

From: Bill.Lehr@noaa.gov
Sent: Thursday, October 07, 2010 4:28:32 PM
To: mark_sogge@usgs.gov
Subject: Fwd: Working Paper No. 3

Mark,

Here was my reply to Jed Borghei. You might want to have the other FRTG team leads put in their comments as well. Any word on the Plume Team Final Report posting?

Bill

----- Original Message -----
Subject: Working Paper No. 3
Date: Thu, 07 Oct 2010 05:35:46 -0700
From: Bill Lehr <Bill.lehr@noaa.gov>
To: Borghei, Jed <Jed.Borghei@OilSpillCommission.gov>

Jed

Some comments on the draft report.

1) Missing References.

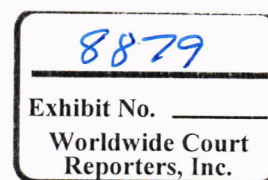
I thought I provided the Commission a copy of the Plume Team Interim Report (May 27) and Final Report (July 21). I see neither cited in Working Paper No. 3 although both are highly relevant to the subject. I can supply a copy of both if you need it. I think both go straight to your suggestion on page 8 that the federal government disclose its methodology or data.

The Interim report was freely available after its publication (It was even posted on a University website). Therefore, I think it is incomplete on page 12 to refer only to the press release that, as noted, contained little information, while failing to mention the actual Interim report, available at the same time.

Both reports describe in detail the methods used by the individual experts in determining estimates. Certainly the 215 page peer-reviewed final report provides more than ample information for the evaluation by qualified scientists of the approach and conclusions of the team.

The Working Paper suggestion of encouraging outsiders to criticize the unified command estimates while the emergency response is underway is a bad idea. Any large spill event already produces a large supply of 'instant oil experts' who

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compete for headlines and funding. The scientific community has established procedures for evaluating the scientific soundness of any methods or models used by those directly involved in the Response. The appropriate technical conferences and peer-reviewed publications are better forums than Press announcements.

2) Estimating surface oil volume of DHS

There was only one scientifically sound effort to estimate surface oil volume for this spill. That was the NASA/AVIRIS study. Working Paper no 3 does not mention it at all, which I find surprising.

The methods based upon the Bonn Agreement or the ASTM thickness standards are not sound methods to estimate spill volume, as I explained in the paper I provided the Commission (Lehr, 'Visual Observations and the Bonn Agreement', Proceedings of the Thirty-Third AMOP Technical Seminar on Environmental Contamination and Response, pp669-678, 2010). Spilled oil on the water surface varies in thickness by as much as three orders of magnitude (1000 times) and visual methods cannot distinguish this except for the very thin sheens where only a small fraction of the spilled oil will be found.

The crude method that I used in my estimates was to ask those doing visual overflights what percentage of the oil slick surface was sheen and what was dark oil. The answer I received was one percent (BP apparently were reporting 3%). Dark oil 'begins' when the oil is thicker than about 5-50 microns. I used 100, the same as Amos, but we both could have been wrong by a factor of 10 or more. Sheen varies between 0.05- 3 microns. I used 0.1, although it would have made little difference if I had chosen Amos' number of 1 micron. The latter thickness implies that the sheen was not silver but all rainbow, something not observed in the visual overflights.

Either estimate assumes we know the area of the slick from satellite data but the satellite images varied according to the sensor and sea-state, both of which are not related to spill volume. Essentially, both estimates are just guesses.

I am mystified by how Dr. MacDonald arrived at his numbers. The USCG did not, as far as I am aware, produce color maps that showed slick size and classified the color of the surface oil. At least there are no such maps in the daily Federal Remote Sensing Situation Reports. Perhaps he was referring to the daily forecast maps that combined past locations of observed oil with NOAA generated trajectory forecasts (the colored parts). These are totally unsuitable to estimate surface thickness using either the Bonn agreement or ASTM standards. The colors on the maps are relative values based upon the percentage of Lagrangian elements (LE's) that are present in a specific area compared to

another area. The choice of the number of LE's that are used in any map is arbitrary. We would generate similar maps if the spilled oil had been vegetable oil rather than crude oil. Increasing or decreasing spill volume by a factor of 100 would not change the maps to any extent. The maps sole purpose is to predict oil trajectory, not volume.

The statement on page 4 of the Working Paper is incorrect where it says that I did not use the surface volume calculation in estimating the flow rate. As noted elsewhere, it gave the 5000 bbl/day figure that I used as my rough forecast.

3) Estimation of the flow rate

None the experts who used variants of PIV could produce precise estimates of the flow rate prior to severing the riser for reasons that are detailed in the Plume Team final report. This applies to estimates from within the Plume Team and to external scientific estimates, particularly with regard to the You-tube quality video first provided. Dr Wereley, for example, estimated 70 K bbl/day prior to joining the plume but reduced that to half after viewing more videos made available to the team.

I disagree with the statement on page 7 that the government estimates would have been more accurate if it had enlisted outside scientific expertise. The Plume Team, assembly of which preceded FRTG, WAS that outside expertise. Please review the credentials of the Team members and I think you will see that we tapped outstanding scientists for this project.

I entirely disagree with the third paragraph on page 11. The Plume Team did not rely primarily upon the DOE estimates for its calculations. The consensus 35,000-60,000 bbl/day of the two groups represents just that, a consensus of all the teams.

Moreover, I think it would be premature for the Commission to imply that the DOE numbers were more accurate than the Plume team estimates or that the Plume Team pre-riser cut estimates of 20,000-40,000 bbl/day were chronically too low.

If we consider the post-riser cut situation, the two best measurements in my opinion were the one pressure reading as they capped the flow and the best estimate of the plume team (page 15 of the final report). At 53K bb/day and 46 K bbl/day respectively, these two numbers are probably within the real margin of error of each other. The WHOI calculations, while having a larger confidence bound, are somewhat consistent with these numbers, as is the recently published Columbia U. study. I might note that WHOI has adjusted down its GOR to 41%.

Both measurements have limitations. In the case of the PIV measurement, it is chiefly in estimating the interior velocity profile and gas/liquid ratio. For the successful DOE pressure readings (other gauges gave spurious results) it is using a single-phase model for multiple-phase flow and assuming the pressure readings are accurate. We certainly DO NOT KNOW that "the high end of this estimate is accurate because of pressure readings from a sensor..." as stated on page 14.

With regard to the present estimates of flow prior to the riser cut, the initial value of 62 K bbl/day rests primarily on two sets of assumptions; (1) properties of the reservoir and (2) impedance of the riser pipe. In both cases, my understanding is that the given BP values would lower this number significantly. For example, the DOE/FRTG estimates allow a 4% reduction due to the riser impedance while BP suggested prior to the cut that the true value would be 20%. If the BP assumptions prove correct (something yet to be determined), then the lower Plume Team estimates would be supported. I think that DOJ has suggested actually measuring the impedance, an action that could help resolve the matter.

I think that the Commission should note that all government estimates to date, including the present one, are tentative and subject to further change as more data and analysis becomes available.