

D-4

GORDON

2ND REPLY FROM GAINES (v. 17)

Reply to MVS comments on Ver 17
Andy Gaines 31 August 2002

Comment:

1. Last page of Ch.2 - goodness of fit described/defined
2. Last page of Ch.2 - Do not know what portions from the comparison report is mentioned. Added reference to other report - Gaines, Gordon, and Maynard (2002), but don't see that insertion of intro material would add to this section.
3. pg 3-1- add of
4. pg 3-2 - adversely - suggestion noted but no change; these techniques all affect reproduction of flow patterns and bed configuration, **some of them however have negative affects.** I agree that there is an affect, however, you even state only some of them are negative. Therefore, adversely implies that all the affects are negative. The wording of this paragraph reads: A review of the literally hundreds of references on loose-bed modeling reveals that guidance for design and operation of loose-bed models consists of similar sediment mobility and flow patterns yielding similar bed configuration. As will be discussed subsequently, some of the techniques for insuring similar sediment mobility can adversely affect reproduction of flow patterns and thus bed configuration. -- I don't see the problem with the revised wording which states that some of the techniques cause adverse effects. No additional change. "Adversely" is just an adjective that does not add anything useful to the reader. Use it in your conclusions and not here in the main body.
The statement indicates that "some cause adverse" what is the problem here? What will be talked about in subsequent para. pertains primarily to the negative effects. This simply leads into that discussion. Is it possible that achieving the desired sediment mobility in the model results in a departure from the prototype in other areas? I think this has to be the case. The empirical approach we take in micromodels has to acknowledge that, it's a fact. We utilize distortions to achieve a desired result. That does not mean that there are no adverse effects in other areas. If you distort one phenomenon, others will change as a result. There is no way to hold one thing constant (e.g. the same) in a physical loose-bed model while you change something else to better fit your requirements. You can't have it both ways.
What is important in this sentence is that limitations derive from adverse effects and that is what we're tasked with looking at. We could spend days, weeks, months, even years looking at every aspect -- some would be neutral and have no effect, others would have adverse effects. We don't have time to look at the neutral effects -- they don't enter into the question of limitations.
5. pg 3-2 delineated possible - changed
6. bottom pg. 3-4 - inconsequential - deleted. However, the comments on top of 3-5 are noted. Thalweg position is a factor of US boundary conditions which are also affected by a restricted thalweg. The restriction being talked about in the preceding

para.s refers to the influence produced confining the channel within more or less fixed banks. Placement of training structures further reduces thalweg freedom to move -- they are placed in the river to shift the main thread of the channel to a desired alignment and to restrict width in order to increase depth. These restrictions are further influenced by the use of vertical distortion, slope exaggeration, and roughness distortions in the model. More detail on the specific influences can be provided regarding the effects of each of these if warranted/desired. The meandering thalweg in the Wolf channel does not dispute these conclusions because the small (relative to the MS) channel is more restricted thalweg movement. This results from a much lower width-depth ratio in the prototype Wolf. If structures had somehow been placed in the Wolf channel, more restriction in thalweg positional freedom would have resulted. I'm confused here. This topic seems to come up repeatedly throughout the report. How do we deal with this? Change wording from small-scale models to highly distorted models. There are cross-section comparisons where the model section has exaggerated scour depth as opposed to the prototype -- limiting the scour depth in the model could in no way result in the shape of the prototype section. The position of the thalweg within that section would also most likely be different in the model because of the distortion effects.

The thalweg location is fixed within the channel banks. The more structures that are placed within the channel, the greater restriction is forced on the thalweg position. For example, at Salt Lake Chute (RM 133-140 above Cairo, IL on upper MS) there are a number of closely spaced dikes along the left bank; these dikes restrict where the thalweg is located -- almost to the point that they dominate where the thalweg is. If those dikes were not there, esp. around 140-141, then the thalweg would probably be aligned quite differently than exists with the dikes I agree. Where just one or a few dikes are located, the thalweg is not "held" in a general position like where there are a number of closely spaced dikes like at Salt Lake Chute -- Thalweg location can switch from side to side more readily in this case I disagree. Although the thalweg would be in a different position without the dikes, it still would not switch from side to side without an upstream change in alignment (such as in the bankline).

Thalweg location is also affected by the secondary currents -- cross circulation -- because there is a tendency for the flow to shift from side to side in wide shallow channels. This happens even without the direct influence of the bankline. An example of this is where the flow exited from the left bank and switched to the opposite, right bank in the Kate-Aubrey reach. The primary change occurred in a relatively short one year period (though there was a tendency for the thalweg to drift in this reach before the 1973 flood). There was no change in bank alignment anywhere in this reach that I've discovered from aerial photographs going way back. This happened to be an almost 90 degree switch which continued during the 1975-1979 time period (even with the continual construction of dikes and dredging in the reach).

The upstream alignment does have an influence on the position of the thalweg. However, the secondary currents that result from bank irregularities and the bank alignment have a major influence as well. Why does the thalweg shift from one bank to the other in the Westover reach? Why is the model having difficulty

reproducing this tendency? Similar circumstances exist in the Richardson Landing reach, the Loosahatchie-Shelby Forrest reach, the reach DS of Mhoon Bend and others where the thalweg does not follow expected locations, primarily because of the influence of secondary currents.

While there are few (or no) locations in the river today where a single structure is used, the expected influence on the thalweg would be SIMILAR to that depicted in the short contraction figure. In the figure depicting a single structure, the shift in flow direction forced by the presence of the dike sets up an oscillating flow pattern back and forth across the channel -- this is not a result of the channel alignment, but it does act upon the banks. If the banks are "fixed" then all that can change is the bathymetry in response to the flow shifting back and forth from one side to the other. The wider the channel, the greater the cross circulation which produces changes in the thalweg location.

These figures provide a fair, unbiased depiction of variables that influence thalweg position. There is no agenda to push.

What are some details of why you disagree? What is the basis of your disagreement? There are numerous examples where the thalweg shifts without direct influence of the banks in the lower MS River. How can you explain this away?

Call if more explanation is needed to clarify this.

7. pg 3-7 - strike Thalweg position sentence

8. Comment on figures 3-2, 3-3, 3-4 pg 3-7 - These figures refer to hypothetical alignment and not any specific condition. Descriptions of these figures have been modified to indicate that they are hypothetical, not actual. In general, the position and response of the thalweg is depicted in these figures and associated discussions, not the upstream or downstream boundary conditions. Figure titles have also been modified to show Hypothetical I don't even agree with these figures being labeled hypothetical. They should be removed because they have no relevance to what actually may occur. These figures relate to previous comments (#6), but they are specifically intended to identify the variables involved, not depict any particular prototype configuration. These variables, in turn, help define what is of most importance when considering similarity between model and prototype. I use some of these variables in my conclusions. I don't understand the point of presenting a hypothetical situation that would never occur. These figures give the absolute wrong impression of a thalweg in dike field. They should be removed.

See #6 above. Although these figures are intended to describe the variables that influence thalweg location within a fixed bed channel, the depiction of thalweg position in these figures does not give an "absolute wrong" representation of reality. There are numerous examples where the thalweg location in the MS River departs from what one would "think" it

should be. Maybe the MS above Cairo does not exhibit this tendency -- I don't know about that reach.

I fail to understand the emphasis on these figures -- they simply outline what our consultant used in his analysis and what variables influence the thalweg position.

~~9.8.~~ pg 3-12 - B/y of WES models is not available for +20 as used in the micromodel values shown in this para. The only numbers available for the WES models are at 0 LWRP. However at this water level, the B/y relationship between model and prototype are the same as shown (5 in MM to 50 in Prototype). The MM B/y values are 1/10 that of the prototype (Prot. B/y= MM B/y *10) while WES B/y values are about 4/10 that of the prototype (Prot. B/y = WES B/y *2.5). Please state this for comparative purposes Noted, reluctantly added. I don't feel it adds anything to the report or the outcome to keep dredging up the WES model numbers-- They were larger and generally had less distortion (coal-bed models). Therefore, the numbers will be closer to the prototype regarding the B/y ratio and the Froude number ratio as compared to the micromodels. It presents a good comparison to the reader to know what values the past models have utilized. Without this it is hard to know what the numbers from the micro model mean. The numbers from the micromodel should be compared to the B/v >5 or B/v > 5-10 mentioned from the two references. The relative comparison between the micromodels and WES models doesn't do much to describe this. What is important is that the micromodels have B/v about 1/10 of the prototype B/v (they are much narrower and deeper than the prototype).

~~10.9.~~ pg. 3-12 - cross circulation - brief explanation added

~~11.10.~~ pg. 3-12 - next to last para. inconsequential - Strike sentence

~~12.11.~~ pg. 3-13 - para. deleted. I am now clear on what occurs with the rails. I don't think the paragraph should be deleted. Please clarify that the rails adjusted the datum. Defer to debate between Rob and Tom. I really don't see how this matters regarding conclusions about the micromodels. It doesn't matter what was done in the WES models regarding rails in making my conclusions. Maybe not your conclusions but we could reference this fact in our conclusions. Defer any further discussion on this matter until principal parties work out their differences.

~~13.12.~~ pg 3-17 - para after eq. (2). Discussion will be added regarding distortion in bends.

~~14.13.~~ pg. 3-18 - sect. 3.2.4: change section title to Performance Categories -- this section is heavily modified. Refer to re-write to make additional comments. Where is the rewrite? You should have revision copy. OK

~~15.14.~~ pg. 3-27 ref to 6-4 omitted.

~~16.15.~~ pg. 3-28 "on" added

~~17.16.~~ pg 3-29 - non-porous not added. This para. is talking about the framework which involved both experimenting with solid and porous structures. Ok – but the experiments also investigated a loose bed. (also change flag done to flat)
pg 3-30 - added fixed bed flume. Last sentence not added -- use of controlled is speculative. Bed response is modified by use of porous dikes, but talking about specific details of scour depth and lateral extent is not quantifiable. This can be added to individual opinion. You can change the wording if you don't like the word controlled. We need to mention here that the models use a porous structure in an attempt to deal with these problems. See last sentence of 3.4.1. I think this says what you are talking about. No further changes made. What sentence? The one that says: "Porous dikes are used in micromodels in order to reduce the depth and lateral extent of scour exaggeration."

~~18.17.~~

~~19.18.~~ pg 4-1 General section moved to beginning of viewpoints sections.

~~20.19.~~ pg 4-2 - Please verify table 4-1 listing of published MM investigations. There are probably more now. If so, these could be added at the bottom of the table. Paragraph before this table - 16 model studies published. Remove Big Creek, it was not published. Add Ballard's Island (Illinois River), 1:3600, 15:1, Side Channel Enhancement. Done

~~20.~~ chapter 4 - heavily redone. See following specific noted on comments What do you mean here See new chapter 4 -- case studies.doc -- which includes all MVS case studies and ERDC opposing viewpoints.

~~22.21.~~ pg 4-18 Need Vicksburg Front case study from MVS -- I have flow visualization, but nothing on basic model. section 4.3 wording changed in 1st and 2nd para. OK

~~23.22.~~ pg. 4-19, 20, 21 & 22 - sections suggested for moving to main report noted. The way these para read, they are more geared toward proponent's section. I put these paragraphs into the sections where are thought they would fit. Who is making the decisions on what to put into the main body? Should we not be given the same opportunity to submit our thoughts as you have? Maybe Steve would agree. Maybe not. We'll never know until he sees it. I thought this was a joint report. For the most part, St. Louis has just been a reviewer of what has already been written. Should we just write three separate reports? If not, let's make it a team report!

~~24.23.~~ pg bottom of 4-22 and 4-23, 25, & 26 - case study references eliminated per suggestion.