IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of July 28, 2006

Regular Board Members Present

A. Abu-Hawash
J. Adam
R. Ettema
T. Fonkert
J. Ites
L. Jesse
J. Joiner
J. Krist
M. Nahra
J. Rasmussen
R. Schletzbaum
C. Schloz

Alternate Board Members Present

J. Cable for J. Alleman

Board Members with No Representation

Lyle Brehm
Scott Dockstader

Secretary - M. Dunn

Visitors

Jon Singelstad	District 3/Manona County
Becky Hiatt	Federal Highway Administration
John Thomas	Hungry Canyon Alliance
Jim Berger	Iowa Department of Transportation
Edward Engle	Iowa Department of Transportation
Sandra Larson	Iowa Department of Transportation
Mary Starr	Iowa Department of Transportation

The meeting was held at Iowa State University's Scheman Center, Room 159, Ames, Iowa. The meeting was called to order at 9:00 a.m. by chairperson Jon Ites with a total of 12 voting members/alternates at the table.

Agenda review/modification

- Item number 4 on the Agenda, proposal *Measuring Concrete Pavement Thickness Using Electromagnetic Sensors* was removed.

- After Final Report TR-508, "Design Guide and Construction Specifications for National Pollutant Discharge Elimination System" (item number 3) was presented, Larry Stevens continued his presentation to the Board with an update on the Stormwater Runoff Control Project including information on the IDNR erosion and sediment control manual, post-construction stormwater BMPs as well as education and demonstration projects at Arnold's Park, Iowa.

- All other Agenda items followed in sequential order.

Approval of the minutes

- Motion by Larry Jesse to approve the minutes from the June 30, 2006 meeting. 2nd by Jim Cable. Carried 11 yea, 0 nay, 0 abstaining.

FINAL REPORTS

Final Report TR-508, "Design Guide and Construction Specifications for National Pollutant Discharge Elimination System", Larry Stevens, SUDAS ($207,800)

Problem – Through application of the Clean Water Act in 1972, the Environmental Protection Agency (EPA) applied a set of regulations for the National Pollutant Discharge Elimination System (NPDES). The purpose of these regulations is to reduce pollution of the nation's waterways. In addition to other pollutants, the NPDES regulates stormwater discharges associated with industrial activities, municipal storm sewer systems and construction sites.

Phase II of the NPDES stormwater regulations, which went into effect in Iowa in 2003, applies to construction activities that disturb more than one acre of ground. The regulations also require certain communities with Municipal Separate Storm Sewer Systems (MS4) to perform education, inspection, and regulation activities to reduce stormwater pollution within their communities.

Iowa does not currently have a resource to provide guidance on the stormwater regulations to contractors, designers, engineers, and municipal staff. The Statewide Urban Design and Specifications (SUDAS) manuals are widely accepted as the statewide standard for public improvements.

Purpose – To create uniformity of standards by creating a guide for designers and those in the construction industry.

The SUDAS Design manual contained a brief chapter (Chapter 7) on erosion and sediment control; however, it was outdated and Phase II of the NPDES stormwater regulations was not discussed.

In response to the need for guidance, chapter 7 was completely rewritten; it now describes the need for erosion and sediment control and explains the NPDES stormwater regulations, providing information for the development and completion of Stormwater Pollution Prevention Plans (SWPPPs) that comply with the stormwater regulations, as well as the proper design and implementation of 28 different erosion and sediment control practices.

In addition to the design chapter, this project also updated a section in the SUDAS Specifications manual (Section 9040), which describes the proper materials and methods of construction for the erosion and sediment control practices.

Manual Information & Conclusions include:

- Benefits of various measures (flow control, erosion control, sediment control, runoff diversion, flow diversion)
- Control measures (28) to be used on construction sites
- Each of the 28 measures has its own section with a summary sheet, including a of picture of practice, indication of benefits effectiveness, general description, typical uses, advantages, limitations and longevity
- Compact guide table of Control Measures rated on a Low, Medium and High ratio
- Reference to applicable SUDAS application
- Full design methodology
- Several sections present other details and applications
- Modification section 9040
- Various choices for accommodating preparation, management and inspection of SWPPP

SUDAS Board of Directors approved in June 2006 both the Design and Specifications to be incorporated into revisions of the addendum in October 2006, so the report is already adopted by SUDAS and will be published this fall and will be on their website.

Recognition: Steve Klocke, Snyder & Associates, was recognized for his assistance in putting the research and manual together.

During the presentation two additional Board Members joined the table.

Motion to Approve
Motion by Mark Nahra, 2nd by Clark Schloz.
Motion carried with 13 aye, 0 nay, 0 abstaining.

UPDATE – **I**owa **S**tormwater **R**unoff **C**ontrol **P**roject, Steve Klocke, Larry Stevens, Bill Ehm

This project's purpose is to develop and implement Pollution Prevention and tools for jurisdictional Stormwater Management Plans. SRF1 Funds will be offered to developers for installation of best management practices after the SUDAS development guidelines for post-construction runoff are in place. Guidelines are divided into Construction Site Activities and Municipal Separate Storm Sewer Systems (MS4) as follows:

Part 1: Manuals
Update Iowa DNR's Iowa Construction Site Erosion Control Manual (Funds $49,412)

Part 2: Erosion & Sediment Control - Update SUDAS and Iowa DOT Standard Design & Specification Manuals (Funds $207,800)
Part 2B: Storm Water Quality Design & Specifications (Funds $125,342)

Part 3: Education Program
Invest in technology transfer & publications (Funds $148,095)

Part 4: Demonstration Projects, Arnold's Park, Iowa
Research MBPs & give demonstrations (Funds $74,084)

Part 5: Iowa Stormwater Runoff Control Interactive Manual
Implement Iowa Stormwater runoff Control Interactive Manual (Funds $44,048)

PROPOSALS

Proposal – *Adding Scour Estimation to the Iowa Bridge Backwater Software*, LaDon Jones, Digital Control, Inc. (Budget: $52,000)

Background **–** In August of 2002 the Iowa Highway Research Board funded TR-476, "PCVAL: A Computer Program for Valley Stage-Discharge Curves and Bridge Backwater Calculations." The result was software titled: Iowa Bridge Backwater.

The Iowa Bridge Backwater software was released in November of 2003. The Iowa Bridge Backwater software is a user friendly program for Microsoft Windows that: Computes design flow rates using

USGS methodology, computes stage discharge curves for a valley cross-section and the estimated increase in the upstream water surface elevation resulting from the reduction in flow area caused by the structural components of a bridge.

This increase in water level (compared to conditions without the bridge), is called the bridge backwater. Iowa regulations limit the amount of backwater that is acceptable and backwater estimation is required as part of bridge permitting. The Iowa Bridge Backwater software is used by the Iowa Department of Transportation, Preliminary Bridge and Structures, Iowa Department of Natural Resources, Flooding and Floodplain Management, and Iowa County Engineers.

Iowa Bridge Backwater software has been a valuable tool of estimating the impacts of bridges on river hydraulics; scour estimation would be a valuable addition to the software.

Estimating scour requires estimating the stream flow across the valley cross-section and through the bridge cross-section. The current Iowa Bridge Backwater software contains many of the tools needed for estimating flow distribution, water velocities and depths. Scour estimation is a natural extension to the existing software.

Adding scour estimation will be the most significant and time consuming proportion of this project. The result will be a valuable time saving tool for city, county and state engineers. In addition to scour, the following items will also be completed as part of Version 2 of the software:

- Improved convergence and iteration on backwater with overtopping
- Improved label scaling on plots and graphs
- Design flow rate copying
- Updated user manual & On-line help

The project will be implemented under the direction of Mr. Dave Claman of the Iowa DOT Preliminary Bridge section.

The final computer code, installation files and user manual will be delivered to the IDOT 12 months from the start of the contract.

Q: Are there software descriptions? An explanation of what and how these computations are founded?

A: Equations are located in the back with descriptions of how estimations are founded in Appendix.

Q: What about equation updates? For example, abutments' equations…

A: Yes, if it's a dramatic change I'd have to do a new version of the software but for simple updates could make section changes only. Those kind of things aren't that hard to do.

Q: What you're providing is software that would replace the paper process we're now using?

A: Yes. This provides a formula alternative to using the paper process. The formula that we use will be based on previous work by Dave Eash.

Motion to Approve
Motion by Mark Nahra, 2nd by Ahmed Abu-Hawash.
Motion carried with 13 aye, 0 nay, 0 abstaining.

Proposal – [Continuation of TR-524, "Review of Inconsistencies Between DOT and SUDAS Specifications" (Phase I)] - *Phase II – Implementation of Recommendations into SUDAS Specifications*, Steve Klocke, Snyder & Associates (Budget: $188,929)

Background – Phase I Review: The IHRB recently reviewed and approved project TR-524 at its June 30, 2006 Travel Meeting. A short presentation was made discussing the purpose, scope and resulting products of the project.

Scope – Phase II: In Phase II recommendations from selected sections from Phase 1 will be incorporated into the SUDAS Specifications and standard drawings. Phase II will focus on revision of Phase 1 areas that the review committee identified as being the highest priority for the DOT's successful utilization of the SUDAS Specifications. These areas include:

- Trench and backfill
- Trenchless construction
- Storm and sanitary sewers
- Water mains
- Manholes
- Intakes
- Sidewalks
- Recreational trails
- Driveways
- Utility locations

The DOT will provide input into this process in an effort to lessen potential revisions needed prior to their adoption of the SUDAS Specifications. Upon incorporation of the Phase 1 recommendations, each applicable Division of the SUDAS Specifications will be updated into the active-imperative style, utilizing the 3-part specification format currently utilized by SUDAS.

The following SUDAS Divisions will be reviewed and updated as described:

- Division 3: Trench, Backfill, and Trenchless
- Division 4: Sewers and Drains
- Division 5: Water Main and Appurtenances
- Division 6: Structures for Sanitary and Storm
- Section 7030: Recreational Trails, Sidewalks, and Driveways
- Standard Drawings

The final product produced as part of this project will be revised SUDAS Specifications for Divisions 3, 4, 5, 6, and Section 7030. Revised drafts will be submitted periodically to CTRE & DOT for review and comment. Upon acceptance of the committee and the SUDAS Board of Directors, it is the intent the specifications produced will be incorporated into the SUDAS Specifications and made available for reference by the DOT.

Revised SUDAS figures will also be produced for each of the revised SUDAS specification section, plus those in Division 10. These figures will follow a new SUDAS format similar to the DOT Standard Road Plans.

The revised specifications and figures developed as a part of this project are intended to replace existing specifications in the SUDAS Specifications. It is anticipated the revised specifications as adopted by SUDAS will be adopted by reference by the DOT with its next Standard Specifications revision, either as a replacement of existing outdated specifications or as new specifications.

The project will help make the SUDAS Specifications compatible to the DOT letting/specification system. It will also correct shortcomings in the existing DOT Specifications, making them applicable to more varied project types.

In order to make the deadline for the DOT's 2008 book, this project will need to be completed within 12 months or by September 20, 2007.

Q: Is the 150% standard for overhead cost?

A: That's our standard approved overhead with the DOT.

Motion to Approve
Motion by Larry Jesse, 2nd by Roger Schletzbaum.
Motion carried with 13 aye, 0 nay, 0 abstaining.

Proposal – *Development of State-Discharge Relations For Ungaged Bridge Waterways*, Thanos Papanicolaou, The University of Iowa (Budget: $112,000 for a 3-year project)

Background – Discharge is one of the most important variables that control fluvial, geomorphologic, and ecological processes in streams. The challenge for engineers is to predict channel response to natural events without knowledge of the flow discharge. Stream response to changes in flow discharges are influenced by:

- Aggradations and degradation
- Channel scour during floods
- Local scour around structures
- Formation of river bends,
- Fining
- Coarsening
- Armoring of stream beds

Measurement of stream discharges can also provide information about flood, wet and dry seasons, performance of existing structures, etc. Statistical analysis of flow discharge records state-wide can helping decision making and effective design of hydraulic structures and enhance ability to model and predict changes in river morphology and engineering impacts on bridge waterway crossings.

Objective 1: This 3-year project will establish stage-discharge relationships for 10 ungaged-streams in the HCA region by setting a semi-automatic sensor network.

Objective 2: Expand the stage-discharge relationships for a selected number of streams state-wide using dimensionless analysis and statistical methods. A QA/QC protocol will be also provided as a way of testing the performance of the stage-discharge relationships.

The focus would be on 9 sites throughout the state.

Objectives will be obtained through:
- Installation of 10-Water Level Loggers sensors to automate the discharge monitoring process
- Sstatistical analysis to establish general stage-discharge relationships for streams in the HCA (and state-wide)

Product –

- Stage-discharge relations for small to medium size ungaged streams in Iowa
- A tool for predicting river response based on discharge knowledge with explanation of scour and erosion processes that may occur at bridge waterways
- Description and documentation of knickpoint propagation in the HCA region to aid in identifying and prioritizing at-risk sites to avoid potential safety and asset risks due to knickpoint propagation and channel vertical shift
- A detailed technical report describing the performance of bridge crossings under different flow conditions - The report would be thoroughly illustrated to show the field conditions as well as to portray the results and data trends.
- A conference paper compiling the main findings for presentation at appropriate conferences, serving as an educational tool to get further input from people and agencies with concerns about, and practical suggestions for, predicting river response based on discharge knowledge.

John Thomas from Hungry Canyon Alliance (HCA) spoke to the Board. HCA board approved this project contingent on other funding sources for $70,000. There is no discharge data available for western Iowa and this project would avail that information for future application.

Q: Is this going to do any good to the Alliance as far as control of the stream bed? What's this do for a county engineer?

A: What we've done is fly over about a 5,000 miles of stream in western Iowa and found the location of knickpoints. Once we have a general idea of discharge relationships in western Iowa compared to size, and with the completion of the knickpoint study, we can approximate how fast these knickpoints will migrate upstream effecting bridges along the way. We'll know if we need to place another structure or if the knickpoint is stable based on the discharge; that's HCA take on it, that's why we want the information.

A: We'd like to be able to know how fast knickpoints are propagating and what we need to protect our bridges and how fast we need to move as far as adding protection.

C: Stage discharge sampling in eastern Iowa would lower our costs; in addition to gaining data this would be less expensive.

C: Iowa DNR has also been approached for funding and placing water quality sensors along with our sensors. We would basically be starting our own stage discharge quality water network in western Iowa.

Q: How would the results from this study be generalized from the 10 particular sites in application across Iowa? This seems vague. There's already been an IHRB project on knickpoint migration, runoff and small watersheds which should be mentioned in this proposal that have been done at the University of Iowa. I think this proposal needs to be rewritten, clarifying objectives and how it ties in with other Research Board projects.

A: There is information that explains the results from the Hungry Canyon region and how they will later be used at the 9 other sites.

Q: That doesn't explain how that extrapolation actually works if you're talking about different bridge sections.

A: It works in 2 ways: one way is basically developing the state's discharge relation in a generic way from the Hungry Canyon region; there are 3 drainage areas. Based on that, we're going to conclude the differences among those areas. Secondly, we're going to go to the 9 different sites, perhaps of a bigger size which may be closer to the third drainage size area we'll be looking at in the Hungry Canyon region and then basically readjust the computations using the current data from over 50 years. The theory is based on utilizing those equations for future predictions since USGS will no longer be collecting data. We will do statistical analysis that will allow us using historic and current information from the 9 sites statewide to extrapolate information. With respect to the knickpoints, it's true that applies to western Iowa but we thought we could apply this information statewide. There is no cost for the knickpoints.

Q: Are you interested in the runoff from small watersheds on which there are bridges or are you interested in the stage discharge relationships to protect bridges themselves?

A: The focus is on the stage discharge relationships in western Iowa; the drainage area comes into view because we saw based on a previous study that there are 3 clear trends. If we use a universal stage discharge relation for all drainage areas then we're getting to the conclusion based on the design and type of structures. There are different gradient of structures and sizes, etc.

We decided to classify the regions into 3 drainage areas; of course there will be surface runoff contributing laterally into the stream but primarily we're talking about in-stream flow. That's the reason there's no reference to the previous work from the University of Iowa.

C: Do we have a conflict? We already have USGS doing new equations for 3 different drainage areas.

C: They're averaging for areas between 50-100, for areas 100 and up and equations for smaller than 50 acres.

C: If this data conflicts with USGS data then we have two sets of equations.

C: That's confusing; we don't have a lot of gauging stations in eastern Iowa that are on small watersheds. There are a few in the 50-100 square mile but nothing smaller than that. The implication is that we have enough data in eastern Iowa and not enough in western Iowa yet these equations are going to apply to the entire state.

What is the goal of the stage discharge study? If you're focusing on Hungry Canyon and the uniqueness of those streams and trying to come up with stage discharge equations I don't have a problem with that, but somehow this is saying for small to medium ungauged streams in Iowa…eastern Iowa has bigger rivers than western Iowa does. More drains into the Mississippi than goes to the Missouri river; I'm concerned about the focus here and applying that over the entire state.

C: The intrinsic work has merit but the proposal needs to be more focused. There's no mention of differences in bridge cross-section shape on stage discharge if the intent is to develop relationships for stage discharge at bridges.

C: Before we make an assumption for the whole state we have to be able to show that with the data you've got is consistent before you apply it statewide.

A: That's actually one of our intentions; to utilize information that would be gained in western Iowa to eastern Iowa. The larger drainage areas in western Iowa may be applicable in eastern Iowa; there are some similarities of bridge crossings. The larger areas in western Iowa would be applicable to medium-to-smaller sized streams in eastern Iowa.

C: We're concerned about overlapping studies.

C: We've expressed a concern about middle range streams that the equations don't seem to be consistent because what we're experiencing; we've asked they be looked at. Is this somewhat of an overlap of that same size of stream? Is there potential to either conflict or confirm?

If we come up with confirmation that's good; but if we come up with things that are extrapolated from two different directions then we'll be confusing the issue. If they're doing some things to extrapolate into western Iowa and he's trying to do some data collection and projections on what's in western Iowa and you get confirmation there you could extrapolate that statewide.

C: The proposal has merit but needs to be more focused, perhaps on small streams in western Iowa.

Motion For Return
Motion by Rob Ettema to consider a rewritten proposal for this project by Dr. Papanicolaou, 2nd by Jim Cable. Motion carried with 13 aye, 0 nay, 0 abstaining.

NEW BUISNES

Mark thanked Iowa State University representatives for providing the meeting room and refreshments.

C: Several members & alternates did not receive the informational email sent out with links to the web zip file containing Board minutes, agenda and presentation materials.

Mary: I will check to make certain you are on the list.

C: I couldn't open the zip file.

Mark: The zip file folders on the web offer immediate access of information.

Ed: If it's a matter of size we can take care of that.

Mark: We're continuing to refine the process; if you have problems with the link to pdf files please notify us.

ADJOURN
Motion to Adjourn
1st by Jim Cable, 2nd by Mark Nahra.
Motion carried with 13 aye, 0 nay, 0 abstaining.

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Mark J. Dunn, IHRB Secretary