Response to comments from Alaska Department of Environmental Conservation (Richard Heffern) and Army Corp of Engineers (Bret Walters)

ADEC comment: Resolved – 45-day test run for Tier IV testing. NewFields/CBJ agreed to conduct the 45-day test if we requested. I recommend we formally request the 45-day test.

The recommendation to conduct the 45-day bioaccumulation test could be accommodated if the sediment were split into three test replicates for the 28-day test and 3 replicates that could run for up to 45-days if survival of the clam bioaccumulation test organisms remains above 70% in all replicates during testing. However, we do not recommend this approach for several reasons:

The Inland Testing Manual protocol for conducting the bioaccumulation test is 28-days using five test replicates. The 28-day period has been established and approved for use all over the United States for a variety of contaminants including metals. In the absence of a regional guidance manual, the federal manual guidance is used. We do not have ample sediment to conduct both the 28-day and 45-day test with five replicates each. The rationale for the 28-day testing period is on page 6-3 through 6-5 of the ITM. The guidance states that:

- "the time to reach or approach steady-state varies among different compounds and, to a lesser extent among different species. Test designs that assure that steady state has been attained require a large number of samples and substantial expense. As a cost-effective compromise, it is recommended that a 28-day exposure be used for the "standard" bedded sediment bioaccumulation test for neutral organics and metals."

- "Where it is desirable to know the steady-state concentration of neutral organic compounds as, for example, comparison to an FDA action level, fish advisory or similar numerical values, the following procedure is recommended. The log K_{ow} of the neutral organic compound of concern should be compared with the log K_{ow} in Figure 6-1 (from the ITM 1998) and will indicate the proportion of steady-state concentration (Css) expected in 28 days based on empirical evidence. This will allow estimation of the steady-state value from the 28-day laboratory exposure data using a steady-state correction factor. The correction factor is the reciprocal of the decimal fraction indicating the proportion of Css expected in 28 days."

The octanol/water partition coefficient (K_{ow}) for methyl mercury was not provided in the ITM, therefore a list of published K_{ow} along with their citations are provided in Table 1.

Table 1. Published K_{ow} for Methyl Mercury

Kow	Citation
1.7	Mason et al. 1995
1.5	National Academic Press 2000

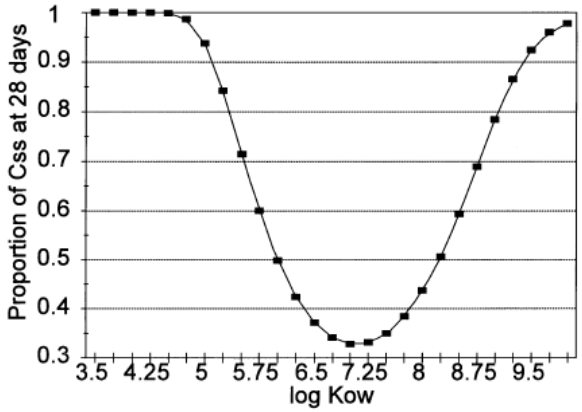

Figure 6-1 from ITM 1

This graph shows that Log K_{ow} values below 4.25 reach steady state within the 28-day exposure period. The low Log Kow for methyl mercury suggests that 28-days is an appropriate amount of time to for any methyl mercury uptake into the bioaccumulation organisms to reach steady state.

Further, extending the bioaccumulation period beyond the standard 28-day test could result in higher mortality of the test organisms due to starvation, especially if sediments contain low levels of total organic carbon, which is likely for the test composites representing the deeper sandy grey native sediment layer.

It is our position that based on the low K_{ow} for methyl mercury, the 28-day bioaccumulation protocol established ITM federal guidance document is the appropriate method for conducting the bioaccumulation test. Using an established method provides a robust *scientifically defensible* data set for making decisions regarding appropriate placement of dredged material from Douglas Harbor.

Second comment: DEC reserves the right to revise project's proposed Tier IV acceptance testing criteria for mercury in fish tissue (based upon US FDA mercury in fish tissue recommended safe level) considering the additional risk Alaskans may be exposed to from our increased seafood consumption rate above the national FDA determined average. I will be in Anchorage next week and plan to meet with the person who is the multi-agency work group lead on developing Alaska recommendations for fish consumption considering mercury toxicity in fish.

It is important to establish test interpretation criteria for the chemical and biological tests at the start of the project. This ensures that the criteria are clearly defined, not influenced by the outcome of the test results, nor open to interpretation. When regional guidance for conducting dredged material evaluations has not been formally developed, the appropriate course of action is to use federal guidance provided in the ITM. The federal guidance compares the tissue concentrations to FDA action levels and compares the tissue concentrations in the test treatments to those of the reference treatments. These interpretation guidelines should be used to evaluate the bioaccumulation potential of mercury from sediment in Douglas Harbor. If fish consumption rates relative to Alaska are considered, in addition to the EPA national guidance, then the interpretation criteria for evaluating the bioaccumulation data should be defined prior to submission of test results.

The most current Alaska Fish Consumption Guidelines we could find were published on October 15, 2007 by the State of Alaska Department of Health and Social Services as a joint agency guideline. The guidelines are:

Adult men, teenage boys, and adult women who cannot become pregnant:
To get the maximum health benefits form eating fish, eat at least two fish meals/week.

There are no suggested consumption limits for any species of Alaska fish. This group can eat as much fish caught from Alaskan waters, as they want.

Women who are or can become pregnant, nursing mothers and teen-age girls (same advice applies to children under twelve except the meal size is considered 3 ounces of less (uncooked weight) :

To get the maximum health benefits form eating fish, eat at least two fish meals/week while following a suggested set of guidelines to limit the amount of mercury exposure to unborn or nursing babies. No limits to consumption for: Pacific cod, Walleye Pollock, Black rockfish, Pacific ocean perch, any species of wild Alaska salmon, Halibut under 20 pounds, or Lingcod under 30 inches in length. Limits of consumption have been set for Black cod, Rough eye and Yellow eye rockfish, Halibut over 20 pounds, Lingcod over 30 inches, salmon shark, and spiny dogfish

The State of Alaska Department of Health and Social Services issued a report (October 15, 2007) describes the hair biomonitoring studies; the guidelines for acceptable mercury uptake by the various agencies (Table 7 of the document) and provides consensus recommendations from the Alaska Scientific Advisory Committee for Fish Consumption (p.28 -29) several highlights from the findings are noted here:

- The 2004 EPA/FDA federal fish advisory, which advises sensitive populations to limit fish consumption to 12 ounces per week, is inappropriately restrictive for Alaskans because it does not adequately factor in the relatively low levels of mercury in most Alaska fish species and the important health benefits of fish consumption.
- Fish consumption guidelines for women who are or can become pregnant, nursing mothers, and young children are warranted for a small number of Alaska fish species due to elevated mercury levels in these fish. *However, the EPA reference dose for mercury is unnecessarily restrictive for application in Alaska where the risk/benefit balance is influenced strongly by local factors.*
- Alaska demographics groups other than women who are or can become pregnant, nursing mothers, and young children should continue to enjoy unlimited consumption of all fish from Alaska waters.
- The Alaska-specific chronic oral Acceptable Daily intake for methyl mercury for women who are or can become pregnant, nursing mothers and young children is 0.0004 mg/kg body weight/day. This value was derived using the ATSDR No Observed Adverse Effect Level of 0.0013 mg/kg body weight/day divided by a 3-fold uncertainty factor for human pharmacokinetic and pharmacodynamic variability. This value of 0.004 mg/kg body

weight/day is four times higher than the EPA Reference Dose of 0.0001 mg/kg body weight/day.

This report also provides a Consumption Allowance (Table 8) which can be used to develop interpretive guidance for the bioaccumulation study.

Alaska-Caught Fish Monthly Consumption Allowance- Women who are or can become pregnant, nursing mothers, and young children (≤12)		
Methyl Mercury concentration, ppm (wet weight of fish)	**Meals**	**Fish Species**
0 – 0.150	Unlimited	Pacific cod
		Walleye Pollock
		Pacific ocean perch
		King, Chum, Pink, Red, Silver Salmon
		Halibut up to 19.9 pounds
		Lingcod up to 29.9 inches
>0.150 – 0.320	4/week or 16/month	Sablefish
		Rough eye rockfish
		Halibut 20 – 39.9 pounds
		Lingcod 30 – 39.9 inches
>0.320 – 0.400	3/week or 12/month	Halibut 40 – 49.9 pounds
		Yellow eye rockfish
>0.400 – 0.640	2/week or 8/month	Halibut 50 – 89.9 pounds
		Lingcod 40 – 44.9 inches
>0.640 – 1.23	1/week or 4/month	Salmon shark
		Spiny dogfish
		Halibut ≥ 90 pounds
		Lingcod ≥ 45 inches
Guidelines are unrestricted consumption of all fish from Alaskan waters for other groups.		

In summary, the bioaccumulation test as proposed should follow established testing protocols and interpretation guidance provided in the ITM. However, the results of the bioaccumulation studies can be reviewed within an emphasis on regional applicability as long as the interpretation criteria are clearly delineated and approved prior to submission of the report. We believe the regional guidance for the mercury concentrations and evaluation framework for the bioaccumulation test results can be consistent and recommend the bioaccumulation data on the potential uptake of mercury be compared against these management options.

Comment from Bret Walters regarding acclimation of the reference composite:
Based on our conversations and decisions during meetings in Juneau, The reference area approach is expected to provide the basis for our evaluation of the test results. Results of testing for individual reference site samples are expected to be used as supporting information. Please consider adding acclimation testing to the composite reference sample or explain why that is not necessary for evaluation of the results.

Response to Comment: The reference composite bulk sediment ammonia and sulfide data were well below amphipod threshold levels (<30 mg/L total ammonia pH 7.7). However, the ammonia concentrations for the test composites were higher in the bulk sediment and in one case above threshold testing level. In addition, the interstitial salinity for some the test composites ranged from 21 – 27ppt; we typically conduct the tests at 30 - 32 ppt. Therefore, it is appropriate to *acclimate* the test sediments prior to adding the test organisms.

We agree that the reference composite should be included in the acclimated test scheme to compare the results of the test treatments to a reference that was processed and testing under similar conditions. The plan in the SAP calls for testing using standard protocols and, if necessary, testing using acclimation procedures. We plan to conduct the acclimation tests until after we have the results of each test using the standard protocols without an acclimation period. A summary of the bulk sediment data are included for your review (Table 2).

Table 2. Douglas Harbor Bulk Sediment Water Quality

Treatment*	Total Ammonia (mg/L	Total Sulfide (mg/L)	pH	Salinity (ppt)
Area 1 Upper	15.8	0.200	7.1	25
Area 2 Upper	15.9	0.486	7.7	21
Area 4A Upper	23.1	0.290	7.6	27
Area 4B Upper	36.6	0.502	7.7	27
Ref 1	2.18	0.155	7.3	32
Ref 2	3.4	0.267	7.3	32
Ref 3	4.28	0.498	7.2	32
Ref 4	4.43	0.125	7.2	32
Ref 5	3.87	0.077	7.2	32
Ref Comp	2.57	0.125	7.2	32

* Treatment Lower samples not analyzed due to low pore water content. To be estimated based on elutriation technique combined with dilution assessment.