G-5

TEAM MEETINGS

MEMORANDUM FOR RECORD
(GAINES)

MFR

01 April 1999

SUBJECT: Meeting of micro-model evaluation team March 23 and 24, 1999.

1. The following were in attendance at the meeting.
   Rob Davinroy
   Steve Maynord
   Andy Gaines
   Dave Gordon
   Charles Nickles

2. The purpose of the meeting was to review the current status of the Richardson Landing micro-model and to discuss the evaluation proposal.

3. A review of the Richardson Landing model resulted in adjustments being made in the sediment volume and entrance conditions. However, the adjusted sediment volume did not produce the desired result and a problem with the reference plane used to survey the model was discovered. Efforts focused on getting the water surface profile in the model to parallel the reference plane. A different part of the insert was determined to provide a more stable and suitable coordinate reference for future surveys.

4. Selection of 15 previous model studies was discussed. Following is a tentative list of possible studies.

   Traditional WES models
   1. Loosahatchie-Memphis (Memphis Front)
   2. Buck Island
   3. Dogtooth Bend
   4. Kate-Aubrey
   5. Greenville
      --- Suck Bend, GA was an alternate mentioned

   Micro models
   6. Dogtooth Bend
   7. Santa Fe Chute
   8. Lock & Dam 24
   9. Mouth of White River
   10. Copeland Bend
      --- Two White River models and two Kate-Aubrey models to be completed during the next 6-18 months were also possibilities

Other models

11. Frazer River (NW Hydraulics)
12. Iowa River (Univ. Iowa)
13. Rhine River (Europe)
14. ???
15. ???

5. The comparison of model to prototype data was discussed at length concerning what benefit would result of making various comparisons of model bathymetry to prototype bathymetry as currently outlined in the proposal. There was a concern by Mr. Gordon and Mr. Davinroy that this was to produce a way to circumvent the use of engineering judgement on the part of the modeler. Mr. Gaines stated that his intent was primarily to get an index of how the models compared. This could be through plan view comparisons, volumetric comparisons, cross-sectional comparisons, or other comparisons that we could come up with. The dialog continued about what these surface comparisons could be used for and how the statistics generated from such a data set of 15 models would not be "statistically significant". It was agreed that some means of comparison was needed to provide the information necessary for the evaluation outlined.

6. Methodology for comparison of model bathymetric data (micro-model, large WES model, other physical model, or numerical model) to prototype bathymetry was discussed at length. Various levels of comparison to be explored were identified as follows.

Level of Sophistication	Item
1	Thalweg Plan View, Percent Channel Widths
2	Areas of Scour/Fill
3	Thalweg Elevation, Elevation of Percent Channel Widths
4	Channel Elevation

7. Conversion of model and prototype data to digital format was primarily outlined for FY2000. However, some of the conversions were to be done in FY1999. Other digitization of data also appeared possible during FY1999 if funds were to become available. The cost for converting the data was estimated using $500.00 per paper sheet for the 15 model studies. This resulted in a total contract cost of around $52,000. The $52,000 was included as a cost item (Table 1.7-2 in proposal) for FY1999 pending fund availability. This item could be deferred to FY2000 as funding dictates without impacting the evaluation schedule.

8. A review of cost figures shown in Table 1.7-2 resulted in several modifications. The majority of these modifications resulted in a redistribution of funds and no net increase in proposal costs. There were several items omitted from the Draft cost table. These items were added and costs adjusted upward as necessary. The key items adjusted were funds for MVS to assist in developing the proposal and methodology for comparisons in FY1999. An additional item added was the $52,000 for contract work to convert data to a digital format. Costs for conducting the 2x micro-model at Kate Aubrey were revised upward based on discussions at the March 23 & 24 meeting and on conversations that took place during the March 19 conference call.

9. Identifying what prototype data to convert to digital was the next topic of discussion. Mr. Nickles described the WES model methodology to the group. The description of the approach used for calibration and verification phases of the WES models brought out a clearer understanding of how the process differs between the WES model calibration/verification and the micro-model calibration. The discussions let to a conclusion that for base comparisons at least 3 prototype surveys (including 2 used in the model verification phase) should be converted. This was in addition to converting the model base calibration data and the verified model condition. Only the plan recommend for implementation would be converted; various alternative model runs would not be converted.

10. Action items were identified as follows.

Andy Gaines -

- Wrap up proposal and MOA
- Continue Richardson Landing model effort
- Prof. Yalin to visit MVM April 7
- Order Kate-Aubrey traditional insert.
- Have Kate-Aubrey prototype data for 1974, 75, 76 converted to digital
- Pursue Inroads (other software) capability to establish thalweg location, cut/fill areas, surface differences, etc)
- Gather existing digital data for trial work to be accomplished in the next month or two

Charles Nickles -

- Convert Dogtooth and Kate-Aubrey WES model data to digital format
- Review of Kate-Aubrey diary

Rob Davinroy –

- Proposal comment and wrap up
- Identify 5 micro-model studies to be included in comparison
- Prof. Yalin to visit MVM April 7

Dave Gordon –

- Collect data for micro-models to be included in comparisons

Steve Maynord -

- Proposal comment and wrap-up
- Contract and schedule 3 experts for review of evaluation process
- Coordinate Prof. Yalin's visit to MVM April 7
- Provide funding to MVS for proposal work and for team developed methodology for comparisons this FY
- Identify 5 WES model studies to be included in comparison
- Identify 5 Other model studies to be included in comparison
- Literature Review

11. The idea was proposed that we take existing digital data and conduct trial comparisons in a month or so. Any data converted in the next month or two may be available for this effort. No exact time frame was discussed; although, there was a desire to do some trials before the expert review occurs.

Andy Gaines

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TO:	FROM:
ROB DAVINROY	ROGER A. GAINES
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LAST WEEK'S MEETING	

☐ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

NOTES/COMMENTS:

Some notes on last weeks discussions. Please provide me any notes you have made.

I'll email these to you when the attachment restrictions are lifted.

Andy

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FACSIMILE TRANSMITTAL SHEET

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STEVE MAYNORD	ROGER A. GAINES
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Andy

Topics:

1. Effect of excess Froude number and effect on velocity distribution.

2. Effect of using flows that result in stages that are much less than stage at a dominant discharge.

3. Effect of large distortion on bed formation and flow pattern.

4. To what extent can model be used quantitatively.

5. Would model be correct in representing the flow patterns downstream of a dike to predict adequate conditions for navigation?

6. Do you know of previous movable bed model studies that we could evaluate for comparison with prototype?

7. Do you know of accepted techniques for comparing bathymetry from model to prototype?

8. The micro-model uses the concept that some have adopted in bridge pier scour work that once the sediment gets moving, scour will be similar. Is this a valid approach for study of river engineering solutions?

9. Since most physical movable bed models have scale effects from exaggerated Froude numbers and distortion and other factors, how do we show that the micro-model, which has these same scale effects but maybe to a larger degree, is or is not a tool we want to recommend to others?

10. What do you think about getting surface velocities in the prototype and comparing to surface velocities in the micro-model?

11. What do you think about comparing micro-model results to 1:100 undistorted model results?

12. Verification process- not related to a history of the prototype and relates to a single snapshot in time, this type of verification assumes the river to be in equilibrium and that sediment entering the reach is independent of the reach upstream.

13. Micro model flows normally do not have water-surface elevations high enough to cover or form the bars associated with the prototype, for example on the Mississippi bank full stage is the
major channel forming flow.

14. Data differences for the model survey - I think we have talked about this enough that any further explanation ins not needed

15. Adjustment of the micro model to reproduce unusual or unexpected phenomenon of the prototype is very limited.

16. Supplemental or additional slope is added independent of the model channel configuration, for example in the micro model of New Madrid, only a very small portion of the model was affected by any down-table slope and any cross-table slope was a positive slope for half the model and negative slope for the other half.

17. The layout of the model is obviously linked to the prototype; however, what are the relationships to river stage, river discharges, channel and water-surface slopes, and any other parameter?

18. In any sediment model we have the water and associated hydraulics, the sediment, and time. Those are the 3 things can be related to the prototype, what is the relationship between the prototype and the model for these.

19. There are two apparent time scales in the model – a flow response time frame and a sediment response time frame – How can this be compared back to the prototype?

20. How can the model slope be related back to the prototype slope?

21. What relationship exists (or should exist) between model and prototype discharge? Hydrograph shape?

22. What does effect does sediment gradation (in the model) have on model results? On scale effects?

23. What is the best gradation mix to use for maximizing model/prototype agreement?

24. What effect does the grain roughness have on the formation of the model bathymetry at different scales/scale distortions?

Things I want to stay away from:

1. Instrumentation details.
2. Too many details of how we use the LWRP and how the LWRP differs in Memphis and St Louis. This discussion should be about how we apply the micromodel to any stream that may not have a LWRP.
3. Explaining how the micromodel differs from the WES coal bed models or details of the WES models.
4. Make no mention of Prof Yalin opinion. If asked state that we don't want any other opinions to affect our reviewers.
5. Make no mention of us selecting one of the three for long term advice.

Andy

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Sediment Concentration - does it increase with increased flow (e.g. if 25% sed. vol at low flow - doubling the flow produces what concentration - 25% - 50% - ?

1/2' /sec velocity in model

4 parameters
- Slope
- Sed load
- Q
- entrance cond.

Don't force model to a vert. scale - model determines

LWRP

0

+10 - +20 @ St. Louis - most needed area of hydrograph - Prototype response.

- Use Froude / Drag to help get a sense of scale

2 - 2.5% max for correct sorting of grain sizes in model versus prototype —

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A. Is the comparison of 15 previous model studies the best way to establish baseline comparisons → ?

B. Flume Studies

3mm propeller meter

~~X~~ Take surface data and plot at various cross-section distortion's mapping areas ~~of~~ at / lower / higher than the angle of repose. —[Model distortion can not change the angle of repose – angle of repose can't be exaggerated]

Other variables :

types of structures

bed forms

Wrap-up

Ask for innovative thoughts & write-up/report. Would appreciate references

Report by end of June