Bridge Hydraulic Analysis with HEC-RAS-Vernon R. Bonner 1996 The Hydrolologic Engineering Center (HEC) is developing new generation software for one-dimensional river hydraulics. The HEC-RAS River Analysis System is intended to be the successor the current steady-flow HEC-2 Water Surface Profiles Program as well as provide unsteady flow, sediment transport, and hydraulic design capabilities in the future. A common data representation of a river network and bridge data is used by all modeling methods. This paper presents the bridge modeling approach, available methods, and research results on flow transitions and associated modeling guidelines.

Hydraulic Design of Safe Bridges-United States Department of Transportation 2015-02-24 (Hydraulic Design Series) This document provides technical information and guidance on the hydraulic analysis and design of bridges. The goal is to provide information such that bridges can be designed as safely as possible while optimizing costs and limiting impacts to property and the environment. Many significant aspects of bridge hydraulic design are discussed. These include regulatory topics, specific approaches for bridge hydraulic modeling, hydraulic model selection, bridge design impacts on scour and stream instability, and sediment transport.

A Comparison of the One-Dimensional Bridge Hydraulic Routines from HEC-RAS, HEC-2 and WSPRO.-1995 The hydraulics of flow though bridges is an important aspect of computing water surface profiles. The computation of accurate water surface profiles though bridges is necessary in flood damage reduction studies, channel design and analysis, and stream stability and scour evaluations. There are several one-dimensional water surface profile computer programs available for performing this type of computation. The most widely used of these programs are HEC-2 (HEC, 1991) and WSPRO (FHWA, 1990). The Hydrolologic Engineering Center (HEC) has recently released a new program for computing one-dimensional water surface profiles, called HEC-RAS (HEC, 1995). The purpose of this study was to evaluate the effectiveness of the new bridge hydraulics routines in HEC-RAS at sites with extensive observed data, and to compare HEC-RAS to HEC-2 and WSPRO, with respect to bridge modeling performance.

HEC-2 Water Surface Profiles-Hydrolodic Engineering Center (U.S.) 1976

Effects of Debris on Bridge Pier Scour-Peter Frederick Lagasse 2010-01-01 TRB’s National Cooperative Highway Research Program (NCHRP) Report 653: Effects of Debris on Bridge Pier Scour explores guidelines to help estimate the quantity of accumulated, flow event debris, based on the density and type of woody vegetation and river bank condition upstream and analytical procedures to quantify the effects of resulting debris-induced scour on bridge piers. The debris photographic archive, the survey questionnaire and list of respondents, and the report on the field pilot study related to development of NCHRP 653 was published as NCHRP Web-Only Document 148: Debris Photographic Archive and Supplemental Materials for NCHRP Report 653.

Flow Transitions in Bridge Backwater Analysis-John H. Hunt 1995

Hydraulics of Bridge Waterways-Joseph N. Bradley 1973

Guide to Bridge Hydraulics-Transportation Association of Canada 2004 Basic hydraulic considerations - Channel types and behaviour relation to bridges - Basic hydraulic requirements - Hydraulic design procedures Hydrologic estimates - Statistical frequency analysis - Runoff modeling - Empirical methods - High water levels and stage-discharge relations - Extreme floods and risk Scour protection and channel control - Scour protection around bridge foundations - Erosion protection of banks and slopes - Design of rock riprap - Cannel control works Hydraulic aspects of construction, inspection and maintenance - Construction - Inspection - Maintenance Special problems - Tidal crossings - Inland basic crossings - Waves and waves protection - Physical modeling of bridge problems - Alluvial fans - Debris flow and torrents

Practical Channel Hydraulics, 2nd edition-Donald W. Knight 2018-03-05 Practical Channel Hydraulics is a technique guide for estimating flood water levels in rivers using the innovative software known as the Conveyance and Afflux Estimation System (CES-AES). The stand alone software is freely available at HR Wallingford's website www.river-conveyance.net. The conveyance engine has also been embedded within industry standard river modelling software such as InfoWorks RS and Flood Modeler Pro. This 2nd Edition has been greatly expanded through the addition of Chapters 6-8, which now supply the background to the Shiono and Knight Method (SKM), upon which the CES-AES is largely based. With the need to estimate river levels more accurately, computational methods are now frequently embedded in flood risk management procedures, as for example in ISO 18320 ('Determination of the stage-discharge relationship'), in which both the SKM and CES feature. The CES-AES incorporates five main components: A Roughness Adviser, A Conveyance Generator, an Uncertainty Estimator, a Backwater Module and an Afflux Estimator. The SKM provides an alternative approach, solving the governing equation analytically or numerically using Excel, or with the short FORTRAN program provided. Special attention is paid to calculating the distributions of boundary shear stress distributions in channels of different shape, and to appropriate formulations for resistance and drag forces, including those on trees in floodplains. Worked examples are given for flows in a wide range of channel types (size, shape, cover, sinuosity), ranging from small scale laboratory flumes (Q = 2.0 l/s to 107) to European rivers (~2,000 m3s-1), and large-scale world rivers (> 23,000 m3s-1), a ~ 107 range in discharge. Sites from rivers in the UK, France, China, New Zealand and Ecuador are considered. Topics are introduced initially at a simplified level, and get progressively more complex in later chapters. This book is intended for post graduate level students and practising engineers or hydrologists engaged in flood risk management, as well as those who may simply just wish to learn more about modelling flows in rivers.

Proposed BNSF Cajon Third Main Track, Summit to Keenbrook- 2007

An Introduction to Hydraulic Analysis Considerations for Bridge Design-. Paul Guyer, P.E., R.A. 2020-03-12 An Introduction to Hydraulic Analysis Considerations for Bridge Design is a technical guide for civil engineers and construction managers interested in hydraulic analysis for bridge design in flowing water, such as rivers. Here is what is discussed: 1. INTRODUCTION 2. HYDRAULIC MODELING CRITERIA AND SELECTION 3. SELECTING UPSTREAM AND DOWNSTREAM MODEL
EXTENT 4 IDENTIFYING AND SELECTING MODEL BOUNDARY CONDITIONS

Flood Analysis of Bridge-Stream Interactions Using Two-Dimensional Models - Rachel M. Seigel 2021
The 2011 Tropical Storm Irene resulted in considerable property and infrastructure damage in Vermont and neighboring states, including damages to and failure of over 300 bridges and 800 km (500 miles) of roads in Vermont alone, which brought to light the vulnerability of regional transportation infrastructure to extreme flood events. The northeastern United States is experiencing more frequent precipitation events of longer duration (i.e., extreme events). Infrastructure therefore must be able to withstand more frequent flood events of greater magnitude. It is not feasible to analyze and retrofit each structure for the rigorous hydraulic demands of extreme flood events; so prioritizing limited resources to locations at greatest risk in order to minimize flood damage is critical. Current state of practice is often limited in scope to steady-state analysis in the immediate vicinity of a specific structure or feature, and the far-reaching impacts up- and downstream the river are often not understood and considered in decision making. To better understand the interactions among rivers, hydraulic structures and surrounding hydrogeological features, a two-dimensional (2D) transient HEC-RAS (Hydraulic Engineering Center's River Analysis System) model of a Mad River Reach was constructed and calibrated. Available 2D HEC-RAS models of two additional Vermont river reaches supplemented the study allowing comparisons across a range of river gradients. The analyses considered the 2011 Tropical Storm Irene, as well as flood events that have a high exceedance probability of 5%, 4%, 2% and 1%, to analyze hydraulic impacts and interactions surrounding transportation infrastructure. A screening framework, that uses the 2D hydraulic modeling results, was developed to identify bridges and sites best suited for hydraulic intervention such as floodplain lowering and reconnection and addition of culverts for mitigating the impacts of extreme flood events along the bridge-river network. These interventions were then simulated in the developed 2D HEC-RAS models of the three study reaches. The results of the baseline and intervention models were examined to quantify bridge-river interactions on a reach scale, evaluate the overall effectiveness of the screening framework, and identify reach-level impacts of flood mitigation interventions. The results indicate that the developed screening framework that combines geomorphic and hydraulic characteristics can identify suitable bridges and other locations along a river for flood mitigation intervention. The screening framework is comparatively more adaptable to moderate to high gradient rivers, but may still be applied to lower gradient rivers with supplementary data from prior flood damage reports and other hydraulic structures. The results demonstrate that the intervention techniques are applicable in a general sense across the intervention locations. Interventions simulated on a moderate or high gradient river have farther-reaching effects that are often less intuitive and downstream compared to a low gradient river highlighting the importance of a transient, two-dimensional hydraulic analysis. Overall, the results suggest that bridge flood mitigation projects in similar geographic and climate settings should consider the up and downstream geomorphic and hydraulic characteristics to better understand the potential impact the intervention will have on the bridge-river network.

HEC-6: 1995 A review of the historical development of HEC-6 is given. A description of the model capabilities theory, and data requirements is provided. Emphasized throughout is application of HEC-6 to reservoir sediment analysis. (MM).

HEC-RAS 2.2 for Backwater and Scour Analysis - A. David Parr 2000
The Kansas Department of Transportation (KDOT) and most bridge consultants in Kansas have been using the DOS-WSPRO program and the KDOT scour spreadsheets to perform bridge hydraulics and scour analysis for the past several years. Unfortunately, DOS-WSPRO is no longer supported and the new Windows-based hydraulics program HEC-RAS (Hydraulic Engineering Center River Analysis System) developed by the U.S. Army Corps of Engineers appears to be a logical choice to succeed DOS-WSPRO as the basic flow model in KDOT's bridge design and scour analysis program. HEC-RAS has gained considerable popularity in the engineering community and offers many options not previously available to hydraulic modelers. It also has a scour module and has an option, the WSPRO bridge analysis routine (henceforth called HR-WSPRO). This study compared the HEC-RAS program with the DOS-WSPRO program and examined the HEC-RAS program with regard to scour analysis. The possibility of using the existing KDOT scour spreadsheets with output from the HR-WSPRO bridge routine was also considered. Finally, a literature review was performed to determine if any updates in the scour methods and new approaches to special conditions, such as the effect of debris or pressure flow affecting pier scour, were available.

Stream Stability at Highway Structures - U.S. Department of Transportation 2015-03-01
Approximately 500,000 bridges in the National Bridge Inventory (NBI) are built over streams. A large proportion of these bridges span alluvial streams that are continually adjusting their beds and banks. Many, especially those on more active streams, will experience problems with degradation, bank erosion, and lateral channel shift during their useful life. The purpose of this document is to provide guidelines for identifying stream instability problems at highway stream crossings. Techniques for stream channel classification and reconnaissance, as well as rapid assessment methods for channel instability are summarized. Quantitative and qualitative geomorphic and engineering techniques useful in stream channel stability analysis are presented. This publication is an update of the third edition published in 2001. The HEC-20 manual covers geomorphic and hydraulic factors that affect stream stability and provides a step-by-step analysis procedure for evaluation of stream stability problems. Stream channel classification, stream reconnaissance techniques, and rapid assessment methods for channel stability are covered in detail. Quantitative techniques for channel stability analysis, including degradation analysis, are provided, and channel restoration concepts are introduced. Significant new material in this edition includes chapters on sedimt transport concepts and channel stability in gravel bed streams, as well as expanded coverage of channel restoration concepts.

HEC River Analysis System (HEC-RAS) - Gary W. Brunner 1994
The Hydrologic Engineering Center (HE) is developing next generation software for one-dimensional river hydraulics. The HEC-RAS River Analysis System is intended to be the successor to the current steady-flow HEC-2 Water Surface Profiles Program as well as provide unsteady flow, sediment transport, and hydraulic design capabilities in the future. A common data representation of a river network is used by all modeling methods, thus allowing the user to more easily migrate from steady-flow model with several significant advances over HEC-2. An overview of the Version 1 program package and some of the improved hydraulic features are presented.

Practical Channel Hydraulics - Donald W. Knight 2009-10-07
A technical reference guide and instruction text for the estimation of flood and drainage water levels in rivers, waterways and drainage channels. It is written as a user’s manual for the openly available innovative Conveyance and Afflux Estimation System (CES-AES) software, with which water levels, flows and velocities in channels can be calculated. The impact of factors influencing these levels and the sensitivity of channels to extreme levels can also be assessed. Approaches and solutions are focused on addressing environmental, flood risk and land drainage objectives. Practical Channel Hydraulics is the first reference guide that focuses in detail on estimating roughness, conveyance and afflux in fluvial hydraulics. With its universal approach and the application of metric units, both book and software serve an international audience of consultants and engineers dealing with river modelling, flood risk assessment, maintenance of watercourses and the design of drainage systems. Suited as course material for training graduate Master’s students in civil and environmental engineering or geomorphology who focus on river and flood engineering, as well as for professional training in flood risk management issues, open channel flow hydraulics and modelling. The CES-AES software development followed recommendations by practitioners and academics in the UK Network on Conveyance in River Flood Plain Systems, following the Autumn 2000 floods, that operating authorities should make better use of recent improved knowledge on conveyance and related flood (or drainage) level estimation. This led to a Targeted Programme of Research aimed at improving conveyance estimation and subsequent integration with other research on afflux at bridges and culverts at high flows. The CES-AES software tool's useful life. The purpose of this document is to provide guidelines for identifying stream instability problems at highway stream crossings. Techniques for stream channel classification and reconnaissance, as well as rapid assessment methods for channel instability are summarized. Quantitative and qualitative geomorphic and engineering techniques useful in stream channel stability analysis are presented. This publication is an update of the third edition published in 2001. The HEC-20 manual covers geomorphic and hydraulic factors that affect stream stability and provides a step-by-step analysis procedure for evaluation of stream stability problems. Stream channel classification, stream reconnaissance techniques, and rapid assessment methods for channel stability are covered in detail. Quantitative techniques for channel stability analysis, including degradation analysis, are provided, and channel restoration concepts are introduced. Significant new material in this edition includes chapters on sediment transport concepts and channel stability in gravel bed streams, as well as expanded coverage of channel restoration concepts.

A Comparison of the One-dimensional Bridge Hydraulic Routines from HEC-RAS, HEC-2 and WSPRO - 1995
Summary and comparison of multiphase streambed scour analysis at selected bridge sites in Alaska.

Drainage Design-P. Smart 2013-11-11 This book provides a review of the principles and methods of drainage with an emphasis on design. The whole field of drainage is covered, and although the book concentrates mainly on the practice in North America, Europe and Britain, the practice in developing countries is also included. The book is directed primarily at the graduate engineer entering professional practice, but will also provide a useful reference for more senior engineers and for those in adjacent professions. Chapter 1 outlines the necessity for drainage on a large or small scale, for rural and urban areas. As the drainage engineer must decide how much unwanted water there will be and when it will occur, the chapter discusses climatic types, prediction of rainfall, evapotranspiration effects, return periods (of design storms and runoff events), river flow and flood prediction, and various sensing systems for providing short term predictions of rainfall, runoff, streamflow and flood warning. Chapter 2 gives a thorough review of the properties of soil in the context of drainage design. The extensive mathematical theories which relate to the crucial area of soil water movement are outlined and due attention is paid to the growing importance of predicting soil water movement in partially saturated soils.

Computer Models for Rainfall-runoff and River Hydraulic Analysis-Darryl W. Davis 1973 The application of computer technology to analysis of the rainfall-runoff process and the hydraulics of natural rivers has greatly expanded in the past few years. A large number of special purpose programs and a few programs designed for general application have been developed and applied to hydrologic engineering problems. The Hydrologic Engineering Center (HEC) has developed, over the past 8 years, a number of generalized computer programs for use by the US Army Corps of Engineers in analyzing hydrologic engineering problems. This paper briefly describes the activities of the Hydrologic Engineering Center and discusses the capabilities of two of these programs: (1) Flood Hydrograph Package (HEC-1) and (2) Water Surface Profiles (HEC-2). (Author).

Idaho 16, I-84 to Idaho 44, Ada and Canyon Counties- 2009

Reference Guide for Applying Risk and Reliability-Based Approaches for Bridge Scour Prediction-Peter Frederick Lagasse 2013 *TRB's National Cooperative Highway Research Program (NCHRP) Report 761: Reference Guide for Applying Risk and Reliability-Based Approaches for Bridge Scour Prediction presents a reference guide designed to help identify and evaluate the uncertainties associated with bridge scour prediction including hydrologic, hydraulic, and model/evaluation uncertainty. For complex foundation systems and channel conditions, the report includes a step-by-step procedure designed to provide scour factors for site-specific conditions."--Publisher's description

Risk-Based Bridge Engineering-Khaled Mahmoud 2019-08-20 Risk-based engineering is essential for the efficient asset management and safe operation of bridges. A risk-based asset management strategy couples risk management, standard work, reliability-based inspection and structural analysis, and condition-based maintenance to properly apply resources based on process criticality. This ensures that proper controls are put in place and reliability analysis is used to ensure continuous improvement. An effective risk-based management system includes an enterprise asset management or resource solution that properly catalogues asset attribute data, a functional hierarchy, criticality analysis, risk and failure analysis, control plans, reliability analysis and continuous improvement. Such efforts include periodic inspections, condition evaluations and prioritizing repairs accordingly. This book contains select papers that were presented at the 10th New York City Bridge Conference, held on August 26-27, 2019. The volume is a valuable contribution to the state-of-the-art in bridge engineering.

Hydraulic Analysis of Pipe-arch and Elliptical Shape Culverts Using Programable Calculators- 1982

Scour and Erosion IX-Yeh Keh-Chia 2018-10-16 Scour and Erosion IX contains the peer-reviewed scientific contributions presented at 9th International Conference on Scour and Erosion (ICSE 2018, Taipei, Taiwan, 5–8 November 2018), and includes recent accomplishments about scour and erosion in field observoration, experimental laboratory work, theoretical development, numerical modeling and disaster management. The book covers fourteen topics: A. Internal erosion B. River, coastal, estuarine and marine scour and erosion C. Rock scour and erosion D. Sediment transport: grain scale and continuum scale E. Scour and erosion around structures F. Soil erosion, restoration mechanisms and conservation G. Hillslope conservation and debris flow H. Geotechnical issues related to scour and erosion I. Field observation and analyses J. Scour and erosion testing and experiment K. Remote sensing, instrumentation and monitoring L. Advanced numerical modelling of scour and erosion M. Natural hazards due to scour and erosion N. Management of scour/erosion and sediment.

Assessment of HY-8 and HEC-RAS Bridge Models for Large-Span Water-Encapsulating Structures-Dennis Lyn 2019-02 Current INDOT policy requires that culvert-like structures with spans greater than 20 ft be treated for purposes of hydraulic analysis as a bridge, and hence mandates the use of software such as HEC-RAS for predicting the headwater. The effects of bed roughness, the presence or absence of a cover (if present, the rise was 0.5 ft), and a range of tailwater levels, were investigated. The laboratory observations were compared with predictions by HY-8 and HEC-RAS models, and the model performance assessed. In general, HY-8 predictions were found to be as good as, and in some cases superior to, the HEC-RAS predictions, for both long and short culvert-like structures. This was attributed to the empirical information in HY-8 being more tailored to the specific standardized geometry of culvert-like structures, and the automatic inclusion of roughness effects, whereas HEC-RAS, at least when used with default coefficients and settings, relied on generic coefficients and neglected roughness effects. It was therefore recommended that a change in INDOT policy allowing large-span culvert-like structures to be analyzed by conventional culvert hydraulic analysis be technically justified for problems where the structure could be considered in isolation and accurate input data are available.

US-131 Improvement Study, from the Indiana Toll Road (I-80/90) to a Point One Mile North of Cowling Road, St. Joseph County, Michigan and Elkhart County, Indiana- 2008

The Design of Encroachments on Flood Plains Using Risk Analysis-M. L. Corry 1980

Selected Bibliography of Hydraulic and Hydrologic Subjects- 1985

Countermeasures to Protect Bridge Abutments from Scour-Brian D. Barkdill 2007-01-01 Examine selection criteria and guidelines for the design and construction of countermeasures to protect bridge abutments and approach embankments from scour damage. The report explores two common forms of bridge abutments–wing-wall (vertical face with angled walls into the bank) and spill-through (angled face).
The design of bridges across rivers and streams is a major component of many civil engineering projects. The size of waterways must be kept reasonably small for reasons of economy and yet be large enough to allow floods to pass. Bridge Hydraulics is the first book to consider both arched and rectangular waterway openings in detail and to describe a

Hydraulic Charts for the Selection of Highway Culverts - Lester A. Herr 1965

Risk-based Analysis for Corps Flood Project Studies - Earl E. Eiker 1996 The Corps of Engineers now requires risk-based analysis in the formulation of flood damage reduction projects. This policy is a major departure from past practices and is viewed as a significant step forward in improving the basis for Corps project development. The risk-based approach explicitly incorporates uncertainty of key parameters and functions into project benefit and performance analyses. Monte Carlo simulation is used to assess the impact of the uncertainty in the discharge-probability, elevation-discharge, and elevation-damage functions. This paper summarizes historical project development study methods, describes the risk-based approach, presents application results, and discusses project design implications of the new policy.

Hydraulic Engineering Circular -