Brown & Root Environmental

55 Jonspin Road
Wilmington, MA 01887-1020

(508) 658-7899
FAX: (508) 658-7870

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Project Number 6884

Mr. James Shafer
Remedial Project Manager
Northern Division, Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order No. 0254

Subject: Response to RIDEM Comments, Draft Final Marine Ecological Risk Assessment Report
Former Derecktor Shipyard, Naval Education & Training Center, Newport Rhode Island

Dear Mr. Shafer:

Enclosed are four copies of responses to comments received from the Rhode Island Department of Environmental Management on the report referenced above. The comments were received at EAB Meeting No. 11, held March 26, 1997, and they were briefly discussed at that time.

You will recall that a letter describing the approach to address two of these comments was sent out to the EAB by our subcontractor, SAIC, on March 28. After that letter was reviewed by RIDEM, one of their representatives contacted me to clarify his comment (no. 8) and to be sure that we addressed the spirit of the comment in the revised report. After considering his points and evaluating the possible outcomes of the revisions, our team determined that it was most appropriate to issue these responses formally, documenting the logic of both sides of this argument.

We are currently working toward completing the final ERA report based on our responses as described in the attachments. Any further comments on these responses must be brought forward immediately in order to accommodate those concerns in the final ERA.

If you have any questions regarding this material, please do not hesitate to contact me.

Very truly yours,

Stephen S. Parker
Project Manager

SSP/rt

c: B. Wheeler, NETC Newport (w/encl-2)
K. Keckler, USEPA (w/encl - 4)
K. Finkelstein, NOAA (w/encl -1)
T. Prior, USF&W (w/encl - 1)
P. Kulpa, USEPA (w/encl - 4)
J. Trepanowski/M. Turco, B&R (w/encl)
File 6884-3.2 (w/o encl), 8.0 (w/encl)

1850

Response to Comments: Re Draft Final Derecktor Shipyard Marine Ecological Risk Assessment Report- Naval Education and Training Center, Newport, RI From Paul Kulpa, Office of Waste Management, RIDEM, to Mr. James Shafer, USN-Northdiv, dated 3/20/97.

1A. **General Comment.**

As previously discussed, the report had not adequately addressed resuspension issues at the site. Specifically, changes in site conditions from its present inactive state may result in the release of contaminants which will require a reevaluation of the ecological risk assessment. Risk assessments normally address probable reuse scenarios. The document should acknowledge this fact and clearly note that the current assessment only addressees the current <u>inactive</u> status of the site.

Response.

Text in Section 1.0 (executive summary), Section 2.1 (Background), Section 3.5 (Fate and Transport Models), Section 6.6 (Risk Synthesis), Section 6.7 (Risk Uncertainty), and Section 7.1 (Synthesis of Study Findings) will be modified to clearly state that the risk assessment was designed to address current conditions/levels of activity at the site, and that future use scenarios involving fundamentally different uses have not been considered. Also specific reference to resuspension issues
(p. 4-35, last paragraph; Section 6.1.2, last paragraph; Section 1.4.1, last paragraph; Section 7.3, 2nd paragraph) will be modified to indicate current use scenarios only were evaluated.

1B. **General Comment.**

The document should also note that the reuse scenario and associated resuspension events will be addressed in detail in the Feasibility Study for the site. Please be advised that the Office will consider this aspect of the Feasibility Study as being part of the Ecological Risk Assessment. Accordingly, the Office reserves the right for the full review time associated with these independent submittals. In addition, the Office will not considered the Ecological Risk Assessment as being finalized until this issue is addressed.

Response.

Per EAB meeting agreements, the issue of resuspension will be addressed in the Feasibility Study without delaying the finalization of this ERA.

2. **General Comment.**

The Office requested that the Navy expand the discussion of the various test parameters. That is, the report should discuss the function of the test parameters, their limitations, factors which produce false positive/ negatives, etc. This discussion was not found for the various diversity and condition indexes conducted at the site. Please indicate which sections address this request.

Response.

Per EAB meeting agreements, the uncertainty associated with limitations on numbers of individuals used to calculate the diversity index and other community structure indices will be discussed in Section 5.3.1, and further acknowledged in Section 5.5. The uncertainties associated with condition indices will be discussed in Section 5.5.

Because of the new approach to evaluate silt- and sand-bottom habitats separately, and for clarification, the following text will replace current text in Section 5.3.1.1, *Benthic Community Assessment Protocols* (pp. 5-38 and 5-39):

"*Benthic Community Assessment Protocols*. A quartile-based, four-level scoring scheme for evaluation of habitat and metric-specific data was developed following EPA Rapid Bioassessment Protocols (EPA, 1989e). Calculated quartiles, based on the range of data for a specific metric, divide the distribution of data into equal "quarters", defined as the 25th, 50th, and 75th percentiles. Separate scoring schemes were developed for silt- and sand-bottom habitats. In general, habitat-specific quartiles were calculated for site data, based on the station-specific metric value expressed as a percent of that obtained at the corresponding silt or sand reference location. Exceptions were Percent Dominant Taxa, which was evaluated as the actual percent contribution, and not as the percent comparability to reference location per EPA guidance (EPA, 1989e), and the Bray-

Curtis Similarity index, where a comparison to reference is already incorporated into the metric. Furthermore, the calculated quartile for the "Total Individuals" metric may be unreliable for stations at which

total individuals observed were less than 100 (Stations DSY-29 and DSY-40).

Calculated quartiles for each metric are presented in Table 5.3-1. Each habitat/station/metric-specific value was assigned a number of "points" based on its relation to the appropriate quartile distribution (U.S. EPA, 1989e); those values included in the first or lowest quartile were assigned 0 points ($<25^{th}$ percentile), values in the second quartile (25^{th} - 50^{th} percentile) were assigned 2 points, values in the third quartile (50^{th} - 75^{th} percentile) were assigned 4 points, and values in the highest or fourth quartile ($>75^{th}$ percentile) were assigned 6 points.

Quartile values for overall benthic metric ranking for each habitat (silt and sand) are incorporated into Table 5.3-2. Quartile distributions were calculated on the overall metric ratios for each habitat. Input data consisted of the ratio of the sum of points for each station to total possible points (i.e., 42). Based on the overall habitat-specific quartile distribution, each station was assigned a benthic metric ranking as follows: stations included in the first quartile = "+++", second quartile = "++", third quartile = "+", and fourth quartile = "-".

The ecological effects assessment discussions in Sections 1, 5, 6, and 7 will be revised accordingly based on the new ranking strategy.

The following discussion of uncertainties associated with condition indices will be added to Section 5.5, *Biological Investigations*:

"Resources limit the ability to measure every parameter at every site with 100% accuracy and precision. Therefore, the possibility of erroneous conclusions always exists, i.e., false negatives (true trend, response, or pattern is not detected) and false positives (apparent trend, response, or pattern is actually due to natural variability). For standard methods (e.g., use of toxicity tests to measure acute and chronic responses in aquatic organisms), most sources of erroneous conclusions, including inadequate sampling designs, experimental designs, measurement methods, data recording and data analysis techniques, can be recognized in the review of project sampling plans and through QA/QC programs which include SOPs and the use of

positive and negative controls. For newer technologies, particularly biochemical and physiological measurements at cellular and subcellular levels of biological organization (i.e., biomarkers), such as induction of EROD activity and incidence of hematopoietic neoplasia, procedures for reducing erroneous conclusions are still in developmental stages. Despite shortcomings, biomarkers are highly valuable in retrospective risk assessments, where environments are already affected and detectable effects can be observed and measured (Suter, 1990). Biomarker measurements can aid in the determination of actual effects, and thus cause, magnitude, and ultimate consequences. Although biomarkers are not yet predictive of higher-level effects at the population, community, or ecosystem levels of organization, they are useful measures of exposure; they are often evident even when contaminants are below detectable levels and may provide clinical evidence of causative agents (Landis and Yu, 1995).

Sublethal physiological and behavioral indicators of impact within a population (i.e., growth, reproductive success, and condition) are traditional methods used to assess the health of populations (Landis and Yu, 1995). However, no single index can provide predictive capability for evaluating population level changes. In addition, sublethal indices may change with season, reproductive status, and age. Condition indices of mussels, which are useful sentinel organisms given their sessile lifestyle, extensive distribution and abundance, and proven ability to thrive in confinement, have become important in global monitoring programs. However, introduced mussels do not usually become full participants in the ecosystem; therefore, integration of assessments of both indigenous and deployed mussel condition provide more complete characterization of spatial and temporal heterogeneity."

3. **General Comment.**

This Office, in previous correspondence and during EAB meetings, requested that information from historic investigations be included in this document. As an illustration, based upon information provided in the appendixes of the Preliminary Assessment Report, it is known that, the area in the vicinity of the dry docks was subject to periodic releases of contaminated sand blast grit. Samples taken revealed that high levels of copper/zinc (> 400 ppm) and lead (>200 ppm) were found in thirteen of the twenty sample taken at the site. In addition, elevated levels of TPH, PAHs and PCBs (6,000 ppb) were also discovered. A number of these sample stations were located in areas

not sampled or addressed by the current study and therefore it is important that they are included in the report as it may have a bearing on any remedial activity in the area. Please include the requested information in report.

Response.

The following text will be added at the end of Section 4.2.2:

"In August 1987, the Department of the Army conducted a chemical analysis of sediment samples from NETC's Pier I, an area subject to periodic historic releases of sand blast grit (Figure 4.2-8). Of the 20 samples analyzed, 13 were evaluated as being highly contaminated by at least one of the three trace metals, Cu, Pb, and Zn, while the remaining seven sediments were moderately contaminated with at least one of the three trace metals (Table 4.2-3). All tin levels were below the analytical detection limit, therefore no estimation of tin contamination was made. Titanium was also analyzed, but concentrations could not be differentiated from background levels. Minor organic contamination was observed in two samples, but was not numerically reported except to indicate detection. However, the presence of organic contaminants was far outweighed by the high contamination levels of copper, lead, and zinc. The fact that low concentrations of organic contaminants (i.e., PAHs, phthalate) were detected at all, however, could indicate similar pollution by these or related compounds in adjacent areas."
New Table 4.2-3 and Figure 4.2-8 will be added (attached) and subsequent tables, figures and text references will be renumbered. Additionally, the following statement will be added to Section 6.7, p. 6-65, 5th bullet:

"Specific areas of contamination identified in historic studies which were not addressed in the current investigation."

4. **General Comment.**

The report has compared the results of the diversity indexes, and other test to the background sampling locations. It is important to know whether the results of these indexes or other tests indicate that the background sampling locations are impacted. Please indicate which pages of the report include this discussion as it is pertinent to any comparisons to onsite sampling locations.

Response.

The following statement will be added before the last sentence in the last paragraph of Section 5.3.1, p. 5-46:

"...impact has not occurred. Reference locations are considered to be adequately representative of unimpacted sites as indicated by the low CoC concentrations measured in sediments and tissues during this study. Thus, ..."

(and field observations)
?

5. **Comment.**

Section 1.6, Impact on Benthic Communities;
Page 1-26, Paragraph 2.

Shallow depths of sediment oxygenation (redox depth) were found in surface sediments at Stations DSY-25, DSY-29, DSY-40 *and* DSY-41 *suggesting that near-bottom hypoxia or sewage-associated organic enrichment may contribute somewhat to the altered benthic community structure at these locations.*

The report indicates that Station DSY-40 and 41 are subject to hypoxia. Information presented in an earlier section of the report described these stations as having sandy bottoms and no oxygen deficiency problems. Please explain.

Response.

The Navy was unable to locate the alluded text in the report identified by DEM as describing Stations DSY-40 and DSY-41 as having no oxygen deficiency problems. If the state can provide the location of this text, the Navy will correct it to be consistent with text presented in Section 1.6 and elsewhere in the report. However, for clarification, the following text will be revised:

Section 1.6, insert new text in p. 1-26, line 6, 1st full paragraph:

"...structure at these stations. Since Stations DSY-40 and DSY-41 have sediments low in TOC content, conditions of high oxygen demand at these stations may be intermittent, and may be due to factors other than organic carbon, such as nutrient enrichment. Intermediate..."

Section 4.2.4, p. 4-15, "Conclusions", revision to last sentence:

"In general, these results do not demonstrate that low dissolved oxygen is adversely impacting indigenous biota within Coddington Cove. However, localized hypoxia may occur at some specific locations (e.g., Stations DSY-40 and DSY-41); such phenomena are not resolvable using the above modeling approach."

Section 6.5.1, revised/new text in p. 6-37, line 7, 1st paragraph:

"...for this condition. Hypoxic conditions were also apparent in the inner dock area, where the oxygenated layer was thin at Stations DSY-40 (0.2 cm) and DSY-41 (0.5 to 1 cm). This condition may have arisen from excessive nutrient enrichment, possibly from a source associated with high organic materials, despite the fact that these stations have sediments low in TOC content. Although high levels of organic matter may have been present at Stations DSY-40 and DSY-41 in the past, such levels were not observed during this investigation. [new ¶] The presence of..."

Section 6.6.2, p. 6-59, "Benthic Community Structure", insert the following text before next to last sentence:

"...CoC concentrations. Although the cause for this hypoxia is unclear, this condition may have been associated with past conditions of excessive nutrient enrichment and/or restricted circulation, which may have since subsided as a result of episodic flushing. Exposure-response..."

6. **Comment.**

Table 5.3-1, Biological Condition Scoring Criteria for assessment of .....

This table uses quantiles for the biological condition scoring criteria. The report should include a detailed discussion describing how the values for the quantiles were chosen.

Response.

For clarification, separate scoring schemes have been developed for silt-bottom and sand-bottom communities. See revised text in Comment Response 2 above.

7. **Comment.**

Table 5.3-2, Distribution of the 20 most common benthic invertebrate.....

The calculated values for Stations DSY-27 and DSY-32 appear to be less that 29. The report should be modified accordingly and the designation changed for these locations.

Response.

As indicated in the response to Comment 2, separate overall scoring schemes have been developed for silt-bottom and sand-bottom communities. Based on the re-calculated habitat-specific quartile distributions, Stations DSY-27 and DSY-32 are placed in the first quartile, and assigned a ranking of "+ + +". Results are carried forward into Tables 6.6-2, 6.6-3, and 1.6-1, and summary Figures 1.6-4 and 6.6-4. Revised Tables 5.3-1, 5.3-2, 6.6-2, 6.6-3, and 1.6-1 and Figures 1.6-4 and 6.6-4 are attached.

8. **Comment.**

Table 6.6-2, Summary of Effects based Weights.....
Table 6.6-3, Overall Summary of Exposure.....

Table 6.6-2 summarizes the results of the individual test to produce an overall risk ranking for each group of tests. Based upon the information presented in this table, lobster and cunner test were prominent factors in determining the overall effects ranking for tissue residue effects (the results from the other test in this grouping were approximately equal). Cunner and lobster samples were not collected in Stations DSY-40, DSY-41. This lack of analysis skewed the overall evaluation. In addition, since these stations are known to be devoid of life it is likely that the aforementioned skewed analysis resulted in these stations receiving an overall lower ranking. Furthermore, Station DSY-40 and DSY-41 were differentiated from each other by

the results of fecal analysis in the blue mussel. This analysis was not conducted at Station DSY-41, which once again skewed the analysis. The report should discuss this lack of analysis. In addition, the Office recommends that the overall ranking for these stations in Table 6.6-3 be changed to intermediate or high.

Response.

Adjustments have been made to the characterization of Station DSY-41 which compensate for the absence of data for certain assessment endpoints. Due to spatial proximity, the exposure-ranking for Elutriate Hazard Quotients (Table 6.6-1, attached) and the indicator ranking for fecal pollution indicators (Table 6.6-2) for Station DSY-41 have been assumed to be equivalent to the corresponding endpoint rankings observed at Station DSY-40. These results are carried forward into Tables 6.6-3 and 1.6-1, and summary Figures 1.6-2 and 6.6-2 (attached).

This above information was transmitted to the members of the EAB in a letter from SAIC dated March 28, 1997. On April 3, 1997, Bob Richardson of the RIDEM called Steve Parker at Brown and Root Environmental and requested that the spatial proximity logic be applied to fill data gaps between these two stations for other field effects indicators and tissue residue effects. In this manner, measured data from station DSY-40 could be applied to station DSY-41 when data for that station does not exist (and vice versa). This would enforce the assumption of similarity between stations DSY-40 and -41 in the ranking process for both stations. Initially, it was agreed that this was a reasonable approach. However, since these changes proposed by Bob Richardson do not affect the current overall rankings of stations DSY-40 and -41 as described in the revised Table 6.6-3, these changes were not made in the attached tables until input from the remainder of the EAB could be aquired.

Finally, Bob Richardson also clarified a point he made at EAB meeting 11, which was that all stations sampled for cunner were ranked "+ + " for tissue residue effects and almost all stations sampled for lobster were ranked "+ + + " for tissue residue effects. He stated that if lobster and cunner had been sampled at stations DSY-40 and -41 the residue effects would have been ranked as high as the stations where samples were collected. His comment was that if this was the case, the stations would have had an overall risk probability ranking of "high", instead of "intermediate" or "low". After consideration of this comment, it is the Navy's response that the data collected outside the

confined area where stations DSY-40 and 41 are located are not likely to be reflective of the situation inside the confined area, and this substitution of data is not appropriate.

Based on revised rankings, the Overall Exposure Risk Rankings for Stations DSY-40 and 41 are defined as "L" (low), and the Overall Effects Risk Rankings are defined as "I" (intermediate). Therefore, the revised Overall Risk Probability Ranking *for both stations* is "Intermediate". These changes will be noted in the text in Section 6.1.2 (*Sediment Elutriate Contaminants*), Section 6.5.4 (*Deployed Mussel Fecal Pollution Indicators - Exposure Relationships*), and Section 6.6 (*Risk Synthesis*).

9. **Comment.**

Section 7.1, Synthesis of Study Findings; Page 7-2, Whole Section.

This section of the report delineates which stations are considered to be low, medium and high risk stations. As previously stated, evaluation of resuspension events may alter the conclusions in the report and the associated risk ranking. This should be clearly noted in this Section and in Section 7.3 of the report.

Response.

See Comment Response 1 above.

Table 1.6-1. Overall Summary of Exposure and Effects-based Weights of Evidence and Characterization of Risk for the Derecktor Shipyard Marine Ecological Risk Assessment.

	WEIGHTS OF EVIDENCE										
	EXPOSURE					EFFECTS					
Station	Sediment Hazard Quotients[1]	Elutriate HQs[2]	SEM and AVS[3]	Tissue Conc. Ratio[4]	Rank[9]	Tissue Residue Effects[5]	Laboratory Toxicity[6]	Field Effects[7]	Avian Predators[8]	Rank[9]	Overall Risk Probability Ranking[10]
DSY-24				++	I	+		-	+	L	Intermediate
DSY-25	+	+	-	+++	I	++	+	++	+	I	Intermediate
DSY-26	+		-	+++	I	+	++	++	+	I	Intermediate
DSY-27	+++	+	+	+++	H	+++	-	++	+	H	High
DSY-28	+		+	++	L	+	++	+	++	I	Intermediate
DSY-29	+++	+	+	++	H	+++	++	+++	++	H	High
DSY-30	+		+		L		-	+		B	Low
DSY-31	+++	+	-	+	I	+	+	+	+	L	Intermediate
DSY-32	+	+	-	+	L	+	+	++	+	L	Low
DSY-33	-	+	+	+	L	++	+	++	+	I	Intermediate
DSY-34	+		-	+	L	+	-	-	+	L	Low
DSY-35	-		+	+	L	++	-	-	+	L	Low
DSY-36	+	+	-	++	L	+	-	+	++	L	Low
DSY-37	+	+	+	+	L	+	+	-	+	L	Low
DSY-38	+	+	-	+	L	++	+	+	+	L	Low
DSY-39	+	+	-	+	L	++	+	+	+	L	Low
DSY-40	+	+	-	+	L	+	-	+++	+	I	Intermediate
DSY-41	-	+	-	+	L	+	+	+++	+	I	Intermediate
JPC-1	-	+	-		B	+++	-	-	+	I	Low
JPC-2	-		+		B		-	-	+	B	Baseline
CHC-1						+++		-		I	Intermediate

1- Sediment Hazard Quotient Risk Ranking: see Table 6.6-1.
2- Elutriate Hazard Quotient Risk Ranking: see Table 6.6-1.
3- SEM and AVS Risk Ranking: see Table 6.6-1.
4- Tissue Concentration Ratios Risk Ranking: see Table 6.6-1.
5- Tissue-based Risk Ranking: Based on Site vs. Reference Tissue Concentration Ratio (Table 6.6-1), Tissue Screening Concentration (Table 6.6-2) and Critical Body Residues (Table 6.6-2).
6- Laboratory Toxicity Risk Ranking: see Table 6.6-2.
7- Field Effects Ranking: Based on results of Condition Index, Benthic Community Structure, Hematopoietic neoplasia, cytochrome P450, and fecal pollution indicators; see Table 6.6-2.
8- Avian Predator effects ranking based on Toxicity Reference Value Hazard Quotients; see Table 6.6-2.
9- Overall Exposure/Effects (E/E) Ranking:
B = Baseline Risk; L = Low Risk Probability; I = Intermediate Risk Probability; H = High Risk Probability.
B = Low (+) E/E ranking observed for only one indicator or baseline E/E ranking observed for all indicators;
L = Intermediate (++) E/E ranking observed for only one indicator or low (+) E/E ranking observed for two or more indicators;
I = High (+++) E/E ranking observed for only one indicator or intermediate (++) E/E ranking observed for two or more indicators;
H = Intermediate (++) or greater E/E ranking observed for two indicators including high (+++) E/E ranking observed for one indicator.
10- Overall Risk Ranking (See also Section 6.6):
Baseline = No greater than Baseline (B) ranking for E/E WoE summaries;
Low = No greater than Low (L) ranking for E/E WoE summaries;
Intermediate = No greater than Intermediate (I) ranking for E/E WoE summaries, or High (H) ranking for one WoE and no greater than Low (L) ranking for the other WoE summary;
High = High (H) ranking for one WoE summary and Intermediate (I) or greater ranking for the other WoE summary.

Table 4.2-3. Concentrations of three trace metals in sediments collected in August, 1987 near Pier I, Derecktor Shipyard. Source: USACE, 1987.

Sample	Cu (ppm)	Pb (ppm)	Zn (ppm)
1815	926	320	537
1816	183	86	288
1817	145	103	261
1818	146	76	303
1819	339	212	496
1820	3116	231	473
1821	315	91	420
1822	322	123	477
1823	262	291	504
1824	279	196	529
1825	139	90	216
1826	163	126	259
1827	1188	502	630
1828	684	654	617
1829	87	304	528
1830	148	146	522
1831	162	70	333
1832	456	700	580
1833	148	65	244
1834	228	65	564

Table 5.3-1. Biological Condition Scoring Criteria for assessment of benthic communities in the Derecktor Shipyard/Coddington Cove Study Area.

Habitat	Metric	Biological Condition Scoring Criteria[1]			
		1st Quartile (0 pts.)	2nd Quartile (2 pts.)	3rd Quartile (4 pts.)	4th Quartile (6 pts.)
Silt	Total Species Observed[4]	< 0.67	0.67 - 0.81	0.81 - 0.86	> 0.86
	Total Individuals[4]	< 1.74	1.74 - 2.17	2.17 - 2.85	> 2.85
	%Dominant Taxa[3]	> 0.88	0.71 - 0.88	0.59 - 0.71	< 0.59
	Margalef Species Richness[4]	< 0.60	0.60 - 0.66	0.66 - 0.76	> 0.76
	Shannon-Wiener Diversity[4]	< 0.31	0.31 - 0.41	0.41 - 0.70	> 0.70
	Pielou's Evenness[4]	< 0.39	0.39 - 0.57	0.57 - 0.76	> 0.76
	Bray-Curtis Similarity[2]	< 46.0	46.0 - 54.0	54.0 - 61.5	> 61.5
Overall Silt Benthic Metric Ranking:[5]		< 0.3	0.3 - 0.38	0.38 - 0.67	> 0.67
Sand	Total Species Observed[4]	< 0.04	0.04 - 0.27	0.27 - 0.46	> 0.46
	Total Individuals[4]	< 0.03	0.03 - 0.25	0.25 - 0.45	> 0.45
	%Dominant Taxa[3]	> 0.29	0.28 - 0.29	0.27 - 0.28	< 0.27
	Margalef Species Richness[4]	< 0.35	0.35 - 0.48	0.48 - 0.57	> 0.57
	Shannon-Wiener Diversity[4]	< 0.72	0.72 - 0.80	0.80 - 0.87	> 0.87
	Pielou's Evenness[4]	< 1.02	1.02 - 1.09	1.09 - 1.16	> 1.16
	Bray-Curtis Similarity[2]	< 6.00	6.00 - 27.0	27.0 - 38.3	> 38.3
Overall Sand Benthic Metric Ranking:[5]		< 0.08	0.08 - 0.48	0.48 - 0.69	> 0.69

1 - Scoring estimated as quartile distribution of habitat and metric specific site data.
2 - Quartile based on range of values obtained; a comparison to reference is incorporated into index.
3 - Scoring evaluates actual % contribution, not percent comparability to reference location.
4 - Score is a ratio of study site to reference location.
5 - Expressed as decimal fraction of total possible points (42 pts. total) - no point score assigned to this ranking

Table 5.3-2. Distribution of the 20 most common benthic invertebrate species in silt- and sand-bottom habitats at the Derecktor Shipyard/ Coddington Cove (DSY) study area stations and the Jamestown Potter Cove (JPC) reference locations.

A. SILT-BOTTOM HABITATS[3]

Class	Species	Abundance (no./ 0.05 m²)[1] Stations DSY-27	DSY-28	DSY-29	DSY-30	DSY-31	DSY-32	DSY-34	DSY-36	DSY-37	DSY-38	DSY-39	Site Mean	REF JPC-2
AMPHIPODA	*Ampelisca abdita/vadorum*	0	5	2	5	0	0	1	0	0	0	0	1.2	0
	Leptocheirus pinguis	1	1	0	0	0	0	0	0	14	0	0	1.5	0
BIVALVIA	*Macoma tenta*	4	16	0	0	27	0	37	17	14	0	21	12.2	0
	Mulinia lateralis	0	12	0	8	9	0	7	3	11	0	20	6.2	0
	Nucula annulata	595	431	0	192	740	818	441	1246	359	860	2299	725.3	198
	Pitar morrhuanus	0	1	0	0	0	0	2	3	4	0	8	1.5	4
	Tellina agilis	6	11	0	10	5	0	0	0	7	7	17	5.5	0
	Yoldia limatula	0	7	0	0	9	0	2	7	7	5	0	3.3	5
GASTROPODA	*Acteocina canaliculata*	2	0	0	8	13	0	7	15	17	0	1	5.6	0
	Acteon punctostriatus	2	0	0	8	7	1	7	4	8	0	0	3.2	0
	Cylichnella oryza	9	0	0	20	27	3	10	8	53	4	39	15.6	3
	Nassarius trivittatus	3	10	0	0	16	8	0	6	3	14	11	6.4	1
NEMERTINEA	*Tubulanus pellucidus*	5	0	0	5	4	7	20	2	11	1	2	5.0	0
OLIGOCHAETA	*Oligochaeta spp.*	0	68	0	22	5	0	3	0	0	0	0	8.8	0
POLYCHAETA	*Mediomastus ambiseta*	45	250	0	228	193	281	88	35	173	83	29	127.5	23
	Nephtys incisa	11	13	0	12	19	19	24	27	31	23	56	21.1	15
	Ninoe nigripes	11	0	0	5	4	3	5	7	13	7	3	5.0	0
	Spio spp.	0	0	0	0	0	2	4	0	0	0	3	0.8	0
	Streblospio benedicti	0	12	0	0	0	0	0	0	0	0	0	1.1	0
	Tharyx acutus	0	9	0	4	0	0	0	1	1	1	0	1.4	0
BENTHIC	Total Species[2]	13 +++	18 +	1 +++	15 ++	19 -	11 +++	18 +	17 ++	23 -	16 ++	18 +	15.4	21
COMMUNITY	Total Individuals[2]	700 ++	849 ++	2 +++	532 +++	1082 +	1148 -	661 +++	1384 -	739 ++	1012 +	2519 -	966	392
METRICS/	%Dominant Taxa	0.85 ++	0.51 -	1.00 +++	0.43 -	0.68 +	0.71 ++	0.67 +	0.90 +++	0.49 -	0.85 ++	0.91 +++	0.73	0.51
RANK	Margalef Species Richness[2]	1.8 +++	2.5 +	0.0 +++	2.2 +	2.6 -	1.4 +++	2.6 -	2.2 ++	3.3 -	2.2 ++	2.2 ++	2.1	3.4
	Shannon-Wiener Diversity[2]	0.7 ++	1.4 -	0.0 +++	1.6 -	1.2 +	0.8 ++	1.3 +	0.6 +++	1.8 -	0.7 ++	0.5 +++	0.95	1.97
	Pielou's Evenness[2]	0.3 ++	0.5 -		0.6 -	0.4 +	0.3 ++	0.5 +	0.2 +++	0.6 -	0.2 +++	0.2 +++	0.37	0.65
	Bray-Curtis Similarity Index (%)[2]	56 +	45 +++	0 +++	54 +	64 -	38 +++	64 -	59 +	65 -	47 ++	54 +	50	NA
Overall Silt Benthic Metric Ranking:[4]		0.29 +++	0.67 +	0.00 +++	0.67 +	0.81 -	0.29 +++	0.67 +	0.33 ++	0.90 -	0.33 ++	0.38 ++		

1 - Mean of two replicate grabs per station.
2 - 1st quartile (0 pts.) = "+++"; 2nd quartile (2 pts.) = "++"; 3rd quartile (4 pts.) = "+"; 4th quartile (6 pts.) = "-". See Table 5.3-1 for metric specific point assignments.
3 - Sediment composition < 40% sand, except JPC-2 = 65% sand and DSY-37 = 50% sand.
4 - Overall Benthic Metric Ranking: expressed as decimal fraction of total possible points (42); see Table 5.3-1.

Table 5.3-2 (continued). Distribution of the 20 most common benthic invertebrate species in silt- and sand-bottom habitats at the Derecktor Shipyard/Coddington Cove (DSY) study area stations and the Jamestown Potter Cove (JPC) reference locations.

B. SAND-BOTTOM HABITATS[3]

		Abundance (no./ 0.05 m²)[1]													
		Stations												Site	REF
Class	Species	DSY-25		DSY-26		DSY-33		DSY-35		DSY-40		DSY-41		Mean	JPC-1
AMPHIPODA	*Ampelisca abdita/vadorum*	0		2		0		0		4		0		1.0	16
	Leptocheirus pinguis	0		0		79		0		0		0		13.1	0
	Photis pollex	0		0		27		0		0		0		4.4	0
BIVALVIA	*Gemma gemma*	0		0		0		41		0		0		6.8	0
	Nucula annulata	0		12		10		0		12		0		5.7	4
	Tellina agilis	0		25		0		29		0		0		8.9	24
GASTROPODA	*Crepidula plana*	0		10		0		0		0		0		1.7	0
OLIGOCHAETA	*Oligochaeta spp.*	0		6		96		27		0		0		21.4	106
POLYCHAETA	*Aricidea catherinae*	0		0		23		66		0		0		14.8	55
	Glycera americana	0		12		10		10		3		0		5.8	16
	Macroclymene zonalis	0		5		4		0		0		0		1.4	9
	Mediomastus ambiseta	0		48		163		0		13		0		37.2	94
	Montocellina baptisteae	0		12		44		0		0		0		9.3	2
	Neanthes succinea	0		0		0		0		11		0		1.8	0
	Nephtys incisa	0		0		8		0		0		0		1.3	0
	Ninoe nigripes	0		15		57		0		0		0		12.0	7
	Polycirrus eximius	0		9		18		0		0		0		4.4	2
	Spiophanes bombyx	0		0		0		15		0		0		2.5	0
	Tharyx acutus	0		8		0		0		0		0		1.3	5
	Tharyx crochet	0		0		0		8		0		0		1.3	0
BENTHIC	Total Species[2]	0	+++	19	-	25	-	14	+	7	++	0	+++	10.8	39
COMMUNITY	Total Individuals[2]	0	+++	177	+	574	-	212	-	49	++	0	+++	168.5	450
METRICS/	%Dominant Taxa			0.27	-	0.28	++	0.31	+++	0.26	-			0.28	0.24
RANK	Margalef Species Richness[2]			3.5	+	3.8	-	2.4	++	1.5	+++			2.81	6.2
	Shannon-Wiener Diversity[2]			2.5	-	2.3	+	2.0	++	1.8	+++			2.13	2.7
	Pielou's Evenness[2]			0.8	+	0.7	+++	0.8	++	0.9	-			0.80	0.7
	Bray-Curtis Similarity Index (%)[2]	0	+++	46	-	41	-	30	+	24	++	0	+++	23.5	NA
Overall Sand Benthic Metric Ranking:[4]		0.00	+++	0.86	-	0.71	-	0.48	+	0.43	++	0.00	+++		

1 - Mean of two replicate grabs per station.
2 - 1st quartile (0 pts.) = "+++"; 2nd quartile (2 pts.) = "++"; 3rd quartile (4 pts.) = "+"; 4th quartile (6 pts.) = "-". See Table 5.3-1 for metric specific point assignments.
3 - Sediment composition ≥ 70% sand.
4 - Overall Benthic Metric Ranking: expressed as decimal fraction of total possible points (42); see Table 5.3-1.

Table 6.6-1. Summary of Exposure-based Weights of Evidence for the Derecktor Shipyard Marine Ecological Risk Assessment.

	Sediment Hazard Quotients (HQs)[1]																													Elutriate HQs[2]					SEM[3]	Tissue Concentration Ratios[4]						
	PAHs[1A]																PCBs[1]	PST[1A]	BT[1B]	Metals[1A]																						
Station	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	HMW PAHs	LMW PAHs	Naphthalene	Phenanthrene	Pyrene	Total PAHS	Total PCBs	p,p'-DDE	Tributyltin	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	Exposure Ranking[5]	Total PCBs	Arsenic	Copper	Lead	Exposure Ranking[5]	Exposure Ranking[5]	Cunner	Deployed Mussels	Indigenous Mussels	Lobster	Mercenaria	Pitar	Exposure Ranking[5]
DSY-24																																						++				++
DSY-25	-	+	+	+	+	-	+	-	-	+	+	+	-	+	-	+	+	-	-	-	-	-	-	-	-	+	-	-	+	+	-	+		+	-			+++	++			+++
DSY-26	-	-	+	+	+	+	+	-	+	+	+	+	-	+	+	+	+	-	-	+	-	-	+	-	-	-	-	-	+						-	++	++	+++				+++
DSY-27	-	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+++	+	+	+	-	+	+	+	+	+	-	++	+++	+				+	+			+++	++			+++
DSY-28	-	+	+	+	+	-	-	+	-	+	+	+	-	-	-	+	+	-	++	+	-	-	+	+	+	+	-	+	+						+	++	+	++	++			++
DSY-29	+	+	+	++	++	++	++	++	+	+	++	++	-	++	+++	+	+++	+	++	+	+	+	+	+	+	+	-	+	+++	+			+	+	+	++	+		++			++
DSY-30	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	++	+	+	+	+	-	+	+	+	+	-	+	+						+							
DSY-31	-	+	+	+	+	-	+	-	-	+	+	+	-	-	+	+	++	-	+++	+	-	-	+	+	+	+	-	+	+++	-	-	++	+	+	-		+				+	+
DSY-32	-	-	+	+	+	+	+	+	-	+	+	+	-	-	+	+	++	+	-	+	-	+	+	+	+	+	-	+	+	+	-	+	+	+	-						+	+
DSY-33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	+	+		+		++		+	+
DSY-34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	+	-	-	-	+						-						+	+
DSY-35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						+			+	+	++	+	+
DSY-36	-	-	+	+	-	-	-	-	-	-	+	-	-	-	-	-	+	+	+	+	-	+	+	+	+	+	-	-	+	-	+	+	+	+	-	++		+	++		+	++
DSY-37	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	+	-	-	-	+	+	-	+	+	+	+						+	+
DSY-38	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	+	+	+	-	-	+	-	+	+	+	+	-		+		+		+	+
DSY-39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	+	-	++	+	+	+	-		+		+			+
DSY-40	-	+	+	+	-	-	+	-	+	+	+	+	-	+	+	+	+	-	-	-	-	-	-	-	+	-	-	-	+	+	-	+	+	+	-		+	+				+
DSY-41[6]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-					+	-					++	+	+
JPC-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	+	-	+	-							
JPC-2																			-	-	-	-	-	+	-	-	-	-	-						+							
CHC-1																																										

PAH = Polycyclic Aromatic Hydrocarbons; PCB = Polychlorinated Biphenyls; PST = Pesticides; BT = Butyltins; SEM = Simultaneously Extractable Metals;
WQC = EPA Water Quality Criteria; LMW = Low Molecular Weight; HMW = High Molecular Weight.
Exposure rankings for stations for which only one indicator observation was available are equal to the indicator observation ranking.
1- Benchmark for PCBs, PAHs, PST = NOAA ER-L/ER-M (Long et al., 1995); TBT benchmark = 5 ng Sn/g dry wt. (lower, Macauley et al., 1994) and 50 ng Sn/g dry wt. (upper).
1A - Hazard Quotient Codes for Sediment Concentrations: < ER-L = "-" ; ER-L to ER-M = "+" ; >=ER-M = "++"; >=2x ER-M = "+++".
1B - Tributyltin Codes: lower HQ<1 = "-"; lower HQ>=1 = "+"; upper HQ>=1 = "++"; upper HQ>=2 = "+++".
2 - Analytes included for which WQC are available and CoCs were above detection.
Hazard Quotient Codes for Elutriate Concentrations: < WQC-Chronic = - ; WQC-Chronic to Acute = "+" ; > WQC-Acute = "++"; "+++" = > 2 x WQC-Acute.
3 - SEM Bioavailability Codes (see Table 6.1-1).
Exposure Ranking: "-" = no exposure, "+" = exposure seen in one indicator, "++" = exposure seen in two indicators, "+++" = exposure in all indicators.
4 - Site vs. Reference Tissue Concentration Ratios (TCRs; Table 6.2-1).
TCR Codes: TCR>=10 = "+++"; TCR>=3 = "++"; TCR>1 = "+"; TCR<1 or TCR=1 = "-".
5 - Exposure Ranking: "+++" = intermediate (++) or higher exposure observed for two or more indicators, one of which indicates high (+++) exposure;
"++" = intermediate (++) exposure observed for two or more indicators or high (+++) exposure for one indicator; "+" = low (+) exposure observed for two or more indicators or intermediate (++) exposure for one indicator; "-" = low (+) exposure observed for only one indicator or no exposure for all indicators. See text in Section 6.6.
6 - No data available for elutriate exposure at Station DSY-41; ranking assumed to be the same as Station DSY-40 due to spatial proximity to Station DSY-40.

Table 6.6-2. Summary of Effects-based Weights of Evidence for the Derecktor Shipyard Marine Ecological Risk Assessment.

	Tissue Residue Effects[1]							Laboratory Toxicity[2]				Field Effect Indicators[3]						Avian Predator[4]		
Station	Cunner	Deployed Mussels	Indigenous Mussels	Lobster	*Mercenaria*	*Pitar*	Effects Ranking[5]	*Ampelisca* Survival	*Arbacia* Fertilization	*Arbacia* Development	Effects Ranking[5]	Benthic Community Structure[3A]	Bivalve Condition Index[3B]	Hematopoietic neoplasia[3C]	Cytochrome P450[3D]	Fecal Pollution Indicators[3E]	Effects Ranking[5]	Herring Gull	Great Blue Heron	Effects Ranking[5]
DSY-24			+				+						-				-	+	+	+
DSY-25			+	+++			++	-	-	*++	+	+++	-		+		++	+	+	+
DSY-26	++	+	+				+	-	-	*+++	++	-	++	++	+	++	++	+	+	+
DSY-27			++	+++			+++	*+	-	-	-	+++	-		+		++	+	+	+
DSY-28	++	+	+	-			+	*+	-	*+++	++	+	-		+	-	+	++	++	++
DSY-29	++	+		+++			+++	-	-	*+++	++	+++	++	+	+++	+	+++	++	++	++
DSY-30								-	-	-	-	+			+		+			
DSY-31		+				+	+	-	-	*++	+	-	++	-	+	-	+	+	+	+
DSY-32						+	+	-	-	*++	+	+++			+		++	+	+	+
DSY-33		+		+++		+	++	-	-	*++	+	-	++		-	++	++	+	+	+
DSY-34						+	+	-	-	-	-	+			-		-	+	+	+
DSY-35			+	+++	+	+	++	-	-	-	-	+	-	-	-		-	+	+	+
DSY-36	++		+	++		+	+	-	-	*+	-	++	-	-	+		+	++	++	++
DSY-37						+	+	-	-	*++	+	-			-		-	+	+	+
DSY-38		+		+++		+	++	-	-	*++	+	++	-		-	+	+	+	+	+
DSY-39		+		+++			++	-	-	*++	+	++	-		-	+	+	+	+	+
DSY-40		+	+				+	-	-	*+	-	++	-	+	+	+++	+++	+	+	+
DSY-41[6]					++	+	+	-	-	*++	+	+++			-	+++	+++	+	+	+
JPC-1	++	+	+	+++	+	+	+++	-	-	-	-	-	-		-	+	-	+	+	+
JPC-2								-	-	-	-	-					-	+	+	+
CHC-1	++	+	+	+++			+++						-			+	-			

Effects rankings for stations for which only one indicator observation was available are equal to the indicator observation ranking.

1- Assessment of possible adverse effects due to CoCs in target species tissues; see Table 6.2-4.

2- Reduced survival, fertilization or development in bioassay species exposed to sediments or sediment elutriates. See Table 5.2-1 for test-specific ranks.

3- Reduced fitness in field species exposed to sediments or sediment elutriates.

3A - see Tables 5.3-1 and 5.3-2.

3B - see Figure 5.3-9.

3C - see Table 5.3-4.

3D - see Section 6.5 text and Figure 6.5-9.

3E - see Table 5.3-5.

4 - Toxicity Reference Value Hazard Quotient (TRV-HQ); see Table 6.3-4.

5 - Effects Ranking: "+++" = intermediate (++) or higher effect observed for two or more indicators, one of which indicates high (+++) effect; "++" = intermediate (++) effect observed for two or more indicators or high (+++) effect for one indicator; "+" = low (+) effect observed for two or more indicators or intermediate (++) effect for one indicator; "-" = low (+) effect observed for only one indicator or no effect for all indicators. See text in Section 6.6.

6 - No data available for fecal pollution indicator effects at Station DSY-41; ranking assumed to be the same as Station DSY-40 due to spatial proximity to Station DSY-40.

Table 6.6-3. Overall Summary of Exposure and Effects-based Weights of Evidence and Characterization of Risk for the Derecktor Shipyard Marine Ecological Risk Assessment.

	WEIGHTS OF EVIDENCE										
	EXPOSURE					EFFECTS					
Station	Sediment Hazard Quotients[1]	Elutriate HQs[2]	SEM and AVS[3]	Tissue Conc. Ratio[4]	Rank[9]	Tissue Residue Effects[5]	Laboratory Toxicity[6]	Field Effects[7]	Avian Predators[8]	Rank[9]	Overall Risk Probability Ranking[10]
DSY-24				++	I	+		-	+	L	Intermediate
DSY-25	+	+	-	+++	I	++	+	++	+	I	Intermediate
DSY-26	+		-	+++	I	+	++	++	+	I	Intermediate
DSY-27	+++	+	+	+++	H	+++	-	++	+	H	High
DSY-28	+		+	++	L	+	++	+	++	I	Intermediate
DSY-29	+++	+	+	++	H	+++	++	+++	++	H	High
DSY-30	+		+		L		-	+		B	Low
DSY-31	+++	+	-	+	I	+	+	+	+	L	Intermediate
DSY-32	+	+	-	+	L	+	+	++	+	L	Low
DSY-33	-	+	+	+	L	++	+	++	+	I	Intermediate
DSY-34	+		-	+	L	+	-	-	+	L	Low
DSY-35	-		+	+	L	++	-	-	+	L	Low
DSY-36	+	+	-	++	L	+	-	+	++	L	Low
DSY-37	+	+	+	+	L	+	+	-	+	L	Low
DSY-38	+	+	-	+	L	++	+	+	+	L	Low
DSY-39	+	+	-	+	L	++	+	+	+	L	Low
DSY-40	+	+	-	+	L	+	-	+++	+	I	Intermediate
DSY-41	-	+	-	+	L	+	+	+++	+	I	Intermediate
JPC-1	-	+	-		B	+++	-	-	+	I	Low
JPC-2	-		+		B		-	-	+	B	Baseline
CHC-1						+++		-		I	Intermediate

1- Sediment Hazard Quotient Risk Ranking: see Table 6.6-1.
2- Elutriate Hazard Quotient Risk Ranking: see Table 6.6-1.
3- SEM and AVS Risk Ranking: see Table 6.6-1.
4- Tissue Concentration Ratios Risk Ranking: see Table 6.6-1.
5- Tissue-based Risk Ranking: Based on Site vs. Reference Tissue Concentration Ratio (Table 6.6-1), Tissue Screening Concentration (Table 6.6-2) and Critical Body Residues (Table 6.6-2).
6- Laboratory Toxicity Risk Ranking: see Table 6.6-2.
7- Field Effects Ranking: Based on results of Condition Index, Benthic Community Structure, Hematopoietic neoplasia, cytochrome P450, and fecal pollution indicators; see Table 6.6-2.
8- Avian Predator effects ranking based on Toxicity Reference Value Hazard Quotients; see Table 6.6-2.
9- Overall Exposure/Effects (E/E) Ranking:
B = Baseline Risk; L = Low Risk Probability; I = Intermediate Risk Probability; H = High Risk Probability.
Rankings for stations for which only one WoE observation was available are equal to the WoE observation ranking.
B = Low (+) E/E ranking observed for only one indicator or baseline E/E ranking observed for all indicators;
L = Intermediate (++) E/E ranking observed for only one indicator or low (+) E/E ranking observed for two or more indicators;
I = High (+++) E/E ranking observed for only one indicator or intermediate (++) E/E ranking observed for two or more indicators;
H = Intermediate (++) or greater E/E ranking observed for two indicators including high (+++) E/E ranking observed for one indicator.
10- Overall Risk Ranking (See also Section 6.6):
Baseline = No greater than Baseline (B) ranking for E/E WoE summaries;
Low = No greater than Low (L) ranking for E/E WoE summaries, or Intermediate (I) ranking for one WoE summary and no greater than Baseline (B) ranking for the other WoE summary;
Intermediate = No greater than Intermediate (I) ranking for E/E WoE summaries, or High (H) ranking for one WoE and no greater than Low (L) ranking for the other WoE summary;
High = High (H) ranking for one WoE summary and Intermediate (I) or greater ranking for the other WoE summary.

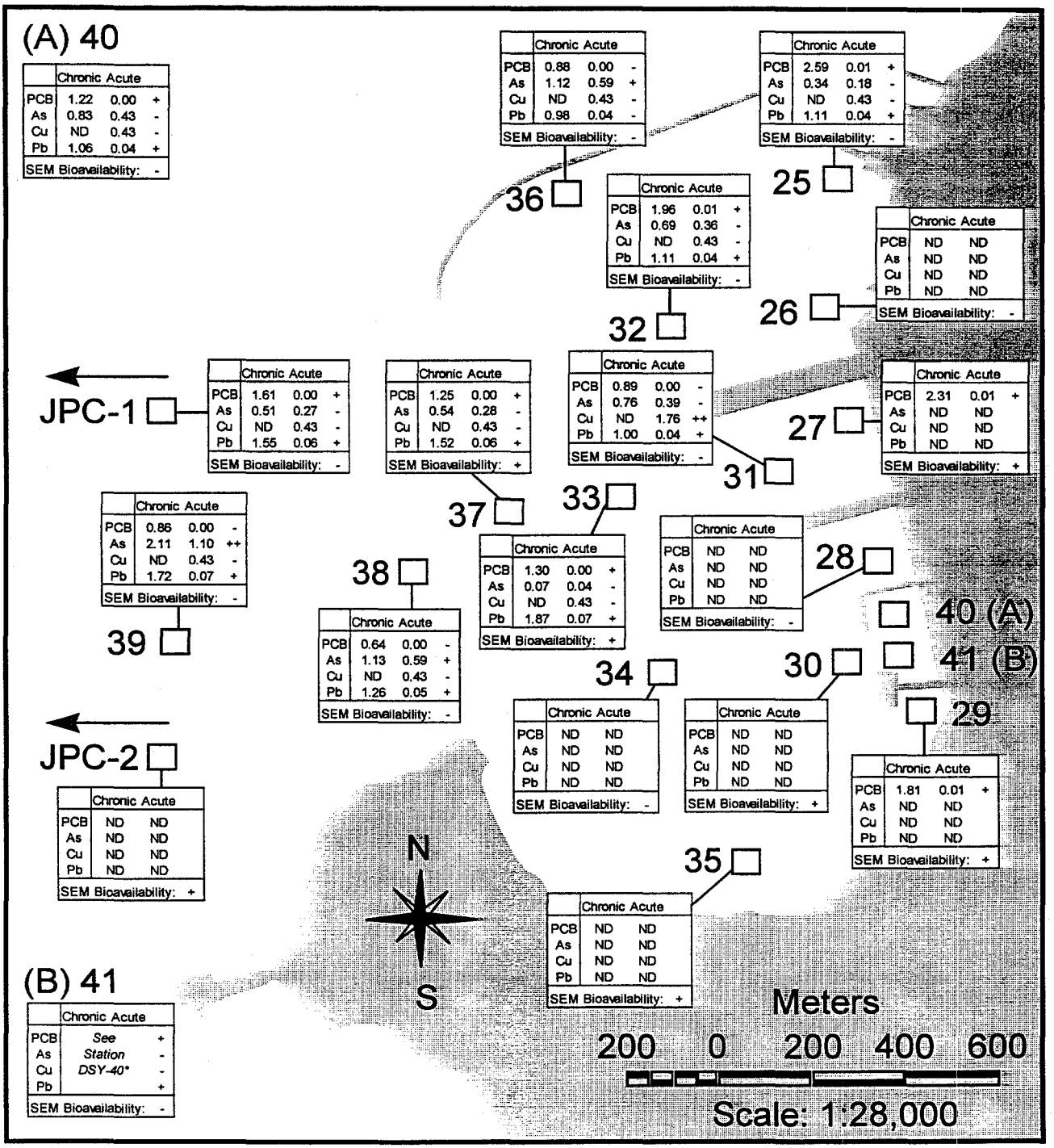


Figure 1.6-2. SEM Bioavailability and Hazard Quotients for elutriates prepared from sediments collected in the Derecktor Shipyard/Coddington Cove study area and Jamestown Potter Cove (JPC) reference stations. Benchmarks for elutriates=EPA Water Quality Criteria- Saltwater Chronic and Saltwater Acute values. As=arsenic; Cu=copper; Pb=lead; PCB=Total PCBs. Refer to Section 6.1 for discussion of the sediment elutriate weight of evidence and explanation of rankings. Refer to Section 6.4 for discussion of the Simultaneously Extractable Metals (SEM) Bioavailability weight of evidence and explanation of rankings. *No data available for elutriate exposure at Station DSY-41; ranking assumed to the same as for Station DSY-40 due to spatial proximity to Station DSY-40.

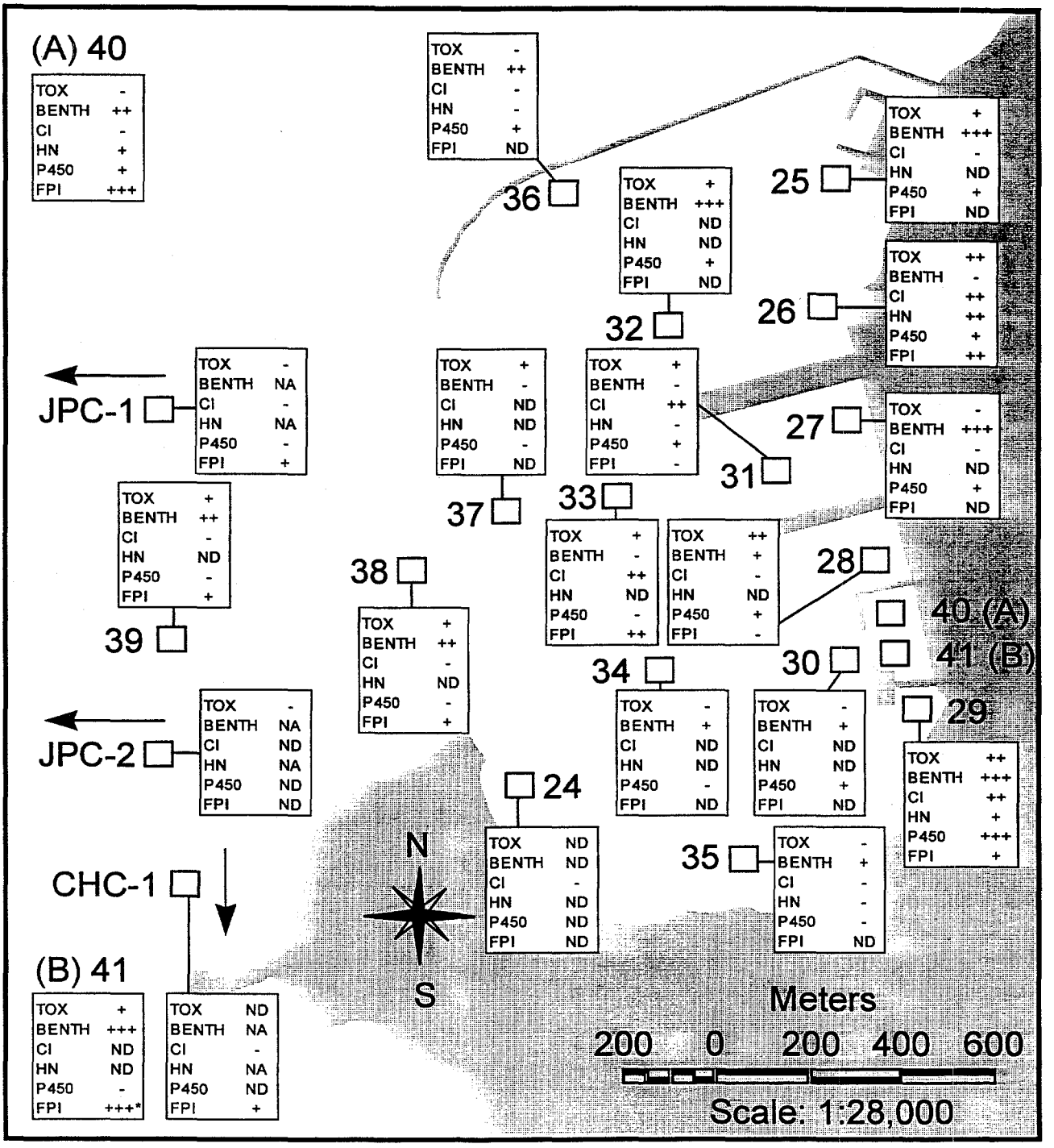
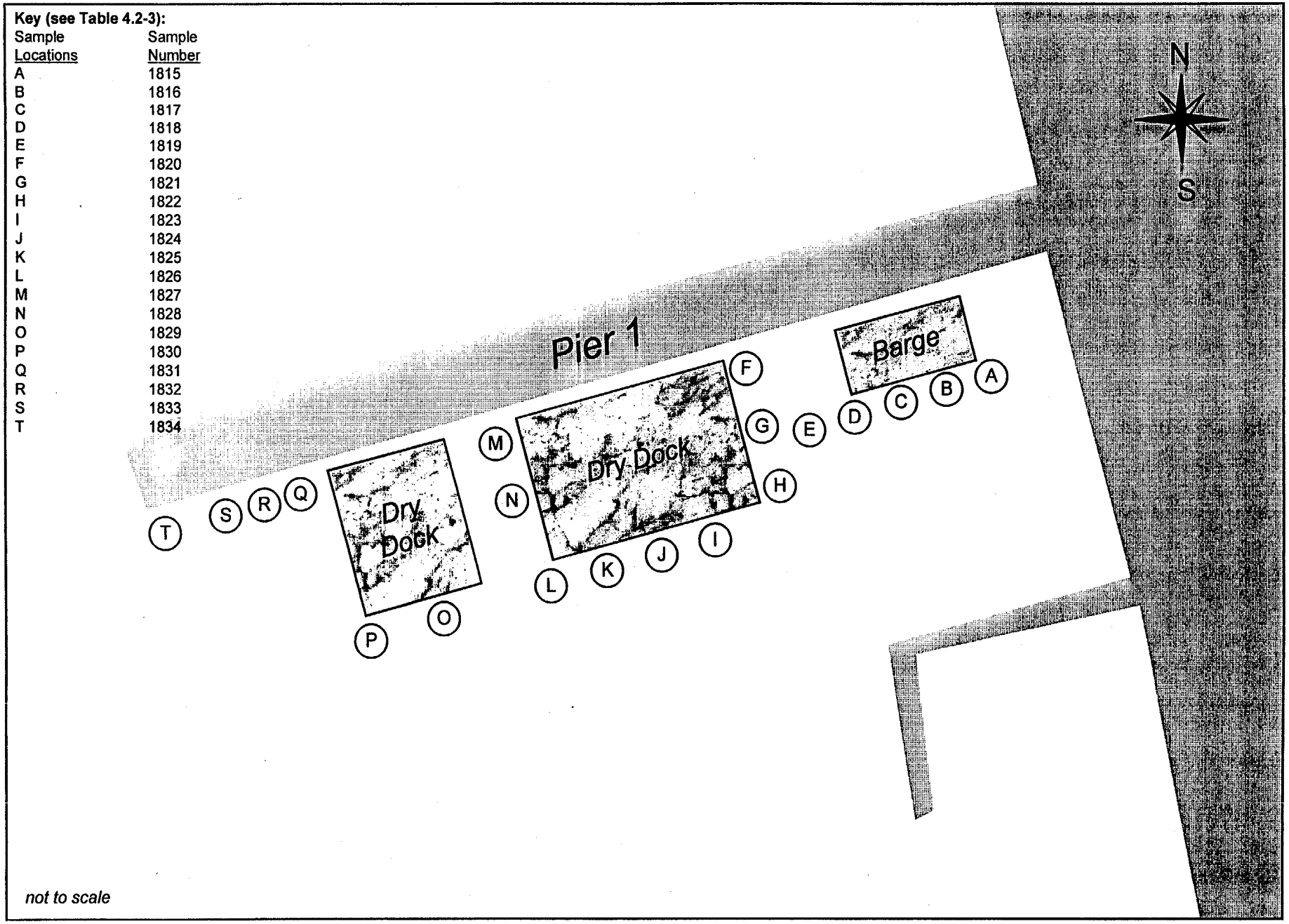


Figure 1.6-4. Field Effects Indicators and Overall Laboratory Toxicity results for the Derecktor Shipyard/Coddington Cove study area and Jamestown Potter Cove (JPC) and Castle Hill Cove (CHC) reference stations. TOX=Overall Toxicity; BENTH=Benthic Community Structure; CI=Bivalve Condition Indices; HN=Hematopoietic Neoplasia; P450=Cytochrome P450; FPI=Fecal Pollution Indicators. ND=no data; NA=not applicable, values based on comparison to reference station values. Refer to Sections 5.2 and 6.4 for discussion of Laboratory Toxicity weight of evidence and explanation of risk rankings. Refer to Sections 5.3 and 6.5 for discussion of Field Effects weight of evidence and explanation of risk rankings. *No data available for fecal pollution indicator effects at Station DSY-41; ranking assumed to be the same as for Station DSY-40 due to spatial proximity to Station DSY-40.

Figure 4.2-8. Sampling locations for sediments collected for chemical analysis near Pier 1, Derecktor Shipyard, in August, 1987. Source: USACE, 1987.



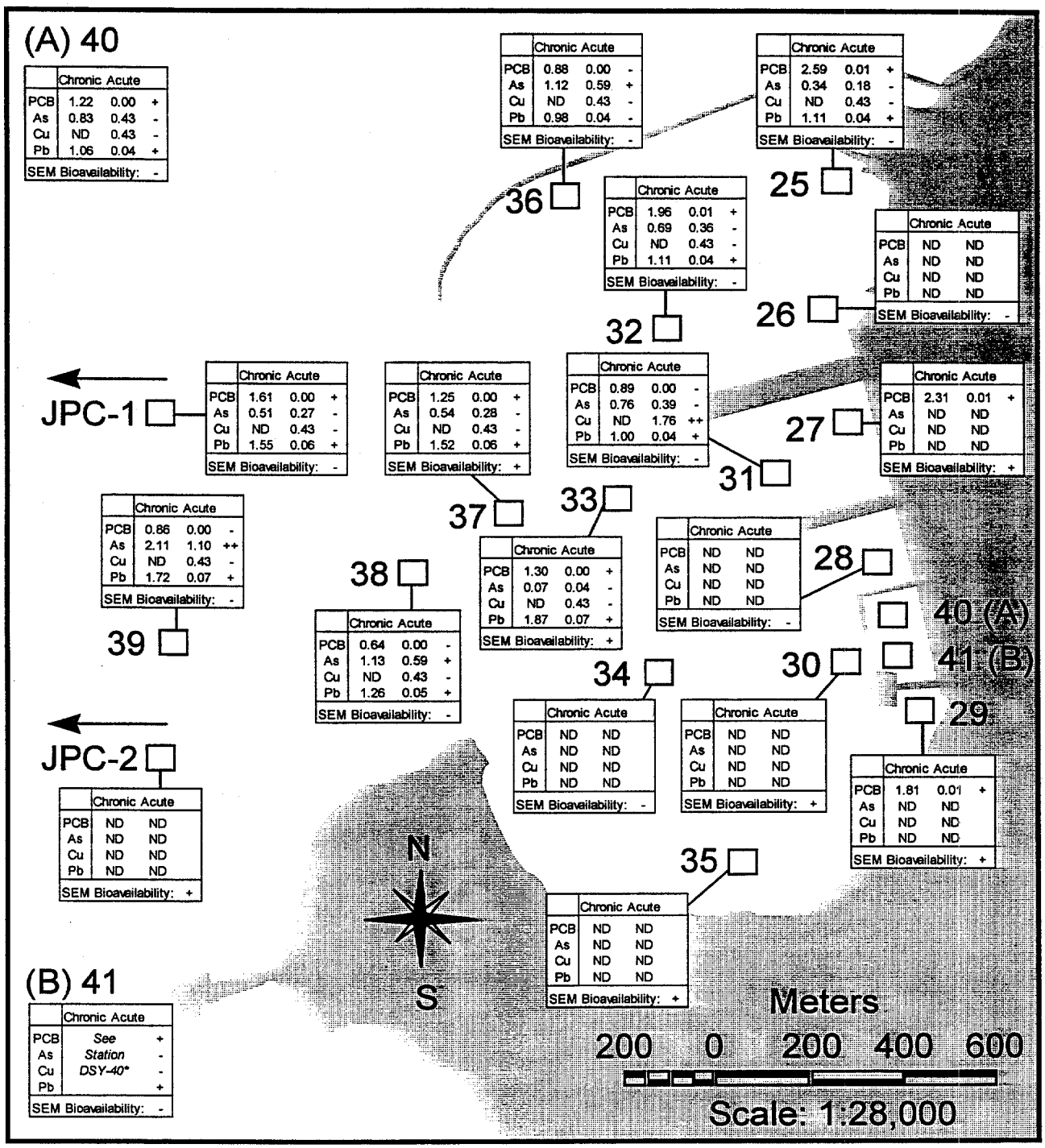


Figure 6.6-2. SEM Bioavailability and Hazard Quotients for elutriates prepared from sediments collected in the Derecktor Shipyard/Coddington Cove study area and Jamestown Potter Cove (JPC) reference stations. Benchmarks for elutriates=EPA Water Quality Criteria- Saltwater Chronic and Saltwater Acute values. As=arsenic; Cu=copper; Pb=lead; PCB=Total PCBs. Refer to Section 6.1 for discussion of the sediment elutriate weight of evidence and explanation of rankings. Refer to Section 6.4 for discussion of the Simultaneously Extractable Metals (SEM) Bioavailability weight of evidence and explanation of rankings. *No data available for elutriate exposure at Station DSY-41; ranking assumed to be the same as for Station DSY-40 due to spatial proximity to Station DSY-40.

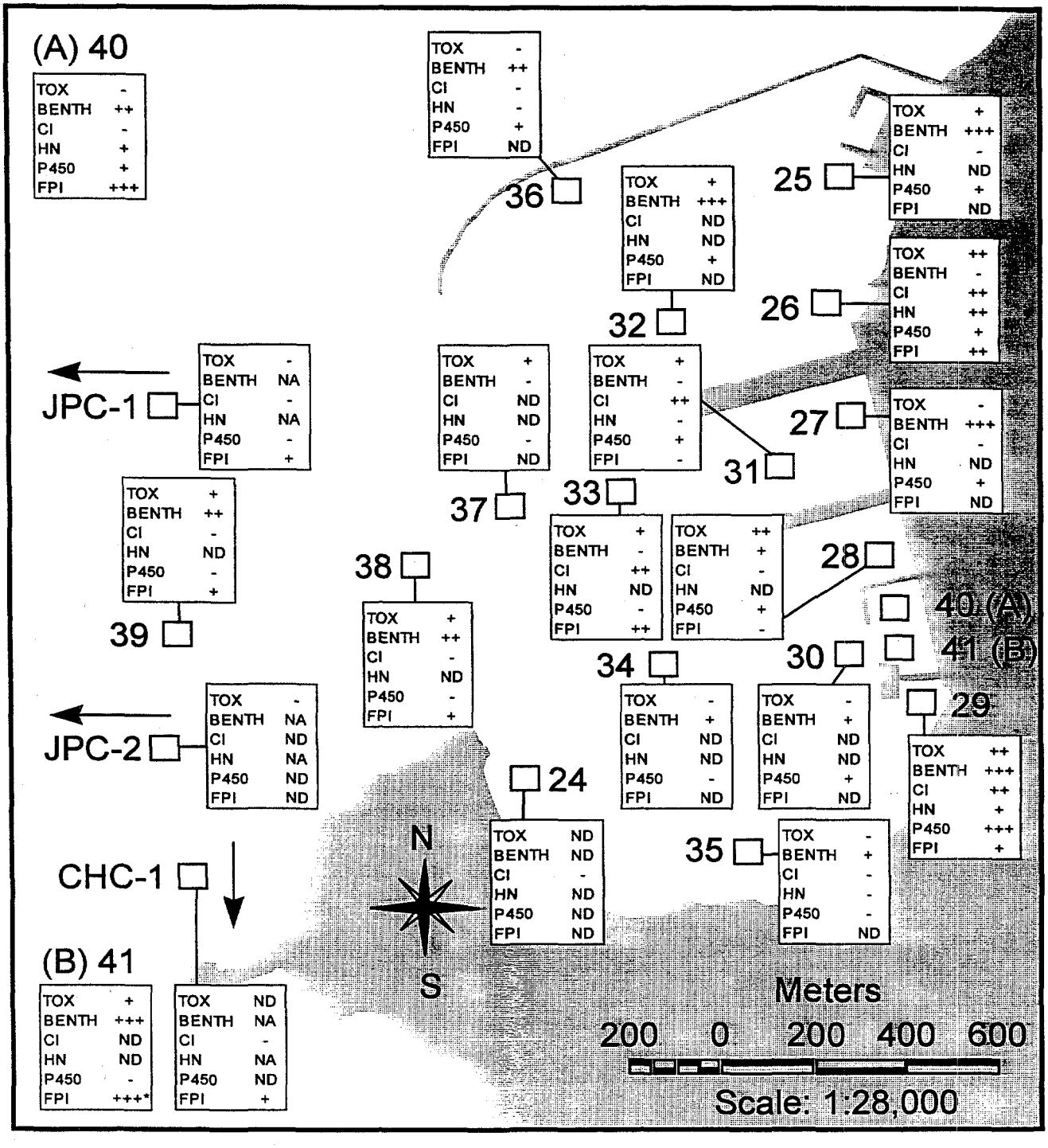


Figure 6.6-4. Field Effects Indicators and Overall Laboratory Toxicity results for the Derecktor Shipyard/Coddington Cove study area and Jamestown Potter Cove (JPC) and Castle Hill Cove (CHC) reference stations. TOX=Overall Toxicity; BENTH=Benthic Community Structure; CI=Bivalve Condition Indices; HN=Hematopoietic Neoplasia; P450=Cytochrome P450; FPI=Fecal Pollution Indicators. ND=no data; NA=not applicable, values based on comparison to reference station values. Refer to Sections 5.2 and 6.4 for discussion of Laboratory Toxicity weight of evidence and explanation of risk rankings. Refer to Sections 5.3 and 6.5 for discussion of Field Effects weight of evidence and explanation of risk rankings. *No data available for fecal pollution indicator effects at Station DSY-41; ranking assumed to the same as for Station DSY-40 due to spatial proximity to Station DSY-40.