CENPS-OP-RG

MEMORANDUM FOR RECORD 19 June 1989

SUBJECT: DECISION ON THE SUITABILITY OF DREDGED MATERIAL TESTED UNDER PSDDA CRITERIA FOR THE U.S.NAVY HOMEPORT PROJECT (OYB-2-012844) TO BE DISPOSED OF AT THE PORT GARDNER OPEN WATER DISPOSAL SITE.

1. On 5 June 1989, PSDDA agency regulatory personnel met at Seattle District to discuss and evaluate preliminary test data on the above referenced project. A subsequent data package dated June 8, 1989 was sent to the PSDDA agencies for evaluation and review. Subsequent discussions were held on 14 June 1989 on PSDDA agency evaluation of these data. The following summary reflects the PSDDA agencies (Corps, Department of Ecology, and the Environmental Protection Agency) consensus decision on the acceptability of the sampling plan and test data to make a determination of suitability of the dredged material proposed for dredging from the Element I area in the East Waterway for disposal at the Port Gardner PSDDA disposal site.

2. The PSDDA approved sampling and testing plan was followed, and quality assurance/quality control guidelines specified by PSDDA were followed. The data gathered was deemed sufficient and acceptable for regulatory decision making under the PSDDA program.

3. Chemistry data collected indicated that the 58 chemicals of concern were generally below the June 1988 PSDDA screening level (SL) values in all 31 composited samples with all analyses well below the PSDDA maximum level (ML) values. Screening level exceedences were noted as follows: L1S1C3 for Zn (400 ppm); L1S1C1 for Zn (220 ppm), Pb (79 ppm), and Indeno (1, 2, 3-cd) pyrene (110 ppm). The June 1988 SL value for Ni (28 ppm) was exceeded in all 31 composite samples/ analyses, although the concentrations measured were all well below the proposed new Ni SL of 140 ppm. The June 1988 EPTA bioaccumulation trigger value for Ni of 43 ppm was exceeded in 10 of the analyses, although the new proposed bioaccumulation trigger value for Ni is 1,022 ppm. Problems with the naturally high concentrations of Ni measured throughout Puget Sound was previously documented in PSDDA memo dated January 27, 1989 (enclosure 1) and justified not using the 1988 SL values for dredged material suitability decision making. The issue of bioaccumulation trigger exceedences of Ni has previously been discussed in a Corps memo dated May 12, 1989 (enclosure 2) that documented the rationale for not conducting bioaccumulation tests. The chemical analyses conducted also noted that quantitation limits for Hexachlorobutadiene were expressed as undetected above the PSDDA SL in composited samples L1S3C2, L1S2C1, L1S3C2, L1S1C1, and L1S1C2. Congeners of DDT and PCB were expressed as undetected at the lowest quantitation level, and total DDT and PCB (i.e., where analyzed) were all undetected below the PSDDA SL values. In the case of Hexachlorobutadiene, the results indicate limits of detection were insufficient to quantify at lower levels with the method/sample sizes used, and would have triggered the requirement to do acute bioassay testing. Since biological testing was conducted concurrently on all 31 analyses, these exceedences have no bearing on the determination of suitability for PSDDA disposal. Likewise other chemicals analyzed for under the Settlement Agreement were noted during

Table 1

review, but had no bearing on the determination discussed below, which is governed entirely by the results of the biological testing.

4. A summary of the bioassay interpretation results are given in enclosure 3. PSDDA interpretation guidelines specified in June 1988 EPTA, and Bivalve larvae/Echinoderm embryo bioassay interpretation guidelines clarified in PSDDA memorandum dated October 1988 (enclosure 4) were used to evaluate the bioassay data. Interpretation guidelines specified in enclosure 4 for the Oyster larvae/Echinoderm embryo bioassay specified necessary clarifications/changes in the mortality and abnormality performance standards for control sediment, reference sediment, and dredged material relative to those specified in June 1988 EPTA. In general the Amphipod, Echinoderm embryo, and Microtox bioassays performed well with respect to appropriate control and reference sediment (Samish Bay and Jetty Island) guidelines as specified by PSDDA. Amphipod bioassay results indicated 30 out of 31 composite samples passed, with a single statistically significant failure in L7S3C1. No toxicity was observed in any of the 31 Microtox analyses performed on the Element I material.

5. Problems with the Samish Bay reference sediment were apparent with the round 1 Geoduck tests with an average mortality of 62 percent, which was well outside the PSDDA performance standard for reference sediments (i.e., less than or equal to 20 percent absolute over the control mortality). The poor performance of the Samish Bay reference sediment for the round 1 Geoduck bioassay coupled with the large number of test sediment exceedences (12 of 17) of the control standard (greater than 20 percent absolute mortality over the control) cast serious doubt on the validity of the round 1 test results relative to a determination of a significant toxic response directly attributable to any of the chemicals of concern and/nr polar compounds quantitated in the Element I study area. These results are not inconsistent with all the previously unsuccessful experiences with the Geoduck test, and are the reason that the PSDDA agencies have not required and subsequently accepted the Geoduck test results in any previous regulatory deliberation.

6. The two apparent toxic responses noted in composite samples L3S3C1 and L6S3C1 for the Echinoderm embryo bioassay show no correspondence with responses noted for the other two PSDDA approved bioassays (i.e., Amphipod and Microtox bioassays). However, they do show a highly significant positive correlation with sediment ammonia levels ($p < 0.01$ significance level), particularly in highly reduced subsurface sediments (enclosure 5). It is noteworthy that the two highest sediment ammonia concentrations measured (35.2 ppm at L3S3C1 and 46.0 ppm at L6S3C1 (dry sample weight basis)) corresponded with the two highest and only statistically significant Echinoderm embryo mortalities observed (34.3 and 38.6 percent, respectively). Elevated ammonia concentrations in fine-grained reduced sediments are generally the result of bacterial degradation of organic nitrogen compounds. While ammonia is not listed as a chemical of concern it is a plant nutrient, which when elevated can significantly increase toxicity in bioassays. Ammonia generally results from the decomposition of nitrogenous organic matter, and is one of the major constituents of the complex nitrogen cycle. Ammonia toxicity in dredged material is acknowledged in a laboratory environment, but at a disposal site would be transitory and short lived (i.e., hours or less) due to rapid dilution in the surrounding water (Burkes and Engler, 1978). Ammonia toxicity

has been well documented in the literature for Echinoderm embryo(s)/larvae and effects found are more pronounced in larvae (pluteus stage) than during the gastrulation stage of development (Kobayashi, 1984). The Echinoderm embryo/larval test measures successful larval attainment of the pluteus stage. Concentrations of ammonia as low as 1 to 3.2 ppm were associated with arrested fertilization and development in various sea urchin eggs in a study by Kobayashi (1984). Cardwell et. al. (1979) established ammonia EC50 (medium effective concentration) and LC50 (median lethal concentration) concentrations of 15 ppm and 21.7 ppm respectively for oyster larvae. Ammonia toxicity to fish fry, snails (Physa heterostropha) and diatoms has been reviewed by McKee and Wolf (1963). Because of the lack of correspondence with the sediment chemistry and the other standard PSDDA bioassay results, and the apparent effect of sediment ammonia concentrations on the sand dollar embryos (Dendraster excentricus), the PSDDA regulatory agencies (Corps, EPA, Ecology) agreed by consensus to set aside the two significant bioassay responses for stations L3S3C1 and L6S3C1. Accordingly, these results will not be used in the determination of suitability of the dredged material for unconfined open water disposal at the Port Gardner PSDDA site.

7. It was noted that elevated levels of some of the resin acids (Sandaracopimaric Acid, Isopimaric Acid, Dehydroabietic Acid, and Abietic Acid) were observed particularly in L1S3C2, although this sample did not show a corresponding toxic response for the three PSDDA approved bioassays. There currently are no SL/ML values for these chemicals, and results of bioassays provide the information on toxicity necessary to assess the suitability of sediments for disposal when they are present.

8. Based on the above discussion and rationale for the bioassay results, which are supported by the low levels of chemicals of concern observed throughout the Element I study area, the PSDDA agencies concluded that all the dredged material tested (31 composited samples/analyses) is suitable for disposal at the Port Gardner PSDDA disposal site.

Concur:

June 19, 1989
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Table 1. Project: U.S. Navy Homeport Project - Everett (DY90) Chemistry Testing Results: HOME11BF009

DAIS Value Table - Dry Weight Basis

	units	C1	C2	C3	C4	C5	C6	C7	C8
SEDIMENT CONVENTIONALS									
Total Solids	%	51.7	54.6	63.8	56.4	55.2	62.2	65.5	57.9
Volatile Solids	%	21	8.5	4.8	11.3	8	7.3	5.1	4.2
Total Organic Carbon	%	10.9	2.2	0.9	3.3	3.7	2	5.5	5.6
Ammonia	MG/KG	7.24	32.28	26.41	0.01	11.8	24.98	13.35	15.14
Total Sulfides	MG/KG	1.18	1.51	2.53	1.73	2.14	1.12	0.76	1.06
METALS									
Antimony (1)	MG/KG	0.17 u	0.18	0.15	0.15 u	0.18	0.25	0.14 u	0.17 u
Arsenic	MG/KG	15	11	12	10	11	7.5	7.7	7.6
Cadmium	MG/KG	0.33	0.48	0.48	0.22	0.38	0.09	0.05	0.1
Chromium (4)	MG/KG	-	-	-	-	-	-	-	-
Copper	MG/KG	76	58	50	36	54	49	56	45
Lead	MG/KG	79	13	16	4.5	11	6.5	8.4	6.5
Mercury	MG/KG	0.14	0.09	0.11	0.04	0.05	0.06	0.02	0.02
Nickel	MG/KG	40	49	42	39	48	74	67	64
Selenium (4)	MG/KG	-	-	-	-	-	-	-	-
Silver	MG/KG	0.15	0.2	0.11	0.12	0.2	0.08	0.08	0.07
Zinc	MG/KG	220	88	400	70	95	68	63	76
LPAH									
2-Methylnaphthalene (1)	UG/KG	33 u	32 u	26 u	30 u	31 u	27 u	28 u	30 u
Acenaphthene (1)	UG/KG	33 u	32 u	26 u	30 u	31 u	27 u	28 u	30 u
Acenaphthylene (1)	UG/KG	33 u	32 u	26 u	30 u	31 u	27 u	28 u	30 u
Anthracene (1)	UG/KG	85	32 u	26 u	30 u	31 u	27 u	28 u	30 u
Fluorene (1)	UG/KG	33 u	32 u	26 u	30 u	31 u	27 u	28 u	30 u
Naphthalene (1)	UG/KG	33 u	41	32	30 u	31 u	27 u	28 u	30 u
Phenanthrene (1)	UG/KG	170	48	61	30 u	31 u	27 u	37	30 u
Total LPAH (1)	UG/KG	255	89	93	30 u	31 u	27 u	37	30 u
HPAH									
Benzo(a)anthracene (1)	UG/KG	180	41	55	36	52	27 u	34	33
Benzo(a)pyrene (1)	UG/KG	160	32 u	66	38	31 u	27 u	43	47
Benzo(g,h,i)perylene (1)	UG/KG	190	54	26 u	30 u	31 u	27 u	28 u	30 u
Benzofluoranthenes (1)	UG/KG	280	32 u	138	68 e	31 u	27 u	74 e	72
Chrysene (1)	UG/KG	300	54	71	41	46	27 u	34	39
Dibenzo(a,h)anthracene (1)	UG/KG	52	32 u	26 u	30 u	31 u	27 u	28 u	30 u
Fluoranthene	UG/KG	320	67	58	30	43	32	37	36
Indeno(1,2,3-c,d)pyrene (1)	UG/KG	110	38	26 u	30 u	31 u	27 u	28 u	30 u
Pyrene	UG/KG	360	73	210	62	98	56	85	86
Total HPAH (1)	UG/KG	1952	327 e	598 e	275 e	239 e	88 e	307 e	313 e
CHLORINATED HYDROCARBONS									
1,2,4-Trichlorobenzene (1)	UG/KG	4.9 u	4.8 u	4 u	4 u	4.6 u	4 u	4.3 u	4.4 u
1,2-Dichlorobenzene (1)	UG/KG	9.8 u	9.5 u	7.9 u	8.9 u	9.2 u	8 u	8.5 u	8.9 u

Table 1 (continued).

	units	C1		C2		C3		C4		C5		C6		C7		C8	
1,3-Dichlorobenzene (3)	UG/KG	20	u	19	u	16	u	18	u	18	u	16	u	17	u	18	u
1,4-Dichlorobenzene (1)	UG/KG	20	u	19	u	16	u	18	u	18	u	16	u	17	u	18	u
Hexachlorobenzene	UG/KG	20	u	19	u	16	u	18	u	18	u	16	u	17	u	18	u
PHTHALATES																	
Bis(2-ethylhexyl)phthalate (1)	UG/KG	33	u	32	u	26	u	30	u	31	u	27	u	28	u	30	u
Butyl benzyl phthalate (1)	UG/KG	33	u	32	u	26	u	30	u	31	u	27	u	28	u	30	u
Di-n-butyl phthalate (1)	UG/KG	33	u	32	u	26	u	30	u	31	u	27	u	31		30	u
Di-n-octyl phthalate (1)	UG/KG	33	u	32	u	26	u	30	u	31	u	27	u	28	u	30	u
Diethyl phthalate (1)	UG/KG	33	u	32	u	26	u	30	u	31	u	27	u	28	u	30	u
Dimethyl phthalate (1)	UG/KG	33	u	32	u	26	u	30	u	31	u	27	u	28	u	30	u
PHENOLS																	
2 Methylphenol (1)	UG/KG	4.9	u	4.8	u	4	u	4.4	u	4.6	u	4	u	4.3	u	4.4	u
2,4-Dimethylphenol (1)	UG/KG	9.8	u	9.5	u	7.9	u	8.9	u	9.2	u	8	u	8.5	u	8.9	u
4 Methylphenol (1)	UG/KG	33	u	32		26	u	30	u	31	u	27	u	28	u	30	u
Pentachlorophenol	UG/KG	98	u	95	u	79	u	89	u	92	u	80	u	85	u	89	u
Phenol (1)	UG/KG	33	u	32	u	26	u	30	u	31	u	27	u	28	u	30	u
MISCELLANEOUS EXTRACTABLES																	
Benzoic acid (1)	UG/KG	164	u	159	u	132	u	150	u	150	u	130	u	140	u	148	u
Benzyl alcohol (1)	UG/KG	9.8	u	9.5	u	7.9	u	8.9	u	9.2	u	8	u	8.5	u	8.9	u
Dibenzofuran (1)	UG/KG	33	u	32	u	26	u	30	u	31	u	27	u	28	u	30	u
Hexachlorobutadiene (1)	UG/KG	33	u	32	u	26	u	30	u	31	u	27	u	28	u	30	u
Hexachloroethane (1)	UG/KG	33	u	32	u	26	u	30	u	31	u	27	u	28	u	30	u
N-Nitrosodiphenylamine (1)	UG/KG	20	u	19	u	16	u	18	u	18	u	16	u	17	u	18	u
VOLATILE ORGANICS																	
Ethylbenzene (1)	UG/KG	2.2	u	2	u	1.8	u	2	u	-	u	-	u	1.9	u	-	u
Tetrachloroethene (1)	UG/KG	4.5	u	4	u	3.6	u	3.9	u	-	u	-	u	3.9	u	-	u
Total Xylene (1)	UG/KG	2.2	u	2	u	1.8	u	2	u	-	u	-	u	1.9	u	-	u
Trichloroethene (1)	UG/KG	4.5	u	4	u	3.6	u	3.9	u	-	u	-	u	3.9	u	-	u
PESTICIDES AND PCBs																	
Aldrin (3)	UG/KG	1.3	u	1.3	u	1	u	1.2	u	1.2	u	1.1	u	1.1	u	1.2	u
Chlordane (2)	UG/KG	1.6	u	1.6	u	1.3	u	1.5	u	1.5	u	1.3	u	1.4	u	1.5	u
Dieldrin (3)	UG/KG	1.6	u	1.6	u	1.3	u	1.5	u	1.5	u	1.3	u	1.4	u	1.5	u
Heptachlor (3)	UG/KG	1	u	0.9	u	0.8	u	0.9	u	0.9	u	0.8	u	0.8	u	0.9	u
Lindane (3)	UG/KG	1.3	u	1.3	u	1	u	1.2	u	1.2	u	1.1	u	1.1	u	1.2	u
Total DDT	UG/KG	6.5	u	6.3	u	5.3	u	5.9	u	6.1	u	5.3	u	5.7	u	6	u
Total PCBs	UG/KG	65	u	62	u	53	u	59	u	-	u	-	u	57	u	-	u
ORGANOMETALLICS																	
Tributyltin (porewater) (2)	UG/L	-		-		-		-		-		-		-		-	

A dash indicates that no data exists for this analyte in DAIS

(1) = No BT exists (2) = No ML exists (3) = No BT or ML exists (4) = No SL or ML exists

Table 1 (continued). Project: U.S. Navy Homeport Project - Everett (DY90) Chemistry Testing Results.

DAIS Value Table - Dry Weight Basis

	units	C9		C10		C11		C12		C13		C14		C15		C16		C17
SEDIMENT CONVENTIONALS																		
Total Solids	%	58.7		71.3		69.4		74.4		61.4		65.7		68.9		74.7		68.4
Volatile Solids	%	8.2		3.2		2.5		4.1		4.2		6.5		3.4		2.2		4.5
Total Organic Carbon	%	2.8		1.1		1.2		1.2		3.8		2.3		1.6		1.1		2.6
Ammonia	MG/KG	21.31		14.43		9.91		25		28		32.1		28.7		11.5		35.2
Total Sulfides	MG/KG	3.07		1.56		1.08		1.16		1.71		0.2		21.1		0.75		4.3
METALS																		
Antimony (1)	MG/KG	0.15		0.13	u	0.13		0.12	u	0.15	u	0.15		0.13		0.12	u	0.13
Arsenic	MG/KG	7.9		3		7.6		5.4		3.9		8.3		9.7		4.7		6.8
Cadmium	MG/KG	0.11		0.16		0.15		0.04		0.06		0.03		0.2		0.1		0.04
Chromium (4)	MG/KG	-		-		-		-		-		-		-		-		-
Copper	MG/KG	51		27		39		25		39		51		40		22		48
Lead	MG/KG	4.6		4.1		3.8		3.8		5.1		4.3		2.8		3.9		1.3
Mercury	MG/KG	0.06		0.03		0.05		0.04		0.02		0.04		0.04		0.05		0.05
Nickel	MG/KG	75		34		39		53		65		69		39		29		65
Selenium (4)	MG/KG	-		-		-		-		-		-		-		-		-
Silver	MG/KG	0.08		0.07		0.15		0.04		0.04		0.07		0.08		0.1		0.22
Zinc	MG/KG	74		51		60		41		57		63		61		46		59
LPAH																		
2-Methylnaphthalene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Acenaphthene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Acenaphthylene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Anthracene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Fluorene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Naphthalene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Phenanthrene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Total LPAH (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
HPAH																		
Benzo(a)anthracene (1)	UG/KG	44		28		24	u	22	u	42		30		24	u	23	u	30
Benzo(a)pyrene (1)	UG/KG	52		24	u	36		22	u	50		50		27		23	u	40
Benzo(g,h,i)perylene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	35
Benzofluoranthenes (1)	UG/KG	87		24	u	53	e	22	u	65	e	65	e	51	e	23	u	25
Chrysene (1)	UG/KG	57		33		29		22	u	47		35		24	u	23	u	32
Dibenzo(a,h)anthracene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Fluoranthene	UG/KG	30		24	u	27		22	u	26	u	25	u	27		23	u	25
Indeno(1,2,3-c,d)pyrene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	32
Pyrene	UG/KG	77		24	u	53		31		73		58		51		23	u	32
Total HPAH (1)	UG/KG	347	e	61	e	198	e	31	e	277	e	238	e	156	e	23	u	201
CHLORINATED HYDROCARBONS																		
1,2,4-Trichlorobenzene (1)	UG/KG	4.1	u	3.5	u	3.6	u	3.3	u	3.9	u	3.8	u	3.7	u	3.4	u	3.7
1,2-Dichlorobenzene (1)	UG/KG	8.2	u	7	u	7.2	u	6.7	u	7.8	u	7.5	u	7.3	u	6.7	u	7.5

Table 1 (continued).

	units	C9		C10		C11		C12		C13		C14		C15		C16		C17
1,3-Dichlorobenzene (3)	UG/KG	16	u	14	u	14	u	13	u	16	u	15	u	15	u	14	u	15
1,4-Dichlorobenzene (1)	UG/KG	16	u	14	u	14	u	13	u	16	u	15	u	15	u	14	u	15
Hexachlorobenzene	UG/KG	16	u	14	u	14	u	13	u	16	u	15	u	15	u	14	u	15
PHTHALATES																		
Bis(2-ethylhexyl)phthalate (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Butyl benzyl phthalate (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Di-n-butyl phthalate (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Di-n-octyl phthalate (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Diethyl phthalate (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Dimethyl phthalate (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	47
PHENOLS																		
2 Methylphenol (1)	UG/KG	4.1	u	3.5	u	3.6	u	3.3	u	3.9	u	3.8	u	3.7	u	3.4	u	3.7
2,4-Dimethylphenol (1)	UG/KG	8.2	u	7	u	7.2	u	6.7	u	2.8	u	7.5	u	7.3	u	6.7	u	7.4
4 Methylphenol (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Pentachlorophenol	UG/KG	82	u	70	u	72	u	67	u	78	u	75	u	72	u	68	u	75
Phenol (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
MISCELLANEOUS EXTRACTABLES																		
Benzoic acid (1)	UG/KG	137	u	120	u	120	u	110	u	130	u	125	u	120	u	110	u	125
Benzyl alcohol (1)	UG/KG	8.2	u	7	u	7.2	u	6.7	u	7.8	u	7.5	u	7.3	u	6.7	u	7.4
Dibenzofuran (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Hexachlorobutadiene (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
Hexachloroethane (1)	UG/KG	27	u	24	u	24	u	22	u	26	u	25	u	24	u	23	u	25
N-Nitrosodiphenylamine (1)	UG/KG	16	u	14	u	14	u	13	u	16	u	15	u	15	u	14	u	15
VOLATILE ORGANICS																		
Ethylbenzene (1)	UG/KG	-	u	1.5	u	-	u	-	u	-	u	-	u	-	u	-	u	-
Tetrachloroethene (1)	UG/KG	-	u	3.1	u	-	u	-	u	-	u	-	u	-	u	-	u	-
Total Xylene (1)	UG/KG	-	u	1.5	u	-	u	-	u	-	u	-	u	-	u	-	u	-
Trichloroethene (1)	UG/KG	-	u	3.1	u	-	u	-	u	-	u	-	u	-	u	-	u	-
PESTICIDES AND PCBs																		
Aldrin (3)	UG/KG	1.1	u	0.9	u	1	u	0.9	u	1	u	1	u	1	u	0.9	u	1
Chlordane (2)	UG/KG	1.4	u	1.2	u	1.2	u	1.1	u	1.3	u	1.2	u	1.2	u	1.1	u	1.2
Dieldrin (3)	UG/KG	1.4	u	1.2	u	1.2	u	1.1	u	1.3	u	1.2	u	1.2	u	1.1	u	1.2
Heptachlor (3)	UG/KG	0.8	u	0.7	u	0.7	u	0.7	u	0.8	u	0.8	u	0.7	u	0.7	u	0.8
Lindane (3)	UG/KG	1.1	u	0.9	u	1	u	0.9	u	1	u	1	u	1	u	0.9	u	1
Total DDT	UG/KG	5.5	u	4.7	u	4.8	u	4.4	u	5.2	u	5	u	4.9	u	4.5	u	5
Total PCBs	UG/KG	-	u	47	u	-	u	-	u	-	u	-	u	-	u	-	u	-
ORGANOMETALLICS																		
Tributyltin (porewater) (2)	UG/L	-		-		-		-		-		-		-		-		-

A dash indicates that no data exists for this analyte in DAIS

(1) = No BT exists (2) = No ML exists (3) = No BT or ML exists (4) = No S

Table 1 (continued). Project: U.S. Navy Homeport Project - Everett (DY90) Chemistry Testing Results

DAIS Value Table - Dry Weight Basis

	units	C18	C19	C20	C21	C22	C23	C24	C25
SEDIMENT CONVENTIONALS									
Total Solids	%	65.4	70.6	74.6	67.7	72	70.2	75.6	70.6
Volatile Solids	%	4.9	3.6	2.2	5.1	3.2	3.7	2	3.5
Total Organic Carbon	%	2.6	1.7	0.8	2.4	1.1	1.8	0.7	1.5
Ammonia	MG/KG	23	17	4.18	31.7	16.7	17.6	15.1	27.4
Total Sulfides	MG/KG	8.05	9.04	1.07	1.65	1.28	1.87	5.66	5.3
METALS									
Antimony (1)	MG/KG	0.24	0.1	0.12 u	0.12	0.14 u	0.12	0.13 u	0.26
Arsenic	MG/KG	8.3	7.7	3.6	6.8	7.5	5.5	3.1	6.8
Cadmium	MG/KG	0.11	0.13	0.09	0.11	0.09	0.11	0.08	0.11
Chromium (4)	MG/KG	-	-	-	-	-	-	-	-
Copper	MG/KG	48	34	21	42	30	33	25	34
Lead	MG/KG	6	3.1	2.5	2.5	4	5	2.8	2.6
Mercury	MG/KG	0.06	0.06	0.03	0.06	0.05	0.06	0.05	0.04
Nickel	MG/KG	44	33	32	39	35	35	35	36
Selenium (4)	MG/KG	-	-	-	-	-	-	-	-
Silver	MG/KG	0.1	0.1	0.06	0.1	0.08	0.09	0.06	0.11
Zinc	MG/KG	62	50	43	58	52	50	44	53
LPAH									
2-Methylnaphthalene (1)	UG/KG	u 25	u 24	u 23	u 25	u 24	u 25	u 23	u 24 u
Acenaphthene (1)	UG/KG	u 25	u 24	u 23	u 25	u 24	u 25	u 23	u 24 u
Acenaphthylene (1)	UG/KG	u 25	u 24	u 23	u 25	u 24	u 25	u 23	u 24 u
Anthracene (1)	UG/KG	u 25	u 24	u 23	u 25	u 24	u 25	u 23	u 24 u
Fluorene (1)	UG/KG	u 25	u 24	u 23	u 25	u 24	u 25	u 23	u 24 u
Naphthalene (1)	UG/KG	u 31	24	u 23	u 25	u 24	u 25	u 23	u 24 u
Phenanthrene (1)	UG/KG	u 28	24	u 23	u 25	u 28	25	u 23	u 24
Total LPAH (1)	UG/KG	u 59	24	u 23	u 25	u 28	25	u 23	u 24
HPAH									
Benzo(a)anthracene (1)	UG/KG	31	24	u 23	u 32	45	27	23	u 24 u
Benzo(a)pyrene (1)	UG/KG	36	24	u 23	u 30	24	u 29	23	u 24 u
Benzo(g,h,i)perylene (1)	UG/KG	31	24	u 23	u 25	u 33	25	23	u 24
Benzofluoranthenes (1)	UG/KG	u 25	u 24	u 23	u 52	24	u 25	u 23	u 24 u
Chrysene (1)	UG/KG	36	24	23	u 30	49	29	23	u 24 u
Dibenzo(a,h)anthracene (1)	UG/KG	u 25	u 24	u 23	u 25	u 24	u 25	u 23	u 24 u
Fluoranthene	UG/KG	u 36	24	u 23	u 25	u 45	27	23	u 24 u
Indeno(1,2,3-c,d)pyrene (1)	UG/KG	31	24	u 23	u 25	u 24	u 25	u 23	u 24 u
Pyrene	UG/KG	59	36	23	u 80	45	42	23	u 40
Total HPAH (1)	UG/KG	e 260	e 60	e 23	u 224	e 217	e 179	e 23	u 40 e
CHLORINATED HYDROCARBONS									
1,2,4-Trichlorobenzene (1)	UG/KG	u 3.8	u 3.6	u 3.5	u 3.7	u 3.5	u 3.7	u 3.5	u 3.6 u
1,2-Dichlorobenzene (1)	UG/KG	u 7.6	u 7.2	u 6.9	u 7.5	u 7	u 7.3	u 6.9	u 7.1 u

Table 1 (continued).

	units		C18		C19		C20		C21		C22		C23		C24		C25	
1,3-Dichlorobenzene (3)	UG/KG	u	15	u	15	u	14	u	15	u	14	u	15	u	14	u	14	u
1,4-Dichlorobenzene (1)	UG/KG	u	15	u	15	u	14	u	15	u	14	u	15	u	14	u	14	u
Hexachlorobenzene	UG/KG	u	15	u	15	u	14	u	15	u	14	u	15	u	14	u	14	u
PHTHALATES																		
Bis(2-ethylhexyl)phthalate (1)	UG/KG	u	36		24	u	23	u	25	u	24	u	25	u	23	u	29	
Butyl benzyl phthalate (1)	UG/KG	u	25	u	24	u	23	u	25	u	24	u	25	u	23	u	24	u
Di-n-butyl phthalate (1)	UG/KG	u	25	u	24	u	23	u	25	u	24	u	25	u	23	u	24	u
Di-n-octyl phthalate (1)	UG/KG	u	25	u	24	u	23	u	25	u	24	u	25	u	23	u	24	u
Diethyl phthalate (1)	UG/KG	u	48		24	u	23	u	62		24	u	25	u	23	u	40	
Dimethyl phthalate (1)	UG/KG		25	u	24	u	23	u	25	u	24	u	25	u	23	u	24	u
PHENOLS																		
2 Methylphenol (1)	UG/KG	u	3.8	u	3.6	u	3.5	u	3.7	u	3.5	u	3.7	u	3.5	u	3.6	u
2,4-Dimethylphenol (1)	UG/KG	u	7.6	u	7.2	u	6.9	u	7.5	u	7	u	7.3	u	6.9	u	7.1	u
4 Methylphenol (1)	UG/KG	u	25	u	24	u	23	u	25	u	24	u	25	u	23	u	24	u
Pentachlorophenol	UG/KG	u	76	u	72	u	69	u	75	u	70	u	75	u	69	u	71	u
Phenol (1)	UG/KG	u	25	u	24	u	23	u	25	u	24	u	25	u	23	u	24	u
MISCELLANEOUS EXTRACTABLES																		
Benzoic acid (1)	UG/KG	u	127	u	120	u	120	u	124	u	120	u	120	u	120	u	120	u
Benzyl alcohol (1)	UG/KG	u	7.6	u	7.2	u	6.9	u	7.5	u	7	u	7.3	u	6.9	u	7.1	u
Dibenzofuran (1)	UG/KG	u	25	u	24	u	23	u	25	u	24	u	25	u	23	u	24	u
Hexachlorobutadiene (1)	UG/KG	u	25	u	24	u	23	u	25	u	24	u	25	u	23	u	24	u
Hexachloroethane (1)	UG/KG	u	25	u	24	u	23	u	25	u	24	u	25	u	23	u	24	u
N-Nitrosodiphenylamine (1)	UG/KG	u	15	u	15	u	14	u	15	u	14	u	15	u	14	u	14	u
VOLATILE ORGANICS																		
Ethylbenzene (1)	UG/KG	u	-	u	-	u	-	u	-	u	-	u	-	u	-	u	-	u
Tetrachloroethene (1)	UG/KG	u	-	u	-	u	-	u	-	u	-	u	-	u	-	u	-	u
Total Xylene (1)	UG/KG	u	-	u	-	u	-	u	-	u	-	u	-	u	-	u	-	u
Trichloroethene (1)	UG/KG	u	-	u	-	u	-	u	-	u	-	u	-	u	-	u	-	u
PESTICIDES AND PCBs																		
Aldrin (3)	UG/KG	u	1	u	1	u	0.9	u	1	u	0.9	u	1	u	0.9	u	0.9	u
Chlordane (2)	UG/KG	u	1.3	u	1.2	u	1.2	u	1.2	u	1.2	u	1.2	u	1.2	u	1.2	u
Dieldrin (3)	UG/KG	u	1.3	u	1.2	u	1.2	u	1.2	u	1.2	u	1.2	u	1.2	u	1.2	u
Heptachlor (3)	UG/KG	u	0.8	u	0.7	u	0.7	u	0.8	u	0.7	u	0.7	u	0.7	u	0.7	u
Lindane (3)	UG/KG	u	1	u	1	u	0.9	u	1	u	0.9	u	1	u	0.9	u	0.9	u
Total DDT	UG/KG	u	5.1	u	4.8	u	4.6	u	5	u	4.7	u	4.9	u	4.6	u	4.7	u
Total PCBs	UG/KG	u	-	u	-	u	-	u	-	u	-	u	-	u	-	u	-	u
ORGANOMETALLICS																		
Tributyltin (porewater) (2)	UG/L		-		-		-		-		-		-		-		-	

A dash indicates that no data exists for this analyte in DAIS

(1) = No BT exists (2) = No ML exists (3) = No BT or ML exists (4) = No S

Table 1 (continued). Project: U.S. Navy Homeport Project - Everett (DY90) Chemistry Testing Results.

DAIS Value Table - Dry Weight Basis

	units	C26		C27		C28		C29		C30		C31	
SEDIMENT CONVENTIONALS													
Total Solids	%	72.8		69.9		74		73.1		75.2		75.2	
Volatile Solids	%	2.5		4.2		2.4		3.3		2.3		2.3	
Total Organic Carbon	%	1.3		1.7		1.1		1.2		0.6		0.7	
Ammonia	MG/KG	15.12		46		17.4		20.3		21.3		8.97	
Total Sulfides	MG/KG	12.69		2.78		0.54		4.01		1.67		1.74	
METALS													
Antimony (1)	MG/KG	0.12	u	0.12	u	0.1	u	0.12		0.12		0.12	u
Arsenic	MG/KG	5.7		7.2		3.2		5.1		4.9		4.3	
Cadmium	MG/KG	0.09		0.11		0.1		0.11		0.11		0.12	
Chromium (4)	MG/KG	-		-		-		-		-		-	
Copper	MG/KG	30		40		28		30		27		27	
Lead	MG/KG	4.4		3.6		4		4.1		3.2		3.3	
Mercury	MG/KG	0.06		0.05		0.05		0.05		0.05		0.09	
Nickel	MG/KG	36		39		36		33		37		34	
Selenium (4)	MG/KG	-		-		-		-		-		-	
Silver	MG/KG	0.07		0.07		0.07		0.09		0.07		0.05	
Zinc	MG/KG	46		57		46		46		47		45	
LPAH													
2-Methylnaphthalene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Acenaphthene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Acenaphthylene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Anthracene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Fluorene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Naphthalene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Phenanthrene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Total LPAH (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
HPAH													
Benzo(a)anthracene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Benzo(a)pyrene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Benzo(g,h,i)perylene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Benzofluoranthenes (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Chrysene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Dibenzo(a,h)anthracene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Fluoranthene	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Indeno(1,2,3-c,d)pyrene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Pyrene	UG/KG	35		30		23	u	23	u	23	u	23	u
Total HPAH (1)	UG/KG	35	e	30	e	23	u	23	u	23	u	23	u
CHLORINATED HYDROCARBONS													
1,2,4-Trichlorobenzene (1)	UG/KG	3.5	u	3.7	u	3.5	u	3.5	u	3.5	u	3.4	u
1,2-Dichlorobenzene (1)	UG/KG	7	u	7.4	u	7	u	7	u	6.9	u	6.8	u

Table 1 (continued).

	units	C26		C27		C28		C29		C30		C31	
1,3-Dichlorobenzene (3)	UG/KG	14	u	15	u	14	u	14	u	14	u	14	u
1,4-Dichlorobenzene (1)	UG/KG	14	u	15	u	14	u	14	u	14	u	14	u
Hexachlorobenzene	UG/KG	14	u	15	u	14	u	14	u	14	u	14	u
PHTHALATES													
Bis(2-ethylhexyl)phthalate (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Butyl benzyl phthalate (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Di-n-butyl phthalate (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Di-n-octyl phthalate (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Diethyl phthalate (1)	UG/KG	23	u	32		23	u	23	u	23	u	23	u
Dimethyl phthalate (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
PHENOLS													
2 Methylphenol (1)	UG/KG	3.5	u	3.7	u	3.5	u	3.5	u	3.5	u	3.4	u
2,4-Dimethylphenol (1)	UG/KG	7	u	7.4	u	7	u	7	u	6.9	u	6.8	u
4 Methylphenol (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Pentachlorophenol	UG/KG	70	u	74	u	70	u	70	u	69	u	68	u
Phenol (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
MISCELLANEOUS EXTRACTABLES													
Benzoic acid (1)	UG/KG	120	u	120	u	120	u	120	u	120	u	110	u
Benzyl alcohol (1)	UG/KG	7	u	7.4	u	7	u	7	u	6.9	u	6.8	u
Dibenzofuran (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Hexachlorobutadiene (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
Hexachloroethane (1)	UG/KG	23	u	25	u	23	u	23	u	23	u	23	u
N-Nitrosodiphenylamine (1)	UG/KG	14	u	15	u	14	u	14	u	14	u	14	u
VOLATILE ORGANICS													
Ethylbenzene (1)	UG/KG	-	u	-	u	-	u	-	u	-	u	-	u
Tetrachloroethene (1)	UG/KG	-	u	-	u	-	u	-	u	-	u	-	u
Total Xylene (1)	UG/KG	-	u	-	u	-	u	-	u	-	u	-	u
Trichloroethene (1)	UG/KG	-	u	-	u	-	u	-	u	-	u	-	u
PESTICIDES AND PCBs													
Aldrin (3)	UG/KG	0.9	u	1	u	0.9	u	0.9	u	0.9	u	0.9	u
Chlordane (2)	UG/KG	1.2	u	1.2	u	1.2	u	1.2	u	1.2	u	1.1	u
Dieldrin (3)	UG/KG	1.2	u	1.2	u	1.2	u	1.2	u	1.2	u	1.1	u
Heptachlor (3)	UG/KG	0.7	u	0.7	u	0.7	u	0.7	u	0.7	u	0.7	u
Lindane (3)	UG/KG	0.9	u	1	u	0.9	u	0.9	u	0.9	u	0.9	u
Total DDT	UG/KG	4.7	u	5	u	4.6	u	4.6	u	4.6	u	4.5	u
Total PCBs	UG/KG	-	u	-	u	-	u	-	u	-	u	-	u
ORGANOMETALLICS													
Tributyltin (porewater) (2)	UG/L	-		-		-		-		-		-	

A dash indicates that no data exists for this analyte in DAIS

(1) = No BT exists (2) = No ML exists (3) = No BT or ML exists (4) = No S

CENPS-OP-RG 27 January 1989

MEMORANDUM FOR RECORD

SUBJECT: Review Meeting of Results of Partial Characterization of Sediments from the Element I Dredging Site, Naval Station Puget Sound, Everett, Washington

Enclosure 1

1. Meeting was held in the Albeni Falls Conference Room at the Seattle District on 17 January 1989. Attendees were Frank Urabeck, Dave Kendall, and Tom Mueller, Corps of Engineers; Dave Jamison, Washington Department of Natural Resources (WDNR); John Malek, Environmental Protection Agency (EPAO; and Jim Thornton and Russ McMillan, Washington Department of Ecology (Ecology). The purpose of the meeting was to review the results of the partial characterization (PC) to determine the final rankings for the full characterization (FC) and to determine if certain chemicals of concern may be deleted from further analysis during the FC. The Navy had submitted the PC results in a document entitled, "Partial Characterization of Sediments From the Element I Dredging Site Naval Station Puget Sound, Everett, Washington - Final Report."

2. Regarding ranking for the FC, we agreed that we would rank the three subareas as we normally would for PSDDA based on the PC results, although the ultimate FC ranking was stipulated by the Settlement Agreement. We discussed the values for nickel, which exceeded the screening levels in 8 of the 11 samples. Nickel has been found to be higher than SL in many other areas including "clean" reference areas (i.e., Sequim Bay and West Beach) and the Blake Island State Park Marina. Because of this and information contained in the recently released PSEP, Sediment Quality Values Refinement: Vol. II 1988 Final Report, September 1988, nickel was deleted from consideration, as has been done for all other projects which have been evaluated under the PSDDA procedures. We agreed to rank the subareas both ways considering the nickel values and by deleting them. With nickel considered, the three subareas would have been ranked: Subarea I - Moderate; Subarea II - Low-Moderate; and subarea III - Low-Moderate. Deleting nickel would result in ranks of: Subarea I - Low-Moderate; Subarea II - Low; Subarea III - Low. Regarding Nickel, our final uniform position was to delete the values from consideration in the ranking process to be consistent with previous decisions; discount nickel as a chemical of concern. Comparison of the final ranking for FC based on regular PSDDA ranking versus that required by the Settlement Agreement (SA) is as follows:

Subarea	Ranking by PSDDA Agencies	Ranking by S.A.
I	Low-Moderate	Moderate
II	Low	Low-Moderate
III	Low	Low

Because we agreed to delete the nickel results, the rankings specified by the Settlement Agreement would denote the final rankings for the FC.

3. Regarding deleting chemicals of concern from the FC sampling, we agreed to first consider what would be allowed under PSDDA and then consider what would be allowed by the Settlement Agreement. Dropping chemicals of concern is

Enclosure 1

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Kobayashi, N. 1984. Marine Ecotoxicological Testing with Echinoderms. In: Ecotoxicological Testing for the Marine Environment. Editors: G. Persoone, E. Jaspers, and C. Claus. State Univ. Ghent and Inst. Mar. Scient. Res., Bredene, Belgium. Vol. 1 (798 pp).

McKee, J.E. and H.W. Wolf (Eds.). 1963. Water Quality Criteria. Publication 3-A of the California State Water Resources Control Board.

provided for in PSDDA if those proposed chemicals were not detected in a PC and are not known to be available from nearby sources (refer to EPTA, page II-65). The following positions were provided from those present:

a. EPA - John Malek said that EPA would accept phenols, volatiles, PCB's, organo nitrogen and pesticides being dropped.

b. Everyone agreed that volatiles would be dropped.

c. Ecology would drop volatiles, PCB's (based on past data from the harbor area), phenols, organo nitrogen and the miscellaneous compounds, including dibenzofuran.

d. DNR felt that phenols should not be dropped in the old log-sorting areas (near the southern face of the proposed south side) because of 4-methylophenol which may be found in the area and station 5A showed 1,2,4-Trichlorobenzene slightly above the SL value for this compound. DNR would also retain PCB's because the detection limits would still allow some PCB to be in the area and not be detected. (Ecology and EPA do not have a concern for PCB's.)

Because of the Settlement Agreement, we acknowledged that phenols would have to be included in all surface sediment analysis of subarea I and in portions of subareas II and III, where wood chips are predominant. Volatiles could be dropped only from subareas II and III (except for woodchip areas near south side) and the subsurface portion of subarea I. We would defer on the PCB's until John Malek talked to PTI (this issue was subsequently resolved and PCB's can be deleted). Similarly, organo nitrogen and miscellaneous compounds could also be dropped from subareas II and III and the subsurface portion of subarea I except for dibenzofuran, which should be retained for all three subareas.

4. This information was discussed with John Lunz, SAIC, and Bob Cook of the U.S. Navy on 17 January 1989. We stated we would prepare a Memorandum regarding our discussion and resolution of these issues. A final decision on requirements for FC will be made later when we have reviewed the Navy's Final FC sampling plan.

for TOM MUELLER
Chief, Processing Section

cc:
EPA (Malek)
WDE (McMillan)
Opns Div (Mueller)
Navy (Cook)
PSDDA (Urabeck)
WDE (Thornton)
WDNR (Jamison)
Opns Div (Kendall)
SAIC (Lunz)

MFR/12

MEMORANDUM FOR RECORD: 12 May 1989

Subject: Navy Homeport Bioaccumulation Testing Based on Nickel Concentrations Found During the Full Characterization (FC) Analysis.

1. On 4 May 1989, the U.S. Navy submitted information regarding nickel (Ni) concentrations found during the FC analysis for the upper 12 feet of the proposed dredging prism for the Element I project (see Enclosure 1). Ten of the 18 composite samples had concentration levels which exceeded the bioaccumulation trigger level of 43 ppm (see Enclosure 2) that was specified in the PSDDA Phase I (June 1988) document.

Enclosure 2

2. On 5 May 1989, Tom Mueller provided this sediment data to the other PSDDA agencies and they were contacted by phone by either Tom Mueller or Alisa Ralph between 5 and 9 May 1989. The data was coordinated with Frank Urabeck, the PSDDA study director; John Wakeman, Asst. PSSDA director; and Dave Kendall, Regulatory Branch. Dave Jamison (DNR), Jim Thornton and Russ McMillan (Ecology); and Bill Riley (EPA) were contacted by phone.

3. The consensus of the above was that bioaccumulation testing should not be performed based only on the concentration of Ni found in the samples provided by the Navy. (Note: If further testing determines that chemicals other than Ni exceed the bioaccumulation trigger levels for those chemicals, then bioaccumulation testing would have to be performed.) The rationale for not performing the bioaccumulation testing, based only on Ni, is as follows:

a. Bioaccumulation testing has not been required by the PSDDA agencies on previous projects evaluated under PSDDA, even though the concentrations on Ni exceeded the 43 ppm trigger value under PSDDA, June 1988 (projects included: Washington State Parks and Recreation at Blake Island, Port of Everett marina dredging, Duwamish Yacht Club and the Olympia Harbor Navigation Project). Several of those projects had values for Ni similar to the Element I values. (Note: 60, 59, and 69 ppm were representative values for three of the projects where the samples were ultimately determined to be acceptable for open-water disposal. Bioassays were also performed on some of those samples with the materials deemed acceptable for open-water disposal at PSDDA sites.)

b. The Phase II PSDDA Draft Management Plan Report, dated March 1989, proposes both a new Screening level of 140 ppm, no maximum level and a new bioaccumulation trigger level of 1022 ppm for Ni (see Enclosure 3) based on new information gained since the June 1988 Phase I document was published. This is in light of the experiences in the program wherein Ni has been found above the June 1988 Screening Level, even in reference sediments which exhibited no significant toxicity. Although it has been suggested by some, the PSDDA agencies are not prepared at this time to remove Ni as a chemical of concern because it has toxic properties at high concentrations; however, from extensive data analysis to date of Puget Sound sediments, Ni presence has been uncorrelated with toxic response (see PTI Sept. 1988 report). In the PSDDA baseline studies for Port Gardner, the Strong Acid Digest Extract showed the following values (dry weight, ppm) at stations around and on the disposal site: 53, 57, 44, 40, 47, 42, 38, 61, 54, 52, 58, 49, 59, 52, 64 or

enclosure 2

a mean of 48.8 (the Total Acid Digest mean was 51.4). The reference area in Port Susan showed 98. Wet weight tissue concentration for Ni were 0.96, 0.89, 0.77 and 1.1 ppm, or a mean of 0.93 ppm. (Converting to dry weight, this would be 3 to 5.8 ppm. The tissue concentrations are only about 12%, maximum, compared to the sediment concentrations. This does not suggest that bioconcentration is occurring.) These data demonstrate that existing onsite Ni levels are slightly above the June 1988 Phase I PSDDA bioaccumulation trigger (43 ppm) but well below the new proposed trigger (1022 ppm). Also the data do not show a corresponding bioconcentration of Ni in tissues of indigenous infauna organisms.

c. Bioaccumulation testing is triggered by a reason to believe that elevated chemical levels will lead to bioaccumulation or biomagnification and potential human health concerns. Comparing baseline information from the Port Gardner PSDDA disposal site with the Element I sediments suggests that Ni concentration levels are of the same order of magnitude. Disposal of material similar to material found at the diposal site is usually found acceptable under Section 404 of the Clean Water Act.

4. The bottom line is that the Ni values provided by the U.S. Navy do not warrant bioaccumulation testing and such testing would not be required for any other projects evaluated under the PSDDA guidelines. The Settlement Agreement (with the Friends of the Earth, et. al.) provision at IV.G.1 allows for departures from strict adherence to the June 1988 PSDDA guidelines when the appropriate technical rationale and documentation has occurred. This MFR constitutes that documentation.

Tom Mueller

Tom Mueller
Chief, Processing Section
Regulatory Branch

Enclosures

Copies Furnished:

PSDDA/Frank Urabeck and John Wakeman
OP-RG/Dave Kendall
OP-RG/Alisa Ralph
EPA/John Malek and Bill Riley
DOE/ Jim Thornton and Russ McMillan
ROICC/Lt. Cdr. Al Souders
SAIC/John Lunz
SCLDF/Todd True

4 May 89

Full Characterization Data (preliminary)

Nickel above bioaccumulation trigger levels per PSDDA 1988

Trigger level: 43 ppm

Station	Nickel concentration (ppm)
$L_1S_3C_1$ *	67
$L_1S_3C_2$	64
$L_1S_3C_3$	75
$L_2S_3C_1$	65
$L_2S_3C_2$	69
$L_3S_3C_1$	65
$L_3S_3C_2$	44
$L_1S_2C_2$	48
$L_2S_2C_3$	53
$L_1S_1C_2$	49

Ten samples exceeded trigger level

* key to notation: e.g., $L_1S_3C_1$ means -

Lift 1 Subarea 3 Composite 1

Enclosure 1

Encl 1

TABLE A.8

SEDIMENT CHEMISTRY GUIDELINE VALUES
FOR BIOACCUMULATION

Chemical	Concentration 1/
Metals (mg/kg dry weight)	
Antimony	19
Arsenic	511
Mercury	1.5
Nickel	43
Silver	4
Organic Compounds (ug/kg dry weight)	
Flouranthene	4,600
Benzo(a)pyrene	4,964
1,2-Dichlorobenzene	37
1,3-Dichlorobenzene	1,241 2/
1,4-Dichlorobenzene	190
Dimethyl phthalate	1,168 2/
Di-n-butyl phthalate	10,220 2/
Bis(2-ethylheryl) phthalate	13,870 2/
Hexachloroethane	1,022
Hexachlorobutadiene	212
Phenol	876
Pentachlorophenol	1,022 2/
Ethylbenzene	27
N-Nitrosodiphenylamine	161
Hexachlorobenzene	168
Trichloroethene	1,168
Tetrachloroethane	102
Total DDT	50
Aldrin	37 2/
Chlordane	37 2/
Dieldrin	37 2/
Heptachlor	37 2/
Total PCBs	1,789

1/Concentration = 0.7 * (ML - SL) + SL; When the concentration of any chemical is above this value, a bioaccumulation test must be conducted on the sediment. As a result of information received during public review of the Phase I documents, several of the SL and ML values have been updated (see table A.7 for current values). The older SL and ML values were used to calculate these bioaccumulation sediment guidelines, which were left unchanged pending development of additional information and annual review of the PSDDA program.

2/These chemicals do not have an ML value. Therefore, the concentration = ((10SL - SL) * 0.7) + SL = 7.3 * SL.

Enclosure 2

Enclosure 3

TABLE A.8

SEDIMENT CHEMISTRY GUIDELINE VALUES
FOR BIOACCUMULATION

Chemical	Concentration 1/	New Concentration
	Metals (mg/kg dry weight)	
Antimony	19	
Arsenic	511	
Mercury	1.5	
Nickel	43	1,022 2/
Silver	4	
	Organic Compounds (ug/kg dry weight)	
Flouranthene	4,600	
Benzo(a)pyrene	4,964	
1,2-Dichlorobenzene	37	
1,3-Dichlorobenzene	1,241 2/	
1,4-Dichlorobenzene	190	
Dimethyl phthalate	1,168 2/	
Di-n-butyl phthalate	10,220 2/	
Bis(2-ethylhexyl) phthalate	13,870 2/	
Hexachloroethane	1,022	504
Hexachlorobutadiene	212	
Phenol	876	
Pentachlorophenol	1,022 2/	
Ethylbenzene	27	
N-Nitrosodiphenylamine	161	
Hexachlorobenzene	168	
Trichloroethene	1,168	
Tetrachloroethane	102	
Total DDT	50	
Aldrin	37 2/	
Chlordane	37 2/	
Dieldrin	37 2/	
Heptachlor	37 2/	
Total PCBs	1,789	

1/Concentration = 0.7 * (ML-SL) + SL; When the concentration of any chemical is above this value, a bioaccumulation test must be conducted on the sediment. As a result of information received during public review of the Phase I documents, several of the SL and ML values have been updated (see table A.7 for current values). The older SL and ML values were used to calculate these bioaccumulation sediment guidelines, which were left unchanged pending development of additional information and annual review of the PSDDA program.

2/These chemicals do not have an ML value. Therefore, the concentration = ((10SL-SL) * 0.7) + SL = 7.3 * SL.

Encl 3

Enclosure 3b

U.S.NAVY HOMEPORT PROJECT (OYB-2-012844)

BIOASSAY RESULTS MATRIX

STATIONS	AMPHIPOD	ECHINODERM	MICROTOX	GEODUCK	OVERALL PASS/FAIL
L1S1C1	P	P	P	P	PASS
L1S1C2	P	P	P	F	PASS
L1S1C3	P	P	P	P	PASS
L1S2C1	P	P	P	P	PASS
L1S2C2	P	P	P	F***	PASS
L1S2C3	P	P	P	P	PASS
L1S3C1	P	P	P	P	PASS
L1S3C2	P	P	P	F***	PASS
L1S3C3	P	P	P	F***	PASS
L2S2C1	P	P	P	F***	PASS
L2S2C2	P	P	P	F***	PASS
L2S2C3	P	P	P	F***	PASS
L2S3C1	P	P	P	F***	PASS
L2S3C2	P	P	P	F***	PASS
L3S2C1	P	P	P	F***	PASS
L3S2C2	P	P	P	F***	PASS
L3S3C1	P	F*	p	F***	PASS**
L3S3C2	P	P	P	P	PASS
L4S2C1	P	P	P	P	PASS
L4S2C2	P	P	P	P	PASS
L4S3C1	P	P	P	P	PASS
L4S3C2	P	P	P	P	PASS
L5S2C1	P	P	P	P	PASS
L5S2C2	P	P	P	P	PASS
L5S3C1	P	P	P	P	PASS
L6S2C1	P	P	P	P	PASS
L6S3C1	P	F*	P	P	PASS
L7S2C1	P	P	P	P	PASS
L7S3C1	F*	P	P	P	PASS
L8-10S2C1	P	P	P	P	PASS
L8-10S3C1	P	P	P	P	PASS

P = PASS (< 20 percent absolute difference over control mortality)
F = > 20 percent absolute difference over control mortality
* statistically significant from reference (t-test; $p < 0.05$)
** PASS based on setting aside Echinoderm embryo bioassay results at stations L3S3C1 and L6S3C1 due to high Ammonia levels.
*** statistically significant from Jetty Island Reference, but test results questionable due to failure of Samish Bay reference.

enclosure 3

Enclosure 4

October 31, 1988

MEMORANDUM

TO: Keith Phillips
John Malek
Dave Jamison
Dave Kendall
Fred Weinmann

SUBJECT: PSDDA Oyster Larave Acute Toxicity Test

FROM: Frank Urabeck

1. See attached revised pages of EPTA containing clarifications for the subject test based on recent discussions with you, Scott Becker (PTI), Peter Chapman (EVS) and others. We were experiencing problems with dredgers understanding how to handle our PSDDA "mortality" in checking the control, reference and dredged material sediments against the PSDDA guidelines. Under the clarification we will be computing both mortality and abnormality inaccordance with ASTM and PSEP protocols and then applying the PSDDA disposal guidelines:

- o Control sediments - unacceptable if mortality > 30% or if abnormality > 10%

- o Reference sediments - unacceptable if mortality > 20% (absolute) over control mortality or if abnormality > 20% (absolute) over control abnormality

- o Dredged material - unacceptable if mortality statistically significant relative to reference sediment (using "t" test and if mortality > 20% (absolute) over control ~~reference~~ sediment mortality) and at least one other bioassay is statistically significant relative to reference or if mortality is > 30% (absolute) over reference mortality if this is the only bioassay that is statistically significant.

  - unacceptable if abnormality statistically significant relative to reference sediment and at least one other bioassay is statistically significant relative to reference or if

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abnormality is > 30% (absolute) over reference abnormality if this is the only bioassay that is statistically significant.

2. Per Beaker (10/28/88) doing more than one aliquot for reference and dredged material mortality check is unnecessarily expensive and is not reasonable to require. In most cases the abnormality determination will control anyway.

3. Please call me by COB Wednesday (Nov 2, 88) if you have objections to the above clarification. Receiving none, I will put this out for regulatory and planning usage. We have projects in the pipeline right now so that it is urgent that we have agreement now. Thanks.

cc: Wakeman
Krueger
Scott Becker
file:a:oysl

The PSEP protocols specify a hydrofluoric acid/aqua regia digest for metals analysis in sediments, a total acid digest that is a relatively thorough extraction of sediment metals. Additional comparisons are recommended between the two digest techniques to assess whether sediment metals data derived from this digest will be fully comparable to the screening and maximum levels derived from past Puget Sound data.

Three ~~Two~~ modifications of the ~~sediment toxicity bioassay larvae test~~ are specified. First, to allow chemical tests to be conducted prior to biological tests (tiering), sediment storage will be allowed beyond the PSEP recommended limit (2 weeks in the PSEP protocol) (see section II-4.5.2 for storage requirements specified by PSDDA). Second, dissolved oxygen (DO) in the larval test medium will not be allowed to drop below 4 ppm during the test (as recommended by EPA/Corps national protocol guidance). If a DO drop below 4 ppm is anticipated (or detected during the test), aeration of the test is specified, though care must be taken not to over agitate the medium and further resuspend sediment particles. In these cases, reference and control samples should also be aerated.

To ensure comparability with the larval test, the embryo test should be conducted with sediment present in the test chamber. This modification of the PSEP protocol is necessary to ensure complete exposure of test species.

Finally, Microtox tests conducted pursuant to the PSDDA evaluation procedures should use the PSEP protocol for the saline extract method. Though the PSEP protocols slightly discourage widespread use of this extract pending further developmental work with the test, recent studies (in Puget Sound and San Francisco Bay) suggest that the saline extract method is perferred over the organic extract method when comparing the Microtox test to other lab and field biological indicators. This is thought to be in part due to the saline extract better representing the bioavailable fraction of sediment chemicals of concern.

5.2.3 Data Verification. Verification of test results is an important part of the agency review process for dredging permit applications. Data verification assures that the data provided with these applications are technically appropriate. Verification procedures will be included in the user manual for implementing the PSDDA plan (see MPTA). These procedures will address the extent to which data can deviate from optimal standards and still be considered acceptable. Application of the procedures will enable managers (e.g., environmental officers, permit officers) to determine the relevance of data, including whether the data were generated using specified methods and whether the results reported are within acceptable limits. The development of data verification procedures requires application of experienced professional judgment and review.

Third, to ensure that abnormality determinations are made using adequate sample sizes, a minimum of 50 larvae should be evaluated for each test sample. This criterion may require that multiple sample aliquots be evaluated at the end of testing.

The sensitivity of the proposed bioassay species to fine-grained sediments and chemical constituents associated with fine-grained sediments (e.g., sulfides) strongly suggests that a sedimentologically-similar reference sediment is needed to avoid unnecessary "failure" of the dredged material. When assessing dredged material that is relatively coarse-grained, the option to rely solely on the control sediments is acceptable.

When the mortality rate in sediments from reference areas is unusually high in acute bioassay tests (i.e., much greater than in control samples) additional action is necessary. The performance standard for reference area samples is not more than 20 percent absolute mortality over control, although reference area mortality is often less than 10 percent (the performance standards for laboratory control samples). When mortality exceeds 20 percent over control for a reference sediment, the dredger must rerun the bioassay with a new sediment sample from a reference area. This ensures that dredged material testing results are compared with reference results on a consistent basis among projects.

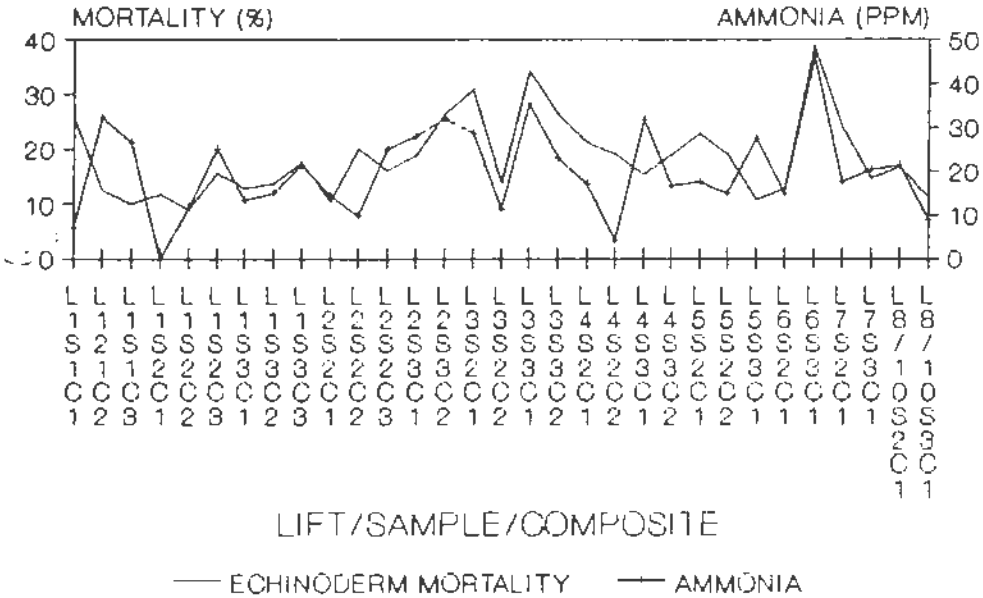
6.3 Acute Testing Protocols. The biological testing requirements were designed to address possible sediment toxicity and the potential for adverse water column effects, as necessary. Multiple acute/lethal or acute/sublethal biological tests have been recommended to provide phylogenetic diversity that might address the different sensitivities of various taxa to a range of chemicals. The recommended acute tests are available, have been used in past studies, are sensitive to a range of containing chemicals of concern sediments, are accepted as measures of potential environmental toxicity, and have interpretable endpoints (e.g., organism mortality for acute/lethal tests, organism abnormality for acute/sublethal).

Sediment bioassay protocols were the subject of the PSEP report "Recommended Protocols for Conducting Laboratory Bioassays on Puget Sound Sediments." The report is summarized in exhibit E-11 of the Technical Appendix and appears in full in "Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound." Those areas where PSDDA differs from the PSEP protocols (or where standard protocols are lacking) are noted below.

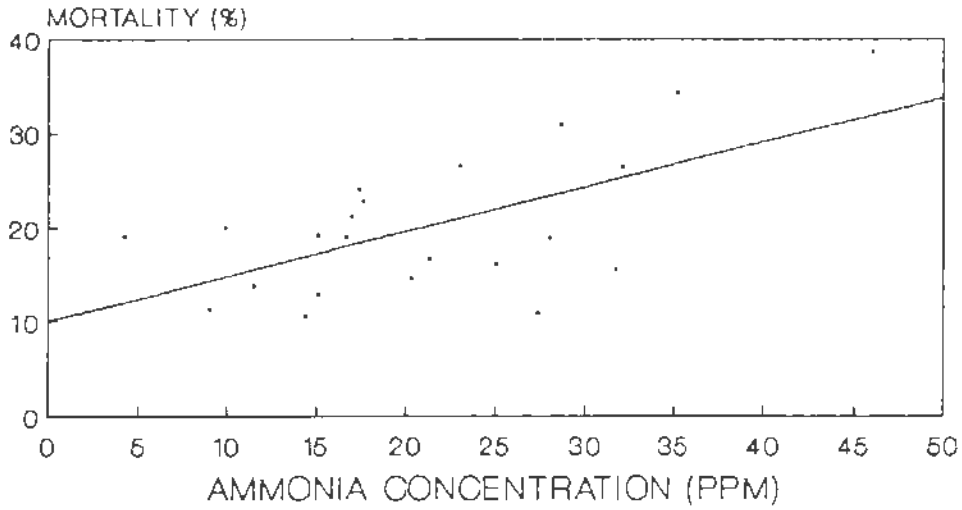
for the amphipod test and less than 30 percent for the bivalve larvae test

Enclosure 5

MORTALITY VERSUS AMMONIA
ECHINODERM EMBRYO BIOASSAY



MORTALITY VERSUS AMMONIA
ECHINODERM EMBRYO BIOASSAY



(SUBSURFACE SEDIMENT)

enclosure 5

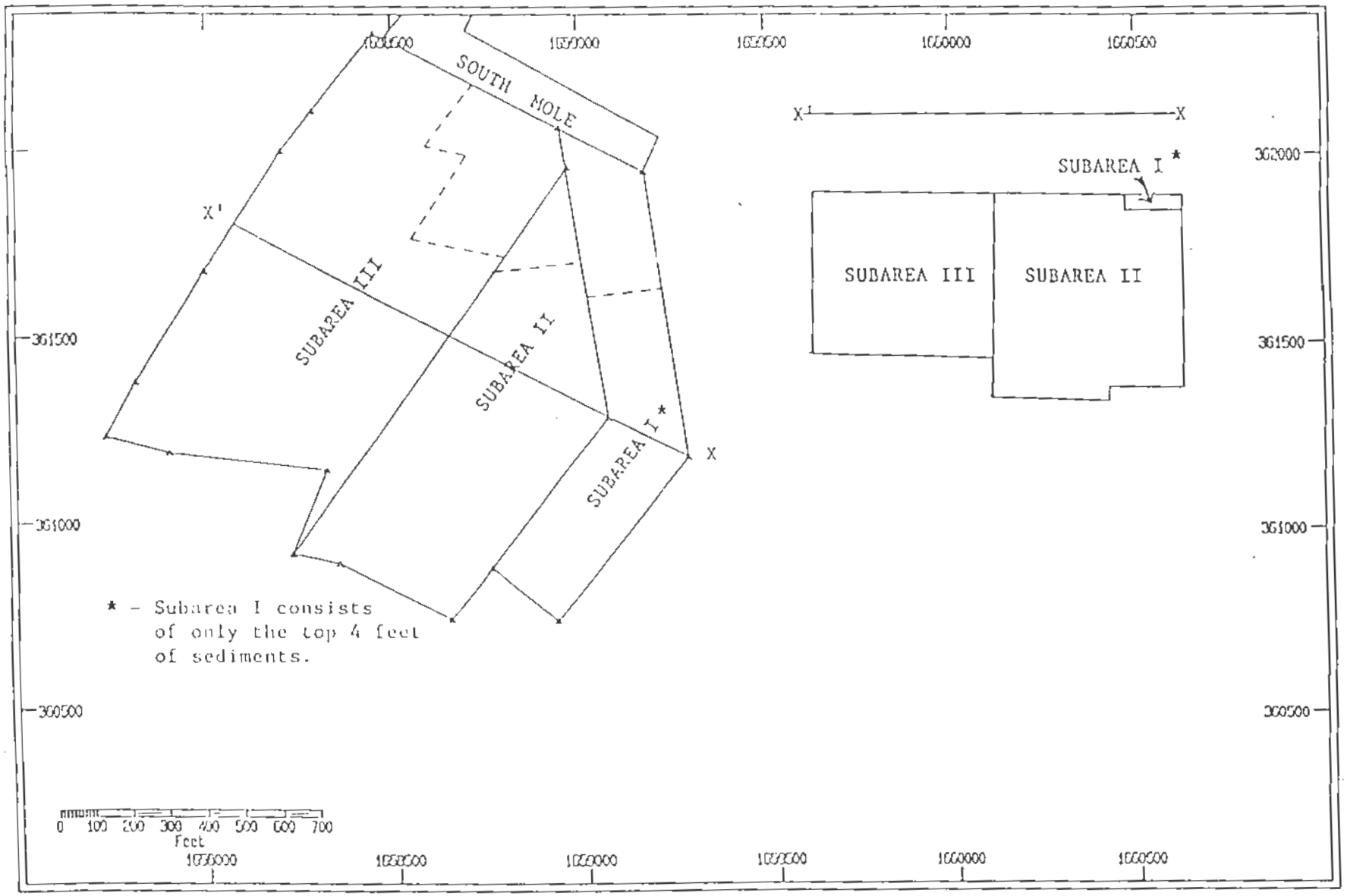


Figure 1-1. (Left) Plan view of the Element I dredging site and subareas. Sediments from the two surface lifts (0-8') in the area north and east of the dashed line were not composited with samples from outside this boundary.

(Right) Cross-section through the Element I site showing that Subarea I consists of only the surface lift (0-4').

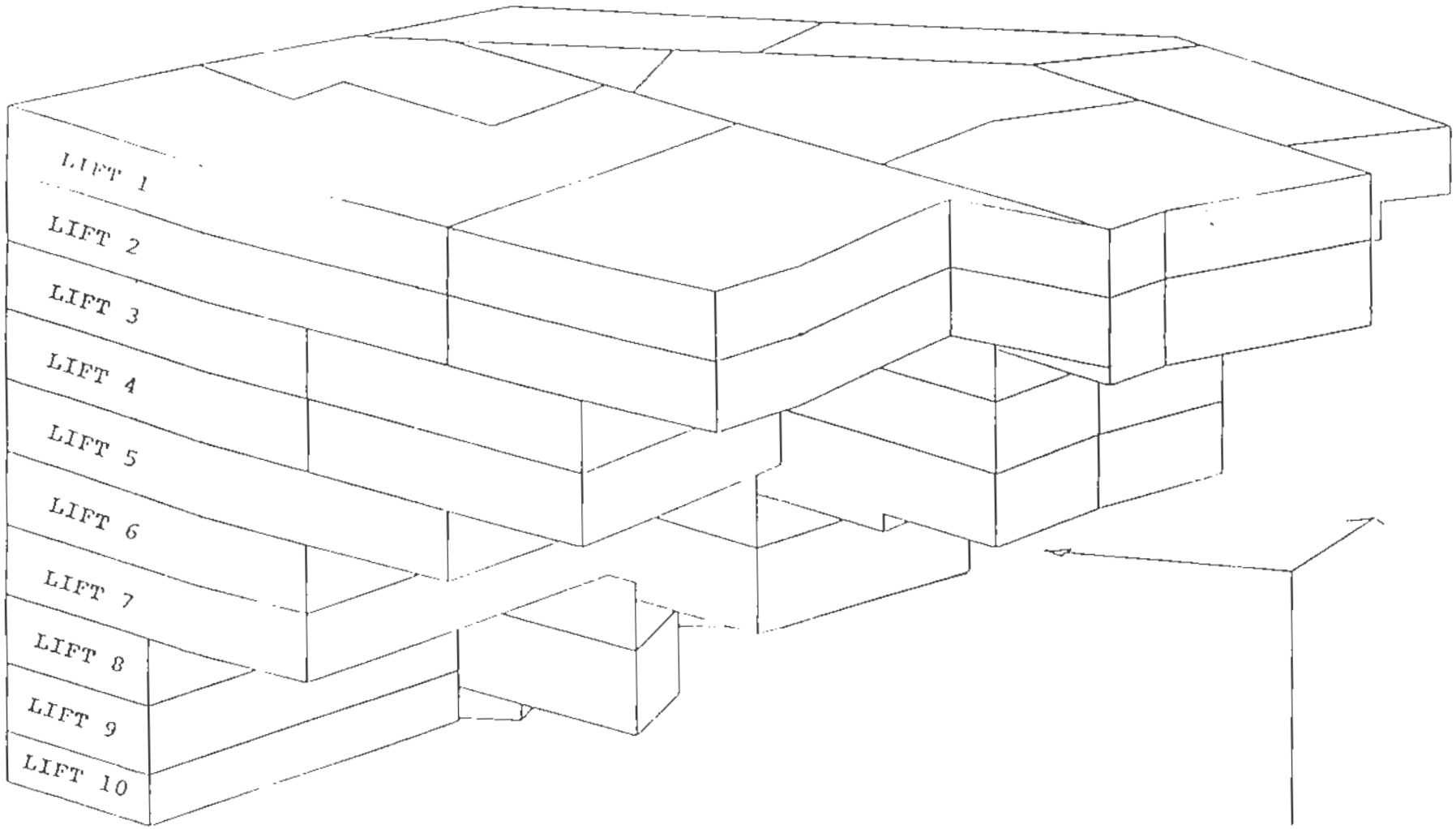


Figure 1-2. Three dimensional view of the Element One Dredging Site showing the lifts to desired dredging depth. Each "block" unit represents a composite. Element One is drawn to scale in the X-Y plane where 1" = 175', the Z-dimension is expanded 20X. The closed arrow points to true north while the open arrow points to east.

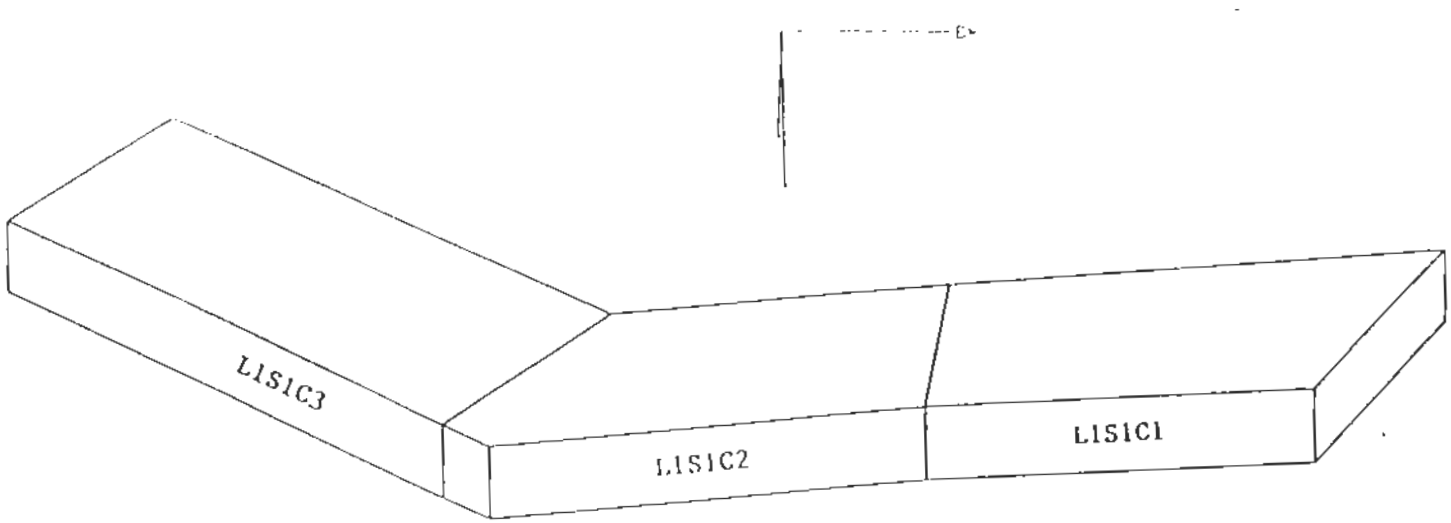
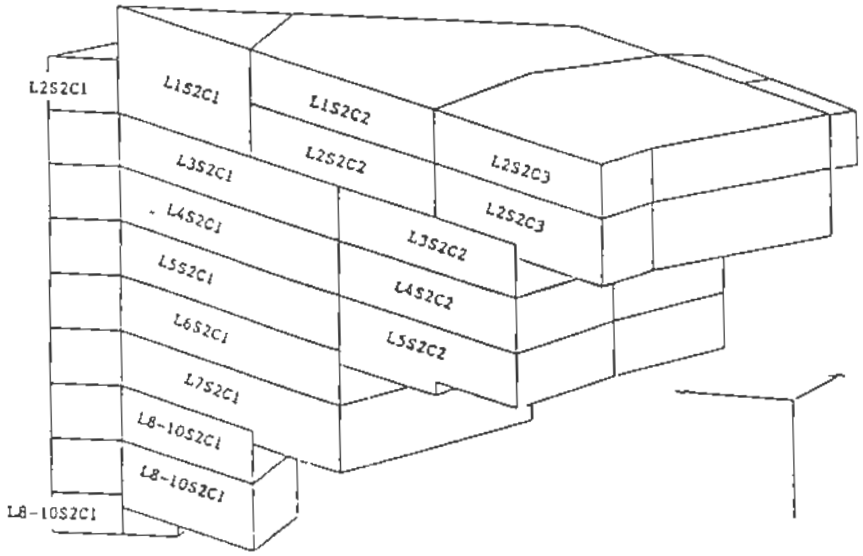


Figure 1-3. Three dimensional view of Subarea One showing the spatial location of composites. Subarea One is drawn to scale in the X-Y plane, where 1" = 175'; the Z-dimension is expanded 20X. The closed arrow points to true north while the open arrow points east.



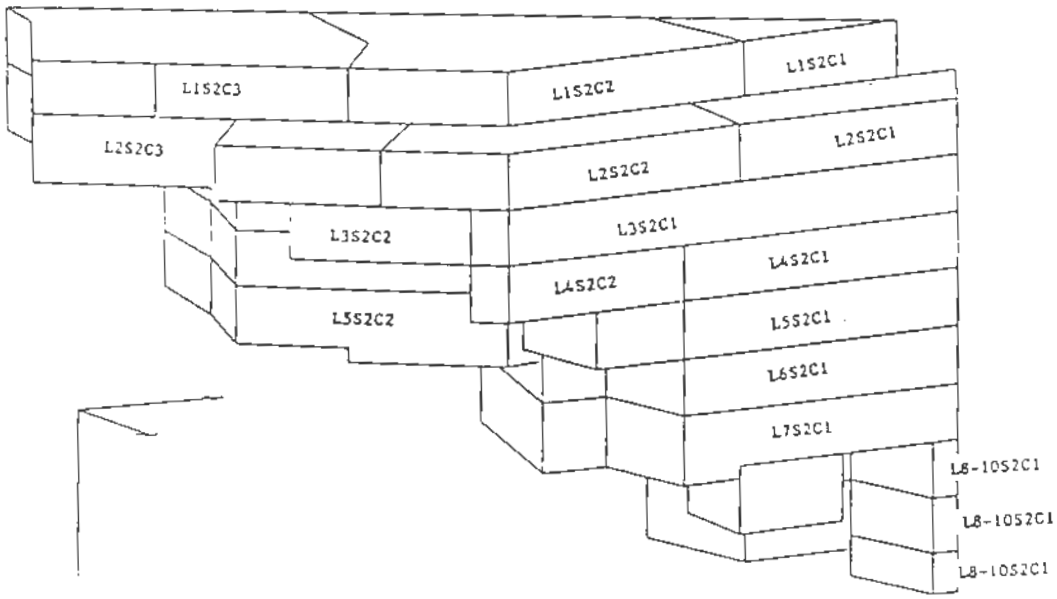


Figure 1-4. Three dimensional view of Subarea Two showing the spatial location of composites. Subarea Two is drawn to scale in the X-Y plane where 1" = 273'; the Z-dimension is expanded 20X. The closed arrows point to true north while the open arrows point east.

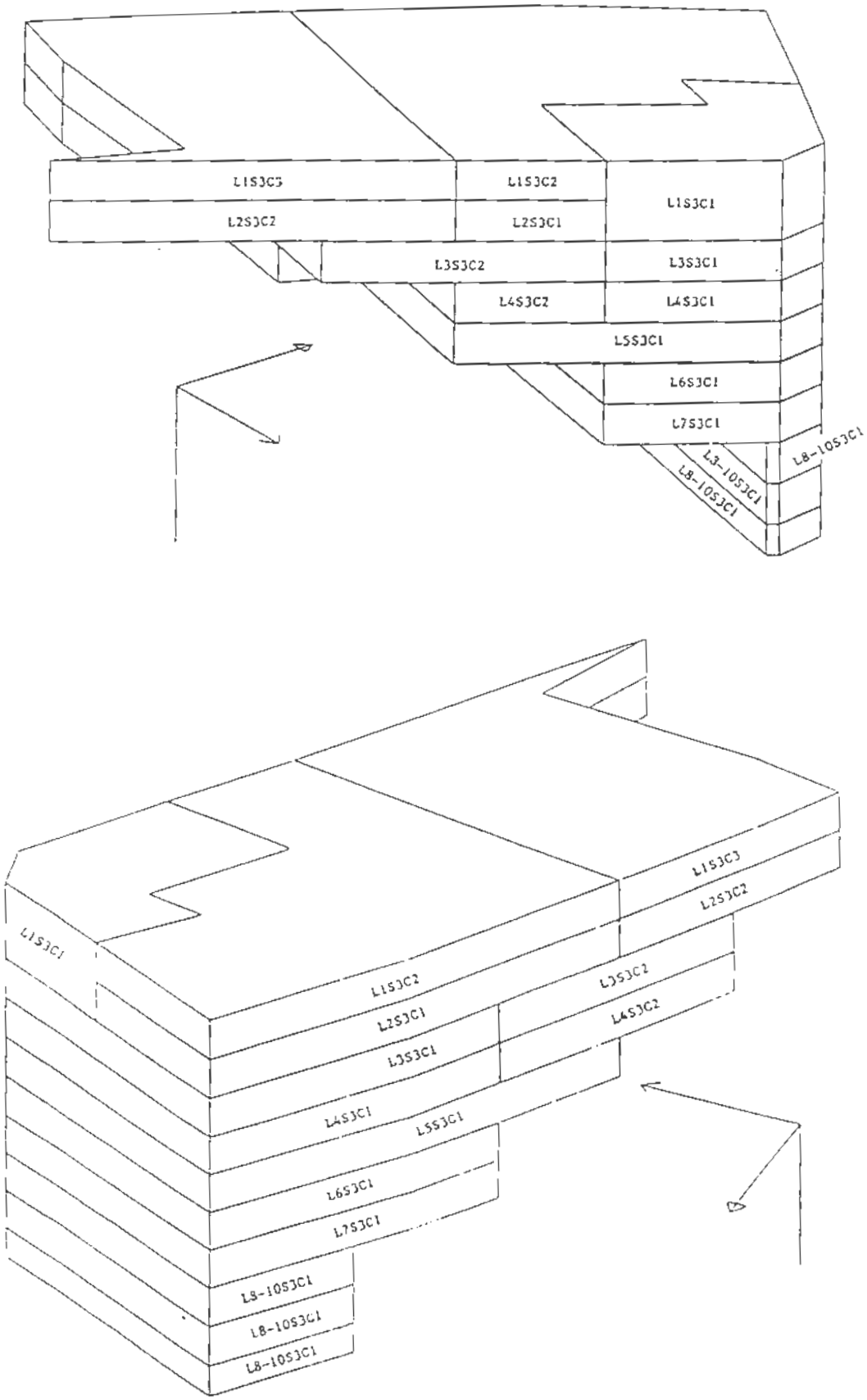


Figure 1-5. Three dimensional view of Subarea Three showing the spatial location of composites. Subarea Three is drawn to scale in the X-Y plane where 1" = 273'; the Z-dimension is expanded 20X.