

Notes on Mercury Methylation Studies July 2010

Apparent mercury methylation was observed in dredge settling ponds during the 2008 and 2009 O&M dredging. The increases in methylation were unexpected in that the placement sites were generally open, un-vegetated, shallow and oxygenated.

Sampling in 2009 was undertaken over a 4 week period on the assumption that the longer residence time would result in photodemethylation. However this was not seen in the data results.

In preparation for the 2010 O&M dredging, and in advance consideration of possible issues that may be raised concerning the proposed Sacramento Deep Water Ship Channel deepening project, additional studies are being considered.

Studies proposed to date have focused on field studies at the placement sites to examine turbidity vs. methylation over time. The purpose of these studies are to determine if a BMP involving the relatively quick release of decant water with both low turbidity and low methylation can be achieved.

A second bench study in discussion involves duplicating this effort in a controlled lab environment using the same dredged material placed in settling columns. The purpose of this effort would be to produce a more controlled curve of turbidity and methylation over time, and provide a basis for which to compare the results of the previously mentioned field studies.

Additional studies, proposed and discussed, have focused on BMPs to achieve low methylation rates in dredge ponds.

An area of study that has not received additional consideration to date, is an effort to determine the cause of the high methylation rates, and the apparent, and unexpected, lack of photodemethylation in the shallow, un-vegetated, oxygenated settling ponds.

Aside from prevention of methylation in the first place, photodemethylation is our primary tool for reducing methylation. A study effort made in this area would be valuable, because unless we understand why photodemethylation is not occurring, we cannot design BMPs to favor this process. Therefore, in addition to the testing of specific BMPs, additional field and bench efforts should be directed at understanding the primary factors affecting methylation and demethylation in the dredge settling ponds.

Another area of study should be an examination of the importance of the existing sediment in the ponds before placement of the slurry water. Specific BMPs have been discussed which are based on modification of the existing sediment and/or vegetation characteristics at the placement sites. However, we may not yet have a full understanding of the relative importance of the site characteristics vs. the dredge material characteristics. Are methylation processes driven primarily by the characteristics of the

existing sediments at the placement sites, or by the characteristics of the dredged slurry? This fundamental question has not yet been fully addressed.

An example of a simple test, in this regard, would be to design two small cell treatments, one of which received only river water placed on existing sediments, and the second cell lined with a liner, receiving dredged slurry. This test may be performed on a bench scale as well, and can be duplicated with a variety of existing sediment types, with or without vegetation, if possible.

If the results of this test revealed that some, or all, types of existing sediments at the placement sites have little or no effect on methylation, then BMPs can be designed accordingly.

In summary, the primary study three questions are discussed in this note:

- 1) Can low methylation and low turbidity be simultaneously achieved through judicious timing of release?
- 2) Why is photodemethylation not seen in dredge settling ponds, which are open, shallow, un-vegetated, and oxygenated?
- 3) How important to methylation rates are the characteristics of the existing sediments, and/or vegetation, at the placement sites?

The first question is designed to test a specific BMP, while the remaining questions are focused on increasing our understanding of the processes, and in particular, why methylation is occurring in greater rates than demethylation. The answers to these questions will in turn allow development of further BMPs for testing.