



AMERICAN ASSOCIATION OF STATE HIGHWAY
AND TRANSPORTATION OFFICIALS

COMMITTEE CORRESPONDENCE

October 14 , 2002

Address Reply to
Philip L. Thompson, HIBT-20
Senior Hydraulics Engineer
Federal Highway Administration
400 7th Street, SW., Room 3203
Washington, D.C. 20590

TO: Members, AASHTO Task Force on Hydrology and Hydraulics
Officers, AASHTO Subcommittee on Design (Attachment A)

FROM: Secretary

SUBJECT: Minutes of the Fall Meeting, Oklahoma City, OK

Attached are minutes of the meeting of the Task Force on Hydrology and Hydraulics held at the Westin Hotel in Oklahoma City, OK on October 7-11, 2002. Corrections will be accepted prior to the next meeting. At the meeting, the task force members extended their appreciation to Te Ngo for his outstanding handling of the meeting arrangements and for setting up the very interesting field trip.

All members should check the minutes for action items which are identified with an * on the left margin.

Sincerely,

Philip L. Thompson, P.E.

Enclosures

Chair Merrill Dougherty opened the meeting at 8 a.m. The following members were present unless noted absent or resigned. (See attachment A for addresses):

<u>TASK FORCE MEMBER</u>	<u>STATE</u>	<u>JOINED</u>	<u>REGION</u>
B. Bailey	Wyoming	1994	4
B. Booher	Arkansas	2002	2 (new)
J. Boynton	Minnesota	1998	3
S. Choudhary	Ontario	1998	3
G. DeCou	California	1994	4 (absent)
M. Dougherty, Chair	Indiana	1994	3
M. Fazio	Utah	2001	4
P. Helms	South Carolina	2001	2 (absent)
D. Henderson	North Carolina	2000	2
M. Miles	Alaska	2000	4
R. Mills	Virginia	1999	2
B. Newman	Pennsylvania	1997	1
F. Nishioka	Hawaii	1991	4
T. Ngo	Oklahoma	1991	4
M. O'Connor/Bob Dawe	Illinois	2001	3 (absent)
R. Phillips	South Dakota	2002	4 (new)
L. Reese	Idaho	1996	4
R. Renna	Florida	2001	2
J. Richardson, Vice Chair	Kansas	1996	3
N. Schips	New York	2002	1 (new)
D. Stolpa	Texas	2001	4
P. Thompson, Secretary	Washington, DC	1989	1
Duc minh Tran	Quebec	1999	1 (absent)
R. Veeramachaneni	Maryland	1997	1 (absent)

VISITORS PRESENT (see attachment B)

1. **MEETING SUMMARY**

MEETING AGENDA (See attachment C)

PAST MEETINGS (Minutes available from Secretary)

<u>YEAR</u>	<u>MEETING</u>	<u>ZONE</u>	<u>LOCATION</u>	<u>DATE</u>
2003	64-Spring	3	IN	May
2003	65-Fall	4	WY	October
2004	66-Spring	3	IL	May
2004	67-Fall	4	TX	October

2. **WELCOME AND INTRODUCTIONS**

- A. Chair Merrill Dougherty welcomed the members of the task force and:
 - ! Thanked Te for making the outstanding meeting arrangements.
 - ! Asked everyone to introduce themselves (see attachment B for visitors).
 - ! Noted that the meeting registration cost would be \$85.
 - ! During the business meeting, thanked vice chair and secretary for their activities in support of the task force.
- B. Te Ngo welcomed the task force.
 - 1. Provided a handout listing the field trip activities: Bricktown canal MAPS project by Mr. Robbie Williams of the Triad Design Group and scour measurement demonstration by Dr. James Schall at the SH-4 bridge over the south Canadian River.
 - 2. In the afternoon, he introduced Mr. Gary Ridley, Director of the OK DOT. Mr. Ridley welcomed the task force and discussed the commissioner's meeting that he attended this morning. He related the following story about one of his early meetings with Te. When Mr. Ridley was a District Engineer in SW OK, he was asked by the speaker of the house to assist in solving a water problem. Mr. Ridley said that he would be happy to come down and check it out. The speaker said: "That would be fine, but bring that other guy, the one who knows what he is talking about." He noted that water problems in OK are monumental and that outside of traffic problems that water is the next biggest problem. In response to a question, he indicated that they replaced the 600' I-40 bridge in 64 days at a cost of \$30M. He was complimentary of the assistance provided by FHWA and especially the Administrator Mary Peters. He said that the loss of 14 people affected everyone involved.

3. **BUSINESS MEETING ACTIVITIES (Monday & Friday)**

- A. Membership: full with all appointment letters received.
- B. Treasurer Report - current.
- C. The chair or secretary discussed the following attachments:
 - A. Membership List
 - B. Visitors List
 - C. Agenda
 - D. HDG & MDM Status and assignments (updated this meeting)
 - E. Task Force Publication History
 - F. Scour Evaluations Progress Report
 - G. FHWA Technology Applications
 - H. FHWA NHI Training Activities
 - I. FHWA Publication List (not handed out)
 - J. FHWA Software List (not handed out)
- D. Handouts - The following items were provided before or at the meeting:
 - 1. For NCHRP 15-23, Roy Jorgensen provided CDROM with 2003 SI MDM to all reviewers and emailed to each chapter chair their chapter of SI HDG.
 - 2. For NCHRP 15-23, Ken Shearin, Roy Jorgensen, provided a hard copy of the final draft 2003 SI MDM & HDG to chair and secretary.
- * E. Future meeting locations were discussed and sites selected (see page 1). The Spring 2003 meeting will be in Indiana, May 12-16 at the Radisson downtown. A shuttle is available for \$9 each way. The Fall 2003 meeting will be in WY at Cody (decided after discussion and vote). The Spring 2004 meeting will be in Illinois. The Fall 2004 meeting will be held in Texas.
- F. The following agenda items are proposed for the next meeting:
 - 1. Resolution of SOD comments of rewrites for 2003 Dual unit HDG and US customary MDM.
 - * 2. Ballot of proposed NCHRP projects for 2005. The following topics were suggested: Turbidity reduction of scour (Renna), worse case design storm (Renna), joint probably table, storm sewer research to follow up Joe Krolak's work, TMDL, water quality of bridge decks, EPA Effluent guidelines. For TRB statements, go to <http://vortex.spd.louisville.edu/a2a03/>
 - * 3. Recommended that Glossary of HDG/MDM be put on the web.

- * 4. Enhancements to MDM that were tabled. (Secretary and Don Potter)
- G. Reviewed guideline and MDM target dates. See attachment D which contains assignments for MDM chapters and HDG volumes. Revisions were made at the meeting to assignments on attachment D.
- H. The following topics were previously suggested for future work of the task force: MS4 guidelines, workflow processing guideline, marketing, ground water hydraulics, hydroplaning.
- * I. The Chronicles were discussed at the 10/02 meeting. Phil and Dan agreed to add items such as the numerous visits that were made to the Creamery when we met at PSU. Recommended that pictures be added and Te agreed to provide some electronic pictures.
- J. Jim McDonnell provided a handout and briefed the task force on AASHTO activities:
- * 1. Pointed out the site design.transportation.org contains links to State DOT manuals. He requested that members provide links to their manuals on line. Phil agreed to provide FHWA links to State DOT manuals.
- 2. Discussed draft guidelines for Accessible Public Rights-of-Way and encouraged others to submit comments to www.access-board.gov.
- 3. Noted that SOD has not changed meeting requirements for task forces, but has shortened their own meeting from 4.5 to 2.5 days and reduced length of regional meetings. However, topic will be discussed at upcoming meeting.
- 4. SCOH will be discussing frequency and duration of sub-group meetings.
- 5. SCOH will discuss Consultant selection publications by task force (HDG 15), Subcommittee on Maintenance and Subcommittee on Systems Operation and Management.

4. **FHWA ACTIVITIES AND SCOUR EVALUATION PROGRESS REPORT**

Phil Thompson briefed the task force on the status of FHWA Technology Applications projects, NHI course development and scour evaluation activities. (Some FHWA publications are available at isddc.dot.gov.)

A. The following is a summary of items discussed from attachments G and H:

- 1. Users Manual for FESWMS (Flo2DH) is complete.
- 2. All NHI courses have now been awarded under new 5 year IDIQ contract. The last one to be awarded was NHI 135081, Introduction to Highway Hydraulic Software.
- * 3. Mark Miles recommended that HEC-RAS unsteady flow be a part of NHI 135082 and that a regional course be offered for FESWMS.
- 4. The task force discussed the NHI billing system and indicated that they would prefer the cost by day method of billing instead of the cost per person method. Secretary provided to NHI.
- 5. Cynthia Nurmi reported that Erosion Control course is available from NHI in construction area.
- B. The overview of scour evaluations progress was prepared by Jorge Pagán. A handout was provided which indicated a Summary of Scour Evaluations Nationwide (Attachment F). Phil noted the following which is summary of 4/15/02 data:
 - 1. Only 202 of 484,264 bridges over water have not been screened. Of bridges screened, 18.3% (88,826 bridges) have unknown foundations.
 - 2. 93% (368,100) of 395,438 bridges needing evaluation have been evaluated for scour and 7% (27,338) still need evaluation.
 - 3. 7 DOTs have completed 100% and 35 DOTs have completed more that 90% of needed evaluations (11 > 90%, 7 > 95% and 17 > 98%), see attachment F (Part 2)
 - 4. 10 DOTs have not completed 90% of their needed evaluations (6 > 80%, 3 > 70%, & 1 > 65%).
 - 5. 24 DOTs have over 1000 bridges to evaluate if unknown foundations are included.
 - 6. When unknown foundations are included, only 18 DOTs have completed > 90%.
- C. Research Topics - not presented, see www.tfhr.gov or contact Sterling Jones, FHWA.

5. **NCHRP**

Timothy Hess, NCHRP Program Officer who handles hydraulics, geotechnical and roadside design, provided an overview of NCHRP projects related to hydraulics. He provided handout of the presentation slides (some of the material below was provided at earlier meetings):

A. Background - TRB is a unit of the National Academy of Sciences which is the operating arm for the

National Academies. TRB has 5 Divisions. The two divisions of most interest to the task force are Division A Technical Activities and Division D Cooperative Research Council. NCHRP started in 1962 and the Transit CRP started in 1992. NCHRP has 13 FTE that administers 157 active panels with 1039 panel members. The CRP homepage is trb.org.

1. Financial support is from State DOTs which provide a 5.5% contribution from their State Planning and Research Federal-aid funds. The contribution is voluntary and comes through FHWA. The funding was \$3.5M in 1968, \$8.5M in 1991, \$15.3M in 1992 and \$17.7M in 1997. TEA21 increased funding to \$27M through 2003.
 2. Division B synthesis projects are provided funds by SCOR through project 20-5 which is managed by Jon Williams (JWilliams@nas.edu).
- B. Problem Statements - Ideas come from States, AASHTO and FHWA.
1. TRB committees can submit statements through AASHTO subcommittees.
 2. The review process begins on June 1 with problem statements, FHWA and NCHRP review the statements. The revised statements must be submitted to NCHRP by November 1 in order to be considered at the March SCOR meeting. Both Research Advisory Committee and SCOR rank projects and then a combined ranking is prepared.
 3. Most awards go to industry, 45%, and universities, 36%. About 90% of projects are published.
 4. The task force members should send proposed projects to: Robert J. Reilly, Secretary, Standing Committee on Research, TRB, 2101 Constitution Avenue, Washington, D.C. 20418.
- C. NCHRP Project Status Reports for Hydrology and Hydraulics (updated 10/8/02). Current status can be found at <http://www4.nationalacademies.org/trb/crp.nsf/NCHRP+projects>
1. 21-5(2) Unknown Foundation Instrumentation - research has stopped, final report is complete and will not be printed. Report will be made available as an agency report.
 2. 24-7(2) Countermeasures - \$450k Ayres will include partnering with states for field verification. Phase 1 report is available for loan. Phase 2 guidelines start 4/01 for 3 years to 10/2004.
 3. 24-14 Scour at Contracted Bridge Sites - \$500k Art Parola/Dave Mueller - interim report, complete June 2003. USGS is matching with \$500k.
 4. 24-15 Bridge Scour in Cohesive Materials - \$350k TX A&M, have draft final report, complete 8/2002. The panel received \$400k for FY 2003 to study abutments.
 5. 24-16 Channel Migration - \$550k Ayres, Pete Lagasse, extended to 6/2003 to include photo interpolation handbook.
 6. 25-12 Wet Detention Pond Research - \$580k by David Young of WSU, final report is being published.
 7. 21-07 Development of Portable Scour Monitoring Equipment - \$300k Ayres, Jim Schall, started 4/00 and is complete. Final report will be printed next year.
 8. 24-8, Scour at Bridge Foundations Research Needs - FY 98 three projects were funded from list: 24-14, 24-15 and 24-16. No projects funded in FY 99 or 2000 and 3 in FY 2001.
 9. 15-23 Technical support for MDM and HDG - \$200k (see below), \$50k added in FY 2003.
 10. 24-18 Countermeasures to Protect Bridge Abutments - #12 on 24-8, \$450k, Brian Bartoff has 3 year contract to July 2004 which is being transferred to Michigan Tech Univ.
 11. 24-19 Environmentally Sensitive (Non-structural) Channel & Bank Protection - \$350k, John McCallum, Redding, CA (see Erosion draw and Biodraw software) awarded 6/2001, target completion 5/2004
 12. 24-20 Prediction of Scour at Bridge Abutments - \$500k, contract awarded 4/2002 to Robert Ettama, University of Iowa, awarded in the Spring, complete 10/2005.
 13. 20-07(146) Development of Software Verification Protocol for Hydrologic and Hydraulic Models - \$100k, panel members are: Saeed (chair), Barry, Te, Mark, Bill and Joe Krolak. Scope has been developed and RFP will be by invitation.
 14. 15-24 Hydraulic Loss Coefficients for Culverts (FY 2003) - \$325K RFP complete, proposals are due 10/8/02.
 15. 24-23 Riprap Design Criteria, Specifications, and Quality Control (FY 2003) - \$350K RFP complete and posted, proposals due 11/19/02
- D. NCHRP Projects for 2001 - 3 of 5 (60%) task force submitted projects approved. Overall success

rate is 40% (20 of 51) for AASHTO Committees and 15% (6 of 66) for AASHTO members. Overall, 45 of 144 (35%) submitted projects were funded for \$17.2M plus 19 of 20 continuations for \$9.2M. Total funded was \$26.4M of \$58M requested. The approved hydraulics projects are:

1. 15-23 Technical support for MDM and HDG - (see below)
 2. 24-18 Countermeasures to Protect Bridge Abutments (see above)
 3. 24-19 Environmentally Sensitive (Non-structural) Channel & Bank Protection (see above)
- E. NCHRP Projects for 2002 - The chair sent the following problem statements to Tim Hess of NCHRP with a copy to Ken Kobetsky on August 18, 2000:
1. Effects of Debris on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Art Parola based on #14 of 24-8
 2. Coordinated Update of Rainfall Maps in U.S. - prepared by Sterling Jones and Will Thomas
 3. Software Validation and Certification Protocol for Hydrologic and Hydraulic Models for All Aspects of Storm Drainage - prepared by Bill Hulbert and Saeed Choudhary
 4. Riprap Design Criteria, Specifications and Quality Control - prepared by Dr. Larry Arneson
 5. Effects of Fractured or Degradable Rock on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Joe Haggerty based on #13 of 24-8
- F. NCHRP Projects for 2002 - None of the above submitted projects were funded.
1. 24-20 Prediction of Scour at Bridge Abutments that was submitted by AZ was funded. This project which was similar to 24-8 project 5 was funded for \$500k
 2. SCOR funded \$14.6M (28 out of 147) new projects and \$9M, 20 project continuations, for a total of \$23.6M. The total requested was \$63.3M for 167 projects.
- G. NCHRP Projects 2003 - The following priority order was agreed to 5/2001. Tim Hess indicated at 5/2002 meeting that the problem statements were considered at March 2002 SCOR meeting and that the top two projects were funded. This year 42 of 121(35%) funded for \$15.5 M and 17 continuations for \$9.2 M. DOTs got 16 of 72 (24%), AASHTO 23 of 41 (56%) and task force 3 of 8 (38%).
1. Riprap Design Criteria, Specifications and Quality Control - prepared by Dr. Larry Arneson who included reference to 24-18 and 24-7(2). [see 24-23]
 2. Develop Hydraulic Loss Coefficients for Culverts - prepared by Saeed Choudhary [see 15-24]
 3. Effects of Debris on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Art Parola based on #14 of 24-8
 4. Criteria for Selecting Hydraulic Models (1D/2D) - prepared by Shawn McLemore
 5. Effects of Fractured or Degradable Rock on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Joe Haggerty based on #13 of 24-8
 6. Effects of Riprap on Fish Habitat - prepared by Dave Bryson
 7. Time Rate of Scour at Wide & Skewed Bridge Piers - #8 on 24-8, Phil Thompson/Jorge Pagán
- * H. NCHRP Projects 2004 - The following projects were proposed at the 5/2003 meeting. Problem statements were developed for each. An electronic ballot was sent to the task force. The secretary forwarded the top 8 statements and request to fund continuation of unknown foundations identification project which is numbered 9 below. Projects 10-13 have problem statements.
1. Effects of Debris on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Art Parola based on #14 of 24-8
 2. Criteria for Selecting Hydraulic Models (1D/2D) - prepared by Shawn McLemore
 3. Time Rate of Scour at Wide & Skewed Bridge Piers - #8 on 24-8, Phil Thompson/Jorge Pagán
 4. Effects of Fractured or Degradable Rock on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Joe Haggerty based on #13 of 24-8
 5. Coordinated Update of Rainfall Maps in U.S. - David Stolpa will update based on TXDOT study
 6. Integration of Water Quality and Drainage Structure Design - Raja Veeramachaneni/Dave Henderson
 7. Development of Bench Test Method for Determining Manning's n for Culverts - Phil Thompson
 8. Effects of Riprap on Fish Habitat - prepared by Dave Bryson
 9. Risk-based Guidelines for Determining the Need for Investigation of Unknown Bridge Foundations
 10. Long Term Performance of BMPs - Barry Newman/Raja Veeramachaneni

11. Development of a Specification to Mitigate Hydroplaning Effects - Phil Thompson will consider NCHRP 1-29, superpave, and legal case studies
 12. Develop Hydraulically Efficient Bridge Rail - David Stolpa
 13. Development of a Prediction Model for Ice Jam Formation - Saeed Choudhary
 14. In-Situ Scour Measuring Device - Bart Bergendahl
 15. Coastal and Tidal Waterway Stability and Scour - Mark Miles will use NCHRP 24-8 (tabled)
 - * 16. Turbidity and Wash Load Effect on Scour Depth - Rich Renna (agreed to draft for 4/2003)
- I. NCHRP 15-23 Technical support for MDM and HDG, \$200k (Tim Hess, project manager) - Task force panel is Merrill Dougherty (chair), Phil Thompson, Dave Bryson, Shawn McLemore, Roy Mills, and John Boynton.
1. At the 5/01 meeting, Roy Jorgensen PI, Ken Shearin, and Don Potter provided a handout and discussed their vision of the project. The following items were discussed:
 - a. P2, 1A3 - Don will do all conversions and accuracy consistent determinations.
 - b. P3 - Peter Smith will provide independent review of both HDG and MDM.
 - c. P4 - Units will generally be kept as used in manual. Ken gets "US Metric Association Newsletter" which indicates that only about 10 states are primarily SI.
 - d. P7 - Don will rerun all problems with new versions of programs. Joe Krolak agreed to provide Don with a Windows version of HYDRAIN.
 - e. P8 - Word 97 to Word 2000 conversions are better than earlier conversions.
 - f. P8, 8D3 - agreed to use one column in HDG with small figures on right of text wrapped left.
 - g. P9 - DGN micro station format graphics will be converted to EPS or DXT format so that they can be read into Word.
 - h. Agreed to use the following: 11 pt, Arial with 1.1 line spacing, block letters in equations, margins left and right will be 1", margins top and bottom will be tried at 0.75", line numbers will be used down margin for the draft, and that lines in margins will be considered to indicate where major changes have been made.
 2. At the 10/01 meeting, Roy Jorgensen PI, Ken Shearin, and Don Potter provided handouts and discussed the following items:
 - a. Ken passed around a mock up of the SI MDM to demonstrate the format used. Handed out & discussed Style and Format Guide and the Editing Recommendations. Ken Kobetsky provided guides to AASHTO staff for review. AASHTO style recommendations were adopted.
 - b. Ken passed out inventory of graphics and indicated that Phil would review and provide updates.
 - c. Don will rerun computer models, review metric numbers using Green Book as a guide.
 - d. Ken reviewed schedule: SI drafts in Jan 2002, draft approved in April, conversion strategy will need to be approved by May 2002.
 - e. Don reviewed the task 1 & 2 requirements. He noted that 300 hours of review provided 635 suggestions. He indicated that there were differences between HYDRA 6.1 and previous calculations. (NOTE: 6.2 should be obtained from Joe Krolak)
 - f. Task Force chairs reviewed and approved the majority of comments. The remainder were discussed and either adopted, rejected or modified. Ken and Don took notes and will revise the recommendations report to indicate the changes and corrections. The chairs will draft material for the Appendix C enhancements and provide to the secretary by 11/ 9/01 so that they can be reviewed by task force by 11/26/01 and provided to Ken by 12/1/01.
 - g. Ken Kobetsky recommended SOD balloting of the draft 2003 SI MDM and HDG when complete 4/2001.
 - h. Task Force agreed to request \$50k from NCHRP to enhance graphics. The chair who is also chair of the NCHRP panel will formally send the request to Tim Hess. Funding approved.
 3. At the 5/02 meeting, Roy Jorgensen PI, Ken Shearin, and Don Potter provided hard copies of the draft 2003 SI HDG & MDM to the chair and secretary. A CDROM was provided before the meeting to all task force members which included files of the manuals and comments. The following items were discussed at the meeting:

- a. Ken summarized the improvements made to the HDG and MDM and the issues remaining to be resolved such as format of references. He circulated copies of the 85 figures that had been updated and they looked great. Don Potter summarized items remaining to be accomplished in conversion to US units and checking of computations.
 - b. Task force decided the following:
 - (1) Bullets - open bullets will be used for 2nd level bullets
 - (2) Header - use comma and space instead of "/" to separate title
 - (3) Table of Contents - add chapter #, all caps, center and bold title
 - (4) Changes - from the meeting will be shown in yellow highlight
 - (5) References - number in order used in the text, Word endnotes will be used, combination of forms will be used in the text, that acronym can be used with number, figures should contain reference, and HDG chapters may retain alphabetic order if used.
 - (6) References were reviewed, secretary emailed to Ken Shearin.
 - (7) Next draft will retain track changes.
 - (8) Some figures which are examples do not need to be converted, e.g. Fig. 18.13.
 - (9) Culvert dimensions should be soft converted. Roadway geometry should be hard converted and should conform to AASHTO green book.
 - (10) Readme file - add doc file which contains notes to assist State DOTs in revising Word files. Note styles/format feature used and instructions on changing features like template, endnote, binder and numbering.
 - c. Ken requested and received the metric version of Chapter 18 from Billy Edge.
 - d. Ken and Noreen Arvin used a computer and projector to effectively show text which needed to be discussed. Fixes were agreed to on the spot and changes incorporated in the files as highlighted text. Some corrections were identified at the meeting, but most were provided before the meeting in electronic format by chapter chairs and by FHWA reviewers. Since Noreen had fixed about half of the corrections before the meeting, a quick review of the fix was all that was needed.
4. At the 10/02 meeting, Roy Jorgensen PI, Ken Shearin, and Don Potter provided hard copies of the final 2003 SI HDG & MDM to the chair and secretary. A CDROM was provided before the meeting to all reviewers. Each chapter chair received their chapter of the final 2003 SI HDG. The following items were discussed at the meeting:
- a. Ken indicated that the following items had been accomplished for this draft: changed headers, table of contents automated, open bullet used for 2nd level bullets, task force changes received after the meeting have been incorporated, 140 figures have been upgraded (80 have been drafted), reference strategy has been implemented and references have been corrected, turned off track changes and reformatted, fixed all equations, added enhancements prepared by chairs, and received final editorial comments at this meeting.
 - b. Next task is to convert MDM and HDG to US customary units and get to the task force for review before the Spring 2003 meeting.
 - c. Don discussed the following items concerning conversion to US customary units:
 - (1) numerous SI figures are new and were not in the 1991 US MDM
 - (2) the 1991 US MDM contains 25 low quality figures which need to be drafted
 - (3) reformatting has made MDM and HDG consistent
 - (4) some conversions are soft, like convert diameter, and some hard, like gutter width
 - (5) MDM, chapter 7, wetlands hydrology, is only in 1999 MDM
 - (6) 1999 MDM has 56 SI figures to convert to US and 1999 HDG has 31
 - (7) all the example problems have been reworked and computer solutions redone.
 - d. Ken indicated that the target for completion of the SI MDM and HDG is November 15th.

6. **AASHTO HIGHWAY DRAINAGE GUIDELINES**

- A. See attachment D for status. [Guideline development time is at least 30 months: 6 months for a draft, 6 months for a table review, 6 months for SOD review, 6 months for SOD ballot, and 6 months

for SCOH ballot.]

B. HDG, Edition 3, Metric Conversion

1. The chair previously send a letter to AASHTO and requested that HDG and MDM be provided to the States in electronic format and on CDROM. The chair will check the status of the request.
2. The secretary has PDF files for all volumes except 7. As of 5/02, all volumes have now been converted to Word.

C. HDG 2003, Edition 4, Updates and Revisions - The task force initiated this revision project in 1997 to prepare an updated version of the metric Edition 3. While all volumes will be reviewed, volumes 4-7 were given highest priority for a future table reading, because they are the oldest.

1. Accomplishments to date:
 - a. Fall 1997, volume chairs identified editorial corrections and sections which should be updated.
 - b. Spring 1998, secretary handed out a consolidated list of comments. The list was updated after the meeting and emailed to the task force.
 - c. Fall 1998, revised sections were handed out at the meeting for volumes 4, 6, 7, and 9.
 - d. Fall 1999, secretary handed out a consolidated list of comments.
 - e. Spring 2000, revised sections were handed out at the meeting for volumes 1, 8 and 10.
 - f. Fall 2000, consolidated list of comments provided by email after the meeting.
 - g. Spring 2001, revised sections were handed out at the meeting for volumes 2, 9 and 13.
 - h. Secretary updated approved list of comments dated 7/20/01& provided to NCHRP 15-23 contractor.
 - i. Fall 2001, NCHRP 15-23 corrections reviewed and most adopted.
 - j. Spring 2002, draft SI edition reviewed before the meeting, email list of corrections provided to Ken Shearin before the meeting and final comments resolved at the meeting.
 - k. Fall 2002, final SI edition (emailed to chairs) reviewed before the meeting and corrections provided at the meeting by Ken and chapter chairs.
2. The status of all chapters are listed below. Chapter chairs and FHWA reviewers, identified corrections All corrections have been incorporated, except as noted below:

* **Chairs must provide items below by end of October.**

- * 0 Front Matter (Secretary)
 - * 0 Jim McDonnell will provide file of SOD and SCOH front matter
 - 1. Planning (Danny Landry thru 5/2002, Mike Fazio) - complete
 - 2. Hydrology (John Boynton) - complete
 - 3. Erosion & Sediment (Dave Henderson) - complete
 - 4. Culverts (Phil Thompson) - complete (see handout of corrections)
 - 5. Legal (Jim Richardson) - complete
 - * a. Need to make gender neutral, Jim will check
 - * 6. Channels (Dave Bryson thru 5/2002, Brooks Booher) - Brooks will review
 - * 7. Bridges (Roy Mills) - being reviewed
 - 8. Restoration (John Boynton) - complete
 - * 9. Storm Drains (Bill Bailey) - Bill will review
 - 10. Environment (Mark Miles) - complete
 - a. Figure 10-1 edit
 - b. Figure 10-2 rotate
 - c. Figure 10-5 wrong figure
 - d. Figure 10-12 modify
 - e. Figure 10-17 improve
 - * 11. Coastal Zone (Raja Veeramachaneni thru 10/02, Rick Renna) - not reviewed
 - 12. SWM (Merril Dougherty) - complete
 - 13. Training (Mark Miles thru 10/02, Rich Phillips) - complete
 - * 14. Culvert Rehabilitation (Glenn DeCou) - not reviewed
 - 15. Consultants - AASHTO SCOH ballot complete, but results were not available.
- Glossary (Bill Bailey thru 10/02, Norm Schips) - The definition of "guide" and "guideline" on

page 40 of the glossary should be combined. The AASHTO supplied definition of a guideline is: “Guidelines - Provides direction, illustrates established practices and is intended to form a comprehensive reference manual for assistance in administrative, planning, “design,” and educational efforts in a particular area.” Note: “design” added by the task force to definition provided by AASHTO staff.

- D. HDG Volume 15, Guidelines for Selecting and Utilizing Hydraulic Engineering Consultants - The drafting team is Veeramachaneni (leader), Newman, and Richardson.
 - 1. The proposed outline of the guideline was approved at the fall 1998 meeting. At that meeting, it was decided to:
 - a. Reference the AASHTO consultant document and reduce the size of section 1.
 - b. Reference ACEC joint group 1996 document and planned update.
 - 2. A draft was read at 10/2000 meeting. The task force agreed to include checklists. The very well written draft received minor editing at the meeting. The task force adopted the draft and voted to send it to SOD for review by Jan 15, 2001. Since review draft was not completed, SOD review was deferred until summer 2001.
 - 3. At Fall 2001 meeting, final draft provided to AASHTO (Ken Kobetsky) for SOD ballot.
 - 4. Spring 2002 meeting, SOD ballot comments received provided to task force by email before the meeting. Raja Veeramachaneni discussed comments at the meeting. Raja will make the corrections, add a column to the comment matrix to discuss resolution and provide the updated files to Jim McDonnell and the secretary.
 - 5. Fall 2002 meeting, SCOH ballot is underway. Jim McDonnell will provide results after the SCOH meeting at the end of the week.

7. **MODEL DRAINAGE MANUAL (MDM)**

A. Metric Edition 2 (1999 MDM)

- 1. The text of all chapters was updated and graphics converted to TIF format by Dr. Tom Debo. The graphics were integrated into the WP 6.1 files by TTI. On June 30, 1998, TTI sent deliverables to NCHRP who sent to AASHTO by letter dated July 8, 1998.
- 2. 7E Wetlands Hydrology - The Water Budget, distributed February 2000.
- 3. 15G Wetland Creation and Restoration, distributed February 2000.

B. Edition 3, (2003 MDM) - Accomplishments to date:

- 1. Fall 1997, leaders identified editorial corrections and sections which should be updated.
- 2. Spring 1998, secretary handed out a consolidated list of comments. The list was updated after the meeting and emailed to the task force.
- 3. Fall 1998, revised sections have been emailed or handed out for chapters 2, 6, 8, 9, and 10.
- 4. Fall 1999, secretary handed out a consolidated list of comments.
- 5. Spring 2000, revised sections were handed out for chapters 6, 17, 18, 20 and 21.
- 6. Fall 2000, consolidated list of comments provided by email after the meeting.
- 7. Spring 2001, revised sections were handed out for chapters 13, 15-19.
- 8. Secretary updated approved list of comments dated 7/31/01 & provided to NCHRP 15-23 contractor.
- 9. Fall 2001, NCHRP 15-23 corrections reviewed and most adopted.
- 10. Spring 2002, draft SI edition CDROM reviewed before the meeting, email list of corrections provided to Ken Shearin before the meeting and final comments resolved at the meeting.
- 11. Fall 2002, final SI edition comments discussed.

* C. Edition 3, (2003 MDM), Status by Chapter - All corrections have been incorporated, except as noted below. **Chairs must provide items below by end of October.**

- 1. Introduction (Phil Thompson) - complete
- 2. Legal (Jim Richardson) - complete
- 3. Policy (Francis Nishioka) - complete
- * 4. Documentation (Glenn DeCou) - not reviewed
- 5. Planning (Danny Landry through 5/2002, Mike Fazio) - complete
- 6. Data Collection (Lotwick Reese) - complete

- * 7. Hydrology (John Boynton) - complete
 - a. NFF is still not complete, provide reference or web site address
 - b. 7-34 table needs reference
 - c. 7-45 figure 7-6 needs reference
 - d. 7-46 table 7-8 needs reference
- 8. Channels (Dave Bryson thru 5/22/02, Brooks Booher) - complete, review provided after meeting.
 - a. 8-55 add CAESAR sentence
- 9. Culverts (Phil Thompson) - complete
 - a. HDS 6 date is December 2001, web site has been changed from 2002 to 2001.
- 10. Bridges (Roy Mills) - complete
- 11. Energy (Phil Thompson) - complete
 - a. Check SAF basin output for HY8
- * 12. Storage (SWM) (Merril Dougherty) - complete
 - a. Example on 12-54 needs to be checked.
- * 13. Storm Drains (Bill Bailey) - complete
 - a. 13-69 table 13-7 (Joe agreed to provide reference)
- * 14. Pump Stations (Dan Ghere) - complete
 - a. Fig 14-8, 9 & 10 use reference 6
 - b. 14-28 add per pump on right scale
 - c. 14-47 Figures 14-23 & 24 Dan will check
 - d. 14-49 Bart will check on date.
- * 15. Environment (Mark Miles) - complete
 - a. Ken noted that references were needed for 15-25 L31, 15-26 L8 add HYDRAIN, 15-34 L35, 15-44 table 15-6, 15A2 table 15A1, 15G14 L7, 15G28 L18
 - b. 15-15 rotate figures
 - c. 15-38 L112 use culvert for flowline
 - d. 15-50 figure 15-7
 - e. 15D6 check for artwork
- 16. Erosion & Sediment Control (Dave Henderson) - complete
- 17. Bank Protection (Bill Hulbert thru 10/2001, Barry Newman) - complete
- 18. Coastal Zone (Raja Veeramachaneni thru 10/02, Rick Renna) - complete
 - a. Bill Hulbert arranged for the tidal pooled fund study to have Ayres/Dr. John Fisher and Dr. Billy Edge prepare this chapter:
 - b. A draft was discussed at 10/00 meeting. Task Force reviewed draft and provided comments to Bill Hulbert by 12/1. Consolidated list of comments were provided to Dr. Billy Edge that were dated 12/14/2000. Dr. Edge handed out copies of the comments and a new draft at the May 2001 meeting and highlighted major changes. He invited another reading of the draft so that all editorial corrections are identified. It was agreed that this version be produced in SI units to agree with NCHRP first task to make all MDM corrections in 1999 SI edition; that references should be numbered and identified in the text.
 - c. Secretary provided updated file to NCHRP 15-23 contractor after the 5/01 meeting.
 - d. 18-14 need link to tidal benchmark (Mark Miles will provide).
- * 19. Construction (Te Ngo) - complete
- * 20. Maintenance (David Stolpa) - complete
 - a. 20-9 L3, section 20.5.3 - refer to culvert rehabilitation guidelines, HDG 14 (comment 268)
- 21. Restoration (John Boynton) - chapter deleted from this edition at 5/00 meeting
- Glossary (Bill Bailey thru 10/02, Norm Schips) - complete

8. **FIELD TRIP**

On Wednesday, the task force received an overview of the tour. The following sites were toured:

- A. North Canadian River Project Update - Robbie Williams of Triad Design Group provided a summary of the activities that have been accomplished or are underway with a Powerpoint presentation:
 - 1. The river is the water source for the city, but has also been the source of much damage. The city

- experienced a 190K cfs flood when Q100 is 145K cfs for 13K sm.
2. City partnered with the USACE in 50s to construct a 400' straight floodway. Q100 flood level is about 2' above the riprap.
 3. The current project is to construct 3 low water dams and a sedimentation basin in 7 miles for \$38 M from the city and \$15 M from the USACE for environmental restoration. The funding is from MAPS.
 4. The \$350M Metropolitan Area Projects (MAPS) has funded the construction of the brick town canal, arena, music hall and library in addition to the 3 low water dams.
 5. The dams which have hinged crest gates are located at Eastern Avenue (downstream), Western Avenue and May Avenue. The dams are centrally controlled by a Supervisory Control and Data Acquisition (SCADA) system that includes 22 groundwater wells for monitoring.
 6. Each of the dams was visited in the field. The control of one of the dams was demonstrated by John Rhodes of the City. He raised one of the 4-100' gates which took 15 minutes and opened one of the sluice gates. The sluice gates can handle up to 2000 cfs which is well above the average flow of 150 cfs. He discussed the redundancies built into the system.
- B. Culvert Drop Structure - An Oklahoma Solution to Head cut Progression - Zia Siavahpour handed out copies of his Powerpoint presentation of the project and discussed it on site. The project started with the failure of a about 14x14x47' RCB on Rockwell Avenue which was over tributary 14 of the North Canadian River in Oklahoma City. The head cut that caused the failure was moving up the channel at the rate of 9 ft/day. Since I-40 was only 750' away, OKDOT took action to protect the Interstate.
- C. Portable Scour Measurement Articulated Arm - Dr. Jim Schall of Ayres Associates demonstrated the operation of the equipment at the SH-4 bridge over the south Canadian River. The arm is capable of extending 30 feet and can be used to quickly sweep arcs and determine the geometry of a scour hole.

9. TECHNOLOGY PRESENTATIONS

- A. Portable Scour Monitoring Equipment - Dr. Jim Schall, Ayres Associates, gave a Powerpoint presentation that provided the background and overview of NCHRP 21-07 project that funded the development of the scour monitoring equipment that was demonstrated during the field trip. He pointed out that many bridges have scour problems as identified through item 113 of the FHWA Recording and Coding Guide. Those bridges that are identified as scour critical are required to have a plan of action (POC) that can be a combination of monitoring and instrumentation. An earlier project NCHRP 21-03 investigated fixed instruments (sliding collar, sonar, sliding rod and others). Portable instruments range from lead line, physical probing, and sonar. The limit of existing portable methods is deployment during flood flows. The objective of 21-07 was to develop improved and/or alternates to existing portable scour monitoring equipment and techniques which had to meet a range of requirements. Since they could not identify practical alternate methods, they concentrated on improving existing deployment methods. The products explored were: MNDOT winch, articulated arm (\$15K), Interphase twinscope scanning sonar (\$1500) and a truck for deployment. The truck with arm installed cost \$50K, instrumentation and modifications \$20K for a total to duplicate of \$70K. Modifications included moving controls to bed, high load castors, sensors, and rotator on the arm. The arm position is determined with tilt meters, draw wires, and survey wheel. Data is managed with data loggers, wireless modem, and laptop computer. An acoustic stage sensor (\$1200) is used to determine the water surface level. The equipment has been field tested in CO, AL, MN, WI, MO, IN and ID. He noted that ETI Instruments is a good source for the electronic packages.
- B. Scour Countermeasures NHI Course - Dr. Jim Schall presented a Powerpoint overview of HEC 23 and the new course NHI 135048. HEC 23 is available at www.fhwa.dot.gov/bridge/hydpub.htm. He provided a summary of the 18 lessons in the course and the 12 design guidelines that are included in HEC 23. He noted that 7 guidelines are available to be taught, but the host will have to select 4 to be taught. The course will include monitoring techniques from DP 97 which are included in HEC 23 and a video of the articulated arm that he demonstrated. He walked through lesson 15 on fixed instrumentation and showed a video of the related demonstration.
- C. Precipitation Atlas for Oklahoma - Dr. Robert Tortorelli, USGS OK City, provided a handout of his

PowerPoint presentation. The regionalization of annual precipitation maxima project was a cooperative 2-year effort with OKDOT who contributed \$93.5K. The project was designed to replace all 3 old NWS studies and include 12 durations (15 min to 7 days) and 7 frequencies (2 to 500 years). He said that they could not go below 15 min because the 5 min data from the OK Mesonet (fully operational in 1994) did not have 10 years of data at the time of the project (1999). 3 types of data were used – 15-min, hourly, and daily. He discussed how the data was reviewed and analyzed. He produced maps in an 11”X17” format report, “Depth-Duration Frequency of Precipitation for Oklahoma”, and a digital product on CDROM of 2-km gridded data (on the web <http://csdokokl/gis/>). He noted that the results are generally about the same magnitude as TP-40, but much greater spatial detail (TP-40 has only 4 contour lines). A cooperative project with OKDOT to estimate potential extreme peak discharge using gaged and indirect measurement data was completed recently. He noted that an updated USGS National Flood Frequency program with every state’s regression equations should be on the web soon at: <http://water.usgs.gov/osw/programs/nffp.html>.

- D. Model Study of Sugar Creek Riffle-Pool Rock Chute - Kem Kadavy, USDA Agricultural Research Service (ARS), showed a Powerpoint presentation and discussed background, design model study and results. The project is located in Caddo County, 50 miles southwest of OK City. The area was settled in 1901 and converted to agricultural which increased sedimentation and flooding. The NRCS was given the charge in PL534 to construct 43 retarding dams which reducing flooding and changed the system to degrading. Sugar Creek degraded as much of 22'. A gabion check dam was used at the Route 281 bridge, but was being undermined. The proposed design downstream was 3 riffle- pools. The structural length will be 160' between sheet piles and the rock size is D50 of 24". The bankfull discharge is 1255 cfs and Q100 is 19,900 cfs. They performed a seepage analysis both physical and computer (SEEP2D) to design the depth of sheet piling. A 2-D physical model was constructed in a 6x96' flume and a 3-D model was constructed in the 22x65' large facility. He noted that they constructed the model very accurately using templates, but detail was lost when model riprap was installed. Flows were tested from bankfull of 1255 to 100-yr. Recommendations included grouting between sheet pile and drainage fabric to handle low flows which drop straight down. The study was performed very quickly starting in February of 2001 and completed with a final report in June 2001. Prototype construction began in July 2001 and was completed in October 2001. Rock size modeling was done with rock chute criteria (1.8") developed by ARS rather than Froude scaling (1.2"). He showed construction photos. He provided the secretary a copy of ASAE paper 01-2079 presented at their 2001 annual meeting July 30 in Sacramento, CA. An ASAE journal article is being prepared. [After the meeting he provided an electronic copy of the paper for distribution to the task force.]
- E. Aggradation and Degradation of OK Streams - Janet Meshek, Meshek Associates, Inc, showed a Powerpoint presentation overview of a study that she conducted for OKDOT. The study location was Highway 11 (HW 11) over a lake in the Salt Fork watershed which was 3000 km. HW 11 has 6 bridges A-F in the 11 miles that traverse the reservoir. The drop in the cross section across the floodplain is 15 m. A single section analysis was tried but did not work. The analysis that worked was grouping the bridges together in groups of 2 using ridge line and levees. The sedimentation data came from sediment ranges of the lakes provided by the USACE, NRCS soil surveys and bridge maintenance records. HEC 6 was tried for extrapolation of trends, but engineering judgement was used. Sedimentation was estimated at 2' at bridge A, 7' at B, 3' at C, none at D, 3 to 6' at E and 4 to 6' at F. Roadway was raised 11' and new bridges have riprap placed across the channel. She showed total scour plots calculated assuming clear water scour. The total scour was as much as 26 m. She also showed highway 266 bridge over the Deep Fork River which had a 324 sm drainage. HEC-RAS produced similar scour numbers as hand calculations.
- F. Floodplain Application of GIS - Jim Leach, Hydrology and Hydraulics Branch, Tulsa District of the USACE, discussed a totally electronically documented study using a Powerpoint presentation. He indicated that he used GIS to produce a totally digital floodplain model. He said that a more modern term to use is GEO spatial data. In the past, it took four people to do a study (technician, engineer, CAD technician and report writer/word processor). Now, the complete study can be done by one engineer. He illustrated the process by using a case study at Wellington, KS which is near I-35 south

of Wichita. The study has 2 main streams Railroad Creek and Narcas Creek. Hydrology was accomplished with WMS. Railroad Creek was divided into 4 subareas. WMS uses USGS DEMs which were converted to TIN then to sub areas from which basin properties are calculated which are used to determine flood hydrographs. The current version of WMS uses DEMs directly which is much quicker. Hydraulic analysis was accomplished with RiverCAD by BOSS International. A digital ortho photo was converted using CAD and stream geometric properties calculated with RiverCAD. Digital photos were used to document the site. The final products were produced with ArcView, now Arc-GIS8.2 and Digital profiles were created using RAS Plot. He listed a number of useful GIS sites such as: www.gisdatadepot.com, www.esri.com and www.blumarblegeo.com. His web site is www.swt.usace.army.mil.

- G. I-40 Bridge Repair - Yongyut (Ute) Ganjanathavat, OKDOT Bridge Division Engineering Manager, showed a 5 minute video summary of the bridge repair project for the I-40 bridge over the Arkansas River at Webber Falls. The repair was necessary, because the bridge was hit on May 26, 2002 by a barge that caused the western spans to collapse and the death of 14 people. He showed Powerpoint slides of all phases of the project: recovery (10 days), detours, deconstruction (June 2-10) took only 4 days for demolition, and construction (June 12 letting) took 47 days. Consultant determined that 130' prestressed concrete spans would be quicker. They also turned out to be cheaper. The damaged end of the steel beam over the navigation channel was heat straightened and the new replacement girders were spliced to the straightened ends. The contractor bid 57 days for the A+B contract. By finishing in 47 days, the bonus was \$6k/hr for the 10 days. The project cost about \$30M. Some of the costs were \$10.9M for the bridge plus \$1.44M bonus, \$12M for detours and \$3M for demolition. He noted that the pier impact risk is being evaluated and pier protection is being considered.
- H. Comparison of Hydraulics Models - Dr. Mark Browning, FHWA Western FLH, handed out copies of his Presentations slide show and a copy of his paper: "Cispus River Case Comparison of Mobile and Fixed Boundary Computer Models." He used the Tom Music Bridge replacement project to illustrate the different results that can be obtained from various models. The bridge was originally built in 1953 with 2 spans and a total length of 170'. A 600' dike was constructed in 1979. The bridge failed in 1996 from scour caused by a flood > 100-yr. Replacement in 1997 was with a single span 170' bridge. The river is cobbled, gravel bed with a D50 = 30 to 35 mm and is Rosgen stream type C4 with fairly stable river morphology. Deposition occurs upstream of the bridge which is at a natural constriction. Computer models compared were: HEC-RAS, FESWMS, HEC-6, and BRI-STARS. All were used with a fixed bed and the last two were also evaluated with a mobile boundary. He showed cross section plots at the bridge with all the results superimposed for easy comparison.

10. CONCERNS OF THE STATES

- * KS Jim noted that the Division of Water Resources is recommending a watershed approach, that they have budget problems that may limit him to one meeting a year, and that because of a lawsuit they are considering getting permits for ponding outside of the ROW. A poll of those present indicated that many states take up to 1' of backwater similar to FEMA and that 7 states get easements.
- ID Lotwick discussed scour work on the Snake River where they plan to install 2' Ajacks, that they have contract with Ayres to write procedures for scour critical bridges (office and field manual), that natural resource agencies are trying to eliminate riprap. (Mark indicated that AK has adopted a policy to use riprap at critical structures.)
- OK Te said that referring to the Oklahoma Daily News (Monday 7, 2002), ODOT is expecting a \$60M shortfall in the 2003 fiscal year . This information was provided to the Oklahoma Daily News by Mr. Gary Ridley, ODOT Director, during an interview. He also said that ODOT is producing a drainage manual using Roy Jorgenson & Associates.
- FL Rick indicated that when they build a new bridge that they use the broken up concrete to create fish habitat, that SW FL projects are being held up because of TMDL issues, that they are starting Stormwater Academy with U of Central FL to help resolve policy issues, that they are using Efficient Transportation Design Method which requires early buy-in of criteria by resource agencies, that Cynthia is holding a video conference on NPDES, that because their pipe alternates bid process does not result in much difference in cost that they are proposing to use a long-term

service life of 100 years, that they are doing soil box testing for culverts, that they have an E&S control handbook on the web, that they are researching the depth of pavement from the water table, that they just completed high velocity scour test in New Zealand, that they have found that suspended solids decrease scour (he will write NCHRP problem statement) and that hurricane elevations produced by FEMA/USACE are off for FL.

- ON Saeed reported that they have a floodplain policy in design which considers historic flood hazard and that their privatized delivery (95%) leads to conservative design and that people are being attracted away, that emergency access is a concern and that environmental issues are still a concern.
- WY Bill said that basin wide approach is being used, that they had a huge flood (500-yr plus) August 27 that caused 40' of headwater US of a bridge which drops to 10' DS that resulted in scour at abutments DS and that the rain was 7" for 6 hours over 50 sm basin that was 100 miles N of Casper.
- NC Dave reported that they are almost complete with statewide FEMA study for tidal areas, that they plan to do the western part of the state in 2 years, that because of their unknown foundation problems that they are trying to establish a schedule for inspection, that they are applying for renewal of phase 1 permit, that for phase 2 that they may be responsible for outfalls in 100 counties (have 76K miles of roads), and that they are using GPS to identify outfalls on all new construction, that they are developing a Maintenance & Operation BMP Manual and that resource agency wants a Design BMP manual that is very specific down to the extent of mitigation.
- AR Brooks said that unknown foundations are a problem and that they have no way to prioritize, that they are building a large bridge over Mississippi that is being constructed on large caissons that use cable tied blocks around the caisson for 300', construction is seen at www.greenvillebridge.com.
- NY Norm noted that they have scour and environmental issues.
- SD Rich asked if others are using Bentley Storm & Sanitary Software (NY, AR, FL & IN use parts FL noted that they use ASAD software for plan development), that they are having problems with endangered species critical habitat, and that local groups are working basin wide study with USACE for an area that has been flooded every year for the last 8 years on the James River.
- AK Mark said that controversy over bio-engineering has led to a policy of not using soft methods near critical infrastructure, that bridge on Cooper River delta is having a daily flow that is near the 50-yr flow, that the Dept. of Env. Conservation is looking at 1st flush for low flows which is requiring separation of flows at outfalls, that tidal scour work is costly so they have identified LIDAR survey which can be accomplished for \$4K/sm and can be done at the rate of 10 sm/day, that staff retention is a problem which has resulted in a young staff and big projects going to consultants.
- PA Barry related that their secretary is moving to AASHTO, that they have formed a work group for NPDES phase 2 and submitted an application July 2 (state would like to apply to all waters in PA), that they are trying programmatic permits to streamline process, that they have not made any progress on their drainage manual, that a new E&S manual will include stormwater design and E&S field guide based on GA guide, that scour study results are available on the web, that he has been contacted by FEMA for hydraulic information in their files, that GIS mapping of urban areas was done for homeland security. He thanked Phil and FHWA for their support of software.
- IN Merrill noted that they were also having problems with NPDES phase 2 and that they also were experiencing budget problems.
- UT Michael provided his web site address to Jim McDonnell after the meeting: <http://www.dot.utah.gov/str/Hydraulics.htm>. The web site is under construction.
- VA Roy noted after the meeting that revenues have decreased and project budgets (estimated costs) have increased resulting in a decrease in the number of projects on our Six Year Plan as well as extending the construction time line for many of those projects remaining. The Hydraulics Section has been given the task of leading the development of the DOT's plan for implementing the Phase II NPDES requirements, including applying for and obtaining the necessary permits (both general and construction). Currently have a 25% vacancy rate (four positions) in our Hydraulic Engineering staff in the Central Office. Currently moving from IGRDS to a GeoPak platform for roadway and drainage design. System will be customized to meet our specific criteria and needs.

AASHTO TASK FORCE MEMBERS/MEMBER'S REPRESENTATIVES (October 10, 2002)

MEMBER	ADDRESS	TELEPHONE
Mr. Bill Bailey Hydraulics Engineer	Wyoming Transportation Department P.O. Box 1708, Cheyenne, WY 82003 5300 Bishop Blvd., Cheyenne, WY 82009	(307) 777-4045 FAX 777-4279 william.bailey@dot.state.wy.us
Mr. Brooks Booher Staff Hydraulics Engineer	AR State Highway & Transportation Dept. 10324 I-30, Little Rock, AR, 72209 PO Box 2261, Little Rock, 72203-2261	(501) 569-2589 FAX 569-2057 brooks.booher@ahrd.state.ar.us
Mr. John Boynton State Hydraulics Engineer Office of Bridges and Structures	Minnesota Department of Transportation 3485 Hadley Avenue North Oakdale, MN 55128	(651) 747-2162 FAX 747-2108 john.boynton@dot.state.mn.us
Mr. Saeed Choudhary Senior Hydrotechnical Engineer Highway Design Office	Ministry of Transportation 301 St. Paul St, 2nd Floor North St. Catherines, Ontario L2R 7R4	(905) 704-2238 FAX 704-2051 saeed.choudhary@mto.gov.on.ca
Mr. Glenn DeCou Headquarters Hydraulic Engineer State Highway Drainage Design	CALTRANS, 1120 N Street, Room 2206, Sacramento, CA 95814, P.O. Box 942874 Sacramento, CA 94274-0001	(916) 653-1302 FAX 653-1446 Glenn_S_DeCou@dot.ca.gov
Mr. Merrill E. Dougherty Hydraulics Engineer Supervisor (Chair)	Indiana Department of Transportation 100 North Senate Avenue, Rm N642 Indianapolis, IN 46204-2228	(317) 232-6776 FAX 233-4929 mdougherty@indot.state.in.us
Mr. Mike Fazio Hydraulic Engineer	Utah Department of Transportation 4501 South 2700 West Salt Lake City, Utah 84119	(801) 957-8556 FAX 965-4564 mfazio@utah.gov
Mr. Preston Helms Hydraulics Engineer	SC Department of Transportation P.O. Box 191, Columbia, SC 29202 955 Park Street, Columbia, SC 29201	(803) 737-1723 FAX 737-9868 helmspw@dot.state.sc.us
Mr. David Henderson State Hydraulics Engineer	NC DOT, P.O. Box 25201 (for mail) Raleigh, North Carolina 27611 1020 Birch Ridge Rd., 27610 (deliveries)	(919) 250-4100 FAX 250-4108 dhenderson@dot.state.nc.us
Mr. Mark D. Miles State Hydraulic Engineer D&ES/Bridge	Alaska DOT and Public Facilities 3132 Channel Drive, Rm 100 Juneau, Alaska 99801	(907) 465-8893 FAX 465-6947 mark_miles@dot.state.ak.us
Mr. Roy T. Mills Assistant State Hydraulics Engineer	VA Dept. of Transportation 1401 East Broad St. Richmond, Virginia 23219	(804) 786-9013 FAX 225-3686 roy.mills@virginiadot.org
Mr. Barry Newman Chief, Hydrology and Hydraulics Section	Bureau of Design, PADOT 400 North St, 7th Floor, P.O. Box 3560 Harrisburg, PA 17105-3560	(717) 787-5024 FAX 787-2882 newmanb@dot.state.pa.us
Mr. Te Anh Ngo Roadway Drainage Engineer Roadway Design Division	Oklahoma Dept. of Transportation 200 N.E. 21st Street Oklahoma City, Oklahoma 73105	(405) 521-6772 FAX 522-4519 tngo@odot.org
Mr. Francis Nishioka Hydraulic Engineer	Department of Transportation 601 Kamokila Boulevard, Rm 636 Kapolei, Hawaii 96707	(808) 692-7561 FAX 692-7617 francis_nishioka@exec.state.hi.us
Mr. Matt O'Connor Hydraulics Engineer or Mr. Bob Dawe (785-2917)	Illinois Department of Transportation 2300 S. Dirksen Parkway Springfield, Illinois 62764	(217) 782-2714 FAX 782-7960 oconnormr@nt.dot.state.il.us dawerl@nt.dot.state.il.us

AASHTO TASK FORCE MEMBERS/MEMBER'S REPRESENTATIVES (October 10, 2002)

MEMBER	ADDRESS	TELEPHONE
Mr. Richard Phillips Bridge Hydraulics Engineer Office of Bridge Design	South Dakota Department of Transportation 700 East Broadway Pierre, South Dakota 57501	(605) 773-3285 FAX 773-2614 rich.phillips@state.sd.us
Mr. Lotwick I. Reese Hydraulics Engineer	Idaho Transportation Department P.O. Box 7129, Boise, Idaho 83703 3311 West State Street Boise, Idaho 83707-1129	(208) 334-8491 FAX 334-3040 lreese@itd.state.id.us
Mr. Rick Renna State Drainage Engineer	Florida Department of Transportation 605 Suwannee Street M.S. 32 Tallahassee, Florida 32399-0450	(850) 414-4351 FAX 922-9293 rick.renna@dot.state.fl.us
Mr. James R. Richardson Road Design Leader (Vice Chair)	Kansas Department of Transportation Bureau of Design, 9th Floor Docking State Office Bldg. Topeka, Kansas 66612-1568	(785) 368-8292 FAX 296-6946 jimr@ksdot.org
Mr. Norman P. Schips Senior Civil Engineer	NY State Department of Transportation 1220 Washington Avenue State Campus, Building 5, Rm 408 Albany, NY 12232	(518) 485-8611 FAX 457-6477 nschips@gw.dot.state.ny.us
Mr. David Stolpa Manager, Hydraulics Branch	TX DOT, 125 E. 11th Street (for mail) 118 E. Riverside (for overnight) Austin, Texas 78701-2483	(512) 416-2271 FAX 416-2354 dstolpa@dot.state.tx.us
Mr. Philip L. Thompson Senior Hydraulics Engineer (Secretary)	FHWA, HIBT-20 400 7th Street, SW., Room 3203 Washington, D.C. 20590	(202) 366-4611 FAX 366-3077 philip.thompson@fhwa.dot.gov
Dr. Duc minh Tran	Ministère des Transports du Québec 930 Chemin Sainte-Foy 7è étage Ville Québec Province Québec, Canada G1S 4X9	(418) 644-0894 FAX 646-5415 mdtran@mtq.gouv.qc.ca
Mr. Raja Veeramachaneni Chief, Highway Hydraulics Division	Maryland State Highway Adm. 707 N. Calvert St, C-201 Baltimore, Maryland 21202	(410) 545-8390 FAX 209-5031 rveeramachaneni@sha.state.md.us

AASHTO HIGHWAY SUBCOMMITTEE ON DESIGN OFFICERS

Dr. Kam K. Movassaghi (Chair) Secretary, LA DOT & Development	P.O. Box 94245 1201 Capitol Access Road Baton Rouge, LA 70804-9245	(225) 379-1200 FAX 379-1851 kammovassaghi@dotd.state.la.us
Mr. Dwight Horne (Secretary) Director, Office of Program Administration	FHWA, (HIPA-1) 400 7th Street, SW., Room 3134 Washington, D.C. 20590	(202) 366-5530 FAX 366-7298 dwright.horne@fhwa.dot.gov
Mr. Jim McDonnell, Associate Program Director for Engineering	AASHTO, Suite 249 444 North Capitol Street, NW. Washington, D.C. 20001	(202) 624-5448 FAX 624-5469 jimm@ashto.org

VISITORS**Oklahoma City, OK, October 7-11, 2002**

<u>NAME</u>	<u>ADDRESS</u>	<u>TELEPHONE/FAX/EMAIL</u>
Joe Krolak	Et. Resource Center, FHWA, 10 S. Howard St., Suite 4000, Baltimore, MD 21201-2532	410-962-0091, FAX 962-3419 joseph.krolak@fhwa.dot.gov
Dan Ghere	MW. Resource Center, FHWA, Suite 301 19900 Governors Dr., Olympia Fields, IL 60461	708-283-3557, FAX 283-3501 dan.ghere@fhwa.dot.gov
Cynthia Nurmi	So. Resource Center, FHWA, 61 Forsyth St, Suite 17T26, Atlanta, GA 30303	404-562-3908, FAX 562-3700 cynthia.nurmi@fhwa.dot.gov
Bart Bergendahl	Central Federal Lands Highway Division, FHWA, 555 Zang St., Lakewood, CO 80228	303-716-2288, FAX 969-5953 bart.bergendahl@fhwa.dot.gov
Dr. Mark Browning	Western Federal Lands Highway Div., FHWA, 610 Et Fifth Street, Vancouver, WA 98661	360-698-7964, FAX 696-7864 mark.c.browning@fhwa.dot.gov
Timothy Hess	TRB, NCHRP, 500 5th St. NW Washington., DC 20001	202-334-2049, FAX 334-2006 timhess@nas.edu
Ken Shearin	Roy Jorgensen Associates, P.O. Box 70, 3735 Buckeystown Pike, Buckeystown, MD 21717	301-831-1000, FAX 874-2876 ken_shearin@royjorgensen.com
Don Potter	Roy Jorgensen Associates #7 Kali Court, Conway, AR 72302	501-514-4370, FAX 796-4082 donp@tcworks.net
Jim McDonnell	see Attachment A for address	
Dr. Jim Schall	Ayres Associates, 3665 JFK Parkway, Bldg 2, St 200, PO Box 270460, Ft. Collins, CO 80527	970-223-5556, FAX 223-5578 schallj@AyresAssociates.com
Zia Siavashpour Leslie Lewis Mike Kimbro Shelly Williams Carl Eldridge Yongyut (Ute) Ganjanathavat	Bridge Hydraulics, OK DOT, 200 N.E. 21st St, Oklahoma City, Oklahoma 73105-3204 FAX 405-522-0134	405-521-6500, zsiavashpour@odot.org 405-521-0613, llewis@odot.org 405-522-0612, mkimbro@odot.org 405-521-4141, slwilliams@odot.org 405-522-6088, celdridge@odot.org 405-521-6492, yganjanathavat@odot.org
Dr. Robert Tortorelli	USGS, 202 NW 66th St, Bldg 7 Oklahoma City, OK 73116	405-810-4404 FAX 843-7712 rltort@usgs.gov
Jim Leach	USACE, 1645 S. 101th East Avenue Tulsa , OK 74128	918-669-7091 James.Leach@usace.army.mil
Janet Meshek	Meshek & Associates , Inc., P O. Box 636 Sand Springs, OK 74063	918-241-2803 jmeshek@meshekengr.com
Kem Kadavy	USDA Agricultural Research Service, 1301 N. Western St, Stillwater OK 74075	405-624-4135x236, FAX 624-4136 kkadavy@pswcr1.ars.usda.gov
Robbie Williams Mary Cordell	Triad, 14313 N. May, Oklahoma City, OK 73134	405-752-1122 triad@triaddesigngroup.com

AASHTO TASK FORCE ON HYDROLOGY AND HYDRAULICS**Fall 2002 MEETING**

Oklahoma City, OK, October 7-11, 2002

AGENDA

Monday 10/7	! Call to Order ! Status of Task Force projects ! FHWA Activities & Updates ! Scour Update ! NCHRP 15-23 Project Update ! NCHRP 15-23 Recommended Changes ! MDM Review of 2003 SI Final	Merril Dougherty, Chair Phil Thompson Phil Thompson Phil Thompson Ken Shearin Don Potter Chapter 1-14 Chairs
Tuesday 10/8	! MDM Review of 2003 SI Final ! HDG Review of 2003 SI Final ! NCHRP Update ! AASHTO Activities	Chapter 15-20 Chairs Chapter 1-14 Chairs Tim Hess Jim McDonnell
Wednesday 10/9	! Field trip	All
Thursday 10/10	Technical Presentations ! Portable Scour Monitoring Equipment ! Scour Countermeasures NHI Course ! Depth-Duration Frequency of Prec. In OK ! Riffle-Pool Rock Chute of Sugar Creek ! Aggradation and Degradation of OK Streams ! Floodplain Applications of GIS ! I-40 Bridge Repair ! Comparison of Hydraulics Models	Dr. Jim Schall Dr. Jim Schall Dr. Robert Tortorelli Kem Kadavy Janet Meshek Jim Leach Yongyut (Ute) Ganjanathavat Dr. Mark Browning
Friday 10/11	! Business Meeting ! Concerns of States	All

GOALS AND TARGET DATES FOR COMPLETION (October 2002)
AASHTO (202) 624-5800, www.aashto.org

AASHTO HIGHWAY DRAINAGE GUIDELINES

1999 Metric Edition 3 - Volumes 1-13 & Glossary, 740 pg, Cost \$125 (\$100 to members)

2000 Volume 14 is \$39 (\$32 to members)

4th Edition in dual units & chapters in progress for 2003

<u>Chapter</u>	<u>GUIDES</u>	<u>Chair</u>	<u>Ch</u>	<u>GUIDES</u>	<u>Chair</u>
1	Planning	Fazio	9	Storm Drainage	Bailey
2	Hydrology	Boynton	10	Environmental	Miles
3	Erosion Control	Henderson	11	Coastal Zone	[Renna]
4	Culverts	Thompson	12	Stormwater Man.	Dougherty
5	Legal Aspects	Richardson	13	Training	[Phillips]
6	Channels	Booher	14	Culvert Materials	DeCou
7	Bridges	Mills		Glossary	[Schips]
8	Restoration	Boynton			

STEP

<u>Chapter</u>	<u>NEW GUIDES</u>	<u>Chair</u>	<u>COMPLETE</u>	<u>ACTION NEEDED</u>
15	Consultants	Veeramachaneni	10	Resolve SCOH comments
	Chronicles	Ghere/Thompson	4	Review and update

STEPS FOR GUIDELINE PREPARATION

1. Author prepares draft.
2. Draft is reviewed by task force.
3. Author revises draft and defends at a task force meeting.
4. Author finalizes draft and sends copy of text and file to the secretary.
5. Secretary transmits to AASHTO for Subcommittee on Design (SOD) review.
6. Secretary transmits comments to author.
7. Author prepares final draft and sends file to the secretary who forwards to AASHTO.
8. AASHTO ballots SOD and informs secretary & task force chair of ballot results.
9. Author resolves comments and sends file to the secretary who forwards to AASHTO.
10. AASHTO ballots SCOH and informs secretary & task force chair of ballot results and whether the Board of Directors has elected to ballot.
11. AASHTO prints and distributes guide.

MODEL DRAINAGE MANUAL ASSIGNMENTS

1991 First Edition, 1368 pages, Cost \$260 (\$208 to members)

1999 Metric Edition [2nd] - WP6.1, 1248 pg, Cost \$400 (\$334 to members)

2000 Appendix 7E & 15G \$40 (\$34 to members)

3rd Edition, separate SI & English manuals in progress for 2003

<u>Chapter</u>	<u>Leader</u>	<u>Team - FHWA in italics</u>	<u>Chapter</u>	<u>Leader</u>	<u>Team - FHWA in italics</u>
1 Intro	Thompson		12 Storage (SWM)	Dougherty	Veeramachaneni
2 Legal	Richardson		13 Storm Drain	Bailey	Reese, Jones
3 Policy	Nishioka	Ngo, Richardson	14 Pump Station	Ghere	DeCou, Reese
4 Document.	DeCou	Bailey	15 Environment	Miles	Henderson, Newman
5 Planning	Fazio	Richardson, Tran	16 Erosion & Sed.	Henderson	Dougherty
6 Data Col.	Reese	Nishioka, Veeramachaneni	17 Bank Protection	Newman	Choudhary, Bergendahl
7 Hydrology	Boynton	Newman, Stolpa, Krolak	18 Coastal Zone	[Renna]	Henderson
8 Channels	Booher	Choudhary, Browning	19 Construction	Ngo	Richardson
9 Culverts	Thompson	Ngo, [O'Connor]	20 Maintenance	[Stolpa]	Henderson
10 Bridge	Mills	Nishioka, Arneson	21 Restoration	(only in 1991 & 1999 editions)	
11 Energy	Thompson	Newman, Ngo	Glossary	[Schips]	Thompson

AASHTO TASK FORCE ON HYDROLOGY AND HYDRAULICS (October 2002)

www.aashto.org/aashto/home.nsf/FrontPage
for SOD use *design.transportation.org*

1. AASHTO Highway Drainage Guidelines (HDG) contain an overview, discussion and design philosophy for each of the covered topics:
 - A. HDG [Edition 1]
 - 1973, Volumes 1-3, Planning & Location, Hydrology, Erosion & Sediment Control
 - 1975, Volume 4, Hydraulic Design of Culverts
 - 1977, Volume 5, Legal Aspects of Highway Drainage
 - 1979, Volume 6, Hydraulic Analysis & Design of Open Channels
 - 1982, Volume 7, Hydraulic Analysis for the Location and Design of Bridges
 - 1987, Volumes 1-7 and 8, Hydraulic Aspects in Restoration & Upgrading of Highways
 - B. HDG [Edition 2]
 - 1992, Volumes 1-8 updated, Volume 9 (Storm Drain), Volume 10 (Environment) and Glossary
 - 1994, Volume 11, Coastal Zone
 - C. HDG, 1999 Metric Edition [3]
 - 1995, Volume 12, Stormwater Management approved, but printing was deferred.
Volume 13, Hydraulics Engineer Training and Career Development also deferred.
 - 1999, Volumes 1-13 and glossary were distributed on July 26, 1999.
 - 1999, Volume 14, Culvert Inspection, Material Selection and Rehabilitation was approved by SCOH. AASHTO distributed on 3/06/00.
 - D. HDG Edition 4 (Dual Units)
 - 1997, Review and update of volumes 1-13 was initiated.
 - 1998, Volume 15, Guideline for Hydraulic Design Consultants, *SOD ballot complete*.
 - 2001, NCHRP 15-23 www4.nationalacademies.org/trb/crp.nsf/rfps
 - 2001, Fall, review and discuss list of recommended changes prepared by Roy Jorgensen Associates.
 - 2002, Fall, review and finalize 2003 SI Final prepared by Roy Jorgensen Associates.
2. AASHTO Model Drainage Manual (MDM) contains recommended design policy, criteria and procedures:
 - A. 1991 - MDM Edition 1 distributed 1/92 to states, Cost \$235 and \$190 to members. The 21 chapters include design procedures, example problems, and computer solutions for most aspects of highway hydraulic design.
 - B. 1994 - All chapters have been updated and graphics have been converted to digital format in preparation for producing metric version of the manual (not distributed).
 - C. 1999 - MDM Metric Edition [2] - The NCHRP contractor was TTI and Dr. Tom Debo. Three chapters (storage, pump stations and storm drains) were substantially revised. The WP6.1 format includes graphics in electronic format. MDM distributed on April 26, 1999.
2000 - Wetlands Hydrology appendices 7E & 15G distributed by AASHTO on 3/6/00.
 - D. 1997 - MDM Edition 3 (Dual Units), Review and update of chapters 1-21 was initiated
2001, NCHRP 15-23 www4.nationalacademies.org/trb/crp.nsf/rfps
2001, Fall, review and discuss list of recommended changes prepared by Roy Jorgensen Associates.
2002, Fall, review and finalize 2003 SI Final prepared by Roy Jorgensen Associates.

TOTAL HIGHWAY BRIDGES AS OF 4/15/02 (10/4/02)

Attachment F

State	Bridges Over Waterways	Scour Screening										Scour Evaluations			
		Low Risk				Scour Susceptible	Unknown Foundations	Tidal	Scour Critical	Total Screened	%	Total Evaluated	Evaluation Candidates	%	
		Culverts	Screened	Assessed	Total										
AK	810	34	0	372	406	0	201	53	150	810	100	556	53	91	
AL	14108	5559	0	2222	7781	3386	2797	0	144	14108	100	7925	3386	70	
AR	11623	2304	0	3518	5822	0	5548	0	253	11623	100	6075	0	100	
AZ	5561	3482	40	956	4478	71	172	0	840	5561	100	5278	111	98	
CA	15386	2910	2507	5536	10953	412	3661	29	324	15379	100	8770	2955	75	
CO	6793	1339	0	4987	6326	12	38	0	417	6793	100	6743	12	100	
CT	2365	576	0	1272	1848	39	67	0	411	2365	100	2259	39	98	
DC	94	0	0	93	93	0	0	0	1	94	100	94	0	100	
DE	576	181	0	270	451	0	0	0	125	576	100	576	0	100	
FL	8258	1711	653	2604	4968	196	2681	149	264	8258	100	4579	998	82	
GA	12139	5340	0	732	6072	0	5991	0	76	12139	100	6148	0	100	
HI	860	130	50	566	746	24	11	2	64	847	98	760	89	90	
IA	23500	3160	699	14776	18635	95	3960	0	810	23500	100	18746	794	96	
ID	3209	1073	0	1284	2357	0	587	0	265	3209	100	2622	0	100	
IL	21641	3914	160	15633	19707	3	1272	0	614	21596	100	20161	208	99	
IN	15903	1001	0	12703	13704	56	444	0	1699	15903	100	15403	56	100	
KS	23803	6100	57	15685	21842	1432	93	0	441	23808	100	22226	1484	94	
KY	11225	2641	0	8110	10751	11	424	0	39	11225	100	10790	11	100	
LA	9891	0	0	3060	3060	810	5473	0	548	9891	100	3608	810	82	
MA	2464	282	0	706	988	215	395	1	865	2464	100	1853	216	90	
MD	3163	1017	0	992	2009	0	560	0	594	3163	100	2603	0	100	
ME	1867	272	0	1039	1311	18	191	112	235	1867	100	1546	130	92	
MI	7575	1111	0	2700	3811	2375	709	0	680	7575	100	4491	2375	65	
MN	11331	4460	31	5474	9965	377	509	0	480	11331	100	10414	408	96	
MO	20912	4026	0	16435	20461	308	18	0	101	20888	100	20562	332	98	
MS	14790	2269	0	3137	5406	14	8608	0	762	14790	100	6168	14	100	
MT	3578	154	304	1289	1747	34	1746	0	51	3578	100	1494	338	82	
NC	14135	4485	49	3227	7761	14	6195	81	88	14139	100	7800	140	98	
ND	4132	771	113	1023	1907	20	2132	0	73	4132	100	1867	133	93	
NE	14830	2780	13	2616	5409	1237	7762	0	395	14803	100	5791	1277	82	
NH	1755	163	80	1388	1631	30	50	0	44	1755	100	1595	110	94	
NJ	3551	316	0	2428	2744	49	344	40	367	3544	100	3111	96	97	
NM	3001	1563	172	671	2406	73	498	0	24	3001	100	2258	245	90	
NV	889	555	31	114	700	33	53	0	102	888	100	771	65	92	
NY	12097	1614	0	9491	11105	124	62	133	673	12097	100	11778	257	98	
OH	23326	1338	0	16283	17621	5273	241	0	191	23326	100	17812	5273	77	
OK	20835	5981	8	14345	20334	0	0	0	501	20835	100	20827	8	100	
OR	5480	252	0	1782	2034	17	1890	68	1471	5480	100	3505	85	98	
PA	17328	1680	886	7315	9881	1442	461	0	5544	17328	100	14539	2328	86	
PR	1605	244	63	758	1065	26	372	33	109	1605	100	1111	122	90	
RI	337	30	0	176	206	0	0	0	131	337	100	337	0	100	
SC	7784	1054	0	1170	2224	0	3704	155	1701	7784	100	3925	155	96	
SD	5373	1000	0	1653	2653	136	2584	0	0	5373	100	2653	136	95	
TN	16520	7816	0	6022	13838	391	1236	0	1055	16520	100	14893	391	97	
TX	40562	16647	0	12442	29089	757	9923	49	673	40491	100	29762	877	97	
UT	1682	435	0	527	962	101	447	0	172	1682	100	1134	101	92	
VA	9818	2747	0	7014	9761	2	0	0	55	9818	100	9816	2	100	
VT	2304	68	0	1348	1416	373	246	0	298	2333	101	1714	344	83	
WA	5133	147	0	3627	3774	41	295	0	965	5075	99	4739	99	98	
WI	10689	1682	0	6722	8404	215	2002	0	68	10689	100	8472	215	98	
WV	5742	350	4	3404	3758	25	1735	0	225	5743	100	3979	28	99	
WY	1931	396	12	1063	1471	32	438	0	2	1943	101	1461	32	98	
Nationwide	484264	109160	5932	232760	347852	20299	88826	905	26180	484062		368100	27338		
Percent		22.5%	1.2%	48.1%	71.8%	4.2%	18.3%	0.2%	5.4%	100.0%		93.1%	6.9%		

BRIDGE SCOUR EVALUATION SUMMARY as of 4/15/02 (10/12/02)
(SORTED BY "EVALUATIONS > 90%" AND "EVALUATIONS NEEDED," Bold if >1000)

State	Scour Evaluation Progress				Substantial Progress		Action Plan		Unknown Foundations		
	Needed	Completed	Total	Percent	Evaluations Complete	Evaluations >90%	Revised Plan	Target Date	Unknown Needed	Total Needed	Percent
OH	5273	17812	23085	77%			No		241	5514	76%
AL	3386	7925	11311	70%				1/2003	2797	6183	56%
PA	2328	14539	16867	86%			No		461	2789	84%
CA	2955	8770	11725	75%				12/2002	3661	6616	57%
MI	2375	4491	6866	65%			No		709	3084	59%
NE	1277	5791	7068	82%			No		7762	9039	39%
FL	998	4579	5577	82%			No		2681	3679	55%
LA	810	3608	4418	82%			No		5473	6283	36%
VT	344	1714	2058	83%			No		246	590	74%
MT	338	1494	1832	82%			No		1746	2084	42%
KS	1484	22226	23710	94%		Yes			93	1577	93%
TX	877	29762	30639	97%		Yes			9923	10800	73%
IA	794	18746	19540	96%		Yes			3960	4754	80%
MN	408	10414	10822	96%		Yes			509	917	92%
TN	391	14893	15284	97%		Yes			1236	1627	90%
MO	332	20562	20894	98%		Yes			18	350	98%
NY	257	11778	12035	98%		Yes			62	319	97%
NM	245	2258	2503	90%		Yes			498	743	75%
MA	216	1853	2069	90%		Yes			395	611	75%
WI	215	8472	8687	98%		Yes			2002	2217	79%
IL	208	20161	20369	99%		Yes			1272	1480	93%
SC	155	3925	4080	96%		Yes			3704	3859	50%
NC	140	7800	7940	98%		Yes			6195	6335	55%
SD	136	2653	2789	95%		Yes			2584	2720	49%
ND	133	1867	2000	93%		Yes			2132	2265	45%
ME	130	1546	1676	92%		Yes			191	321	83%
PR	122	1111	1233	90%		Yes			372	494	69%
AZ	111	5278	5389	98%		Yes			172	283	95%
NH	110	1595	1705	94%		Yes			50	160	91%
UT	101	1134	1235	92%		Yes			447	548	67%
NJ	96	3111	3207	97%		Yes			344	440	88%
HI	89	760	849	90%		Yes			11	100	88%
OR	85	3505	3590	98%		Yes			1890	1975	64%
WA	99	4739	4838	98%		Yes			295	394	92%
NV	65	771	836	92%		Yes			53	118	87%
IN	56	15403	15459	100%		Yes			444	500	97%
AK	53	556	609	91%		Yes			201	254	69%
CT	39	2259	2298	98%		Yes			67	106	96%
WY	32	1461	1493	98%		Yes			438	470	76%
WV	28	3979	4007	99%		Yes			1735	1763	69%
MS	14	6168	6182	100%		Yes			8608	8622	42%
CO	12	6743	6755	100%		Yes			38	50	99%
KY	11	10790	10801	100%		Yes			424	435	96%
OK	8	20827	20835	100%		Yes			0	8	100%
VA	2	9816	9818	100%		Yes			0	2	100%
GA	0	6148	6148	100%	Yes				5991	5991	51%
AR	0	6075	6075	100%	Yes				5548	5548	52%
ID	0	2622	2622	100%	Yes				587	587	82%
MD	0	2603	2603	100%	Yes				560	560	82%
DE	0	576	576	100%	Yes				0	0	100%
RI	0	337	337	100%	Yes				0	0	100%
DC	0	94	94	100%	Yes				0	0	100%
Nationwide	27338	368100	395438	93%	7	35	8	2	88826	116164	76%

TECHNOLOGY APPLICATIONS (October 2002)

www.fhwa.dot.gov/bridge/hyd.htm

Chien-Tan Chang, HIBT, (202) 366-6749 is the COTR (Contract Office Technical Representative) for all projects. The COTR and the hydraulic engineers shown in parentheses provide technical oversight. The lead hydraulic engineer for each project is shown in **BOLD**.

1. DOT Information Service Digital Document Center (isddc.dot.gov) (**Thompson**)
 DOT publications can be obtained over the web or through the mail (one free copy).
 ! 32 publications on CD in HTML are available in PDF format at www.fhwa.dot.gov/bridge/hydpub.htm
 ! *New reports are being provided in PDF format and historic reports are being scanned.*
 ! *HDS 5, FHWA-NHI-01-020 is now available.*
 ! *HDS 6, FHWA-NHI-01-004 is now available.*
 ! *HDS 1 & HEC 14 have been converted, but are not section 508 compatible HTML, will be posted as PDF*
 ! *HDS 2 is complete and should be posted soon.*
2. FHWA Hydraulics Library (CD ROM) (**Thompson**) - Dr. Bill Grenney & Pallas Inc.
 ! The CD with HDS 5, video, and MDM Chapter 9 was distributed in February 1997.
 ! Library includes 32 publications (7 HDS, 19 HEC, HIRE, & 5 TS/IP), 3 videos. CDS distributed on 6/8/00. Windows HY8Energy, HY8InpGen and *HDS 5 Calculator* available at bridge web site.
 ! *Dr. Grenney has completed task to enhance HY8InpGen to cover all shapes (final received).*
3. SMS & WMS (**Arneson**) - Version 6.1 of WMS and Version 8 of SMS are available at "www.ems-i.com".
 FHWA purchased new 3 year unlimited licenses for State DOTs on 10/1/99.
 ! SMS contains FESWMS (FLO2DH), RMA2, and WSPRO interfaces; *.BRI-STARS is being added.*
 ! WMS contains HEC1, TR20, NFF and rational interfaces.
 ! WMS interface for HYDRA awarded summer 2001.
 ! *"User's Manual for FESWMS (Flo2DH) 2-dimensional depth-average flow and sediment transport model," Version 3, Sept 2002 is being prepared for posting. Enhancements are proposed for 2003.*
 ! *2003, FLOID public domain interface proposed*
 ! *2003, Bri-Stars enhancements are proposed*
 ! *2003, 5 year agreements and licenses are proposed.*
4. HEC 24, Design of Highway Pump Stations (**Ghere**, Thompson) - FY97, Contract to develop a manual, software and 1-day module for NHI 13027 was awarded to PB (Peter Smith).
 ! On 7/99 final \$100k obligated to contract and completion date extended to 1/21/2000.
 ! HEC 24 available on web site. Training materials & HEC 24 printed.
 ! *Final test version received 5/3/02*
5. HEC Conversion to Dual Units (**Thompson**, Bergendahl)
 ! *2003, HEC 14 and 15 proposed*
6. HEC 9, Design of Debris Control Structures (**Beucler**, Pagan, Krolak) - West Consultants, PI Dennis Richards.
 ! Kick off meeting has been held 4/01.
 ! *Draft manual is being reviewed, final manual spring 2003*
7. HEC 25, Tidal Hydrology and Hydraulics (**Arneson**, Pagán, Krolak) - Ayres (Dr. Lyle Zevenbergen) tidal pool funded project contractor awarded task to convert project material to HEC format.
 ! *Outline has been reviewed.*
8. CAESAR Manual (**Pagán**, Arneson) - Dr. Richard Palmer, University of Washington awarded contract 9/01 to develop manual and customize CAESAR for use by State DOTs.
 ! *Enhancements underway, beta version due this month.*
9. Convert HEC 18, 20, and 23 to Spanish (**Pagán**) - pool funded project with NHI, International & HIBT
 ! *HEC 18 draft is being reviewed.*

NATIONAL HIGHWAY INSTITUTE (October 2002)

www.nhi.fhwa.dot.gov

Larry Jones, (703) 235-0523, is the NHI Course Coordinator. Technical oversight of each course is provided by Larry Jones and the hydraulic engineers shown in parentheses. The lead FHWA and contractor hydraulic engineer for each course is shown in **BOLD**. Course descriptions can be found at www.nhi.fhwa.dot.gov/coursecff.htm and www.fhwa.dot.gov/bridge/hydtrain.htm. See www.fhwa.dot.gov/bridge for study of alternatives for providing dual units. *Tasks have been awarded through FHWA-DTFH61-02-D-63000 for course presentations until 12/31/2006.*

1. NHI 135010, River Engineering for Highway Encroachments, 5 days (**Phil Thompson**) FHWA instructor Dr. Larry Arneson. Ayres instructors are **Dr. Pete Lagasse**, Dr. E.V. Richardson, Dr. Lyle Zevenbergen, Dr. Jim Schall & *Dr. Jerry Richardson*. HDS 6 is available at www.fhwa.dot.gov/bridge/hydpub.htm
2. NHI 135027, Urban Drainage Design, 3 days & NHI 135028, Pump Station Design, 1 day (**Dan Ghere**, Cynthia Nurmi, Bart Bergendahl and Brian Beucler FHWA instructors). Ayres instructors are: **Johnny Morris**, Dr. Jim Schall, Arlo Waddoups & Chris Doherty. HEC 22 & 24 are available at www.fhwa.dot.gov/bridge/hydpub.htm
3. NHI 135041, HEC-RAS, 3 days (**Arneson**) Ayres instructors are **John Hunt**, Dr. Lyle Zevenbergen, Tony Firenzi, William deRosset and Brian Varrella. *Enhanced Participant manual proposed for 2003.*
4. NHI 135046, Stream Stability and Scour at Highway Bridges, NHI 135047 Stream Stability and Scour at Highway Bridges for Bridge Inspectors and NHI 135048 Countermeasure Design for Bridge Scour and Stream Instability, 3 days (**Jorge Pagán**, Arneson, Sterling Jones, Joe Krolak, Nurmi, Ghere FHWA instructors); Ayres instructors are Drs. **Pete Lagasse**, E.V. Richardson, Lyle Zevenbergen, Jim Schall, Jim. Ruff, & Jerry Richardson.
! *Dual unit conversion and updates are complete, except 135047 which is underway.*
5. NHI 135056, Culvert Design, 3 days (**Phil Thompson**, Steve Toillion, Joe Krolak FHWA instructors) Ayres Associates instructors are **Dr. Jim Schall**, John Morris, Arlo Waddoups, John Hunt, Dave Frick & Scott Hogan.
! HDS 5 is reference manual. The "Reprint 1998" edition is available at isddc.dot.gov.
! Metric HEC 14 in PDF format available at www.fhwa.dot.gov/bridge/hydpub.htm
! Dual unit HDS 5 has been completed. *Course is being converted to dual units.*
6. NHI 135065, Introduction to Highway Hydraulics, 3.5 days, (**Jorge Pagán**, Steve Toillion, Brian Beucler FHWA instructors) Ayres Associates instructors are **Dr. Jim Schall**, John Morris, Arlo Waddoups, Dave Frick, and Doug Laiho. HDS 4 has been converted to dual units. *Course is being updated (format and style).*
7. NHI 135067, Practical Highway Hydrology, 3 days, (**Joe Krolak** FHWA instructor) Kilgore Consulting and Management instructors are **Roger Kilgore**, Dr. Gary Lewis, Jerry Normann, and Tamim Atayee.
! HDS 2, Highway Hydrology - *Draft dual units edition has been completed.*
! *Course Update has been completed.*
8. NHI 135071, FESWMS/SMS, 4.5 days, (**Dr. Larry Arneson** FHWA instructor) EMS-I Instructors are **Dr. Alan Zundel**, Darren Gonzales, Rusty Jones, Tom Moreland, and Jeff Davis.
9. NHI 135080, Hydrologic Modeling with the Watershed Modeling System (WMS), 3 days (**Dr. Larry Arneson** FHWA instructor) EMS-I instructors are **Dr. Jim Nelson**, Colby Manwaring, Chris Smemoe, Doug Gallup, and Jeff Davis.
10. NHI 135081, Introduction to Highway Hydraulics Software, 3 days, (**Joe Krolak** FHWA instructor) Kilgore Consulting and Management instructors are **Roger Kilgore**, Dr. Gary Lewis, Jerry Normann, and Tamim Atayee.
11. *NHI 135082, Tidal Hydrology and Hydraulics, (Dr. Larry Arneson) - proposed for 2003*
12. *NHI 135083, Tidal Software - proposed for 2004*
13. *NHI 135084, Sediment Transport Modeling - proposed for 2005*

FHWA Hydraulic Engineering Publications
www.fhwa.dot.gov/bridge/hydpub.htm
October 2002

Publications are available from NTIS, National Technical Information Service, 5285 Port Royal Rd, Springfield, VA 22161, (703) 605-6000 (www.fedworld.gov/ntis). Electronic versions for some publications are available at DOT digital document center: isddc.dot.gov.

HYDRAULIC DESIGN SERIES (HDS)		YEAR	FHWA-#	NTIS-#
HDS-1	Hydraulics of Bridge Waterways	1978	EPD-86-101	PB86-181708
HDS-2	Highway Hydrology (SI)	1996	SA-96-067	PB97-134290
HDS-3	Design Charts for Open-Channel Flow	1961	EPD-86-102	PB86-179249
HDS-4	Introduction to Highway Hydraulics (Dual Units)	2001	NHI-01-010	
HDS-5	Hydraulic Design of Highway Culverts *	1985	IP-85-15	PB86-196961
HDS-5	Hydraulic Design of Highway Culverts	2001	NHI-01-020	
HDS-6	River Engineering for Highway Encroachments	2001	NHI-01-004	
HYDRAULIC ENGINEERING CIRCULARS (HEC)		YEAR	FHWA-#	NTIS-#
HEC-9	Debris-Control Structures	1971	EPD-86-106	PB86-179801
HEC-11	Design of Riprap Revetment	1989	IP-89-016	PB89-218424
HEC-14	Hyd. Design of Energy Dissipators for Culverts & Channels *	1983	EPD-86-110	PB86-180205
HEC-15	Design of Roadside Channels with Flexible Linings *	1988	IP-87-7	PB89-122584
HEC-17	Design of Encroachments on Flood Plains using Risk Analysis	1981	EPD-86-112	PB86-182110
HEC-18	Evaluating Scour at Bridges, Edition 3 (Dual units)	2001	NHI-01-001	
HEC-20	Stream Stability at Highway Structures, Edition 2 (Dual units)	2001	NHI-01-002	
HEC-21	Bridge Deck Drainage Systems	1993	SA-92-010	PB94-109584
HEC-22	Urban Drainage Design Manual (Dual Units)	2001	NHI-01-021	
HEC-23	Bridge Scour & Stream Instability Countermeasures (Dual Units)	2001	NHI-01-003	
HEC-24	Highway Stormwater Pump Station Design	2001	NHI-01-007	
IMPLEMENTATION REPORTS (IMP)		YEAR	FHWA-#	NTIS-#
IMP	Underground Disposal of Storm Water Runoff, Design Guidelines	1980	TS-80-218	PB83-180257
IMP	Guide for Selecting Manning's Roughness Coef. for Natural Channels and Flood Plains	1984	TS-84-204	PB84-242585
IMP	Culvert Inspection Manual	1986	IP-86-2	PB87-151809
IMP	Structural Design Manual *	1983	IP-83-6	PB84-153485
PUBLICATIONS ON CD-ROM		YEAR	FHWA-#	NTIS-#
HDS-5	Hydraulic Design of Highway Culverts (CDROM), v1.00	1996	SA-96-080	N/A
	Installation and User's Guide (SI computation aids)	1996	SA-96-081	N/A
	FHWA Hydraulics Library	2000	IF-00-022	

* Also available from McTRANS - 512 Weil Hall, Univ. of Florida, Gainesville, FL 32611-6585
352- 392-0378, FAX 352- 392-3224, Messages 1-800-226-1013

FHWA Hydraulics Software List
www.fhwa.dot.gov/bridge/hydsoft.htm
October 2002

The software and related publications listed below are available at www.fhwa.dot.gov/bridge/hydsoft.htm or:

McTRANS - 512 Weil Hall, Univ. of Florida, Gainesville, FL 32611-6585, (352) 392-0378, FAX (352) 392-3224, Messages 1-800-226-1013 (www-mctrans.ce.ufl.edu)

PC-TRANS - 2011 Learned Hall, Lawrence, KS 66045, (913) 864-5655, FAX (913) 864-3199
(kuhub.cc.ukans.edu/~pctrans/index.html)

	TITLE	YEAR	MCTRANS	FHWA-#	NTIS-#
HY-7	Bridge Waterways Analysis Model	1999	WSPRO		
	WSPRO Research Report	1986	WSPRO.D	RD-86-108	PB87-216107
	WSPRO User's Manual (Version P60188)	1999	WSPRO.D	SA-98-080	
HY-8	FHWA Culvert Analysis (Version 6.1)	1999	HY8		
	Hydraulic Design of Highway Culverts	1985	HY8.D	IP-85-15	PB86-196961
	Research Report (Version 1.0)	1987	HY8.D		
	HY 8 User's Manual (see Hydrain)	1999			
HY8InpGen	HY 8 Input Generator (95/98/NT)	2000			
HY8Energy	HY 8 Energy (95/98/NT)	2000			
HY-10	BOXCAR (Version 1) [Version 2 ACPA]	1989	BOXCAR		
	BOXCAR Users Manual	1989	BOXCAR.D	IP-89-018	PB90-115486
	Structural Design Manual	1983	BOXCAR.DS	IP-83-6	PB84-153485
	PIPECAR (Version 2.1)	1993	PIPECAR		
	PIPECAR Users Manual (Version 1.0)	1989	PIPECAR.D	IP-89-019	PB90-115478
	Structural Design Manual	1983	PIPECAR.DS	IP-83-6	PB84-153485
	CMPCHECK (Version 1.0)	1989	CMPCHECK		
HY-11	Preliminary Analysis System for WSP	1989	PAS		
	PAS USERS MANUAL	1989	PAS.D	IP-89-013	PB90-112723
FESWMS	Flo2DH (Version 3)	2002			
	<i>Users Manual for FESWMS(Flo2DH)</i>	2002		RD-03-028	NA
	FESWMS-2DH, Research Report	1989	FESWMS.DS	RD-88-146	PB91-106492
HY-22	Urban Drainage Design (see HEC-22)	1999			
	VisualUrban (95/98/NT)	2001			
CANDE	CANDE-89 (Version 1.0)	1989	CANDE		
	CANDE, Users Manual	1989	CANDE.D	RD-89-169	NA
HYDRAIN	Drainage Design System (Version 6.1)	1999	HYD6		
	HYDRAIN Users Manual (PDF)	1999	NA	IF-99-008	NA
BRI-STARS	Bridge Stream Tube for Alluvial River Sim.	2000			
	BRI-STARS Users Manual (Version 5.03)	2000		RD99-190&1	