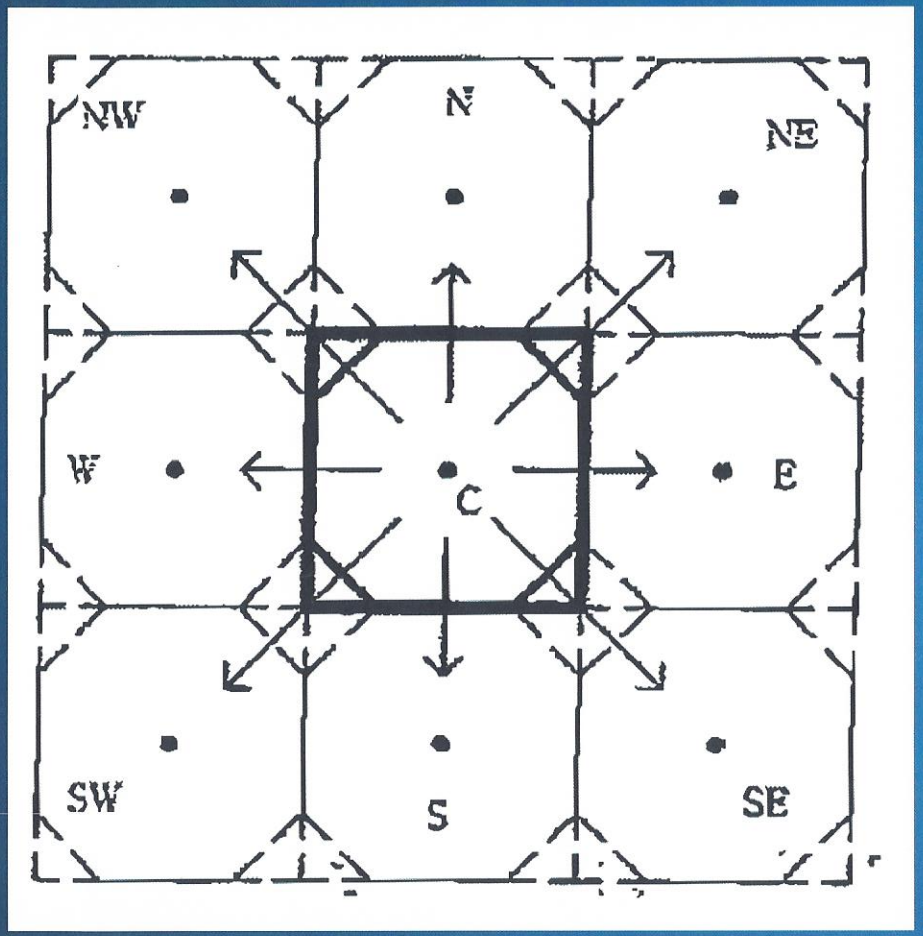
6-SIDED TEST . . .

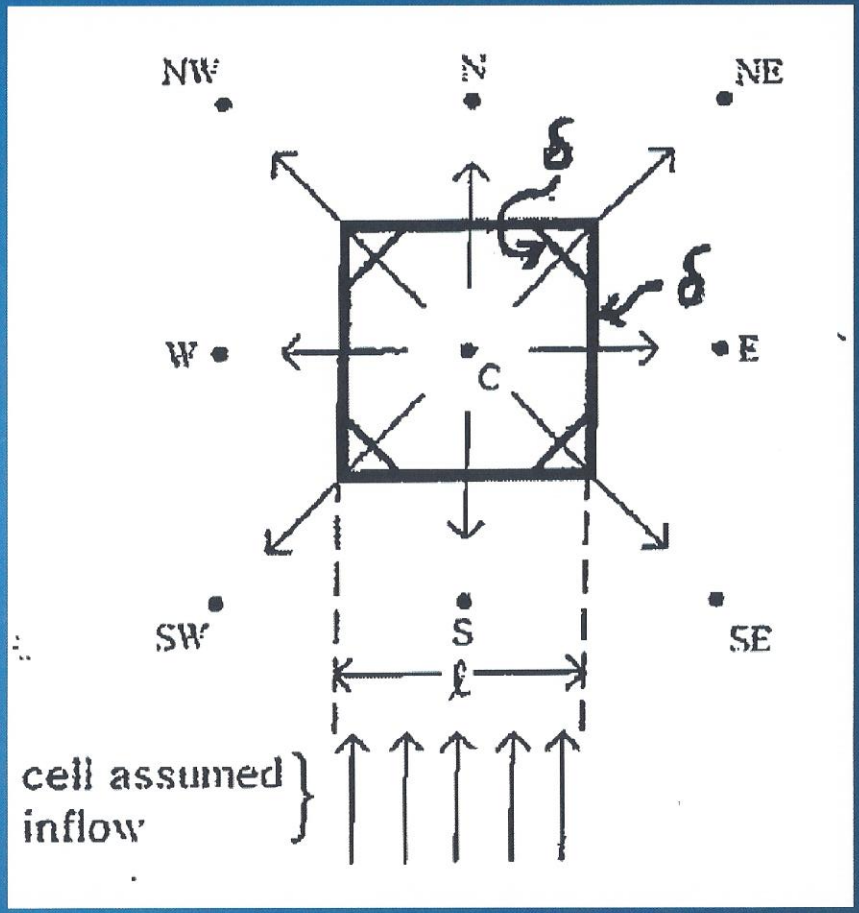




$$h_6 = \left(\frac{2\sqrt{2}}{2+\sqrt{2}} \right)^{3/5} y_n \approx 0.89\, y_n$$

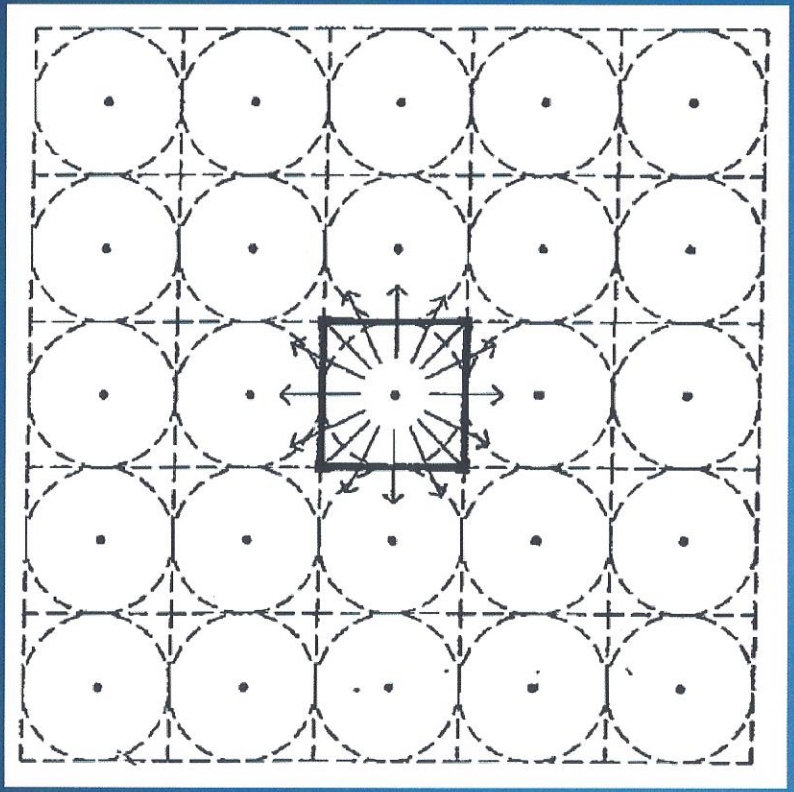
8-SIDED TEST . . .

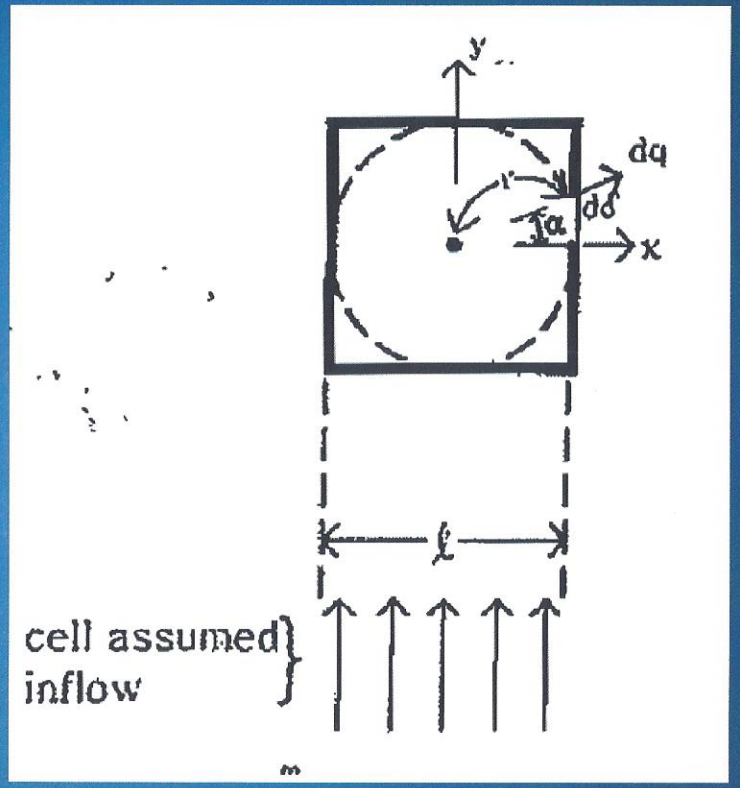




$$h_8 = \left(\frac{(1+\sqrt{2})}{(1+2^{3/4})} \right)^{3/5} y_n$$

2^M-SIDED TEST AND M = ∞ FOR THE CIRCLE . . .





$$h_{2^m} = y_n \Big/ \left(\left[2 \sum_{i=1}^{(2^{m-2}-1)} \sin^{1/2}(\pi / 2^{m-1}) + 1 \right] \tan(\pi / 2^m) \right)^{3/5}$$

$$h_\infty = y_n \Big/ \left(\int_0^{\pi/2} (\sin\alpha)^{1/2} d\alpha \right)^{3/5}$$

ALL TILE SHAPES EXCEPT THE 4-SIDED FIGURE SLIGHTLY UNDERESTIMATED NORMAL FLOW DEPTH

(1) j	(2) L/ℓ	(3) L_d/ℓ	(4) α	(5) s_{od}/s_o	(6) δ/ ℓ	(7) k_j
3	√3/3	√3/3	π/6	1/2	1	0.81
4	1	--	--	--	1	1.00
6	√3/2	√3/2	π/6	1/2	1/2	0.89
8	1	√2	π/4	√2/2	1/(1+√2)	0.94
2^m	W	various	various	$s_o \sin\square_{\square}$	Δδ	Eqn.39:(8)(9)
∞	W	various	various	$s_o \sin\alpha$	dδ	0.90

SIDES	Hn / NORMAL DEPTH
3	0.81
4	**1.00**
6	0.89
8	0.94
CIRCLE	0.90

IS THIS BIAS A PROBLEM?

"FOR THE CASE OF SHALLOW OVERLAND FLOW, IT HAS BEEN SHOWN (ENGMAN, 1989) THAT THE GOVERNING FLOW EQUATIONS CAN BE SOLVED WITH PROPER BOUNDARY CONDITIONS AND THE SELECTION OF ONLY ONE PARAMETER, MANNING'S N."

"ACCORDINGLY, FRICTION FACTOR MAY BE ADJUSTED SO THAT COMPUTED DEPTHS MATCH ACTUAL DEPTHS."

"THE ADJUSTMENTS IN FRICTION FACTOR IN SOME CASES WOULD BE LESS THAN THE PUBLISHED VARIATION IN FRICTION FACTOR."

BOTTOM LINE: NOT NECESSARILY, IF RECOGNIZED.

Neil Jordan

From: Neil Jordan <neiljordan98@gmail.com>
Sent: 14 August, 2013 11:45
To: neiljordan@cox.net
Subject: Fwd: Request for Copyright Permission - JAIH Paper

---------- Forwarded message ----------
From: **Rolando Bravo** <aih@engr.siu.edu>
Date: Wed, Aug 14, 2013 at 11:24 AM
Subject: RE: Request for Copyright Permission - JAIH Paper
To: Neil Jordan <neiljordan98@gmail.com>
Cc: Ted Hromadka <tedhromadka@yahoo.com>

Dear Mr. Jordan,

On behalf of AIH I granted permission to use the reference paper.

Sincerely,

Rolando Bravo, Ph.D., P.E., P.H., D.WRE

Associate Professor and

Executive Director of the

American Institute of Hydrology

1230 Lincoln Drive

Carbondale, IL 62901-6603

Phone: 618-453-7809

Email: aih@engr.siu.edu

Web site: www.aihydrology.org

From: Neil Jordan [mailto:neiljordan98@gmail.com]
Sent: Tuesday, August 13, 2013 3:03 PM
To: aih@engr.siu.edu
Cc: Ted Hromadka
Subject: Request for Copyright Permission - JAIH Paper

Dr. Ted Hromadka and I have been invited to present papers at the Floodplain Management Association Floodplain Management Conference during the first week of September, 2013. I have attached a copy of the relevant paper, "Multi-Directional Analogs of Two-Dimensional Flow".

We intend to present the relevant results of this paper in the form of a PowerPoint or similar format and we request your permission to submit the paper itself, along with the presentation materials, to the Floodplain Management Association. We will provide full acknowledgement to the American Institute of Hydrology.

Please respond directly to me, copy to Dr. Hromadka.

Neil M. Jordan, P.E., D.WRE
Civil Engineer
Licensed Civil Engineer 44012 by the California Board for
Professional Engineers and Land Surveyors
Also licensed in Oregon and Arizona
1 Buckeye
Irvine CA 92604-1909
Mobile 714-270-8422
Fax 949-857-2184
mailto:neiljordan@cox.net

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