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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

May 8, 2013

Enbridge Energy, Limited Partnership
c/o Mr. Rich Adams
Vice President, Operations
Superior City Center
Second Floor
1409 Hammond Ave.
Superior, Wisconsin 54880

Re: Review of Enbridge Energy, Limited Partnership's March 21, 2013 *"Quantification of Submerged Oil Report"*

Dear Mr. Adams:

Enbridge Energy, Limited Partnership, (Enbridge) submitted the following document as required by the U.S. Environmental Protection Agency's (U.S. EPA) November 20, 2012 Directive (Directive):

> *Enbridge Energy, Limited Partnership,* ***Supplement to the Response Plan for Downstream Impacted Areas, commonly referred to as the "Quantification of Submerged Oil Report"****, Enbridge Line 6B MP608, 3/21/2013*

U.S. EPA has reviewed Enbridge's Quantification of Submerged Oil Report (Report) and has determined that the conclusions in Enbridge's Report are not valid as discussed below and in Attachment 1 to this letter. Moreover, Enbridge failed to use the methodology required by the Directive. As a result of these deficiencies, the Report significantly underestimates the volume of submerged Line 6B oil which remains in the Kalamazoo River. The Report estimates the volume in the River as between 1,528 gallons to 8,012 gallons. However, U.S.EPA's application of the methodology required by the Directive results in an estimate of residual submerged Line 6B oil of 180,000 (± 100,000) gallons, which is as much as 100 times higher than the Enbridge estimated volume.

Deficiencies in Enbridge's Report

U.S. EPA's review identified the following deficiencies in Enbridge's Report:

1. Enbridge Did Not Consider Large Areas of the River Impacted by the Discharge

Enbridge's quantification is incomplete and significantly underestimates the amount of Line 6B oil, in part, because Enbridge inappropriately excluded river areas mapped in the "none" poling category in its oil volume calculations. The area of the Kalamazoo River affected by the Line 6B discharge includes the entire area between its confluence with Talmadge Creek and the Morrow Lake Dam, and possibly beyond the Morrow Lake Dam. Since the discharge occurred, the presence of submerged oil in this area has been evaluated qualitatively using a field method referred to as poling. After sediments are agitated during the poling process, observers note the appearance of oil sheen and globules at the water surface. Enbridge, in consultation with U.S. EPA, developed a scale to characterize the level of oil released by poling into the four (4) categories of "heavy," "moderate," "light," and "none."

The Directive required Enbridge to perform quantification in all impacted areas of the river, including those areas categorized as "none" via poling. However, Enbridge excluded the portions of river with poling data for oil sheen and globules identified as "none" from its Line 6B quantification calculations. This exclusion leads to a gross underestimation of residual Line 6B oil for the reasons discussed below.

A. As a result of extensive forensic chemistry evaluation performed over the past year, including analysis of data Enbridge generated, U.S. EPA has confirmed that Line 6B oil is present at some locations categorized as "none." Despite knowing that Line 6B oil was present in these areas and possessing the ability to quantify that oil, Enbridge failed to quantify Line 6B oil in these areas.

B. Poling is a visual method that produces a snapshot of field conditions at a given place and time. Extensive documentation demonstrates that, as a result of dynamic river conditions (e.g., oil recovery activities; sedimentation rates induced by low-flow or high-flow conditions), poling results at a given location may and do change over time. For example, in the table on page 16, Enbridge reports that 26 sediment core locations were mapped as poling category "none" in Spring 2012. However, at the time of sediment core collection in July/August 2012, 12 of those core locations exhibited Line 6B oil sheen, resulting in a categorization other than "none." It is clear that the poling categorization of an area as "none" does not demonstrate the absence of Line 6B oil.

C. The areas categorized as "none" comprise a large portion of the Kalamazoo River affected by the Line 6B discharge.

    i. The areas categorized as "none" comprise approximately 935 acres out of a total of 1,780 acres, or approximately 53%, of the portion of river affected by the discharge.

    ii. The "none" areas included approximately 25% of the sediment cores to be assessed under the Directive.

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The Report's failure to explain or otherwise justify the exclusion of sediment data in the "none" areas from consideration results in serious understatement of the total amount of oil in the river system and makes the report unreliable. Although this was a critical decision by Enbridge, the only reference regarding the exclusion of "none" areas is provided as a single footnote to Table 4.

2. Lack of Substantiating Data

Enbridge's Report lacks transparency because many of the supporting details were not presented. For example:

- Tables 5, 6, 7, and 8 of the Report present summaries in which the sediment core sample data are categorized and compiled to create Line 6B oil volume estimates for various subunits of the system. However, concentrations of Line 6B oil are not identified for individual sediment samples in these tables. In the absence of analytical results for individual samples, the Report does not provide support for the reported average concentrations.

- Enbridge states that it used a numeric model (oil calculator) that was defined in the 2012 Consolidated Work Plan (2012 CWP). The 2012 CWP requires that the representative oil concentration for each reporting stratum is to be calculated per each one-tenth foot interval of the array for sample cores. *See* page 44 of the 2012 CWP. Section 4.7 of Enbridge's Report provides no detail on how the layer-weighted average concentrations per core were calculated from the individual sample concentrations. Additionally, comparison of Tables 5 and 6 indicates that upper-bound layer-weighted average concentrations were smaller than their lower-bound counterparts. The failure to demonstrate compliance with the requirements of 2012 CWP makes the summaries in Tables 5 and 6 unreliable.

- The method by which Enbridge determined the thickness of the oil-impacted layer of sediment is unclear. Without detailed data or examples substantiating Enbridge's method, U.S. EPA cannot verify that Enbridge included the full interval from water-sediment interface to the maximum depth of oil impacts in its thickness parameter estimate.

The absence of transparency makes much of the information contained in Enbridge's Report unreliable and, as a result, unusable.

3. Enbridge's ATS Model Contains Errors in Interpretation of Oil Chemistry

Enbridge's preferred volume estimate is based on a methodology (ATS Model) not contained in the Directive or approved by U.S. EPA. Use of the ATS Model clearly underestimates Line 6B oil concentrations in most sediment samples examined during this study. A detailed discussion of misinterpretations of oil chemistry in the ATS Model is presented in Attachment 1, some of which are summarized below.

- The Kalamazoo River sediments contain residual background hydrocarbons (RBH) in addition to Line 6B oil. The ability to distinguish Line 6B oil from RBH is based upon diagnostic ratios of specific oil constituents that differ for Line 6B oil and RBH. When the amount of RBH varies from sample to sample, it can have a direct impact on the

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diagnostic ratio that is used to calculate Line 6B oil. Any method used to quantify submerged Line 6B oil must recognize the presence of RBH and account for variations in RBH in each sediment sample. U.S. EPA's methodology (NewFields Model) for calculating Line 6B oil concentrations accounts for sample-specific variations in RBH. The ATS Model does not. As a result, the ATS Model substantially underestimates Line 6B oil concentration in the vast majority of sediment samples.

- Enbridge declared that the NewFields Model is less accurate because it overestimates Line 6B oil concentrations, but Enbridge fails to provide any convincing evidence or documentation to support this position. The sediment sample selected by Enbridge to prove its point does not demonstrate any failing of the NewFields Model, but just the opposite. By not accounting for sample-specific RBH, Enbridge misinterprets the chemical data. The NewFields Model is more accurate and more robust because it accounts for sample-specific RBH, as explained in Attachment 1.

- Enbridge used C3-DBTs and C4-DBTs,[1] two petroleum-related groups, as part of its quantification process. However, Enbridge did not account for the weathering of C3-DBTs and C4-DBTs in its report and that failure results in Enbridge underestimating Line 6B oil concentrations, as explained in Attachment 1.

4. Additional Deficiencies

The deficiencies described above are substantive and by themselves undermine the integrity of Enbridge's Report estimate of residual Line 6B oil. Additional deficiencies in Enbridge's Report are summarized below.

- In its Directive, U.S. EPA required that Enbridge include an assessment of the uncertainty associated with its volume estimate. The uncertainty estimate provides a context for the volume estimate, and assists in documenting the level of understanding of the amount of residual Line 6B oil in the affected portion of the Kalamazoo River. The uncertainty estimate requires an evaluation of the uncertainty associated with five variables in the equation used to calculate oil volume: Line 6B oil concentration, area of impact, depth of impact, oil density, and sediment dry bulk density. Despite the requirement to evaluate uncertainty, Enbridge does not discuss uncertainty in any of these variables or uncertainty in its residual Line 6B oil volume estimates. Failure to address the uncertainties in the available information associated with these variables undermines the reliability of the Report's conclusions.

- Enbridge did not provide either a description of the quality assurance/quality control (QA/QC) program or results utilized in the field and laboratory in its Report.

- Dry bulk density is an important variable in the oil quantification calculation. Enbridge failed to evaluate and include all available dry bulk density data as required by the Directive. The Report's failure to provide and address dry bulk density data undermines the reliability of its calculations and further undermines the reliability of its conclusions.

[1] C3-dibenzothiophenes (C3-DBTs), C4-dibenzothiophenes(C4-DBTs)

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- Enbridge provided "lower bound" and "upper bound" estimates of residual Line 6B oil volume that relied on substitution values for non-detect samples (zero and ½ detection limit, respectively). The substitution of zero or ½ detection limit for non-detect results is not chemically or statistically defensible. Peer-reviewed literature has amply demonstrated that such an arbitrary substitution introduces known negative bias to the data set, and should be avoided by using better and widely available methods.[2]

- U.S. EPA directed Enbridge to use Line 6B oil concentrations as calculated by Dr. Gregg Douglas (NewFields). In Section 4.8.1 and Tables 5 and 6, Enbridge states that it calculated the volume of Line 6B oil based upon the NewFields-determined Line 6B oil concentrations in the sediment samples. However, Enbridge's Report does not include any discussion regarding how it utilized the NewFields concentrations to calculate Line 6B oil volume, making it impossible for U.S. EPA to verify the Enbridge reported results.

Conclusion

U.S. EPA has completed its own analysis regarding the quantification of submerged Line 6B oil remaining in the Kalamazoo River using the methodology required by the Directive and which we believe addresses the insufficiencies in Enbridge's Report. Using that methodology, U.S. EPA estimates the residual submerged Line 6B oil to be 180,000 (± 100,000) gallons. The details of U.S. EPA's residual submerged Line 6B oil volume evaluation are presented in Attachment 2.

If you have any questions regarding this reply, please contact me immediately at (231) 301-0559.

Sincerely,

Ralph Dollhopf
Federal On-Scene Coordinator
U.S. EPA, Region 5

Attachments

[2] Helsel, D.R. 2006. Fabricating data: How substituting values for nondetects can ruin results, and what can be done about it. Chemosphere 65:2434–2439.

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