Expert Report of Kenneth D. Jenkins, Ph.D.

State of Louisiana and Vermilion Parish School Board
versus
The Louisiana Land and Exploration Company, et al., Docket No. 82162

15th Judicial District Court for the Parish of Vermilion
State of Louisiana

June 5, 2014

1. Qualifications

I have over 35 years of experience in the field of environmental toxicology. I served as a Professor of Biology at California State University at Long Beach from 1970 to 1997 and am now a Professor Emeritus. As a professor, I developed and managed an extensive research program in environmental toxicology, founded and directed a research institute, and taught graduate-level courses in environmental toxicology. Since leaving the university I have continued my environmental toxicology practice as a consultant. I am presently a Principal, Vice President and National Technical Leader for the Liability Management Practice area at Cardno ENTRIX.

As an environmental toxicologist, I have been responsible for the design, implementation and interpretation of numerous ecological risk assessments, natural resource damage assessments, and water and sediment quality investigations. I have extensive experience evaluating factors controlling the fate, transport, bioavailability and toxicity of chemicals. I have evaluated the ecological effects of a wide range of contaminants including metals and organic chemicals in marsh systems, streams, rivers, and estuaries throughout the United States and in Canada.

I have served on panels and boards dealing with various aspects of environmental toxicology including the Science Advisory Board of the U.S. Environmental Protection Agency (EPA), a National Research Council Panel on the Fate and Effects of Drilling Fluids, and a task force that developed revised water quality standards for metals for the State of Colorado, which I chaired. I have also given testimony before Congress, and briefed house and congressional staff on technical issues relating to Natural Resource Damages. I am an active member of the Society of Environmental Toxicology and Chemistry (SETAC), and have chaired sessions and symposia on ecological risk assessment and natural resource damage assessment at annual SETAC meetings.

My resume can be found in **Attachment 1**.

Over the past four years I have testified by deposition and at trial in the following cases:

Atlantic Richfield Company v. State of California, et al., BC380474 (Superior Court of the State of California, County of Los Angeles). In this case, I prepared an expert report which was submitted to the court and I testified by deposition in 2012.

Georgia-Pacific Consumer Products LP, et al. v. NCR Corporation et al., 1:11-CV-00483 (United States District Court, Western District of Michigan, Southern Division). In this case, I prepared an expert report which was submitted to the court and I testified by deposition and at trial in 2012 and 2013, respectively.

2. Charge

I have been asked by King & Spalding LLP, on behalf of Chevron U.S.A. Inc., Chevron Midcontinent, LP, Union Oil Company of California, Union Exploration Partners NS, and Carrollton Resources, LLC, to evaluate allegations of harmful ecological impacts of historical oil and gas production activities at the East White Lake Oil and Gas Field located in Vermilion Parish, Louisiana (Section 16 of Township 15 South Range 01 East).

Compensation:

My hourly rate is $375 per hour.

Information Considered:

In my evaluation of alleged harmful ecological impacts to the East White Lake Oil and Gas Field from historical oil and gas production, I have relied on information and data collected by experts for both plaintiffs and defendants, expert reports prepared by experts for plaintiffs and defendants, and depositions taken of experts for both plaintiffs and defendants, including exhibits. In addition, I have relied on published scientific literature and state and federal guidance documents. Finally, I have relied on my own personal observations of the East White Lake Oil and Gas Field on May 13th and 14th, 2014. A list of references that I have cited in this report is provided in **Attachment 2**. A list of documents that I considered in preparing this report is provided in **Attachment 3**.

The opinions I provide in this report are given to a reasonable degree of scientific certainty, and are based on my knowledge, skill, experience, training, education, and information and data about this case made available to me at the time these opinions were rendered. I reserve the right to supplement this report should additional information become available.

3. Background

3.1 East White Lake Oil and Gas Field

I have relied on reports by Barnhill (2010) and Barrett (2010) for background information on the development and operations of the East White Lake Oil and Gas Field (EWL Field). The EWL Field comprises approximately 1,180 acres (Barnhill 2010). Approximately 140 wells have been

permitted in the field since oil production operations began in the late 1930s. The wells were developed by drilling barges which accessed the EWL Field through dredged canals (Barrett 2010).

The location of the EWL Field and its boundaries are shown in Figure 1.

3.2 Analytical Data Considered

All analytical data that I relied upon for conducting this ecological risk assessment at the EWL Field are presented in Attachment 4.

3.3 Overview of the Ecological Risk Assessment Framework

LADEQ (2003) RECAP guidance requires that, "Ecological risk assessments performed under the RECAP shall be conducted in accordance with current EPA guidelines (Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, EPA 1997)." LADEQ defers to EPA guidance, and Section 7.0 (Ecological Risk Assessment) of the LADEQ (2003) RECAP provides additional LDEQ-specific requirements.

Under RECAP guidance Section 2.6.1.5 (Sediment AOI), for sediment samples, the AOI is defined as the three dimensional space that contains all samples with concentrations above screening standards (SS) or RECAP standards (RS)**.** All samples outside the AOI with concentrations below the analytical quantitation limit (e.g., not detected), below SSs and /or RSs, or below background are to be excluded from further consideration. I have taken these RECAP definitions to mean that for any chemical never detected or, if detected, is detected at or below background concentrations, it would not be considered a COEC and would not be carried forward in the baseline risk assessment. RECAP (Section 2.1.3) defines background "as the concentration of a constituent present in an environmental medium that is distinguishable from an identifiable source concentration." (LADEQ 2003).

4. Approach

I was asked to review the Rogers' ecological risk assessment (March, 2014), which he describes as a Baseline Ecological Risk Assessment (BERA) and to evaluate his opinion that the EWL Field posed an ecological risk. In this process I also reviewed the Lingle Screening Level Ecological Risk Assessment (SLERA) (June, 2010).

I also reviewed the reports of Barbee and Castille (April, 2010) and Barbee (November, 2010). The Barbee and Castille (April, 2010) report provides a brief overview of recreational and agricultural activities in the vicinity of the EWL Field, and speculates that "contaminant concentrations in site media will affect the propagation and growth of biota and fauna" (Barbee and Castille Opinion 6). However, the authors provide no basis for this speculation. Although they reference both EPA and LADEQ guidance, they make no attempt to follow the methods outlined in those guidance documents for the implementation of a quantitative and defensible Ecological Risk Assessment.

The subsequent report by Barbee (November, 2010) presents data on a study conducted by Dr. William J. Rogers in October of 2010. This study measured the concentrations of select chemicals in the whole crabs collected from locations within the EWL Field. Barbee provides a cursory comparison of these data against screening benchmarks developed for evaluation of potential human health concerns but does not provide an evaluation of risk to ecological receptors (e.g., fish and wildlife). However, the data on chemical concentrations in whole crabs, presented in the Barbee (November, 2010) report, is used subsequently by Rogers in his 2014 BERA and I discuss it in that context.

I have also reviewed Patricia William's report of April 20, 2014, specifically her opinion on bioaccumulation and biomagnification.

My primary quantitative focus was to evaluate the overall methodology and the toxicology and exposure assumptions used by Rogers in the context of the EPA (1997, 1998) and LADEQ (2003) RECAP guidance. My evaluation of the Rogers' BERA considered COEC selection, identification of representative ecological receptors and complete exposure pathways, and the toxicological and exposure assumptions used to assess risk.

The Lingle report provides a transparent and rigorous evaluation potential risk to ecological receptors using the habitat available at the EWL Field. His rational for selecting an appropriate range of receptors for evaluating ecological risk and for selecting COECs are clearly presented (Section 2). He carefully accounts for factors, such as Acid Volatile Sulfides, which EPA has determined will significantly reduce exposure to metals in sediments (Table 2). Moreover, he clearly acknowledges information gaps and uncertainties (Section 4.3). Based upon my review Of Lingle's work and my independent evaluation of the EWL Field I concur with Lingle's conclusion that the site does not pose an unacceptable ecological risk.

I found Rogers BERA to lack transparency and I identified a number of oversights, erroneous assumptions and quantitative errors. As an example; 1) he provides no discussion of the basis for his choice of receptor species; 2) he does not provided a basis for relating the COECs to actual activities at the EWL Field; and 3) he assumes that all COECs are 100% bioavailable. Because of these and related problems I have systematically reviewed and revised Rogers' assumptions and calculations to correct errors and properly align the assessment with the purpose and objectives of a BERA, per EPA (1997, 1998) guidance, which is to provide upper-bound yet realistic best-estimates of ecological risk. The details of my re-evaluation of potential ecological risks posed by the EWL Field are provided in the following opinions.

The analytical data that I utilized in my evaluation are presented in Attachment 4. The associated sediment, surface water, and crab tissue sampling locations are presented in Figure 2. The details of my supplemental ecological risk analyses are presented in Attachment 5.

5. Opinions

Opinion 1. Dr. Rogers purports to have followed EPA ecological risk assessment guidelines and LADEQ Risk Evaluation/Corrective Action Program (RECAP) guidelines in his

ecological risk assessment but in fact he violated many components of EPA's guidelines, which resulted in unrealistic and significantly over-stated estimates of risk.

Data Usability Assessment: Based on the information provided by Rogers there is no evidence that he considered the quality and usability of the data he relied upon. He provides no discussion of data quality objectives, data review, data validation, or the biological relevance of the data he used. Therefore, there is no confidence that he utilized the correct data or that such data were of sufficient quality for conducting his ERA. The full dataset used in his analyses could not be confirmed. The footnote below Tables 1-2a (Soil Evaluation) and 1-2b (Sediment Evaluation) of Rogers' report states the following confusing remark, "Note: some samples have been excluded for brevity; tables include samples with maximum PCOEC concentrations." It is unclear whether these samples were "excluded" from these tables or the risk analyses themselves. In addition, Rogers does not provide any discussion regarding the selection of samples and target analytes to effectively characterize the potential risk to ecological receptors in the AOI. Without the presentation of the specific dataset, which he relied upon, it is not possible to determine the actual range of sediment sample depths considered by Rogers in his ERA.

It is clear from the data he does present, that he included data from sampling depths that were inappropriate for the conduct of an ecological risk assessment. The biologically active zone (BAZ) is often considered to be 0 to 6 inches below sediment surface (bss). However, Rogers included some samples as deep as 4 feet bss, which are well below the BAZ, and therefore not considered exposure media to ecological receptors. Data collected below the BAZ are not appropriate for a BERA because ecological receptors could not be exposed to those sediments.

Conceptual Site Model: It does not appear that Rogers developed a conceptual site model (CSM), which would have provided a framework for the evaluation of exposure pathways, and the selection of appropriate and representative ecological receptor species. Exposure pathways relate the sources of contaminants to exposure media to which receptors may be exposed. EPA (1989) defines the three elements of a complete exposure pathway as having (1) a source, (2) an exposure point, and (3) an exposure route. All three elements must be present for an exposure pathway to be complete. In the absence of any one of these elements, the exposure pathway is considered incomplete (EPA 1989). In the absence of a complete exposure pathway, there is no exposure and consequently no risk.

In Section 8 of his report, Rogers provides a brief discussion of exposure pathways but provides no evidence that he actually evaluated those exposure pathways and found them to be "complete". Rogers appears to have simply assumed that all of the possible exposure pathways are complete exposure pathways. His only discussion of specific exposure pathways is on Page 7 of his report, where he states that exposure pathways were considered based on the potential site use for "recreation (i.e., hunting and fishing) in the freshwater swamp, marshes, lakes and canals." While recreation may be relevant from a human health risk perspective, it is not relevant to the evaluation of complete exposure pathways for the ecological receptors he evaluates in his risk assessment.

My previous discussion on the usability of sediment sample data relative to the depth of the BAZ is an example of how the CSM and exposure pathway analysis can properly align the ERA by

employing the EPA (1997) ERA framework. If Rogers had developed a CSM and conducted an exposure pathway analysis, then it would have been obvious that there is no "exposure route" for receptors in deep sediments since there are no ecological receptors dwelling in deep sediments or depending on prey from deep sediments. As an example, a proper exposure pathways analysis would have found that there is no complete exposure pathway for deep sediments and those sediments would have been appropriately eliminated by Rogers from further consideration.

Also in Section 8 of his report, Rogers describes his selection of representative receptors for evaluation in his ERA as "based on these predicted pathways and exposures and a review of the species expected to be found at the site." He provides no references for his "review" of the species expected to be found at the site. In fact, he identifies four terrestrial species, the least shrew, the red fox, the swamp rabbit, and the American robin, all of which would only be rarely found within the wetland habitat of the EWL Field. According to John Rodgers, foraging of these receptors would be largely limited to the upland terrestrial areas of site. Conservatively, these receptors would forage within the aquatic environment (e.g., sediments, benthic invertebrates, aquatic plants) no more than 10 percent of their total foraging time (personal communication Rodgers 2014).

Rogers' lack of consideration of key components of a conceptual site model resulted in the inclusion of a number of inappropriate and poorly documented assumptions, upon which he based his evaluation of risk at the EWL Field. These assumptions each contribute to a significant overestimate of potential risk to receptor species using the habitat at the EWL Field.

Selection of Chemicals of Ecological Concern: On page 6 of his report, Rogers states, "Prior to beginning the ERA, I compared site concentrations to background concentration levels in samples collected by ICON (2010) in accordance with LDEQ (2003) *Risk Evaluation / Corrective Action Program* guidance." However, I could find no comparison of site samples to background anywhere in his report. Nor did he indicate what his findings were or how he used his comparison in his ERA. Rather in Section 6 of his report, Rogers states, "chemicals were compared to the appropriate ecological screening levels (ESLs) to identify the chemicals of ecological concern." EPA guidance is very clear that the first steps in selecting COEC are to determine whether the chemical of interest is site-related and whether it exceeds background conditions.

Among the most significant implications of Rogers' failure to follow EPA guidance deals with the selection of COECs. Many of the chemicals he chose to evaluate are unrelated to historical site activities and/or are within the range of background conditions (i.e., should not have been selected as COECs). As a consequence, his risk estimates are likely significantly over-estimated by the inclusion of chemicals unrelated to site activities and the use of very conservative and unrealistic exposure assumptions. I address the more significant of these factors in my Opinion 5.

In addition to the issues I described above, there were several other problems I found during the evaluation of the Rogers' ERA related to COEC selection and otherwise, which impact the reliability of his risk assessment, including:

- He presented hazard quotients, but did not identify and document how these related to species-specific measurement endpoints or assessment endpoints which he failed to define in his ERA;
- He did not consider the bioavailability of barium in sediments or food prey and thus substantially overestimated actual exposure to ecological receptors;
- He did not consider foraging range or home range which would significantly reduce estimates of exposure for many of the receptor species;
- He used maximum sediment and crab tissue concentrations rather than average (or 95% UCL) concentrations as recommended by EPA guidance and RECAP;
- For many other exposure parameters, he also used maximum or extreme and unrealistic values that would result in over-estimated risk estimates.

In conclusion, I found a number of problems with the methods employed in Rogers' ecological risk assessment including: 1) inconsistencies with EPA and RECAP guidance; 2) poorly documented and lacked transparency; 3) includes receptor species that would make little use of the wetland habitat at EWL Field; and 4) includes chemicals that were unrelated to activities at EWL Field. These problems render Rogers' estimates of risk at EWL Field unreliable.

Opinion 2. Rogers' report contains technical errors and inconsistencies that render his assessment unreliable and the results invalid.

Errors that overestimate or misrepresent ecological risk

Dr. Rogers used an incorrect body weight in his great blue heron dose calculations. He presents a correct great blue heron average body weight of 2.229 kg in his Attachment 1-5e, but his dose calculations use a body weight of 1 kg. Because the body weight is the only value in the denominator of the dose calculation, by using a body weight of 1 kg instead of the actual great blue heron body weight of 2.229 kg, Rogers overestimates dose and the hazard quotient[1] (HQ) by a factor of 2.229. For example, Rogers calculated an HQ of 5.7 for barium for the great blue heron, when in fact the HQ using the correct body weight but keeping all other exposure parameters the same, is 2.6 This error results in a more than two fold over-estimate of risk to the great blue heron for each of the chemicals Rogers includes in his analysis.

In another example, Rogers appears to have used the Kushlan (1978) formula for wading birds (presented in the EPA (1993a,b) *Wildlife Exposure Factors Handbook*) to estimate food ingestion rate for the spotted sandpiper. However, this formula estimates food ingestion on a wet weight basis, while all of the other formulas Rogers used are based on dry weight. Rogers did not take into account the moisture content of sandpiper prey or convert his calculated value to a dry weight basis. This error over-estimates dry weight food ingestion rate, which in turn results in an over-estimation of the HQ for the spotted sandpiper by a factor of 4.9 for each of the metals he considered as COECs. I addressed this issue in more detail in Opinion 3.

[1] The hazard quotient, or HQ, is a unitless measure of risk whereby the target threshold is defined as a value of 1. HQs less than 1 indicate very low potential for risk and typically result in no further action decisions. HQs greater than 1 indicate a potential for ecological risk and the need for further site-specific studies such as field validation studies (EPA 1997, 1998). The magnitude of the HQ does not directly correspond with the magnitude of severity of effect.

Examples of additional errors

Rogers incorrectly stated the soil bioavailability factor of cadmium that he estimated from Prokop et al. (2003). He stated that he estimated the bioavailability of cadmium to be "3.6% based on the percentage of cadmium in solution." However, Prokop et al. (2003) states that "Thirty-six percent of total cadmium was in the solution…"

Rogers also states that he utilized "minimum body weight to maximum ingestion rate" to calculate the food and sediment ingestion rates for each representative receptor. However, based upon his equations it appears that Rogers instead used average body weights (using formulas presented by Nagy (2001) and Kushlan (1978)).

These errors reinforce my concerns regarding the reliability of Rogers' conclusions regarding the potential for ecological risk at EWL Field.

Opinion 3. Rogers used inappropriate exposure parameters in his ecological risk assessment that taken together grossly over-estimated exposure to COECs and consequently significantly over-estimated ecological risk.

A baseline risk assessment should provide upper-bound yet realistic estimates of ecological risk. Rogers' assessment includes numerous unsupportable or incorrect assumptions that in no way reflect actual site-specific conditions, receptor behavior, and COEC characteristics in environmental media and biota of the EWL Field. These assumptions are inconsistent with EPA and RECAP guidance. Examples of these problems are presented below.

Incorrect use of the maximum detected concentration in media

As noted in Opinion 1, Rogers' estimate of exposure point concentrations (EPCs) is inconsistent with EPA and Louisiana RECAP guidance and grossly over-estimates potential exposures. EPA (2002) specifies that the 95% UCL (95% upper confidence limit of the arithmetic mean) be used as the EPC when conducting baseline ecological risk assessments. The 95% UCL is an estimate of the average concentration of a compound in the site area for which there is 95% confidence that the true average concentration does not exceed that value. It provides a conservative estimate of the average concentration of a compound in the exposure area (*e*.g., for the EWL Field, this would be the AOI). The EPA recommends using the 95% UCL to represent "a reasonable estimate of the concentration likely to be contacted over time" (EPA 1989). The 95% UCL, not the maximum detected concentration, reasonably and realistically represents the potential exposure of ecological receptors to site contaminants because receptors do not spend all of their time at one small location, they regularly move about the site area during foraging and breeding activities. Rogers' use of the maximum detected concentration as the EPC is representative of a scenario in which the individual receptor is confined to the site sample location with the highest concentration, which is not biologically realistic. My calculations of the 95% UCL sediment concentrations as well as other statistical metrics for each COEC are presented in Attachment 5.

Using the EPA-recommended 95% UCL instead of the maximum detected concentration used by Rogers drastically decreases HQs for all receptors and COECs and provides an estimate of risk based on concentrations to which receptors may realistically be exposed. For this first HQ adjustment, the spotted sandpiper (an aquatic receptor; Table 1) and least shrew (a terrestrial receptor; Table 2) are used for illustrative purposes because Rogers' calculations consistently showed the highest HQs for these two species (see Rogers' Attachment 1-3m). All of the additional exposure parameters and HQ adjustments/calculations for the spotted sand piper and least shrew are presented in Attachment 5 as are the exposure parameters and HQ adjustments/calculations for all of the other receptors.

Table 1 - Comparison of Spotted Sandpiper HQs Calculated Using the Maximum Detected Sediment Concentration and the 95% UCL Sediment Concentration

COEC	Rogers Maximum Concentration (mg/kg)	95% UCL (mg/kg)	Rogers HQ (unitless)	95% UCL Adjusted HQ (unitless)
Arsenic	40	6.8	0.93	0.16
Barium	15,700	2,758	**221**	**39**
Cadmium	2.1	0.66	0.19	0.061
Chromium	501	16	**8.2**	0.27
Lead	179	43	**5.3**	**1.3**
Mercury	17	1.4	**9.0**	0.75
Selenium	2.1	1.5	**6.1**	**4.3**
Zinc	194	181	**1.6**	**1.4**

*Bold, shaded values indicate HQs greater than 1.

Table 2 - Comparison of Least Shrew HQs Calculated Using the Maximum Detected Sediment Concentration and the 95% UCL Sediment Concentration

COPEC	Rogers Maximum Concentration (mg/kg)	95% UCL (mg/kg)	Rogers HQ (unitless)	95% UCL Adjusted HQ (unitless)
Arsenic	40	6.8	**2.1**	0.35
Barium	15,700	2,758	**10**	**1.8**
Cadmium	2.1	0.66	**4.1**	**1.3**
Chromium	501	16	**14**	0.46
Lead	179	43	**2.5**	0.60
Mercury	17	1.4	**174**	**14**
Selenium	2.1	1.5	**2.9**	**2.1**
Zinc	194	181	**1.6**	**1.5**

*Bold, shaded values indicate HQs greater than 1.

Using the 95% UCL instead of the maximum detected concentration as the EPC decreases the HQs for chromium, and mercury to below 1 for the spotted sandpiper and decreases the HQs for arsenic, chromium, and lead to below 1 for the least shrew. While Rogers' use of the maximum detected concentration as the EPC for each metal was the largest contributing factor to his grossly over-estimated HQs, he also used other overly conservative, unrealistic, or incorrect exposure parameters, which will be discussed below.

Incorrect or unrealistic body weight, food ingestion rate, and/or sediment ingestion rate

Rogers used incorrect or unrealistic estimates of body weight (BW), food ingestion rate (IR), and/or sediment IR for half of the representative receptors presented in his BERA. As noted in Opinion 2, Rogers calculated the potential exposure dose of the great blue heron using an incorrect body weight. This error over-estimates risk to the great blue heron by a factor of 2.229.

Rogers calculated food ingestion rate for the majority of his receptors using formulas presented in Nagy (2001) based on a dry weight basis. However, for the spotted sandpiper, he appears to have used the formula developed by Kushlan (1978) and presented in the EPA (1993a, b) *Wildlife Exposure Factors Handbook* that estimates food ingestion rates for wading birds on a wet weight basis (also noted in Opinion 2). He then failed to convert the wet weight food ingestion rate to a dry weight basis, which greatly over-estimates food ingestion rate because sandpiper prey items (benthic invertebrates) contain 80% moisture. Furthermore, because the sediment ingestion rate is derived as a percentage of the food ingestion rate, an overestimation of the food ingestion rate also causes an over-estimation of the sediment ingestion rate.

Independent of the food ingestion rate, Rogers used an inappropriately high sediment ingestion rate for certain receptors. For example, he used a sediment ingestion rate of 7.7% for the least shrew based on the value for a black–tailed prairie dog (Beyer et al. 1994). However, the EPA has estimated a sediment ingestion rate of 1% for the short-tailed shrew, a much more closely related and appropriate surrogate species for the least shrew (EPA 1999b). The combination of inaccurately high food and sediment ingestion rates results in spuriously high HQs for various receptors (see Attachment 5 for body weight, food ingestion rate, and sediment ingestion rate adjustments to HQs).

Failure to incorporate home range and habitat use into risk calculations

Rogers failed to consider the nature of the exposure area (e.g., the area of interest or AOI) and the habitat use and behavior of representative receptors in his calculations of risk. The EWL Field is an intermediate to freshwater marsh (Rodgers 2010), and all of the samples collected and subsequently used for the risk assessment were surface water and sediment samples. However, half of the representative receptors chosen by Rogers are terrestrial receptors (least shrew, swamp rabbit, American robin, American woodcock, and red fox). Rogers incorrectly assumed that these receptors would be constantly exposed to the COECs in sediments (thus using an area use factor (AUF) =1), which is biologically unrealistic and greatly over-estimates risk. Due to the very nature of these receptors as terrestrial organisms, this assumption is biologically inaccurate and not representative of real-world conditions. For example, swamp rabbits alter their home range to avoid areas of inundation during flooding events (Zollner et al. 2000). Consequently, a conservative terrestrial AUF of 0.5, representing potential exposure to 50% of the site area, has been applied to all terrestrial receptor calculations (see Attachment 5).

Rogers also estimated unrealistically small home/foraging ranges for certain aquatic receptors and assumed all aquatic receptors foraged only in the site area (note that neither the site area nor AOI was actually defined by Rogers). The site area, as I have determined, is defined as the area over which sample concentrations exceed background/reference site concentrations, and is approximately 337 acres (see Figure 3). In contrast, the area of the entire EWL Field is 1,180

acres. It is the AOI of 337 acres (e.g., the exposure area) to which ecological receptors may be exposed to COECs. The home/foraging ranges for the snowy egret and mallard as described by EPA (1993a, b) exceed the size of the AOI. Incorporating realistic estimates of potential exposure to the site sediments by terrestrial receptors and accurate home/foraging range into HQ calculations further reduces Rogers' HQs and provides biologically more accurate estimates of potential site related risk.

Unfounded estimation of barium sediment bioavailability and bioaccumulation

Rogers unreasonably assumed sediment (though he refers to them as soil, despite the fact that the samples are sediments, not soil) bioavailability factors of 1.0 and 0.1 for barium and true total barium, respectively (Rogers Attachment 1-5d, Soil Bioavailability Factors (Dose Calculations) Page 92). It is important to distinguish true total barium measurements in sediments from standard measurements of barium**.** The true total barium analytical method utilizes an extremely aggressive acid digestion that in no way reflects barium dissolution under natural environmental conditions. The use of true total barium data in the baseline ecological risk assessment is entirely inappropriate. Rogers' bioavailability factor of 0.1 for true total barium assumes that 10% of the barium quantified by this method is biologically available. This is entirely inappropriate and overstates the potential bioavailability of barium by orders of magnitude. Rogers' use of a bioavailability factor of 1.0 for the standard measure of in sediments also significantly overstates the potential exposure of sediment dwelling organisms to barium. The bioavailability factor of 1.0 assumes that 100% of the barium in sediments in the EWL Field is available to be taken up by organisms living in those sediments. However, barium associated with drilling fluids is composed of barium sulfate (barite), rather than the free barium ion (see Opinion 4 and Attachment 6). Barium sulfate has very low solubility in water (Neff 2002; Menzie et al. 2008); therefore, a sediment bioavailability factor of 1.0 is not valid and is not based on any sound scientific evidence, it is purely speculative. In the very paper that Rogers references regarding barium bioavailability, Menzie et al. (2008) state that "solubility of barite is several orders of magnitude lower than those for soluble barium compounds (e.g., barium chloride, nitrate, and acetate) and that this incredibly low solubility limits the potential for barium from barite to be accumulated in the tissues of soil invertebrates and plants, organisms present in the diet of many wildlife species."

As I discuss in detail in Opinion 4, barium in the sediments of EWL Field is not bioavailable. However, to be overly conservative, I have incorporated a sediment bioavailability factor of 0.15 (e.g., 15% bioavailability), which was derived from data from a site having no relationship to the EWL Field (Zimmerman 2010). I used this literature derived bioavailability factor in the HQ calculations for the spotted sandpiper and mallard, which both feed on benthic invertebrates (see Attachment 5). I found no risk to either spotted sandpipers or mallards even though these calculations conservatively assume that 15% of the barium in sediments of the EWL Field is actually bioavailable and thus significantly overstate any potential risk due to barium in sediments (Attachment 5).

Rogers does not consider the site-specific data that demonstrates no significant relationship between concentrations of barium in sediments and crabs collected from the EWL Field. Instead he assumes that barium is completely bioavailable and thus significantly overstates the soluble

fraction of barium. The barium sediment-to-benthic invertebrate bioaccumulation factor (BAF) is used to predict the concentrations of barium in benthic invertebrates dwelling in those sediments. This is in turn used to predict the dose of barium that will be received by species feeding on invertebrates in sediments. In his analysis, Rogers uses a BAF of 1.154, which is not based on site-specific data nor is it even based on barium data at all. Instead it is based on the average of the BAFs of other metals (Rogers 2010; EPA 1999a), which exhibit very different behavior than barium does in environmental media and biota. Rogers does not discuss the specific origin of this BAF or the uncertainties in introduces in his analysis.

Rogers estimated exposure to great blue heron and mink based on the whole body concentrations of each COEC in blue crab. Once again, he assumed that 100 percent of each of the chemicals measured in blue crab tissues (e.g., aluminum, barium and copper) is bioavailable to the great blue heron and mink upon ingestion (Rogers, pages 9 and 10). However, as discussed in Opinion 4, some 97% of the barium in crabs is incorporated into the exoskeleton and is largely unavailable to both great blue herons and mink (See Opinion 4 and Attachment 6). Moreover, Rogers provides no evidence that aluminum and copper measured in crab tissues are in any way associated with historic oil and gas development at the EWL Field.

Rogers also failed to consider site-specific sediment geochemistry conditions, which is important for understanding the bioavailability of metals to benthic invertebrates. For example, the EPA (2005) has determined that acid-volatile sulfides (AVS) in sediments are capable of sequestering various metals in sediments, including cadmium, copper, lead, nickel, and zinc, thus reducing or eliminating the toxicity of these metals to aquatic organisms.

The EPA (2005) recommended method for measuring the potential toxicity of metals in sediments is organic carbon-normalized excess simultaneously extracted metal (SEM; metal yielded during AVS extraction), which is presented as:

$$(\sum \text{SEM-AVS})/f_{OC}\ (\mu\text{mol}/g_{OC})^2$$

This is a modification of the SEM-AVS procedure used to account for the fraction of organic carbon (f_{OC}) in sediment. The approach provides greater accuracy for assessing metal toxicity by accounting for partitioning to both sediment organic carbon and AVS. Metal toxicity in sediments can be extrapolated from this formula as follows:

- >3,000 μmol/g_{OC} (toxicity is likely)
- 130 – 3,000 μmol/g_{OC} (toxicity is uncertain)
- <130 μmol/g_{OC} (toxicity is not likely)

Mr. Lingle utilized an earlier version of EPA's SEM-AVS methodology in his SLERA. Mr. Lingle's AVS/$\sum$SEM evaluations and my own (normalized for organic carbon) evaluation clearly indicate that cadmium, copper, lead, nickel, and zinc are completely sequestered by AVS and organic carbon and are therefore not bioavailable and not toxic (Table 3).

[2] μmol/g_{OC} means micro moles per gram of organic carbon

Table 3. EWL Sediment SEM-AVS Data

Analyte	SED-BK-10	SED-BK-05	SED-BK-11	SED-BK-06	SED-BK-04	SED-BK-07	SED-BK-08	SED-BK-03	SED-BK-02	SED-BK-01	SED-BK-09
AVS (µmol/g)	0.11	0.617	1.12	4.8	8.9	14.5	15.4	20.3	20.4	0.052	0.058
Cadmium SEM (µmol/g)	0.0031	0.0027	0.0027	0.0019	0.0018	0.0024	0.002	0.0021	0.0022	0.0021	0.0022
Copper SEM (µmol/g)	0.016	0.011	0.01	0.01	0.019	0.014	0.015	0.044	0.052	0.01	0.016
Lead SEM (µmol/g)	0.062	0.015	0.044	0.036	0.02	0.027	0.022	0.018	0.03	0.035	0.031
Nickel SEM (µmol/g)	0.098	0.026	0.029	0.028	0.033	0.019	0.041	0.029	0.043	0.037	0.058
Zinc SEM (µmol/g)	0.308	0.091	0.745	0.228	0.139	0.258	0.148	0.134	0.189	0.067	0.083
Total Organic Carbon (%)	13.4	17.2	19.5	5.5	4.27	6.6	5.88	1.44	5.15	18.4	10.6
$(\sum$SEM-AVS)/f_{OC} ($\mu mol/g_{OC}$)	-2.81	-2.74	-1.48	-81.75	-203.45	-214.8	-258.03	-1393.9	-389.9	0.54	1.25
AVS/$\sum$SEM (unitless) (Lingle)	0.23	4.23	1.35	15.79	41.82	45.26	67.54	89.39	64.52	0.34	0.30

Analyte	SED120	SED31	SED9	SED24	SED115	SED26	SED11	SED15	SED13	SED19
AVS (µmol/g)	1.66	4.7	9.5	13.8	15.1	16.9	20.1	33.6	56.5	60.9
Cadmium SEM (µmol/g)	0.0031	0.0028	0.0024	0.0019	0.0021	0.0039	0.0034	0.0023	0.0031	0.0028
Copper SEM (µmol/g)	0.011	0.102	0.081	0.021	0.018	0.02	0.058	0.008	0.008	0.009
Lead SEM (µmol/g)	0.028	0.068	0.052	0.029	0.023	0.094	0.083	0.037	0.078	0.073
Nickel SEM (µmol/g)	0.024	0.077	0.057	0.029	0.021	0.088	0.077	0.032	0.049	0.05
Zinc SEM (µmol/g)	1.559	0.438	0.325	0.208	0.21	0.665	0.498	0.28	0.557	0.5
Total Organic Carbon (%)	28.4	5.41	3.61	4.56	4.08	9.45	5.5	6.77	4.59	4.08
$(\sum$SEM-AVS)/f_{OC} ($\mu mol/g_{OC}$)	-0.12	-74.16	- 248.8	-296.3	-363.38	-169.6	-352.4	-491.0	-1215.8	-1477.1
AVS/$\sum$SEM (unitless) (Lingle)	1.02	6.83	18.36	47.77	55.09	19.41	27.94	93.52	81.28	95.94

Note: these evaluations were conducted in samples collected from 0 to 6 inches below sediment surface and are therefore, reflective of conditions within the BAZ.

Unrealistic assumptions regarding diets of receptor species

Rogers incorrectly assumed that 100 percent of great blue heron and mink diet is comprised of crab. While both are opportunistic feeders and would occasionally consume crab, their preferred diets are comprised largely of fish (EPA 1993a, b). However, even with this incorrect diet assumption, HQs for both organisms and all COECs fall below one when the exposure parameters discussed above (95% UCL, food and sediment ingestion rates, and sediment bioavailability factor) are adjusted with biologically realistic values.

Final Hazard Quotient Calculations

The final HQs for each receptor and COEC resulting from incorporating accurate and biologically realistic exposure parameters into the calculations are presented in Table 4. As can be seen, the final HQs for each of the receptors are at or below 1 (e.g., no evidence of risk) once

the Rogers' errors and erroneous assumptions are corrected. Detailed information used in the calculations of final HQs for each receptor is presented in Attachment 5.

The results of the final HQ calculations (Table 4) demonstrate that concentrations of arsenic, barium, cadmium, chromium, lead, mercury, selenium and zinc in sediments from the EWL Field do not pose a risk to representative receptor species utilizing the wetland habitat of EWL Field including snowy egrets, spotted sandpipers, mallards, mink, great blue herons, least shrews, woodcocks, robins, swamp rabbits and red fox. In addition, the AVS-SEM analysis (Table 3) demonstrate that, cadmium, copper, lead, nickel, and zinc pose no risk to benthic organisms dwelling in sediments from EWL Field. These results are consistent with my findings from my site visit that there is no evidence of harmful impacts to ecological services provided by the aquatic and wetland habitat of the EWL Field.

Table 4. Comparison of Rogers' HQs and Final Adjusted HQs

COEC	Snowy Egret		Spotted Sandpiper		Mallard		Mink[1]		Great Blue Heron[1]	
	Rogers HQ	Final HQ	Rogers HQ	Final HQ	Rogers' HQ	Final HQ	Rogers HQ	Final HQ	Rogers HQ	Final HQ
Arsenic	**7.2**	0.59	0.93	0.031	0.089	0.0038	0.17	0.12	0.11	0.035
Barium	**31**	0.79	**221**	0.075	**25**	0.067	**1.6**	0.48	**5.7**	0.62
Cadmium	0.070	0.011	0.19	0.013	0.042	0.0033	0.12	0.046	0.086	0.015
Chromium	**4.3**	0.072	**8.2**	0.053	0.83	0.0069	--	--	--	--
Lead	**3.2**	0.40	**5.3**	0.25	0.43	0.026	0.039	0.0052	0.16	0.0094
Mercury	**11**	0.46	**9.0**	0.15	**1.6**	0.033	0.97	0.37	0.10	0.017
Selenium	**4.0**	1.0	**6.1**	0.88	0.78	0.14	--	--	--	--
Zinc	0.058	0.027	**1.6**	0.29	0.19	0.046	--	--	--	--

COEC	Least Shrew		Woodcock[2]		Robin[2]		Swamp Rabbit		Red Fox	
	Rogers HQ	Final HQ	Rogers HQ	Final HQ	Rogers HQ	Final HQ	Rogers HQ	Final HQ	Rogers HQ	Final HQ
Arsenic	**2.1**	0.15	0.6	--	0.4	--	0.15	0.012	0.014	0.0023
Barium	**10**	0.0079	**18**	0.061	**17**	0.28	**3.4**	0.22	0.35	0.061
Cadmium	**4.1**	0.65	**1.3**	0.21	0.90	0.14	0.083	0.013	0.019	0.0061
Chromium	**14**	0.21	**8.0**	0.13	**5.6**	0.081	0.79	0.013	0.27	0.0087
Lead	**2.5**	0.25	**4.6**	0.56	**3.2**	0.31	0.18	0.022	0.062	0.015
Mercury	**174**	0.17	**7.5**	0.31	**6.2**	0.26	**18**	0.70	0.96	0.080
Selenium	**2.9**	1.0	0.88	0.31	0.84	0.29	0.53	0.18	0.043	0.030
Zinc	**1.6**	0.75	**1.1**	0.53	0.80	0.36	0.053	0.024	0.027	0.025

*Bold, shaded values indicate HQs greater than 1.

[1] – Chromium, selenium, and zinc were not measured in crab tissue and therefore not evaluated by Dr. Rogers as COECs for mink and great blue heron.

[2] – Rogers states that arsenic was not evaluated for woodcock and robin because maximum concentrations did not exceed screening criteria for terrestrial birds. However, he then presents an HQ in his summary table, Rogers Attachment 1-3m.

Opinion 4. My evaluation finds that while concentrations of barium in sediments of the EWL Field are elevated above background, the barium found in crab tissues is unrelated to concentrations of barium in sediments and is consistent with barium ion concentrations in the surface water which is controlled by salinity rather than historical operations at the site.

The analysis Rogers presents in his expert report concludes that barium in sediments poses the greatest risk to ecological receptor species utilizing EWL Field habitat. He lists nine species ranging from the least shrew to the American mink as being at risk (Rogers' report Section 8.6, Page 47). He attributes the highest estimate of risk to the spotted sand piper, which he calculates receives a dose of barium that is 221 times higher than the toxic threshold (HQ = 221). Based on Rogers' summary, barium poses the greatest risk of any of the COECs that he considers. Rogers' opinion is based on two important assumptions, 1) that barium in the EWL Field ecosystem is entirely attributable to activities associated with oil development, and 2) that all barium measured in the EWL Field system is in a chemical form that renders it both available and toxic to species utilizing EWL Field. Rogers' assumptions are incorrect.

There are multiple sources of barium to the East White Lake Field region unrelated to oil and gas development

Based nonparametric statistical tests, I found that the median concentration of barium in sediment of the Reference locations in Schooner Canal and White Lake is statistically comparable ($p<0.05$) to that for both Barataria Basin and Pontchartrain Estuary. From these comparisons I conclude that there is substantial naturally occurring barium in EWL Field sediments that is accurately represented by the median barium concentrations from the Reference locations in Schooner Bayou and White Lake (Attachment 6). This validates the Reference locations as accurately representative of regional background levels of barium in sediment.

Barium in drilling fluids is tightly bound and largely unavailable to wildlife

Drilling fluids or muds, such as those used at EWL Field, typically contained relatively high concentrations of finely ground barite, a mineral composed largely of barium sulfate ($BaSO_4$) (Neff 2002). However, drilling muds were not normally released into the environment. As noted by Barrett (2010) drilling muds were contained on drilling barges and reutilized. Drilling barges had drilling mud systems onboard which included "pits" and "tanks" for storage and reutilization of the mud (Barrett 2010). Although the use of drilling muds during drilling operations represents a potential source of barium to the environment of EWL Field, the storage and reuse of these muds would have limited releases to the environment (Barrett 2010).

The historic use of drilling fluids containing barite does not, in and of it itself, demonstrate risk to ecological resources at EWL Field. The contribution of barium to the EWL Field due to oil development activities must be evaluated in the context of the high natural concentrations of background barium described in the previous section.

The toxicity of barium in the environment is determined by concentrations of the free barium ion (Ba^{2+}), which is in turn determined by the solubility of the specific chemical form of barium

(Neff 2002; Menzie et al. 2008; Lamb et al. 2013). Barium sulfate, which is used in drilling fluids, exhibits extremely low water solubility and thus is not a significant source of the barium ion or barium related toxicity (Neff 2002; Menzie et al. 2008). Menzie et al. (2008) provide examples where no toxicity was found in soils with concentrations of barium that are orders of magnitude higher (e.g., 17,000 to 1,000,000 mg/kg) than the 330 mg/kg Eco-SSL threshold developed by EPA for protecting soil invertebrates from barium related toxicity. Note that Rogers utilized Eco-SSLs as toxicity thresholds in his analysis of soil toxicity without giving any consideration of the chemical form of barium in sediments of the EWL Field (Rogers' Report Table 1-2a, page 61).

The EPA and the National Research Council acknowledge that the bioavailability and toxicity of many metals is related to the concentrations of free metal ions in the environment rather than the total concentrations of the metals in soils or sediments (NRC 2002; Langmuir et al. 2004; McGeer et al. 2004; Newman et al. 2004; Kapustka et al. 2004; EPA 2005a; NRC 2002). Rogers does not acknowledge the importance of determining the soluble concentrations of barium or any of the other metals for which he evaluates toxicity. Instead he bases his risk assessment on the total concentrations of the metals in EWL Field sediments. In the case of barium, his lack of consideration of the soluble form of barium (i.e., Ba^{2+}) can overstate potential barium toxicity to each of the receptor species he evaluated by orders of magnitude.

The concentrations of barium in crabs show no statistically significant relationship to the concentrations of barium in sediments

Analysis of data provided in a recent study by Unocal (2014) and the sediment data confirms that barium in the crabs collected in the EWL Field is due to natural processes rather than the uptake of barium from the sediments. This Unocal study evaluated the concentrations of barium in crab tissues from crabs sampled from locations within the EWL Field and the Reference locations in Schooner Bayou and White Lake discussed above. The crab tissues analyzed included the exoskeleton, the meat, the hepatopancreas and other soft tissue. Approximately 97% of the barium accumulated in crabs from both the reference site and the EWL Field was found in the exoskeleton (Attachment 6 Table 6-2). The median concentrations of barium in exoskeletons from the EWL Field samples was 846 mg/kg compared to 854 mg/kg for crabs collected at the Reference locations. These concentrations of barium in exoskeletons for these two groups were not statistically different ($p>0.05$) from one another (Attachment 6 Figure 6-4). Concentrations of barium in the hepatopancreas, meat and other soft tissues, while much lower than the exoskeleton, were also not statistically different ($p>0.05$) between the crabs from the EWL Field and the Reference locations (Attachment 6 Figure 6-4).

Sediment samples from the EWL Field and Reference locations corresponded to those of the crab samples. Barium concentrations in sediments from the EWL Field had a median concentration of 631 mg/kg, which is about 2 times higher and significantly different ($p<0.001$) from that of the Reference locations which had a median concentration 319 mg/kg (Attachment 6 Figure 6-2). This is in sharp contrast to the concentrations of barium in the various tissues of crabs from the EWL Field which are not statistically different ($p>0.05$) from those of the Reference locations, in spite of the two-fold difference in barium concentrations in sediments (Attachment 6 Figure 6-4).

These data demonstrate that the two-fold higher concentrations of barium in sediments from the EWL Field, relative to the Reference locations, are not reflected in the concentrations of barium in tissues of crabs utilizing those habitats. They indicate that elevated concentrations of barium in sediments of the EWL Field, relative to the Reference locations, are in forms that are not bioavailable.

Rogers's adjusted Level III hazard quotients (Section 8.6, Page 47) indicate significant risk due to exposure to barium in soil/sediments for seven species (American robin, American woodcock, spotted sandpiper, mallard, snowy egret, least shrew and swamp rabbit). In his calculations of these hazard quotients, Rogers uses a bioavailability factor of 1, assuming that barium in sediments is 100% bioavailable (See Rogers' report Footnote 2 of Attachment 1-5d: Soil Bioavailability Factor (Dose Calculations).[3] Based on the above discussion Rogers' assumptions are clearly incorrect. If 100% of the barium in sediments from EWL Field were bioavailable, we should find a strong and consistent correlation between concentrations of barium in sediments and in crab tissues. Instead, we find no correlation between concentrations of barium in sediments and crab tissues. These site-specific data demonstrate that barium in sediments of the EWL Field is not bioavailable to crabs.

Crab Exposure Pathway

As discussed above, Rogers' evaluation of risk from exposure to barium for most of the species which he considers is based on estimates of exposure to barium in sediments. However, for the great blue heron and American mink he bases his evaluation of ecological risk on ingestion of whole crabs (Rogers' report Section 8.6, page 47). Rogers' data on the concentrations of barium and other metals in crabs from his study are presented in his Attachment 1-5a, page 89. Rogers does not distinguish tissue types in his data, so I have assumed that these data reflect concentrations of barium and other metals in whole crabs.

In his analysis Rogers makes a number of unsupported erroneous assumptions that when combined dramatically overstate the potential impact of oil and gas development activities on the great blue heron and mink. Rogers' assumptions include:

- Barium in whole body crabs from the EWL Field is entirely attributable to oil and gas development
- 100% of the barium in whole body crabs is bioavailable to herons and mink
- The diet of great blue herons and mink consists entirely of crabs
- Foraging of crabs by great blue herons is limited only to those crabs collected in the EWL Field.

First, the data from the Unocal (2014) study, which was discussed above, demonstrate that there is no statistical relationship between the concentrations of barium in sediments from the EWL

[3] Although this table deals specifically with soils, Rogers has a single data set which he uses to evaluate both soil and sediment toxicity (Note Sed Designation in Sample IDs of column 1, Table 1-2a, Page 61). He assumes 100% bioavailability for both sediment and soil calculations. The only differences between these two analyses are the specific toxicity thresholds, which he applies to the common data set.

Field and in the tissues of crabs collected from the EWL Field. These results show that other factors control the concentrations of free barium ions in the water column of the EWL Field and this, in turn, controls the uptake of barium in tissues of crabs collected in this study.

Second, the Unocal (2014) study demonstrates that 97% of the barium, in crabs collected from the EWL Field, is located in the exoskeleton rather than the soft tissues (i.e.., meat, hepatopancreas etc.) (Attachment 6 Table 6-2). Barium is a calcium analog, and will accumulate, along with calcium as mineralized calcite in the exoskeleton. However, the crab exoskeleton is a rigid and highly stable structure consisting of calcite in a matrix of chitin-protein fibers. It is difficult for heron and mink to digest, significantly reducing the bioavailability of barium to predators ingesting crabs (see Attachment 6).

Finally, both blue herons and mink are piscivorous species foraging largely (greater than 90%) on fish (EPA 1993a,b), which will have lower concentrations of barium than crabs. Although both species are opportunistic and will take crabs as well as fish, Rogers assumption of a 100% crab diet crabs is not credible.

Opinion 5. Based on a thorough review of available site-specific information, including plaintiffs' expert reports, I find no evidence that historical oil and gas production activities at the East White Lake Oil and Gas Field are harming the ecological health at the site.

This opinion is based on the following:

1) My years of experience conducting ecological risk assessments throughout the country.
2) My review of all related relevant expert reports in this case and published scientific literature.
3) My application of ecological risk assessment methods consistent with EPA and Louisiana RECAP guidance, including my own field observations;
4) A careful review of Rogers' ecological risk assessment including my explicit corrections to his risk estimates, which I present in Opinions 1-3.
5) My evaluation of barium sources and exposure pathways in the EWL Field which I present in Opinion 4.
6) My observations of wetland and aquatic habitat of the EWL Field on May 13th and 14th, 2014.

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Figure 1.
Site Map - East White Lake Oil and Gas Field, Vermilion Parish, Louisiana

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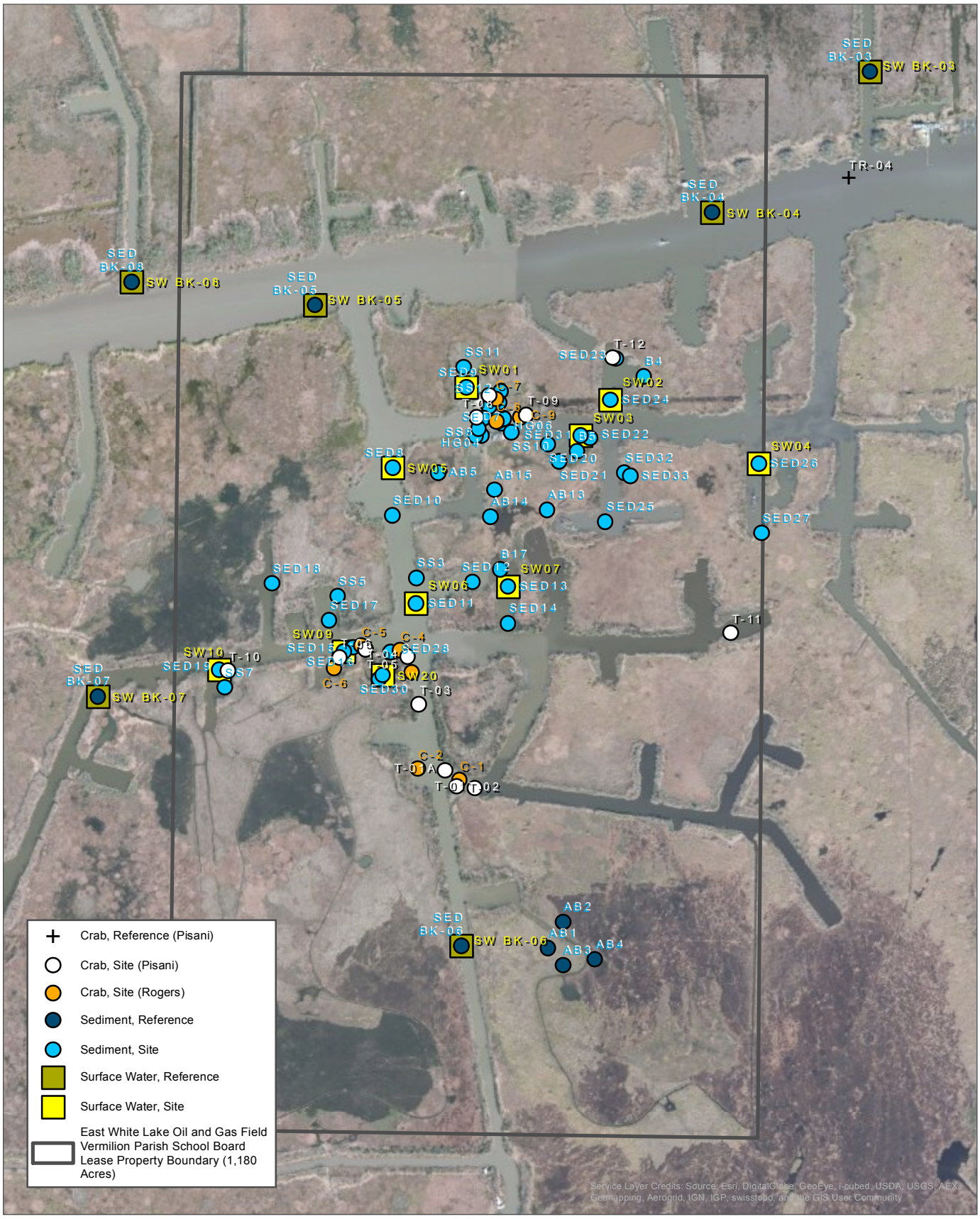

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Figure 2.
Site Map - East White Lake Oil and Gas Field, Vermilion Parish, Louisiana

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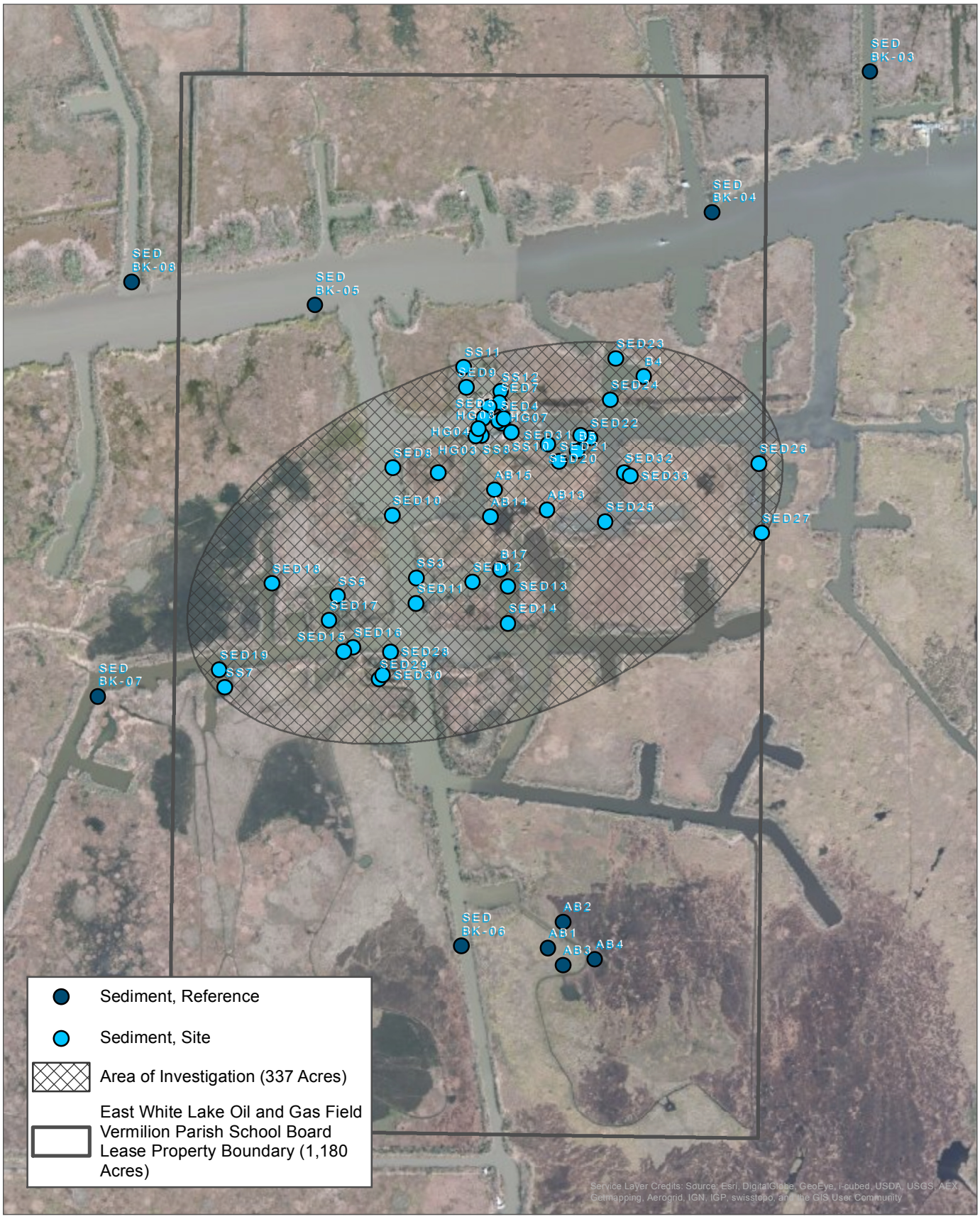

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Figure 3.
Site Map - East White Lake Oil and Gas Field, Vermilion Parish, Louisiana

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Attachment 1

Kenneth D. Jenkins, Ph.D.

Curriculum Vitae

Kenneth Jenkins PhD

Current Position
Technical Director

Discipline Area
> Environmental Toxicology
> Natural resource damage assessment
> Ecological risk assessment
> Sediment quality evaluation
> Water quality evaluation/TMDLs
> Habitat equivalency analysis (HEA)
> Resource equivalency analysis (REA)

Years' Experience
35 Years

Joined Cardno
2011

Education
> PhD, Biology, University of California at Los Angeles
> BA, Biology, California State University at Northridge

Affiliations
> Society of Environmental Toxicology & Chemistry
> American Chemical Society
> American Society for Testing and Materials
> Editorial Board for Chemical Speciation & Bioavailability, an international scientific journal
> Technical Advisory

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Summary of Experience

Dr. Jenkins is a Principal, Vice President, and National Technical Leader of the Liability Management Practice at Cardno Entrix. He has more than 35 years of experience in the field of environmental toxicology. He has given testimony before Congress, and briefed house and congressional staff on technical issues relating to Natural Resource Damages. He has served as a member of the Science Advisory Board (SAB) of the U.S. Environmental Protection Agency and has participated in numerous SAB panels. He served on the National Research Council Panel on the Fate and Effects of Drilling Fluids and the task force to develop revised water-quality standards for the State of Colorado, which he chaired. Dr. Jenkins has served as a peer reviewer of sediment criteria and wildlife-based water quality criteria. He is an active member of the Society of Environmental Toxicology and Chemistry (SETAC), and has chaired numerous sessions and symposia on ecological risk assessments (ERAs) and natural resource damage assessments (NRDAs) at national SETAC meetings. He has authored more than 100 scientific papers, book chapters, and technical reports.

As a principal toxicologist, Dr. Jenkins has been responsible for the design and implementation of numerous cooperative and litigation driven natural resource damage assessments (NRDAs), ecological risk assessments ERAs), and water quality and sediment quality evaluations. He has worked on many of the largest and most complex sites in the country. These include large mining sites in the arid southwest and rocky mountains, large river systems in the North East, Great Lakes and North West, costal estuaries throughout the country and offshore environments from the Gulf of Mexico to the Southern California Bight. He has experience evaluating risk and resource damages for a wide range of chemicals including PCBs, dioxins/furans, metals, petroleum releases, PAHs, perfluorocarbons and pesticides.

Dr. Jenkins was a Professor of Biology at California State University at Long Beach (CSULB) for over 20 years and is now a Professor Emeritus. At CSULB, he oversaw an extensive research program in environmental toxicology, founded and directed a research institute, chaired the radiation safety committee and taught graduate-level courses in risk assessment and environmental toxicology. His research was funded by the Department of Energy, the U.S. Environmental Protection Agency and corporate sponsors.

Significant Projects

Natural Resource Damages Assessments (NRDAs)

NRDA Technical Advisor – Viacom Corporation Litigation Support, California

Dr. Jenkins provided strategic and technical support to Viacom, a POCB PRP in the Montrose Chemical Superfund Site Natural Resource Damages litigation. Evaluated damages to aquatic resources, avian species and marine mammals foraging off the Palos Verdes Peninsula in Southern California.

NRDA Technical Advisor – ARCO Litigation Support, Montana

Dr. Jenkins provided technical advice and expert testimony in the Clark Fork River Superfund Site NRD litigation. Issues dealt with potential injuries due metals from historical mining activities. Resources included surface water, sediments and aquatic and terrestrial species utilizing the Clark Fork River and associated floodplain habitat.

Committee for Assessment of Urban & Industrial Storm Water Runoff Toxicity & the Evaluation/Development of Treatment for Runoff Toxicity Abatement, Storm & Combined Sewer Programs, USEPA

> Subcommittee on Bioavailability, Environmental Analytical Commission of the International Union of Pure & Applied Chemistry (IUPAC) Division V

> Delphi Panel Evaluating Methods for Quantifying the Toxicological Effects of Sediment Contaminant Bioaccumulation in Benthic Organisms for EPA Regions I & II

> Project Advisory Committee, Common Ion Toxicity in Membrane Concentrates, American Water Works Association Research Foundation

NRDA Technical Advisor – Hecla Mining Company, Litigation Support, Idaho

Dr. Jenkins provided strategic, technical support and expert testimony in Phase 2 of the Coeur d'Alene Superfund Site NRD litigation. He review plaintiffs' expert reports regarding injuries to aquatic resources, surface waters, migratory birds and riparian vegetation and prepared technical reports regarding purported injuries to aquatic resources, surface water and tundra swans and testified in deposition.

NRDA Technical Advisor – Litigation Support for Noranda Minerals, Idaho

Dr. Jenkins served as technical expert dealing with NRD liabilities for Blackbird Mine Superfund Site. Chemicals of concern (COCs) included cadmium, copper, cobalt, lead, and zinc. Natural resources at issue included surface waters, sediments, Chinook salmon, steelhead trout, resident trout species, and aquatic invertebrates. Dr. Jenkins implemented field and laboratory studies designed to evaluate purported injuries to provide a basis for allocation of liabilities among responsible parties.

NRDA Technical Leader – Confidential Client Litigation Support, Great Lakes, United States

Dr. Jenkins assisted a client at a multi-party site in the Great Lakes. Resources of concern included benthic invertebrates, fish, and piscivorous birds. Strategies were developed, in anticipation of litigation, to allow injuries due to historical refinery operations, to be differentiated from other sources at this complex site. These studies provided the technical basis for scaling our client's NRD liabilities in settlement negotiations with the Trustees.

NRDA Technical Advisor – Confidential Client Cooperative Settlement, Multiple Sites in Arizona and New Mexico

Dr. Jenkins provided strategic and technical support for the development and implementation of cooperative NRDAs at several large mining sites in the New Mexico and Arizona. Issues included migratory birds, threatened and endangered species and aquatic and terrestrial resources. Potential compensatory projects were identified Service losses and gains were scaled using both HEA and REA methods.

NRDA – Fox River Cooperative Settlement for Georgia Pacific, Wisconsin

Dr. Jenkins served as principal scientist for a cooperative settlement of NRD claims arising from the presence of PCBs on the Fox River Superfund Site. This work included the development of a technical basis for quantifying injury and service losses. Resources evaluated included aquatic invertebrates, fish, birds and mammals. Potential restoration projects were identified and scaled using HEA and REA. These analyses provided a basis for negotiation and settlement of NRD liabilities with the trustees.

NRDA –Cooperative Settlement for Exxon, Multiple Sites in South Carolina

Dr. Jenkins provided strategic and technical support for the cooperative settlement of NRD liabilities at multiple estuarine sites in South Carolina. Metals were the primary COCs. Resources evaluated included aquatic invertebrates, fish, birds and mammals. Focused site- specific studies were conducted to constrain estimates of services losses. Potential compensatory projects were evaluated in collaboration with State and Federal Trustees. HEA methods were used to scale the selected project and reach settlement.

NRDA – Romic Environmental Technologies Corporation Cooperative Settlement, East Palo Alto, California

Dr. Jenkins directed a cooperative NRD action resulting from a chemical release in to wetlands adjacent to San Francisco Bay. Potential resources of concern included wetland habitat, aquatic invertebrates, fish, endangered avian and mammalian resources and recreational use of the wetland. Studies were designed to establish baseline conditions

and evaluate potential for injury. Resulting data demonstrated that potential injuries were very limited and provide a basis for a focused cooperative settlement.

Ecological Risk Assessment (ERA)

ERA – Atlantic Richfield , Hastings on Hudson Site,, New York

Dr. Jenkins was a testifying expert in litigation brought by River Keeper. He was the principal scientist for an ongoing series of studies evaluating ecological risk associated of PCBs and metals in the sediments and floodplain of the lower Hudson River. Site-specific studies demonstrated that acid volatile sulphides and organic carbon in sediments limited the bioavailability and toxicity of metals to aquatic organisms.

ERA – Georgia Pacific , Kalamazoo River Superfund Site, Michigan

Dr. Jenkins was principal scientist for the ecological risk assessments for the Kalamazoo River Superfund Site in South Western Michigan. This site includes over 80 miles of river and floodplain habitat with historic PCB contamination. Subject matter experts have been retained and extensive studies have been conducted to evaluate site specific-risk. These data have been presented to a peer review panel chosen and managed in collaboration with USEPA.

ERA – BASF, Detroit River, Michigan

Dr. Jenkins provided technical and strategic support for the design and implementation of studies to evaluate the potential risk associated with chemical releases to sediments of the Detroit river. Engaged with USEPA and State regulators.

ERA – Shell and ARCO, Santa Barbara Channel, California

Dr. Jenkins designed and implemented studies valuating the effects of drilling fluids from offshore drilling, on the marine environment. Chemicals of concern included, barium, mercury, lead, cadmium, copper and zinc. These studies demonstrated that metals associated with drilling fluids from an exploratory well had no measurable ecological effects on sediment dwelling organisms. Based on these data permits were granted for the development of the last two production platforms in the San Pedro Channel.

ERA –Navistar, San Diego Bay, California

Dr. Jenkins was the technical lead for a baseline ecological risk assessment of a large industrial site located adjacent to San Diego Bay. COCs included metals, TPH, PAHs, VOCs, and PCBs. The ecological risk assessment focused on San Diego Bay. Primary pathways include storm water discharges and groundwater intrusion to the bay. Receptors of concern include benthos, fish, and piscivorous birds.

ERA – Romic Environmental Technologies Corporation, San Francisco Bay, California

Dr. Jenkins evaluated risk to upland, wetland, and slough habitats adjacent to Romic facilities in San Francisco Bay. Chemicals of concern included VOCs and metals. He oversaw strategy development, and the design and implementation of all phases of the field and laboratory programs. In-situ bioassays and population and community structure studies were conducted to evaluate the risk of sediment and surface-water contamination to aquatic species. Site-specific exposure of birds and mammals via the food chain was also evaluated.

ERA – Rhone-Poulenc Site, San Francisco Bay, California

Dr. Jenkins was principal scientist in a baseline ecological risk assessments (ERAs) of tidal and non-tidal wetlands bordering the South San Francisco Bay. Constituents of concern (COCs) included several metals and metalloids. Contamination in the wetlands was of

particular concern due to the presence of two endangered species. He designed and oversaw the collection of an extensive suite of site-specific data that provided a basis for a rigorous evaluation of risk to aquatic, avian, and mammalian species. Parallel studies on two remote reference wetlands properties to properly define ambient conditions in a heavily industrial area of San Francisco Bay. Data were also used as a basis in evaluating and settling natural resource damage (NRD) claims at the site.

ERA – U.S. Navy and DOJ, Concord Naval Weapons Station, Suisun Bay, California

Dr. Jenkins was senior technical advisor to the Navy and participated in the design and implementation of a ecological risk assessment, remedial investigation, feasibility study and remedy selection for the tidal wetlands of the Concord Naval Weapons Station. Dr. Jenkins provided testimony in subsequent litigation regarding ecological risk associated with residual contamination in tidal wetlands.

ERA – Fuller Obrien Oyster Point Site, San Francisco Bay, California

Dr. Jenkins conducted the initial characterization and ecological risk work for the Fuller Obrien Facility at Oyster Point in San Francisco Bay. Ecological impacts of metals, VOCs, and SVOCs were evaluated for chemicals accumulated in soil, sediments, surface water, and groundwater. Receptors included vegetation, aquatic organisms, small mammals, and birds from the mudflats, wetlands, and upland areas. Lead was the primary COC. Lead isotope ratio studies were used to differentiate site- related sources of lead from the urban baseline.

Water Quality

Technical Advisor – Refinery Effluent Evaluation for, Western States Petroleum Association, San Francisco Bay, California

Dr. Jenkins conducted studies to support the development of methods for evaluating the potential for constituents present in refinery effluents at very low concentrations to bioaccumulations in aquatic food chains. This was a requirement for NPDES permit renewal for all of the refineries located on the San Francisco Bay. COCs included PAHs, chlorinated hydrocarbons, and metals from petroleum refinery effluent. A pilot study at the Unocal Refinery and confirmatory studies at five remaining refineries. The methods and results were approved by the Regional Water Quality Control Board (RWQCB) and provided a basis for the refineries to meet NPDES discharge permit requirements.

Expert Witness – Copper Treatment of Drinking Water Reservoirs for Los Angeles Department of Water and Power (LADWP), California

Dr. Jenkins provided technical support and expert testimony for the Los Angeles Department of Water and Power (LADWP) in a series of matters involving the application of copper sulphate as an algaecide at a drinking-water reservoirs. He designed and conducted studies to evaluate the partitioning and speciation of copper in sediments.

Technical Advisor – Evaluation of Technical Basis for Chronic Silver Standard for Silver Coalition, Colorado

Dr. Jenkins evaluated evaluate the technical basis for the existing chronic silver standard for the State of Colorado. He reviewed all previous and newly gathered data, prepared an expert report, and testified before the Colorado Water Quality Commission. The existing chronic standard for silver was subsequently put on hold pending further review.

Publications

Representative Peer-Reviewed, Published Papers

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Document	Author	Date
Expert Report of Mary L. Barrett	Mary L. Barrett	6/14/2010
Expert Report of Calvin C. Barnhill	Calvin C. Barnhill	6/13/2010
Transmittal of Crab and Forage Fish Tissue Sampling Results for Total Petroleum Hydrocarbons , including all figures, tables, attachments, and/or appendices	UNOCAL	3/16/2014
Transmittal of Preliminary Crab and Forage Tissue Sampling Results, including all figures, tables, attachments, and/or appendices	UNOCAL	3/17/2011
Project Update to LA Department of Natural Resources, including all figures, tables, attachments, and/or appendices	Michael Pisani and David Angle (Michael Pisani & Associates)	9/24/2010
Quality Assurance Project Plan/Sampling Analysis and Assessment Plan for Crab and Forage Fish Tissue, including all figures, tables, attachments, and/or appendices	UNOCAL	12/6/2010
Screening-Level Ecological Risk Assessment, including all references, figures, tables, attachments, and/or appendices	David Lingle (URS Corporation)	6/29/2010
Incorporation of Additional Laboratory Analytical Data, Screening-Level Ecological Risk Assessment - June 29, 2010, including all figures, tables, attachments, and/or appendices.	David Lingle (URS Corporation)	10/15/2010
Supplemental Data/Report, including all figures, tables, attachments, and/or appendices	Michael Pisani and David Angle (Michael Pisani & Associates)	10/15/2010
Expert Report, including all figures, tables, attachments, and/or appendices	B. Arville Touchet	6/28/2010
Site Assessment and Expert Report, including all figures, tables, attachments, and/or appendices	John H. Rodgers	6/28/2010
Expert Report of Michael Pisani and David Angle, including all figures, tables, attachments, and/or appendices	Michael Pisani and David Angle (Michael Pisani & Associates)	6/15/2010
Incorporation of Additional Data into Opinions of Angela Levert, including all figures, tables, attachments, and/or appendices	UNOCAL	10/15/2010
Process Affecting Wetland Development at the Vermilion Parish School Board Property, Section 16 (T15S, R1E), Vermilion Parish, Louisiana, including all figures, tables, attachments, and/or appendices	Mark Byrnes (Applied Coastal Research and Engineering)	6/29/2010
Expert Report of Barbara D. Beck, Ph.D., including all figures, tables, attachments, and/or appendices	Barbara D. Beck	6/29/2010
Expert Opinions of Angela Levert, including all references, figures, tables, attachments, and/or appendices	Angela Levert	6/29/2010
Incorporation of Additional Data into Expert Report of Barbara D. Beck, Ph.D., including all references, figures, tables, attachments, and/or appendices	Barbara D. Beck	10/15/2010
Deposition of John H. Rodgers and all exhibits	John H. Rodgers	7/27/2010
Crab and Fish Collection Report, including all figures, tables, attachments, and/or appendices	Helen Connelly (Michael Pisani & Associates)	3/20/2012
Deposition of David Lingle and all exhibits		8/2/2010
Deposition of David Lingle and all exhibits		11/9/2010
Corporate Deposition of Sherry Laboratories, L.L.C., and all exhibits		10/26/2010
Petition for Damages to School Lands		9/2004
First Supplemental and Amending Petition for Damages		2/21/2005
Second Supplemental and Amending Petition for Damages		3/2/2005
Third Supplemental and Amending Petition for Damages		8/10/2007
Motion for Leave to File Fourth Supplemental and Amending Petition for Damages		9/8/2008
Revised Case Management Order		2013
Investigation of Historical Land Use and Environmental Impacts on the Vermilion Parish School Board Property, Section 16, T. 15 S. - R. 1 E., Vermilion Parish, Louisiana, including all figures, tables, attachments, and/or appendices	Gary C. Barbee/George Castille	4/15/2010
Supplemental Toxicological Evaluation Report for the Vermilion Parish School Board Property, including all figures, tables, attachments, and/or appendices	Gary C. Barbee	11/2/2010
Crab Tissue Study, including all figures, tables, attachments, and/or appendices	William J. Rogers	2010
Assessment Report of ICON, including all figures, attachments, tables, and/or appendices	Greg Miller (ICON)	3/2010
Feasibility Study and Remediation Estimate, including all figures, attachments, tables, and/or appendices	Greg Miller (ICON)	4/2010
Deposition of Gary Barbee, Ph.D. and all exhibits	Gary C. Barbee	7/20/2010
Deposition of Julia Battle and all exhibits	Julia Battle	7/15/2010
Deposition of Walker Wilson, M.S. and all exhibits	Walker Wilson	7/13/2010
Expert Report of Dr. Patricia Williams	Patricia Williams	4/1/2014
Supplemental Report and Transmission of Data, including all figures, tables, attachments, and/or appendices	Greg Miller (ICON)	11/2/2010
Ecological Risk Assessment And Toxicological Evaluation Associated With Oil Exploration And Production Activities East White Lake Field, Vermilion Parish, LA, including all figures, tables, attachments, and/or appendices	William J. Rogers	3/1/2014
Deposition of George J. Castille, III, Ph.D., and all exhibits		7/12/2010
Deposition of Gregory W. Miller, and all exhiibits		7/9/2010
Deposition of John Wayne Prejean, Jr. and all exhibits		10/22/2010

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	Bulk Parameter Total Moisture	Bulk Parameter TOC	Metals Arsenic ICON	Metals Arsenic Pisani	Metals Barium ICON	Metals Barium Pisani
								Percent	mg/kg-dry	mg/kg-dry	mg/kg-dry	mg/kg-dry	mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment	81.90		7.66		257.00	
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment	85.60		7.64		247.00	
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment	82.80		6.50		279.00	
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment	86.10		10.00		22.70	
AB13		0-3	0	3	11/13/2006	Syringe	Sediment	86.00		12.90		551.00	
AB14		0-3	0	3	11/13/2006	Syringe	Sediment	62.80		5.51		200.00	
AB15		0-6	0	6	11/13/2006	Syringe	Sediment	78.70		8.15		362.00	
AB5		0-6	0	6	11/13/2006	Syringe	Sediment	69.90		6.03		253.00	
B17		0-3	0	3	8/10/2006	Vibracore	Sediment	81.00		7.75		453.00	
B4		0-1	0	1	8/9/2006	Vibracore	Sediment	78.40		10.00		631.00	
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment	74.40		8.17		368.00	
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	29.20		5.28		2750.00	
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	45.80		6.17		2030.00	
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	62.70		8.79		1600.00	
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	57.50		11.40		7450.00	
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	71.70		22.00		15700.00	
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment	77.30		7.36	3.93	428.00	379.44
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment	65.40		5.20	4.37	769.00	691.10
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment	69.90		3.80	3.43	933.00	1015.58
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment	70.70		3.33	3.56	1180.00	1021.35
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment	78.60		5.09	5.24	270.00	324.32
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment	68.00		3.31	4.42	1720.00	1729.37
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment	74.50		5.48	6.91	1430.00	2139.00
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment	80.80		8.29	5.17	308.00	333.91
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment	67.20		5.11	4.77	686.00	803.92
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment	69.80		3.61	3.47	578.00	485.80
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment	68.30		3.14	4.58	639.00	823.72
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment	67.90		6.73	3.76	888.00	1234.46
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment	66.60		5.95	4.13	1070.00	1449.10
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment	72.90		4.95	3.30	548.00	584.23
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment	76.70		5.04	3.27	495.00	485.98
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment	83.40		4.47		539.00	658.65
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment	83.20		8.72	8.82	315.00	334.72
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment	72.30		4.47	2.21	460.00	473.31
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment	73.40		3.21	2.60	395.00	670.00
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment	61.40		5.42	1.58	662.00	341.75
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment	96.80		4.75	6.18	216.00	122.80
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment	64.80		8.06	3.31	522.00	226.53
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment	69.60		3.93	3.47	686.00	726.11
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment	67.20		8.03	6.52	843.00	996.69
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment	64.00		8.12	7.89	871.00	1041.55
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	67.90	55000	4.80	4.39	713.00	549.71

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	Bulk Parameter Total Moisture	Bulk Parameter TOC	Metals Arsenic ICON	Metals Arsenic Pisani	Metals Barium ICON	Metals Barium Pisani
								Percent	mg/kg-dry	mg/kg-dry	mg/kg-dry	mg/kg-dry	mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment	NA	284000		3.66		754.29
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	75.60	45900	3.11	5.02	586.00	909.09
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	73.50	67700	2.76	6.75	470.00	943.09
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	78.70	40800	2.30	3.70	516.00	509.26
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	68.90	45600	3.15	10.48	434.00	1197.60
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	70.50	94500	3.28	5.13	406.00	538.22
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	67.90	54100	4.80	8.03	554.00	1096.88
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	61.10		5.65	4.06	720.00	496.14
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	71.00	36100	3.36	6.61	455.00	671.05
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	68.3	184000	4.99	1.041	897	155
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	66.4	51500	4.26	4.167	317	288
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	71.2	14400	2.83	4.514	319	347
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	63.6	42700	4.79	3.874	388	582
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	67.5	172000	6.32	2.369	388	388
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	70.2	55000	4.33	3.255	753	768
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	77.1	66000	2.16	3.93	397	463
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	75.8	58800	5.98	4.711	313	383
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	75.8	106000	9.45	8.471	231	264
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	74.9	134000	6.79	4.86	205	274
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	80.2	195000		9.95		319
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	NA					
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	NA					
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	NA					
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	NA					
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	NA					
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	NA					
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	NA					
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	NA					
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	NA					

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	Metals Cadmium ICON mg/kg-dry	Metals Cadmium Pisani mg/kg-dry	Metals Chromium ICON mg/kg-dry	Metals Chromium Pisani mg/kg-dry	Metals Lead ICON mg/kg-dry	Metals Lead Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment	0.41		12.90		17.80	
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment	0.32		12.40		15.70	
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment	0.31		14.50		21.00	
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment	0.36		9.02		12.60	
AB13		0-3	0	3	11/13/2006	Syringe	Sediment	0.45		7.73		8.11	
AB14		0-3	0	3	11/13/2006	Syringe	Sediment	0.22		12.80		14.40	
AB15		0-6	0	6	11/13/2006	Syringe	Sediment	0.28		11.00		12.60	
AB5		0-6	0	6	11/13/2006	Syringe	Sediment	0.23		7.84		8.46	
B17		0-3	0	3	8/10/2006	Vibracore	Sediment	0.24		11.90		12.30	
B4		0-1	0	1	8/9/2006	Vibracore	Sediment	0.77				28.70	
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment	0.64				23.10	
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment			25.10		63.60	
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment			12.70		49.90	
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment			17.90		28.80	
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment			21.80		117.00	
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment			20.00		67.50	
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment	<0.496	0.04	19.40	3.50	22.30	22.48
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment						
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment						
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment						
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment						
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment						
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment						
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment	<0.496	1.26	19.20	8.74	21.00	26.22
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment						
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment						
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment						
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment						
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment						
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment						
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment	<0.498	0.22	17.50	6.54	17.90	19.44
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment	<0.496	0.11	16.90	13.70	16.30	20.19
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment	<0.496		15.20		19.90	26.74
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment						
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment						
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment	0.59		16.40	5.27	22.40	11.90
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment	<0.496		15.30		15.40	14.86
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment	1.21	2.10	24.10	3.57	55.20	18.73
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment	<0.496	0.10	19.00	6.91	19.90	20.99
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment	0.52	0.31	14.70	4.64	28.30	23.31
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment	0.54	0.17	15.80	4.96	24.50	35.18
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.498	<0.58	13.60	14.47	19.30	18.77

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(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	Metals Cadmium ICON mg/kg-dry	Metals Cadmium Pisani mg/kg-dry	Metals Chromium ICON mg/kg-dry	Metals Chromium Pisani mg/kg-dry	Metals Lead ICON mg/kg-dry	Metals Lead Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		0.22		35.83		34.00
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.499	<0.73	15.70	18.51	18.10	22.04
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.497	<0.81	12.30	17.97	16.70	23.66
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.497	<0.93	13.80	20.51	17.00	23.43
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<0.499	0.03	12.70	14.76	18.00	25.15
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<0.497	<0.64	11.60	17.17	16.70	23.06
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<0.497	0.06	12.90	17.00	18.50	24.75
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.498	<0.51	12.40	14.76	18.90	21.18
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<0.498	<0.66	13.80	13.95	19.60	20.36
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.496	<0.026	11.7	13.123	12.6	11.546
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.495	<0.025	12.5	14.732	17.9	18.452
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.500	0.049	13.4	17.986	17	22.257
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.497	0.099	11.5	13.242	17.6	20.275
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.499	<0.026	8.26	7.2	8.21	7.846
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.497	<0.028	15.1	19.866	18.7	26.846
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.497	<0.036	14.3	18.166	18.6	23.057
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.498	<0.034	12.2	17.727	17.3	24.05
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.497	<0.034	10.2	11.736	11	11.446
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	<0.499	<0.0331	12.9	23.3	13.8	27.2
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.042		18.59		21.26
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	Metals Mercury ICON mg/kg-dry	Metals Mercury Pisani mg/kg-dry	Metals Selenium ICON mg/kg-dry	Metals Selenium Pisani mg/kg-dry	Metals Sodium ICON mg/kg-dry	Metals Strontium ICON mg/kg-dry	Metals Strontium Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment						106.00	
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment						87.20	
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment						63.90	
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment						100.00	
AB13		0-3	0	3	11/13/2006	Syringe	Sediment						459.00	
AB14		0-3	0	3	11/13/2006	Syringe	Sediment						121.00	
AB15		0-6	0	6	11/13/2006	Syringe	Sediment						251.00	
AB5		0-6	0	6	11/13/2006	Syringe	Sediment						237.00	
B17		0-3	0	3	8/10/2006	Vibracore	Sediment			<1.99				
B4		0-1	0	1	8/9/2006	Vibracore	Sediment			<4.72			59.30	
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment			<4.01			64.10	
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment						64.80	
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment						72.90	
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment						74.30	
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment						140.00	
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment						231.00	
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment	0.14	0.09	<1.98			56.30	59.81
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment	0.20	0.09	<1.99				
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment	0.13	0.07	<1.99	1.53			
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment	0.10	0.07	<1.99	1.42			
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment	0.60	0.09	<1.99	2.11			
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment	0.15	0.07	<2	1.52			
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment	0.15	0.12	<1.98	1.58			
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment	<0.1	0.06	<1.98			59.20	54.78
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment	0.19	0.08	<2	1.24			
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment	<0.1	0.04	<1.98	1.17			
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment	<0.1	0.07	<1.99	1.54			
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment	<0.1	0.07	<1.98	1.61			
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment	<0.1	0.08	<1.99	1.56			
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment	<0.1	0.08	<1.98	0.97			
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment	1.21	0.61	<1.99				292.99
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment	<0.1	0.11	<1.98			223.00	213.94
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment	<0.1	0.14	<1.99			60.20	79.17
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment	0.13	0.04	<1.99	0.93			
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment	<0.1	0.08	<1.99				
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment	0.22	0.04	<1.98			91.70	59.09
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment	0.62	0.04	<1.99			58.90	36.20
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment	14.30	0.88	<1.98			140.00	80.20
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment	0.12	0.08	<1.98			48.30	47.13
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment	0.28	0.15	<1.99	1.32		65.30	61.26
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment	0.86	1.63	<2	1.14		65.30	74.52
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.100	0.10	<1.99	<4.68		45.10	44.15

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	Metals Mercury ICON mg/kg-dry	Metals Mercury Pisani mg/kg-dry	Metals Selenium ICON mg/kg-dry	Metals Selenium Pisani mg/kg-dry	Metals Sodium ICON mg/kg-dry	Metals Strontium ICON mg/kg-dry	Metals Strontium Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		0.41		<9.14			442.29
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.100	0.11	<2.00	<5.82		49.40	55.27
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	0.24	0.17	<1.99	<6.5		40.30	65.45
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	0.16	0.18	<1.99	<7.41		47.40	58.33
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<0.100	0.11	<1.99	<4.79		41.50	68.86
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	0.31	0.16	<1.99	<5.1		44.20	53.82
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	0.12	0.16	<1.99	<5		43.60	63.13
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	0.12	0.10	<1.99	<4.11		43.70	41.13
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<0.100	0.12	<1.99	<5.26		43.50	46.05
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.1	<0.104	<1.98	<0.789		80.5	69.401
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	0.132	<0.095	<1.98	<0.744		44.4	44.643
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.1	<0.08	<2	<0.868		37.4	45.833
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.1	0.096	<1.99	<0.687		38.5	41.758
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.1	<0.077	<1.99	<0.769		129	84.308
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.1	<0.094	<1.99	<0.839		52	59.396
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	0.185	0.568	<1.99	<1.092		50.5	61.135
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.1	0.14	<1.99	<1.033		47.8	64.463
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.1	<0.083	<1.99	<1.033		84.6	84.711
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	<0.1	<0.011	<1.99	<0.996		62.8	103
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.014		<1.26			100
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	0.39	0.245					
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	0.281	0.322					
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	0.203	0.173					
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	0.137	0.115					
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		0.254					
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	0.222	0.134					
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	0.204	0.122					
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	0.172	0.108					
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	11	0.141					

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	Metals Zinc ICON mg/kg-dry	Metals Zinc Pisani mg/kg-dry	Metals AVS Pisani µmol/g	Metals Cadmium SEM Pisani µmol/g
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment	46.40			
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment	45.90			
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment	46.80			
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment	40.90			
AB13		0-3	0	3	11/13/2006	Syringe	Sediment	24.80			
AB14		0-3	0	3	11/13/2006	Syringe	Sediment	63.90			
AB15		0-6	0	6	11/13/2006	Syringe	Sediment	32.20			
AB5		0-6	0	6	11/13/2006	Syringe	Sediment	20.40			
B17		0-3	0	3	8/10/2006	Vibracore	Sediment				
B4		0-1	0	1	8/9/2006	Vibracore	Sediment				
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment				
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	194.00			
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	73.50			
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	92.50			
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	174.00			
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	111.00			
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment				
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment				
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment				
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment				
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment				
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment				
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment				
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	51.40	51.75	20.10	0.0034

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	Metals Zinc ICON mg/kg-dry	Metals Zinc Pisani mg/kg-dry	Metals AVS Pisani µmol/g	Metals Cadmium SEM Pisani µmol/g
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		414.29	1.66	<0.0031
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	61.40	65.09	56.50	0.00
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	51.30	73.17	33.60	<0.0023
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	57.10	70.37	60.90	0.00
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	50.30	61.98	13.80	<0.0019
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	50.70	64.01	16.90	0.00
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	49.70	64.69	4.70	0.00
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	48.30	52.96		
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	54.30	53.62	9.50	<0.0024
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	23.4	30.978	<0.052	<0.0021
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	46.6	46.131	20.4	<0.0022
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	48.3	58.333	20.3	<0.0021
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	42.9	42.857	8.9	<0.0018
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	19.3	21.508	0.617	<0.0027
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	48.4	64.765	4.8	<0.0019
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	61.6	68.996	14.5	<0.0024
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	44.1	58.264	15.4	<0.002
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	29.3	16.446	<0.058	<0.0022
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	43.9	205	0.11	<0.0031
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		90.9	1.12	<0.0027
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	Metals Copper SEM Pisani µmol/g	Metals Lead SEM Pisani µmol/g	Metals Nickel SEM Pisani µmol/g	Metals Zinc SEM Pisani µmol/g
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment				
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment				
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment				
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment				
AB13		0-3	0	3	11/13/2006	Syringe	Sediment				
AB14		0-3	0	3	11/13/2006	Syringe	Sediment				
AB15		0-6	0	6	11/13/2006	Syringe	Sediment				
AB5		0-6	0	6	11/13/2006	Syringe	Sediment				
B17		0-3	0	3	8/10/2006	Vibracore	Sediment				
B4		0-1	0	1	8/9/2006	Vibracore	Sediment				
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment				
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment				
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment				
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment				
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment				
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment				
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment				
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment				
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment				
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment				
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment				
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment				
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment				
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment				
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment				
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	0.06	0.08	0.08	0.50

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	Metals Copper SEM Pisani µmol/g	Metals Lead SEM Pisani µmol/g	Metals Nickel SEM Pisani µmol/g	Metals Zinc SEM Pisani µmol/g
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment	<0.011	0.03	<0.024	1.56
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.008	0.08	0.05	0.56
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.008	0.04	0.03	0.28
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.009	0.07	0.05	0.50
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	0.02	0.03	0.03	0.21
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	0.02	0.09	0.09	0.67
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	0.10	0.07	0.08	0.44
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment				
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	0.08	0.05	0.06	0.33
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	0.01	0.035	0.037	0.067
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	0.052	0.03	0.043	0.189
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	0.044	0.018	0.029	0.134
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	0.019	0.02	0.033	0.139
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	0.011	<0.015	0.026	0.091
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	0.01	0.036	0.028	0.228
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	0.014	0.027	0.019	0.258
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	0.015	0.022	0.041	0.148
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	0.016	0.031	0.058	0.083
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	0.016	0.062	0.098	0.308
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	<0.01	0.044	0.029	0.745
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment				

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PCB Aroclor1016 Pisani Dry Wt.	PCB Aroclor1221 Pisani Dry Wt.	PCB Aroclor1232 Pisani Dry Wt.	PCB Aroclor1242 Pisani Dry Wt.	PCB Aroclor1248 Pisani Dry Wt.	PCB Aroclor1254 Pisani Dry Wt.	PCB Aroclor1260 Pisani Dry Wt.
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment							
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment							
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment							
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment							
AB13		0-3	0	3	11/13/2006	Syringe	Sediment							
AB14		0-3	0	3	11/13/2006	Syringe	Sediment							
AB15		0-6	0	6	11/13/2006	Syringe	Sediment							
AB5		0-6	0	6	11/13/2006	Syringe	Sediment							
B17		0-3	0	3	8/10/2006	Vibracore	Sediment							
B4		0-1	0	1	8/9/2006	Vibracore	Sediment							
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment							
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment							
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment							
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment							
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment							
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment							
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment							
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment							
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment							
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment							
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment							
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment							
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment							
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment							
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment							
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment							
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment							
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment							
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment							
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment							
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment							
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment							
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment							
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment							
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment							
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment							
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment							
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment							
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment							
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment							
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment							
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment							

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PCB Aroclor1016 Pisani Dry Wt.	PCB Aroclor1221 Pisani Dry Wt.	PCB Aroclor1232 Pisani Dry Wt.	PCB Aroclor1242 Pisani Dry Wt.	PCB Aroclor1248 Pisani Dry Wt.	PCB Aroclor1254 Pisani Dry Wt.	PCB Aroclor1260 Pisani Dry Wt.
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment							
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment							
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment							
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment							
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment							
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment							
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment							
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment							
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment							
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment							
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment							
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment							
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment							
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment							
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment							
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment							
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment							
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment							
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment							
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment							
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment							
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment							
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment							
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment							
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment							
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment							
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment							
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment							
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment							

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PCB Total PCBs ICON Dry Wt.	TPH Aliphatic >C10C12 Pisani Dry Wt.	TPH Aliphatic >C12C16 Pisani Dry Wt.	TPH Aliphatic >C16C35 Pisani Dry Wt.	TPH Aromatic >C10C12 Pisani Dry Wt.
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment					
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment					
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment					
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment					
AB13		0-3	0	3	11/13/2006	Syringe	Sediment					
AB14		0-3	0	3	11/13/2006	Syringe	Sediment					
AB15		0-6	0	6	11/13/2006	Syringe	Sediment					
AB5		0-6	0	6	11/13/2006	Syringe	Sediment					
B17		0-3	0	3	8/10/2006	Vibracore	Sediment					
B4		0-1	0	1	8/9/2006	Vibracore	Sediment					
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment					
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment					
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment					
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment					
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment					
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment					
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment					
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment					
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment					
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment					
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment					
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment					
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment			44.40	182.63	
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment					
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment					
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment					
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment					
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment			102.54	1129.94	
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment			62.87	289.82	
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment			24.34	275.27	
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		514.02	560.75	12570.09	30.84
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment			257.69	2254.81	
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment					
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		93.59	914.59	2619.22	
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment			204.50	466.00	
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment	<0.097				
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment	<0.0785				
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment	<1.19				
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment					
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment			80.46	202.65	
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment			32.69	130.19	
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment					

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PCB Total PCBs ICON Dry Wt.	TPH Aliphatic >C10C12 Pisani Dry Wt.	TPH Aliphatic >C12C16 Pisani Dry Wt.	TPH Aliphatic >C16C35 Pisani Dry Wt.	TPH Aromatic >C10C12 Pisani Dry Wt.
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment					
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment					
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment					
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment					
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment					
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment					
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment					
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment					
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment					
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment					
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment					
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment					
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment					
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment					
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment					
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment					
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment					
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment					
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment					
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment					
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment					
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment					
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment					
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment					
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment					
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment					
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment					
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment					
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment					

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	TPH Aromatic >C12C16 Pisani Dry Wt.	TPH Aromatic >C16C21 Pisani Dry Wt.	TPH Aromatic >C21C35 Pisani Dry Wt.	TPH TPHDRO ICON Dry Wt.	TPH TPHDRO Pisani Dry Wt.	TPH TPHGRO ICON Dry Wt.
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment						
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment						
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment						
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment						
AB13		0-3	0	3	11/13/2006	Syringe	Sediment						
AB14		0-3	0	3	11/13/2006	Syringe	Sediment						
AB15		0-6	0	6	11/13/2006	Syringe	Sediment				59.62		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment						
B17		0-3	0	3	8/10/2006	Vibracore	Sediment						
B4		0-1	0	1	8/9/2006	Vibracore	Sediment				2037.04		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment				51.56		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment				326.00		<70.6
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment				412.00		<92.3
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment				121.00		<134
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment				185.00		<118
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment				386.00		<177
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment						
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment				352.60		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment				717.61		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment						
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment				330.84		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment				981.25		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment				1823.53	311.58	
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment						
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment				341.46		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment				456.95		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment				403.79		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment	20.28	96.05	184.75	5202.49	1169.49	
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment				2982.04	252.69	
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment				660.52	379.93	
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment	789.72	1355.14	2023.36	36137.34	25327.10	
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		290.38	879.81	9156.63	4951.92	
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment						
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment	59.07	238.08	349.82	5162.45	3220.64	
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment				488.72	775.00	
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment				743.52		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment				228.30		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment				1022.73	67.14	
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment				536.18		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment				379.00	463.58	
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment				829.00	182.27	
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment				200.00		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	TPH Aromatic >C12C16 Pisani Dry Wt.	TPH Aromatic >C16C21 Pisani Dry Wt.	TPH Aromatic >C21C35 Pisani Dry Wt.	TPH TPHDRO ICON Dry Wt.	TPH TPHDRO Pisani Dry Wt.	TPH TPHGRO ICON Dry Wt.
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment						
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment				168.00		
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment				93.70		
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment				<93.9		
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment				175.00		
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment				2360.00		
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment				160.00		
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment				344.00		
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment				92.30		
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment						
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment						
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment						
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment						
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment						
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment						
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment						
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment						
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment						
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment						
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment						
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment						

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	TPH TPHORO ICON Dry Wt.	TPH TPHORO Pisani Dry Wt.
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment	1606.48	
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	317.00	
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	468.00	
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<134	
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<118	
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	553.00	
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment	410.40	
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment	644.52	
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment	551.40	
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment	603.13	
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment	1164.71	24.71
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment	304.88	
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment	447.02	
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment	362.78	
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment	2825.55	310.73
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment	1577.84	25.09
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment	645.76	71.68
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment	14420.60	4233.64
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment	7771.08	1379.81
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment	1292.42	629.89
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment	207.14	176.50
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment	948.19	
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment	283.02	
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment	3068.18	100.20
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment	1039.47	
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment	263.00	30.56
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment	450.00	
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	208.00	

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	TPH TPHORO ICON Dry Wt.	TPH TPHORO Pisani Dry Wt.
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<205	
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<189	
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<235	
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	176.00	
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	1440.00	
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<156	
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	315.00	
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<172	
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH 2Methylnaphthalene ICON mg/kg-dry	PAH 2Methylnaphthalene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH 2Methylnaphthalene ICON mg/kg-dry	PAH 2Methylnaphthalene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.057
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.051
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.063
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.047
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.055
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.057
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.074
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.074
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.070
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.068
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.086
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Acenaphthene ICON mg/kg-dry	PAH Acenaphthene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Acenaphthene ICON mg/kg-dry	PAH Acenaphthene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.060
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.054
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.066
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.049
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.058
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.060
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.079
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.079
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.074
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.072
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.091
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Acenaphthylene ICON mg/kg-dry	PAH Acenaphthylene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Acenaphthylene ICON mg/kg-dry	PAH Acenaphthylene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.035
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.033
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.038
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.030
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.034
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.037
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.048
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.045
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.045
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.044
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.056
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Anthracene ICON mg/kg-dry	PAH Anthracene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Anthracene ICON mg/kg-dry	PAH Anthracene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.038
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.033
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.038
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.030
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.034
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.037
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.048
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.045
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.045
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.044
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.056
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Benzo(a)anthracene ICON mg/kg-dry	PAH Benzo(a)anthracene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Benzo(a)anthracene ICON mg/kg-dry	PAH Benzo(a)anthracene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.044
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.042
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.049
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.038
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.043
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.047
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.061
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.058
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.058
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.056
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.071
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Benzo(a)pyrene ICON mg/kg-dry	PAH Benzo(a)pyrene Pisani mg/kg-dry	PAH Benzo(b)fluoranthene ICON mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment			
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment			
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment			
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment			
AB13		0-3	0	3	11/13/2006	Syringe	Sediment			
AB14		0-3	0	3	11/13/2006	Syringe	Sediment			
AB15		0-6	0	6	11/13/2006	Syringe	Sediment			
AB5		0-6	0	6	11/13/2006	Syringe	Sediment			
B17		0-3	0	3	8/10/2006	Vibracore	Sediment			
B4		0-1	0	1	8/9/2006	Vibracore	Sediment			
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment			
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment			
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment			
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment			
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment			
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment			
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment			
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment			
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96	

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Benzo(a)pyrene ICON mg/kg-dry	PAH Benzo(a)pyrene Pisani mg/kg-dry	PAH Benzo(b)fluoranthene ICON mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89	
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2	
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32	
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52	
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97	
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04	
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02	
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83	
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07	
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.060	
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.057	
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.066	
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.052	
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.058	
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.064	
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.083	
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.079	
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.079	
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.076	
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.096	
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Benzo(k)fluoranthene ICON mg/kg-dry	PAH Benzo(k)fluoranthene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.96	<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Benzo(k)fluoranthene ICON mg/kg-dry	PAH Benzo(k)fluoranthene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment	<1.89	<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<1.2	<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<1.32	<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<1.52	<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<0.97	<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<1.04	<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<1.02	<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.83	<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.032	<0.047
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.030	<0.045
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.035	<0.052
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.027	<0.041
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.031	<0.046
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.034	<0.050
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.044	<0.066
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.041	<0.062
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.041	<0.062
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	<0.040	<0.060
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	<0.051	<0.076
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Chrysene ICON mg/kg-dry	PAH Chrysene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Chrysene ICON mg/kg-dry	PAH Chrysene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		0.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.035
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.033
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.038
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.030
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.034
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.037
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.048
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.045
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.045
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.044
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.056
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Dibenz(a,h)anthracene ICON mg/kg-dry	PAH Dibenz(a,h)anthracene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Dibenz(a,h)anthracene ICON mg/kg-dry	PAH Dibenz(a,h)anthracene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.028
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.027
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.031
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.025
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.028
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.030
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.039
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.037
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.037
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.0356
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.0452
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Fluoranthene ICON mg/kg-dry	PAH Fluoranthene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Fluoranthene ICON mg/kg-dry	PAH Fluoranthene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.023
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.021
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.025
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.020
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.022
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.024
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.031
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.030
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.030
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.029
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.036
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Fluorene ICON mg/kg-dry	PAH Fluorene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Fluorene ICON mg/kg-dry	PAH Fluorene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		0.92
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.032
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.030
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.035
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.027
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.031
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.033
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.043
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.041
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.041
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.0397
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.0504
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Indeno(1,2,3cd)pyrene ICON mg/kg-dry	PAH Indeno(1,2,3cd)pyrene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Indeno(1,2,3cd)pyrene ICON mg/kg-dry	PAH Indeno(1,2,3cd)pyrene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		0.31
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.041
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.039
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.045
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.036
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.040
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.044
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.057
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.054
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.054
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.052
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.066
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Naphthalene ICON mg/kg-dry	PAH Naphthalene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment		
AB13		0-3	0	3	11/13/2006	Syringe	Sediment		
AB14		0-3	0	3	11/13/2006	Syringe	Sediment		
AB15		0-6	0	6	11/13/2006	Syringe	Sediment		
AB5		0-6	0	6	11/13/2006	Syringe	Sediment		
B17		0-3	0	3	8/10/2006	Vibracore	Sediment		
B4		0-1	0	1	8/9/2006	Vibracore	Sediment		
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment		
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment		
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment		
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment		
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment		
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Naphthalene ICON mg/kg-dry	PAH Naphthalene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.035
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.033
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.038
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.030
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.034
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.037
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.048
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.045
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.045
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.044
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.056
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment		

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Phenanthrene ICON mg/kg-dry	PAH Phenanthrene Pisani mg/kg-dry	PAH Pyrene ICON mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment			
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment			
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment			
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment			
AB13		0-3	0	3	11/13/2006	Syringe	Sediment			
AB14		0-3	0	3	11/13/2006	Syringe	Sediment			
AB15		0-6	0	6	11/13/2006	Syringe	Sediment			
AB5		0-6	0	6	11/13/2006	Syringe	Sediment			
B17		0-3	0	3	8/10/2006	Vibracore	Sediment			
B4		0-1	0	1	8/9/2006	Vibracore	Sediment			
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment			
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466	<0.466	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609	<0.609	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885	<0.885	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776	<0.776	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17	<1.17	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment			
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment			
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment			
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment			
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment			
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment			
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment			
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment			
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment			
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.96	

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Phenanthrene ICON mg/kg-dry	PAH Phenanthrene Pisani mg/kg-dry	PAH Pyrene ICON mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment		<1.89	
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.2	
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.32	
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<1.52	
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<0.97	
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.04	
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.02	
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment		<0.83	
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment		<1.07	
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.041	
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.039	
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.045	
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.036	
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.040	
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment		<0.044	
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.057	
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.054	
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment		<0.054	
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.052	
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment		<0.066	
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment			

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Pyrene Pisani mg/kg-dry
AB1	Background	0-3	0	3	11/13/2006	Syringe	Sediment	
AB2	Background	0-3	0	3	11/13/2006	Syringe	Sediment	
AB3	Background	0-3	0	3	11/13/2006	Syringe	Sediment	
AB4	Background	0-3	0	3	11/13/2006	Syringe	Sediment	
AB13		0-3	0	3	11/13/2006	Syringe	Sediment	
AB14		0-3	0	3	11/13/2006	Syringe	Sediment	
AB15		0-6	0	6	11/13/2006	Syringe	Sediment	
AB5		0-6	0	6	11/13/2006	Syringe	Sediment	
B17		0-3	0	3	8/10/2006	Vibracore	Sediment	
B4		0-1	0	1	8/9/2006	Vibracore	Sediment	
B9		0-0.5	0	0.5	8/9/2006	Vibracore	Sediment	
SS11		0-2.5	0	2.5	4/27/2006	Syringe	Sediment	<0.466
SS12		0-3.7	0	3.7	4/27/2006	Syringe	Sediment	<0.609
SS3		0-0.6	0	0.6	4/25/2006	Syringe	Sediment	<0.885
SS5		0-2.15	0	2.15	4/26/2006	Syringe	Sediment	<0.776
SS7		0-1.4	0	1.4	4/26/2006	Syringe	Sediment	<1.17
SED1		0-2	0	2	2/25/2010	Russian Borer	Sediment	
SED10		0-2	0	2	2/25/2010	Russian Borer	Sediment	
SED12		0-2	0	2	2/25/2010	Russian Borer	Sediment	
SED14		0-2	0	2	2/26/2010	Russian Borer	Sediment	
SED16		0-2	0	2	2/26/2010	Russian Borer	Sediment	
SED17		0-2	0	2	2/26/2010	Russian Borer	Sediment	
SED18		0-2	0	2	2/26/2010	Russian Borer	Sediment	
SED2		0-2	0	2	2/25/2010	Russian Borer	Sediment	
SED20		0-2	0	2	2/26/2010	Russian Borer	Sediment	
SED21		0-2	0	2	2/26/2010	Russian Borer	Sediment	
SED22		0-2	0	2	2/26/2010	Russian Borer	Sediment	
SED23		0-2	0	2	3/2/2010	Russian Borer	Sediment	
SED25		0-2	0	2	3/2/2010	Russian Borer	Sediment	
SED27		0-2	0	2	3/2/2010	Russian Borer	Sediment	
SED28		0-2	0	2	3/2/2010	Russian Borer	Sediment	
SED29		0-2	0	2	3/2/2010	Russian Borer	Sediment	
SED3		0-2	0	2	2/25/2010	Russian Borer	Sediment	
SED32		0-2	0	2	3/1/2010	Russian Borer	Sediment	
SED33		0-2	0	2	3/1/2010	Russian Borer	Sediment	
SED4		0-2	0	2	2/25/2010	Russian Borer	Sediment	
SED5		0-2	0	2	2/25/2010	Russian Borer	Sediment	
SED6		0-2	0	2	2/25/2010	Russian Borer	Sediment	
SED7		0-2	0	2	2/25/2010	Russian Borer	Sediment	
SS10		0-2	0	2	2/26/2010	Russian Borer	Sediment	
SS8		0-2	0	2	2/26/2010	Russian Borer	Sediment	
SED11		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.96

Attachment 4. Analytical Data
(Sediment)

Boring ID	Boring ID notes	Core Interval (ft bls)	Upper Depth Range (ft bls)	Lower Depth Range (ft bls)	Date	Sample Type	Matrix	PAH Pyrene Pisani mg/kg-dry
SED120	equivalent station SED30	0-0.5	0	0.5	5/7/2010	Unknown	Sediment	<1.89
SED13		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<1.2
SED15		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<1.32
SED19		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<1.52
SED24		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<0.97
SED26		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<1.04
SED31		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<1.02
SED8		0-0.5	0	0.5	5/6/2010	Unknown	Sediment	<0.83
SED9		0-0.5	0	0.5	5/5/2010	Unknown	Sediment	<1.07
SED-BK-01	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.145
SED-BK-02	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.137
SED-BK-03	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.160
SED-BK-04	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.126
SED-BK-05	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.142
SED-BK-06	Background	0-0.5	0	0.5	10/5/2010	Unknown	Sediment	<0.154
SED-BK-07	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.201
SED-BK-08	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.190
SED-BK-09	Background	0-0.5	0	0.5	11/5/2010	Unknown	Sediment	<0.190
SED-BK-10	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	<0.183
SED-BK-11	Background	0-0.5	0	0.5	5/19/2010	Unknown	Sediment	<0.232
HG MPA 01		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	
HG MPA 02		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	
HG MPA 03		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	
HG MPA 04		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	
HG MPA 05		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	
HG MPA 06		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	
HG MPA 07		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	
HG MPA 08		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	
HG MPA 09		0-0.5	0	0.5	10/6/2010	Unknown	Sediment	

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total Metals Arsenic (mg/L) ICON	Total Metals Arsenic (mg/L) Pisani	Total Metals Barium (mg/L) ICON	Total Metals Barium (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water	<0.0100	<0.010	0.284	0.28
SW-02		5/5/2010	Unknown	Surface Water	<0.0100	<0.010	0.285	0.29
SW-03		5/5/2010	Unknown	Surface Water	<0.0100	<0.010	0.262	0.3
SW-04		5/5/2010	Unknown	Surface Water	<0.0100	<0.010	0.245	0.27
SW-05		5/5/2010	Unknown	Surface Water	<0.0100	0.0019	0.265	0.29
SW-06		5/6/2010	Unknown	Surface Water	<0.0100	<0.010	0.346	0.39
SW-07		5/6/2010	Unknown	Surface Water	<0.0100	<0.010	0.413	0.45
SW-09		5/6/2010	Unknown	Surface Water	<0.0100	<0.010	0.378	0.42
SW-10		5/6/2010	Unknown	Surface Water	<0.0100	<0.010	0.345	0.38
SW-20		5/7/2010	Unknown	Surface Water		0.013		1.23
SW BK-01	Background	5/10/2010	Unknown	Surface Water	<0.0100	<0.010	0.282	0.3
SW BK-02	Background	5/10/2010	Unknown	Surface Water	<0.0100	<0.010	0.276	0.31
SW BK-03	Background	5/10/2010	Unknown	Surface Water	<0.0100	<0.010	0.279	0.3
SW BK-04	Background	5/10/2010	Unknown	Surface Water	<0.0100	<0.010	0.297	0.32
SW BK-05	Background	5/11/2010	Unknown	Surface Water	<0.0100	<0.010	0.301	0.31
SW BK-06	Background	5/10/2010	Unknown	Surface Water	<0.0100	0.0024	0.375	0.43
SW BK-07	Background	5/11/2010	Unknown	Surface Water	<0.0100	<0.010	0.415	0.44
SW BK-08	Background	5/11/2010	Unknown	Surface Water	<0.0100	<0.010	0.315	0.34
SW BK-09	Background	5/11/2010	Unknown	Surface Water		0.004		0.31
SW BK-10	Background	5/11/2010	Unknown	Surface Water		0.0035		0.22
SW BK-11	Background	5/11/2010	Unknown	Surface Water		0.0054		0.25

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total Metals Cadmium (mg/L) ICON	Total Metals Cadmium (mg/L) Pisani	Total Metals Calcium (mg/L) ICON	Total Metals Calcium (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water	<0.00500	<0.0027		38.4
SW-02		5/5/2010	Unknown	Surface Water	<0.00500	<0.0027		44.1
SW-03		5/5/2010	Unknown	Surface Water	<0.00500	<0.0027		43.3
SW-04		5/5/2010	Unknown	Surface Water	<0.00500	<0.0027		44.6
SW-05		5/5/2010	Unknown	Surface Water	<0.00500	<0.0027	<0.0100	43.1
SW-06		5/6/2010	Unknown	Surface Water	<0.00500	<0.0027		54.3
SW-07		5/6/2010	Unknown	Surface Water	<0.00500	<0.0027		56.1
SW-09		5/6/2010	Unknown	Surface Water	<0.00500	<0.0027		58.6
SW-10		5/6/2010	Unknown	Surface Water	<0.00500	<0.0027		50.6
SW-20		5/7/2010	Unknown	Surface Water		<0.0027		73.9
SW BK-01	Background	5/10/2010	Unknown	Surface Water	<0.00500	<0.0027		65.8
SW BK-02	Background	5/10/2010	Unknown	Surface Water	<0.00500	<0.0027		71.5
SW BK-03	Background	5/10/2010	Unknown	Surface Water	<0.00500	<0.0027		52.8
SW BK-04	Background	5/10/2010	Unknown	Surface Water	<0.00500	<0.0027		66.4
SW BK-05	Background	5/11/2010	Unknown	Surface Water	<0.00500	<0.0027		65.9
SW BK-06	Background	5/10/2010	Unknown	Surface Water	<0.00500	<0.0027		97.7
SW BK-07	Background	5/11/2010	Unknown	Surface Water	<0.00500	<0.0027		57
SW BK-08	Background	5/11/2010	Unknown	Surface Water	<0.00500	0.00021		70
SW BK-09	Background	5/11/2010	Unknown	Surface Water		<0.0027		63.2
SW BK-10	Background	5/11/2010	Unknown	Surface Water		0.00051		
SW BK-11	Background	5/11/2010	Unknown	Surface Water		0.00056		

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total Metals Chromium (mg/L) ICON	Total Metals Chromium (mg/L) Pisani	Total Metals Iron (mg/L) ICON	Total Metals Iron (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water	<0.0100	0.0026		1.26
SW-02		5/5/2010	Unknown	Surface Water	<0.0100	0.0023		0.8
SW-03		5/5/2010	Unknown	Surface Water	<0.0100	0.0026		1.08
SW-04		5/5/2010	Unknown	Surface Water	<0.0100	0.0022		0.49
SW-05		5/5/2010	Unknown	Surface Water	<0.0100	0.0025		0.85
SW-06		5/6/2010	Unknown	Surface Water	<0.0100	0.0025		0.94
SW-07		5/6/2010	Unknown	Surface Water	<0.0100	0.0025		0.94
SW-09		5/6/2010	Unknown	Surface Water	<0.0100	0.0027		1.12
SW-10		5/6/2010	Unknown	Surface Water	<0.0100	0.0022		1.09
SW-20		5/7/2010	Unknown	Surface Water		0.0075		11.3
SW BK-01	Background	5/10/2010	Unknown	Surface Water	<.0100	0.0035		0.58
SW BK-02	Background	5/10/2010	Unknown	Surface Water	<0.0100	0.0035		0.7
SW BK-03	Background	5/10/2010	Unknown	Surface Water	<0.0100	0.0025		0.71
SW BK-04	Background	5/10/2010	Unknown	Surface Water	<0.0100	0.0038		0.94
SW BK-05	Background	5/11/2010	Unknown	Surface Water	<0.0100	0.0034		0.71
SW BK-06	Background	5/10/2010	Unknown	Surface Water	<0.0100	0.0041		1.55
SW BK-07	Background	5/11/2010	Unknown	Surface Water	<0.0100	0.0026		1.07
SW BK-08	Background	5/11/2010	Unknown	Surface Water	<0.0100	0.0046		1.76
SW BK-09	Background	5/11/2010	Unknown	Surface Water		0.0039		1.14
SW BK-10	Background	5/11/2010	Unknown	Surface Water		0.0041		
SW BK-11	Background	5/11/2010	Unknown	Surface Water		0.004		

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total Metals Lead (mg/L) ICON	Total Metals Lead (mg/L) Pisani	Total Metals Magnesium (mg/L) ICON	Total Metals Magnesium (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water	<0.0100	<0.0080		88.2
SW-02		5/5/2010	Unknown	Surface Water	<0.0100	<0.0080		100
SW-03		5/5/2010	Unknown	Surface Water	<0.0100	<0.0080		98.3
SW-04		5/5/2010	Unknown	Surface Water	<0.0100	<0.0080		103
SW-05		5/5/2010	Unknown	Surface Water	<0.0100	<0.0080		99.1
SW-06		5/6/2010	Unknown	Surface Water	<0.0100	<0.0080		127
SW-07		5/6/2010	Unknown	Surface Water	<0.0100	<0.0080		130
SW-09		5/6/2010	Unknown	Surface Water	<0.0100	<0.0080		140
SW-10		5/6/2010	Unknown	Surface Water	<0.0100	<0.0080		120
SW-20		5/7/2010	Unknown	Surface Water		0.021		149
SW BK-01	Background	5/10/2010	Unknown	Surface Water	<0.0100	0.0017		157
SW BK-02	Background	5/10/2010	Unknown	Surface Water	<0.0100	<0.0080		166
SW BK-03	Background	5/10/2010	Unknown	Surface Water	<0.0100	<0.0080		126
SW BK-04	Background	5/10/2010	Unknown	Surface Water	<0.0100	<0.0080		161
SW BK-05	Background	5/11/2010	Unknown	Surface Water	0.017	<0.0080		156
SW BK-06	Background	5/10/2010	Unknown	Surface Water	<0.0100	0.0019		244
SW BK-07	Background	5/11/2010	Unknown	Surface Water	<0.0100	<0.0080		138
SW BK-08	Background	5/11/2010	Unknown	Surface Water	<0.0100	0.003		162
SW BK-09	Background	5/11/2010	Unknown	Surface Water		0.0034		152
SW BK-10	Background	5/11/2010	Unknown	Surface Water		0.0058		52.3
SW BK-11	Background	5/11/2010	Unknown	Surface Water		0.0042		76.2

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total Metals Manganese (mg/L) ICON	Total Metals Manganese (mg/L) Pisani	Total Metals Mercury (mg/L) ICON	Total Metals Mercury (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water		0.23	<0.000200	0.00007
SW-02		5/5/2010	Unknown	Surface Water		0.27	<0.000200	0.00009
SW-03		5/5/2010	Unknown	Surface Water		0.3	<0.000200	0.00007
SW-04		5/5/2010	Unknown	Surface Water		0.16	<0.000200	0.00009
SW-05		5/5/2010	Unknown	Surface Water		0.31	<0.000200	0.00009
SW-06		5/6/2010	Unknown	Surface Water		0.46	<0.000200	0.00008
SW-07		5/6/2010	Unknown	Surface Water		0.61	<0.000200	0.00008
SW-09		5/6/2010	Unknown	Surface Water		0.51	<0.000200	0.00011
SW-10		5/6/2010	Unknown	Surface Water		0.48	<0.000200	0.00007
SW-20		5/7/2010	Unknown	Surface Water		0.83		0.0001
SW BK-01	Background	5/10/2010	Unknown	Surface Water		0.15	<0.000200	<0.0002
SW BK-02	Background	5/10/2010	Unknown	Surface Water		0.23	<0.000200	<0.0002
SW BK-03	Background	5/10/2010	Unknown	Surface Water		0.34	<0.000200	<0.0002
SW BK-04	Background	5/10/2010	Unknown	Surface Water		0.29	<0.000200	<0.0002
SW BK-05	Background	5/11/2010	Unknown	Surface Water		0.16	<0.000200	<0.0002
SW BK-06	Background	5/10/2010	Unknown	Surface Water		0.88	<0.000200	<0.0002
SW BK-07	Background	5/11/2010	Unknown	Surface Water		0.59	<0.000200	<0.0002
SW BK-08	Background	5/11/2010	Unknown	Surface Water		0.25	<0.000200	0.00007
SW BK-09	Background	5/11/2010	Unknown	Surface Water		0.24		<0.0002
SW BK-10	Background	5/11/2010	Unknown	Surface Water				<0.0002
SW BK-11	Background	5/11/2010	Unknown	Surface Water				<0.0002

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total Metals Potassium (mg/L) ICON	Total Metals Potassium (mg/L) Pisani	Total Metals Selenium (mg/L) ICON	Total Metals Selenium (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water		29.2	0.035	<0.0050
SW-02		5/5/2010	Unknown	Surface Water		33.3	0.034	<0.0050
SW-03		5/5/2010	Unknown	Surface Water		32.7	0.039	<0.0050
SW-04		5/5/2010	Unknown	Surface Water		34.4	0.033	<0.0050
SW-05		5/5/2010	Unknown	Surface Water		33.1	0.037	<0.0050
SW-06		5/6/2010	Unknown	Surface Water		38.6	0.048	<0.0050
SW-07		5/6/2010	Unknown	Surface Water		40.7	0.032	<0.0050
SW-09		5/6/2010	Unknown	Surface Water		42.6	0.036	<0.0050
SW-10		5/6/2010	Unknown	Surface Water		37.2	0.039	<0.0050
SW-20		5/7/2010	Unknown	Surface Water		59.6		<0.0050
SW BK-01	Background	5/10/2010	Unknown	Surface Water		52	0.054	<0.0050
SW BK-02	Background	5/10/2010	Unknown	Surface Water		54.7	0.047	<0.0050
SW BK-03	Background	5/10/2010	Unknown	Surface Water		42.2	0.039	<0.0050
SW BK-04	Background	5/10/2010	Unknown	Surface Water		53.4	0.051	<0.0050
SW BK-05	Background	5/11/2010	Unknown	Surface Water		53	0.037	<0.0050
SW BK-06	Background	5/10/2010	Unknown	Surface Water		70.4	0.051	<0.0050
SW BK-07	Background	5/11/2010	Unknown	Surface Water		42.9	0.036	<0.0050
SW BK-08	Background	5/11/2010	Unknown	Surface Water		50.3	0.042	<0.0050
SW BK-09	Background	5/11/2010	Unknown	Surface Water		50.5		<0.0050
SW BK-10	Background	5/11/2010	Unknown	Surface Water				<0.0050
SW BK-11	Background	5/11/2010	Unknown	Surface Water				<0.0050

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total Metals Sodium (mg/L) ICON	Total Metals Sodium (mg/L) Pisani	Total Metals Strontium (mg/L) ICON	Total Metals Strontium (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water		631	0.554	0.64
SW-02		5/5/2010	Unknown	Surface Water		727	0.637	0.71
SW-03		5/5/2010	Unknown	Surface Water		771	0.558	0.7
SW-04		5/5/2010	Unknown	Surface Water		808	0.614	0.72
SW-05		5/5/2010	Unknown	Surface Water		769	0.602	0.72
SW-06		5/6/2010	Unknown	Surface Water		935	0.729	0.9
SW-07		5/6/2010	Unknown	Surface Water		981	0.778	0.95
SW-09		5/6/2010	Unknown	Surface Water		915	0.829	0.99
SW-10		5/6/2010	Unknown	Surface Water		917	0.721	0.86
SW-20		5/7/2010	Unknown	Surface Water		1230		1.74
SW BK-01	Background	5/10/2010	Unknown	Surface Water		1230	0.98	1.04
SW BK-02	Background	5/10/2010	Unknown	Surface Water		1320	1.09	1.13
SW BK-03	Background	5/10/2010	Unknown	Surface Water		1050	0.788	0.85
SW BK-04	Background	5/10/2010	Unknown	Surface Water		1340	1	1.06
SW BK-05	Background	5/11/2010	Unknown	Surface Water		1270	0.989	1.04
SW BK-06	Background	5/10/2010	Unknown	Surface Water		2010	1.52	1.65
SW BK-07	Background	5/11/2010	Unknown	Surface Water		1080	0.898	0.96
SW BK-08	Background	5/11/2010	Unknown	Surface Water		1180	0.903	1.03
SW BK-09	Background	5/11/2010	Unknown	Surface Water		1230		1.05
SW BK-10	Background	5/11/2010	Unknown	Surface Water				0.38
SW BK-11	Background	5/11/2010	Unknown	Surface Water				0.52

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total Metals Zinc (mg/L) ICON	Total Metals Zinc (mg/L) Pisani	Dissolved Metals Arsenic (mg/L) ICON	Dissolved Metals Arsenic (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water	0.017	0.0062		<0.010
SW-02		5/5/2010	Unknown	Surface Water	0.013	0.0045		<0.010
SW-03		5/5/2010	Unknown	Surface Water	0.015	<0.020		<0.010
SW-04		5/5/2010	Unknown	Surface Water	0.012	<0.020		<0.010
SW-05		5/5/2010	Unknown	Surface Water	0.012	<0.020		<0.010
SW-06		5/6/2010	Unknown	Surface Water	0.016	<0.020		<0.010
SW-07		5/6/2010	Unknown	Surface Water	<0.0100	<0.020		<0.010
SW-09		5/6/2010	Unknown	Surface Water	<0.0100	<0.020		<0.010
SW-10		5/6/2010	Unknown	Surface Water	0.02	<0.020		<0.010
SW-20		5/7/2010	Unknown	Surface Water		0.067		0.0075
SW BK-01	Background	5/10/2010	Unknown	Surface Water	0.055	0.0045		<0.010
SW BK-02	Background	5/10/2010	Unknown	Surface Water	0.013	0.13		<0.010
SW BK-03	Background	5/10/2010	Unknown	Surface Water	0.013	0.013		<0.010
SW BK-04	Background	5/10/2010	Unknown	Surface Water	0.02	0.01		<0.010
SW BK-05	Background	5/11/2010	Unknown	Surface Water	0.033	0.0074		<0.010
SW BK-06	Background	5/10/2010	Unknown	Surface Water	0.018	0.0092		0.0047
SW BK-07	Background	5/11/2010	Unknown	Surface Water	0.022	<0.020		0.0033
SW BK-08	Background	5/11/2010	Unknown	Surface Water	0.014	0.0085		<0.010
SW BK-09	Background	5/11/2010	Unknown	Surface Water		0.0076		<0.010
SW BK-10	Background	5/11/2010	Unknown	Surface Water		0.013	0.011	0.003
SW BK-11	Background	5/11/2010	Unknown	Surface Water		0.0097	0.014	0.0029

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Dissolved Metals Barium (mg/L) ICON	Dissolved Metals Barium (mg/L) Pisani	Dissolved Metals Cadmium (mg/L) ICON	Dissolved Metals Cadmium (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water		0.28		0.00026
SW-02		5/5/2010	Unknown	Surface Water		0.28		0.00027
SW-03		5/5/2010	Unknown	Surface Water		0.29		<0.0027
SW-04		5/5/2010	Unknown	Surface Water		0.26		0.00035
SW-05		5/5/2010	Unknown	Surface Water		0.26		<0.0027
SW-06		5/6/2010	Unknown	Surface Water		0.37		0.0002
SW-07		5/6/2010	Unknown	Surface Water		0.42		0.00024
SW-09		5/6/2010	Unknown	Surface Water		0.37		<0.0027
SW-10		5/6/2010	Unknown	Surface Water		0.35		<0.0027
SW-20		5/7/2010	Unknown	Surface Water		1.1		<0.0027
SW BK-01	Background	5/10/2010	Unknown	Surface Water		0.28		<0.0027
SW BK-02	Background	5/10/2010	Unknown	Surface Water		0.3		<0.0027
SW BK-03	Background	5/10/2010	Unknown	Surface Water		0.28		<0.0027
SW BK-04	Background	5/10/2010	Unknown	Surface Water		0.29		<0.0027
SW BK-05	Background	5/11/2010	Unknown	Surface Water		0.3		<0.0027
SW BK-06	Background	5/10/2010	Unknown	Surface Water		0.39		<0.0027
SW BK-07	Background	5/11/2010	Unknown	Surface Water		0.4		<0.0027
SW BK-08	Background	5/11/2010	Unknown	Surface Water		0.31		<0.0027
SW BK-09	Background	5/11/2010	Unknown	Surface Water		0.33		<0.0027
SW BK-10	Background	5/11/2010	Unknown	Surface Water	0.144	0.14	<0.00500	0.00086
SW BK-11	Background	5/11/2010	Unknown	Surface Water	0.216	0.18	<0.00500	0.00078

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Dissolved Metals Chromium (mg/L) ICON	Dissolved Metals Chromium (mg/L) Pisani	Dissolved Metals Lead (mg/L) ICON	Dissolved Metals Lead (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water		0.0017		<0.0080
SW-02		5/5/2010	Unknown	Surface Water		0.0016		<0.0080
SW-03		5/5/2010	Unknown	Surface Water		0.0018		<0.0080
SW-04		5/5/2010	Unknown	Surface Water		0.0017		<0.0080
SW-05		5/5/2010	Unknown	Surface Water		0.0018		<0.0080
SW-06		5/6/2010	Unknown	Surface Water		0.0021		<0.0080
SW-07		5/6/2010	Unknown	Surface Water		0.002		<0.0080
SW-09		5/6/2010	Unknown	Surface Water		0.0024		<0.0080
SW-10		5/6/2010	Unknown	Surface Water		0.0022		<0.0080
SW-20		5/7/2010	Unknown	Surface Water		0.0051		0.0088
SW BK-01	Background	5/10/2010	Unknown	Surface Water		0.0032		0.0023
SW BK-02	Background	5/10/2010	Unknown	Surface Water		0.0033		<0.0080
SW BK-03	Background	5/10/2010	Unknown	Surface Water		0.0025		<0.0080
SW BK-04	Background	5/10/2010	Unknown	Surface Water		0.0038		<0.0080
SW BK-05	Background	5/11/2010	Unknown	Surface Water		0.003		<0.0080
SW BK-06	Background	5/10/2010	Unknown	Surface Water		0.0036		0.0021
SW BK-07	Background	5/11/2010	Unknown	Surface Water		0.0024		<0.0080
SW BK-08	Background	5/11/2010	Unknown	Surface Water		0.0028		<0.0080
SW BK-09	Background	5/11/2010	Unknown	Surface Water		0.003		<0.0080
SW BK-10	Background	5/11/2010	Unknown	Surface Water	<0.0100	0.00071	<0.0100	<0.0080
SW BK-11	Background	5/11/2010	Unknown	Surface Water	<0.0100	0.0011	<0.0100	<0.0080

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Dissolved Metals Mercury (mg/L) ICON	Dissolved Metals Mercury (mg/L) Pisani	Dissolved Metals Selenium (mg/L) ICON	Dissolved Metals Selenium (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water		<0.00020		<0.0050
SW-02		5/5/2010	Unknown	Surface Water		0.00009		<0.0050
SW-03		5/5/2010	Unknown	Surface Water		0.00009		<0.0050
SW-04		5/5/2010	Unknown	Surface Water		0.00006		<0.0050
SW-05		5/5/2010	Unknown	Surface Water		0.00007		<0.0050
SW-06		5/6/2010	Unknown	Surface Water		0.0001		<0.0050
SW-07		5/6/2010	Unknown	Surface Water		0.00009		<0.0050
SW-09		5/6/2010	Unknown	Surface Water		0.0001		<0.0050
SW-10		5/6/2010	Unknown	Surface Water		0.00012		<0.0050
SW-20		5/7/2010	Unknown	Surface Water		<0.00020		<0.0050
SW BK-01	Background	5/10/2010	Unknown	Surface Water		0.00006		<0.0050
SW BK-02	Background	5/10/2010	Unknown	Surface Water		<0.00020		<0.0050
SW BK-03	Background	5/10/2010	Unknown	Surface Water		<0.00020		<0.0050
SW BK-04	Background	5/10/2010	Unknown	Surface Water		0.00006		<0.0050
SW BK-05	Background	5/11/2010	Unknown	Surface Water		<0.00020		<0.0050
SW BK-06	Background	5/10/2010	Unknown	Surface Water		<0.00020		<0.0050
SW BK-07	Background	5/11/2010	Unknown	Surface Water		<0.00020		<0.0050
SW BK-08	Background	5/11/2010	Unknown	Surface Water		<0.00020		<0.0050
SW BK-09	Background	5/11/2010	Unknown	Surface Water		<0.00020		<0.0050
SW BK-10	Background	5/11/2010	Unknown	Surface Water	<0.000200	<0.00020	0.024	<0.0050
SW BK-11	Background	5/11/2010	Unknown	Surface Water	<0.000200	<0.00020	0.032	<0.0050

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Dissolved Metals Strontium (mg/L) ICON	Dissolved Metals Strontium (mg/L) Pisani	Dissolved Metals Zinc (mg/L) ICON	Dissolved Metals Zinc (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water		0.69		<0.020
SW-02		5/5/2010	Unknown	Surface Water		0.74		<0.020
SW-03		5/5/2010	Unknown	Surface Water		0.71		<0.020
SW-04		5/5/2010	Unknown	Surface Water		0.73		<0.020
SW-05		5/5/2010	Unknown	Surface Water		0.69		<0.020
SW-06		5/6/2010	Unknown	Surface Water		0.91		<0.020
SW-07		5/6/2010	Unknown	Surface Water		0.93		<0.020
SW-09		5/6/2010	Unknown	Surface Water		1		0.0095
SW-10		5/6/2010	Unknown	Surface Water		0.88		<0.020
SW-20		5/7/2010	Unknown	Surface Water		1.66		0.023
SW BK-01	Background	5/10/2010	Unknown	Surface Water		1.05		<0.020
SW BK-02	Background	5/10/2010	Unknown	Surface Water		1.12		<0.020
SW BK-03	Background	5/10/2010	Unknown	Surface Water		0.84		<0.020
SW BK-04	Background	5/10/2010	Unknown	Surface Water		1.06		<0.020
SW BK-05	Background	5/11/2010	Unknown	Surface Water		1.04		<0.020
SW BK-06	Background	5/10/2010	Unknown	Surface Water		1.56		<0.020
SW BK-07	Background	5/11/2010	Unknown	Surface Water		0.95		<0.020
SW BK-08	Background	5/11/2010	Unknown	Surface Water		1.04		<0.020
SW BK-09	Background	5/11/2010	Unknown	Surface Water		1.06		<0.020
SW BK-10	Background	5/11/2010	Unknown	Surface Water	0.339	0.34	<0.0100	<0.020
SW BK-11	Background	5/11/2010	Unknown	Surface Water	0.497	0.52	0.011	<0.020

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total PAH 2-Methylnaphthalene (mg/L) ICON	Total PAH 2-Methylnaphthalene (mg/L) Pisani	Total PAH Acenaphthene (mg/L) ICON	Total PAH Acenaphthene (mg/L) Pisani	Total PAH Acenaphthylene (mg/L) ICON
SW-01		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-02		5/5/2010	Unknown	Surface Water		<0.000104		<0.000104	
SW-03		5/5/2010	Unknown	Surface Water		<0.000104		<0.000104	
SW-04		5/5/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW-05		5/5/2010	Unknown	Surface Water		<0.000101		<0.000101	
SW-06		5/6/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW-07		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-09		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-10		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-20		5/7/2010	Unknown	Surface Water		<0.000101		<0.000101	
SW BK-01	Background	5/10/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW BK-02	Background	5/10/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW BK-03	Background	5/10/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW BK-04	Background	5/10/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-05	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-06	Background	5/10/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-07	Background	5/11/2010	Unknown	Surface Water		<0.000104		<0.000104	
SW BK-08	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-09	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-10	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-11	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total PAH Acenaphthylene (mg/L) Pisani	Total PAH Anthracene (mg/L) ICON	Total PAH Anthracene (mg/L) Pisani	Total PAH Benzo(a)anthracene (mg/L) ICON	Total PAH Benzo(a)anthracene (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-02		5/5/2010	Unknown	Surface Water	<0.000104		<0.000104		<0.000104
SW-03		5/5/2010	Unknown	Surface Water	<0.000104		<0.000104		<0.000104
SW-04		5/5/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW-05		5/5/2010	Unknown	Surface Water	<0.000101		<0.000101		<0.000101
SW-06		5/6/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW-07		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-09		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-10		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-20		5/7/2010	Unknown	Surface Water	<0.000101		<0.000101		<0.000101
SW BK-01	Background	5/10/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW BK-02	Background	5/10/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW BK-03	Background	5/10/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW BK-04	Background	5/10/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-05	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-06	Background	5/10/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-07	Background	5/11/2010	Unknown	Surface Water	<0.000104		<0.000104		<0.000104
SW BK-08	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-09	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-10	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-11	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total PAH Benzo(a)pyrene (mg/L) ICON	Total PAH Benzo(a)pyrene (mg/L) Pisani	Total PAH Benzo(b)fluoranthene (mg/L) ICON	Total PAH Benzo(b)fluoranthene (mg/L) Pisani	Total PAH Benzo(k)fluoranthene (mg/L) ICON
SW-01		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-02		5/5/2010	Unknown	Surface Water		<0.000104		<0.000104	
SW-03		5/5/2010	Unknown	Surface Water		<0.000104		<0.000104	
SW-04		5/5/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW-05		5/5/2010	Unknown	Surface Water		<0.000101		<0.000101	
SW-06		5/6/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW-07		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-09		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-10		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-20		5/7/2010	Unknown	Surface Water		<0.000101		<0.000101	
SW BK-01	Background	5/10/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW BK-02	Background	5/10/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW BK-03	Background	5/10/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW BK-04	Background	5/10/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-05	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-06	Background	5/10/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-07	Background	5/11/2010	Unknown	Surface Water		<0.000104		<0.000104	
SW BK-08	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-09	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-10	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-11	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total PAH Benzo(k)fluoranthene (mg/L) Pisani	Total PAH Chrysene (mg/L) ICON	Total PAH Chrysene (mg/L) Pisani	Total PAH Dibenz(a,h)anthracene (mg/L) ICON	Total PAH Dibenz(a,h)anthracene (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-02		5/5/2010	Unknown	Surface Water	<0.000104		<0.000104		<0.000104
SW-03		5/5/2010	Unknown	Surface Water	<0.000104		<0.000104		<0.000104
SW-04		5/5/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW-05		5/5/2010	Unknown	Surface Water	<0.000101		<0.000101		<0.000101
SW-06		5/6/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW-07		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-09		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-10		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-20		5/7/2010	Unknown	Surface Water	<0.000101		<0.000101		<0.000101
SW BK-01	Background	5/10/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW BK-02	Background	5/10/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW BK-03	Background	5/10/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW BK-04	Background	5/10/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-05	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-06	Background	5/10/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-07	Background	5/11/2010	Unknown	Surface Water	<0.000104		<0.000104		<0.000104
SW BK-08	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-09	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-10	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-11	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total PAH Fluoranthene (mg/L) ICON	Total PAH Fluoranthene (mg/L) Pisani	Total PAH Fluorene (mg/L) ICON	Total PAH Fluorene (mg/L) Pisani	Total PAH Indeno(1,2,3-cd)pyrene (mg/L) ICON
SW-01		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-02		5/5/2010	Unknown	Surface Water		<0.000104		<0.000104	
SW-03		5/5/2010	Unknown	Surface Water		<0.000104		<0.000104	
SW-04		5/5/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW-05		5/5/2010	Unknown	Surface Water		<0.000101		<0.000101	
SW-06		5/6/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW-07		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-09		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-10		5/6/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW-20		5/7/2010	Unknown	Surface Water		<0.000101		<0.000101	
SW BK-01	Background	5/10/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW BK-02	Background	5/10/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW BK-03	Background	5/10/2010	Unknown	Surface Water		<0.000103		<0.000103	
SW BK-04	Background	5/10/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-05	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-06	Background	5/10/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-07	Background	5/11/2010	Unknown	Surface Water		<0.000104		<0.000104	
SW BK-08	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-09	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-10	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	
SW BK-11	Background	5/11/2010	Unknown	Surface Water		<0.000102		<0.000102	

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total PAH Indeno(1,2,3-cd)pyrene (mg/L) Pisani	Total PAH Naphthalene (mg/L) ICON	Total PAH Naphthalene (mg/L) Pisani	Total PAH Phenanthrene (mg/L) ICON	Total PAH Phenanthrene (mg/L) Pisani
SW-01		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-02		5/5/2010	Unknown	Surface Water	<0.000104		<0.000104		<0.000104
SW-03		5/5/2010	Unknown	Surface Water	<0.000104		<0.000104		<0.000104
SW-04		5/5/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW-05		5/5/2010	Unknown	Surface Water	<0.000101		<0.000101		<0.000101
SW-06		5/6/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW-07		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-09		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-10		5/6/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW-20		5/7/2010	Unknown	Surface Water	<0.000101		<0.000101		<0.000101
SW BK-01	Background	5/10/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW BK-02	Background	5/10/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW BK-03	Background	5/10/2010	Unknown	Surface Water	<0.000103		<0.000103		<0.000103
SW BK-04	Background	5/10/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-05	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-06	Background	5/10/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-07	Background	5/11/2010	Unknown	Surface Water	<0.000104		<0.000104		<0.000104
SW BK-08	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-09	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-10	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102
SW BK-11	Background	5/11/2010	Unknown	Surface Water	<0.000102		<0.000102		<0.000102

Attachment 4. Analytical Data
(Surface Water)

Sample ID	Sample ID Notes	Date	Sample Type	Matrix	Total PAH Pyrene (mg/L) ICON	Total PAH Pyrene (mg/L) Pisani	TPH TPHDRO ICON	TPH TPHDRO Pisani	TPH TPHORO ICON	TPH TPHORO Pisani
SW-01		5/6/2010	Unknown	Surface Water		<0.000102	<0.135		<0.125	
SW-02		5/5/2010	Unknown	Surface Water		<0.000104	<0.135		<0.125	
SW-03		5/5/2010	Unknown	Surface Water		<0.000104	<0.134		<0.124	
SW-04		5/5/2010	Unknown	Surface Water		<0.000103	<0.135		<0.125	
SW-05		5/5/2010	Unknown	Surface Water		<0.000101	<0.135		<0.135	
SW-06		5/6/2010	Unknown	Surface Water		<0.000103	<0.135		<0.125	
SW-07		5/6/2010	Unknown	Surface Water		<0.000102	<0.134		<0.124	
SW-09		5/6/2010	Unknown	Surface Water		<0.000102	<0.134		<0.124	
SW-10		5/6/2010	Unknown	Surface Water		<0.000102	<0.133		0.173	
SW-20		5/7/2010	Unknown	Surface Water		<0.000101	1.34		1.11	
SW BK-01	Background	5/10/2010	Unknown	Surface Water		<0.000103	<0.134		<0.124	
SW BK-02	Background	5/10/2010	Unknown	Surface Water		<0.000103	<0.131		<0.121	
SW BK-03	Background	5/10/2010	Unknown	Surface Water		<0.000103	<0.134		<0.124	
SW BK-04	Background	5/10/2010	Unknown	Surface Water		<0.000102	<0.135		<0.125	
SW BK-05	Background	5/11/2010	Unknown	Surface Water		<0.000102	<0.136		<0.126	
SW BK-06	Background	5/10/2010	Unknown	Surface Water		<0.000102	<0.135		<0.150	
SW BK-07	Background	5/11/2010	Unknown	Surface Water		<0.000104	<0.135		<0.125	
SW BK-08	Background	5/11/2010	Unknown	Surface Water		<0.000102	<0.133		<0.122	
SW BK-09	Background	5/11/2010	Unknown	Surface Water		<0.000102	<0.142		<0.131	
SW BK-10	Background	5/11/2010	Unknown	Surface Water		<0.000102				
SW BK-11	Background	5/11/2010	Unknown	Surface Water		<0.000102				

Sediment, Surface Water, and Crab Tissue Summary Statistics

Analyte	Total/Dissolved	Matrix	Number of Samples	% Frequency of Detection	Units	Maximum Detected Concentration	Mean of Detected Concentrations	Median of Detected Concentrations	Standard Deviation of Detected Concentrations	95% UCL Estimation Method	95%UCL
Arsenic	N/A	Sediment	47	100	mg/kg dw	22	6.021	5.17	3.237	Student's-t	6.813
Barium	N/A	Sediment	47	100	mg/kg dw	15700	1218	631	2422	Chebyshev	2758
Cadmium	N/A	Sediment	27	70.4	mg/kg dw	1.66	0.4	0.23	0.431	KM(Chebyshev)	0.663
Chromium	N/A	Sediment	31	100	mg/kg dw	35.83	14.82	13.87	5.37	Student's-t	16.46
Lead	N/A	Sediment	33	100	mg/kg dw	117	27.35	20.44	20.88	Chebyshev	43.19
Mercury	N/A	Sediment	44	100	mg/kg dw	7.59	0.488	0.135	1.379	Chebyshev	1.394
Selenium	N/A	Sediment	30	46.7	mg/kg dw	2.11	1.403	1.47	0.306	KM(t)	1.494
Strontium	N/A	Sediment	21	100	mg/kg dw	442.3	95.23	55.18	101	Chebyshev	191.3
Zinc	N/A	Sediment	19	100	mg/kg dw	414.3	90.35	62.24	90.26	Chebyshev	180.6
Arsenic - background	N/A	Sediment	15	100	mg/kg dw	10	5.887	5.35	2.434	Student's-t	6.994
Barium - background	N/A	Sediment	15	100	mg/kg dw	760.5	345.6	319	165.4	Student's-t	420.9
Cadmium - background	N/A	Sediment	15	40	mg/kg dw	0.41	0.258	0.315	0.147	KM (t)	0.188
Chromium - background	N/A	Sediment	15	100	mg/kg dw	18.59	13.8	13.62	3.171	Student's-t	15.24
Lead - background	N/A	Sediment	15	100	mg/kg dw	22.77	17.41	18.94	4.45	Student's-t	19.44
Mercury - background	N/A	Sediment	11	36.4	mg/kg dw	0.38	0.188	0.135	0.129	KM(t)	0.147
Selenium - background	N/A	Sediment	11	0	mg/kg dw	N/A	N/A	N/A	N/A	--	--
Strontium - background	N/A	Sediment	15	100	mg/kg dw	106.7	73.35	74.95	23.84	Student's-t	84.19
Zinc - background	N/A	Sediment	15	100	mg/kg dw	124.5	52.1	46.4	26.4	Adjusted Gamma	67.22
Arsenic	Total	Surface Water	10	20	mg/L	0.013	0.00745	0.00745	0.00785	KM (BCA)	N/A
Barium	Total	Surface Water	10	100	mg/L	1.23	0.418	0.325	0.292	Student's-t	0.587
Cadmium	Total	Surface Water	9	0	mg/L	N/A	N/A	N/A	N/A	--	--
Chromium	Total	Surface Water	10	100	mg/L	0.0075	0.00296	0.0025	0.0016	Student's-t	0.00389
Lead	Total	Surface Water	10	10	mg/L	0.021	0.021	0.021	N/A	--	--
Mercury	Total	Surface Water	10	100	mg/L	0.00011	0.000085	0.000085	0.00001354	Student's-t	9.28E-05
Selenium	Total	Surface Water	10	90	mg/L	0.048	0.037	0.036	0.0048	KM (t)	0.0403
Strontium	Total	Surface Water	10	100	mg/L	1.74	0.835	0.732	0.335	Adjusted Gamma	1.067
Zinc	Total	Surface Water	10	80	mg/L	0.067	0.0203	0.0135	0.0192	KM (BCA)	0.0293
Arsenic - background	Total	Surface Water	11	36.4	mg/L	0.0054	0.00383	0.00375	0.00124	KM (t)	0.00495
Barium - background	Total	Surface Water	11	100	mg/L	0.428	0.311	0.306	0.0595	Student's-t	0.344
Cadmium - background	Total	Surface Water	11	27.3	mg/L	0.00056	0.00042667	0.00051	0.0001893	KM (t)	6.25E-04
Chromium - background	Total	Surface Water	11	100	mg/L	0.0046	0.00364	0.0038	0.00063604	Student's-t	0.00398
Lead - background	Total	Surface Water	11	54.5	mg/L	0.0058	0.00333	0.0032	0.00153	KM (t)	0.00446
Mercury - background	Total	Surface Water	11	0.09	mg/L	0.00007	0.00007	0.00007	N/A	--	--
Selenium - background	Total	Surface Water	11	72.7	mg/L	0.054	0.0446	0.0445	0.00703	KM (t)	0.0446
Strontium - background	Total	Surface Water	11	100	mg/L	1.585	0.947	1.01	0.313	Student's-t	1.118
Zinc - background	Total	Surface Water	11	100	mg/L	0.0715	0.0206	0.0136	0.018	Adjusted Gamma	0.033
Arsenic	Dissolved	Surface Water	10	10	mg/L	0.0075	0.0075	0.0075	N/A	--	--
Barium	Dissolved	Surface Water	10	100	mg/L	1.1	0.398	0.32	0.253	Student's-t	0.544
Cadmium	Dissolved	Surface Water	10	50	mg/L	0.00035	0.000264	0.00026	0.000055045	KM (t)	2.82E-04
Chromium	Dissolved	Surface Water	10	100	mg/L	0.0051	0.00224	0.0019	0.00104	Student's-t	0.00284
Lead	Dissolved	Surface Water	10	10	mg/L	0.0088	0.0088	0.0088	N/A	--	--
Mercury	Dissolved	Surface Water	10	80	mg/L	0.00012	0.00009	0.00009	0.000018516	KM (t)	1.02E-04
Selenium	Dissolved	Surface Water	10	0	mg/L	N/A	N/A	N/A	N/A	--	--
Strontium	Dissolved	Surface Water	10	100	mg/L	1.66	0.894	0.81	0.292	Student's-t	1.063

Analyte	Total/Dissolved	Matrix	Number of Samples	% Frequency of Detection	Units	Maximum Detected Concentration	Mean of Detected Concentrations	Median of Detected Concentrations	Standard Deviation of Detected Concentrations	95% UCL Estimation Method	95%UCL
Zinc	Dissolved	Surface Water	10	20	mg/L	0.023	0.0163	0.0163	0.00955	KM (t)	0.0142
Arsenic - background	Dissolved	Surface Water	11	36.4	mg/L	0.00845	0.00586	0.00585	0.0023	KM (t)	0.00795
Barium - background	Dissolved	Surface Water	11	100	mg/L	0.4	0.293	0.3	0.074	Student's-t	0.333
Cadmium - background	Dissolved	Surface Water	11	18.2	mg/L	0.00086	0.00082	0.00082	0.000056569	KM (t)	5.34E-04
Chromium - background	Dissolved	Surface Water	11	100	mg/L	0.0038	0.00267	0.003	0.00097275	Student's-t	0.00321
Lead - background	Dissolved	Surface Water	11	18.2	mg/L	0.0023	0.0022	0.0022	0.00014142	KM (t)	0.00238
Mercury - background	Dissolved	Surface Water	11	18.2	mg/L	0.00006	0.00006	0.00006	0	--	--
Selenium - background	Dissolved	Surface Water	11	18.2	mg/L	0.032	0.028	0.028	0.00566	KM (t)	0.0162
Strontium - background	Dissolved	Surface Water	11	100	mg/L	1.56	0.961	1.04	0.321	Student's-t	1.136
Zinc - background	Dissolved	Surface Water	11	0	mg/L	N/A	N/A	N/A	N/A	--	--
Barium	N/A	Tissue (whole body-blue crab)	22	100	mg/kg ww	452	254.7	237.5	72.1	Student's-t	281

Notes:

- Data from 0-6 inches below sediment surface (bss) sample intervals were used when available. Data from other depths including 0-2' and 0-3' bss were excluded from those locations.

- ICON and MPA split results for each analyte were averaged. However, only detected results were used in cases where one analyte was non-detect (ND). If both splits were non-detect, the lowest detection limit was used.

- Field duplicates were not included when collected at the same date/time as the associated primary samples. Otherwise, field duplicate data were used if the primary sample and associated field duplicate were collected at same station. For field duplicates collected at different times, only the 0-6" bss interval was used (e.g., SED-30/SED-120).
- Non-detected (ND) results were used for primary samples that did not have an associated split or field duplicate sample. ProUCL calculated statistics based on non-detects at the detection limit.
- For the calculation of 95% UCLs, the minimum size of the data set was 8 samples. Of those, a minimum of 5 samples were required to be detected concentrations.
- Statistics including 95%UCLs were calculated using ProUCL Version 5.0.00 (EPA 2013a,b).

Spotted Sandpiper Hazard Quotient Adjustments

Exposure Parameters	Arsenic†			Barium					Cadmium		
	Rogers' values	95%UCL[1]	Food and Sediment IR[2]	Rogers' values	95%UCL[1]	Food and Sediment IR[2]	SBF, BAF[3]	TRV Adjustment[4]	Rogers' values	95% UCL[1]	Food and Sediment IR[2]
Toxicity Reference Value (TRV) (mg/kg-day)	2.24	2.24	2.24	20.8	20.8	20.8	20.8	41.7	1.47	1.47	1.47
Body Weight (BW) (kg)	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425
Ingestion Rate (IR) Food (kg/day)	0.00933	0.00933	0.0019	0.00933	0.00933	0.0019	0.0019	0.0019	0.00933	0.00933	0.0019
Ingestion Rate (IR) Sediment (kg/day)	0.0016794	0.0016794	0.000323	0.0016794	0.0016794	0.000323	0.000323	0.000323	0.0016794	0.0016794	0.000323
Sediment Bioavailability Factor (SBF) (ingestion by wildlife)	0.6	0.6	0.6	1	1	1	0.15	0.15	0.036	0.036	0.036
Bioaccumulation Factor (BAF) (sediment to benthic invertebrate)	0.127	0.127	0.127	1.154	1.154	1.154	7.5E-06	7.5E-06	0.614	0.614	0.614
Maximum Concentration (mg/kg)	40.3	--	--	15,700	--	--	--	--	2.1	--	--
95% Upper Confidence Limit (UCL) (mg/kg)	--	6.8	6.8	--	2,758	2,758	2,758	2,758	--	0.66	0.66
Hazard Quotient (HQ)*	0.93	0.16	0.031	**221**	**39**	**7.8**	0.15	0.075	0.19	0.061	0.013

Spotted Sandpiper Hazard Quotient Adjustments (continued)

Exposure Parameters	Chromium†			Lead			Mercury		
	Rogers' values	95%UCL[1]	Food and Sediment IR[2]	Rogers' values	95%UCL[1]	Food and Sediment IR[2]	Rogers' values	95%UCL[1]	Food and Sediment IR[2]
TRV (mg/kg-day)	2.66	2.66	2.66	1.63	1.63	1.63	0.45	0.45	0.45
BW (kg)	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425
IR Food (kg/day)	0.00933	0.00933	0.0019	0.00933	0.00933	0.0019	0.00933	0.00933	0.0019
IR Sediment (kg/day)	0.0016794	0.0016794	0.000323	0.001679	0.0016794	0.000323	0.001679	0.0016794	0.000323
SBF (ingestion by wildlife)	0.5	0.5	0.5	0.86	0.86	0.86	0.1	0.1	0.1
BAF (sediment to benthic invertebrate)	0.108	0.108	0.108	0.066	0.066	0.066	1.081	1.081	1.081
Maximum Concentration (mg/kg)	501	--	--	179	--	--	16.7	--	--
95% UCL (mg/kg)	--	17	17	--	43	43	--	1.4	1.4
HQ*	**8.2**	0.27	0.053	**5.3**	**1.3**	0.25	**9.0**	0.75	0.15

Spotted Sandpiper Hazard Quotient Adjustments (continued)

Exposure Parameters	Selenium			Zinc		
	Rogers' values	95%UCL[1]	Food and Sediment IR[2]	Rogers' values	95%UCL[1]	Food and Sediment IR[2]
TRV (mg/kg-day)	0.29	0.29	0.29	66.1	66.1	66.1
BW (kg)	0.0425	0.0425	0.0425	0.0425	0.0425	0.0425
IR Food (kg/day)	0.00933	0.00933	0.0019	0.00933	0.00933	0.0019
IR Sediment (kg/day)	0.0016794	0.0016794	0.000323	0.0016794	0.0016794	0.000323
SBF (wildlife ingestion)	0.4	0.4	0.4	0.44	0.44	0.44
BAF (sediment to benthic invertebrate)	3.75	3.75	3.75	2.33	2.33	2.33
Maximum Concentration (mg/kg)	2.1	--	--	194	--	--
95% UCL (mg/kg)	--	1.5	1.5	--	181	181
HQ*	**6.1**	**4.3**	0.88	**1.6**	**1.4**	0.29

*Bold values indicate HQs greater than 1.
Cells shaded in grey indicate the value that is altered in the iteration of the HQ adjustment.
†Site concentrations of arsenic and chromium are not statistically significantly different than background arsenic and chromium concentrations (Lingle 2010). Thus, arsenic and chromium are not COECs. However, they are included in these tables for purposes of comparison to Dr. Rogers' HQs.
[1] – 1st HQ Adjustment: The 95%UCL is used as the exposure point concentration instead of the maximum detected concentration used by Dr. Rogers (EPA 1998). 95%UCL values were calculated using ProUCL Version 5.0.00 (EPA 2013a,b).
[2] – 2nd HQ Adjustment: Appropriate Food and Sediment ingestion rates are used.

- Food IR: Based on formula developed by Kushlan (1978) for wading birds and presented in EPA Wildlife Exposure Factors Handbook (1993a,b). log(FI) = 0.966 log(BW) - 0.640 where FI equals food ingestion in grams wet weight per day and BW equals body weight in (g). Using BW = 42.5 g, FI = 9.591 g ww/day = 0.009591 kg ww/day. This value is then converted to a dry weight assuming 80% moisture content of benthic invertebrates (EPA 1999a), to obtain a final value of 0.0019 kg dw/day. It appears Dr. Rogers did not convert his wet weight value to a final dry weight value.
- Sediment IR: This value is based on sediment ingestion rate = 17% of diet (Beyer et al. 2004). This is the same % used by Dr. Rogers, but the final value is different because our Food IR is different.

[3] – 3th HQ adjustment: A sediment-to-benthic invertebrate BAF of 7.5E-06 is used for barium based on an adjustment to EPA's (199b) sediment-to-benthic BAF of 0.9. The adjustment takes into account the differences in solubility of barium chloride (37 g/100 g @25C; Lide 2007) and barium sulfate (0.00031

g/100g @20C; Lide 2007). The BAF adjustment was made by multiplying the 0.9 BAF by the ratio of solubility between barium sulfate and barium chloride (0.9 x (0.00031/37) = 7.5E-06). In addition, a sediment bioavailability factor of 0.15 is used based on data from Zimmerman (2010).

$_4$ – 4th HQ adjustment: An alternative TRV, chronic LOAEL of 41.7 mg/kg-d was used in the HQ calculation, which was estimated by adjusting the subchronic LOAEL (416.53 mg/kg-d) using a chronic uncertainty factor of 0.1. The previous TRV, subchronic NOAEL of 20.8 mg/kg-d was estimated using the chronic uncertainty factor from the subchronic NOAEL (208.26 mg/kg-d) (Sample et al. 1996).

Least Shrew Hazard Quotient Adjustments

Exposure Parameters	Arsenic†				Barium				Cadmium			
	Rogers' values	95% UCL[1]	Food and Sediment IR[2]	Home range[3]	Rogers' values	95% UCL[1]	SBF, BAF, Sediment IR[2]	Home range[3]	Rogers' values	95% UCL[1]	Sediment IR[2]	Home range[3]
Toxicity Reference Value (TRV) (mg/kg-day)	1.04	1.04	1.04	1.04	51.8	51.8	51.8	51.8	0.77	0.77	0.77	0.77
Body Weight (BW) (kg)	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055
Ingestion Rate (IR) Food (kg/day)	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108
IR Sediment (kg/day)	0.000083	0.000083	0.00001	0.00001	0.000083	0.000083	0.00001	0.00001	0.000083	0.000083	0.00001	0.00001
Sediment Bioavailability Factor (SBF) (ingestion by wildlife)	0.6	0.6	0.6	0.6	1	1	0.15	0.15	0.036	0.036	0.036	0.036
Bioaccumulation Factor (BAF) (sediment to invertebrate)	0.224	0.224	0.224	0.224	0.091	0.091	7.5E-06	7.5E-06	7.708	7.708	7.708	7.708
Terrestrial Area Use Factor (AUF)	--	--	--	0.5	--	--	--	0.5	--	--	--	0.5
Maximum Concentration. (mg/kg)	40.3	--	--	--	15,700	--	--	--	2.1	--	--	--
95% Upper Confidence Limit (UCL) (mg/kg)	--	6.8	6.8	6.8	--	2,758	2,758	2,758	--	0.66	0.66	0.66
Hazard Quotient (HQ)*	**2.1**	0.35	0.30	0.15	**10**	**1.8**	0.016	0.0079	**4.1**	**1.3**	**1.3**	0.65

Least Shrew Hazard Quotient Adjustments (continued)

	Chromium†				Lead				Mercury				
Exposure Parameters	Rogers' values	95% UCL[1]	Sediment IR[2]	Home range[3]	Rogers' values	95% UCL[1]	Sediment IR[2]	Home range[3]	Rogers' values	95% UCL[1]	Food and Sediment IR[2]	Home range[3]	BAF[4]
TRV (mg/kg-day)	2.4	2.4	2.4	2.4	4.7	4.7	4.7	4.7	0.032	0.032	0.032	0.032	0.032
BW (kg)	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055
IR Food (kg/day)	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108
IR Sediment (kg/day)	0.000083	0.000083	0.00001	0.00001	0.000083	0.000083	0.00001	0.00001	0.000083	0.000083	0.00001	0.00001	0.00001
SBF (ingestion by wildlife)	0.5	0.5	0.5	0.5	0.86	0.86	0.86	0.86	0.1	0.1	0.1	0.1	0.1
BAF (sediment to invertebrate)	0.306	0.306	0.306	0.306	0.266	0.266	0.266	0.266	1.693	1.693	1.693	1.693	0.04
Terrestrial AUF	--	--	--	0.5	--	--	--	0.5	--	--	--	0.5	0.5
Maximum Concentration (mg/kg)	501	--	--	--	179	--	--	--	16.7	--	--	--	--
95%UCL (mg/kg)	--	16	16	16	--	43	43	43	--	1.4	1.4	1.4	1.4
HQ*	**14**	0.46	0.42	0.21	**2.5**	0.60	0.49	0.25	**174**	**15**	**14**	**7.2**	0.17

Least Shrew Hazard Quotient Adjustments (Continued)

	Mercury (SED6 sample removed)				Selenium				Zinc			
Exposure Parameters	95% UCL[1]	Sediment IR[2]	Home range[3]	BAF[4]	Rogers' values	95% UCL[1]	Sediment IR[2]	Home range[3]	Rogers' values	95% UCL[1]	Sediment IR[2]	Home range[3]
TRV (mg/kg-day)	0.032	0.032	0.032	0.032	0.143	0.143	0.143	0.143	75.4	75.4	75.4	75.4
BW (kg)	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055	0.0055
IR Food (kg/day)	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108	0.00108
IR Sediment (kg/day)	0.000083	0.00001	0.00001	0.00001	0.000083	0.000083	0.00001	0.00001	0.000083	0.000083	0.00001	0.00001
SBF (ingestion by wildlife)	0.1	0.1	0.1	0.1	0.4	0.4	0.4	0.4	0.44	0.44	0.44	0.44
BAF (sediment to invertebrate)	1.693	1.693	1.693	0.04	0.985	0.985	0.985	0.985	3.201	3.201	3.201	3.201
Terrestrial AUF	--	--	0.5	0.5	--	--	--	0.5	--	--	--	0.5
Maximum Concentration (mg/kg)	--	--	--	--	2.1	--	--	--	194	--	--	--
95%UCL (mg/kg)	0.89	0.89	0.89	0.89	--	1.5	1.5	1.5	--	181	181	181
HQ*	**9.2**	**9.2**	**4.6**	0.11	**2.9**	**2.1**	**2.0**	1.0	**1.6**	**1.5**	**1.5**	0.75

*Bold values indicate HQs greater than 1.

Cells shaded in grey indicate the value that is altered in the iteration of the HQ adjustment.

†Site concentrations of arsenic and chromium are not statistically significantly different than background arsenic and chromium concentrations (Lingle 2010). Thus, arsenic and chromium are not COECs. However, they are included in these tables for purposes of comparison to Dr. Rogers' HQs.

[1] – 1st HQ Adjustment: The 95%UCL is used as the exposure point concentration instead of the maximum detected concentration used by Dr. Rogers (EPA 1998). 95%UCL values were calculated using ProUCL Version 5.0.00 (EPA 2013a,b).

[2] – 2nd HQ Adjustment: Appropriate Food and Sediment ingestion rates are used.

- Food IR: Based on formula developed by Nagy 2001 for insectivorous mammals - FIR (g dw/day) = 0.373*(BW in g)^0.622. This is the same value used by Dr. Rogers.
- Sediment IR: This value is based on sed ingestion rate of 1% of diet as estimated for the short-tailed shrew (USEPA 1999b). It appears Dr. Rogers assumes sediment ingestion rate is 7.7% of diet based on the rate estimated for the black-tailed prairie dog (Beyer et al. 2004).

A sediment-to-benthic invertebrate BAF of 7.5E-06 is used for barium based on an adjustment to EPA's (199b) sediment-to-benthic BAF of 0.9. The adjustment takes into account the differences in solubility of barium chloride (37 g/100 g @25C; Lide 2007) and barium sulfate (0.00031 g/100g @20C; Lide 2007). The BAF adjustment was made by multiplying the 0.9 BAF by the ratio of solubility between barium sulfate and barium chloride (0.9 x (0.00031/37) = 7.5E-06). In addition, a sediment bioavailability factor of 0.15 is used based on data from Zimmerman (2010).

[3] – 3rd HQ adjustment: The least shrew is a terrestrial receptor and it is inappropriate to assume an area use factor (AUF) of 1, representing constant exposure to sediments in the AOI. A conservative area use factor of 0.5 (representing 50% exposure to sediments in the AOI) is applied for all terrestrial receptors.

[4] – 4th HQ adjustment: A BAF of 0.04 is used as recommended by the EPA (1999a) for mercuric chloride. This value was calculated using the geometric mean of 5 laboratory values for mercuric chloride.

Snowy Egret Hazard Quotient Adjustments

Exposure Parameters	Arsenic†			Barium						Cadmium		
	Rogers' values	95% UCL[1]	Food and Sediment IR[2]	Rogers' values	95% UCL[1]	Food and Sediment IR[2]	Home range[3]	SBF[4]	TRV Adjustment[5]	Rogers' values	95% UCL[1]	Food and Sediment IR[2]
Toxicity Reference Value (TRV) (mg/kg-day)	2.24	2.24	2.24	20.8	20.8	20.8	20.8	20.8	41.7	1.47	1.47	1.47
Body Weight (BW) (kg)	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371
Ingestion Rate (IR) Food (kg/day)	0.0428	0.0428	0.021	0.0428	0.0428	0.021	0.021	0.021	0.021	0.0428	0.0428	0.021
IR Sediment (kg/day)	0.00312	0.00312	0.0019	0.00312	0.00312	0.0019	0.0019	0.0019	0.0019	0.00312	0.00312	0.0019
Sediment Bioavailability Factor (SBF) (ingestion by wildlife)	0.6	0.6	0.6	1	1	1	1	0.15	0.15	0.036	0.036	0.036
Bioaccumulation Factor (BAF) (sediment to fish)	3.4	3.4	3.4	0.28	0.28	0.28	0.28	0.28	0.28	0.42	0.42	0.42
Home range (acres)							470	470	470			
Area of Investigation (AOI) (acres)							337	337	337			
Area Use Factor							0.72	0.72	0.72			
Maximum Concentration (mg/kg)	40.3	--	--	15,700	--	--	--	--	--	2.1		--
95% Upper Confidence Level (UCL) (mg/kg)	--	6.8	6.8	--	2,758	2,758	2,758	2,758	2,758	--	0.66	0.66
Hazard Quotient (HQ)*	**7.2**	**1.2**	0.59	**31**	**5.4**	**2.8**	**2.0**	**1.6**	0.79	0.070	0.022	0.011

Snowy Egret Hazard Quotient Adjustments (continued)

Exposure Parameters	Chromium†			Lead			Mercury		
	Rogers' values	95% UCL[1]	Food and Sediment IR[2]	Rogers' values	95%UCL[1]	Food and Sediment IR[2]	Rogers' values	95%UCL[1]	Food and Sediment IR[2]
TRV (mg/kg-day)	2.66	2.66	2.66	1.63	1.63	1.63	0.45	0.45	0.45
BW (kg)	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371
IR Food (kg/day)	0.0428	0.0428	0.021	0.0428	0.0428	0.021	0.0428	0.0428	0.021
IR Sediment (kg/day)	0.00312	0.00312	0.0019	0.00312	0.00312	0.0019	0.00312	0.00312	0.0019
SBF (ingestion by wildlife)	0.5	0.5	0.5	0.86	0.86	0.86	0.1	0.1	0.1
BAF (sediment to fish)	0.161	0.161	0.161	0.187	0.187	0.187	2.62	2.62	2.62
Maximum Concentration (mg/kg)	501	--	--	179	--	--	16.7	--	--
95%UCL (mg/kg)	--	16	16	--	43	43	--	1.4	1.4
HQ*	**4.3**	0.14	0.072	**3.2**	0.76	0.40	**11**	0.94	0.46

Snowy Egret Hazard Quotient Adjustments (continued)

	Selenium				Zinc		
Exposure Parameters	Rogers' values	95%UCL[1]	Food and Sediment IR[2]	Home range[3]	Rogers' values	95%UCL[1]	Food and Sediment IR[2]
TRV (mg/kg-day)	0.29	0.29	0.29	0.29	66.1	66.1	66.1
BW (kg)	0.371	0.371	0.371	0.371	0.371	0.371	0.371
IR Food (kg/day)	0.0428	0.0428	0.021	0.021	0.0428	0.0428	0.021
IR Sediment (kg/day)	0.00312	0.00312	0.0019	0.0019	0.00312	0.00312	0.0019
SBF (ingestion by wildlife)	0.4	0.4	0.4	0.4	0.44	0.44	0.44
BAF (Sediment to fish)	4.81	4.81	4.81	4.81	0.138	0.138	0.138
Home range (acres)				470			
AOI (acres)				337			
Area Use Factor				0.72			
Maximum Concentration (mg/kg)	2.1	--	--	--	194	--	--
95%UCL (mg/kg)	--	1.5	1.5	1.5	--	181	181
HQ*	**4.0**	**2.9**	**1.4**	1.0	0.058	0.054	0.027

*Bold values indicate HQs greater than 1.
Cells shaded in grey indicate the value that is altered in the iteration of the HQ adjustment.
†Site concentrations of arsenic and chromium are not statistically significantly different than background arsenic and chromium concentrations (Lingle 2010). Thus, arsenic and chromium are not COECs. However, they are included in these tables for purposes of comparison to Dr. Rogers' HQs.
[1] – 1st HQ Adjustment: The 95%UCL is used as the exposure point concentration instead of the maximum detected concentration used by Dr. Rogers (EPA 1998). 95%UCL values were calculated using ProUCL Version 5.0.00 (EPA 2013a,b).
[2] – 2nd HQ Adjustment: Appropriate Food and Sediment ingestion rates are used.

- Food IR: Based on formula developed by Kushlan (1978) for wading birds and presented in EPA Wildlife Exposure Factors Handbook (1993a,b). log(FI) = 0.966 log(BW) - 0.640 where FI equals food ingestion in grams wet weight per day and BW equals body weight in (g). Using BW = 371 g, FI = 83.0 g ww/day = 0.0830 kg ww/day. This value is then converted to a dry weight assuming 80% moisture content of fish (EPA 1999a; Nagy 2001), to obtain a final value of 0.0208 kg dw/day. It appears Dr. Rogers did not convert his wet weight value to a final dry weight value.
- Sediment IR: This value is based on sediment ingestion rate = 9% of diet (EPA 1999b). Dr. Rogers uses a sediment ingestion rate of 7.3%, which appears to be based on the sediment ingestion rate for a least sandpiper in Beyer et al. 1994.

[3] – 3rd HQ Adjustment: Home range of the snowy egret is incorporated into the PCL calculation. Snowy egret home range data is lacking. We extrapolated from the great blue heron average foraging range of 7 km using the ratio of the body weights of the two species to estimate a snowy egret home range of 1.7 sq. km to obtain a home range of 470 acres.

[4] - 4th HQ Adjustment: A sediment bioavailability factor of 0.15 is used based on data from Zimmerman (2010).

[5] – 5th HQ adjustment: An alternative TRV, chronic LOAEL of 41.7 mg/kg-d was used in the HQ calculation, which was estimated by adjusting the subchronic LOAEL (416.53 mg/kg-d) using a chronic uncertainty factor of 0.1. The previous TRV, subchronic NOAEL of 20.8 mg/kg-d was estimated using the chronic uncertainty factor from the subchronic NOAEL (208.26 mg/kg-d) (Sample et al. 1996).

Swamp Rabbit Hazard Quotient Adjustments

Exposure Parameters	Arsenic†				Barium				Cadmium			
	Rogers' values	95% UCL[1]	BW, Food and Sediment IR[2]	Home Range[3]	Rogers' values	95% UCL[1]	BW, Food and Sediment IR, SBF[2]	Home Range[3]	Rogers' values	95% UCL[1]	BW, Food and Sediment IR[2]	Home Range[3]
Toxicity Reference Value (TRV) (mg/kg-day)	1.04	1.04	1.04	1.04	51.8	51.8	51.8	51.8	0.77	0.77	0.77	0.77
Body Weight (BW) (kg)	1.882	1.882	2.0445	2.0445	1.882	1.882	2.0445	2.0445	1.882	1.882	2.0445	2.0445
Ingestion Rate (IR) food (kg/day)	0.0978	0.0978	0.1031	0.1031	0.0978	0.0978	0.1031	0.1031	0.0978	0.0978	0.1031	0.1031
IR Sediment (kg/day)	0.00616	0.00616	0.0065	0.0065	0.00616	0.00616	0.0065	0.0065	0.00616	0.00616	0.0065	0.0065
Sediment Bioavailability Factor (SBF) (ingestion by wildlife)	0.6	0.6	0.6	0.6	1	1	0.15	0.15	0.036	0.036	0.036	0.036
Bioaccumulation Factor (BAF) (sediment to plant)	0.0375	0.0375	0.0375	0.0375	0.156	0.156	0.156	0.156	0.586	0.586	0.586	0.586
Terrestrial Area Use Factor (AUF)	--	--	--	0.5	--	--	--	0.5	--	--	--	0.5
Maximum Concentration (mg/kg)	40.3	--	--	--	15,700	--	--	--	2.1	--	--	--
95% Upper Confidence Level (UCL) (mg/kg)	--	6.8	6.8	6.8	--	2,758	2,758	2,758	--	0.66	0.66	0.66
Hazard Quotient*	0.15	0.026	0.025	0.012	**3.4**	0.61	0.44	0.22	0.083	0.026	0.026	0.013

Swamp Rabbit Hazard Quotient Adjustments (continued)

Exposure Parameters	Chromium†				Lead				Mercury			
	Rogers' values	95% UCL[1]	BW and Food and Sediment IR[2]	Home Range[3]	Rogers' values	95% UCL[1]	BW and Food and Sediment IR[2]	Home Range[3]	Rogers' values	95% UCL[1]	BW and Food and Sediment IR[2]	Home Range[3]
TRV (mg/kg-day)	2.4	2.4	2.4	2.4	4.7	4.7	4.7	4.7	0.032	0.032	0.032	0.032
BW (kg)	1.882	1.882	2.0445	2.0445	1.882	1.882	2.0445	2.0445	1.882	1.882	2.0445	2.0445
IR Food (kg/day)	0.0978	0.0978	0.1031	0.1031	0.0978	0.0978	0.1031	0.1031	0.0978	0.0978	0.1031	0.1031
IR Sediment (kg/day)	0.00616	0.00616	0.0065	0.0065	0.00616	0.00616	0.0065	0.0065	0.00616	0.00616	0.0065	0.0065
SBF (ingestion by wildlife)	0.5	0.5	0.5	0.5	0.86	0.86	0.86	0.86	0.1	0.1	0.1	0.1
BAF (sediment to plant)	0.041	0.041	0.041	0.041	0.0389	0.0389	0.0389	0.0389	0.652	0.652	0.652	0.652
Terrestrial AUF	--	--	--	0.5	--	--	--	0.5	--	--	--	0.5
Maximum Concentration (mg/kg)	501	--	--	--	179	--	--	--	16.7	--	--	--
95%UCL (mg/kg)	--	16	16	16	--	43	43	43	--	1.4	1.4	1.4
HQ*	0.79	0.026	0.025	0.013	0.18	0.044	0.043	0.022	**18**	**1.5**	**1.4**	0.70

Swamp Rabbit Hazard Quotient Adjustments (continued)

Exposure Parameters	Mercury (with SED6 removed)			Selenium				Zinc			
	95%UCL[1]	BW, Food and Sediment IR[2]	Home Range[3]	Rogers' values	95%UCL[1]	BW, Food and Sediment IR[2]	Home Range[3]	Rogers' values	95%UCL[1]	BW, Food and Sediment IR[2]	Home Range[3]
TRV (mg/kg-day)	0.032	0.032	0.032	0.143	0.143	0.143	0.143	75.4	75.4	75.4	75.4
BW (kg)	1.882	2.0445	2.0445	1.882	1.882	2.0445	2.0445	1.882	1.882	2.0445	2.0445
IR Food (kg/day)	0.0978	0.1031	0.1031	0.0978	0.0978	0.1031	0.1031	0.0978	0.0978	0.1031	0.1031
IR Sediment (kg/day)	0.00616	0.0065	0.0065	0.00616	0.00616	0.0065	0.0065	0.00616	0.00616	0.0065	0.0065
SBF (ingestion by wildlife)	0.1	0.1	0.1	0.4	0.4	0.4	0.4	0.44	0.44	0.44	0.44
BAF (Sediment to plant)	0.652	0.652	0.652	0.672	0.672	0.672	0.672	0.366	0.366	0.366	0.366
Terrestrial AUF	--	--	0.5	--	--	--	0.5	--	--	--	0.5
Maximum Concentration (mg/kg)				2.1	--	--	--	194	--	--	--
95%UCL (mg/kg)	0.89	0.89	0.89	--	1.5	1.5	1.5	--	181	181	181
HQ*	0.95	0.92	0.46	0.53	0.38	0.37	0.18	0.053	0.049	0.048	0.024

*Bold values indicate HQs greater than 1.
Cells shaded in grey indicate the value that is altered in the iteration of the HQ adjustment.
†Site concentrations of arsenic and chromium are not statistically significantly different than background arsenic and chromium concentrations (Lingle 2010). Thus, arsenic and chromium are not COECs. However, they are included in these tables for purposes of comparison to Dr. Rogers' HQs.
[1] – 1st HQ Adjustment: The 95%UCL is used as the exposure point concentration instead of the maximum detected concentration used by Dr. Rogers (EPA 1998). 95%UCL values were calculated using ProUCL Version 5.0.00 (EPA 2013a,b).
[2] – 2nd HQ Adjustment: Appropriate BW, Food and Sediment ingestion rates, and Sediment Bioavailability are used.

- BW: The average of male (2013 g) and female (2076 g) swamp rabbits in Louisiana is used (Mullins 1982 as reported in Bond et al. 2006).
- Food IR: Based on formula developed by Nagy 2001 for herbivorous mammals - FIR (g dw/day) = 0.859*(BW in g)^0.628. This is the same formula used by Dr. Rogers but the IR differs based on the adjusted body weight.
- Sediment IR: This value is based on sediment ingestion rate of 6.3% of diet as estimated for the black-tailed jackrabbit (USEPA 1999b). This is the same % diet used by Dr. Rogers but the IR differs based on the adjusted body weight and resultant food IR.
- Sediment Bioavailability: A sediment bioavailability factor of 0.15 is used based on data from Zimmerman (2010).

[3] – 3rd HQ adjustment: The least shrew is a terrestrial receptor and it is inappropriate to assume an area use factor (AUF) of 1, representing constant exposure to sediments in the AOI. A conservative area use factor of 0.5 (representing 50% exposure to sediments in the AOI) is applied for all terrestrial receptors.

American Robin Hazard Quotient Adjustments

	Barium					Cadmium				Chromium†			
Exposure Parameters	Rogers' values	95%UCL[1]	BW, SBF, BAF, Food, and Sediment IR[2]	Home Range[3]	TRV Adjustment[4]	Rogers' values	95%UCL[1]	BW and Food and Sediment IR[2]	Home Range[3]	Rogers' values	95%UCL[1]	BW and Food and Sediment IR[2]	Home Range[3]
Toxicity Reference Value (TRV) (mg/kg-day)	20.8	20.8	20.8	20.8	41.7	1.47	1.47	1.47	1.47	2.66	2.66	2.66	2.66
Body Weight (BW) (kg)	0.0773	0.0773	0.0810	0.0810	0.0810	0.0773	0.0773	0.0810	0.0810	0.0773	0.0773	0.0810	0.0810
Ingestion Rate (IR) Food (kg/day)	0.0102	0.0102	0.0105	0.0105	0.0105	0.0102	0.0102	0.0105	0.0105	0.0102	0.0102	0.0105	0.0105
IR Sediment (kg/day)	0.00053	0.00053	0.0001	0.0001	0.0001	0.00053	0.00053	0.0001	0.0001	0.00053	0.00053	0.0001	0.0001
SBF (ingestion by wildlife)	1	1	0.15	0.15	0.15	0.036	0.036	1	1	0.5	0.5	1	1
Bioaccumulation Factor (BAF) (sediment to plant)	0.156	0.156	0.156	0.156	0.156	0.586	0.586	0.586	0.586	0.041	0.041	0.041	0.041
% plant in diet	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
BAF (sediment to invertebrate)	0.091	0.091	7.5E-06	7.5E-06	7.5E-06	7.708	7.708	7.708	7.708	0.306	0.306	0.306	0.306
% invertebrate in diet	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Terrestrial Area Use Factor (AUF)	--	--	--	0.5	0.5	--	--	--	0.5	--	--	--	0.5
Maximum Concentration (mg/kg)	15,700	--	--	--	--	2.1	--	--	--	501	--	--	--
95% Upper Confidence Level (UCL) (mg/kg)	--	2,758	2,758	2,758	2,758	--	0.66	0.66	0.66	--	16	16	16
Hazard Quotient (HQ)*	**17**	**3.0**	**1.1**	0.56	0.28	0.90	0.29	0.28	0.14	**5.6**	0.18	0.16	0.081

American Robin Hazard Quotient Adjustments (continued)

Exposure Parameters	Lead				Mercury				Selenium				Zinc			
	Rogers' values	95% UCL[1]	BW and Food and Sediment IR[2]	Home Range[3]	Rogers' values	95% UCL[1]	BW and Food and Sediment IR[2]	Home Range[3]	Rogers' values	95% UCL[1]	BW and Food and Sediment IR[2]	Home Range[3]	Rogers' values	95% UCL[1]	BW and Food and Sediment IR[2]	Home Range[3]
TRV (mg/kg-day)	1.63	1.63	1.63	1.63	0.45	0.45	0.45	0.45	0.29	0.29	0.29	0.29	66.1	66.1	66.1	66.1
BW (kg)	0.0773	0.0773	0.0810	0.0810	0.0773	0.0773	0.0810	0.0810	0.0773	0.0773	0.0810	0.0810	0.0773	0.0773	0.0810	0.0810
IR Food (kg/day)	0.0102	0.0102	0.0105	0.0105	0.0102	0.0102	0.0105	0.0105	0.0102	0.0102	0.0105	0.0105	0.0102	0.0102	0.0105	0.0105
IR Sediment (kg/day)	0.00053	0.00053	0.0001	0.0001	0.00053	0.00053	0.0001	0.0001	0.00053	0.00053	0.0001	0.0001	0.00053	0.00053	0.0001	0.0001
SBF (ingestion by wildlife)	0.86	0.86	1	1	0.1	0.1	1	1	0.4	0.4	1	1	0.44	0.44	1	1
BAF (sediment to plant)	0.0389	0.0389	0.0389	0.0389	0.652	0.652	0.652	0.652	0.672	0.672	0.672	0.672	0.366	0.366	0.366	0.366
% plant in diet	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
BAF (sediment to invertebrate)	0.266	0.266	0.266	0.266	1.693	1.693	1.693	1.693	0.985	0.985	0.985	0.985	3.201	3.201	3.201	3.201
% invertebrate in diet	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Terrestrial AUF				0.5				0.5				0.5				0.5
Maximum Concentration (mg/kg)	179	--	--	--	16.7	--	--	--	2.1	--	--	--	194	--	--	--
95%UCL (mg/kg)	--	43	43	43	--	1.4	1.4	1.4	--	1.5	1.5	1.5	--	181	181	181
HQ*	**3.2**	0.76	0.63	0.31	**6.2**	0.52	0.51	0.26	0.84	0.60	0.58	0.29	0.80	0.74	0.73	0.36

*Bold values indicate HQs greater than 1.
Cells shaded in grey indicate the value that is altered in the iteration of the HQ adjustment.
†Site concentrations of chromium are not statistically significantly different than background chromium concentrations (Lingle 2010). Thus, chromium is not a COEC. However, it is included in this table for purposes of comparison to Dr. Rogers' HQs.

Dr. Rogers states in Attachment 1-3e: "*arsenic not evaluated for this species because maximum site concentrations did not exceed screening criteria for terrestrial birds*" and he does not provide exposure parameters. However, he does show a final HQ for arsenic in Attachment 1-3m. Arsenic was not evaluated herein for the robin due to the fact that it is not a COEC (site levels are not greater than background) and site concentrations did not exceed screening criteria as per Dr. Rogers' own report.

[1] – 1st HQ Adjustment: The 95%UCL is used as the exposure point concentration instead of the maximum detected concentration used by Dr. Rogers (EPA 1998). 95%UCL values were calculated using ProUCL Version 5.0.00 (EPA 2013a,b).

[2] - 2nd HQ Adjustment: Appropriate BW and Food and Sediment ingestion rates are used.

- BW: The average body weight of males and female across seasons as stated in the EPA Wildlife Exposure Factor Handbook (1993a,b) is used.
- Food IR: Derived from the formula developed by Nagy 2001 for omnivorous birds - FIR (g dw/day) = 0.670*(BW in g)^0.627. This is the same formula used by Dr. Rogers but the IR differs based on the adjusted body weight.
- Sediment IR: This value is based on sediment ingestion rate of 1% of diet as stated in EPA 1999b. Dr. Rogers appears to use a 5% sediment ingestion rate but the basis for this assumption is not clear.
- BAF: A sediment-to-benthic invertebrate BAF of 7.5E-06 is used for barium based on an adjustment to EPA's (199b) sediment-to-benthic BAF of 0.9. The adjustment takes into account the differences in solubility of barium chloride (37 g/100 g @25C; Lide 2007) and barium sulfate (0.00031 g/100g @20C; Lide 2007). The BAF adjustment was made by multiplying the 0.9 BAF by the ratio of solubility between barium sulfate and barium chloride (0.9 x (0.00031/37) = 7.5E-06).
- Sediment Bioavailability: sediment bioavailability factor of 0.15 is used based on data from Zimmerman (2010).

[3] – 3rd HQ adjustment: The American robin is a terrestrial receptor and it is inappropriate to assume an area use factor (AUF) of 1, representing constant exposure to sediments in the AOI. A conservative area use factor of 0.5 (representing 50% exposure to sediments in the AOI) is applied for all terrestrial receptors.

[4] – 4th HQ adjustment: An alternative TRV, chronic LOAEL of 41.7 mg/kg-d was used in the HQ calculation, which was estimated by adjusting the subchronic LOAEL (416.53 mg/kg-d) using a chronic uncertainty factor of 0.1. The previous TRV, subchronic NOAEL of 20.8 mg/kg-d was estimated using the chronic uncertainty factor from the subchronic NOAEL (208.26 mg/kg-d) (Sample et al. 1996).

American Woodcock Hazard Quotient Adjustments

	Barium				Cadmium			Chromium†		
Exposure Parameters	Rogers' values	95%UCL[1]	Home Range, SBF, BAF[2]	TRV Adjustment[3]	Rogers' values	95%UCL[1]	Home Range[2]	Rogers' values	95%UCL[1]	Home Range[2]
Toxicity Reference Value (TRV) (mg/kg-day)	20.8	20.8	20.8	41.7	1.47	1.47	1.47	2.66	2.66	2.66
Body Weight (BW) (kg)	0.169	0.169	0.169	0.169	0.169	0.169	0.169	0.169	0.169	0.169
Ingestion Rate (IR) Food (kg/day)	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201
IR Sediment (kg/day)	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209
Sediment Bioavailability Factor (SBF) (ingestion by wildlife)	1	1	0.15	0.15	0.036	0.036	0.036	0.5	0.5	0.5
Bioaccumulation Factor (BAF) (sediment to invertebrate)	0.091	0.091	7.5E-06	7.5E-06	7.708	7.708	7.708	0.306	0.306	0.306
Terrestrial Area Use Factor (AUF)	--	--	0.5	0.5	--	--	0.5	--	--	0.5
Maximum Concentration (mg/kg)	15,700	--	--	--	2.1	--	--	501	--	--
95% Upper Confidence Level (UCL) (mg/kg)		2,758	2,758	2,758	--	0.66	0.66	--	16	16
Hazard Quotient (HQ)*	**18**	**3.1**	0.12	0.061	**1.3**	0.41	0.21	**8.0**	0.26	0.13

American Woodcock Hazard Quotient Adjustments (continued)

	Lead			Mercury			Selenium			Zinc		
Exposure Parameters	Rogers' values	95% UCL[1]	Home Range[2]	Rogers' values	95% UCL[1]	Home Range[2]	Rogers' values	95% UCL[1]	Home Range[2]	Rogers' values	95% UCL[1]	Home Range[2]
TRV (mg/kg-day)	1.63	1.63	1.63	0.45	0.45	0.45	0.29	0.29	0.29	66.1	66.1	66.1
BW (kg)	0.169	0.169	0.169	0.169	0.169	0.169	0.169	0.169	0.169	0.169	0.169	0.169
IR Food (kg/day)	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201	0.0201
IR Sediment (kg/day)	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209	0.00209
SBF (ingestion by wildlife)	0.86	0.86	0.86	0.1	0.1	0.1	0.4	0.4	0.4	0.44	0.44	0.44
BAF (sediment to invertebrate)	0.266	0.266	0.266	1.693	1.693	1.693	0.985	0.985	0.985	3.201	3.201	3.201
Terrestrial AUF	--	--	0.5	--	--	0.5	--	--	0.5	--	--	0.5
Maximum Concentration (mg/kg)	179	--	--	16.7	--	--	2.1	--	--	194	--	--
95%UCL (mg/kg)	--	43	43	--	1.4	1.4	--	1.5	1.5	--	181	181
HQ*	**4.6**	**1.1**	0.56	**7.5**	0.63	0.31	0.88	0.63	0.31	**1.1**	**1.1**	0.53

*Bold values indicate HQs greater than 1.

Cells shaded in grey indicate the value that is altered in the iteration of the HQ adjustment.

†Site concentrations of chromium are not statistically significantly different than background chromium concentrations (Lingle 2010). Thus, chromium is not a COEC. However, it is included in this table for purposes of comparison to Dr. Rogers' HQs.
Dr. Rogers states in Attachment 1-3e: "*arsenic not evaluated for this species because maximum site concentrations did not exceed screening criteria for terrestrial birds*" and he does not provide exposure parameters. However, he does show a final HQ for arsenic in Attachment 1-3m. Arsenic was not evaluated herein for the robin due to the fact that it is not a COEC (site levels are not greater than background) and site concentrations did not exceed screening criteria as per Dr. Rogers' own report.

[1] – 1st HQ Adjustment: The 95%UCL is used as the exposure point concentration instead of the maximum detected concentration used by Dr. Rogers (EPA 1998). 95%UCL values were calculated using ProUCL Version 5.0.00 (EPA 2013a,b).

[2] – 2nd HQ adjustment: The American woodcock is a terrestrial receptor and it is inappropriate to assume an area use factor (AUF) of 1, representing constant exposure to sediments in the AOI. A conservative area use factor of 0.5 (representing 50% exposure to sediments in the AOI) is applied for all terrestrial receptors.

- BAF: A sediment-to-benthic invertebrate BAF of 7.5E-06 is used for barium based on an adjustment to EPA's (199b) sediment-to-benthic BAF of 0.9. The adjustment takes into account the differences in solubility of barium chloride (37 g/100 g @25C; Lide 2007) and barium sulfate (0.00031 g/100g

@20C; Lide 2007). The BAF adjustment was made by multiplying the 0.9 BAF by the ratio of solubility between barium sulfate and barium chloride (0.9 x (0.00031/37) = 7.5E-06).

- Sediment Bioavailability: sediment bioavailability factor of 0.15 is used based on data from Zimmerman (2010).

[3] – 3rd HQ adjustment: An alternative TRV, chronic LOAEL of 41.7 mg/kg-d was used in the HQ calculation, which was estimated by adjusting the subchronic LOAEL (416.53 mg/kg-d) using a chronic uncertainty factor of 0.1. The previous TRV, subchronic NOAEL of 20.8 mg/kg-d was estimated using the chronic uncertainty factor from the subchronic NOAEL (208.26 mg/kg-d) (Sample et al. 1996).

Mallard Hazard Quotient Adjustments

	Arsenic†			Barium					Cadmium			Chromium†		
Exposure Parameters	Rogers' values	95% UCL[1]	Home Range[2]	Rogers' values	95% UCL[1]	Home Range[2]	SBF, BAF[3]	TRV Adjustment[4]	Rogers' values	95% UCL[1]	Home Range[2]	Rogers' values	95% UCL[1]	Home Range[2]
Toxicity Reference Value (TRV) (mg/kg-day)	2.24	2.24		20.8	20.8		20.8	41.7	1.47	1.47		2.66	2.66	2.66
Body Weight (BW) (kg)	1.134	1.134		1.134	1.134		1.134	1.134	1.134	1.134		1.134	1.134	1.134
Ingestion Rate (IR) Food (kg/day)	0.0551	0.0551		0.0551	0.0551		0.0551	0.0551	0.0551	0.0551		0.0551	0.0551	0.0551
IR Sediment (kg/day)	0.00182	0.00182		0.00182	0.00182		0.00182	0.00182	0.00182	0.00182		0.00182	0.00182	0.00182
Sediment Bioavailability Factor (SBF) (ingestion by wildlife)	0.6	0.6		1	1		0.15	0.15	0.036	0.036		0.5	0.5	0.5
Bioaccumulation Factor (BAF) (sediment to plant)	0.0375	0.0375		0.156	0.156		0.156	0.156	0.586	0.586		0.041	0.041	0.041
% plant in diet	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5		0.5	0.5	0.5
BAF (Sediment to invertebrate)	0.127	0.127		1.15371	1.15371		7.5E-06	7.5E-06	0.614	0.614		0.108	0.108	0.108
% invertebrate in diet	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5		0.5	0.5	0.5
Home Range (acres)			1,334			1,334	1,334	1,334			1,334			1,334
Area of Investigation (AOI) (acres)			337			337	337	337			337			337
Area Use Factor			0.25			0.25	0. 0.25	0. 0.25			0.25			0.25
Maximum Concentration (mg/kg)	40.3			15,700					2.1			501		
95% Upper Confidence Limit (UCL) (mg/kg)		6.8	6.8		2,758	2,758	2,758	2,758		0.66	0.66		16	16
Hazard Quotient (HQ)*	0.089	0.015	0.0038	**25**	**4.4**	**1.1**	0.14	0.067	0.042	0.013	0.0033	0.83	0.027	0.0069

Mallard Hazard Quotient Adjustments (continued)

Exposure Parameters	Lead			Mercury			Selenium			Zinc		
	Rogers' values	95% UCL[1]	Home Range[2]	Rogers' values	95% UCL[1]	Home Range[2]	Rogers' values	95% UCL[1]	Home Range[2]	Rogers' values	95% UCL[1]	Home Range[2]
TRV (mg/kg-day)	1.63	1.63	1.63	0.45	0.45	0.45	0.29	0.29	0.29	66.1	66.1	66.1
BW (kg)	1.134	1.134	1.134	1.134	1.134	1.134	1.134	1.134	1.134	1.134	1.134	1.134
IR food (kg/day)	0.0551	0.0551	0.0551	0.0551	0.0551	0.0551	0.0551	0.0551	0.0551	0.0551	0.0551	0.0551
IR Sediment (kg/day)	0.00182	0.00182	0.00182	0.00182	0.00182	0.00182	0.00182	0.00182	0.00182	0.00182	0.00182	0.00182
SBF (ingestion by wildlife)	0.86	0.86	0.86	0.1	0.1	0.1	0.4	0.4	0.4	0.44	0.44	0.44
BAF (Sediment to plant)	0.0389	0.0389	0.0389	0.652	0.652	0.652	0.672	0.672	0.672	0.366	0.366	0.366
% plant in diet	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
BAF (Sediment to invertebrate)	0.066	0.066	0.066	1.081	1.081	1.081	3.75	3.75	3.75	2.33	2.33	2.33
% invertebrate in diet	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Home range (acres)			1,334			1,334			1,334			1,334
AOI (acres)			337			337			337			337
Area Use Factor			0.25			0.25			0. 0.25			0. 0.25
Maximum Concentration (mg/kg)	179			16.7			2.1			194		
95%Upper Confidence Level (UCL) (mg/kg)		43	43		1.4	1.4		1.5	1.5		181	181
HQ*	0.43	0.10	0.026	**1.6**	0.13	0.033	0.78	0.56	0.14	0.19	0.18	0.046

*Bold values indicate HQs greater than 1.
Cells shaded in grey indicate the value that is altered in the iteration of the HQ adjustment.
†Site concentrations of arsenic and chromium are not statistically significantly different than background arsenic and chromium concentrations (Lingle 2010). Thus, arsenic and chromium are not COECs. However, they are included in these tables for purposes of comparison to Dr. Rogers' HQs.

[1] – 1st HQ Adjustment: The 95%UCL is used as the exposure point concentration instead of the maximum detected concentration used by Dr. Rogers (EPA 1998). 95%UCL values were calculated using ProUCL Version 5.0.00 (EPA 2013a,b).

[2] – 2nd HQ Adjustment: The average home range size of male and female mallards is 540 hectares, which is equivalent to 1334 acres (EPA 1993a,b). The home range is divided by the AOI to determine the area use factor of the receptor.

[3] – 3rd HQ adjustment: A sediment-to-benthic invertebrate BAF of 7.5E-06 is used for barium based on an adjustment to EPA's (199b) sediment-to-benthic BAF of 0.9. The adjustment takes into account the differences in solubility of barium chloride (37 g/100 g @25C; Lide 2007) and barium sulfate (0.00031 g/100g @20C; Lide 2007). The BAF adjustment was made by multiplying the 0.9 BAF by the ratio of solubility between barium sulfate and barium chloride (0.9 x (0.00031/37) = 7.5E-06). In addition, a sediment bioavailability factor of 0.15 is used based on data from Zimmerman (2010).

[4] - HQ adjustment: An alternative TRV, chronic LOAEL of 41.7 mg/kg-d was used in the HQ calculation, which was estimated by adjusting the subchronic LOAEL (416.53 mg/kg-d) using a chronic uncertainty factor of 0.1. The previous TRV, subchronic NOAEL of 20.8 mg/kg-d was estimated using the chronic uncertainty factor from the subchronic NOAEL (208.26 mg/kg-d) (Sample et al. 1996).

Red Fox Hazard Quotient Adjustments

Exposure Parameters	Arsenic†		Barium		Cadmium		Chromium†	
	Rogers' values	95% UCL[1]	Rogers' values	95% UCL[1]	Rogers' values	95% UCL[1]	Rogers' values	95% UCL[1]
Toxicity Reference Value (TRV) (mg/kg-day)	1.04	1.04	51.8	51.8	0.77	0.77	2.4	2.4
Body Weight (BW) (kg)	4.53	4.53	4.53	4.53	4.53	4.53	4.53	4.53
Ingestion Rate (IR) Food (kg/day)	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171
IR Sediment (kg/day)	0.004788	0.004788	0.004788	0.004788	0.004788	0.004788	0.004788	0.004788
Sediment Bioavailability Factor (SBF) (ingestion by wildlife)	0.6	0.6	1	1	0.036	0.036	0.5	0.5
Bioaccumulation Factor (BAF) (sediment to plant)	0.0375	0.0375	0.156	0.156	0.586	0.586	0.041	0.041
% plant in diet	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
BAF (sediment to invertebrate)	0.224	0.224	0.091	0.091	7.708	7.708	0.306	0.306
% invertebrate in diet	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
BAF (sediment to mammal)	0.0025	0.0025	0.0566	0.0566	0.3333	0.3333	0.0846	0.0846
% mammal in diet	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Area Use Factor (AUF)	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Maximum Concentration (mg/kg)	40.3	--	15,700	--	2.1	--	501	--
95% Upper Confidence Level (UCL) (mg/kg)	--	6.8	--	2,758	--	0.66	--	16
Hazard Quotient (HQ)*	0.014	0.0023	0.35	0.061	0.019	0.0061	0.27	0.0087

Red Fox Hazard Quotient Adjustments (continued)

	Lead		Mercury		Selenium		Zinc	
Exposure Parameters	Rogers' values	95% UCL[1]	Rogers' values	95% UCL[1]	Rogers' values	95% UCL[1]	Rogers' values	95% UCL[1]
TRV (mg/kg-day)	4.7	4.7	0.032	0.032	0.143	0.143	75.4	75.4
BW (kg)	4.53	4.53	4.53	4.53	4.53	4.53	4.53	4.53
IR Food (kg/day)	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171
IR Sediment (kg/day)	0.004788	0.004788	0.004788	0.004788	0.004788	0.004788	0.004788	0.004788
SBF (ingestion by wildlife)	0.86	0.86	0.1	0.1	0.4	0.4	0.44	0.44
BAF (sediment to plant)	0.0389	0.0389	0.652	0.652	0.672	0.672	0.366	0.366
% plant in diet	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
BAF (sediment to invertebrate)	0.266	0.266	1.693	1.693	0.985	0.985	3.201	3.201
% invertebrate diet	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
BAF (sediment to mammal)	0.1054	0.1054	0.0543	0.0543	0.1619	0.1619	0.7717	0.7717
% mammal in diet	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
AUF	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Maximum Concentration (mg/kg)	179	--	16.7	--	2.1	--	194	--
95%UCL (mg/kg)	--	43	--	1.4	--	1.5	--	181
HQ*	0.062	0.015	0.96	0.080	0.043	0.030	0.027	0.025

Cells shaded in grey indicate the value that is altered in the iteration of the HQ adjustment.

†Site concentrations of arsenic and chromium are not statistically significantly different than background arsenic and chromium concentrations (Lingle 2010). Thus, arsenic and chromium are not COECs. However, they are included in these tables for purposes of comparison to Dr. Rogers' HQs.

[1] – 1st HQ Adjustment: The 95%UCL is used as the exposure point concentration instead of the maximum detected concentration used by Dr. Rogers (EPA 1998). 95%UCL values were calculated using ProUCL Version 5.0.00 (EPA 2013a,b). All other values/assumptions used are from Dr. Rogers' expert report.

Mink Hazard Quotient Adjustments

Exposure Parameters	Aluminum‡		Arsenic†		Barium			Cadmium	
	Rogers' values	Tissue 95% UCL[1]	Rogers' values	Sediment and tissue 95%UCL[1]	Rogers' values	Sediment and crab tissue 95% UCL[1]	Fish/crab Diet, SBF, BAF, CBF[2]	Rogers' values	Sediment and tissue 95% UCL[1]
Toxicity Reference Value (TRV) (mg/kg-day)	1.93	1.93	1.04	1.04	51.8	51.8	51.8	0.77	0.77
Body Weight (BW) (kg)	1	1	1	1	1	1	1	1	1
Ingestion Rate (IR) Food (kg ww/kg bw-day)	0.164	0.164	0.164	0.164	0.164	0.164	0.164	0.164	0.164
IR Sediment (kg dw/kg bw-day)	0.00066	0.00066	0.00066	0.00066	0.00066	0.00066	0.00066	0.00066	0.00066
SBF (ingestion by wildlife)	--	--	0.6	0.6	1	1	0.15	0.036	0.036
% diet crab							0.1		
Bioaccumulation Factor (BAF) (sediment to fish)							0.28		
Crab Bioavailability Factor (CBF) (ingestion by wildlife)							0.03		
Concentration in fish (mg/kg ww calculated)							154.5		
% diet fish							0.9		
Maximum Concentration in crab (mg/kg ww)	79.9	--	0.99	--	452	--	--	0.55	--
95% Upper Confidence Level (UCL) in crab (mg/kg ww)	--	55.85	--	0.744	--	281.2	281.2	--	0.216
Maximum concentration in sediment (mg/kg dw)	0	--	40.3	--	15,700	--	--	2.1	--
95% UCL in sediment (mg/kg dw)	--	--	--	6.8	--	2,758	2,758	--	0.663
Dose (mg/kg-day)	13	9.2	0.18	0.12	84	48	29	0.090	0.035
Hazard Quotient (HQ)*	**6.8**	**4.8**	0.17	0.12	**1.6**	0.93	0.48	0.12	0.046

Mink Hazard Quotient Adjustments (continued)

	Copper‡		Lead‡		Mercury		Nickel‡	
Exposure Parameters	Rogers' values	Tissue 95%UCL[1]	Rogers' values	Sediment and Tissue 95%UCL[1]	Rogers' values	Sediment and tissue 95%UCL[1]	Rogers' values	Tissue 95%UCL[1]
TRV (mg/kg-day)	5.6	5.6	4.7	4.7	0.032	0.032	1.7	1.7
BW (kg)	1	1	1	1	1	1	1	1
IR Food (kg ww/kg bw-day)	0.164	0.164	0.164	0.164	0.164	0.164	0.164	0.164
IR Sediment (kg dw/ kg bw-day)	0.00066	0.00066	0.0007	0.00066	0.00066	0.00066	0.00066	0.00066
SBF (ingestion by wildlife)	--	--	0.86	0.86	0.1	0.1	--	--
Maximum concentration in crab (mg/kg ww)	18.6	--	0.5	--	0.182	--	2.1	--
95% UCL in crab (mg/kg ww)	--	11.81	--	0	--	0.0723	--	0.763
Maximum concentration in sediment (mg/kg dw)	0	--	179	--	16.7	--	0	0
95% UCL in sediment (mg/kg dw)	--	--	--	43	--	1.4	--	--
Dose (mg/kg-day)	3.1	1.9	0.18	0.025	0.031	0.012	0.34	0.13
HQ*	0.54	0.35	0.039	0.0052	0.97	0.37	0.20	0.074

*Bold values indicate HQs greater than 1.

Cells shaded in grey indicate the value that is altered in the iteration of the HQ adjustment.

†Site concentrations of arsenic are not statistically significantly different than background arsenic concentrations (Lingle 2010). Thus, arsenic is not a COEC. However, it is included in these tables for purposes of comparison to Dr. Rogers' HQs.

‡Aluminum, copper, and nickel are not COECs. They are not related to site activities and were not even measured in sediments and/or surface water samples. Their inclusion as COECs because they were measured in crab tissue is inappropriate (see Opinions 1 and 3). However, they are included in the mink and great blue heron tables for purposes of comparison to Dr. Rogers' HQs.

ǂLead was below detection limits in all crab tissue samples analyzed by Dr. Rogers. Calculation of an HQ based on non-detected chemistry values is inappropriate and meaningless.

[1] – 1st HQ Adjustment: The 95%UCLs of crab tissue concentrations (and sediment concentrations, when measured) are used as the exposure point concentration instead of the maximum detected concentration used by Dr. Rogers (EPA 1998). 95%UCL values were calculated using ProUCL Version 5.0.00 (EPA 2013a,b).

[2] – 2nd HQ Adjustment: A sediment bioavailability factor of 0.15 is used based on data from Zimmerman (2010). Adjustment made based on a diet of 90% fish and 10% crab. Crab bioavailability factor of 0.03 is used based on the percentage of barium present in soft tissues (represents potential exposure tissue type). Sediment to fish bioavailability factor of 0.28 is taken from Hamilton et al. (2002).

Great Blue Heron Hazard Quotient Adjustments

Exposure Parameters	Aluminum‡			Arsenic†			Barium				
	Rogers' values	Heron body weight[1]	Tissue 95% UCL[2]	Rogers' values	Heron BW[1]	Sediment and Tissue 95% UCL[2]	Rogers' values	Heron BW[1]	Sediment and Tissue 95% UCL[2]	SBF, BAF, CBF, Fish/crab diet, Food and Sediment IR[3]	TRV Adjustment[4]
Toxicity Reference Value (TRV) (mg/kg-day)	109.7	109.7	109.7	2.24	2.24	2.24	20.8	20.8	20.8	20.8	41.7
Body Weight (BW) (kg)	1	2.229	2.229	1	2.229	2.229	1	2.229	2.229	2.229	2.229
Ingestion Rate (IR) Food (kg ww/kg bw-day)	0.23015	0.23015	0.23015	0.23015	0.23015	0.23015	0.23015	0.23015	0.23015	0.18	0.18
IR Sediment (kg dw/ kg bw-day)	0.00092	0.00092	0.00092	0.00092	0.00092	0.00092	0.00092	0.00092	0.00092	0.0007	0.0007
Sediment Bioavailability Factor (SBF) (ingestion by wildlife)	--	--	--	0.6	0.6	0.6	1	1	1	0.15	0.15
Maximum Concentration in crab (mg/kg ww)	79.9	79.9	--	0.99	0.99	--	452	452	--	--	--
95% Upper Confidence Level (UCL) in crab (mg/kg ww)	--	--	55.85	--	--	0.744	--	--	281.2	281.2	281.2
Maximum Concentration in sediment (mg/kg dw)	--	--	--	40.3	40.3	--	15700	15700	--	--	--
% diet crab										0.1	0.1
Bioaccumulation Factor (BAF) (sediment to fish)										0.28	0.28
Crab Bioavailability Factor (CBF) (ingestion by wildlife)										0.03	
Concentration in fish (mg/kg ww calculated)										154.4	154.4
% diet fish										0.9	0.9
95%UCL in sediment (mg/kg dw)	--	--	--	--	--	6.8	--	--	2758	2758	2758
Dose (mg/kg-day)	18	8.3	5.8	0.25	0.10	0.079	118	53	30	31	31
Hazard Quotient (HQ)*	0.17	0.075	0.053	0.11	0.046	0.035	**5.7**	**2.6**	**1.5**	**1.3**	0.62

Great Blue Heron Hazard Quotient Adjustments (continued)

Exposure Parameters	Cadmium			Copper‡			Lead‡		
	Rogers' values	Heron body weight[1]	Tissue 95% UCL[2]	Rogers' values	Heron body weight[1]	Sediment and tissue 95% UCL[2]	Rogers' values	Heron body weight[1]	Sediment and tissue 95% UCL[2]
TRV (mg/kg-day)	1.47	1.47	1.47	4.05	4.05	4.05	1.63	1.63	1.63
BW (kg)	1	2.229	2.229	1	2.229	2.229	1	2.229	2.229
IR Food (kg ww/kg bw-day)	0.23015	0.23015	0.23015	0.23015	0.23015	0.23015	0.23015	0.23015	0.23015
IR Sediment (kg dw/ kg bw-day)	0.00092	0.00092	0.00092	0.00092	0.00092	0.00092	0.00092	0.00092	0.00092
SBF (ingestion by wildlife)	0.036	0.036	0.036	--	--	--	0.86	0.86	0.86
Maximum Concentration in crab (mg/kg ww)	0.55	0.55	--	18.6	18.6	--	0.5	0.5	--
95%UCL in crab (mg/kg ww)	--	--	0.216	--	--	11.81	--	--	0
Maximum Concentration in sediment (mg/kg dw)	2.1	2.1	--	--	--	--	179	179	--
95%UCL in sediment (mg/kg dw)	--	--	0.66	--	--	--		--	43
Dose (mg/kg-day)	0.13	0.057	0.022	4.3	1.9	1.2	0.26	0.12	0.015
HQ*	0.086	0.039	0.015	**1.1**	0.47	0.30	0.16	0.071	0.0094

Great Blue Heron Hazard Quotient Adjustments (continued)

	Mercury			Nickel‡		
Exposure Parameters	Rogers' values	Heron body weight[1]	Tissue 95% UCL[2]	Rogers' values	Heron body weight[1]	Sediment and tissue 95% UCL[2]
TRV (mg/kg-day)	0.45	0.45	0.45	6.71	6.71	6.71
BW (kg)	1	2.229	2.229	1	2.229	2.229
IR Food (kg ww/kg bw-day)	0.23015	0.23015	0.23015	0.23015	0.23015	0.23015
IR Sediment (kg dw/kg bw-day)	0.00092	0.00092	0.00092	0.00092	0.00092	0.00092
SBF (ingestion by wildlife)	0.1	0.1	0.1	--	--	--
Maximum Concentration in crab (mg/kg ww)	0.182	0.182	--	2.1	2.1	--
95% UCL in crab (mg/kg ww)	--	--	0.0723	--	--	0.763
Maximum Concentration in sediment (mg/kg dw)	16.7	16.7	--	--	--	--
95%UCL in sediment (mg/kg dw)	--	--	1.4	--	--	--
Dose (mg/kg-day)	0.043	0.019	0.0075	0.48	0.22	0.079
HQ*	0.10	0.043	0.017	0.072	0.032	0.012

*Bold values indicate HQs greater than 1.

Cells shaded in grey indicate the value that is altered in the iteration of the HQ adjustment.

†Site concentrations of arsenic are not statistically significantly different than background arsenic concentrations (Lingle 2010). Thus, arsenic is not a COEC. However, it is included in these tables for purposes of comparison to Dr. Rogers' HQs.

‡Aluminum, copper, and nickel are not COECs. They are not related to site activities and were not even measured in sediments and/or surface water samples. Their inclusion as COECs because they were measured in crab tissue is inappropriate (see Opinions 1 and 3). However, they are included in the mink and great blue heron tables for purposes of comparison to Dr. Rogers' HQs.

ǂLead was below detection limits in all crab tissue samples analyzed by Dr. Rogers. Calculation of an HQ based on non-detected chemistry values is inappropriate and meaningless. Since lead was never detected in any crab samples, it would not be considered a COEC for crab tissue.

[1] – 1st HQ Adjustment: Dr. Rogers appears to have used the incorrect body weight (1 kg) in his HQ calculations. The correct great blue heron body weight of 2.229 kg is now used.

[2] – 2nd HQ Adjustment: The 95% UCLs of crab tissue concentrations (and sediment concentrations, when measured) are used as the exposure point concentration instead of the maximum detected concentration used by Dr. Rogers (EPA 1998). 95% UCLs were calculated using ProUCL Version 5.0.00 (EPA 2013a,b).

[3] – 3rd HQ Adjustment: Appropriate food and sediment ingestion rates are used.

- Food IR: The food ingestion rate presented in the EPA Wildlife Exposure Factors Handbook is used (1993a,b).
- Sediment IR: This value is based on sediment ingestion rate of 2% of diet. This is the same % diet used by Dr. Rogers but the IR differs based on the adjusted food IR.
- Fish/crab Diet: Adjustment made based on a diet of 90% fish and 10% crab.
- BAF: A sediment-to-benthic invertebrate BAF of 7.5E-06 is used for barium based on an adjustment to EPA's (199b) sediment-to-benthic BAF of 0.9. The adjustment takes into account the differences in solubility of barium chloride (37g/100g @25C; Lide 2007) and barium sulfate (0.00031 g/100g @20C; Lide 2007). The BAF adjustment was made by multiplying the 0.9 BAF by the ratio of solubility between barium sulfate and barium chloride (0.9 x (0.00031/37) = 7.5E-06).
- Sediment Bioavailability Factor: sediment bioavailability factor of 0.15 is used based on data from Zimmerman (2010).
- Sediment to fish bioavailability factor of 0.28 is taken from Hamilton et al. (2002).

[4] - 4th HQ adjustment: An alternative TRV, chronic LOAEL of 41.7 mg/kg-d was used in the HQ calculation, which was estimated by adjusting the subchronic LOAEL (416.53 mg/kg-d) using a chronic uncertainty factor of 0.1. The previous TRV, subchronic NOAEL of 20.8 mg/kg-d was estimated using the chronic uncertainty factor from the subchronic NOAEL (208.26 mg/kg-d) (Sample et al. 1996).

This attachment provides an overview of processes that affect the transport, partitioning, accumulation, and potential toxicity of barium (Ba) in estuarine systems such as the East White Lake (EWL) Field area. It summarizes the environmental distribution of Ba and the processes that influence movement and distribution of naturally occurring Ba, as well as Ba from relevant anthropogenic sources. The attachment summarizes the results of a statistical (nonparametric) comparison for Ba concentrations between EWL Field sediments, Reference sediments, regional soil and estuary sediments (i.e., background). In addition, the attachment summarizes the statistical comparison for Ba concentrations between EWL Field and Reference surface waters. The attachment further considers the bioavailable forms of Ba, as this pertains to the relationship between contaminant sources and ecological receptors through actual or potential exposure pathways. It also provides a mechanistic basis for interpreting recent studies evaluating the accumulation and distribution of Ba in sediments and in crab tissues from the EWL Field, and for Ba partitioning in crab tissues and potential for uptake by heron and mink. Finally, it discusses the potential for the release of Ba in whole crabs due to boiling.

1.0 Naturally Occurring Barium

Ba is a dense alkaline earth metal that occurs in nature as a divalent cation in combination with other elements. Ba is the 14th most abundant element in the Earth's crust. The most common, naturally occurring sources are as two ores: barite and witherite. Barite consists primarily of barium sulfate (BaSO4), and witherite is predominantly barium carbonate ($BaCO_3$) (WHO 2001). Ba is also present in the naturally occurring minerals barytoangelsite ([Ba,Pb]SO4) and bromlite (Ca,Ba[CO3]). Ba does not readily substitute for other alkaline earth elements in various crystal matrices, with the exception of CaCO3 where it is incorporated more readily into precipitating calcite than aragonite (both forms of calcium carbonate, $CaCO_3$) (API 1995).

All the alkaline earth elements readily form oxides, hydroxides, carbonates, and sulfates. Like other alkaline earth elements, Ba forms soluble salts with chloride, bromide, and nitrate, and forms relatively insoluble salts with sulfate, carbonate, and phosphate (API 1995).

Due to its natural presence in the Earth's crust, Ba is found naturally in most surface waters, soils and sediments. The least soluble naturally occurring form of Ba is barite, with a low solubility in freshwater and significantly lower solubility in seawater, where solubility is controlled by the abundant inorganic sulfate (API 1995; USDHHS 2007). According to the U.S. Geological Survey (USGS), "Although barite contains a "heavy" metal (Ba), it is not a toxic chemical under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986, because it is very insoluble." (http://minerals.usgs.gov/minerals/pubs/commodity/barite/)

2.0 Environmental Distribution, Transport and Speciation of Barium

Concentrations of Ba in soils range from 15 mg/kg (dry weight [dw])[1] to 3,500 mg/kg, depending on soil type. The mean concentrations can range up to about 835 mg/kg (USDHHS 2007). Ba is associated with fine-grained clay mineral rich soils and sediments that are formed from weathering of minerals such as feldspars and micas (Isphording 1982). River output is the most significant source for this particulate-bound Ba from clay minerals into estuaries and ocean waters. The concentration of Ba in Mississippi River suspended particulate loads averages about 740 mg/kg (Neff 2002). As clay bound Ba moves from freshwater, through the estuary and to the ocean, its geochemical behavior determines the accumulation of Ba in the sediments, as well as its chemical form (speciation), its relative bioavailability, and, hence, its toxicity to aquatic organisms (Neff 2002).

Sediments from the regional estuarine systems to the east and west of White Lake show significant levels of Ba: Barataria Basin sediments have been shown to contain 468 mg/kg Ba; and, sediments from the Pontchartrain Estuary have been shown to average 532 mg/kg Ba, with a maximum of 1,789 mg/kg (Flower and Isphording 1990). Ba is present in sediments from Louisiana coastal zone lakes at concentrations that are similar to those found in the regional estuarine system. In the Barataria Basin, sediments from Lake Calcasieu, Lake Salvador, and Bayou Perot range from 297 mg/kg to 558 mg/kg Ba. Sediments from Lake Pontchartrain average 455 mg/kg, with a measured maximum of 900 mg/kg Ba (Landrum 1995).

Partitioning of Ba between the particulate and dissolved forms affects Ba mobility in the aquatic environment, as well as its bioavailability and its toxicity to aquatic organisms (Neff 2002). This partitioning depends on the salinity and the hydrodynamic conditions occurring within the water system (Coffey et al. 1997). In freshwater rivers and lakes Ba exists predominantly adsorbed onto clay particles, and organic matter (Figure 6-1(a)) (Hanor and Chan 1977). At very low salinity of 1 to 2 part per thousand (‰) Ba is displaced from clays by magnesium (Mg^{2+}) and released as the free Ba ion (Ba^{2+}) which is the bioavailable form (Figure 6-1(b)). As salinity increases beyond this range (2 to15 ‰), the concentration of available sulfate ions (SO_4^{2}) gradually increases with salinity in the water column (Figure 6-1(c)) (Hanor and Chan 1977; Coffey et al. 1997). The sulfate ions readily combine with the Ba^{2+} ions to form barium sulfate ($BaSO_4$) which, because of its low solubility, settles out into the sediments (Figure 6-1(d)) (API 1995; Neff 2002).

[1] Soil and sediment data may be reported on either a dry weight (dw) or a wet weight (ww) basis. For the purpose of environmental assessments, soil and sediment data are almost always reported on a dry weight basis because soil and sediment data reported on wet weight basis are not directly comparable because of the variability in the water content (percent moisture) among samples.

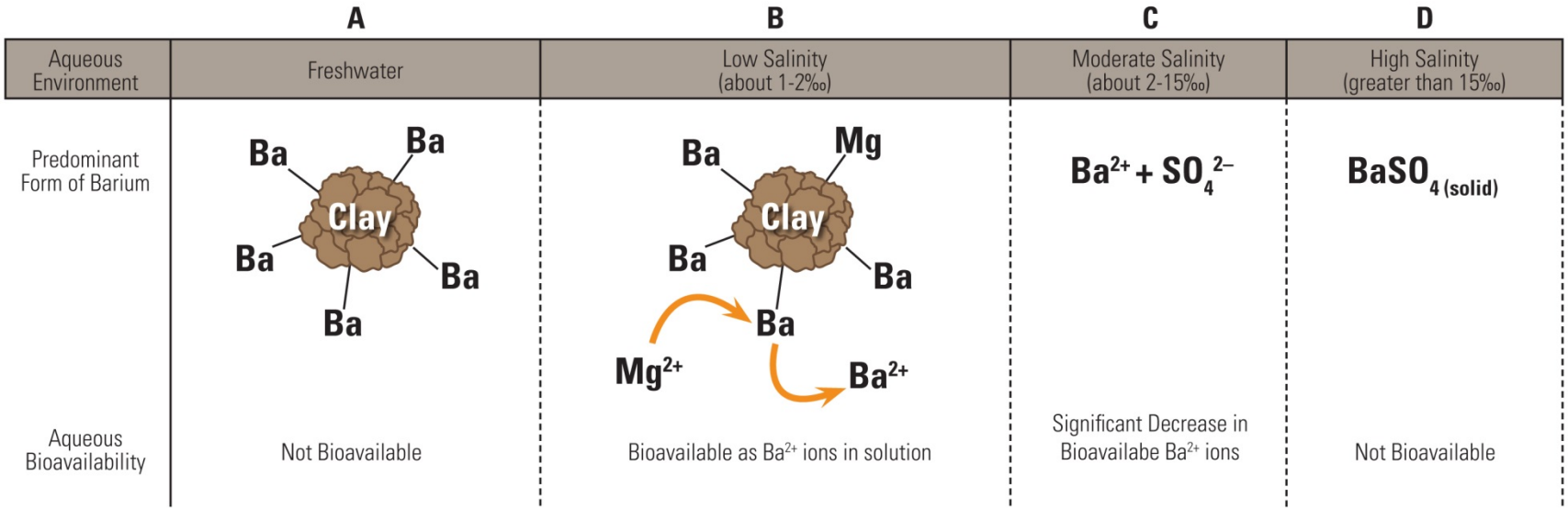


Figure 6-1 Conceptual Diagram for Bioavailable Barium

In summary, the salinity or changes in salinity within an aquatic environment are the primary determinants for potential bioavailability of Ba. In estuaries the Ba can be released from river-borne suspended particulate matter during estuarine mixing. Re-suspended estuarine particulates do not appear to contribute to Ba^{2+} concentrations. The salinity increases normally found in these systems will drive most available Ba^{2+} to $BaSO_4$, rendering the Ba to a much less bioavailable form. In the open ocean, the relatively high salinities and high sulfate ion concentrations also drive the formation of $BaSO_4$, plus re-adsorption onto particulate material, resulting in low bioavailability and reduced toxicity of Ba.

3.0 Relationship of the East White Lake Field Area to Regional Soils and Delta Sediment Influences

White Lake lies within the Chenier Plain that is immediately west of, and adjacent to, the Mississippi Deltaic Region. There is a geomorphological relationship between these two regions. The current day Chenier Plain is an extensive marshland interspersed with large inland lakes formed in river valleys that were flooded and accumulated sediments following the last glaciation. Over more recent geologic time, this coastal marsh area has been molded by forces related to river sediment supply, and not by direct deposition as with the adjacent delta region. The Chenier plain was formed from tidal re-working of a series of Mississippi River delta deposits, resulting in an undulating landscape of relic beach ridges (cheniers) with marsh areas in between (USGS 1998).

There are also contemporary influences on the regional marshland and lake sediments that maintain the geomorphological relationship between the Chenier Plain marshland and lakes, and the adjacent delta region. Man-made canals/channels and water control systems have greatly altered the natural hydrology in many areas of the Chenier Plain. Sediment entering the region is predominantly from upland freshwater flow, small tributaries, and tidal flooding (USGS 1998).

The Atchafalaya River (a tributary of the Mississippi) flows along the eastern edge of the plain and delivers fluvial sediment through Vermilion Bay into the Gulf of Mexico intercontinental shelf. This process has created a delta deposit that is predominated by fine-grained sediments. This material is also transported westward by currents to form a mudflat region directly east of the White Lake area (Smith 2012).

Because of the distance of White Lake from the Gulf of Mexico coast, tidal flooding would not be an expected mechanism for re-depositing the suspended sediment material originating from the adjacent delta regions (Smith 2012); the Gulf of Mexico coastline is approximately seven miles due south of White Lake. However, periodic influence from hurricanes and tropical storms could be significant to the overall depositional environment for White Lake and surrounding marshlands. Storm-surge from these extreme weather events can move deposited delta material up into the general marshland/lake vicinity. On average, one tropical storm passes through this

area every 1.6 years, one hurricane can be expected to impact the area every 3.3 years, and a major hurricane traverses the region every 14 years. These hurricane events have produced storm surges ranging from at least 3 feet to as high as 10 to12 feet of marine water. Deposition rates from coastal storms and hurricanes for coast Louisiana have been documented, with an approximate range from 1 to 70 cm of sediment deposition resulting from a single storm event. From 1900-2009, 21 hurricane events have resulted in probable sediment deposition impacts in the immediate vicinity (Roth 1998, 2009).

The determination of regional background Ba sediment concentrations for the EWL Field area is based on the geomorphological relationship described above, along with the potential for storm-surge impacts on the sedimentation regime. Regional soil background has been determined with USGS soil data, using sample locations that fall within the Mississippi Deltaic region and the Western Gulf Coastal Plain. The Chenier Plain approximates the southern half of the Western Gulf Coastal Plain.

4.0 White Lake/EWL Field is in a Depositional Environment

White Lake, and specifically the EWL Field, located approximately one mile due east of White Lake, is considered to be a predominantly freshwater/low salinity environment that is also a low-energy water flow regime relative to typical estuarine systems. Salinity measurements in White Lake and the Schooner Bayou canal show predominantly low values, with mean salinities ranging from <2 ‰ to about 2.2 ‰ for the year 2010 (Table 6-1; USACE 2014), the timeframe when sediment and crab samples were taken from the EWL Field. The normally low energy environment of this marshland/lake has resulted in a long-term depositional environment for naturally occurring Ba. This relatively low and consistent salinity regime is within the range where Ba can be displaced from clays by available Mg^{2+} ions, but the salinities are low enough such that the formation of barium sulfate will not occur to an appreciable degree (Figure 6-1). The conditions would favor dissolution of particulate-Ba to Ba^{2+}, resulting in an increase of dissolved, bioavailable form of Ba in the water column.

Table 6-1. White Lake Salinity Data for 2010 (annual means, ranges)

USACE Monitoring Location Relative to EWL Field	USACE Station	Mean Salinity (S‰)	Low Salinity (S‰)	High Salinity (S‰)
Schooner Bayou Canal, immediately east of EWL Field	S9	2.2	0.5	4.3
Schooner Bayou Canal, immediately west of EWL Field	S10	2.2	0.5	4.1
Schooner Bayou Canal, mouth of White Lake	S11	2.1	0.5	3.3
White Lake, about 1 mile from mouth to Schooner Bayou Canal	S12	1.8	0.5	3.3

Notes: Data source: USACE (2014).

The sediment regime for White Lake and the EWL Field is related to the regional soils of the Mississippi Deltaic region which provides a significant source of naturally occurring mineral forms of Ba as well as Ba^{2+} associated with river-borne clay particles. Periodic storm-surge events from tropical storms and hurricanes can also influence the sediment environment through potential deposition of re-suspended delta and marine sediment material.

The Ba sediment concentrations for the EWL Field are not significantly different from those found in regional estuaries and the Mississippi Alluvial Plain (delta region) (Figure 6-2) indicating that Ba in sediments in EWL Field is within the range of the natural environment. Further, the low-salinity and low-energy environment of White Lake and the EWL Field provide optimal conditions for the maximum release of Ba^{2+} from clay particulates resulting in a high ratio of bioavailable Ba per total Ba in the system.

5.0 Comparison of Barium Concentrations for Sediments from EWL Field, Reference Locations, and USGS Regional Soil and Regional Estuaries

Sediment Ba concentrations for the EWL Field have been compared to various background sources (i.e., USGS Regional Soil and Regional Estuaries) using a statistical nonparametric test (Mann Whitney Rank Sum). The results of these analyses are presented in Figure 6-2 and discussed briefly below. The evaluation compared the median Ba concentrations for sediments for the following groups:

- EWL Field
- EWL Reference locations (Reference sample locations in East White Lake and Schooner Canal)
- USGS Regional Soil Background Data (Mississippi Alluvial Plain and Western Gulf Coast Alluvial Plain)
- Regional Estuaries (Baritaria Basin and Pontchartrain Estuary)

The nonparametric evaluation of median sediment Ba concentrations is summarized as follows (Figure 6-2):

- The median Ba concentration from the EWL Field is significantly greater ($p<0.05$) than the Reference locations;
- The median Ba concentration for the EWL Field is significantly greater ($p<0.05$) than that for the Western Gulf Coastal Alluvial Plain, but not for Mississippi Alluvial Plain; and,
- The median Ba concentration for Reference locations is significantly lower ($p<0.05$) than that of the Mississippi Alluvial Plain, but not the Western Gulf Coast Alluvial Plain.

The fact that the median sediment Ba concentration for the Reference locations is comparable to that for the Regional Estuaries (although data were insufficient for statistical analysis) and the

Western Gulf Coast Alluvial Plain, substantiates that the Reference locations are representative of background for Ba concentrations in sediment for the region.

Surface water Ba concentrations for the EWL Field have been compared to the Reference locations. The nonparametric evaluation of median surface water Ba concentrations for samples with total Ba (unfiltered water samples) and dissolved Ba (filtered water samples) is summarized as follows (Figure 6-3):

- The median total Ba concentration from the EWL Field is not significantly different from the Reference locations;
- The median dissolved Ba concentration for the EWL Field is not significantly different from the Reference locations.

In addition to natural sources, there is the potential for anthropogenic sources of Ba entering EWL Field from drilling fluids and produced waters from oil and gas activities (Neff 2002, 2005). However, Ba is present as barite in drilling fluids which, because of its low solubility, would precipitate out into the sediments, and not be bioavailable, and therefore not toxic, to aquatic organisms (Neff 2002, 2005). The potential release of produced water over the course of historic oil exploration activities in the EWL Field would have been subject to the same factors that control Ba bioavailability that were discussed in Section 2.0 of this attachment, and would equilibrate quickly. This is confirmed by data discussed in the following section which demonstrates that the concentrations of Ba in crabs from the EWL Field are not statistically elevated relative to crabs collected from Reference locations.

6.0 A Lack of Relationship Between Barium in Crab Tissues and Barium in Sediments

To evaluate the bioaccumulation of Ba in crabs from the EWL Field and Reference locations, we evaluated data from crabs that were collected from the same EWL Field and Reference locations (Figure 6-2, Figure 6-3; Unocal 2014). Crabs were dissected into the exoskeleton, the meat, the hepatopancreas and other soft tissue and Ba concentrations were measured in each tissue.

Summary statistics and graphic presentations of these Ba tissue data are presented in Figure 6-4. The vast majority of the bioaccumulated Ba was found in the exoskeleton for crabs from both locations. The median concentration of Ba in exoskeletons from the EWL Field and the Reference locations were 846 mg/kg and 854 mg/kg, respectively (Figure 6-4). These two groups were not statistically different ($p<0.05$) from one another. Concentrations of Ba in the hepatopancreas, meat and other soft tissues were also not statistically different ($p<0.05$) between the two locations. As a comparison, Ba concentrations in the sediments from the EWL Field had a median concentration of 631 mg/kg, which is about two times higher and significantly different ($p<0.05$) from that from the Reference locations which had a median concentration of 319 mg/kg (Figure 6-2). Yet, as indicated in the previous section, the concentrations of Ba in the various

tissues of crabs from the EWL Field locations are not statistically different from those of the Reference locations.

These data demonstrate that the concentrations of total Ba in sediments do not correlate with, and is therefore not a good predictor of, Ba in the tissues of crabs associated with those sediments. Barium bioaccumulation is, instead, related to the soluble Ba^{2+} in surface water.

7.0 Factors that Determine Uptake and Bioaccumulation of Barium in Crabs

The major exposure route for Ba in crabs is uptake of Ba^{2+} from the water column, as barite and Ba-bound clays are not bioavailable (Lamb et al. 2013; Menzie et al. 2008). The exoskeleton and cuticle of the crab is impermeable to free divalent ions including Ca^{2+}, Ba^{2+} and Mg^{2+}. These ions can only enter the crab by binding to specialized transport proteins on the gill that evolved to facilitate the rapid uptake of Ca^{2+} required immediately after molting as part of the formation of the new exoskeleton (Roer 1980; Greenway 1983, 1985; Sheets and Dendinger 1983). The Ba^{2+} piggy backs on the Ca^{2+} transport system and its uptake is dependent upon the Ba^{2+} concentration relative to the Ca^{2+} concentration in the water column.

In turn, as discussed in Section 2.0 of this attachment, the Ba^{2+} concentration in the water column is dependent upon salinity (Figure 6-1; Li and Chan 1979; Turner et al. 1981; Hanor and Chan 1977). The relative uptake of Ba^{2+} into crab tissue is highest in the 1 to 2‰ salinity range and will decrease gradually with increasing salinity (Edmond et al. 1978; Li and Chan 1979). The low salinity environment of both the EWL Field and the Reference locations is within the range of the highest expected Ba^{2+} concentrations in the water column. It is the relationship between salinity and Ba^{2+} that controls uptake and incorporation of Ba into crabs, and not the concentrations of Ba in the EWL Field sediments which is in insoluble form, and not bioavailable.

8.0 Barium Partitioning in Crabs Tissues and Potential for Uptake by Heron and Mink

In crabs, Ba^{2+} is taken up by Ca^{2+} transport proteins in the gill (Roer 1980), and the vast majority of it is transported through the bloodstream to the exoskeleton where it incorporates (in trace amounts relative to Ca^{2+}) into calcite during mineralization[2] (Travis 1963; Dillaman et al. 2005).

[2] As a measure of potential uptake and incorporation of barium into the blue crab carapace, the Ba/Ca ratio was approximated using empirical data for crab carapace Ca and Ba concentrations. The Ba/Ca ratio was estimated from a literature value of total Ca concentration in the carapace of the brown crab (7.36 mmol/g, dry wt., from Greenaway 1985), and the mean concentration of total Ba in the carapace tissue samples from blue crabs taken in the EWL Field area (868 mg/kg dry wt.). Using these data, the Ba/Ca ratio was estimated to be about $3x10^{-3}$.

This approximation for the relative abundance of Ba to Ca in crab carapace tissue indicates that the expected concentrations of Ba should be significantly less than those for Ca. The estimation from empirical data suggests that barium would be present at about 0.3% relative to the calcium within the carapace tissue.

The mineralization process that incorporates Ba^{2+} into calcite is well documented (EPA 1995; Tunusoglu et al. 2007; Gilliken et al. 2008). This mineralized calcite is an integral part of the organic matrix of chitin-protein fibers that creates rigidity in the crab exoskeleton (Rudall 1963; Vigh and Dendinger 1982; Cameron 1985; Luquet 2012). As a result, the Ba in the exoskeleton is locked within its mineralized matrix and isolated from other tissues.

The relative distribution of Ba in crab tissues was evaluated using the tissue Ba concentration data from Unocal (2014). For each group of crab samples (EWL Field and Reference locations), the total Ba was calculated for each tissue type (exoskeleton, meat, hepatopancreas, other soft tissue). These results were then normalized to the whole crab body weight to provide a whole body Ba concentration. Similarly, tissue concentrations were converted to total Ba for exoskeleton and soft tissues (meat, hepatopancreas, and other soft tissue). This information was then used to determine the percentage of Ba mass in the exoskeleton versus the percent Ba mass in all soft tissues (meat, hepatopancreas, and other soft tissue). Approximately 97% of the Ba measured in crabs collected from the EWL Field and Reference locations is found within the exoskeleton (Table 6-2; Unocal 2014). Because the exoskeleton of crabs is particularly thick and rigid, it is difficult for prey to break it into small pieces for ingestion (Mills and Lake 1976). As a consequence, the potential for prey to access and take up Ba within the matrix of the crab exoskeleton is severely limited.

Table 6-2. Comparison of Site and Reference Crab Barium Metrics

Crab Metrics	Whole Body Mass (mg)	Whole Body Barium (mg/kg ww)	Percent Barium Mass in Exoskeleton	Percent Barium Mass in Soft Tissues
Average EWL Field	1,923 (770)	405 (84)	97 (0.94)	3.3 (0.94)
Average Reference	1,384 (235)	390 (64)	97 (0.68)	3.1 (0.68)

Notes: Data source: Unocal (2014). Values in parentheses are standard deviations. Whole body crab weight equals the sum of individual tissue weights. Individual tissue Ba concentrations were converted to tissue Ba mass. Percent Ba mass was then determined for exoskeleton and all soft tissues (meat, hepatopancreas, other soft tissue).

While heron are largely piscivorous, they are known to opportunistically consume crabs as part of their diet. The crab exoskeleton presents a challenge to their digestive tract because the gizzards of heron are less powerful than those of other birds such as gulls, reducing their ability to pulverize the chitin matrix (Montesinos et al. 2008; Hibbert-Ware 1940). Further once ingested, any portions that are not digested are regurgitated as a pellet within six to ten hours after consumption.

The American mink is also largely piscivorous and has been shown to consume crustaceans opportunistically (Fasola et al. 2011). Mink tend to selectively ingest the soft tissue and cannot completely digest the harder tissue. The chitinous remains of the exoskeleton have been observed

within the scat of mink, indicating that mink do not fully digest the exoskeleton and other hard parts of the crab.

In conclusion, 97% of the Ba accumulated in crabs from EWL Field and Reference locations is found compartmentalized in the mineralized exoskeleton making it inaccessible to most prey species. Heron, in particular, have a relatively weak gizzard incapable of pulverizing the tough organic chitin matrix where the vast majority of Ba is stored. While mink can include crabs as part of their diet, their tendency to select the soft tissues for ingestion, and the presence of undigested exoskeleton in their scat indicate that they too have limited access to Ba from the exoskeleton. Taking all of these factors into consideration, it is clear that the use of Ba concentrations measured after a rigorous acid digestion of pulverized exoskeleton such as the procedure used by Rogers (Appendix A of Barbee 2010; described further in the next section), significantly over estimates the amount of Ba accumulated in EWL Field crabs that could be available to heron and mink.

9.0 The Potential for Release of Barium from Whole Crabs Due to Boiling

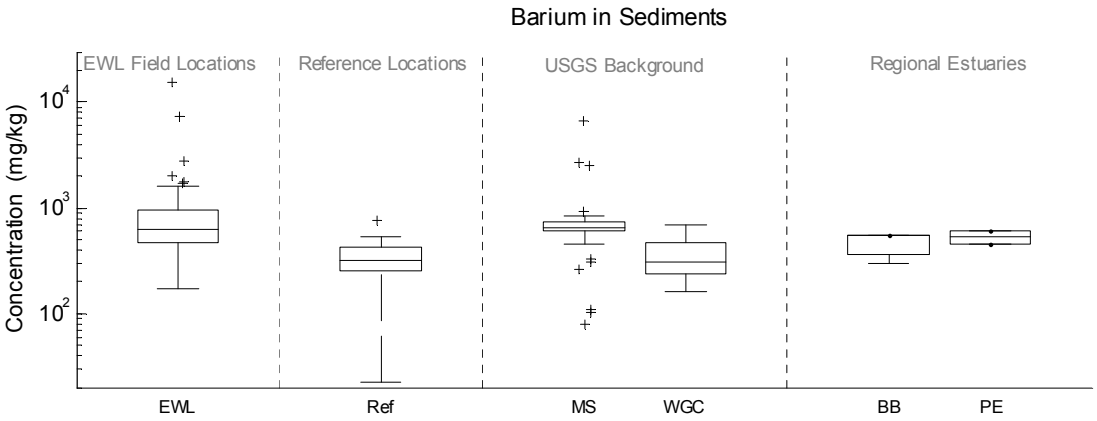
In his November 2, 2010 Report, Barbee presents data from an October 2010 study conducted by Rogers (Barbee, 2010). In this study crabs were collected at nine locations in the EWL Field as shown in Figure 1 of that report. Tissues from whole crabs at each of these sampling locations were analyzed for a number of chemicals, including Ba. These data are based on an aggressive homogenization and acid digestion procedure on the assumption it would simulate metal released from whole crabs placed in boiling water. Specifically, crabs were subjected to "whole body homogenization" in which the crab is mixed with anhydrous sodium sulfate in an "appropriate extraction solvent" and then subject to 3 minutes of "maceration" in a "Tissumizer". Homogenization was followed by an acid digestion to solubilize the elements for laboratory measurement (Appendix A of Barbee 2010).

These extreme chemical and physical methods used by Rogers do not mimic the effects of placing intact crabs in boiling water because the crab is encased in a rigid, heat resistant and impermeable exoskeleton. As described in the previous section of this attachment, approximately 97% of the Ba accumulated in tissues of crabs from the EWL Field is sequestered within the exoskeleton. Further, as elaborated upon in Section 8 of this attachment, Ba in the exoskeleton is locked within mineralized calcite that is closely associated with an organic matrix of chitin-protein fibers and isolated from other tissues.

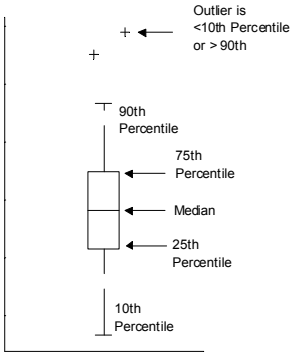
Calcite is highly insoluble even in boiling water (Coto et al. 2012). It does not follow the general trend of becoming more soluble at elevated temperatures in aqueous solution seen in other minerals, which might result in a release of Ba into the boiling water. Instead, calcite exhibits retrograde solubility, where increases in temperature results in a decrease in aqueous solubility (EPA 2005b; Langmuir 1997; Blount 1977; Coto et al. 2012; Dolejs and Manning 2010). For example, calcite solubility decreases about four-fold between 0^{o}C and 50^{o}C (Garrels and Christ 1965). This pattern holds up to about 200^{o}C (Coto et al. 2012).

Given that some 97% of the total Ba in EWL Field crabs is associated with the exoskeleton in a highly stable and insoluble form, an extremely aggressive protocol of homogenizing the whole crab including the exoskeleton, followed by acid digestion before measuring Ba is not representative of the potential for the release of Ba from whole crabs upon boiling.

The literature cited in this attachment is presented in Attachment 2.



Group	Mean	Median	SD	Skewness	Min	Max	NDs	Detects	Total
EWL Field Locations									
EWL Field Locations	1218.2	631.0	2421.8	5.1	169.4	15700	0	47	47
Reference Locations (Ref)									
Schooner Canal & EWL	345.6	319	165.4	0.7	22.7	760.5	0	15	15
USGS Background									
Mississippi Alluvial Plain **(MS)**	791.5	655.5	863.7	5.6	80	6630	0	60	60
Western Gulf Coast Plain **(WGC)**	347.2	304.0	145.3	0.6	162	687	0	30	30
Regional Estuaries									
Barataria Basin **(BB)** *	468.3	NA	NA	NA	NA	NA	0	3	3
Pontchartrain Estuary **(PE)** **	532.5	NA	NA	NA	NA	NA	0	2	2



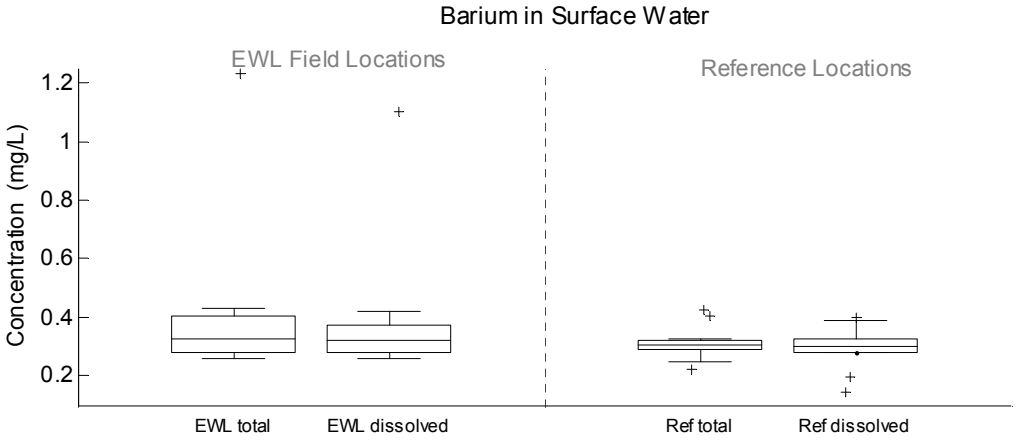
Nonparametric Hypothesis Tests

Group	*p*-value 5% (α-0.05)	Fail to Reject H=0
EWL Field Locations vs Reference Locations		
EWL vs Ref	0.000079	1
EWL Field Locations vs USGS Background		
EWL vs MS	0.81	0
EWL vs WGC	0.00000046	1

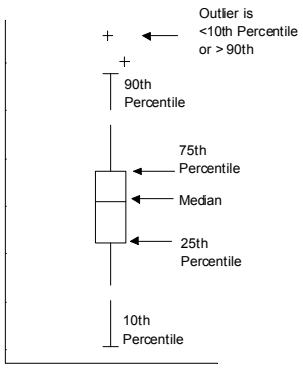
Group	*p*-value 5% (α-0.05)	Fail to Reject H=0
Reference Locations vs USGS Background		
Ref vs MS	0.000006	1
Ref vs WGC	0.87	0

Figure 6-2. Barium in Sediments Statistics

[1] Nonparametric Test – Mann Whitney Rank Sum: H0: Median 1 = Median 2; H1: Median 1 ≠ Median 2.
SD=Standard Deviation.
* Barium Concentrations for these samples were 3 reported means of 104 samples. Descriptive statistics and nonparametric hypothesis test not calculated.
** Barium Concentrations for these samples were 2 reported means of 121 samples. Descriptive statistics and nonparametric hypothesis test not calculated.



Group	Mean	Median	SD	Skewness	Min	Max	NDs	Detects	Total
EWL Field Locations									
EWL Field Locations (total barium)	0.42	0.33	0.29	2.46	0.26	1.23	0	10	10
EWL Field Locations (dissolved barium)	0.40	0.32	0.25	2.43	0.26	1.10	0	10	10
Reference Locations (Ref)									
Schooner Canal & EWL (total barium)	0.31	0.31	0.06	0.65	0.22	0.43	0	11	11
Schooner Canal & EWL (total barium)	0.29	0.30	0.07	-0.53	0.14	0.40	0	11	11



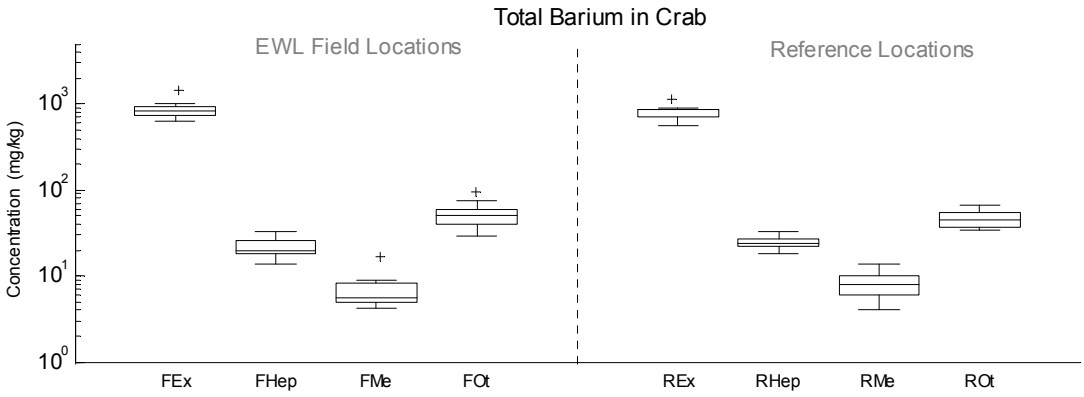
Nonparametric Hypothesis Tests

Group	*p*-value 5% (α-0.05)	Fail to Reject H=0
EWL Field Locations (total barium) vs Reference Locations (total barium)		
EWL vs Ref	0.75	0

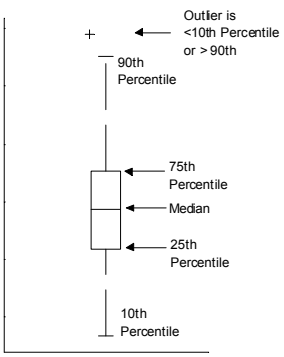
Group	*p*-value 5% (α-0.05)	Fail to Reject H=0
EWL Field Locations (dissolved barium) vs Reference Locations (dissolved barium)		
EWL vs Ref	0.57	0

Figure 6-3. Barium in Surface Water Statistics

[1] Nonparametric Test – Mann Whitney Rank Sum: H0: Median 1 = Median 2; H1: Median 1 ≠ Median 2.
SD=Standard Deviation.



Group	Mean	Median	SD	Skewness	Min	Max	NDs	Detects	Total
EWL Field Locations									
Site Exoskeleton **(FEx)**	867.7	846	194.1	1.4	634	1420	0	15	15
Site Hepatopancreas **(FHep)**	22.2	19.9	5.9	0.4	13.8	32.7	0	15	15
Site Meat **(FMe)**	6.9	5.6	3.1	2.0	4.3	16.5	0	15	15
Site Other Soft Tissue **(FOt)**	51.8	50.5	17.5	0.92	28.8	94.7	0	15	15
Reference Locations									
Reference Exoskeleton **(REx)**	827.7	854	148.7	0.2	565	1130	0	10	10
Reference Hepatopancreas **(RHep)**	24.4	23.7	4.6	0.5	17.9	33.1	0	10	10
Reference Meat **(RMe)**	8.4	7.9	3.2	0.44	4.1	13.7	0	10	10
Reference Other Soft Tissue **(ROt)**	46.5	44.6	11.0	0.5	33.6	66.4	0	10	10



Nonparametric Significance Tests

Group	*p*-value 5% (α-0.05)	Fail to Reject H=0
EWL Field vs Reference - Exoskeleton		
FEx vs REx	0.8	0
EWL Field vs Reference - Hepatopancreas		
FHep vs RHep	0.3	0
EWL Field vs Reference - Meat		
FMe vs RMe	0.1	0
EWL Field vs Reference - Other Soft Tissues		
Fot vs ROt	0.6	0

[1]Figure 6-4. Barium in Crab Tissue Statistics

Nonparametric Test – Mann Whitney Rank Sum: H0: Median 1 = Median 2; H1: Median 1 ≠ Median 2.
SD=Standard Deviation.