CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD October 15, 2009

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF FEDERAL OPERATION AND MAINTENANCE DREDGED MATERIAL FROM THE DUWAMISH RIVER, SEATTLE, KING COUNTY, WASHINGTON (*Public Notice CENWS-OD-TS-NS-26*) EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR BENEFICIAL USE OR UNCONFINED OPEN-WATER DISPOSAL AT THE ELLIOTT BAY NONDISPERSIVE SITE.

A. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) regarding the suitability of up to 109,535 cubic yards (cy) of dredged material from the Duwamish River federal navigation channel and turning basin for beneficial use or for disposal at the Elliott Bay nondispersive open-water site.

B. Background. As authorized by Congress in the Rivers and Harbors Acts of 1925 and 1930, the Seattle District, Corps of Engineers (Corps) conducts maintenance dredging of the Seattle Harbor Federal Navigation Project in the lower Duwamish River in Seattle, Washington (see Figure 1 for a project and vicinity map). The authorized depth of the channel is minus 15-feet (mean lower low water, MLLW) with a 2-foot allowable overdepth (to minus 17-feet, MLLW). The authorized dimension for the channel bottom width is 150 feet. The authorized dimensions for the channel's turning basin include a width of 250 feet and a length of 500 feet. This suitability determination covers the authorized project between stations 242+00 and 275+56.

The channel and turning basin between stations 254+00 and 275+56 were last characterized in 2003 and last dredged in 2007-2008. The channel between stations 242+00 and 254+00 was last characterized in 1998 and last dredged in 1999.

The Lower Duwamish Waterway, including the federal navigation channel and turning basin, has been the focus of an investigation by the EPA Superfund program since September 2001. The DMMP characterization of proposed dredged material between stations 242+00 and 275+56 was conducted in consultation with EPA Superfund. Sampling and testing requirements were modified to address particular concerns expressed by EPA.

C. Project Summary. Table 1 includes project summary and tracking information.

Table 1. Project Summary

Project ranking (stations 242+00 to 254+00)	High
Project ranking (stations 254+00 to 275+56)	Low-Moderate
Proposed dredging volume	109,535 cubic yards[1]

Proposed dredging depth	-17 feet MLLW (including overdepth)
Draft SAP received	September 12, 2008
Draft SAP returned for revisions	October 15, 2008
Revised SAP received	October 28, 2008
Revised SAP approved	October 30, 2008
Round 1 sampling dates	November 3-6, 2008
Round 2 sampling dates	March 4-5, 2009
Round 3 sampling date	August 13, 2009
Draft Round 1 and 2 data report received	April 27, 2009
Comments provided on draft report	August 10, 2009
Revised Round 1 and 2 draft data report received	August 24, 2009
Comments provided on revised draft report	September 14, 2009
Final Round 1 and 2 data report received	October 8, 2009
Draft Round 3 data report received	October 28, 2009
Comments provided on Round 3 report	November 6, 2009
Final Round 3 data report received	November 20, 2009
DAIS Tracking number	DUWA09-1-B-F-270
USACE Public Notice Number	CENWS-OD-TS-NS-26
Recency Determination (high rank = 2 years; Low-moderate = 5-7 years)	Turning Basin: March 2014-2016 Shoal: August 2011

[1]Includes a volume increase for DMMU 1 from 16,929 cy prior to Round 1 to 51,592 cy in August 2009 due to additional sedimentation.

D. Project Ranking and Sampling Requirements. The channel and turning basin between stations 254+00 and 275+56 (Section A) are ranked by the Dredged Material Management Program (DMMP) agencies as "low-moderate" concern for potential contamination (DMMP, 2008). The channel between stations 242+00 and 254+00 (Section B) is ranked by the DMMP agencies as "high" concern for potential contamination.

The sediment in Section A was originally considered homogeneous due to rapid shoaling and routine maintenance. The numbers of required samples and dredged material management units (DMMUs) for this area were calculated using the following guidelines (DMMP, 2008):

- Maximum volume of sediment represented by each field sample = 8,000 cubic yards
- Maximum volume of sediment represented by each DMMU = 40,000 cubic yards

In Section B, where the sediment was considered heterogeneous, the number of samples and DMMUs were calculated using the following guidelines:

- Maximum volume of sediment represented by each field sample = 4,000 cubic yards
- Maximum volume of sediment represented by each DMMU in the upper 4 feet of the dredging prism (surface sediment) = 4,000 cubic yards

- Maximum volume of sediment represented by each DMMU in the subsurface portion of the dredging prism (deeper than 4 feet) = 12,000 cubic yards

The estimated dredged material volume between stations 254+00 and 275+56 (Section A; rank = low-moderate) was 33,509 cubic yards prior to Round 1 (the Section A volume increased to 68,172 cubic yards by August 2009 due to additional sedimentation). While this volume could have been covered by a single DMMU, it was split into two DMMUs - one to cover the turning basin and the other for the navigation channel adjacent to the turning basin. Figures 2 and 3 show the DMMU delineation for Section A.

The estimated volume between stations 242+00 and 254+00 (Section B; rank = high) was 41,363 cubic yards. Because the dredging depth in 1999 was -15 feet (MLLW) plus 1 foot of overdepth, and dredging in the current cycle was planned for -15 feet plus 2 feet of overdepth, concern was expressed that the sediment between -16 feet and -17 feet could have higher concentrations of chemicals of concern, reflecting legacy contamination. The DMMP agencies decided to sample this layer separately from the overlying sediment, which had accumulated since 1999. Ten DMMUs were allocated to the sediment between mudline and -16 feet MLLW. Based on consultation with Superfund, a single sampling station was used for each of these DMMUs. Two DMMUs were allocated to the sediment between -16 and -17 feet. Figure 4 shows the DMMU delineation for Section B.

In addition to the sampling requirements stipulated by the Dredged Material Management Program, EPA Superfund requested that samples be taken in side-slope areas due to the close proximity of Section B to upland sources of contamination, elevated contaminant concentrations in sediment adjacent to the channel, and the potential for the side-slope material to slough into the navigation channel during dredging. A total of 13 side-slope stations were included in the sampling and analysis plan (SAP). Sediment from 5 of these stations was slated for immediate analysis, with sediment from the rest of the stations archived for potential future analysis.

E. Sampling and Analysis. Sampling and testing took place in three rounds. Issues with the chemistry and bioassays in the first round prompted a second round of sampling and testing. The third round of testing was necessitated by a shoal in the navigation channel that created an immediate impediment to navigation. The three rounds of sampling and testing are described in the following sections.

1. Round 1 Sampling and Analysis.

Sampling. Round 1 sampling took place November 3-6, 2008. Section A, considered homogeneous at the time, was sampled using a van Veen grab sampler. The two Section-A DMMUs (DMMUs 1 and 2) were each represented by a composite of four grab samples. Ten of the Section-B DMMUs (DMMUs 3 through 12) were represented by vibracore samples taken from mudline to -16 feet MLLW. The two underlying DMMUs in Section B (DMMUs 13 and 14) were each represented by a composite of five vibracore samples from the -16 to -17 foot stratum. At the side-slope stations, samples from the top two feet of sediment and from two to five feet below the mudline were collected. A z-sample (-17 to -18 feet, MLLW) was collected

at each of the Section-B DMMUs. See Figures 2, 3 and 4 for actual sampling locations and Tables 2 and 3 for detailed sampling and compositing information respectively. Station 3 in DMMU 1 was relocated due to the presence of tribal fishing nets at the time of sampling.

Chemical Analysis. Table 4 provides a cross-reference between DMMU and lab sample IDs. It also indicates which analyses were conducted for each DMMU. The sediment conventional results (Table 5) show that the proposed dredged material was predominantly silty sand or sandy silt, with the exception of DMMU 1, which was 80.9% sand and gravel. Total organic carbon ranged from 1.8 to 3.3 percent. Ammonia and total sulfides concentrations were elevated, with ammonia ranging as high as 510 mg/kg and sulfides as high as 749 mg/kg. Ammonia concentrations were the highest ever measured for a dredging project in the federal navigation channel.

Table 6 includes the results from the analysis of standard chemicals of concern. There was a single DMMP screening-level exceedance for DDT in DMMU 9 and an exceedance of the mercury bioaccumulation trigger in the 2-to-5 foot sample from side-slope station ST22. The preliminary chemical results from TestAmerica also indicated that there were numerous exceedances of the DMMP screening level for PCBs. However, Aroclor 1232, which had not been detected previously on the Duwamish, was reported in numerous DMMUs. In addition, total PCB concentrations were significantly higher than seen previously on this part of the Duwamish. The suspect PCB identification and quantification ultimately led the Corps – after Round 2 of testing – to seek data validation by EcoChem, an independent laboratory. The PCB data from TestAmerica were rejected by EcoChem. After the PCB data were rejected, the Corps had archived samples analyzed by a second lab, Analytical Resources Incorporated (ARI). The ARI data were subjected to validation by EcoChem and found to be acceptable for use. Aroclor 1232 was not found by ARI and PCB concentrations were more consistent with what had been seen historically in this part of the Duwamish. Table 20 includes the rejected PCB data from TestAmerica, as well as the PCB data from the analysis of archived sediment by ARI. Only the validated PCB data from the ARI analysis are presented in Table 6.

The dioxin analysis revealed generally higher concentrations at depth, both within the navigation channel and at the side-slope stations (see Table 7). The dioxin concentrations in DMMUs 1 and 2 within Section A of the dredging prism were 1.99 and 2.77 pptr TEQ respectively. In Section B, the mean in the surface DMMUs was 3.18 pptr TEQ, with a range of 1.66 to 4.72 pptr TEQ. The dioxin concentrations in DMMUs 13 and 14 in the -16 to -17 foot stratum were 3.46 and 4.30 pptr TEQ respectively. The z-samples in Section B, however, had a mean of 6.31 pptr TEQ and a range of 2.57 to 10.75 pptr TEQ. The mean of the 0-to-2 foot samples from the side-slope stations was 3.51 pptr TEQ, while the mean of the 2-to-5 foot samples was 7.27 pptr TEQ. Dredging of DMMUs 13 and 14 would expose the elevated concentrations of dioxin in the z-samples, thus representing a degradation of conditions in comparison to the predredge surface. In consideration of this, the Corps decided after the first Round of testing not to pursue dredging of DMMUs 13 and 14.

Chemical Analysis QA/QC. DMMP QA/QC requirements are shown in Table 8. SAIC performed a QA1 review for all data and EcoChem conducted stage-4 data validation for

dioxins and PCBs. Following is a summary of those aspects of the laboratory review, QA1 review and data validation that resulted in data qualification or rejection:

a. Representativeness:
   - Conventionals: The holding time of 7 days was exceeded by 1-2 days for ammonia for 24 samples. Results for these samples were "J" qualified. Field triplicates were run for all conventionals. The RSD limit of 20% was exceeded for sulfides in one batch and total volatile solids in another. The RSD limit of 20% was exceeded for some grain-size fractions in both batches. Replicate results were "J" qualified for these parameters.
   - Semivolatiles: Field duplicates were run for organics. The RPD limit of 35% was exceeded for acenaphthene in one batch and for 2-methylnaphthalene and dibenzo(a,h)anthracene in another. Replicate results were "J" qualified for these parameters when concentrations were significantly above the reporting limit.

b. Quantitation Limits:
   - Detected values falling between the method detection limit and reporting limit were "J" qualified as estimates.

c. Method Blanks:
   - Results for samples associated with method blanks in which an analyte was detected above the method detection limit, were "B" qualified.

d. Precision:
   - Semivolatiles: The MS/MSD RPD for fluoranthene exceeded the laboratory control limit in one batch and resulted in a "J" qualifier for all associated samples.

e. Accuracy:
   - Semivolatiles: In addition to low precision, fluoranthene was qualified "J" due to low matrix spike recovery.

f. Data Validation:
   - The PCB data from TestAmerica were rejected due to lack of second column confirmation and likely interference from other compounds.

<u>Bioassays.</u> On the basis of the preliminary data - which indicated a number of exceedances of the screening level for PCBs and a single exceedance for DDT - bioassays were conducted on those DMMUs exceeding SL, with the exception of DMMU 13, which was to be left in place due to the elevated dioxin concentrations in the underlying z-layer.

SAIC attempted to collect reference sediment from Dabob Bay on December 19, 2008. However, due to adverse weather conditions and deeper water than anticipated, only a coarse-grained sample was able to be collected (REF-01-DB). SAIC had previously collected Sequim Bay reference sediment (SB-REF-48 and SB-REF-76) for another project and had sufficient volume remaining for use in the Duwamish bioassays. The Sequim Bay sediment, collected on November 25, was still within the 56-day holding time and had been stored in the dark at 4º C at the NewFields laboratory.

The standard suite of three bioassay tests (amphipod mortality, larval development, and polychaete growth) was performed on the seven DMMUs with SL exceedances. The DMMP interpretation guidelines for non-dispersive disposal sites were used to assess the bioassay results. The interpretation guidelines are found in Table 9. Negative control and reference sediments met DMMP performance criteria for all three bioassays (Table 10). Test sediments

were matched with the reference sediments on the basis of grain-size distribution. Table 11 provides the match-ups between test and reference sediment samples.

Amphipod Mortality. The amphipod bioassay test results are shown in Table 12. The test sediments performed well and there were no hits for any DMMU. The salinity values were slightly out of range for the negative control. However, the negative control performed well so the effect, if any, of this deviation was negligible. The maximum pH for several of the test and reference samples exceeded the water chemistry guidelines, but since all samples performed well, these minor deviations did not affect the end result of the bioassay.

Polychaete Growth. The *Neanthes* results are displayed in Table 13. The test sediments performed well and there were no hits for any DMMU. The air flow for a few replicates for SB-REF-48 was temporarily disrupted during the test and dissolved oxygen dropped to as low as 1.1 mg/L in this treatment. Air flow was restored immediately upon discovery. Because there was no mortality, and growth was acceptable, the temporary reduction in dissolved oxygen did not appear to have a significant negative impact on performance and the results for SB-REF-48 were deemed suitable for use in the interpretation of the bioassay results.

Larval Development. Due to a communication failure, the larval test was not aerated, despite the high bulk sulfides and ammonia concentrations. The results are shown in Table 14. All DMMUs scored hits under the 1-hit rule, which would normally make the dredged material unsuitable for open-water disposal. However, based on past experience (DMMP, 1991), the Corps believed that ammonia may have played a role in producing the responses seen in the test samples.

Decision to Retest. The DMMP agencies considered the circumstances surrounding the first round of testing: 1) the larval test had not been aerated despite high bulk sulfides and ammonia concentrations; 2) the turning basin material had never failed testing previously; 3) the PCB results were suspect given the reported presence of Aroclor 1232 - a PCB mixture not seen previously on the Duwamish River - and concentrations much higher than those previously found.

In light of these concerns and issues, the DMMP agencies authorized the Corps to resample and retest the DMMUs that had been subjected to bioassays. Resampling would include vibracore samples in Section A to better represent the entire dredge prism. Full chemistry (with the exception of dioxin) and bioassays would be required in Section A. Retesting in Section B would focus on PCBs and the larval test. The larval test would be aerated for both Section A and B samples.

2. Round 2 Sampling and Analysis.

Revised Volume for DMMU 1. A full bathymetric survey was not conducted prior to Round 2, so revised volumes could not be calculated. However, water depths were measured with a fathometer at the sampling stations during the Round 2 sampling event and are reported in

Table 15. These water depths were comparable to depths measured in an August 2009 bathymetric survey. The August 2009 survey resulted in a revised volume of 51,592 for DMMU 1 due to additional sedimentation. Because the water depths in March were similar to those measured in August, the Round 2 samples can be considered representative of the volume in place in August. The revised volume for DMMU 1 is included in Table 16 and in the total volume for the project.

Sampling. In the second round, vibracore samples were taken from Section A (DMMUs 1 and 2) – instead of van Veen grab samples – in order to better represent the entire dredging prism. Sampling in Section B was restricted to those DMMUs that were subjected to biological testing in the first round (DMMUs 3, 4, 6, 9 and 11). No side-slope stations or Z-samples were collected in Round 2. See Figures 2, 3 and 4 and Table 15 for actual sampling locations and Table 16 for detailed sampling and compositing information.

Chemical Analysis. Table 17 provides a cross-reference between DMMU and lab sample IDs. It also indicates which types of analysis were conducted for each DMMU. The sediment conventional results (Table 18) were similar to Round 1, with the exception of DMMU 2, which had a much higher sand content in Round 2. The Round 2 ammonia and total sulfides concentrations were markedly different when compared to Round 1. Ammonia was much lower, while total sulfides were generally much higher. A different analysis method was used in the second round for ammonia, which may be the reason for the difference in concentrations. The reason for the difference in the total sulfides concentrations is unknown. Sulfides were as high as 2,200 mg/kg in Round 2.

Table 19 includes the results from the analysis of standard chemicals of concern. In Section A, there was a single SL exceedance for benzyl alcohol in a QA duplicate for DMMU 2. In Section B, the preliminary PCB data from TestAmerica indicated that DMMUs 4 and 9 had exceeded the screening level. While the PCB concentrations were generally lower than those reported in Round 1, Aroclor 1232 was again reported in the majority of samples. At this point, the Corps had the TestAmerica PCB data for Rounds 1 and 2 reviewed by EcoChem, which rejected the data. The Corps had ARI analyze archived samples from Rounds 1 and 2. The ARI data were validated and found acceptable for use. Aroclor 1232 was not found by ARI and PCB concentrations were more consistent with what had been seen historically in this part of the Duwamish. Table 20 includes the rejected PCB data from TestAmerica, as well as the PCB data from the analysis of archived sediment by ARI. Only the validated PCB data from the ARI analysis are presented in Table 19.

Chemical Analysis QA/QC. SAIC performed a QA1 review for all data and EcoChem conducted stage-4 data validation for PCBs. Following is a summary of those aspects of the laboratory review, QA1 review and data validation that resulted in data qualification or rejection:

a. Representativeness:

- Conventionals: Field triplicates were run for all conventionals. The RSD limit of 20% was exceeded for some grain-size fractions. Replicate results were "J" qualified for these parameters.
- Semivolatiles: Field duplicates were run for organics. The RPD limit of 35% was

exceeded for benzoic acid, benzyl alcohol, phenol, phenanthrene, 3-methylphenol and 4-methylphenol. Replicate results were "J" qualified for these parameters when concentrations were significantly above the reporting limit.

b. Quantitation Limits:
   - Detected values falling between the method detection limit and reporting limit were "J" qualified.

c. Method Blanks:
   - Results for samples associated with method blanks in which an analyte was detected above the method detection limit, were "B" qualified.

d. Precision:
   - None.

e. Accuracy:
   - Pesticides: Recovery of 4,4-DDT was outside the control limits for the laboratory control sample and outside the 95% confidence interval for the certified reference material. All DDT results were "J" qualified.

f. Data Validation:
   - The PCB data from TestAmerica were rejected due to lack of second column confirmation and likely interference from other compounds.

Bioassays. Bioassays were run concurrently with the chemical analysis in Round 2. The two DMMUs in Section A were subjected to the full suite of bioassays, while the five DMMUs in Section B were tested with the larval development bioassay only.

SAIC collected reference sediment from Carr Inlet on March 6, 2009.

Negative control and reference sediments met DMMP performance criteria for all three bioassays (Table 21). Test sediments were matched with the reference sediments on the basis of grain-size distribution. Table 22 provides the match-ups between test and reference sediment samples.

Amphipod Mortality. The amphipod bioassay test results are shown in Table 23. The test sediments performed well and there were no hits for either of the two DMMUs tested. The temperature was slightly out of range for DMMU 1 and reference sample MSMP-43. But as these samples both performed well, the minor temperature deviations did not adversely affect the end result of the bioassay.

Polychaete Growth. The *Neanthes* results are displayed in Table 24. DMMU 2 scored a hit under the 2-hit rule, with a mean individual growth rate that was only 52% of reference CR-23W. There was no hit for DMMU 1. The temperature was slightly out of range for all samples, with the maximum temperature ranging from 21.1º to 21.8º C. The recommended maximum is 21º C. But, as the maximum temperature for both DMMU 2 and CR-23W was only 21.1º C, the temperature deviations were not expected to have adversely impacted the results of the test.

Larval Development. The larval development results can be found in Table 25. The larval test was aerated in Round 2, but the results were similar to Round 1, with the exception of DMMU 1. DMMUs 3, 4, 6, 9 and 11 all scored hits under the single-hit rule, with seawater-normalized combined mortality and abnormality (NCMA) more than 30% greater than their respective reference samples. DMMU 2 scored a hit under the two-hit rule, with NCMA significantly greater than reference, but less than 30% over reference. DMMU 1 had no hits in the larval test.

3. Round 3 Sampling and Analysis.

The bioassay failures in Rounds 1 and 2 created a situation in which Section B DMMUs were either unsuitable for open-water disposal or were not economically feasible to dredge. However, one large shoal in Section B presented an immediate hazard to navigation. Therefore, the Corps of Engineers proposed characterization of just the top three feet of sediment in this shoal. The DMMP agencies agreed to the testing, but stipulated that bioassays would need to be run concurrently with chemical analysis for both the proposed dredged material and the material to be exposed by dredging (the z-sample).

Sampling. In the third round, vibracore samples were taken from the main shoal in Section B to represent DMMU 15 (see Figure 5). Samples were taken from mudline to -11 ft MLLW to represent the proposed dredged material and from -11 to -12 ft to represent the material that would be exposed by dredging of DMMU 15. See Table 26 for actual sampling locations and Table 27 for detailed sampling and compositing information.

Chemical Analysis. Table 28 provides a cross-reference between DMMU and lab sample IDs. It also indicates which types of analysis were conducted. The sediment conventional results (Table 29) showed that DMMU 15 and the underlying z-layer were similar, with fines content of 70.9 and 64.1% respectively and TOC of 2.43 and 2.46%. Ammonia concentrations were moderate (148 and 145 mg/kg), but the sulfides concentrations were very high with DMMU 15 measured at 2,700 mg/kg and the z-sample at 3,570 mg/kg.

Table 30 includes the results from the analysis of standard chemicals of concern. In DMMU 15, the total PCB concentration was 186 ug/kg, which exceeded the SL of 130 ug/kg. In the z-sample, the total DDT concentration was 7.8 ug/kg, exceeding the SL of 6.9 ug/kg. There were no other SL exceedances.

Chemical Analysis QA/QC. EcoChem conducted stage-4 validation for all data. Following is a summary of those aspects of the laboratory review and data validation that resulted in data qualification:

a. Representativeness:
   - Semivolatiles: For sample DR09-B-D15-CO-3, a single peak was present near the expected retention times for benzo(b)fluoranthene and benzo(k)fluoranthene. The spectra for these compounds are identical, so the compounds can only be differentiated by the retention times, which are only separated by two seconds. Since the laboratory could not determine whether the peak represented one of the analytes or a co-elution of both analytes, both analytes were reported at concentrations representing half of the

peak area. However, since neither the identification nor concentration could be confirmed, both results were qualified as tentative identifications and estimated concentrations (JN).

b. Quantitation Limits:
- Detected values falling between the method detection limit and reporting limit were "J" qualified as estimates.

c. Precision:
- Conventionals: A laboratory triplicate was analyzed for grain size using sample DC09-B15-CO-3. The percent relative standard deviation (%RSD) was greater than the control limit of 35% for the medium silt and fine silt fractions. The results for these fractions in the parent sample were estimated (J).
- Pesticides: The RPD for laboratory duplicates was outside the control limits for 4-4'-DDT. The result for this analyte was estimated (J) in the parent sample.

d. Accuracy:
- Metals: Antimony recovery was lower than the lower control limit for both the MS and MSD analyses. The associated non-detect for sample DC09-B15-CO-3 was qualified as estimated (UJ) to indicate a possible low bias.
- Volatiles: Recoveries for all target analytes were less than the lower control limits for both the MS and MSD analyses. No target analytes were detected in any sample; the results for eight of the nine analytes in the parent sample DC09-B15-CO-3 were qualified as estimated (UJ). The recovery for 1,2,4-trichlorobenzene was less than 10% in both the MS and MSD. Due to the significant low bias, the sample result was rejected (R). However, ARI also analyzed 1,2,4-trichlorobenzene as a semivolatile using selected ion monitoring. The MS/MSD recoveries for that analysis were acceptable and the SIM results for 1,2,4-trichlorobenzene were used in place of the rejected value.
- Semivolatiles: Recoveries for benzoic acid and bis(2-ethylhexyl)phthalate were less than the lower control limits for both the MS and MSD analyses. Benzoic acid was not detected in the parent sample, so was qualified UJ. Bis(2-ethylhexyl)phthalate was qualified as estimated (J).

Bioassays. Bioassays were run concurrently with the chemical analysis in Round 3. DMMU 15 and the underlying z-sample were subjected to the full suite of DMMP bioassays.

SAIC collected reference sediment from Carr Inlet on August 14, 2009.

Negative control and reference sediments met DMMP performance criteria for all three bioassays (Table 31). The Carr Inlet reference sediment grain size matched up well with the two test sediments.

Amphipod Mortality. The amphipod bioassay test results are shown in Table 32. The test sediments performed well and there were no hits for either DMMU 15 or the z-sample. The salinity was slightly out of range, with maximum salinity measurements for all samples equal to 30 ppt. The recommended range is 28±1 ppt. But, as the control and reference treatments performed well and there were no hits in this bioassay, the elevated salinity did not adversely affect the results of the test.

Polychaete Growth. The *Neanthes* results are displayed in Table 33. DMMU 15 scored a hit under the 2-hit rule, with a mean individual growth rate that was 69% of reference CR-24 and statistically different. There was no hit for the underlying z-sample. The salinity was slightly out of range for the z-sample and reference, with a maximum salinity measurement for these samples of 30.5 ppt. The recommended range is 28±2 ppt. But, as the reference treatment out-performed the control and there were was no hit for the z-sample, the elevated salinity did not adversely affect the results of the test.

Larval Development. The larval development results can be found in Table 34. The larval test was aerated in Round 3. DMMU 15 scored a hit under the 2-hit rule, with the difference between the seawater-normalized combined mortality and abnormality of the test and reference sediments being statistically significant. The z-sample passed this bioassay. The reference toxicant test indicated that the test organisms were on the sensitive end of the normal range. The 48-hour EC50 was 5.75 mg/l Cd (see Table 31), which falls outside the laboratory control limits of 6.38 - 12.4 mg/L Cd but within the laboratory action limits of 4.86 – 14.0 mg/L Cd. The laboratory concluded that since the EC50 was within the action limits, and since there was no evidence that the organisms were unusual in any way, the test should be considered valid. The DMMP agencies reviewed the bioassay data as a whole and determined that because the control and reference both met their performance standards in the larval test, and because the results of the larval test were corroborated by the polychaete growth test, the larval test should be considered valid.

F. Summary of Rounds 1, 2 and 3. Results from the three rounds of chemical and biological testing can be summarized as follows:

- DMMU 1 passed biological testing and its dioxin concentration of 1.99 pptr TEQ meets the interim guideline of 8.7 pptr TEQ for the Elliott Bay disposal site. DMMU 1 is therefore suitable for open-water disposal at the Elliott Bay site.
- DMMUs 5, 7, 8, 10 and 12 did not exceed any screening levels and, therefore, did not require biological testing. While suitable for open-water disposal under the DMMP guidelines, the Corps of Engineers deemed these DMMUs infeasible to dredge, considering the potential economic and environmental issues associated with trying to dredge relatively small pockets of suitable material.
- DMMUs 13 and 14 did not exceed any screening levels and, therefore, did not require biological testing. While suitable for open-water disposal under the DMMP guidelines, the Corps of Engineers decided after Round 1 not to pursue dredging of these two DMMUs because of elevated concentrations of dioxin in the underlying z-samples.
- DMMUs 2, 3, 4, 6, 9, 11 and 15 all failed biological testing and are unsuitable for open-water disposal.

G. Sediment Exposed by Dredging. The Corps of Engineers is planning to dredge the turning basin (DMMU1) and DMMU 15. DMMU 1 will be disposed at the Elliott Bay open-water disposal site, while DMMU 15 will be taken to an upland disposal facility. Sediment exposed by dredging must either meet the State of Washington Sediment Quality Standards (SQS) (Ecology, 1995) or the State's antidegradation standard (DMMP, 2001). In the case of DMMU 1, for which the underlying z-samples were not analyzed, comparison of the proposed dredged

material to SQS serves as a first-tier indicator for this purpose. Table 35 shows there were no exceedances of SQS. Therefore, the DMMP agencies agreed that there was no need for analysis of Z-samples for DMMU 1. The sediment that will be exposed by dredging of DMMU 1 is not anticipated to have any exceedances of SQS.

In the case of DMMU 15, the underlying sediment was tested both chemically and biologically. The concentrations of COCs in the z-sample were generally less than those in DMMU 15, including total PCBs with a concentration of 186 ug/kg in DMMU 15 and 68 ug/kg in the z-sample. One exception was total DDT, which was undetected in DMMU 15 but detected at a concentration of 7.8 ug/kg in the z-sample. In the bioassays, DMMU 15 failed, scoring hits under the 2-hit rule in both the *Neanthes* and larval tests. The z-sample had no hits in any of the bioassays. Therefore, the bioassay results indicate that the sediment underlying DMMU 15 is less toxic than the sediment in DMMU 15. Taken together, the weight of evidence provided by the chemical and biological test results indicates that dredging of DMMU 15 would not expose sediment that is degraded relative to the currently exposed sediment.

H. Beneficial-Use Analysis. DMMU 1 was evaluated for beneficial use. As indicated in the previous section, this dredged material management unit had no SQS exceedances. Because there is no numeric SQS for dioxin, the DMMP agencies have used a 2.44 pptr Samish Bay reference guideline for decision-making in recent projects. The TEQ for DMMU 1 was below this guideline. The Sediment Quality Standards and Samish Bay reference pertain to marine sediment; therefore the dredged material is suitable for beneficial use in a marine environment.

To assess the suitability for upland beneficial use, the chemical results were compared to the Model Toxics Control Act (MTCA) guidelines (Ecology, 2005). Table 36 indicates that the concentration of arsenic exceeds the Method B guideline for carcinogens for DMMU 1. Therefore, the dredged material may be unsuitable for some types of upland use. Ecology, DNR and the local health department should be consulted if upland beneficial use is contemplated. All other chemicals were below MTCA guidelines.

I. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment proposed for dredging from the federal navigation project on the Duwamish River for beneficial use or open-water disposal. The approved sampling and analysis plan was followed with the exceptions noted above. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program.

Based on the results of the previously described testing, the DMMP agencies conclude that the 34,389 cubic yards of sediment in DMMUs 2, 3, 4, 6, 9, 11 and 15 are unsuitable for open-water disposal, while the 75,146 cubic yards in DMMUs 1, 5, 7, 8, 10, 12, 13 and 14 are suitable for open-water disposal at the Elliott Bay non-dispersive site. While eight DMMUs are suitable for open-water disposal under the DMMP guidelines, the Corps of Engineers decided it was not feasible to dredge DMMUs 5, 7, 8, 10, 12, 13 and 14. Only DMMU 1 will be dredged and disposed at the Elliott Bay open-water disposal site (DMMU 15 will be dredged and disposed upland). The dredged material in DMMU 1 is also suitable, from a chemical and toxicity standpoint, for beneficial use in a marine environment. Upland beneficial use of DMMU 1 would require additional consultation with Ecology, DNR and the local health department.

This suitability determination does ***not*** constitute final agency approval of the project. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under section 404(b)(1) of the Clean Water Act.

J. References.

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SAIC, 2009c. Dredged Material Characterization for the Duwamish River Navigation Channel – Data Report Addendum, Seattle, Washington. Prepared by Science Applications International Corporation for the U.S. Army Corps of Engineers Seattle District. October 2009.

K. Agency Signatures.

Concur:

10/15/09 David F. Fox
Date David Fox, P.E. - Seattle District Corps of Engineers

10/15/09 Erika Hoffman
Date Erika Hoffman - Environmental Protection Agency

10/15/2009 Laura Inouye
Date Laura Inouye, Ph.D. - Washington Department of Ecology

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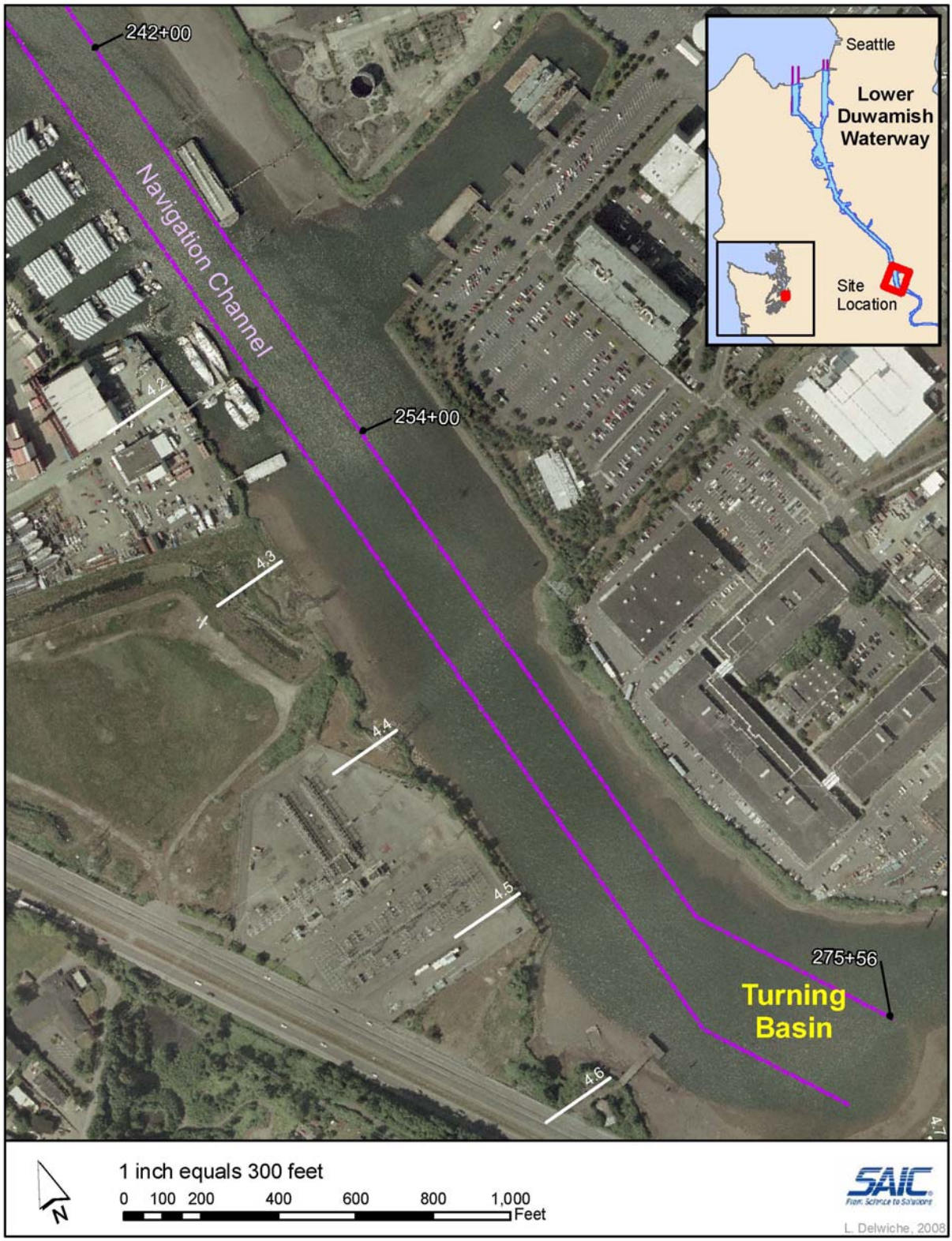

Figure 1 - Project Site for the Duwamish River Dredged Material Characterization

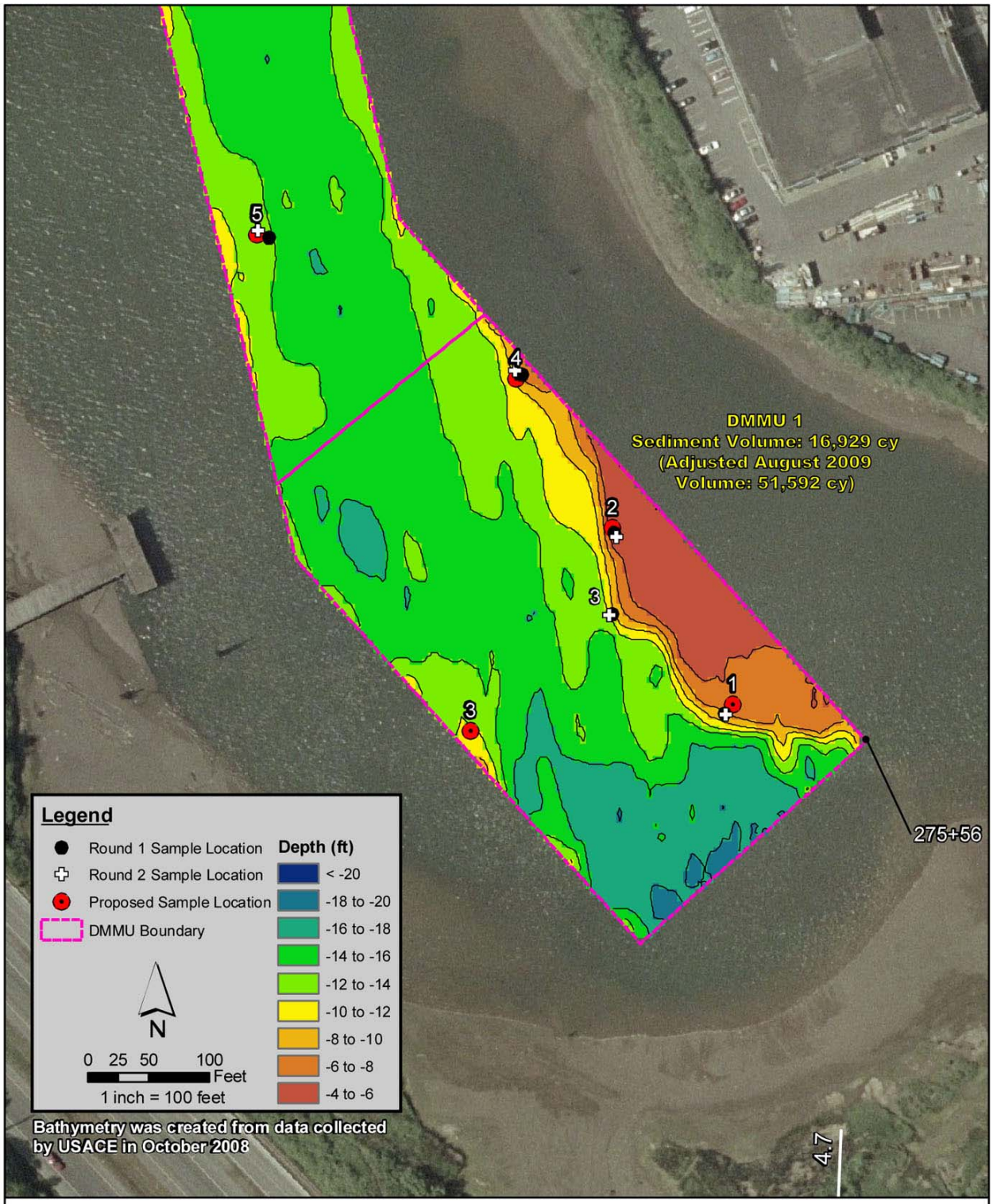

Figure 2 – Target and Actual Sampling Locations in Section A, DMMU 1

SAIC From Science to Solutions

L. Delwiche, 2008

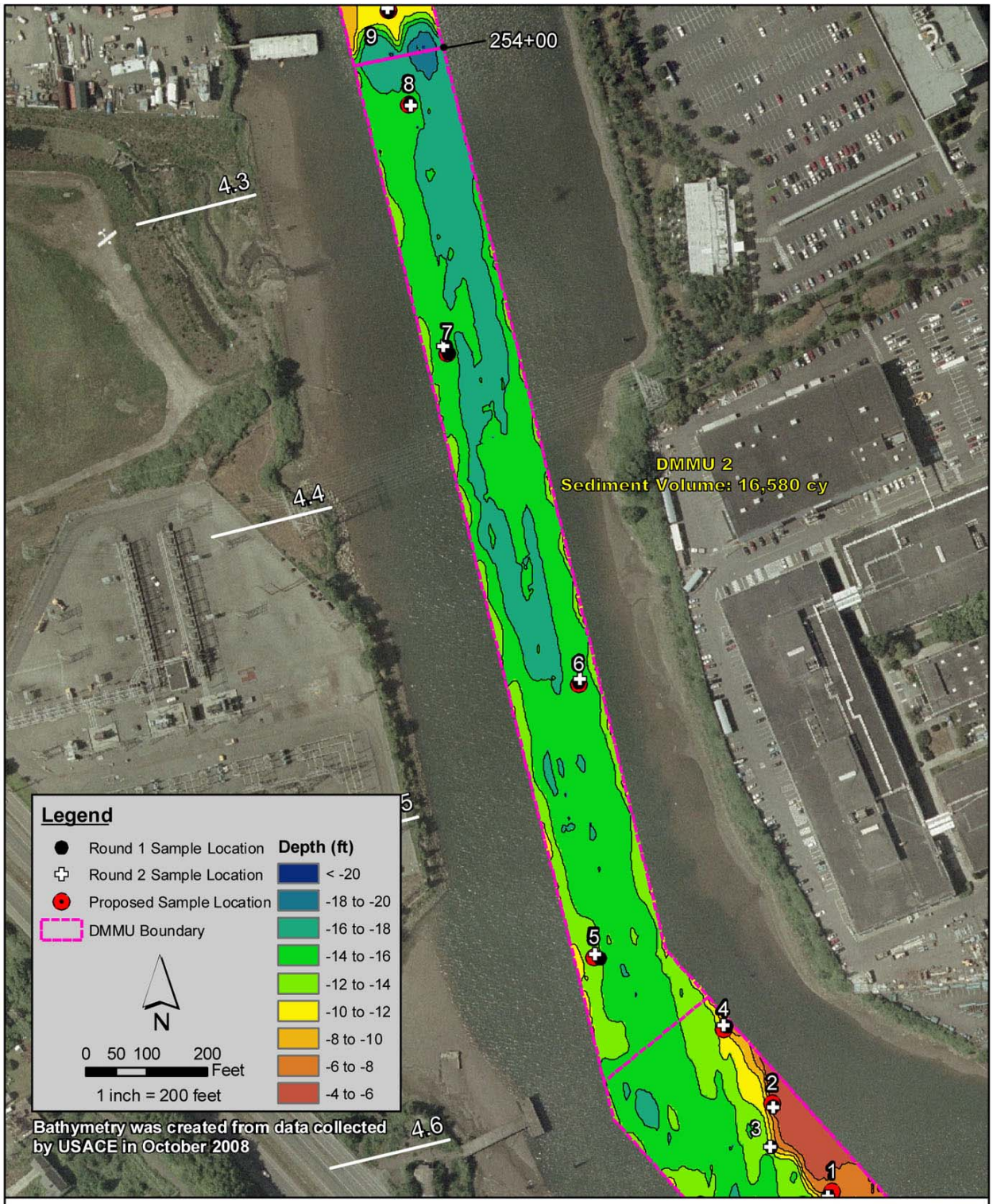

Figure 3 – Target and Actual Sampling Locations in Section A, DMMU 2

SAIC From Science to Solutions

L. Delwiche, 2008

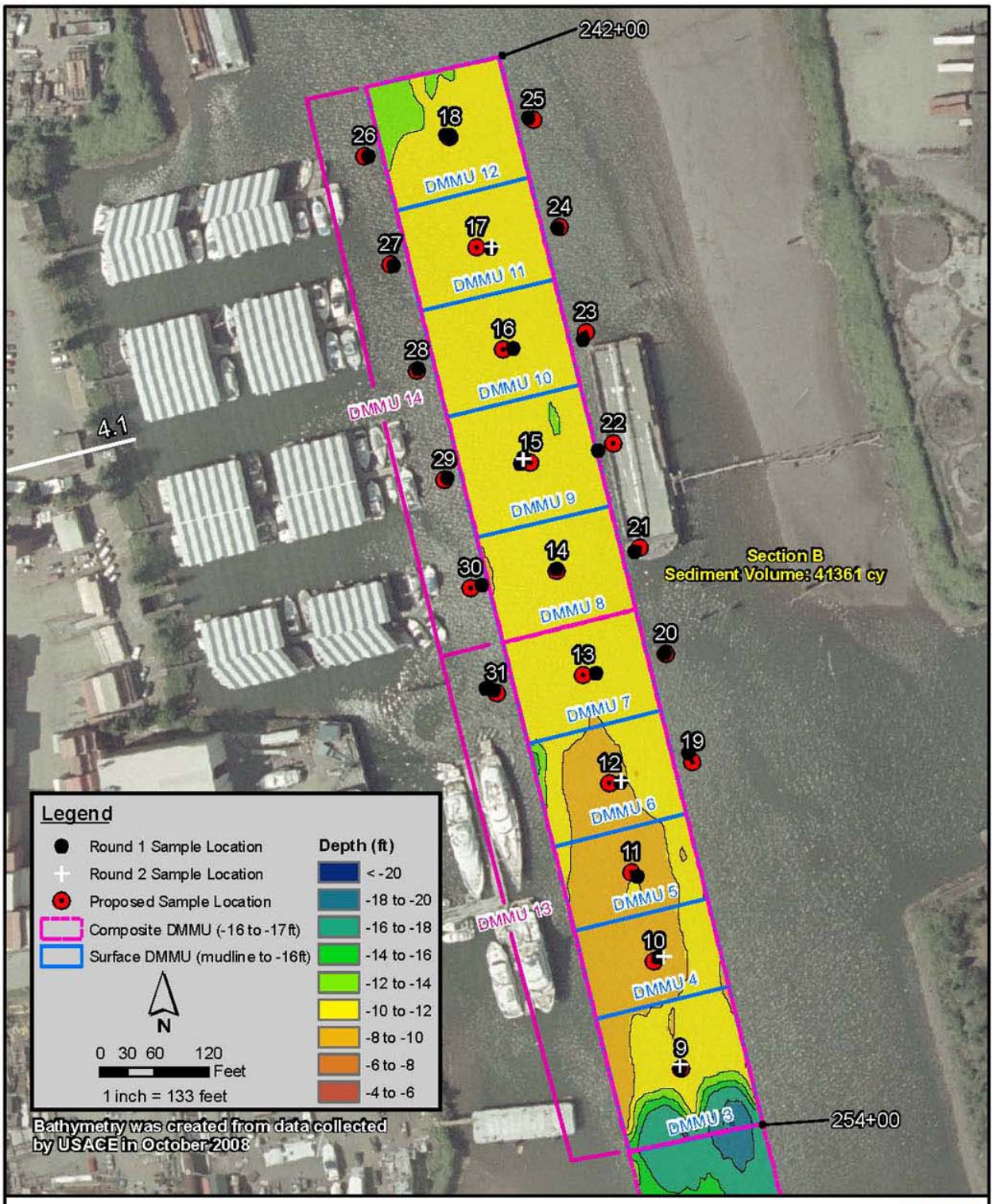

Figure 4 – Target and Actual Sampling Locations in Section B and Side Slopes

L. Delwiche, 2008

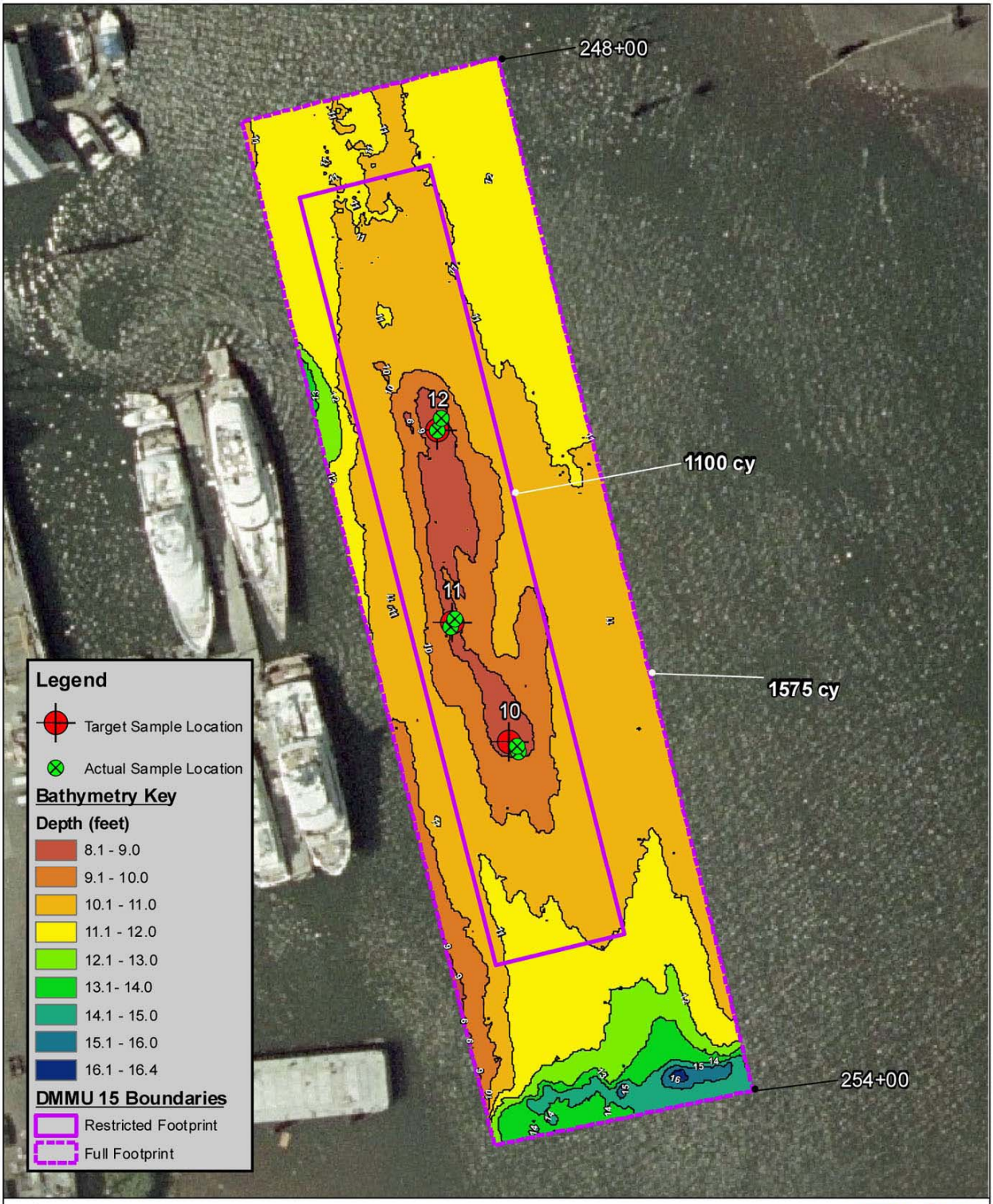

Figure 5 – Target and Actual Sampling Locations for DMMU 15

N

0 20 40 80 120 160 200 Feet

SAIC
From Science to Solutions
J. Nuwer, 2009

Station ID	Section	Type	Latitude[1]	Longitude[1]	Mudline Elevation, ft (MLLW)	**Sample Type**
1	A	DMMU	47.512320	122.302912	-7.8	van Veen
2	A	DMMU	47.512720	122.303288	-5.5	van Veen
3[2]	A	DMMU	47.512538	122.303292	-16.0	van Veen
4	A	DMMU	47.513073	122.303605	-12.3	van Veen
5	A	DMMU	47.513370	122.304458	-14.7	van Veen
6	A	DMMU	47.514618	122.304637	-16.3	van Veen
7	A	DMMU	47.516118	122.305563	-16.0	van Veen
8	A	DMMU	47.517208	122.305833	-16.6	van Veen
9	B	DMMU	47.517622	122.305988	-11.7	vibracore
10	B	DMMU	47.517957	122.306095	-11.3	vibracore
11	B	DMMU	47.518200	122.306197	-11.1	vibracore
12	B	DMMU	47.518482	122.306280	-11.6	vibracore
13	B	DMMU	47.518808	122.306395	-11.5	vibracore
14	B	DMMU	47.519120	122.306583	-11.8	vibracore
15	B	DMMU	47.519453	122.306740	-10.8	vibracore
16	B	DMMU	47.519780	122.306795	-11.1	vibracore
17	B	DMMU	47.520082	122.306902	-10.9	vibracore
18-1	B	DMMU	47.520422	122.307115	-12.8	vibracore
18-2[3]	B	DMMU	47.520413	122.307090	-12.7	vibracore
19	B	SS	47.518575	122.305982	-12.4	vibracore
20	B	SS	47.518873	122.306095	-12.2	vibracore
21	B	SS	47.519177	122.306235	-10.1	vibracore
22	B	SS	47.519480	122.306407	-12.5	vibracore
23	B	SS	47.519813	122.306482	-11.7	vibracore
24	B	SS	47.520148	122.306605	-12.0	vibracore
25	B	SS	47.520477	122.306747	-11.2	vibracore
26	B	SS	47.520352	122.307453	-13.7	vibracore
27	B	SS	47.520027	122.307332	-13.2	vibracore
28	B	SS	47.519717	122.307215	-9.9	vibracore
29	B	SS	47.519390	122.307077	-11.3	vibracore
30	B	SS	47.519067	122.306913	-11.7	vibracore
31	B	SS	47.518757	122.306883	-11.6	vibracore

[1]datum = North American Datum 1983
[2]station 3 was relocated due to the presence of tribal fishing nets at the time of sampling
[3]two cores were needed from location 18 to provide adequate sample volume

DMMU = dredge material management unit; SS = side slope

DMMU	Section	Station	Sample Depth	Volume (CY)
1	A	1	top 10 cm	16,929[1]
	A	2	top 10 cm	
	A	3	top 10 cm	
	A	4	top 10 cm	
2	A	5	top 10 cm	16,580
	A	6	top 10 cm	
	A	7	top 10 cm	
	A	8	top 10 cm	
3	B	9	mudline to -16 ft MLLW	3,394
4	B	10	mudline to -16 ft MLLW	3,467
5	B	11	mudline to -16 ft MLLW	3,405
6	B	12	mudline to -16 ft MLLW	3,785
7	B	13	mudline to -16 ft MLLW	3,339
8	B	14	mudline to -16 ft MLLW	3,459
9	B	15	mudline to -16 ft MLLW	3,982
10	B	16	mudline to -16 ft MLLW	3,414
11	B	17	mudline to -16 ft MLLW	3,181
12	B	18	mudline to -16 ft MLLW	3,370
13	B	9	-16 to -17 ft MLLW	3,094
	B	10	-16 to -17 ft MLLW	
	B	11	-16 to -17 ft MLLW	
	B	12	-16 to -17 ft MLLW	
	B	13	-16 to -17 ft MLLW	
14	B	14	-16 to -17 ft MLLW	3,473
	B	15	-16 to -17 ft MLLW	
	B	16	-16 to -17 ft MLLW	
	B	17	-16 to -17 ft MLLW	
	B	18	-16 to -17 ft MLLW	

[1]The volume of DMMU 1 increased to 51,592 cy by August 2009 due to additional sedimentation.

Primary Samples	DMMU	Conventionals	Standard COCs	dioxin	vanadium	bioassays	archive only
DR08-A-D01-S	DMMU 1	X	X	X	X	X	
DR08-A-D02-S	DMMU 2	X	X	X	X	X	
DR08-B-D03-C	DMMU 3	X	X	X	X	X	
DR08-B-D04-C	DMMU 4	X	X	X	X	X	
DR08-B-D05-C	DMMU 5	X	X		X		
DR08-B-D06-C	DMMU 6	X	X	X	X	X	
DR08-B-D07-C	DMMU 7	X	X		X		
DR08-B-D08-C	DMMU 8	X	X	X	X		
DR08-B-D09-C	DMMU 9	X	X		X	X	
DR08-B-D10-C	DMMU 10	X	X	X	X		
DR08-B-D11-C	DMMU 11	X	X		X	X	
DR08-B-D12-C	DMMU 12	X	X	X	X		
DR08-B-D13-C	DMMU 13	X	X	X	X		
DR08-B-D14-C	DMMU 14	X	X	X	X		
Z-samples	Overlying DMMUs						
DR08-B-D03-Z	DMMUs 3 and 13						X
DR08-B-D04-Z	DMMUs 4 and 13						X
DR08-B-D05-Z	DMMUs 5 and 13						X
DR08-B-D06-Z	DMMUs 6 and 13	X		X			
DR08-B-D07-Z	DMMUs 7 and 13						X
DR08-B-D08-Z	DMMUs 8 and 14	X		X			
DR08-B-D09-Z	DMMUs 9 and 14						X
DR08-B-D10-Z	DMMUs 10 and 14	X		X			
DR08-B-D11-Z	DMMUs 11 and 14						X
DR08-B-D12-Z	DMMUs 12 and 14	X		X			
side-slope samples	Adjacent DMMU						
DR08-B-ST19-C0-2	DMMU 6						X
DR08-B-ST19-C2-5	DMMU 6						X
DR08-B-ST20-C0-2	DMMU 7						X
DR08-B-ST20-C2-5	DMMU 7						X
DR08-B-ST21-C0-2	DMMU 8	X	X	X	X		
DR08-B-ST21-C2-5	DMMU 8	X	X	X	X		
DR08-B-ST22-C0-2	DMMU 9	X	X	X	X		
DR08-B-ST22-C2-5	DMMU 9	X	X	X	X		
DR08-B-ST23-C0-2	DMMU 10	X	X	X	X		
DR08-B-ST23-C2-5	DMMU 10	X	X	X	X		
DR08-B-ST24-C0-2	DMMU 11						X
DR08-B-ST24-C2-5	DMMU 11						X
DR08-B-ST25-C0-2	DMMU 12						X
DR08-B-ST25-C2-5	DMMU 12						X
DR08-B-ST26-C0-2	DMMU 12						X
DR08-B-ST26-C2-5	DMMU 12						X
DR08-B-ST27-C0-2	DMMU 11						X
DR08-B-ST27-C2-5	DMMU 11						X
DR08-B-ST28-C0-2	DMMU 10	X	X	X	X		
DR08-B-ST28-C2-5	DMMU 10	X	X	X	X		
DR08-B-ST29-C0-2	DMMU 9						X
DR08-B-ST29-C2-5	DMMU 9						X
DR08-B-ST30-C0-2	DMMU 8						X
DR08-B-ST30-C2-5	DMMU 8						X
DR08-B-ST31-C0-2	DMMU 7	X	X	X	X		
DR08-B-ST31-C2-5	DMMU 7	X	X	X	X		
QA samples	DMMU						
DR08-B-D03-D	DMMU 3	X	X		X		
DR08-B-D03-T	DMMU 3	X					
DR08-B-D04-D	DMMU 4	X	X		X		
DR08-B-D04-T	DMMU 4	X					
Bioassay Reference Samples	Reference Bay						
REF-01-DB	Dabob Bay	X				X	
SB-REF-48	Sequim Bay	X				X	
SB-REF-76	Sequim Bay	X				X	

Sample ID:	DR08-A-D01-S			DR08-A-D02-S			DR08-B-D03-C			DR08-B-D03-D			DR08-B-D03-T			DR08-B-D04-C			DR08-B-D04-D			DR08-B-D04-T		
Collection Date:	11/06/2008			11/06/2008			11/05/2008			11/05/2008			11/05/2008			11/05/2008			11/05/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Conventionals																								
Ammonia (mg N/kg DW)	430		J	510		J	360			370			370			370		J	380		J	360		J
Total Volatile Solids (% WW)	7.3			10			8.3			8.3			8.1			15		J	8		J	8.3		J
Total Organic Carbon (% WW)	1.8			3.2			2.7			2.5			2.7			2.6			2.6			2.7		
Sulfide (mg/kg DW)	29.2	U		29.4	U		737		J	24.3	U	UJ	616		J	526			567			624		
Total Solids (% DW)	34.3			34			39.5			41.2			45.3			47.3			46.9			46.3		
Grain Size (%)																								
Gravel	2.8			0.1			0.5		J	0.3		J	0.2		J	0.6		J	0.2		J	1.1		J
Sand	78.1			25.7			47.8		J	46.1		J	45.9		J	50.6		J	54		J	44.4		J
Silt	12.9			61.5			45.4		J	48		J	48.4		J	41.9		J	39		J	49.8		J
Clay	6.1			12.6			6.3		J	5.7		J	5.4		J	7		J	6.8		J	4.8		J
Fines	19			74.1			51.7		J	53.7		J	53.8		J	48.9		J	45.8		J	54.6		J

Sample ID:	DR08-B-D05-C			DR08-B-D06-C			DR08-B-D07-C			DR08-B-D08-C			DR08-B-D09-C			DR08-B-D10-C			DR08-B-D11-C			DR08-B-D12-C		
Collection Date:	11/05/2008			11/05/2008			11/05/2008			11/04/2008			11/04/2008			11/04/2008			11/04/2008			11/04/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Conventionals																								
Ammonia (mg N/kg DW)	320			300			330			400		J	400		J	340		J	360		J	360		J
Total Volatile Solids (% WW)	8			7.5			9.5			8.2			8			8			7.3			7.8		
Total Organic Carbon (% WW)	2.4			2.3			2.9			2.7			3.3			2.8			2.6			2.6		
Sulfide (mg/kg DW)	749			527			665			386			555			227			501			20.7	U	
Total Solids (% DW)	38.7			54.8			43.3			48.2			39.8			49			50.3			48.2		
Grain Size (%)																								
Gravel	0.4			1.1			0.7			1.5			0.5			0.3			0.6			1.4		
Sand	52.1			45.1			43			40.7			40.1			30.9			34.7			51.6		
Silt	41.1			47.4			49			51.3			53.5			60.1			58.7			40.5		
Clay	6.4			6.5			7.2			6.5			5.9			8.7			6			6.5		
Fines	47.5			53.9			56.2			57.8			59.4			68.8			64.7			47		

H = holding time exceeded
J = estimate
NA = not analyzed
U = undetected

DMMU
QA sample
Z-sample
side-slope sample
bioassay reference sample

Sample ID:	DR08-B-D13-C			DR08-B-D14-C			DR08-B-D06-Z			DR08-B-D08-Z			DR08-B-D10-Z			DR08-B-D12-Z		
Collection Date:	11/05/2008			11/04/2008			11/05/2008			11/04/2008			11/04/2008			11/04/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Conventionals																		
Ammonia (mg N/kg DW)	310			380		J	420			400		J	340		J	350		J
Total Volatile Solids (% WW)	6.3			7			7.5			8.7			6.5			7.4		
Total Organic Carbon (% WW)	2.2			2.2			2.3			2.9			1.9			2.3		
Sulfide (mg/kg DW)	506			50.6			NA			NA			NA			NA		
Total Solids (% DW)	56.7			51.4			57			58			60			52		
Grain Size (%)																		
Gravel	0.5			0.6			0			0.6			4.8			0		
Sand	51.1			46.4			35.6			44.6			59.3			46.4		
Silt	43			44.7			59.4			40.7			30.7			45.2		
Clay	5.5			8.2			5			14.1			5.1			8.4		
Fines	48.5			52.9			64.4			54.8			35.8			53.6		

Sample ID:	DR08-B-ST21-C0-2			DR08-B-ST21-C2-5			DR08-B-ST22-C0-2			DR08-B-ST22-C2-5			DR08-B-ST23-C0-2			DR08-B-ST23-C2-5		
Collection Date:	11/05/2008			11/05/2008			11/05/2008			11/05/2008			11/03/2008			11/03/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Conventionals																		
Ammonia (mg N/kg DW)	340		J	380		J	410		J	290		J	570		J	360		J
Total Volatile Solids (% WW)	8			8.4			10			8.5			8.5			8.1		
Total Organic Carbon (% WW)	2.5			2.6			3.2			2.7			2.6			2.6		
Sulfide (mg/kg DW)	526			351			652			446			NA			NA		
Total Solids (% DW)	39.2			49			44.8			51.6			46			50		
Grain Size (%)																		
Gravel	0.5			0.5			0.3			0.8			0.2			1		
Sand	29.1			29			28.2			41			28.9			49.3		
Silt	64.5			63.7			64.4			49.6			62.8			39.2		
Clay	5.9			6.9			7.2			8.6			8			10.6		
Fines	70.4			70.6			71.6			58.2			70.8			49.8		

H = holding time exceeded
J = estimate
NA = not analyzed
U = undetected

DMMU
QA sample
Z-sample
side-slope sample
bioassay reference sample

Sample ID:	DR08-B-ST28-C0-2			DR08-B-ST28-C2-5			DR08-B-ST31-C0-2			DR08-B-ST31-C2-5		
Collection Date:	11/05/2008			11/05/2008			11/05/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Conventionals												
Ammonia (mg N/kg DW)	310		J	290		J	330		J	330		J
Total Volatile Solids (% WW)	6			6.6			8.2			7.5		
Total Organic Carbon (% WW)	1.9			2.2			2.9			2.4		
Sulfide (mg/kg DW)	568			34.6	J		446			452		
Total Solids (% DW)	49.8			52			50.5			51.6		
Grain Size (%)												
Gravel	0.2			0.5			0.5			0		
Sand	48.3			53			43.1			49.9		
Silt	46.3			39.8			46.8			43.9		
Clay	5.3			6.7			6.8			6.4		
Fines	51.6			46.5			53.6			50.3		

Sample ID:	SB-REF-48			SB-REF-76			REF-01-DB		
Collection Date:	11/25/2008			11/25/2008			12/19/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Conventionals									
Ammonia (mg N/kg DW)	4.39			132			72		J
Total Volatile Solids (% WW)	2.93			11.4			2.7		
Total Organic Carbon (% WW)	1.45			3.25			0.57		
Sulfide (mg/kg DW)	121			1010			7.1	U	
Total Solids (% DW)	60.7			9.1			71		
Grain Size (%)									
Gravel	0.2			0.1	U		2.7		
Sand	74.7			11.4			86.1		
Silt	14.7			51.6			8.3		
Clay	10.7			37.4			3		
Fines	25.4			89			11.3		

H = holding time exceeded
J = estimate
NA = not analyzed
U = undetected

DMMU
QA sample
Z-sample
side-slope sample
bioassay reference sample

Sample ID:				DR08-A-D01-S			DR08-A-D02-S			DR08-B-D03-C		
Collection Date:				11/06/2008			11/06/2008			11/05/2008		
	SL	BT	ML	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)												
Antimony	150	---	200	0.31	U		0.67	J		0.65	J	
Arsenic	57	507.1	700	9.6			14			9.6	B	
Cadmium	5.1	11.3	14	0.21	JB		0.37	JB		0.16	U	
Chromium	---	267	---	14			21			20	B	
Copper	390	1027	1300	25			43			33	B	
Lead	450	975	1200	11			17			14		
Mercury	0.41	1.5	2.3	0.065			0.11			0.069		
Nickel	140	370	370	14			18			19	B	
Selenium	---	3	---	0.21	JB		0.36	JB		0.4	JB	
Silver	6.1	6.1	8.4	0.081	U		0.11	U		0.089	U	
Vanadium	---	---	---	44			58			58		
Zinc	410	2783	3800	69			93			80		
Low-Molecular PAHs (ug/kg)												
Naphthalene	2100	---	2400	2.7			5.7			3.3		
Acenaphthylene	560	---	1300	0.79	J		3.4			1.3	J	
Acenaphthene	500	---	2000	1.9	J		5.1			3.7		J
Fluorene	540	---	3600	2.4			8.5			5.8		
Phenanthrene	1500	---	21000	22			66			53		
Anthracene	960	---	13000	4.6			15			11		
2-Methylnaphthalene	670	---	1900	2.1			6.1			2.8		
Total LPAHs	5200	---	29000	34.39	J		103.7			78.1	J	
High-Molecular PAHs (ug/kg)												
Fluoranthene	1700	4600	30000	57		J	160			140		J
Pyrene	2600	11980	16000	44			130			120		
Benz(a)anthracene	1300	---	5100	22			63			55		
Chrysene	1400	---	21000	36			95			71		
Benzofluoranthene	3200	---	9900	72			190			150		
Benzo(a)pyrene	1600	---	3600	28			75			64		
Indeno(1,2,3-cd)pyrene	600	---	4400	16			39			36		
Dibenzo(a,h)anthracene	230	---	1900	4.6			6.3			11		
Benzo(g,h,i)perylene	670	---	3200	18			45			39		
Total HPAHs	12000	---	69000	297.6			803.3			686		
Chlorinated Hydrocarbons (ug/kg)												
1,3-Dichlorobenzene	170	---	---	1.3	JB		1.4	JB		1.4	JB	
1,4-Dichlorobenzene	110	---	120	0.8	JB		1.1	JB		0.73	JB	
1,2-Dichlorobenzene	35	---	110	1.4	JB		1.4	JB		1.2	JB	
1,2,4-Trichlorobenzene	31	---	64	2.3	JB		2.5	JB		2.2	JB	
Hexachlorobenzene	22	168	230	0.37	U		0.38	U		0.38	U	
Phthalates (ug/kg)												
Dimethyl phthalate	71	---	1400	2.8	J		5.7	J		5.8	J	
Diethyl phthalate	200	---	1200	1.5	U		1.5	U		1.5	U	
Dibutyl phthalate	1400	---	5100	5.1	J		11	J		17	J	
Butyl benzyl phthalate	63	---	970	14			32			29		
Bis(2-Ethylhexyl) Phthalate	1300	---	8300	200			330			200		
Di-N-Octyl Phthalate	6200	---	6200	9.7	J		37			0.13	U	
Phenols (ug/kg)												
Phenol	420	---	1200	3.6	J		5.3	J		7.2	J	
2-methylphenol	63	---	77	0.69	U		0.71	U		0.71	U	
3&4-methylphenol	670	---	3600	1.6	J		4.5	J		2.4	J	
2,4-Dimethylphenol	29	---	210	0.2	U		0.21	U		0.21	U	
Pentachlorophenol	400	504	690	1.2	U		1.2	U		1.2	U	

Sample ID:				DR08-A-D01-S			DR08-A-D02-S			DR08-B-D03-C		
Collection Date:				11/06/2008			11/06/2008			11/05/2008		
	SL	BT	ML	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)												
Benzyl Alcohol	57	---	870	5.1	J		13			6.1	J	
Benzoic Acid	650	---	760	63	U		65	U		65	U	
Dibenzofuran	540	---	1700	2.3	J		5.5	J		3	J	
Hexachloroethane	1400	---	14000	1.1	U		1.1	U		1.1	U	
Hexachlorobutadiene	29	---	270	0.89	U		0.91	U		0.9	U	
N-Nitrosodiphenylamine	28	---	130	0.89	J		3.4	J		1.4	J	
Volatile Organics (ug/kg)												
Trichloroethene	160	---	1600	0.26	U		0.43	U		0.26	U	
Tetrachloroethene	57	---	210	0.15	U		0.25	U		0.15	U	
Ethylbenzene	10	---	50	0.22	U		0.37	U		0.22	U	
Total Xylenes	40	---	160	0.24	U		0.39	U		0.24	U	
Pesticides (ug/kg)												
4,4'-DDE	---	---	---	0.14	U		0.18	J		0.28	J	
4,4'-DDD	---	---	---	0.14	U		0.14	U		0.56	J	
4,4'-DDT	---	---	---	0.33	J		0.15	U		1.7	J	
Total DDT	6.9	50	69	0.33	J		0.18	J		2.54	J	
Aldrin	10	---	---	0.21	U		0.22	U		0.22	U	
alpha-Chlordane				0.19	J		0.36	J		0.48	J	
gamma-Chlordane				0.13	U		0.13	U		0.13	U	
Total Chlordane	10	37		0.19	J		0.36	J		0.48	J	
Dieldrin	10	---	---	0.11	U		0.12	U		0.11	U	
Heptachlor	10	---	---	0.45	U		0.45	U		0.45	U	
Lindane	10	---	---	0.075	U		0.2	J		0.079	J	
PCB Aroclors (ug/kg)												
PCB-aroclor 1016	---	---	---	2.2	U		4	U		3.1	U	
PCB-aroclor 1221	---	---	---	2.2	U		4	U		3.1	U	
PCB-aroclor 1232	---	---	---	2.2	U		4	U		3.1	U	
PCB-aroclor 1242	---	---	---	2.2	U		4	U		3.1	U	
PCB-aroclor 1248	---	---	---	6.8			17			12		
PCB-aroclor 1254	---	---	---	9.4			20			14		
PCB-aroclor 1260	---	---	---	8.3			16			10		
PCB-aroclor 1262	---	---	---	3.9	U		4	U		3.1	U	
Total PCBs	130	---	3100	24.5			53			36		
Total PCBs (mg/kg TOC)	---	38*	---	1.4			1.7			1.3		

B = detected in blank
J = estimate
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample
Z-sample
side-slope sample
DMMP SL exceedance
DMMP BT exceedance

Sample ID:	DR08-B-D03-D			DR08-B-D04-C			DR08-B-D04-D			DR08-B-D05-C		
Collection Date:	11/05/2008			11/05/2008			11/05/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)												
Antimony	0.7	J		0.52	J		0.63	J		0.46	J	
Arsenic	9.7			10			10			7.3	B	
Cadmium	0.28	JB		0.23	JB		0.38	JB		0.12	U	
Chromium	21			21			22			15	B	
Copper	34			34			38			24	B	
Lead	15			16			17			10		
Mercury	0.077			0.097			0.093			0.067		
Nickel	19			19			20			13	B	
Selenium	0.35	JB		0.39	JB		0.39	JB		0.27	JB	
Silver	0.088	U		0.086	U		0.088	U		0.069	U	
Vanadium	57			56			60			38		
Zinc	81			80			89			58		
Low-Molecular PAHs (ug/kg)												
Naphthalene	3.1			4.3			3.6			2.9		
Acenaphthylene	0.94	J		1.7	J		1.1	J		0.86	J	
Acenaphthene	2.3		J	3.6			1.9	J		2.9		
Fluorene	4.7			5.4			3.8			4.5		
Phenanthrene	40			49			37			37		
Anthracene	9.5			10			8.2			7.6		
2-Methylnaphthalene	2.6			4.6		J	3		J	2.1		
Total LPAHs	60.54	J		74	J		55.6	J		55.76	J	
High-Molecular PAHs (ug/kg)												
Fluoranthene	100			120			98			93		
Pyrene	86			110			88			84		
Benz(a)anthracene	47			49			44			40		
Chrysene	64			62			58			59		
Benzofluoranthene	120			130			120			0.24	U	
Benzo(a)pyrene	52			59			54			52		
Indeno(1,2,3-cd)pyrene	33			33			29			32		
Dibenzo(a,h)anthracene	11			0.22	U		9.6		J	9.6		
Benzo(g,h,i)perylene	38			37			33			36		
Total HPAHs	551			600			533.6			405.6		
Chlorinated Hydrocarbons (ug/kg)												
1,3-Dichlorobenzene	1.5	JB		1.5	JB		1.3	JB		1.1	JB	
1,4-Dichlorobenzene	1	JB		0.97	JB		1.3	JB		0.8	JB	
1,2-Dichlorobenzene	1.6	JB		1.6	JB		1.2	JB		1.1	JB	
1,2,4-Trichlorobenzene	2.6	JB		3.1	JB		2.8	JB		1.9	JB	
Hexachlorobenzene	0.38	U		0.38	U		0.38	U		0.37	U	
Phthalates (ug/kg)												
Dimethyl phthalate	5.8	J		5.5	J		5.4	J		4	J	
Diethyl phthalate	1.5	U		1.5	U		1.5	U		1.5	U	
Dibutyl phthalate	16	J		12	J		13	J		15	J	
Butyl benzyl phthalate	38			26			24			20		
Bis(2-Ethylhexyl) Phthalate	200			240			280			230		
Di-N-Octyl Phthalate	15	J		0.13	U		7.4	J		0.13	U	
Phenols (ug/kg)												
Phenol	5.6	J		5.2	J		15			0.72	U	
2-methylphenol	0.71	U		0.7	U		0.7	U		0.69	U	
3&4-methylphenol	2.6	J		3.4	J		2.7	J		2.2	J	
2,4-Dimethylphenol	0.21	U		0.21	U		0.21	U		0.2	U	
Pentachlorophenol	1.2	U		1.2	U		1.2	U		1.2	U	

Sample ID:	DR08-B-D03-D			DR08-B-D04-C			DR08-B-D04-D			DR08-B-D05-C		
Collection Date:	11/05/2008			11/05/2008			11/05/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)												
Benzyl Alcohol	5.5	J		5.2	J		5.4	J		0.93	U	
Benzoic Acid	65	U		64	U		64	U		110	J	
Dibenzofuran	2.3	J		3.1	J		2.4	J		2.6	J	
Hexachloroethane	1.1	U		1.1	U		1.1	U		1.4	JB	
Hexachlorobutadiene	0.91	U		0.9	U		0.9	U		0.88	U	
N-Nitrosodiphenylamine	2	J		1.8	J		0.22	U		2.4	J	
Volatile Organics (ug/kg)												
Trichloroethene	0.33	U		0.34	U		0.34	U		NA		
Tetrachloroethene	0.19	U		0.2	U		0.2	U		NA		
Ethylbenzene	0.28	U		0.29	U		0.29	U		NA		
Total Xylenes	0.3	U		0.31	U		0.31	U		NA		
Pesticides (ug/kg)												
4,4'-DDE	0.7	J		0.35	J		0.36	J		0.49	J	
4,4'-DDD	0.5	J		0.42	J		0.59	J		0.84	J	
4,4'-DDT	2.6	J		1.6	J		0.15	U		2.4	J	
Total DDT	3.8	J		2.37	J		0.95	J		3.73	J	
Aldrin	0.22	U		0.22	U		0.21	U		0.22	U	
alpha-Chlordane	0.73	J		0.13	U		0.46	J		0.13	U	
gamma-Chlordane	0.39	J		0.28	J		0.13	U		0.13	U	
Total Chlordane	1.12	J		0.28	J		0.46	J		0.13	U	
Dieldrin	0.69	J		0.12	U		0.16	J		0.12	U	
Heptachlor	0.45	U		0.46	U		0.45	U		0.46	U	
Lindane	0.076	U		0.13	J		0.075	U		0.077	U	
PCB Aroclors (ug/kg)												
PCB-aroclor 1016	3.1	U		3.2	U		3.1	U		3	U	
PCB-aroclor 1221	3.1	U		3.2	U		3.1	U		3	U	
PCB-aroclor 1232	3.1	U		3.2	U		3.1	U		3	U	
PCB-aroclor 1242	3.1	U		3.2	U		3.1	U		3	U	
PCB-aroclor 1248	14			19			18			16		
PCB-aroclor 1254	18			21			23			14		
PCB-aroclor 1260	14			15			16			9		
PCB-aroclor 1262	3.1	U		3.2	U		3.1	U		3	U	
Total PCBs	46			55			57			39		
Total PCBs (mg/kg TOC)	1.8			2.1			2.2			1.6		

B = detected in blank
J = estimate
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample
Z-sample
side-slope sample
DMMP SL exceedance
DMMP BT exceedance

Sample ID:	DR08-B-D06-C			DR08-B-D07-C			DR08-B-D08-C			DR08-B-D09-C		
Collection Date:	11/05/2008			11/05/2008			11/04/2008			11/04/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)												
Antimony	0.6	J		0.77	J		0.58	J		0.51	J	
Arsenic	8.7	B		9.7	B		12	B		9.2	B	
Cadmium	0.14	U		0.15	U		0.16	U		0.17	U	
Chromium	19	B		20	B		21	B		21	B	
Copper	32	B		34	B		38	B		34	B	
Lead	14			12			14			14		
Mercury	0.092			0.069			0.12			0.088		
Nickel	17	B		19	B		20	B		18	B	
Selenium	0.32	JB		0.39	JB		0.38	JB		0.3	JB	
Silver	0.081	U		0.086	U		0.092	U		0.093	U	
Vanadium	52			59			58			55		
Zinc	75			76			79			80		
Low-Molecular PAHs (ug/kg)												
Naphthalene	3.6			3.9			2.5			2.8		
Acenaphthylene	1.4	J		1.3	J		1.6	J		1.8	J	
Acenaphthene	3.2			2.7			3.1			2.7		
Fluorene	5.6			5.9			4.6			4.8		
Phenanthrene	39			43			46			41		
Anthracene	8.3			8.4			10			9.4		
2-Methylnaphthalene	3.5			3.7			3			3.4		
Total LPAHs	61.1	J		65.2	J		67.8	J		62.5	J	
High-Molecular PAHs (ug/kg)												
Fluoranthene	110		J	110		J	4.7			110		
Pyrene	100			91			100			90		
Benz(a)anthracene	39			45			52			49		
Chrysene	59			65			77			72		
Benzofluoranthene	0.25	U		0.25	U		140			140		
Benzo(a)pyrene	54			51			65			59		
Indeno(1,2,3-cd)pyrene	32			36			39			41		
Dibenzo(a,h)anthracene	9.7			11			11			12		
Benzo(g,h,i)perylene	36			41			45			46		
Total HPAHs	439.7			450			533.7			619		
Chlorinated Hydrocarbons (ug/kg)												
1,3-Dichlorobenzene	1.3	JB		0.95	JB		0.7	U		0.71	U	
1,4-Dichlorobenzene	1.1	JB		0.68	JB		0.31	U		0.32	U	
1,2-Dichlorobenzene	1.6	JB		1.3	JB		0.63	U		0.63	U	
1,2,4-Trichlorobenzene	2.7	JB		2	JB		1.2	U		1.5	JB	
Hexachlorobenzene	0.38	U		0.37	U		0.37	U		0.38	U	
Phthalates (ug/kg)												
Dimethyl phthalate	4.6	J		4.6	J		9.1	J		7.5	J	
Diethyl phthalate	1.5	U		1.5	U		1.5	U		1.5	U	
Dibutyl phthalate	17	J		13	J		20	JB		26	JB	
Butyl benzyl phthalate	25			27			35	B		34	B	
Bis(2-Ethylhexyl) Phthalate	220			250			310	B		230	B	
Di-N-Octyl Phthalate	11	J		0.13	U		0.13	U		0.13	U	
Phenols (ug/kg)												
Phenol	8.2	J		3.8	J		0.72	U		0.73	U	
2-methylphenol	0.74	J		0.7	U		0.69	U		0.7	U	
3&4-methylphenol	2.7	J		2.6	J		0.55	U		2.2	J	
2,4-Dimethylphenol	0.21	U		0.21	U		0.21	U		0.21	U	
Pentachlorophenol	1.2	U		1.2	U		1.2	U		1.2	U	

Sample ID:	DR08-B-D06-C			DR08-B-D07-C			DR08-B-D08-C			DR08-B-D09-C		
Collection Date:	11/05/2008			11/05/2008			11/04/2008			11/04/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)												
Benzyl Alcohol	6.7	J		5.5	J		5.7	J		5.4	J	
Benzoic Acid	64	U		64	U		64	U		64	U	
Dibenzofuran	3.1	J		3.3	J		3.2	J		3.1	J	
Hexachloroethane	1.1	U		1.1	U		1.1	U		1.1	U	
Hexachlorobutadiene	0.9	U		0.89	U		0.89	U		0.9	U	
N-Nitrosodiphenylamine	1.6	J		2.4	J		2.1	J		2.5	J	
Volatile Organics (ug/kg)												
Trichloroethene	0.25	U		0.25	U		0.36	U		0.36	U	
Tetrachloroethene	0.15	U		0.15	U		0.21	U		0.21	U	
Ethylbenzene	0.22	U		0.21	U		0.31	U		0.3	U	
Total Xylenes	0.23	U		0.23	U		0.33	U		0.32	U	
Pesticides (ug/kg)												
4,4'-DDE	0.38	J		0.36	J		0.26	J		0.66	J	
4,4'-DDD	0.61	J		1	J		0.46	J		0.49	J	
4,4'-DDT	3.4			4.4			1.6	J		6.9		
Total DDT	4.39	J		5.76	J		2.32	J		8.05	J	
Aldrin	0.21	U		0.22	U		0.22	U		0.22	U	
alpha-Chlordane	0.13	J		0.13	U		0.42	J		0.78	J	
gamma-Chlordane	0.13	U		0.37	J		0.13	U		0.13	U	
Total Chlordane	0.13	J		0.37	J		0.42	J		0.78	J	
Dieldrin	0.11	U		0.24	J		0.2	J		0.11	U	
Heptachlor	0.45	U		0.45	U		0.46	U		0.45	U	
Lindane	0.15	J		0.076	U		0.14	J		0.24	J	
PCB Aroclors (ug/kg)												
PCB-aroclor 1016	3	U		3.1	U		3.2	U		3.2	U	
PCB-aroclor 1221	3	U		3.1	U		3.2	U		3.2	U	
PCB-aroclor 1232	3	U		3.1	U		3.2	U		3.2	U	
PCB-aroclor 1242	32			3.1	U		3.2	U		3.2	U	
PCB-aroclor 1248	3	U		12			20			27		
PCB-aroclor 1254	24			14			24			25		
PCB-aroclor 1260	14			11			17			16		
PCB-aroclor 1262	3	U		3.1	U		3.2	U		3.2	U	
Total PCBs	70			37			61			68		
Total PCBs (mg/kg TOC)	3.0			1.3			2.3			2.1		

B = detected in blank
J = estimate
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample
Z-sample
side-slope sample
DMMP SL exceedance
DMMP BT exceedance

Sample ID:	DR08-B-D10-C			DR08-B-D11-C			DR08-B-D12-C			DR08-B-D13-C		
Collection Date:	11/04/2008			11/04/2008			11/04/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)												
Antimony	0.49	J		0.44	J		0.63	J		0.68	J	
Arsenic	6.4	B		9.2	B		8.9	B		9.8	B	
Cadmium	0.13	U		0.15	U		0.16	U		0.28	J	
Chromium	13	B		22	B		20	B		25	B	
Copper	21	B		35	B		34	B		36	B	
Lead	9			14			14			16		
Mercury	0.059			0.09			0.067			0.12		
Nickel	12	B		20	B		18	B		25	B	
Selenium	0.23	JB		0.31	JB		0.34	JB		0.34	JB	
Silver	0.071	U		0.086	U		0.089	U		0.07	U	
Vanadium	36			58			56			57		
Zinc	51			81			77			83		
Low-Molecular PAHs (ug/kg)												
Naphthalene	1.8	J		0.22	U		2.3			2.5		
Acenaphthylene	0.16	U		1.6	J		2	J		0.56	J	
Acenaphthene	2.3			3.2			2.4			2.6		
Fluorene	4.7			5			3.8			3.3		
Phenanthrene	70			46			31			35		
Anthracene	12			10			8.5			6.6		
2-Methylnaphthalene	1.7	J		2.6			2.8			1.5	J	
Total LPAHs	90.96	J		66.02	J		50	J		50.56	J	
High-Molecular PAHs (ug/kg)												
Fluoranthene	8		J	120			89		J	90		J
Pyrene	100			97			76			81		
Benz(a)anthracene	62			50			51			44		
Chrysene	73			71			80			52		
Benzofluoranthene	130			0.24	U		0.25	U		0.25	U	
Benzo(a)pyrene	56			55			56			49		
Indeno(1,2,3-cd)pyrene	37			39			30			33		
Dibenzo(a,h)anthracene	12			11			8.6			12		
Benzo(g,h,i)perylene	40			41			31			39		
Total HPAHs	518			484			421.6			400		
Chlorinated Hydrocarbons (ug/kg)												
1,3-Dichlorobenzene	0.71	U		0.7	U		0.72	U		1.6	JB	
1,4-Dichlorobenzene	0.32	U		0.31	U		0.32	U		1.1	JB	
1,2-Dichlorobenzene	0.63	U		0.63	U		0.64	U		1.5	JB	
1,2,4-Trichlorobenzene	1.4	JB		1.9	JB		2	JB		2.8	JB	
Hexachlorobenzene	0.37	U		0.37	U		0.38	U		0.38	U	
Phthalates (ug/kg)												
Dimethyl phthalate	53			5.7	J		3.3	J		6.7	J	
Diethyl phthalate	1.5	U		1.5	U		1.5	U		1.5	U	
Dibutyl phthalate	15	JB		25	JB		17	JB		8.9	J	
Butyl benzyl phthalate	21	B		27	B		23	B		13		
Bis(2-Ethylhexyl) Phthalate	140	JB		200	B		220	B		90	J	
Di-N-Octyl Phthalate	0.13	U		0.13	U		0.13	U		7.2	J	
Phenols (ug/kg)												
Phenol	0.73	U		0.72	U		0.74	U		0.74	U	
2-methylphenol	0.7	U		0.69	U		0.71	U		0.71	U	
3&4-methylphenol	0.55	U		1.7	J		1.8	J		1.3	J	
2,4-Dimethylphenol	0.21	U		0.28	J		0.21	U		0.21	U	
Pentachlorophenol	1.2	U		1.2	U		1.2	U		1.2	U	

Sample ID:	DR08-B-D10-C			DR08-B-D11-C			DR08-B-D12-C			DR08-B-D13-C		
Collection Date:	11/04/2008			11/04/2008			11/04/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)												
Benzyl Alcohol	3.4	J		4	J		5.4	J		2.4	J	
Benzoic Acid	64	U		64	U		65	U		65	U	
Dibenzofuran	2.5	J		3.1	J		2.5	J		1.7	J	
Hexachloroethane	1.1	U		1.1	U		1.1	U		1.5	JB	
Hexachlorobutadiene	0.9	U		0.89	U		0.91	U		0.91	U	
N-Nitrosodiphenylamine	0.22	U		1.7	J		1.9	J		1.3	J	
Volatile Organics (ug/kg)												
Trichloroethene	0.25	U		0.34	U		0.25	U		0.22	U	
Tetrachloroethene	0.14	U		0.2	U		0.15	U		0.13	U	
Ethylbenzene	0.21	U		0.29	U		0.21	U		0.19	U	
Total Xylenes	0.22	U		0.31	U		0.23	U		0.2	U	
Pesticides (ug/kg)												
4,4'-DDE	0.34	J		0.48	J		0.19	J		0.45	J	
4,4'-DDD	0.84	J		0.29	J		0.37	J		0.67	J	
4,4'-DDT	2.5	J		2.9	J		1.3	J		2.1	J	
Total DDT	3.68	J		3.67	J		1.86	J		3.22	J	
Aldrin	0.21	U		0.21	U		0.22	U		0.21	U	
alpha-Chlordane	0.4	J		0.61	J		0.28	J		0.16	J	
gamma-Chlordane	0.13	U		0.13	U		0.13	U		0.13	U	
Total Chlordane	0.4	J		0.61	J		0.28	J		0.16	J	
Dieldrin	0.11	U		0.11	U		0.17	J		0.17	J	
Heptachlor	0.44	U		0.68	J		0.45	U		0.44	U	
Lindane	0.14	J		0.24	J		0.1	J		0.11	J	
PCB Aroclors (ug/kg)												
PCB-aroclor 1016	3.1	U		3	U		3.2	U		3.9	U	
PCB-aroclor 1221	3.1	U		3	U		3.2	U		3.9	U	
PCB-aroclor 1232	3.1	U		3	U		3.2	U		3.9	U	
PCB-aroclor 1242	3.1	U		3	U		3.2	U		3.9	U	
PCB-aroclor 1248	20			47			18			33		
PCB-aroclor 1254	23			35			18			22		
PCB-aroclor 1260	17			21			12			12		
PCB-aroclor 1262	3.1	U		3	U		3.2	U		3.9	U	
Total PCBs	60			103			48			67		
Total PCBs (mg/kg TOC)	2.1			4.0			1.9			3.1		

B = detected in blank
J = estimate
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample
Z-sample
side-slope sample
DMMP SL exceedance
DMMP BT exceedance

Sample ID:	DR08-B-D14-C			DR08-B-ST21-C0-2			DR08-B-ST21-C2-5			DR08-B-ST22-C0-2		
Collection Date:	11/04/2008			11/05/2008			11/05/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)												
Antimony	0.61	J		0.6	J		0.76	J		0.84	J	
Arsenic	10	B		7.8			11			9.3		
Cadmium	0.14	U		0.35	JB		0.68	JB		0.4	JB	
Chromium	25	B		21			24			22		
Copper	40	B		36			50			40		
Lead	19			15			27			16		
Mercury	0.088			0.092			0.12			0.082		
Nickel	22	B		18			21			20		
Selenium	0.4	JB		0.27	JB		0.38	JB		0.39	JB	
Silver	0.078	U		0.091	U		0.08	U		0.1	U	
Vanadium	66			55			68			61		
Zinc	90			82			110			90		
Low-Molecular PAHs (ug/kg)												
Naphthalene	2.6			5.3			5.8			3.4		
Acenaphthylene	1.3	J		1.9	J		2.6			1.1	J	
Acenaphthene	3.8			4.3			6			2		
Fluorene	5.9			6.3			8.6			3.3		
Phenanthrene	48			64			76			35		
Anthracene	10			16			17			7.5		
2-Methylnaphthalene	3.1			4.9			5.5			2.5		
Total LPAHs	71.6	J		97.8	J		116			52.3	J	
High-Molecular PAHs (ug/kg)												
Fluoranthene	140			150			170		J	86		
Pyrene	110			130			200			72		
Benz(a)anthracene	55			78			89			44		
Chrysene	77			110			120			61		
Benzofluoranthene	160			210			250			120		
Benzo(a)pyrene	68			94			110			53		
Indeno(1,2,3-cd)pyrene	44			47			55			30		
Dibenzo(a,h)anthracene	12			14			15			8.9		
Benzo(g,h,i)perylene	47			47			63			31		
Total HPAHs	713			880			1072			505.9		
Chlorinated Hydrocarbons (ug/kg)												
1,3-Dichlorobenzene	0.7	U		1.5	JB		1.4	JB		1.4	JB	
1,4-Dichlorobenzene	0.31	U		1.1	JB		1.8	JB		1.1	JB	
1,2-Dichlorobenzene	0.62	U		1.4	JB		1.4	JB		1.2	JB	
1,2,4-Trichlorobenzene	1.3	JB		2.5	JB		2.5	JB		2.8	JB	
Hexachlorobenzene	0.37	U		0.37	U		0.38	U		0.38	U	
Phthalates (ug/kg)												
Dimethyl phthalate	6.4	J		10			13			4.9	J	
Diethyl phthalate	1.5	U		1.5	U		3.9	J		1.5	U	
Dibutyl phthalate	16	JB		19	J		9.5	J		11	J	
Butyl benzyl phthalate	22	B		27			39			32		
Bis(2-Ethylhexyl) Phthalate	190	B		230			370			180		
Di-N-Octyl Phthalate	0.13	U		0.13	U		0.13	U		11	J	
Phenols (ug/kg)												
Phenol	0.72	U		5.7	J		12			12		
2-methylphenol	0.69	U		0.7	U		0.71	U		0.7	U	
3&4-methylphenol	2.2	J		2.3	J		3	J		1.7	J	
2,4-Dimethylphenol	0.2	U		0.21	U		0.21	U		0.21	U	
Pentachlorophenol	1.2	U		1.2	U		1.2	U		1.2	U	

Sample ID:	DR08-B-D14-C			DR08-B-ST21-C0-2			DR08-B-ST21-C2-5			DR08-B-ST22-C0-2		
Collection Date:	11/04/2008			11/05/2008			11/05/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)												
Benzyl Alcohol	3.5	J		6.2	J		5.4	J		7.1	J	
Benzoic Acid	63	U		64	U		65	U		64	U	
Dibenzofuran	3.4	J		4.6	J		5.2	J		2.2	J	
Hexachloroethane	1.1	U		1.1	U		1.1	U		1.1	U	
Hexachlorobutadiene	0.89	U		0.9	U		0.9	U		0.9	U	
N-Nitrosodiphenylamine	0.21	U		2.3	J		2.6	J		0.22	U	
Volatile Organics (ug/kg)												
Trichloroethene	0.32	U		0.37	U		0.25	U		0.41	U	
Tetrachloroethene	0.19	U		0.22	U		0.15	U		0.24	U	
Ethylbenzene	0.28	U		0.31	U		0.21	U		0.35	U	
Total Xylenes	0.29	U		0.33	U		0.23	U		0.37	U	
Pesticides (ug/kg)												
4,4'-DDE	0.27	J		0.14	U		0.14	U		0.7	J	
4,4'-DDD	0.51	J		0.15	U		0.22	J		0.14	U	
4,4'-DDT	2	J		1.9	J		3.5	J		2.7	J	
Total DDT	2.78	J		1.9	J		3.72	J		3.4	J	
Aldrin	0.22	U		0.22	U		0.22	U		0.22	U	
alpha-Chlordane	0.49	J		0.19	J		0.38	J		0.98	J	
gamma-Chlordane	0.13	U		0.13	U		0.13	U		0.13	U	
Total Chlordane	0.49	J		0.19	J		0.38	J		0.98	J	
Dieldrin	0.23	J		0.12	U		0.12	U		1.1	J	
Heptachlor	0.46	U		0.47	U		0.46	U		0.46	U	
Lindane	0.15	J		0.089	J		0.077	U		0.089	J	
PCB Aroclors (ug/kg)												
PCB-aroclor 1016	2.8	U		4	U		15	U		4	U	
PCB-aroclor 1221	2.8	U		4	U		15	U		4	U	
PCB-aroclor 1232	2.8	U		4	U		15	U		4	U	
PCB-aroclor 1242	2.8	U		4	U		15	U		4	U	
PCB-aroclor 1248	17			69			32			18		
PCB-aroclor 1254	18			40			38			20		
PCB-aroclor 1260	13			20			34			22		
PCB-aroclor 1262	2.8	U		4	U		15	U		4	U	
Total PCBs	48			129			104			60		
Total PCBs (mg/kg TOC)	2.2			5.2			4.0			1.9		

B = detected in blank
J = estimate
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample
Z-sample
side-slope sample
DMMP SL exceedance
DMMP BT exceedance

Sample ID:	DR08-B-ST22-C2-5			DR08-B-ST23-C0-2			DR08-B-ST23-C2-5			DR08-B-ST28-C0-2		
Collection Date:	11/05/2008			11/03/2008			11/03/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)												
Antimony	0.63	J		0.52	J		0.52	J		0.5	J	
Arsenic	11			9.8	B		9.6	B		6.3		
Cadmium	0.67	JB		0.16	U		0.16	U		0.32	JB	
Chromium	23			24	B		19	B		17		
Copper	46			42	B		35	B		27		
Lead	31			19			16			20		
Mercury	1.8			0.063			0.1			0.078		
Nickel	21			21	B		18	B		16		
Selenium	0.36	JB		0.36	JB		0.32	JB		0.23	JB	
Silver	0.084	U		0.091	U		0.09	U		0.077	U	
Vanadium	72			61			51			46		
Zinc	100			94			77			67		
Low-Molecular PAHs (ug/kg)												
Naphthalene	6			2.4			2.5			3.1		
Acenaphthylene	2	J		1.8	J		2	J		1	J	
Acenaphthene	13			3.2			5.3			2.8		
Fluorene	12			4.1			8.4			3.8		
Phenanthrene	92			49			80			49		
Anthracene	24			11			19			8.9		
2-Methylnaphthalene	5.3			2.1			2.8			2.4		
Total LPAHs	149	J		71.5	J		117.2	J		68.6	J	
High-Molecular PAHs (ug/kg)												
Fluoranthene	200			140			8.4			3.8		J
Pyrene	210			130			170			100		
Benz(a)anthracene	91			56			88			48		
Chrysene	110			82			120			60		
Benzofluoranthene	200			150			250			140		
Benzo(a)pyrene	99			68			110			64		
Indeno(1,2,3-cd)pyrene	46			40			60			36		
Dibenzo(a,h)anthracene	14			12			17			10		
Benzo(g,h,i)perylene	45			43			66			37		
Total HPAHs	1015			721			889.4			498.8		
Chlorinated Hydrocarbons (ug/kg)												
1,3-Dichlorobenzene	1.7	JB		0.73	U		0.71	U		1.4	JB	
1,4-Dichlorobenzene	2.3	JB		0.32	U		0.32	U		0.69	JB	
1,2-Dichlorobenzene	1.8	JB		0.65	U		0.64	U		1.2	JB	
1,2,4-Trichlorobenzene	3.6	JB		1.5	JB		2	JB		2.7	JB	
Hexachlorobenzene	0.38	U		0.39	U		0.38	U		0.38	U	
Phthalates (ug/kg)												
Dimethyl phthalate	6.5	J		7.7	J		8.1	J		20		
Diethyl phthalate	1.5	U		1.5	U		1.5	U		1.5	U	
Dibutyl phthalate	12	J		27	JB		8.2	JB		4.7	J	
Butyl benzyl phthalate	28			22	B		29	B		25		
Bis(2-Ethylhexyl) Phthalate	200			150	JB		180	B		130	J	
Di-N-Octyl Phthalate	0.13	U		8.6	J		0.13	U		0.13	U	
Phenols (ug/kg)												
Phenol	5.4	J		0.75	U		0.73	U		6.9	J	
2-methylphenol	0.71	U		0.72	U		0.7	U		0.71	U	
3&4-methylphenol	3.4	J		0.57	U		1.4	J		1.1	J	
2,4-Dimethylphenol	0.21	U		0.21	U		0.21	U		0.21	U	
Pentachlorophenol	1.2	U		1.2	U		7.9	J		1.2	U	

Sample ID:	DR08-B-ST22-C2-5			DR08-B-ST23-C0-2			DR08-B-ST23-C2-5			DR08-B-ST28-C0-2		
Collection Date:	11/05/2008			11/03/2008			11/03/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)												
Benzyl Alcohol	6	J		0.97	U		3.5	J		2.5	J	
Benzoic Acid	65	U		66	U		65	U		65	U	
Dibenzofuran	6.1	J		2.3	J		3.7	J		2.6	J	
Hexachloroethane	1.1	U		1.1	U		1.1	U		1.1	U	
Hexachlorobutadiene	0.99	J		0.92	U		0.9	U		0.91	U	
N-Nitrosodiphenylamine	2.2	J		1.3	J		1.4	J		1.1	J	
Volatile Organics (ug/kg)												
Trichloroethene	0.33	U		NA			NA			0.27	U	
Tetrachloroethene	0.19	U		NA			NA			0.16	U	
Ethylbenzene	0.28	U		NA			NA			0.23	U	
Total Xylenes	0.3	U		NA			NA			0.24	U	
Pesticides (ug/kg)												
4,4'-DDE	0.15	J		0.34	J		1.1	J		0.42	J	
4,4'-DDD	0.19	J		0.51	J		0.54	J		0.9	J	
4,4'-DDT	1.3	J		5			4.2			2.1	J	
Total DDT	1.64	J		5.85	J		5.84	J		3.42	J	
Aldrin	0.22	U		0.22	U		0.22	U		0.22	U	
alpha-Chlordane	0.29	J		0.66	J		1.5	J		0.21	J	
gamma-Chlordane	0.14	U		0.13	U		0.13	U		0.13	U	
Total Chlordane	0.29	J		0.66	J		1.5	J		0.21	J	
Dieldrin	0.12	U		0.31	J		2.3	J		0.24	J	
Heptachlor	0.47	U		0.46	U		0.46	U		0.45	U	
Lindane	0.11	J		0.22	J		0.18	J		0.11	J	
PCB Aroclors (ug/kg)												
PCB-aroclor 1016	3	U		7.9	U		4	U		14	U	
PCB-aroclor 1221	3	U		7.9	U		4	U		14	U	
PCB-aroclor 1232	3	U		7.9	U		4	U		14	U	
PCB-aroclor 1242	3	U		7.9	U		4	U		14	U	
PCB-aroclor 1248	42			100			29			22		
PCB-aroclor 1254	33			62			42			28		
PCB-aroclor 1260	18			28			35			18		
PCB-aroclor 1262	3	U		7.9	U		4	U		14	U	
Total PCBs	93			190			106			68		
Total PCBs (mg/kg TOC)	3.4			7.3			4.1			3.6		

B = detected in blank
J = estimate
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample
Z-sample
side-slope sample
DMMP SL exceedance
DMMP BT exceedance

Sample ID:	DR08-B-ST28-C2-5			DR08-B-ST31-C0-2			DR08-B-ST31-C2-5		
Collection Date:	11/05/2008			11/05/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)									
Antimony	0.96	J		0.91	J		0.7	J	
Arsenic	7.3			8.7			7.9		
Cadmium	0.69	JB		0.36	JB		0.61	JB	
Chromium	20			21			19		
Copper	37			37			36		
Lead	27			15			27		
Mercury	0.087			0.088			0.41		
Nickel	17			19			16		
Selenium	0.23	JB		0.42	JB		0.28	JB	
Silver	0.075	U		0.096	U		0.18	J	
Vanadium	57			61			48		
Zinc	92			88			98		
Low-Molecular PAHs (ug/kg)									
Naphthalene	3.3			4.4			5.2		
Acenaphthylene	1.2	J		2	J		2.4		
Acenaphthene	5.9			3.7			8.2		
Fluorene	6.7			4.9			11		
Phenanthrene	49			55			82		
Anthracene	14			11			19		
2-Methylnaphthalene	2.7			4.3			5.1		
Total LPAHs	80.1	J		81	J		127.8	J	
High-Molecular PAHs (ug/kg)									
Fluoranthene	98		J	150		J	200		J
Pyrene	110			150			200		
Benz(a)anthracene	52			72			87		
Chrysene	63			90			110		
Benzofluoranthene	97			200			210		
Benzo(a)pyrene	53			93			100		
Indeno(1,2,3-cd)pyrene	27			53			55		
Dibenzo(a,h)anthracene	8.9			16			17		
Benzo(g,h,i)perylene	32			59			64		
Total HPAHs	540.9			883			1043		
Chlorinated Hydrocarbons (ug/kg)									
1,3-Dichlorobenzene	1.4	JB		1.3	JB		1.9	JB	
1,4-Dichlorobenzene	1.8	JB		0.97	JB		2.5	JB	
1,2-Dichlorobenzene	1.9	JB		1.1	JB		3.5	JB	
1,2,4-Trichlorobenzene	2.7	JB		2.9	JB		3.2	JB	
Hexachlorobenzene	0.38	U		0.38	U		0.38	U	
Phthalates (ug/kg)									
Dimethyl phthalate	7.6	J		24			22		
Diethyl phthalate	1.5	U		1.5	U		1.5	U	
Dibutyl phthalate	8.2	J		11	J		9.5	J	
Butyl benzyl phthalate	19			32			48		
Bis(2-Ethylhexyl) Phthalate	170			250			530		
Di-N-Octyl Phthalate	0.13	U		0.13	U		0.13	U	
Phenols (ug/kg)									
Phenol	3	J		14			13		
2-methylphenol	0.71	U		0.71	U		0.72	U	
3&4-methylphenol	3.3	J		2.4	J		4.1	J	
2,4-Dimethylphenol	0.21	U		0.21	U		0.21	U	
Pentachlorophenol	11			1.2	U		1.2	U	

Sample ID:	DR08-B-ST28-C2-5			DR08-B-ST31-C0-2			DR08-B-ST31-C2-5		
Collection Date:	11/05/2008			11/05/2008			11/05/2008		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)									
Benzyl Alcohol	0.95	U		7.6	J		4.1	J	
Benzoic Acid	65	U		65	U		66	U	
Dibenzofuran	2.7	J		3.8	J		5.6	J	
Hexachloroethane	1.1	U		1.1	U		1.1	U	
Hexachlorobutadiene	0.9	U		0.92	U		0.92	U	
N-Nitrosodiphenylamine	1.2	J		0.22	U		3.7	J	
Volatile Organics (ug/kg)									
Trichloroethene	0.26	U		0.33	U		0.28	U	
Tetrachloroethene	0.15	U		0.19	U		0.16	U	
Ethylbenzene	0.22	U		0.28	U		0.24	U	
Total Xylenes	0.24	U		0.3	U		0.25	U	
Pesticides (ug/kg)									
4,4'-DDE	0.13	U		0.36	J		0.82	J	
4,4'-DDD	1.6	J		0.65	J		3.3		
4,4'-DDT	3.5	J		1.8	J		2.7	J	
Total DDT	5.1	J		2.81	J		6.82	J	
Aldrin	0.21	U		0.22	U		0.22	U	
alpha-Chlordane	0.27	J		0.5	J		0.36	J	
gamma-Chlordane	0.13	U		0.13	U		0.13	U	
Total Chlordane	0.27	J		0.5	J		0.36	J	
Dieldrin	0.11	U		0.36	J		0.3	J	
Heptachlor	0.44	U		0.45	U		0.47	U	
Lindane	0.15	J		0.11	J		0.079	J	
PCB Aroclors (ug/kg)									
PCB-aroclor 1016	3.9	U		2.2	U		15	U	
PCB-aroclor 1221	3.9	U		2.2	U		15	U	
PCB-aroclor 1232	3.9	U		2.2	U		15	U	
PCB-aroclor 1242	3.9	U		2.2	U		15	U	
PCB-aroclor 1248	33			2.2	U		38		
PCB-aroclor 1254	33			4.1			43		
PCB-aroclor 1260	20			2.2	U		33		
PCB-aroclor 1262	3.9	U		2.2	U		15	U	
Total PCBs	86			4.1			114		
Total PCBs (mg/kg TOC)	3.9			0.1			4.8		

B = detected in blank
J = estimate
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample
Z-sample
side-slope sample
DMMP SL exceedance
DMMP BT exceedance

Sample ID:		DR08-A-D01-S			DR08-A-D02-S			DR08-B-D03-C			DR08-B-D04-C			DR08-B-D06-C			DR08-B-D08-C			DR08-B-D10-C		
Collection Date:		11/06/2008			11/06/2008			11/05/2008			11/05/2008			11/05/2008			11/04/2008			11/04/2008		
	TEF	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Dioxin/Furan Congeners (pg/g)																						
2,3,7,8-TCDD	1	0.225	J		0.148	U		0.111	U		0.109	U		0.11	U		0.241	J		0.114	U	
1,2,3,7,8-PeCDD	1	0.262	U		0.344	U		0.355	J		1.01	J		0.729	J		0.562	J		0.557	J	
1,2,3,4,7,8-HxCDD	0.1	0.57	J		0.761	J		0.515	J		1.54	J		0.967	J		0.383	U		0.693	J	
1,2,3,6,7,8-HxCDD	0.1	2.2	J		2.79	J		1.49	J		4.74			4.26	J		2.63	J		2.45	J	
1,2,3,7,8,9-HxCDD	0.1	1.41	J		1.97	J		1.04	J		3.21	J		2.57	J		1.9	J		1.72	J	
1,2,3,4,6,7,8-HpCDD	0.01	51.4			81.1			39.5			113			109			68.8			61.5		
OCDD	0.0003	435			691			417			910			1100			594			498		
2,3,7,8-TCDF	0.1	0.107	U		0.614	J		0.37	J		0.706	J		0.603	J		0.545	J		0.449	J	
1,2,3,7,8-PeCDF	0.03	0.302	U		0.396	U		0.296	U		0.581	J		0.295	U		0.3	U		0.306	U	
2,3,4,7,8-PeCDF	0.3	0.672	J		1.05	J		0.569	J		1.51	J		1.41	J		0.796	J		0.841	J	
1,2,3,4,7,8-HxCDF	0.1	1.16	J		1.82	J		0.803	J		2.43	J		2.14	J		1.39	J		1.26	J	
1,2,3,6,7,8-HxCDF	0.1	0.511	J		0.666	J		0.128	U		1.12	J		0.867	J		0.658	J		0.545	J	
2,3,4,6,7,8-HxCDF	0.1	0.744	J		1.03	J		0.541	J		1.39	J		1.34	J		0.856	J		0.795	J	
1,2,3,7,8,9-HxCDF	0.1	0.251	U		0.346	J		0.246	U		0.603	J		0.472	J		0.355	J		0.345	J	
1,2,3,4,6,7,8-HpCDF	0.01	8.96			15.5			6.19			18.1			44.3			11			10.4		
1,2,3,4,7,8,9-HpCDF	0.01	0.613	J		1.18	J		0.561	J		1.63	J		1.3	J		0.826	J		0.862	J	
OCDF	0.0003	27.5			62.4			21.1			51.3			65			35			40.8		
WHO-2005 TEQ (ND=0)		1.83			2.52			1.60			4.67			4.37			2.87			2.52		
WHO-2005 TEQ (ND=½)		1.99			2.77			1.66			4.72			4.43			2.89			2.59		

J = estimated concentration

U = undetected

LQ = laboratory qualifier

VQ = validation qualifier

TEF = toxicity equivalence factor

TEQ = toxicity equivalents

pg/g = picogram/gram (parts per trillion)

DMMU

Z-sample

side-slope sample

Sample ID:		DR08-B-D12-C			DR08-B-D13-C			DR08-B-D14-C			DR08-B-D06-Z			DR08-B-D08-Z			DR08-B-D10-Z			DR08-B-D12-Z		
Collection Date:		11/04/2008			11/05/2008			11/04/2008			11/05/2008			11/04/2008			11/04/2008			11/04/2008		
	TEF	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Dioxin/Furan Congeners (pg/g)																						
2,3,7,8-TCDD	1	0.111	U		0.108	U		0.341	J		0.109	U		1.07			0.108	U		0.108	U	
1,2,3,7,8-PeCDD	1	0.533	J		0.854	J		0.847	J		1.36	J		2.45	J		0.563	J		0.973	J	
1,2,3,4,7,8-HxCDD	0.1	0.811	J		0.737	J		0.989	J		1.75	J		2.17	J		0.639	J		1.3	J	
1,2,3,6,7,8-HxCDD	0.1	2.78	J		3.46	J		4.09	J		7.4			10.2			2.67	J		5.4		
1,2,3,7,8,9-HxCDD	0.1	2.02	J		2.77	J		2.74	J		5.15			7.51			1.77	J		3.67	J	
1,2,3,4,6,7,8-HpCDD	0.01	69.3			79.2			96.3			170			243			63.3			142		
OCDD	0.0003	579			623			749			1250			2230			511			1120		
2,3,7,8-TCDF	0.1	0.105	U		0.432	J		0.631	J		0.771	J		0.875	J		0.446	J		0.103	U	
1,2,3,7,8-PeCDF	0.03	0.306	J		0.34	J		0.387	J		0.691	J		0.713	J		0.308	J		0.537	J	
2,3,4,7,8-PeCDF	0.3	0.948	J		1.04	J		1.38	J		2.1	J		2.31	J		0.768	J		1.77	J	
1,2,3,4,7,8-HxCDF	0.1	1.56	J		1.57	J		2.13	J		3.17	J		4.12	J		1.04	J		2.83	J	
1,2,3,6,7,8-HxCDF	0.1	0.626	J		0.69	J		0.806	J		1.58	J		1.67	J		0.581	J		1.21	J	
2,3,4,6,7,8-HxCDF	0.1	0.874	J		1.02	J		1.14	J		1.95	J		2.47	J		0.788	J		1.72	J	
1,2,3,7,8,9-HxCDF	0.1	0.309	J		0.369	J		0.471	J		0.771	J		0.939	J		0.302	J		0.654	J	
1,2,3,4,6,7,8-HpCDF	0.01	11.4			12.1			16.8			23.8			35.8			8.67			21.1		
1,2,3,4,7,8,9-HpCDF	0.01	0.853	J		0.939	J		1.4	J		1.91	J		2.62	J		0.605	J		1.68	J	
OCDF	0.0003	45.6			46.8			70.4			71.4			120			26.2			83.8		
WHO-2005 TEQ (ND=0)		2.73			3.40			4.30			6.62			10.75			2.51			5.21		
WHO-2005 TEQ (ND=½)		2.79			3.46			4.30			6.67			10.75			2.57			5.27		

J = estimated concentration

U = undetected

LQ = laboratory qualifier

VQ = validation qualifier

TEF = toxicity equivalence factor

TEQ = toxicity equivalents

pg/g = picogram/gram (parts per trillion)

DMMU

Z-sample

side-slope sample

Sample ID:		DR08-B-ST21-C0-2			DR08-B-ST21-C2-5			DR08-B-ST22-C0-2			DR08-B-ST22-C2-5			DR08-B-ST23-C0-2			DR08-B-ST23-C2-5		
Collection Date:		11/05/2008			11/05/2008			11/05/2008			11/05/2008			11/03/2008			11/03/2008		
	TEF	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Dioxin/Furan Congeners (pg/g)																			
2,3,7,8-TCDD	1	0.108	U		0.108	U		0.115	U		0.465	J		0.321	J		0.113	U	
1,2,3,7,8-PeCDD	1	0.619	J		1.03	J		0.438	J		1.08	J		0.879	J		0.817	J	
1,2,3,4,7,8-HxCDD	0.1	0.79	J		1.6	J		0.634	J		1.57	J		1.19	J		1.4	J	
1,2,3,6,7,8-HxCDD	0.1	2.88	J		5.73			2.11	J		6.72			4.12	J		5.13		
1,2,3,7,8,9-HxCDD	0.1	1.91	J		3.66	J		1.59	J		4.31	J		2.69	J		3.21	J	
1,2,3,4,6,7,8-HpCDD	0.01	75.2			163			53.3			219			104			121		
OCDD	0.0003	619			1360			460			2150			914			982		
2,3,7,8-TCDF	0.1	0.486	J		0.714	J		0.413	J		0.658	J		0.636	J		0.108	U	
1,2,3,7,8-PeCDF	0.03	0.308	J		0.533	J		0.309	U		0.676	J		0.521	J		0.52	J	
2,3,4,7,8-PeCDF	0.3	1.02	J		1.66	J		0.787	J		2.1	J		1.39	J		1.65	J	
1,2,3,4,7,8-HxCDF	0.1	1.54	J		2.77	J		1.28	J		6.29			2.67	J		2.77	J	
1,2,3,6,7,8-HxCDF	0.1	0.643	J		1.19	J		0.498	J		2.12	J		0.99	J		1.05	J	
2,3,4,6,7,8-HxCDF	0.1	0.945	J		1.66	J		0.712	J		3.27	J		1.29	J		1.4	J	
1,2,3,7,8,9-HxCDF	0.1	0.402	J		0.6	J		0.308	J		0.978	J		0.479	J		0.252	U	
1,2,3,4,6,7,8-HpCDF	0.01	11.7			20.3			8.51			41.3			17.4			18.6		
1,2,3,4,7,8,9-HpCDF	0.01	0.959	J		1.65	J		0.715	J		4.01	J		1.58	J		1.59	J	
OCDF	0.0003	43.9			72.9			30.1			123			77.4			58.9		
WHO-2005 TEQ (ND=0)		2.97			5.62			2.20			8.11			4.57			4.55		
WHO-2005 TEQ (ND=½)		3.03			5.67			2.26			8.11			4.57			4.62		

J = estimated concentration

U = undetected

LQ = laboratory qualifier

VQ = validation qualifier

TEF = toxicity equivalence factor

TEQ = toxicity equivalents

pg/g = picogram/gram (parts per trillion)

DMMU

Z-sample

side-slope sample

Sample ID:		DR08-B-ST28-C0-2			DR08-B-ST28-C2-5			DR08-B-ST31-C0-2			DR08-B-ST31-C2-5		
Collection Date:		11/05/2008			11/05/2008			11/05/2008			11/05/2008		
	TEF	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Dioxin/Furan Congeners (pg/g)													
2,3,7,8-TCDD	1	0.444	J		1.28			0.114	U		1.47		
1,2,3,7,8-PeCDD	1	2.35	J		3.21	J		0.266	U		3.35	J	
1,2,3,4,7,8-HxCDD	0.1	1.42	J		1.05	J		0.391	U		1.43	J	
1,2,3,6,7,8-HxCDD	0.1	5.79			6.58			1.22	J		6.91		
1,2,3,7,8,9-HxCDD	0.1	4.29	J		6.37			0.964	J		6.89		
1,2,3,4,6,7,8-HpCDD	0.01	110			131			32.3			139		
OCDD	0.0003	811			1350			251			1050		
2,3,7,8-TCDF	0.1	0.635	J		0.479	J		0.109	U		0.69	J	
1,2,3,7,8-PeCDF	0.03	0.542	J		0.376	J		0.306	U		0.533	J	
2,3,4,7,8-PeCDF	0.3	1.42	J		1.23	J		0.476	J		1.52	J	
1,2,3,4,7,8-HxCDF	0.1	2.26	J		1.77	J		0.655	J		2.15	J	
1,2,3,6,7,8-HxCDF	0.1	1.02	J		0.923	J		0.367	J		1.23	J	
2,3,4,6,7,8-HxCDF	0.1	1.41	J		1.23	J		0.401	J		1.6	J	
1,2,3,7,8,9-HxCDF	0.1	0.578	J		0.517	J		0.254	U		0.494	J	
1,2,3,4,6,7,8-HpCDF	0.01	16.2			13.6			4.81			16.9		
1,2,3,4,7,8,9-HpCDF	0.01	1.17	J		1.03	J		0.57	U		1.28	J	
OCDF	0.0003	39.3			36.7			14			43.8		
WHO-2005 TEQ (ND=0)		6.51			8.63			0.95			9.33		
WHO-2005 TEQ (ND=½)		6.51			8.63			1.19			9.33		

J = estimated concentration

U = undetected

LQ = laboratory qualifier

VQ = validation qualifier

TEF = toxicity equivalence factor

TEQ = toxicity equivalents

pg/g = picogram/gram (parts per trillion)

DMMU

Z-sample

side-slope sample

Table 8 - QA/QC requirements for chemical analysis in the DMMP program.

QA ELEMENT		WARNING LIMITS	ACTION LIMITS
Precision	Conventionals	None	20% RPD or COV
	Metals	None	20% RPD or COV
	Organics	35% COV	50% COV or a factor of 2 for duplicates
Matrix Spikes	Metals	None	75-125% recovery
	Organics:[1] ▪ Volatiles ▪ Semivolatiles and Pesticides	▪ 70-150% ▪ 50-150%	None (zero percent recovery may be cause for data rejection however)[2]
Reference Materials	Metals	None	95% CI if specified for a particular CRM; 80-120% recovery if not.
	Organics	None	95% CI for CRMs. No action limit for uncertified RMs.
Surrogate Spikes	Organics ▪ Volatiles ▪ Pesticides ▪ Semi-volatiles	▪ 85% minimum recovery ▪ 60% minimum recovery ▪ 50% minimum recovery	EPA CLP chemical-specific recovery limits

[1] Warning limits set at the CLP advisory limits for matrix spike duplicates for those chemicals covered under CLP.
[2] Rigorous control limits are not recommended due to possible matrix effects and interferences.

Table 9. Solid Phase Bioassay Performance Standards and Evaluation Guidelines.

Bioassay	Negative Control Performance Standard	Reference Sediment Performance Standard	Dispersive Disposal Site Interpretation Guidelines		Nondispersive Disposal Site Interpretation Guidelines	
			1-hit rule	2-hit rule	1-hit rule	2-hit rule
Amphipod	$M_C \leq 10\%$	$M_R - M_C \leq 20\%$	$M_T - M_C > 20\%$ and M_T vs. M_R SS (p=.05) and		$M_T - M_C > 20\%$ and M_T vs. M_R SS (p=.05) and	
			$M_T - M_R > 10\%$	NOCN	$M_T - M_R > 30\%$	NOCN
Larval	$N_C \div I \geq 0.70$	$N_R \div N_C \geq 0.65$	$N_T \div N_C < 0.80$ and N_T/N_C vs. N_R/N_C SS (p=.10) and		$N_T \div N_C < 0.80$ and N_T/N_C vs. N_R/N_C SS (p=.10) and	
			$N_R/N_C - N_T/N_C > 0.15$	NOCN	$N_R/N_C - N_T/N_C > 0.30$	NOCN
Neanthes growth	$M_C \leq 10\%$ and $MIG_C \geq 0.38$	$M_R \leq 20\%$ and $MIG_R \div MIG_C \geq 0.80$	$MIG_T \div MIG_C < 0.80$ and MIG_T vs. MIG_R SS (p=.05) and		$MIG_T \div MIG_C < 0.80$ and MIG_T vs. MIG_R SS (p=.05) and	
			$MIG_T/MIG_R < 0.70$	NOCN	$MIG_T/MIG_R < 0.50$	$MIG_T/MIG_R < 0.70$

M = mortality, N = normal larvae, I = initial count, MIG = mean individual growth rate mg/individual/day)
SS = statistically significant, NOCN = no other conditions necessary, N/A = not applicable
Subscripts: R = reference sediment, C = negative control, T = test sediment

Table 10 - Round 1 bioassay control and reference performance summary

Bioassay	Negative Control Performance	Positive Control Performance	Reference Sediment Performance
Amphipod toxicity (*E. estuarius*)	0% mortality ≤ 10%; pass	$CdCl_2$, 96 hr EC50: 8.0 mg/L Cd Lab control limits: 4.3 - 12.8 mg/L Cd pass	SB-REF-76: 2% mortality SB-REF-48: 3% mortality REF-01-DB: 4% mortality All ≤ 20% over control mortality pass
Larval development (*M. galloprovincialis*)	4.5% CMA ≤ 30%; pass	$CuCl_2$, normality, 12.4 µg/L Cu 3.4 – 18.7 µg/L Cu pass	SB-REF-76: 16.0% NCMA SB-REF-48: 12.6% NCMA REF-01-DB: 17.8% NCMA All ≤ 35% pass
Polychaete growth (*N. arenaceodentata*)	0% mortality ≤ 10% 0.607 MIG ≥ 0.38 pass	$CdCl_2$, 96 hr EC50, 10.4 mg/L Cd 2.7 – 16.9 mg/L Cd pass	0% mortality in all reference samples All ≤ 20% SB-REF-76: 0.490 MIG SB-REF-48: 0.536 MIG REF-01-DB: 0.677 MIG All ≥ 80% control MIG pass

Bolded values are test results. Non-bolded values are performance standards.
CMA = Combined mortality and abnormality; MIG = mean individual growth (mg/day/worm); NCMA = Normalized combined mortality and abnormality (normalized to seawater control)

Table 11. Grain Size and TOC Results for Determining Round 1Reference Sediments Comparisons (from SAIC, 2009).

Sample ID	Percent Fines (silt + clay)	TOC (%)	Reference Sediment for Comparison[1]
Reference **SB-REF-76**	**88.8**	**3.25**	**n/a**
Reference **SB-REF-48**	**25.2**	**1.45**	**n/a**
Reference **REF-01-DB**	**11.2**	**0.57**	**n/a**
Round 1			
DR08-A-D01	19.1	1.8	SB-REF-48
DR08-A-D02	74.2	3.2	SB-REF-76
DR08-B-D03	51.7	2.7	SB-REF-48
DR08-B-D04	48.8	2.6	SB-REF-48
DR08-B-D06	53.8	2.3	SB-REF-48
DR08-B-D09	59.4	3.3	SB-REF-76
DR08-B-D11	64.7	2.6	SB-REF-76

[1]Round 1: Test sediments with percent fines between 15.5 and 57 percent were compared to reference sediment SB-REF-48, and >57 percent were compared to SB-REF-76.

Table 12. Round 1 Amphipod Mortality Bioassay (*E. estuarius*) Results and Evaluation Guidelines (from SAIC, 2009)

Sample ID	% Mortality	Mean Mortality	Reference	1-Hit Rule[1,2]		2-Hit Rule[1,2]	
				$M_T - M_C > 20\%$; M_T vs M_R SD ($p = 0.05$); $M_T - M_R > 30\%$	Hit/ No-Hit	$M_T - M_C > 20\%$; M_T vs M_R SD ($p = 0.05$); NOCN	Hit/ No-Hit
Round 1							
Control	0 0 0 0 0	100 ± 0.0	n/a	n/a	n/a	n/a	n/a
Reference SB-REF-76	5 5 0 0 0	98 ± 2.7	n/a	n/a	n/a	n/a	n/a
Reference SB-REF-48	0 0 0 5 10	97 ± 4.5	n/a	n/a	n/a	n/a	n/a
Reference REF-01-DB	0 0 5 15 0	96 ± 6.5	n/a	n/a	n/a	n/a	n/a
DR08-A-D01-S	15 0 5 10 10	92 ± 5.7	SB-REF-48	8%; No (Student's t-test); 5%	**No Hit**	8%; No (Student's t-test)	**No Hit**
DR08-A-D02-S	0 5 15 15 5	92 ± 6.7	SB-REF-76	8%; No (Student's t-test); 6%	**No Hit**	8%; No (Student's t-test)	**No Hit**
DR08-B-D03-C	0 0 10 0 0	98 ± 4.5	SB-REF-48	2%; No (Mann-Whitney); 1%	**No Hit**	2%; No (Mann-Whitney)	**No Hit**
DR08-B-D04-C	15 10 10 5 5	91 ± 4.2	SB-REF-48	9%; Yes, (Approximate t-test); 6%	**No Hit**	9%; Yes, (Approximate t-test)	**No Hit**
DR08-B-D06-C	5 10 0 10 10	93 ± 4.5	SB-REF-48	7%; No (Students t-test); 4%	**No Hit**	7%; No (Students t-test)	**No Hit**

Sample ID	% Mortality	Mean Mortality	Reference	1-Hit Rule[1,2]		2-Hit Rule[1,2]	
				$M_T - M_C > 20\%$; M_T vs M_R SD ($p = 0.05$); $M_T - M_R > 30\%$	Hit/ No-Hit	$M_T - M_C > 20\%$; M_T vs M_R SD ($p = 0.05$); NOCN	Hit/ No-Hit
DR08-B-D09-C	0 10 5 0 0	97 ± 4.5	SB-REF-76	3%; No (Mann-Whitney); 1%	**No Hit**	3%; No (Mann-Whitney)	**No Hit**
DR08-B-D11-C	5 10 5 0 15	93 ± 5.7	SB-REF-76	7%; No (Students t-test); 5%	**No Hit**	7%; No (Students t-test)	**No Hit**

M = mortality

SD = statistically different

NOCN = no other conditions necessary

N/A = not applicable

Subscripts: R = reference; C = negative control; T = test sediment

[1]Non-dispersive disposal site interpretation guidelines

[2]Comparison to reference includes the numeric result for the comparative criteria, the result of the statistical test, and the statistical test used. All statistics were conducted using BioStat (DMMP/SMS Bioassay Statistics Program; Beta v4.1). All amphipod mortality data were arcsine transformed for statistical analysis, unless noted otherwise.

Table 13. Round 1 Juvenile Polychaete Growth Bioassay (*N. arenaceodentata*) Results and Evaluation Guidelines (from SAIC, 2009)

Sample ID	Individual Growth Rate[1]	Mean Individual Growth Rate[1]	Reference	1-Hit Rule[1,2,3]		2-Hit Rule[1,2,3]	
				$MIG_T \div MIG_C < 0.80$; MIG_T vs MIG_R SD ($p = 0.05$); $MIG_T/MIG_R < 0.50$	Hit/ No-Hit	$MIG_T \div MIG_C < 0.80$; MIG_T vs MIG_R SD ($p = 0.05$); $MIG_T/MIG_R < 0.70$	Hit/ No-Hit
Control	0.506 0.679 0.908 0.450 0.492	0.607	n/a	n/a	n/a	n/a	n/a
Reference SB-REF-76	0.465 0.753 0.498 0.411 0.322	0.490	n/a	n/a	n/a	n/a	n/a
Reference SB-REF-48	0.542 0.598 0.638 0.630 0.272	0.536	n/a	n/a	n/a	n/a	n/a
Reference REF-01-DB	0.541 0.649 0.885 0.629 0.682	0.677	n/a	n/a	n/a	n/a	n/a
DR08-A-D01-C	0.483 0.436 0.422 0.492 0.499	0.466	SB-REF-48	0.77; No (Mann-Whitney); 0.87	**No Hit**	0.77; No (Mann-Whitney); 0.87	**No Hit**
DR08-A-D02-C	0.232 0.735 0.619 0.828 0.308	0.435	SB-REF-76	0.72; No (Approximate t-test); 0.89	**No Hit**	0.72; No (Approximate t-test); 0.89	**No Hit**
DR08-B-D03-C	0.402 0.562 0.568 0.528 0.680	0.548	SB-REF-48	0.90; No (Student's t-test); 1.022	**No Hit**	0.90; No (Student's t-test); 0.81	**No Hit**
DR08-B-D04-C	0.476 0.558 0.501 0.401 0.621	0.511	SB-REF-48	0.84; No (Student's t-test); 0.95	**No Hit**	0.84; No (Student's t-test); 0.95	**No Hit**
DR08-B-D06-C	0.768 0.351 0.644 0.646 0.613	0.604	SB-REF-48	1.00; No (Mann-Whitney); 1.13	**No Hit**	1.00; No (Mann-Whitney); 1.13	**No Hit**

Sample ID	Individual Growth Rate[1]	Mean Individual Growth Rate[1]	Reference	1-Hit Rule[1,2,3]		2-Hit Rule[1,2,3]	
				$MIG_T \div MIG_C < 0.80$; MIG_T vs MIG_R SD ($p = 0.05$); $MIG_T/MIG_R < 0.50$	Hit/ No-Hit	$MIG_T \div MIG_C < 0.80$; MIG_T vs MIG_R SD ($p = 0.05$); $MIG_T/MIG_R < 0.70$	Hit/ No-Hit
DR08-B-D09-C	0.712 0.520 0.526 0.276 0.425	0.492	SB-REF-76	0.81; No (Student's t-test); 1.00	**No Hit**	0.81; No (Student's t-test); 1.00	**No Hit**
DR08-B-D11-C	0.308 0.637 0.736 0.440 0.523	0.529	SB-REF-76	0.87; No (Student's t-test); 1.08	**No Hit**	0.87; No (Student's t-test); 1.08	**No Hit**

MIG = mean individual growth rate (mg/individual/day)

SD = statistically different

N/A = not applicable

Subscripts: R = reference; C = negative control; T = test sediment

[1]mg/individual/day

[2]Non-dispersive disposal site interpretation guidelines

[3]Comparison to reference includes the numeric result for the comparative criteria, the result of the statistical test, and the statistical test used. All statistics were conducted using BioStat (DMMP/SMS Bioassay Statistics Program; Beta v4.1). All juvenile polychaete growth data were log10 transformed for statistical analysis unless otherwise noted.

Table 14. Round 1 Larval Development Bioassay (*M. galloprovincialis*) Results and Evaluation Guidelines (from SAIC, 2009)

Sample ID	Normal Survival (%)	Mean Normal Survival (%)	Reference	1-Hit Rule[1,2]		2-Hit Rule[1,2]	
				$N_T \div N_C < 0.80$; N_T/N_C vs N_R/N_C SD (p = 0.10); $N_R/N_C - N_T/N_C > 0.30$	Hit/ No-Hit	$N_T \div N_C < 0.80$; N_T/N_C vs N_R/N_C SD (p = 0.10); NOCN	Hit/ No-Hit
Control	91.3 84.5 99.7 93.7 98.9	93.6 ± 6.2	n/a	n/a	n/a	n/a	n/a
Reference SB-REF-76	80.2 94.7 84.1 75.2 85.8	84.0 ± 7.3	n/a	n/a	n/a	n/a	n/a
Reference SB-REF-48	93.6 81.3 83.6 90.3 88.3	87.4 ± 5.0	n/a	n/a	n/a	n/a	n/a
Reference REF-01-DB	75.2 90.3 88.3 78.3 78.8	82.2 ± 6.7	n/a	n/a	n/a	n/a	n/a
DR08-A-D01-S	52.8 57.6 51.4 49.7 53.9	53.1 ± 3.0	SB-REF-48	0.57; Yes (Approximate t-test); 0.36	**Hit**	53.1; Yes (Approximate t-test)	**Hit**
DR08-A-D02-S	21.0 29.9 27.1 38.3 41.4	31.5 ± 8.3	SB-REF-76	0.34; Yes (Student's t-test); 0.56	**Hit**	0.34; Yes (Student's t-test)	**Hit**
DR08-B-D03-C	59.0 52.8 38.6 33.5 52.3	47.2 ± 10.7	SB-REF-48	0.50; Yes (Student's t-test); 0.43	**Hit**	0.50; Yes (Student's t-test	**Hit**
DR08-B-D04-C	32.7 29.1 34.1 26.6 28.5	30.2 ± 3.1	SB-REF-48	0.32; Yes (Student's t-test); 0.61	**Hit**	0.32; Yes (Student's t-test)	**Hit**
DR08-B-D06-C	19.0 24.3 27.4 25.7 27.4	24.8 ± 3.5	SB-REF-48	0.26; Yes (Student's t-test); 0.67	**Hit**	0.26; Yes (Student's t-test)	**Hit**

Sample ID	Normal Survival (%)	Mean Normal Survival (%)	Reference	1-Hit Rule[1,2]		2-Hit Rule[1,2]	
				$N_T \div N_C < 0.80$; N_T/N_C vs N_R/N_C SD (p = 0.10); $N_R/N_C - N_T/N_C > 0.30$	Hit/ No-Hit	$N_T \div N_C < 0.80$; N_T/N_C vs N_R/N_C SD (p = 0.10); NOCN	Hit/ No-Hit
DR08-B-D09-C	26.3 26.0 17.9 22.6 23.5	23.3 ± 3.4	SB-REF-76	0.25; Yes (Student's t-test); 0.65	**Hit**	0.25; Yes (Student's t-test	**Hit**
DR08-B-D11-C	24.9 29.6 17.6 24.9 19.6	23.3 ± 4.8	SB-REF-76	0.25; Yes (Student's t-test); 0.65	**Hit**	0.25; Yes (Student's t-test	**Hit**

M = mortality

N = normal development; Round 1: N_C = 358 N_R = 294-313

I = initial count (stocking density); Round 1: 382

SD = statistically different

NOCN = no other conditions necessary

N/A = not applicable

Subscripts: R = reference; C = negative control; T = test sediment

1 Non-dispersive disposal site interpretation guidelines

2 Comparison to reference includes the numeric result for the comparative criteria, the result of the statistical test, and the statistical test used. All statistics were conducted using BioStat (DMMP/SMS Bioassay Statistics Program; Beta v4.1). All larval development data were arcsine transformed for statistical analysis, unless indicated otherwise.

Table 15. Sampling Locations - Round 2 - March 2009

Station ID	Section	Latitude[1]	Longitude[1]	Mudline Elevation, ft (MLLW)	**Sample Type**
1	A	47.512317	122.302909	-5.6	vibracore
2	A	47.512713	122.303284	-4.1	vibracore
3	A	47.512535	122.303301	-4.4	vibracore
4	A	47.513083	122.303630	-4.1	vibracore
5	A	47.513387	122.304494	-5.4	vibracore
6	A	47.514633	122.304628	-12.9	vibracore
7	A	47.516118	122.305582	-12.8	vibracore
8	A	47.517197	122.305827	-15.1	vibracore
9	B	47.517635	122.305992	-12.3	vibracore
10	B	47.517960	122.306072	-10.5	vibracore
12	B	47.518487	122.306277	-10.7	vibracore
15	B	47.519450	122.306738	-11.6	vibracore
17	B	47.520090	122.306897	-11.8	vibracore

[1]datum = North American Datum 1983

Table 16 - Dredged Material Sampling and Compositing - Round 2 - March 2009

DMMU	Section	Station	Sample Depth	Volume (CY)
1	A	1	mudline to -17 ft MLLW	51592[1]
	A	2	mudline to -17 ft MLLW	
	A	3	mudline to -17 ft MLLW	
	A	4	mudline to -17 ft MLLW	
2	A	5	mudline to -17 ft MLLW	16580
	A	6	mudline to -17 ft MLLW	
	A	7	mudline to -17 ft MLLW	
	A	8	mudline to -17 ft MLLW	
3	B	9	mudline to -16 ft MLLW	3394
4	B	10	mudline to -16 ft MLLW	3467
6	B	12	mudline to -16 ft MLLW	3785
9	B	15	mudline to -16 ft MLLW	3982
11	B	17	mudline to -16 ft MLLW	3181

[1]This is a revised estimate for DMMU 1 based on an August 2009 survey (see text).

Table 17. Laboratory Samples - Round 2 - March 2009

Primary Samples	DMMU	Conventionals	Standard COCs	dioxin	vanadium	bioassays	archive only
DR09-A-D01-S	DMMU 1	X	X		X	X	
DR09-A-D02-S	DMMU 2	X	X		X	X	
DR09-B-D03-C	DMMU 3	X	X		X	X	
DR09-B-D04-C	DMMU 4	X	X		X	X	
DR09-B-D06-C	DMMU 6	X	X		X	X	
DR09-B-D09-C	DMMU 9	X	X		X	X	
DR09-B-D11-C	DMMU 11	X	X		X	X	
Z-samples	Overlying DMMUs						
DR09R-A-D01-Z1	DMMU 1						X
DR09R-A-D01-Z2	DMMU 1						X
DR09R-A-D01-Z3	DMMU 1						X
DR09R-A-D01-Z4	DMMU 1						X
DR09R-A-D02-Z5	DMMU 2						X
DR09R-A-D02-Z6	DMMU 2						X
DR09R-A-D02-Z7	DMMU 2						X
DR09R-A-D02-Z8	DMMU 2						X
QA samples	DMMU						
DR09R-A-D02-D	DMMU 2		X (except PCBs)		X		
DR09R-B-D09-D	DMMU 9	X	PCBs only				
DR09R-B-D09-T	DMMU 9	X					
Bioassay Reference Samples	Reference Bay						
MSMP-43	Carr Inlet	X				X	
CR-20/24-S	Carr Inlet	X				X	
CR-23W	Carr Inlet	X				X	

Table 18. Sediment
Conventional Data - Round 2 - March 2009

USACE Duwamish
DMMP Suitability Determination DY 2010

Sample ID:	DR09R-A-D01-S			DR09R-A-D02-S			DR09R-B-D03-S			DR09R-B-D04-S			DR09R-B-D06-S			DR09R-B-D09-S		
Collection Date:	03/04/2009			03/05/2009			03/04/2009			03/04/2009			03/04/2009			03/04/2009		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Conventionals																		
Ammonia (mg N/kg DW)	21			32			100			79			91			83		
Total Volatile Solids (% WW)	3.5			5.3			6.7			7.7			7.3			7.2		
Total Organic Carbon (% WW)	1.5			2			2.3			2.7			2.4			2.7		
Sulfide (mg/kg DW)	100			700			570			1400			1700			2000		
Total Solids (% DW)	55			46			47			51			44			48		
Grain Size (%)																		
Gravel	4			0.5			0.3			0.2			0.3			0.9		J
Sand	89.8			76.3			55.9			38.5			39.6			50.0		J
Silt	4.6			18.6			40.4			57.1			56.6			45.0		J
Clay	1.5			4.7			3.3			4.2			3.4			4.0		J
Fines	6.1			23.3			43.7			61.3			60.0			49.0		J

Sample ID:	DR09R-B-D09-D			DR09R-B-D09-T			DR09R-B-D11-S			MSMP-43			CR-20			CR-23W		
Collection Date:	03/04/2009			03/04/2009			03/04/2009			03/06/2009			03/06/2009			03/06/2009		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Conventionals																		
Ammonia (mg N/kg DW)	69			84			58			11	U		16			18		
Total Volatile Solids (% WW)	7.9			7.5			7.4			0.91			2.3			1.9		
Total Organic Carbon (% WW)	2.9			2.6			2.5			0.2			0.7			0.68		
Sulfide (mg/kg DW)	2200			1800			2200			6.6	U		7.1	U		14		
Total Solids (% DW)	43			47			50			76			71			77		
Grain Size (%)																		
Gravel	0.4		J	0.3		J	0.2			0			0.2			0		
Sand	47.9		J	45.3		J	31.6			96.8			32.4			79		
Silt	48.2		J	50.9		J	64.8			1.6			61.4			16.7		
Clay	3.5		J	3.4		J	3.5			1.5			6.1			4.3		
Fines	51.7		J	54.3		J	68.3			3.1			67.5			21		

J = estimate
U = undetected

DMMU
QA sample
bioassay reference sample

Sample ID:				DR09R-A-D01-S			DR09R-A-D02-S			DR09R-A-D02-D		
Collection Date:				03/04/2009			03/05/2009			03/05/2009		
	SL	BT	ML	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)												
Antimony	150	---	200	0.57	J		0.95	J		1	J	
Arsenic	57	507.1	700	4.2			5.8			7		
Cadmium	5.1	11.3	14	0.11	U		0.13	U		0.12	U	
Chromium	---	267	---	13	B		18	B		21	B	
Copper	390	1027	1300	13	B		22	B		25	B	
Lead	450	975	1200	3.8			7.2			7.8		
Mercury	0.41	1.5	2.3	0.013	J		0.076			0.029	J	
Nickel	140	370	370	13			15			17		
Selenium	---	3	---	0.087	JB		0.22	JB		0.23	JB	
Silver	6.1	6.1	8.4	0.061	U		0.072	U		0.069	U	
Vanadium	---	---	---	34	B		55	B		59	B	
Zinc	410	2783	3800	40			56			58		
Low-Molecular PAHs (ug/kg)												
Naphthalene	2100	---	2400	0.22	U		1.4	J		1.2	J	
Acenaphthylene	560	---	1300	0.28	J		0.45	J		3.6		
Acenaphthene	500	---	2000	0.16	U		1.2	J		4.9		
Fluorene	540	---	3600	0.94	J		2.7			2.7		
Phenanthrene	1500	---	21000	5.3			17		J	10		J
Anthracene	960	---	13000	0.89	J		2.9			3.8		
2-Methylnaphthalene	670	---	1900	0.51	J		1.5	J		0.23	U	
Total LPAHs	5200	---	29000	7.41	J		25.65	J		26.2	J	
High-Molecular PAHs (ug/kg)												
Fluoranthene	1700	4600	30000	11			33			29		
Pyrene	2600	11980	16000	9.5			34			26		
Benz(a)anthracene	1300	---	5100	4.1			15			15		
Chrysene	1400	---	21000	6.4			21			17		
Benzofluoranthene	3200	---	9900	11			40			33		
Benzo(a)pyrene	1600	---	3600	5.4			18			15		
Indeno(1,2,3-cd)pyrene	600	---	4400	4.1			11			9.5		
Dibenzo(a,h)anthracene	230	---	1900	0.82	J		3.3	J		2.4	J	
Benzo(g,h,i)perylene	670	---	3200	4.3			13			11		
Total HPAHs	12000	---	69000	56.62	J		188.3	J		157.9	J	
Chlorinated Hydrocarbons (ug/kg)												
1,3-Dichlorobenzene	170	---	---	0.72	U		0.72	U		0.71	U	
1,4-Dichlorobenzene	110	---	120	0.32	U		0.32	U		0.32	U	
1,2-Dichlorobenzene	35	---	110	0.64	U		0.64	U		0.63	U	
1,2,4-Trichlorobenzene	31	---	64	1.2	U		1.2	U		1.2	U	
Hexachlorobenzene	22	168	230	0.38	U		0.38	U		0.38	U	
Phthalates (ug/kg)												
Dimethyl phthalate	71	---	1400	0.42	U		1.6	J		2	J	
Diethyl phthalate	200	---	1200	1.5	U		1.5	U		1.5	U	
Dibutyl phthalate	1400	---	5100	3.7	JB		5	JB		5.1	JB	
Butyl benzyl phthalate	63	---	970	5.1	J		8.5	J		8.4	J	
Bis(2-Ethylhexyl) Phthalate	1300	---	8300	28	J		76	J		82	J	
Di-N-Octyl Phthalate	6200	---	6200	2.6	J		5.1	J		4.9	J	
Phenols (ug/kg)												
Phenol	420	---	1200	18			10		J	62		J
2-methylphenol	63	---	77	0.71	U		0.82	J		1.1	J	
3&4-methylphenol	670	---	3600	110			33		J	51		J
2,4-Dimethylphenol	29	---	210	0.21	U		0.21	U		0.21	U	
Pentachlorophenol	400	504	690	1.2	U		1.2	U		1.2	U	

Sample ID:				DR09R-A-D01-S			DR09R-A-D02-S			DR09R-A-D02-D		
Collection Date:				03/04/2009			03/05/2009			03/05/2009		
	SL	BT	ML	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)												
Benzyl Alcohol	57	---	870	4.2	J		6.9	J		150		
Benzoic Acid	650	---	760	110	J		100	J		490		
Dibenzofuran	540	---	1700	0.57	J		1.6	J		2.5	J	
Hexachloroethane	1400	---	14000	1.1	U		1.1	U		1.1	U	
Hexachlorobutadiene	29	---	270	0.91	U		0.91	U		0.9	U	
N-Nitrosodiphenylamine	28	---	130	0.22	U		0.22	U		0.22	U	
Volatile Organics (ug/kg)												
Trichloroethene	160	---	1600	0.2	U		0.27	U		0.34	U	
Tetrachloroethene	57	---	210	0.12	U		0.16	U		0.2	U	
Ethylbenzene	10	---	50	0.33	J		0.23	U		0.28	U	
Total Xylenes	40	---	160	1.14	J		0.32	U		0.4	U	
Pesticides (ug/kg)												
4,4'-DDE	---	---	---	0.32	J		0.35	J		0.4	J	
4,4'-DDD	---	---	---	0.14	U		0.18	J		0.15		
4,4'-DDT	---	---	---	1.5	J		1.4	J		1.4	J	
Total DDT	6.9	50	69	1.82	J		1.93	J		1.8	J	
Aldrin	10	---	---	0.22	U		0.22	U		0.22		
alpha-Chlordane				0.38	J		0.14	U		0.17	J	
gamma-Chlordane				0.13	U		0.14	U		0.13		
Total Chlordane	10	37		0.38	J		0.14	U		0.17	J	
Dieldrin	10	---	---	0.25	J		0.12	U		0.12	U	
Heptachlor	10	---	---	0.46	U		0.47	U		0.46	U	
Lindane	10	---	---	0.077	U		0.079	U		0.077	U	
PCB Aroclors (ug/kg)												
PCB-aroclor 1016	---	---	---	2.1	U		3.9	U		---		
PCB-aroclor 1221	---	---	---	2.1	U		3.9	U		---		
PCB-aroclor 1232	---	---	---	2.1	U		3.9	U		---		
PCB-aroclor 1242	---	---	---	2.1	U		3.9	U		---		
PCB-aroclor 1248	---	---	---	2.1	U		13			---		
PCB-aroclor 1254	---	---	---	2.1	U		9.2			---		
PCB-aroclor 1260	---	---	---	2.1	U		4.9			---		
PCB-aroclor 1262	---	---	---	2.1	U		3.9	U		---		
Total PCBs	130	---	3100	2.1	U		27.1			---		
Total PCBs (mg/kg TOC)	---	38*	---	0.1			1.4			---		

B = detected in blank
J = estimate
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample

Sample ID:				DR09R-B-D03-S			DR09R-B-D04-S			DR09R-B-D06-S		
Collection Date:				03/04/2009			03/04/2009			03/04/2009		
	SL	BT	ML	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)												
Antimony	150	---	200	---			---			---		
Arsenic	57	507.1	700	---			---			---		
Cadmium	5.1	11.3	14	---			---			---		
Chromium	---	267	---	---			---			---		
Copper	390	1027	1300	---			---			---		
Lead	450	975	1200	---			---			---		
Mercury	0.41	1.5	2.3	---			---			---		
Nickel	140	370	370	---			---			---		
Selenium	---	3	---	---			---			---		
Silver	6.1	6.1	8.4	---			---			---		
Vanadium	---	---	---	---			---			---		
Zinc	410	2783	3800	---			---			---		
Low-Molecular PAHs (ug/kg)												
Naphthalene	2100	---	2400	---			---			---		
Acenaphthylene	560	---	1300	---			---			---		
Acenaphthene	500	---	2000	---			---			---		
Fluorene	540	---	3600	---			---			---		
Phenanthrene	1500	---	21000	---			---			---		
Anthracene	960	---	13000	---			---			---		
2-Methylnaphthalene	670	---	1900	---			---			---		
Total LPAHs	5200	---	29000	---			---			---		
High-Molecular PAHs (ug/kg)												
Fluoranthene	1700	4600	30000	---			---			---		
Pyrene	2600	11980	16000	---			---			---		
Benz(a)anthracene	1300	---	5100	---			---			---		
Chrysene	1400	---	21000	---			---			---		
Benzofluoranthene	3200	---	9900	---			---			---		
Benzo(a)pyrene	1600	---	3600	---			---			---		
Indeno(1,2,3-cd)pyrene	600	---	4400	---			---			---		
Dibenzo(a,h)anthracene	230	---	1900	---			---			---		
Benzo(g,h,i)perylene	670	---	3200	---			---			---		
Total HPAHs	12000	---	69000	---			---			---		
Chlorinated Hydrocarbons (ug/kg)												
1,3-Dichlorobenzene	170	---	---	---			---			---		
1,4-Dichlorobenzene	110	---	120	---			---			---		
1,2-Dichlorobenzene	35	---	110	---			---			---		
1,2,4-Trichlorobenzene	31	---	64	---			---			---		
Hexachlorobenzene	22	168	230	---			---			---		
Phthalates (ug/kg)												
Dimethyl phthalate	71	---	1400	---			---			---		
Diethyl phthalate	200	---	1200	---			---			---		
Dibutyl phthalate	1400	---	5100	---			---			---		
Butyl benzyl phthalate	63	---	970	---			---			---		
Bis(2-Ethylhexyl) Phthalate	1300	---	8300	---			---			---		
Di-N-Octyl Phthalate	6200	---	6200	---			---			---		
Phenols (ug/kg)												
Phenol	420	---	1200	---			---			---		
2-methylphenol	63	---	77	---			---			---		
3&4-methylphenol	670	---	3600	---			---			---		
2,4-Dimethylphenol	29	---	210	---			---			---		
Pentachlorophenol	400	504	690	---			---			---		

Sample ID: / Collection Date:	SL	BT	ML	DR09R-B-D03-S 03/04/2009			DR09R-B-D04-S 03/04/2009			DR09R-B-D06-S 03/04/2009		
				conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)												
Benzyl Alcohol	57	---	870	---			---			---		
Benzoic Acid	650	---	760	---			---			---		
Dibenzofuran	540	---	1700	---			---			---		
Hexachloroethane	1400	---	14000	---			---			---		
Hexachlorobutadiene	29	---	270	---			---			---		
N-Nitrosodiphenylamine	28	---	130	---			---			---		
Volatile Organics (ug/kg)												
Trichloroethene	160	---	1600	---			---			---		
Tetrachloroethene	57	---	210	---			---			---		
Ethylbenzene	10	---	50	---			---			---		
Total Xylenes	40	---	160	---			---			---		
Pesticides (ug/kg)												
4,4'-DDE	---	---	---	---			---			---		
4,4'-DDD	---	---	---	---			---			---		
4,4'-DDT	---	---	---	---			---			---		
Total DDT	6.9	50	69	---			---			---		
Aldrin	10	---	---	---			---			---		
alpha-Chlordane				---			---			---		
gamma-Chlordane				---			---			---		
Total Chlordane	10	37		---			---			---		
Dieldrin	10	---	---	---			---			---		
Heptachlor	10	---	---	---			---			---		
Lindane	10	---	---	---			---			---		
PCB Aroclors (ug/kg)												
PCB-aroclor 1016	---	---	---	3.9	U		3	U		3.9	U	
PCB-aroclor 1221	---	---	---	3.9	U		3	U		3.9	U	
PCB-aroclor 1232	---	---	---	3.9	U		3	U		3.9	U	
PCB-aroclor 1242	---	---	---	27			3	U		3.9	U	
PCB-aroclor 1248	---	---	---	3.9	U		25			25		
PCB-aroclor 1254	---	---	---	22			26			22		
PCB-aroclor 1260	---	---	---	13			18			12		
PCB-aroclor 1262	---	---	---	3.9	U		3	U		3.9	U	
Total PCBs	130	---	3100	62			69			59		
Total PCBs (mg/kg TOC)	---	38*	---	2.7			2.6			2.5		

B = detected in blank
J = estimate
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample

Sample ID:				DR09R-B-D09-S			DR09R-B-D09-D			DR09R-B-D11-S		
Collection Date:				03/04/2009			03/04/2009			03/04/2009		
	SL	BT	ML	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)												
Antimony	150	---	200	---			---			---		
Arsenic	57	507.1	700	---			---			---		
Cadmium	5.1	11.3	14	---			---			---		
Chromium	---	267	---	---			---			---		
Copper	390	1027	1300	---			---			---		
Lead	450	975	1200	---			---			---		
Mercury	0.41	1.5	2.3	---			---			---		
Nickel	140	370	370	---			---			---		
Selenium	---	3	---	---			---			---		
Silver	6.1	6.1	8.4	---			---			---		
Vanadium	---	---	---	---			---			---		
Zinc	410	2783	3800	---			---			---		
Low-Molecular PAHs (ug/kg)												
Naphthalene	2100	---	2400	---			---			---		
Acenaphthylene	560	---	1300	---			---			---		
Acenaphthene	500	---	2000	---			---			---		
Fluorene	540	---	3600	---			---			---		
Phenanthrene	1500	---	21000	---			---			---		
Anthracene	960	---	13000	---			---			---		
2-Methylnaphthalene	670	---	1900	---			---			---		
Total LPAHs	5200	---	29000	---			---			---		
High-Molecular PAHs (ug/kg)												
Fluoranthene	1700	4600	30000	---			---			---		
Pyrene	2600	11980	16000	---			---			---		
Benz(a)anthracene	1300	---	5100	---			---			---		
Chrysene	1400	---	21000	---			---			---		
Benzofluoranthene	3200	---	9900	---			---			---		
Benzo(a)pyrene	1600	---	3600	---			---			---		
Indeno(1,2,3-cd)pyrene	600	---	4400	---			---			---		
Dibenzo(a,h)anthracene	230	---	1900	---			---			---		
Benzo(g,h,i)perylene	670	---	3200	---			---			---		
Total HPAHs	12000	---	69000	---			---			---		
Chlorinated Hydrocarbons (ug/kg)												
1,3-Dichlorobenzene	170	---	---	---			---			---		
1,4-Dichlorobenzene	110	---	120	---			---			---		
1,2-Dichlorobenzene	35	---	110	---			---			---		
1,2,4-Trichlorobenzene	31	---	64	---			---			---		
Hexachlorobenzene	22	168	230	---			---			---		
Phthalates (ug/kg)												
Dimethyl phthalate	71	---	1400	---			---			---		
Diethyl phthalate	200	---	1200	---			---			---		
Dibutyl phthalate	1400	---	5100	---			---			---		
Butyl benzyl phthalate	63	---	970	---			---			---		
Bis(2-Ethylhexyl) Phthalate	1300	---	8300	---			---			---		
Di-N-Octyl Phthalate	6200	---	6200	---			---			---		
Phenols (ug/kg)												
Phenol	420	---	1200	---			---			---		
2-methylphenol	63	---	77	---			---			---		
3&4-methylphenol	670	---	3600	---			---			---		
2,4-Dimethylphenol	29	---	210	---			---			---		
Pentachlorophenol	400	504	690	---			---			---		

Sample ID: / Collection Date:	SL	BT	ML	DR09R-B-D09-S 03/04/2009			DR09R-B-D09-D 03/04/2009			DR09R-B-D11-S 03/04/2009		
				conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)												
Benzyl Alcohol	57	---	870	---			---			---		
Benzoic Acid	650	---	760	---			---			---		
Dibenzofuran	540	---	1700	---			---			---		
Hexachloroethane	1400	---	14000	---			---			---		
Hexachlorobutadiene	29	---	270	---			---			---		
N-Nitrosodiphenylamine	28	---	130	---			---			---		
Volatile Organics (ug/kg)												
Trichloroethene	160	---	1600	---			---			---		
Tetrachloroethene	57	---	210	---			---			---		
Ethylbenzene	10	---	50	---			---			---		
Total Xylenes	40	---	160	---			---			---		
Pesticides (ug/kg)												
4,4'-DDE	---	---	---	---			---			---		
4,4'-DDD	---	---	---	---			---			---		
4,4'-DDT	---	---	---	---			---			---		
Total DDT	6.9	50	69	---			---			---		
Aldrin	10	---	---	---			---			---		
alpha-Chlordane				---			---			---		
gamma-Chlordane				---			---			---		
Total Chlordane	10	37		---			---			---		
Dieldrin	10	---	---	---			---			---		
Heptachlor	10	---	---	---			---			---		
Lindane	10	---	---	---			---			---		
PCB Aroclors (ug/kg)												
PCB-aroclor 1016	---	---	---	15	U		---			3	U	
PCB-aroclor 1221	---	---	---	15	U		---			3	U	
PCB-aroclor 1232	---	---	---	15	U		---			3	U	
PCB-aroclor 1242	---	---	---	15	U		---			3	U	
PCB-aroclor 1248	---	---	---	36			---			21		
PCB-aroclor 1254	---	---	---	31			---			22		
PCB-aroclor 1260	---	---	---	18			---			14		
PCB-aroclor 1262	---	---	---	15	U		---			3	U	
Total PCBs	130	---	3100	85			---			57		
Total PCBs (mg/kg TOC)	---	38*	---	3.2			---			2.3		

B = detected in blank
J = estimate
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample

Round 1 - November 2008 - Test America (rejected)

Aroclor	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 8		DMMU 9		DMMU 10		DMMU 11		DMMU 12	
1016	1.5	R	1.6	R	1.6	R	1.6	R	1.6	R	1.5	R	1.6	R	1.6	R	1.6	R	32	R	53	R	1.6	R
1221	3.8	R	3.9	R	4	R	4	R	3.9	R	3.8	R	4	R	4	R	3.9	R	3.8	R	3.8	R	4	R
1232	56	R	85	R	69	R	80	R	3.4	R	180	R	3.5	R	41	R	42	R	34	R	49	R	23	R
1242	29	R	44	R	1	R	1.1	R	1	R	160	R	1	R	1	R	82	R	1	R	46	R	1	R
1248	30	R	51	R	37	R	32	R	23	R	110	R	28	R	0.64	R	36	R	0.62	R	42	R	30	R
1254	36	R	56	R	37	R	42	R	18	R	110	R	20	R	19	R	1	R	18	R	37	R	1	R
1260	13	R	24	R	9.6	R	12	R	16	R	1.4	R	14	R	14	R	17	R	19	R	19	R	46	R
Total PCBs	164	R	260	R	152.6	R	166	R	57	R	560	R	62	R	74	R	177	R	103	R	246	R	99	R

Round 1 - November 2008 - ARI analysis of archived sediment (accepted)

Aroclor	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 8		DMMU 9		DMMU 10		DMMU 11		DMMU 12	
1016	2.2	U	4	U	3.1	U	3.2	U	3	U	3	U	3.1	U	3.2	U	3.2	U	3.1	U	3	U	3.2	U
1221	2.2	U	4	U	3.1	U	3.2	U	3	U	3	U	3.1	U	3.2	U	3.2	U	3.1	U	3	U	3.2	U
1232	2.2	U	4	U	3.1	U	3.2	U	3	U	3	U	3.1	U	3.2	U	3.2	U	3.1	U	3	U	3.2	U
1242	2.2	U	4	U	3.1	U	3.2	U	3	U	32		3.1	U	3.2	U	3.2	U	3.1	U	3	U	3.2	U
1248	6.8		17		12		19		16		3	U	12		20		27		20		47		18	
1254	9.4		20		14		21		14		24		14		24		25		23		35		18	
1260	8.3		16		10		15		9		14		11		17		16		17		21		12	
1262	2.2	U	4	U	3.1	U	3.2	U	3	U	3	U	3.1	U	3.2	U	3.2	U	3.1	U	3	U	3.2	U
Total PCBs	24.5		53		36		55		39		70		37		61		68		60		103		48	

Round 2 - March 2009 - Test America (rejected)

Aroclor	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 8		DMMU 9		DMMU 10		DMMU 11		DMMU 12	
1016	1.6	R	1.6	R	1.6	R	1.5	R	NS		1.6	R	NS		NS		1.5	R	NS		1.6	R	NS	
1221	4	R	4	R	3.9	R	3.8	R	NS		4	R	NS		NS		3.8	R	NS		3.9	R	NS	
1232	3.5	R	3.5	R	57	R	110	R	NS		84	R	NS		NS		120	R	NS		59	R	NS	
1242	1	R	1	R	1	R	0.99	R	NS		1	R	NS		NS		1	R	NS		1	R	NS	
1248	0.64	R	0.65	R	0.64	R	0.61	R	NS		0.64	R	NS		NS		0.62	R	NS		0.64	R	NS	
1254	1	R	9.6	R	22	R	51	R	NS		45	R	NS		NS		60	R	NS		38	R	NS	
1260	1.5	R	1.5	R	1.5	R	1.4	R	NS		1.5	R	NS		NS		1.4	R	NS		1.5	R	NS	
Total PCBs	3.5	R	9.6	R	79	R	161	R	NS		129	R	NS		NS		180	R	NS		97	R	NS	

Round 2 - March 2009 - ARI analysis of archived sediment (accepted)

Aroclor	DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		DMMU 7		DMMU 8		DMMU 9		DMMU 10		DMMU 11		DMMU 12	
1016	2.1	U	3.9	U	3.9	U	3	U	NS		3.9	U	NS		NS		15	U	NS		3	U	NS	
1221	2.1	U	3.9	U	3.9	U	3	U	NS		3.9	U	NS		NS		15	U	NS		3	U	NS	
1232	2.1	U	3.9	U	3.9	U	3	U	NS		3.9	U	NS		NS		15	U	NS		3	U	NS	
1242	2.1	U	3.9	U	27		3	U	NS		3.9	U	NS		NS		15	U	NS		3	U	NS	
1248	2.1	U	13		3.9	U	25		NS		25		NS		NS		36		NS		21		NS	
1254	2.1	U	9.2		22		26		NS		22		NS		NS		31		NS		22		NS	
1260	2.1	U	4.9		13		18		NS		12		NS		NS		18		NS		14		NS	
1262	2.1	U	3.9	U	3.9	U	3	U	NS		3.9	U	NS		NS		15	U	NS		3	U	NS	
Total PCBs	2.1	U	27.1		62		69		NS		59		NS		NS		85		NS		57		NS	

NS = not sampled; R = rejected; U = undetected

validated/accepted

rejected

Round 1 - November 2008 - Test America (rejected)

Aroclor	DMMU 13		DMMU 14		ST21-C0-2		ST21-C2-5		ST22-C0-2		ST22-C2-5		ST23-C0-2		ST23-C2-5		ST28-C0-2		ST28-C2-5		ST31-C0-2		ST31-C2-5	
1016	1.5	R	1.5	R	120	R	110	R	81	R	130	R	110	R	1.6	R	1.6	R	100	R	1.5	R	1.6	R
1221	3.7	R	3.8	R	4	R	4	R	4	R	4.1	R	4	R	4	R	4	R	3.9	R	3.9	R	4	R
1232	3.3	R	3.3	R	160	R	120	R	59	R	180	R	140	R	3.5	R	3.5	R	120	R	39	R	110	R
1242	82	R	34	R	79	R	60	R	30	R	88	R	100	R	42	R	44	R	59	R	1	R	54	R
1248	40	R	0.62	R	75	R	94	R	42	R	110	R	97	R	0.65	R	40	R	79	R	25	R	61	R
1254	34	R	20	R	65	R	92	R	55	R	93	R	82	R	39	R	35	R	74	R	25	R	58	R
1260	1.4	R	11	R	23	R	39	R	19	R	30	R	35	R	31	R	15	R	28	R	13	R	24	R
Total PCBs	156	R	65	R	522	R	515	R	286	R	538	R	564	R	112	R	134	R	460	R	102	R	307	R

Round 1 - November 2008 - ARI analysis of archived sediment (accepted)

Aroclor	DMMU 13		DMMU 14		ST21-C0-2		ST21-C2-5		ST22-C0-2		ST22-C2-5		ST23-C0-2		ST23-C2-5		ST28-C0-2		ST28-C2-5		ST31-C0-2		ST31-C2-5	
1016	3.9	U	2.8	U	4	U	15	U	4	U	3	U	7.9	U	4	U	14	U	3.9	U	2.2	U	15	U
1221	3.9	U	2.8	U	4	U	15	U	4	U	3	U	7.9	U	4	U	14	U	3.9	U	2.2	U	15	U
1232	3.9	U	2.8	U	4	U	15	U	4	U	3	U	7.9	U	4	U	14	U	3.9	U	2.2	U	15	U
1242	3.9	U	2.8	U	4	U	15	U	4	U	3	U	7.9	U	4	U	14	U	3.9	U	2.2	U	15	U
1248	33		17		69		32		18		42		100		29		22		33		2.2	U	38	
1254	22		18		40		38		20		33		62		42		28		33		4.1		43	
1260	12		13		20		34		22		18		28		35		18		20		2.2	U	33	
1262	3.9	U	2.8	U	4	U	15	U	4	U	3	U	7.9	U	4	U	14	U	3.9	U	2.2	U	15	U
Total PCBs	67		48		129		104		60		93		190		106		68		86		4.1		114	

Round 2 - March 2009 - Test America (rejected)

Aroclor	DMMU 13		DMMU 14		ST21-C0-2		ST21-C2-5		ST22-C0-2		ST22-C2-5		ST23-C0-2		ST23-C2-5		ST28-C0-2		ST28-C2-5		ST31-C0-2		ST31-C2-5	
1016	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1221	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1232	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1242	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1248	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1254	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1260	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
Total PCBs	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	

Round 2 - March 2009 - ARI analysis of archived sediment (accepted)

Aroclor	DMMU 13		DMMU 14		ST21-C0-2		ST21-C2-5		ST22-C0-2		ST22-C2-5		ST23-C0-2		ST23-C2-5		ST28-C0-2		ST28-C2-5		ST31-C0-2		ST31-C2-5	
1016	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1221	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1232	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1242	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1248	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1254	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1260	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
1262	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	
Total PCBs	NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS		NS	

NS = not sampled; R = rejected; U = undetected

validated/accepted

rejected

Table 21 - Round 2 bioassay control and reference performance summary

Bioassay	Negative Control Performance	Positive Control Performance	Reference Sediment Performance
Amphipod toxicity (*E. estuarius*)	1% mortality ≤ 10%; pass	$CdCl_2$, 96 hr EC50: 5.7 mg/L Cd Lab control limits: 4.6 - 12.9 mg/L Cd pass	CR-23W: 2% mortality MSMP-43: 2% mortality Both ≤ 20% over control mortality pass
Larval development (*M. galloprovincialis*)	9.4% CMA ≤ 30%; pass	$CuCl_2$, normality, 10.4 µg/L Cu 4.0 – 17.0 µg/L Cu pass	CR-23W: 21.5% NCMA MSMP-43: 17.7% NCMA Both ≤ 35% pass
Polychaete growth (*N. arenaceodentata*)	0% mortality ≤ 10% 0.836 MIG ≥ 0.38 pass	$CdCl_2$, 96 hr EC50, 9.7 mg/L Cd 2.8 – 17.5 mg/L Cd pass	0% mortality in all reference samples Both ≤ 20% CR-23W: 0.864 MIG MSMP-43: 0.802 MIG All ≥ 80% control MIG pass

Bolded values are test results. Non-bolded values are performance standards.
CMA = Combined mortality and abnormality; MIG = mean individual growth (mg/day/worm); NCMA = Normalized combined mortality and abnormality (normalized to seawater control)

Table 22. Grain Size and TOC Results for Determining Round 2 Reference Sediments Comparisons (from SAIC, 2009)

Sample ID	Percent Fines (silt + clay)	TOC (%)	Reference Sediment for Comparison[1]
Reference **CR-23W**	**21.0**	**0.68**	**n/a**
Reference **CR-20**	**67.4**	**0.7**	**n/a**
Reference **MSMP-43**	**3.2**	**0.2**	**n/a**
DR08-A-D01	6.2	1.5	MSMP-43
DR08-A-D02	23.2	2	CR-23W
DR08-B-D03	43.8	2.3	CR-23W
DR08-B-D04	61.3	2.7	CR-20
DR08-B-D06	60.1	2.4	CR-20
DR08-B-D09	49.1	2.7	CR-20
DR08-B-D11	68.2	2.5	CR-20

[1]Round 2: Test sediments with fines < 12.1 percent were compared MSMP-43, with fines >12.1 and <44.2 percent were compared to CR-23W, and >44.2 percent were compared to CR-20.

Table 23. Round 2 Amphipod Mortality Bioassay (*E. estuarius*) Results and Evaluation Guidelines (from SAIC, 2009)

Sample ID	% Mortality	Mean Mortality	Reference	1-Hit Rule[1,2]		2-Hit Rule[1,2]	
				$M_T - M_C > 20\%$; M_T vs M_R SD ($p = 0.05$); $M_T - M_R > 30\%$	Hit/ No-Hit	$M_T - M_C > 20\%$; M_T vs M_R SD ($p = 0.05$); NOCN	Hit/ No-Hit
Control	0 0 0 5 0	1.0 ± 2.2	n/a	n/a	n/a	n/a	n/a
Reference CR-23W	0 5 0 0 5	2.0 ± 2.7	n/a	n/a	n/a	n/a	n/a
Reference MSMP-43	5 5 0 0 0	2.0 ± 2.7	n/a	n/a	n/a	n/a	n/a
DR09R-A-D01-C	0 0 0 0 0	0.0 ± 0.0	MSMP-43	-1%; No (Approximate t-test)[3]; -2%	**No Hit**	-1%; No (Approximate t-test)[3]	**No Hit**
DR09R-A-D02-C	10 5 15 5 0	7.0 ± 5.7	CR-23W	6%; No (Student's t-test); 5%	**No Hit**	6%; No (Student's t-test)	**No Hit**

M = mortality

SD = statistically different

NOCN = no other conditions necessary

N/A = not applicable

Subscripts: R = reference; C = negative control; T = test sediment

[1]Non-dispersive disposal site interpretation guidelines

[2]Comparison to reference includes the numeric result for the comparative criteria, the result of the statistical test, and the statistical test used. All statistics were conducted using BioStat (DMMP/SMS Bioassay Statistics Program; Beta v4.1). All amphipod mortality data were arcsine transformed for statistical analysis, unless noted otherwise.

[3]Rankits transformation used due to failure of Shapiro-Wilk test for normality and Levene's test for homoscedasticity.

Table 24. Round 2 Juvenile Polychaete Growth Bioassay (*N. arenaceodentata*) Results and Evaluation Guidelines (from SAIC, 2009)

Sample ID	Individual Growth Rate[1]	Mean Individual Growth Rate[1]	Reference	1-Hit Rule[1,2,3]		2-Hit Rule[1,2,3]	
				$MIG_T \div MIG_C < 0.80$; MIG_T vs MIG_R SD ($p = 0.05$); $MIG_T/MIG_R < 0.50$	Hit/ No-Hit	$MIG_T \div MIG_C < 0.80$; MIG_T vs MIG_R SD ($p = 0.05$); $MIG_T/MIG_R < 0.70$	Hit/ No-Hit
Control	0.874 0.729 0.950 0.685 0.944	0.836 ± 0.12	n/a	n/a	n/a	n/a	n/a
Reference CR-23W	0.957 0.662 0.878 0.826 0.996	0.864 ± 0.13	n/a	n/a	n/a	n/a	n/a
Reference MSMP-43	0.815 0.856 0.746 0.867 0.726	0.802 ± 0.06	n/a	n/a	n/a	n/a	n/a
DR09R-A-D01-C	0.690 0.686 0.646 0.803 0.641	0.693 ± 0.07	MSMP-43	0.83; Yes (Student's t-test); 0.86	**No Hit**	0.83; Yes (Student's t-test); 0.86	**No Hit**
DR09R-A-D02-C	0.485 0.443 0.334 0.355 0.616	0.446 ± 0.11	CR-23W	0.53; Yes (Student's t-test); 0.52	**No Hit**	0.53; Yes (Student's t-test); 0.52	**Hit**

MIG = mean individual growth rate (mg/individual/day)

SD = statistically different

N/A = not applicable

Subscripts: R = reference; C = negative control; T = test sediment

[1]mg/individual/day

[2]Non-dispersive disposal site interpretation guidelines

[3]Comparison to reference includes the numeric result for the comparative criteria, the result of the statistical test, and the statistical test used. All statistics were conducted using BioStat (DMMP/SMS Bioassay Statistics Program; Beta v4.1). All juvenile polychaete growth data were log10 transformed for statistical analysis unless otherwise noted.

Table 25. Round 2 Larval Development Bioassay (*M. galloprovincialis*) Results and Evaluation Guidelines (from SAIC, 2009)

Sample ID	Normal Survival (%)	Mean Normal Survival (%)	Reference	1-Hit Rule[1,2]		2-Hit Rule[1,2]	
				$N_T \div N_C < 0.80$; N_T/N_C vs N_R/N_C SD (p = 0.10); $N_R/N_C - N_T/N_C > 0.30$	Hit/ No-Hit	$N_T \div N_C < 0.80$; N_T/N_C vs N_R/N_C SD (p = 0.10); NOCN	Hit/ No-Hit
Control	98.7 85.8 93.7 90.5 84.0	90.6 ± 5.9	n/a	n/a	n/a	n/a	n/a
Reference CR-23W	71.1 89.3 79.8 74.6 77.8	78.5 ± 6.8	n/a	n/a	n/a	n/a	n/a
Reference CR-20	86.5 50.2 93.6 90.4 95.2	89.2 ± 6.0	n/a	n/a	n/a	n/a	n/a
Reference MSMP-43	66.0 78.6 81.0 86.9 99.1	82.3 ± 12.1	n/a	n/a	n/a	n/a	n/a
DR09R-A-D01-C	73.1 70.3 81.0 78.2 89.3	78.4 ± 7.4	MSMP-43	0.86; No (Student's t-test); 0.05	**No Hit**	0.86; No (Student's t-test)	**No Hit**
DR09R-A-D02-C	39.5 55.3 42.3 87.3 45.4	53.9 ± 19.6	CR-23W	0.59; No (Mann-Whitney); 0.27	**No Hit**	0.59; Yes (Mann-Whitney)	**Hit**
DR09R-B-D03-C	9.9 62.8 48.2 32.8 60.0	42.7 ± 21.9	CR-23W	0.47; Yes (Approximate t-test); 0.40	**Hit**	0.47; Yes (Approximate t-test)	**Hit**
DR09R-B-D04-C	32.4 40.7 27.3 52.5 58.8	42.3 ± 13.3	CR-20	0.47; Yes (Student's t-test); 0.51	**Hit**	0.47; Yes (Student's t-test)	**Hit**
DR09R-B-D06-C	32.4 62.8 19.4 30.0 19.7	32.9 ± 17.7	CR-20	0.36; Yes (Student's t-test); 0.62	**Hit**	0.36; Yes (Student's t-test)	**Hit**

Sample ID	Normal Survival (%)	Mean Normal Survival (%)	Reference	1-Hit Rule[1,2]		2-Hit Rule[1,2]	
				$N_T \div N_C < 0.80$; N_T/N_C vs N_R/N_C SD ($p = 0.10$); $N_R/N_C - N_T/N_C > 0.30$	Hit/ No-Hit	$N_T \div N_C < 0.80$; N_T/N_C vs N_R/N_C SD ($p = 0.10$); NOCN	Hit/ No-Hit
DR09R-B-D09-C	51.3 34.4 59.6 34.0 70.7	50.0 ± 16.0	CR-20	0.55; Yes (Student's t-test); 0.43	**Hit**	0.55; Yes (Student's t-test)	**Hit**
DR09R-B-D11-C	34.0 38.3 33.2 67.9 36.7	42.0 ± 14.6	CR-20	0.46; Yes (Student's t-test); 0.52	**Hit**	0.46; Yes (Student's t-test)	**Hit**

M = mortality

N = normal development; Round 2: $N_C = 253$ $N_R = 199\text{-}226$

I = initial count (stocking density); Round 2: 280

SD = statistically different

NOCN = no other conditions necessary

N/A = not applicable

Subscripts: R = reference; C = negative control; T = test sediment

[1]Non-dispersive disposal site interpretation guidelines

[2]Comparison to reference includes the numeric result for the comparative criteria, the result of the statistical test, and the statistical test used. All statistics were conducted using BioStat (DMMP/SMS Bioassay Statistics Program; Beta v4.1). All larval development data were arcsine transformed for statistical analysis, unless indicated otherwise.

Table 26. Sampling Locations - Round 3 - August 2009

Station ID	Section	Latitude[1]	Longitude[1]	Mudline Elevation, ft (MLLW)	**Sample Type**
10	B	47.517983	122.306170	-8.7	vibracore
11	B	47.518175	122.306332	-8.7	vibracore
12	B	47.518480	122.306373	-8.5	vibracore

[1]datum = North American Datum 1983

Table 27. Dredged Material Sampling and Compositing - Round 3 - August 2009

DMMU	Section	Station	Sample Depth	Volume (CY)
15	B	10	mudline to -11 ft MLLW	1,575
	B	11	mudline to -11 ft MLLW	
	B	12	mudline to -11 ft MLLW	
z-sample	B	10	-11 to -12 ft MLLW	N/A
	B	11	-11 to -12 ft MLLW	
	B	12	-11 to -12 ft MLLW	

Table 28. Laboratory Samples - Round 3 - August 2009

Primary Samples	DMMU	Conventionals	Standard COCs	bioassays
DR09-B-D15-C0-3	DMMU 15	X	X	X
Z-samples	Overlying DMMUs			
DR09-B-D15-Z	DMMU 15	X	X	X
QA samples	DMMU			
DR09-B-D15-C0-3-D	DMMU 15	X		
DR09-B-D15-C0-3-T	DMMU 15	X		
DR09-B-D15-Z-D			X	
Bioassay Reference Samples	Reference Bay			
CR24	Carr Inlet	X		X

Sample ID:	DR09-B-D15-C0-3			DR09-B-D15-C0-3-D			DR09-B-D15-C0-3-T			DR09-B-D15-Z			CR-24		
Collection Date:	08/13/2009			08/13/2009			08/13/2009			08/13/2009			08/14/2009		
	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Conventionals															
Ammonia (mg N/kg DW)	148			150			149			145			5.78		
Total Volatile Solids (% WW)	7.68			7.75			7.79			7.27			2.82		
Total Organic Carbon (% WW)	2.43			2.48			2.46			2.46			0.602		
Sulfide (mg/kg DW)	2700			2690			2990			3570			187		
Total Solids (% DW)	53.8			53.8			53.8			53.9			62.6		
Grain Size (%)															
Gravel	0.0			0.0			0.0			0.0			0.0		
Sand	29.1			29.1			28.3			35.9			33.9		
Silt	57.6		J	58.5			59.2			51.9			56.9		
Clay	13.3			12.4			12.5			12.2			9.3		
Fines	70.9		J	70.9			71.7			64.1			66.2		

DMMU
QA sample
bioassay reference sample

Sample ID:				DR09-B-D15-C0-3			DR09-B-D15-Z			DR09-B-D15-Z-D		
Collection Date:				08/13/2009			08/13/2009			08/13/2009		
	SL	BT	ML	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Metals (mg/kg)												
Antimony	150	---	200	9	U	UJ	9	U	UJ	---		
Arsenic	57	507.1	700	14			13			---		
Cadmium	5.1	11.3	14	0.7			0.4			---		
Chromium	---	267	---	27.4			26.9			---		
Copper	390	1027	1300	44.3			40.4			---		
Lead	450	975	1200	23			15			---		
Mercury	0.41	1.5	2.3	0.14			0.1			---		
Nickel	140	370	370	21			20			---		
Selenium	---	3	---	0.9	U		0.9	U		---		
Silver	6.1	6.1	8.4	0.5	U		0.5	U		---		
Zinc	410	2783	3800	103			88			---		
Low-Molecular PAHs (ug/kg)												
Naphthalene	2100	---	2400	20	U		19	U		20	U	
Acenaphthylene	560	---	1300	20	U		19	U		20	U	
Acenaphthene	500	---	2000	15	J		19	U		20	U	
Fluorene	540	---	3600	13	J		19	U		20	U	
Phenanthrene	1500	---	21000	82			48			54		
Anthracene	960	---	13000	19	J		10	J		11	J	
2-Methylnaphthalene	670	---	1900	20	U		19	U		20	U	
Total LPAHs	5200	---	29000	129	J		58	J		65	J	
High-Molecular PAHs (ug/kg)												
Fluoranthene	1700	4600	30000	240			140			140		
Pyrene	2600	11980	16000	170			110			110		
Benz(a)anthracene	1300	---	5100	86			58			57		
Chrysene	1400	---	21000	120			78			79		
Benzofluoranthene	3200	---	9900	192		JN	133			144		
Benzo(a)pyrene	1600	---	3600	98			62			65		
Indeno(1,2,3-cd)pyrene	600	---	4400	46			31			30		
Dibenzo(a,h)anthracene	230	---	1900	12			6.1			8.5		
Benzo(g,h,i)perylene	670	---	3200	44			29			27		
Total HPAHs	12000	---	69000	996			653	J		652		
Chlorinated Hydrocarbons (ug/kg)												
1,3-Dichlorobenzene	170	---	---	1.4	U	UJ	1.4	U		1.4	U	
1,4-Dichlorobenzene	110	---	120	1.4	U	UJ	1.4	U		1.4	U	
1,2-Dichlorobenzene	35	---	110	1.4	U	UJ	1.4	U		1.4	U	
1,2,4-Trichlorobenzene	31	---	64	6	U		6.1	U		6.1	U	
Hexachlorobenzene	22	168	230	0.99	U		19	U		20	U	
Phthalates (ug/kg)												
Dimethyl phthalate	71	---	1400	14	J		16	J		20	U	
Diethyl phthalate	200	---	1200	20	U		19	U		20	U	
Di-n-butyl phthalate	1400	---	5100	15	J		13	J		20	U	
Butyl benzyl phthalate	63	---	970	20			15	U		15	U	
Bis(2-Ethylhexyl) Phthalate	1300	---	8300	340	B	J	180	B	DNQ	170	B	DNQ
Di-n-Octyl Phthalate	6200	---	6200	20	U		19	U		20	U	
Phenols (ug/kg)												
Phenol	420	---	1200	20	U		19	U		20	U	
2-methylphenol	63	---	77	20	U		19	U		20	U	
4-methylphenol	670	---	3600	20	U		19	U		20	U	
2,4-Dimethylphenol	29	---	210	20	U		19	U		20	U	
Pentachlorophenol	400	504	690	100	U		97	U		97	U	

Sample ID:				DR09-B-D15-C0-3			DR09-B-D15-Z			DR09-B-D15-Z-D		
Collection Date:				08/13/2009			08/13/2009			08/13/2009		
	SL	BT	ML	conc	LQ	VQ	conc	LQ	VQ	conc	LQ	VQ
Miscellaneous Extractables (ug/kg)												
Benzyl Alcohol	57	---	870	20	U		19	U		20	U	
Benzoic Acid	650	---	760	200	U	UJ	190	U		200	U	
Dibenzofuran	540	---	1700	20	U		19	U		20	U	
Hexachloroethane	1400	---	14000	20	U		19	U		20	U	
Hexachlorobutadiene	29	---	270	0.99	U		19	U		20	U	
N-Nitrosodiphenylamine	28	---	130	20	U		19	U		20	U	
Volatile Organics (ug/kg)												
Trichloroethene	160	---	1600	1.4	U	UJ	1.4	U		1.4	U	
Tetrachloroethene	57	---	210	1.4	U	UJ	1.4	U		1.4	U	
Ethylbenzene	10	---	50	1.4	U	UJ	1.4	U		1.4	U	
Total Xylenes	40	---	160	1.4	U	UJ	1.4	U		1.4	U	
Pesticides (ug/kg)												
4,4'-DDE	---	---	---	2	U		1.9	U		2	U	
4,4'-DDD	---	---	---	2	U		1.9	U		2	U	
4,4'-DDT	---	---	---	2	U		7.8		J	2	U	
Total DDT	6.9	50	69	2	U		7.8		J	2	U	
Aldrin	10	---	---	0.99	U		0.97	U		0.98	U	
alpha-Chlordane				0.99	U		0.97	U		0.98	U	
gamma-Chlordane				3.2	Y	U	0.97	U		0.98	U	
oyx-Chlordane				2	U		1.9	U		2	U	
cis-Nonachlor				2	U		1.9	U		2	U	
trans-Nonachlor				2	U		1.9	U		2	U	
Total Chlordane	10	37		3.2	U		1.9	U		2	U	
Dieldrin	10	---	---	2	U		1.9	U		2	U	
Heptachlor	10	---	---	0.99	U		0.97	U		0.98	U	
Lindane	10	---	---	0.99	U		0.97	U		0.98	U	
PCB Aroclors (ug/kg)												
PCB-aroclor 1016	---	---	---	20	U		19	U		19	U	
PCB-aroclor 1221	---	---	---	20	U		19	U		19	U	
PCB-aroclor 1232	---	---	---	20	U		19	U		19	U	
PCB-aroclor 1242	---	---	---	20	U		19	U		19	U	
PCB-aroclor 1248	---	---	---	100			38			31		
PCB-aroclor 1254	---	---	---	58			30			24		
PCB-aroclor 1260	---	---	---	28			19	U		19	U	
PCB-aroclor 1262	---	---	---	20	U		19	U		19	U	
PCB-aroclor 1268	---	---	---	20	U		19	U		19	U	
Total PCBs	130	---	3100	186			68			55		
Total PCBs (mg/kg TOC)	---	38*	---	7.6			2.8			2.2		

B = detected in blank
J = estimate
DNQ = do not qualify
U = undetected
LQ = laboratory qualifier
VQ = validation qualifier
OC = organic carbon
SL = screening level
BT = bioaccumulation trigger
ML = maximum level

DMMU
QA sample
DMMP SL exceedance

Table 31 - Round 3 bioassay control and reference performance summary

Bioassay	Negative Control Performance	Positive Control Performance	Reference Sediment Performance
Amphipod toxicity (*E. estuarius*)	1% mortality ≤ 10%; pass	NH_4Cl, 96 hr EC50: 225 mg/L NH_3 Lab control limits: 18.9 - 318 mg/L NH_3 pass	CR-24: 4% mortality ≤ 20% over control mortality pass
Larval development (*M. galloprovincialis*)	21.0% CMA ≤ 30%; pass	$CdCl_2$, 48 hr EC50: 5.75 mg/L Cd Lab control limits: 6.38 - 12.4 mg/L Cd Lab action limits: 4.86 – 14.0 mg/L Cd acceptable	CR-24: 8.6% NCMA ≤ 35% pass
Polychaete growth (*N. arenaceodentata*)	0% mortality ≤ 10% 1.15 MIG ≥ 0.38 pass	NH_4Cl, 96 hr EC50: 276 mg/L NH_3 Lab control limits: 128 - 314 mg/L NH_3 pass	CR-24: 0% mortality ≤ 20% CR-24: 1.17 MIG ≥ 80% control MIG pass

Bolded values are test results. Non-bolded values are performance standards.
CMA = Combined mortality and abnormality; MIG = mean individual growth (mg/day/worm); NCMA = Normalized combined mortality and abnormality (normalized to seawater control)

Table 32. Round 3 Amphipod Mortality Bioassay (*E. estuarius*) Results and Evaluation Guidelines (from SAIC, 2009)

Sample ID	% Mortality	Mean Mortality	Reference	1-Hit Rule[1,2]		2-Hit Rule[1,2]	
				$M_T - M_C > 20\%$; M_T vs M_R SD ($p = 0.05$); $M_T - M_R > 30\%$	Hit/ No-Hit	$M_T - M_C > 20\%$; M_T vs M_R SD ($p = 0.05$); NOCN	Hit/ No-Hit
Control	0 0 0 5 0	1.0 ± 2.2	n/a	n/a	n/a	n/a	n/a
Reference CR-24	10 5 5 0 0	4.0 ± 4.2	n/a	n/a	n/a	n/a	n/a
DR09-B-D15-C0-3	15 0 5 5 10	7.0 ± 5.7	CR-24	6%; No (Student's t-test); 3%	**No Hit**	6%; No (Student's t-test)	**No Hit**
DR09-B-D15-Z	10 15 5 5 10	9.0 ± 4.2	CR-24	8%; No (Approximate t-test); 5%	**No Hit**	8%; No (Approximate t-test)	**No Hit**

M = mortality
SD = statistically different
NOCN = no other conditions necessary
N/A = not applicable
Subscripts: R = reference; C = negative control; T = test sediment
[1]Non-dispersive disposal site interpretation guidelines
[2]Comparison to reference includes the numeric result for the comparative criteria, the result of the statistical test, and the statistical test used. All statistics were conducted using BioStat (DMMP/SMS Bioassay Statistics Program; Beta v4.1). All amphipod mortality data were arcsine transformed for statistical analysis, unless noted otherwise.

Table 33. Round 3 Juvenile Polychaete Growth Bioassay (*N. arenaceodentata*) Results and Evaluation Guidelines (from SAIC, 2009)

Sample ID	Individual Growth Rate[1]	Mean Individual Growth Rate[1]	Reference	1-Hit Rule[1,2,3]		2-Hit Rule[1,2,3]	
				$MIG_T \div MIG_C < 0.80$; MIG_T vs MIG_R SD ($p = 0.05$); $MIG_T/MIG_R < 0.50$	Hit/ No-Hit	$MIG_T \div MIG_C < 0.80$; MIG_T vs MIG_R SD ($p = 0.05$); $MIG_T/MIG_R < 0.70$	Hit/ No-Hit
Control	1.08 1.38 0.97 0.98 1.32	1.15 ± 0.19	n/a	n/a	n/a	n/a	n/a
Reference CR-24	1.03 1.20 1.18 1.05 1.36	1.16 ± 0.13	n/a	n/a	n/a	n/a	n/a
DR09-B-D15-C0-3	0.97 0.64 0.72 0.78 0.89	0.80 ± 0.13	CR-24	0.70; Yes (Student's t-test); 0.69	**No Hit**	0.70; Yes (Student's t-test); 0.69	**Hit**
DR09-B-D15-Z	0.68 0.86 0.77 0.75 1.15	0.84 ± 0.18	CR-24	0.73; Yes (Student's t-test); 0.72	**No Hit**	0.73; Yes (Student's t-test); 0.72	**No Hit**

MIG = mean individual growth rate (mg/individual/day)

SD = statistically different

N/A = not applicable

Subscripts: R = reference; C = negative control; T = test sediment

[1]mg/individual/day

[2]Non-dispersive disposal site interpretation guidelines

[3]Comparison to reference includes the numeric result for the comparative criteria, the result of the statistical test, and the statistical test used. All statistics were conducted using BioStat (DMMP/SMS Bioassay Statistics Program; Beta v4.1). All juvenile polychaete growth data were log10 transformed for statistical analysis unless otherwise noted.

Table 34. Round 3 Larval Development Bioassay (*D. excentricus*) Results and Evaluation Guidelines (from SAIC, 2009)

Sample ID	Normal Survival[1] (%)	Mean Normal Survival (%)	Reference	1-Hit Rule[2,3]		2-Hit Rule[2,3]	
				$N_T \div N_C < 0.80$; N_T/N_C vs N_R/N_C SD (p = 0.10); $N_R/N_C - N_T/N_C > 0.30$	Hit/ No-Hit	$N_T \div N_C < 0.80$; N_T/N_C vs N_R/N_C SD (p = 0.10); NOCN	Hit/ No-Hit
Control	70.1 75.6 86.6 86.9 75.3	78.9 ± 7.5	n/a	n/a	n/a	n/a	n/a
Reference CR-24	84.2 102.0 92.7 88.5 89.6	91.4 ± 6.7	n/a	n/a	n/a	n/a	n/a
DR09-B-D15-C0-3	74.5 61.1 88.5 75.7 66.5	73.3 ± 10.4	CR-24	0.733; Yes (Mann-Whitney); 0.181	**No Hit**	0.733; Yes (Mann-Whitney)	**Hit**
DR09-B-D15-Z	88.5 83.8 81.1 92.0 92.3	87.6 ± 5.0	CR-24	0.876; No (Student's t-test)[4]; 0.038	**No Hit**	0.876; No (Student's t-test)[4]	**No Hit**

N = normal development; Round 3: N_C = 258.8 N_R = 236.6

I = initial count (stocking density); Round 3: 328

SD = statistically different

NOCN = no other conditions necessary

N/A = not applicable

Subscripts: R = reference; C = negative control; T = test sediment

[1]Normal survival for reference and test sediments are normalized to mean normal survival in the seawater control

[2]Non-dispersive disposal site interpretation guidelines

[3]Comparison to reference includes the numeric result for the comparative criteria, the result of the statistical test, and the statistical test used. All statistics were conducted using BioStat (DMMP/SMS Bioassay Statistics Program; Beta v4.1). All larval development data were arcsine transformed for statistical analysis, unless indicated otherwise.

[4]Due to non-normality of data, Rankits transformation was utilized.

CHEMICAL	SQS	CSL	DMMU 1	
METALS (mg/kg dry)			conc	QL
Arsenic	57	93	4.2	
Cadmium	5.1	6.7	0.11	U
Chromium	260	270	13	B
Copper	390	390	13	B
Lead	450	530	3.8	
Mercury	0.41	0.59	0.013	J
Silver	6.1	6.1	0.061	U
Zinc	410	960	40	
LPAH (mg/kg OC)				
2-Methylnaphthalene	38	64	0.03	J
Acenaphthene	16	57	0.01	U
Acenaphthylene	66	66	0.02	J
Anthracene	220	1200	0.06	J
Fluorene	23	79	0.06	J
Naphthalene	99	170	0.01	U
Phenanthrene	100	480	0.35	
Total LPAH	370	780	0.49	J
HPAH (mg/kg OC)				
Benzo(a)anthracene	110	270	0.27	
Benzo(a)pyrene	99	210	0.36	
Benzo(g,h,i)perylene	34	88	0.29	
Benzofluoranthenes	230	450	0.73	
Chrysene	110	460	0.43	
Dibenzo(a,h)anthracene	12	33	0.05	J
Fluoranthene	160	1200	0.73	
Indeno(1,2,3-c,d)pyrene	34	88	0.27	
Pyrene	1000	1400	0.63	
Total HPAH	960	5300	3.80	J
CHLORINATED HYDROCARBONS (mg/kg OC)				
1,2,4-Trichlorobenzene	0.81	1.8	0.08	U
1,2-Dichlorobenzene	2.3	2.3	0.04	U
1,4-Dichlorobenzene	3.1	9	0.02	U
Hexachlorobenzene	0.38	2.3	0.03	U
PHTHALATES (mg/kg OC)				
Bis(2-ethylhexyl)phthalate	47	78	1.87	J
Butyl benzyl phthalate	4.9	64	0.34	J
Di-n-butyl phthalate	220	1700	0.25	JB
Di-n-octyl phthalate	58	4500	0.17	J
Diethyl phthalate	61	110	0.10	U
Dimethyl phthalate	53	53	0.03	U

CHEMICAL	SQS	CSL	DMMU 1	
PHENOLS (ug/kg dry)				
2 Methylphenol	63	63	0.71	U
2,4-Dimethylphenol	29	29	0.21	U
4 Methylphenol	670	670	110	
Pentachlorophenol	360	690	1.2	U
Phenol	420	1200	18	
MISCELLANEOUS EXTRACTABLES (ug/kg dry)				
Benzoic acid	650	650	110	J
Benzyl alcohol	57	73	4.2	J
MISCELLANEOUS EXTRACTABLES (mg/kg OC)				
Dibenzofuran	15	58	0.04	J
Hexachlorobutadiene	3.9	6.2	0.06	U
N-Nitrosodiphenylamine	11	11	0.01	U
PCBs (mg/kg OC)				
Total PCBs (mg/kg carbon)	12	65	0.26	

B = detected in blank
J = estimate
U = undetected
QL = laboratory qualifier
OC = organic carbon
SMS = Sediment Management Standards
SQS = sediment quality standard
CSL = cleanup screening level

CHEMICAL	Method A[1]	Method B[2]	DMMU 1	
METALS (mg/kg dry)			conc	QL
Arsenic, inorganic	20	0.67	4.2	
Cadmium	2	---	0.11	U
Chromium (total)	---	---	13	B
Chromium VI	19	---	---	
Lead	250	---	3.8	
Mercury	2	---	0.013	J
PAH (ug/kg dry)				
Naphthalene	5,000	---	0.22	U
Benzo(a)anthracene	---	140	4.1	
Benzo(a)pyrene	100	140	5.4	
Benzo(b,k)fluoranthenes	---	---	11	
Benzo(b)fluoranthene	---	140	---	
Benzo(k)fluoranthenes	---	140	---	
Chrysene	---	140	6.4	
Dibenzo(a,h)anthracene	---	140	0.82	J
Indeno(1,2,3-c,d)pyrene	---	140	4.1	
CHLORINATED HYDROCARBONS (ug/kg dry)				
1,4-Dichlorobenzene	---	42,000	0.32	U
Hexachlorobenzene	---	630	0.38	U
PHTHALATES (ug/kg dry)				
Bis(2-ethylhexyl)phthalate	---	71,000	28	J
PHENOLS (ug/kg dry)				
Pentachlorophenol	---	8,300	1.2	U
MISCELLANEOUS EXTRACTABLES (ug/kg dry)				
Hexachlorobutadiene	---	13,000	0.91	U
N-Nitrosodiphenylamine	---	200,000	0.22	U
VOLATILE ORGANICS (ug/kg dry)				
Ethylbenzene	6,000	---	0.33	J
Tetrachloroethene	50	1,900	0.12	U
Total Xylene	9,000	---	1.14	J
Trichloroethene	30	2,500	0.2	U
PESTICIDES AND PCBs (ug/kg dry)				
Aldrin	---	59	0.22	U
Chlordane	---	2,900	0.38	J
Dieldrin	---	63	0.25	J
Heptachlor	---	220	0.46	U
Lindane	10	770	0.077	U
DDT	3,000	2,900	1.82	J
DDE	---	2,900	0.32	J
Total PCBs	1,000	500	3.9	U
Dioxins/Furans (ng/kg TEQ; u = 1/2 DL)				
Dioxins/Furans	11	1,500	1.99[3]	

[1]Soil, Method A, Unrestricted Land Use, Table Value

[2]Soil, Method B, Carcinogen, Standard Formula Value, Direct Contact (ingestion only), unrestricted land use

[3]From Round 1 testing

B = detected in blank
J = estimated concentration
U = undetected
QL = laboratory qualifier