CENPS-OP-DMMO

MEMORANDUM FOR RECORD 21 August 1991

SUBJECT: DECISION ON THE SUITABILITY OF DREDGED MATERIAL TESTED UNDER PSDDA EVALUATION PROCEDURES FOR THE PORT OF TACOMA-BLAIR WATERWAY DREDGING PROJECT (OYB-2-014346) TO BE DISPOSED OF AT THE COMMENCEMENT BAY OPEN-WATER DISPOSAL SITE.

1. The following summary reflects the PSDDA agencies' (Corps of Engineers, Department of Ecology, Department of Natural Resources and the Environmental Protection Agency) consensus decision on the acceptability of the sampling plan and all relevant test data to make a determination of suitability for the 594,000 cubic yards of material proposed for dredging from the Port of Tacoma-Blair Waterway project site for disposal at the PSDDA Commencement Bay open-water disposal site.

2. Based on previous sediment characterization data, the surface sediments in the project area were ranked moderate, while the subsurface sediments were ranked low-moderate. In addition, due to the large volumes of native material existing within the surface (0-4 feet) prism, the sampling requirements were reduced for this stratum. Twenty-two dredged material management units (DMMU C1 through C22), each representing approximately 16,000 cubic yards and comprised of three composited field samples, were tested to characterize the 345,500 cubic yards of surface sediments. The subsurface sediments (>4 feet) were divided into five DMMU, each representing approximately 48,000 cubic yards and consisting of a minimum of six composited field samples. The total subsurface volume was 248,500 cubic yards.

3. The PSDDA-approved sampling and testing plan was followed in its essential elements, and quality assurance/quality control guidelines specified by PSDDA were generally complied with. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the PSDDA program.

4. All DMMU were subjected to concurrent chemical and biological testing. Chemistry data indicated that exceedances of the 1991 PSDDA screening levels (SL) occurred for only one test sample (C5). Screening levels for total LPAH, total HPAH, and eight individual organic chemicals-of-concern were exceeded for C5 (see Attachment 1). There were no exceedances of bioaccumulation triggers (BT) or maximum levels (ML). No other DMMU had any detected or undetected screening level exceedances.

5. The SL exceedances for C5 would trigger the requirement for biological testing under the tiered testing approach. In this case, concurrent biological testing was conducted for all twenty-seven DMMU. The amphipod 10-day acute toxicity test, echinoderm sediment larval combined mortality and abnormality (effective mortality) test, the Neanthes 10-day acute toxicity test, and the Microtox bacterial luminescence test were conducted. PSDDA interpretation guidelines specified in the Phase II Management Plan Report (Sept 1989), modified by changes made at the second annual review meeting, were used to evaluate the bioassay data. West Beach sand was used for the negative control (amphipod and Neanthes) while the reference sediment was collected from Jetty Island (all bioassays). See Attachment 2 for bioassay results.

6. There were no hits for any of the test sediments for either the Neanthes or Microtox bioassays. For the amphipod bioassay, there were two test sediments, C1 and C9, which exhibited hits under the two-hit rule.

7. In the sediment larval test, the Jetty Island reference sediment which was collected for this project failed to meet the performance standard of less than or equal to twenty percent over control. Effective mortality in the reference was 26.1 percent. Statistical comparison of the test sediments with this reference sediment would result in hits under the two-hit rule for samples C5 and C14.

Concurrent with the Port of Tacoma's sediment larval testing, Round 3 samples from the U.S. Army Corps of Engineers' Bellingham O&M project were tested. A second Jetty Island reference sediment was run for these samples and exhibited an effective mortality of 8.0 percent, well within the performance standard. Because both the Blair and Bellingham samples, as well as their respective reference sediments, were run within the same batch, individual statistical comparisons utilizing both Jetty Island reference sediments were conducted.

The two Jetty Island reference sediments were relatively similar in grain-size, containing 38.1 and 49.1 percent fines for the Blair and Bellingham sediments respectively. A statistical comparison was made between the Blair test sediments and the pooled results from the two Jetty Island references. The mean effective mortality for the pooled reference sediments was 17.1 percent, which meets the reference sediment performance standard. The statistical analysis using the pooled reference sediment resulted in hits under the two-hit rule for C1, C4, C5 and C14. Using this approach, test sediment C1 exhibits hits for both the amphipod and sediment larval tests.

Under PSDDA bioassay interpretation guidelines, hits for C1 under the two-hit rule for two bioassays would result in this DMMU being judged unacceptable for open-water disposal. In this case, mitigating evidence exists to contraindicate this decision:

a. A regression analysis was performed for the sediment larval test results. Highly significant statistical correlations ($p<.001$) were found between percent fines and effective mortality as well as percent silt and effective mortality (see Attachments 3 and 4). Because of the statistical sample size and relatively uncontaminated nature of the sediments, the regression analysis seems to indicate a real grain size effect (or other covarying sediment conventional effect) rather than effects from covarying chemical contamination. The C1 results fall well within the general regression pattern. Of further interest is the relatively low mortality for the Bellingham Jetty Island reference. While the Blair Jetty Island sediment falls within the general regression pattern, the Bellingham Jetty Island reference is a relative outlier and may have biased low the pooled Jetty Island reference.

b. The raw data for C1 shows that one of the five replicates expressed an unusually high mortality of 55.3 percent. The other four replicates had a mean mortality of 23.7 percent (range = 16.5-29.2). The possibility exists that there was a problem specific to this replicate.

c. The chemistry data were comparable to the other Blair DMMU (with the exception of C5): C1 had no screening level exceedances. Most organic chemicals were undetected at concentrations well below screening levels. Detected metals

and organics were well below screening level as well, with the highest detected concentration being only 31.3 percent of its respective screening level (zinc).

The weight of evidence in the present case supports the argument that the echinoderm hit for C1 was not due to chemical toxicity. The PSDDA agencies made the decision to pass the sediment characterized by C1, based on the supporting evidence presented in this memorandum and best professional judgement.

8. Based on the results of chemical and biological testing, the following consensus decision was made by the PSDDA agencies concerning the suitability of the characterized material for disposal at the Commencement Bay open-water disposal site:

All 594,000 cubic yards proposed for dredging are suitable for disposal at the Commencement Bay open-water site.

Concur:

Aug 28, 1991
Date

David R. Kendall
David Kendall, Ph.D
Seattle District Corps of Engineers

8/21/91
Date

David F. Fox, P.E.
David Fox
Seattle District Corps of Engineers

August 21, 1991
Date

John Malek
John Malek/Justine Smith
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Aug 28, 1991
Date

Russ McMillan
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Date

Betsy Striplin
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4 Attachments
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DNR/Betsy Striplin
DMMO file

ATTACHMENT 1
Port of Tacoma-Blair Waterway
OYB-2-014346

Chemistry results for C5:

Chemical	Concentration(ug/kg)
Naphthalene	220
Acenaphthene	120
Fluorene	160
Phenanthrene	720
Total LPAH	1,342
Fluoranthene	680
Pyrene	660
Indeno(1,2,3-c,d)pyrene	240
Total HPAH	3,184
Dibenzofuran	110

ATTACHMENT 2
PORT OF TACOMA
BLAIR MAINTENANCE DREDGING
OYB-2-014346

Sample	Sand	Silt	Clay	Amphipod Mortality (percent)	Echinoderm Effective Mortality (percent)	Microtox Light Diminution (percent)	Neanthes Mortality (percent)
C1	44.9	39.1	16.0	44.0*	30.0*	-24.3	2.0
C2	57.1	36.4	6.5	23.0	21.1	-16.4	2.0
C3	51.5	34.6	13.9	30.0	17.0	-15.0	2.0
C4	39.8	50.9	9.5	31.0	34.4*	-7.1	4.0
C5**	26.3	59.2	14.5	33.0	41.9*	-5.4	0.0
C6	68.1	21.9	10.0	21.0	13.7	-14.5	0.0
C7	62.4	33.6	4.0	21.0	15.0	-30.3	2.0
C8	58.7	37.1	4.2	27.0	22.7	-14.4	0.0
C9	33.7	49.3	17.0	46.0*	26.6	-17.7	6.0
C10	66.6	29.9	3.5	33.0	22.3	-44.1	2.0
C11	73.7	20.8	5.5	20.0	27.8	-30.1	12.0
C12	67.7	30.3	2.0	16.0	27.2	-18.9	2.0
C13	52.6	38.9	8.5	29.0	26.8	-19.9	4.0
C14	28.6	55.4	16.0	30.0	36.8*	-10.6	12.0
C15	39.1	47.9	13.0	38.0	23.9	-3.3	2.0
C16	64.4	27.3	6.7	30.0	20.2	-20.7	0.0
C17	68.1	21.0	11.0	26.0	10.6	-14.6	0.0
C18	44.9	39.1	16.0	17.0	17.1	-3.3	2.0
C19	79.7	11.1	9.2	8.0	6.8	-8.9	6.0
C20	72.5	17.8	9.7	21.0	13.1	-11.4	0.0
C21	79.6	18.8	1.6	9.0	14.0	-30.2	0.0
C22	60.1	27.6	12.3	18.0	25.8	-36.8	0.0
C23	80.3	13.7	6.0	14.0	6.2	-23.2	4.0
C24	90.5	9.1	0.4	14.0	7.7	-17.9	4.0
C25	79.9	14.6	5.5	18.0	17.2	-22.6	8.0
C26	80.0	18.5	1.5	10.0	15.4	-2.5	4.0
C27	88.8	8.5	2.7	14.0	21.7	-20.5	0.0
Blair JI	61.9	27.4	10.7	21.0	26.1	-19.7	4.0
Bellingham JI	50.7	37.6	11.5	N/A	8.0	N/A	N/A
Combined JI	56.3	32.5	11.1	N/A	17.1	N/A	N/A
West Beach	N/A	N/A	N/A	10.0	N/A	N/A	6.0

* Denotes statistically different from the reference sediment, and greater than 20% mortality over control sediment.

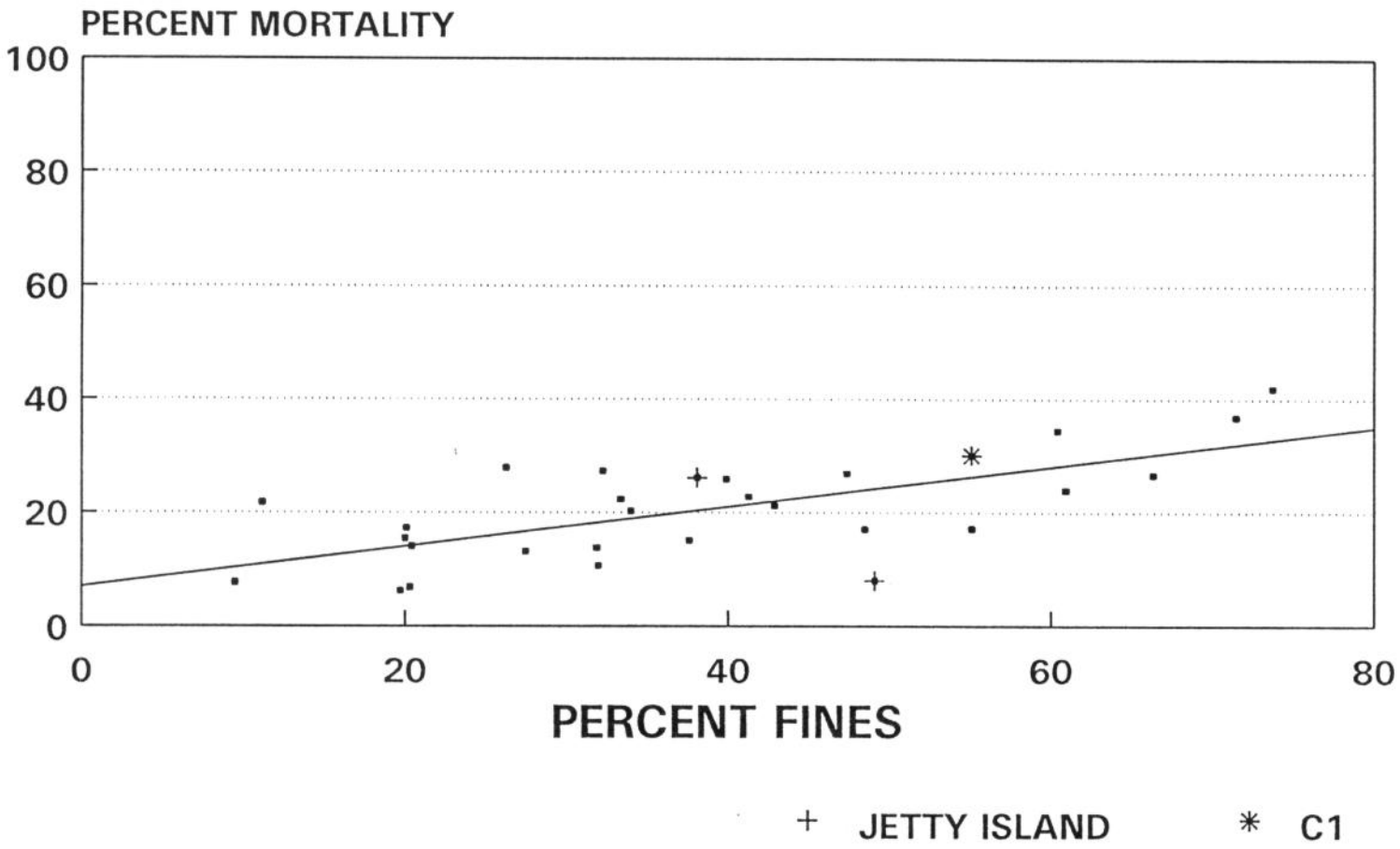
** C5 was the only test sediment with PSDDA screening level exceedances

JI = Jetty Island

Note 1: Parametrix report labels C15-Amphipods as a hit. The basis was a t-test using a pooled variance estimate. The assumption of homogeneity of variance was not met however. A t-test using separate variance estimates resulted in no hit for this sample.

Note 2: The Echinoderm hits shown are based on a t-test comparison to pooled Jetty Island references from the Blair and Bellingham O&M dredging projects which were run in the same batch. Sample C4 is an additional hit which does not appear in the Parametrix report. The hits shown in the Parametrix report are based on a comparison to the Blair Jetty Island reference sediment only.

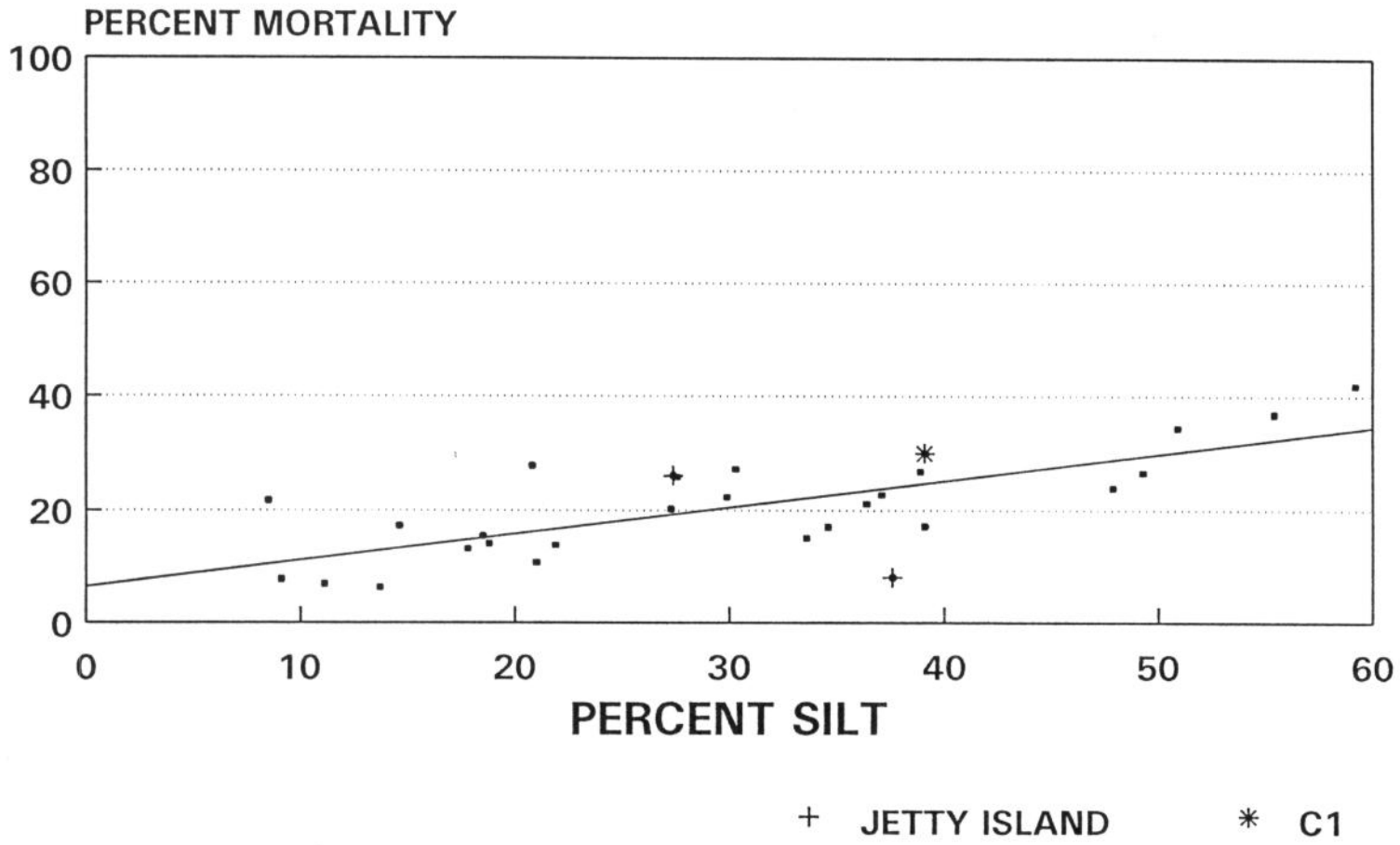
PORT OF TACOMA-BLAIR
ECHINODERM MORTALITY
VS. PERCENT FINES



r = .677, r(.01) = .478, highly significant

Attachment 3

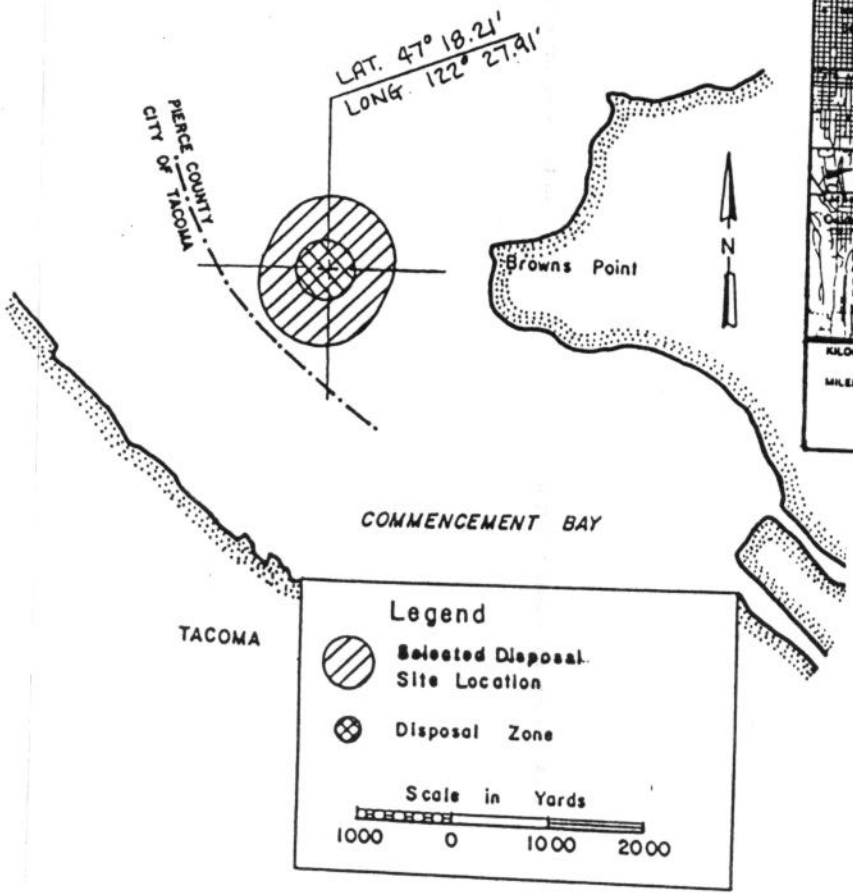
PORT OF TACOMA-BLAIR
ECHINODERM MORTALITY
VS. PERCENT SILT



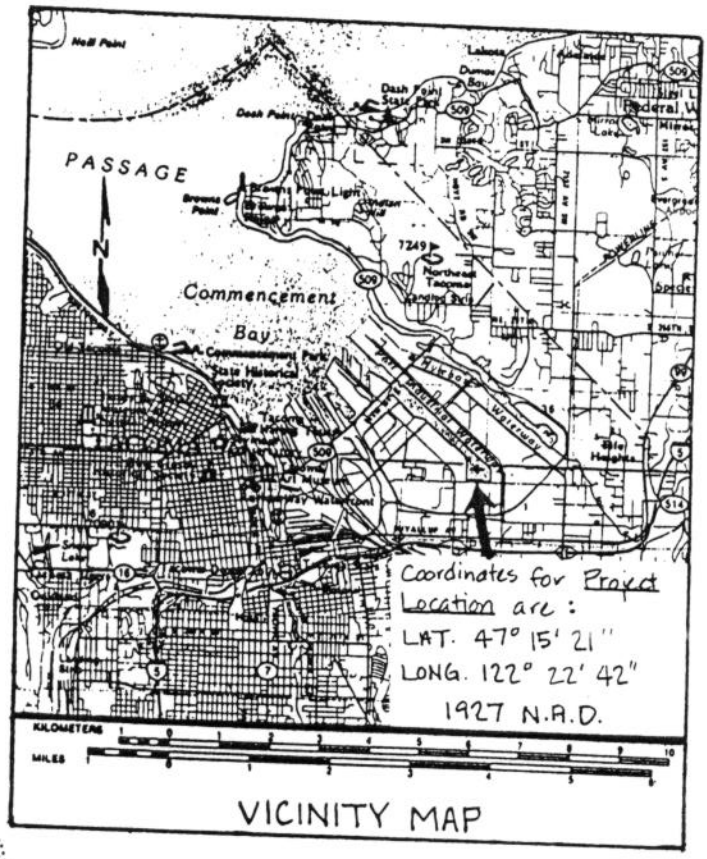
r = .722, r(.01) = .478, highly significant

Attachment 4

Commencement Bay Disposal Site



NOTE: THE COMMENCEMENT BAY DISPOSAL SITE COORDINATES ARE BASED ON 1983 NORTH AMERICAN DATUM (NAD)



VICINITY MAP

PURPOSE: PROVIDE ADEQUATE WATER DEPTH FOR VESSEL MOVEMENT

DATUM MLLW = 0.0'

ADJACENT PROPERTY OWNERS:

(1) Buckeye Service Corporation

(2)

OYB-2-014346

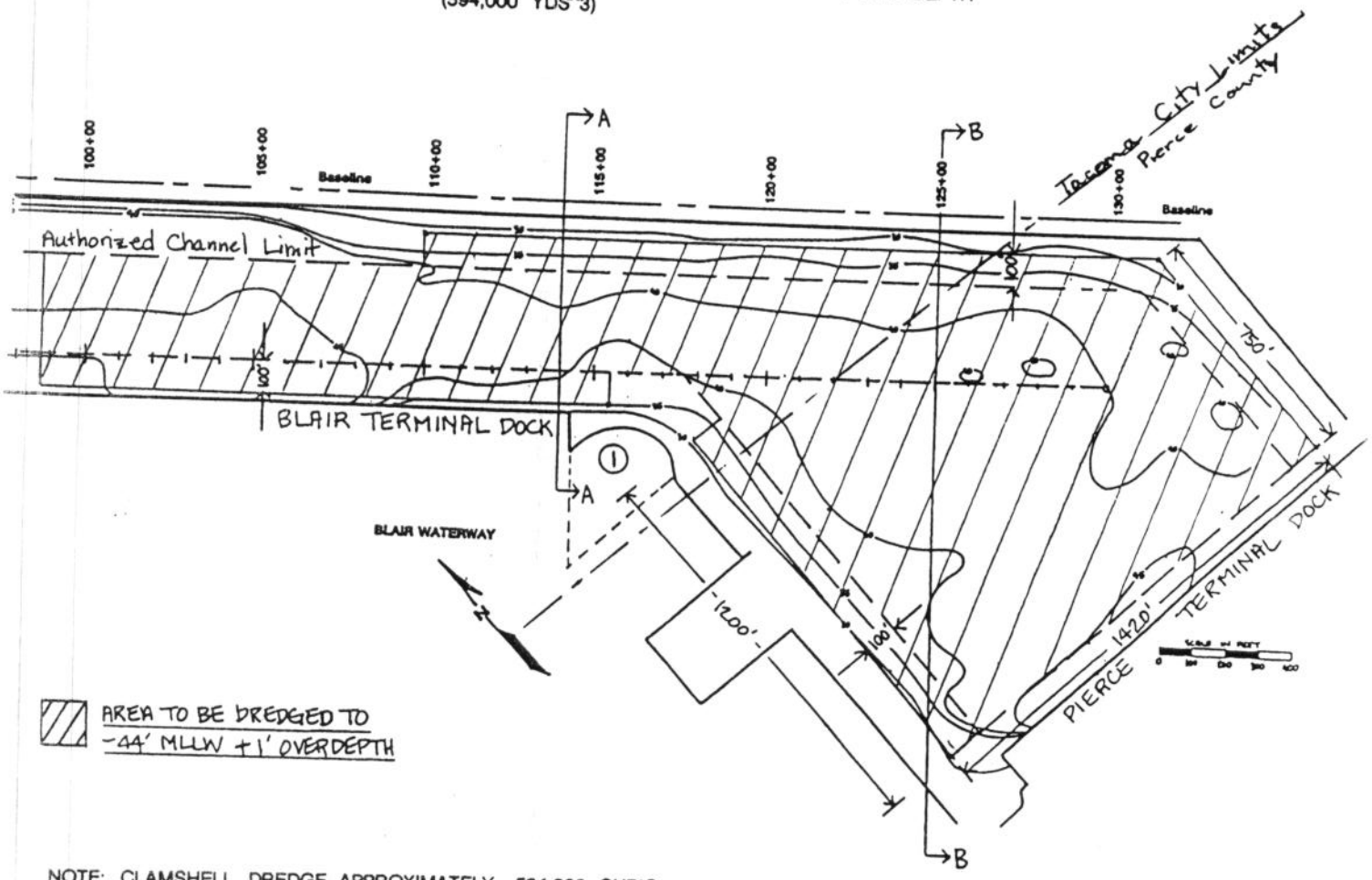
PROPOSED DREDGING IN BLAIR WATERWAY AT COMMENCEMENT BAY, TACOMA, PIERCE CO., WA.

PROPOSED DISPOSAL IN COMMENCEMENT BAY DISPOSAL SITE OR OTHER APPROVED LOCATIONS

APPLICATION BY PORT OF TACOMA

SHEET 1 OF 3 DATE

PROPOSED DREDGING TO -44' MLLW + 1' OVERDEPTH
(594,000 YDS^3)



NOTE: CLAMSHELL DREDGE APPROXIMATELY 594,000 CUBIC YARDS OF SEDIMENTS WITH DISPOSAL AT COMMENCEMENT BAY DISPOSAL SITE OR OTHER APPROVED LOCATIONS. VOLUMES TO BE DETERMINED FOLLOWING SEDIMENT ANALYSIS.

SITE PLAN

PURPOSE: PROVIDE ADEQUATE WATER DEPTH FOR VESSEL MOVEMENT

DATUM MLLW = 0.0'

ADJACENT PROPERTY OWNERS:

(1) Buckeye Service Corporation

(2)

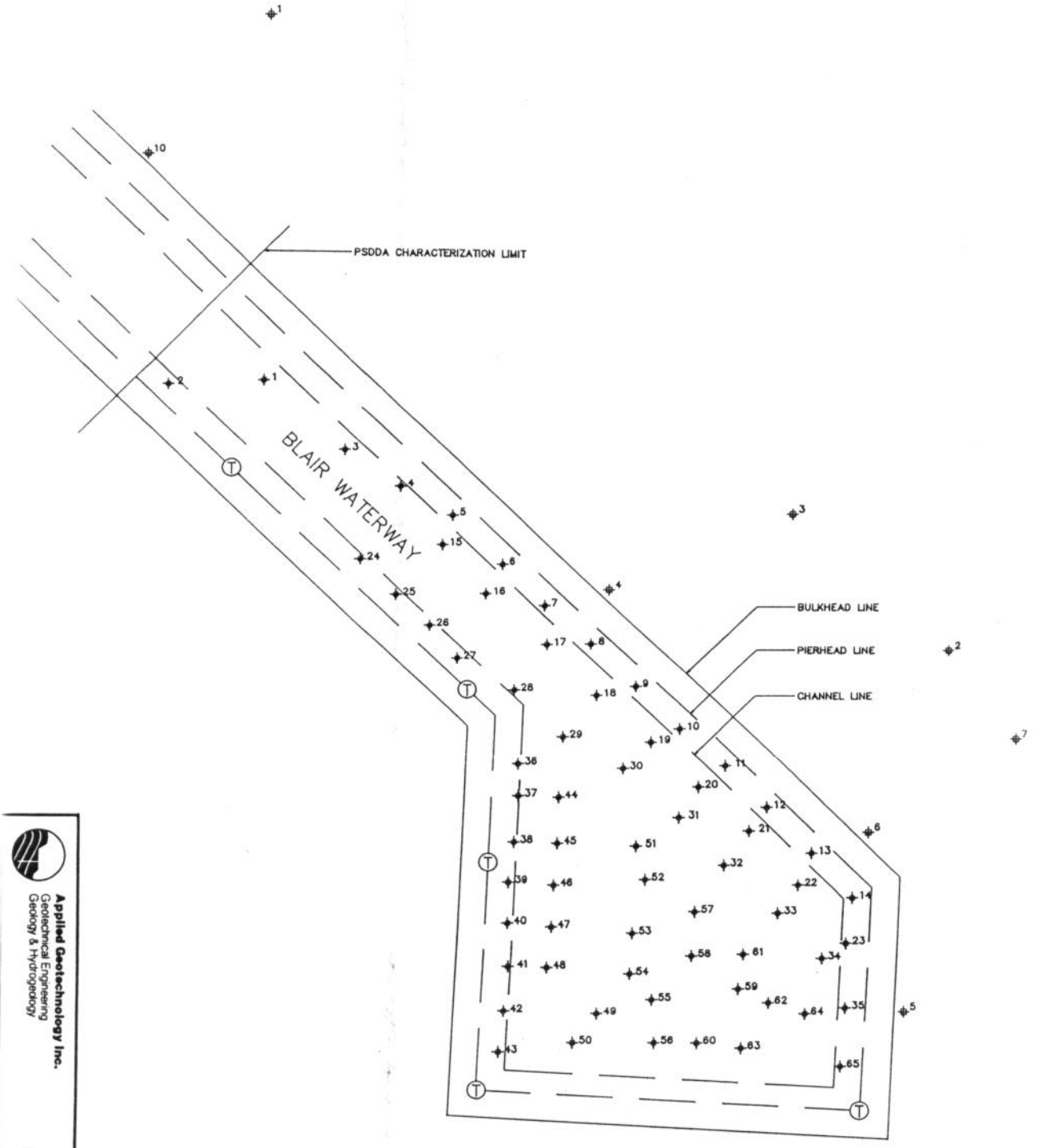
OYB-2-014346

PROPOSED DREDGING IN BLAIR WATERWAY AT COMMENCEMENT BAY, TACOMA, PIERCE CO., WA.

PROPOSED DISPOSAL IN COMMENCEMENT BAY DISPOSAL SITE OR OTHER APPROVED LOCATIONS

APPLICATION BY PORT OF TACOMA

SHEET 2 OF 3 DATE 12/12/90



Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Site Plan

Hartman/Port of Tacoma – Blair San
Tacoma, Washington

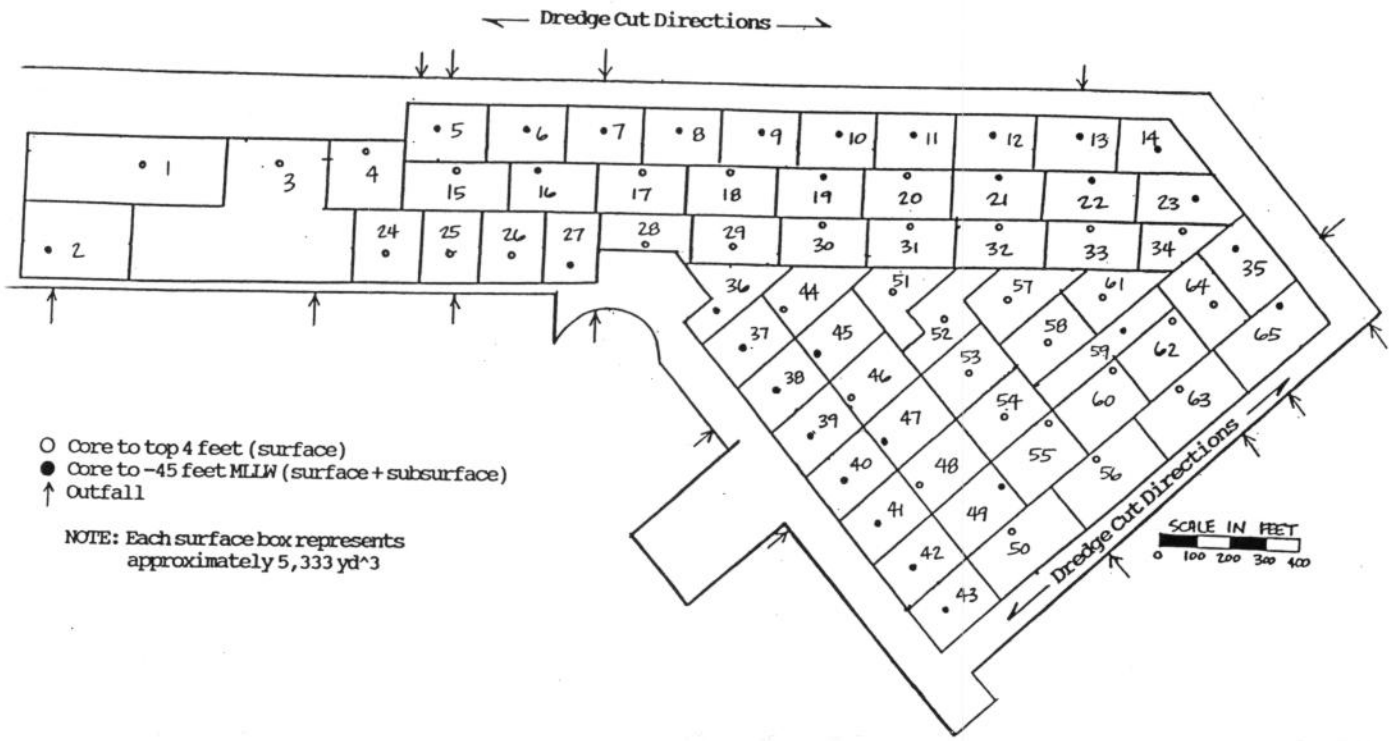


FIGURE 3.1
Surface Management Units, Boring Locations
and Outfall Locations

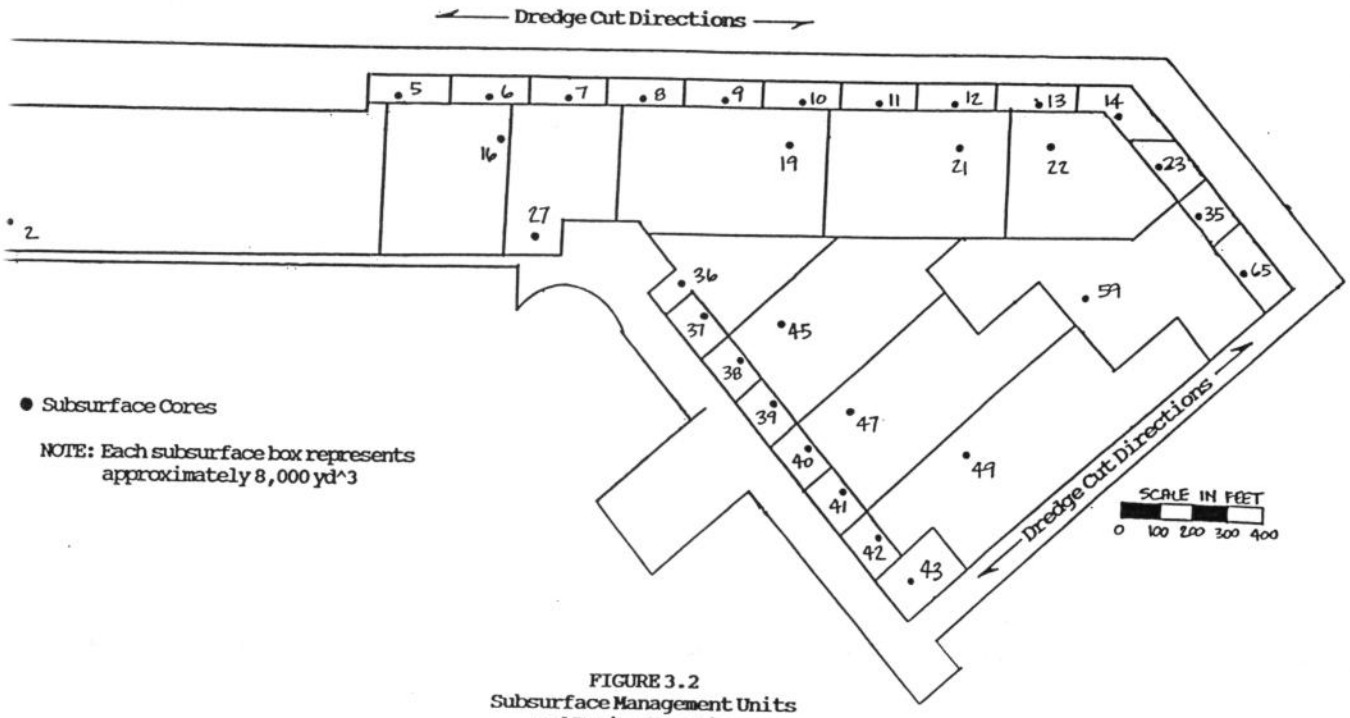


FIGURE 3.2
Subsurface Management Units
and Boring Locations

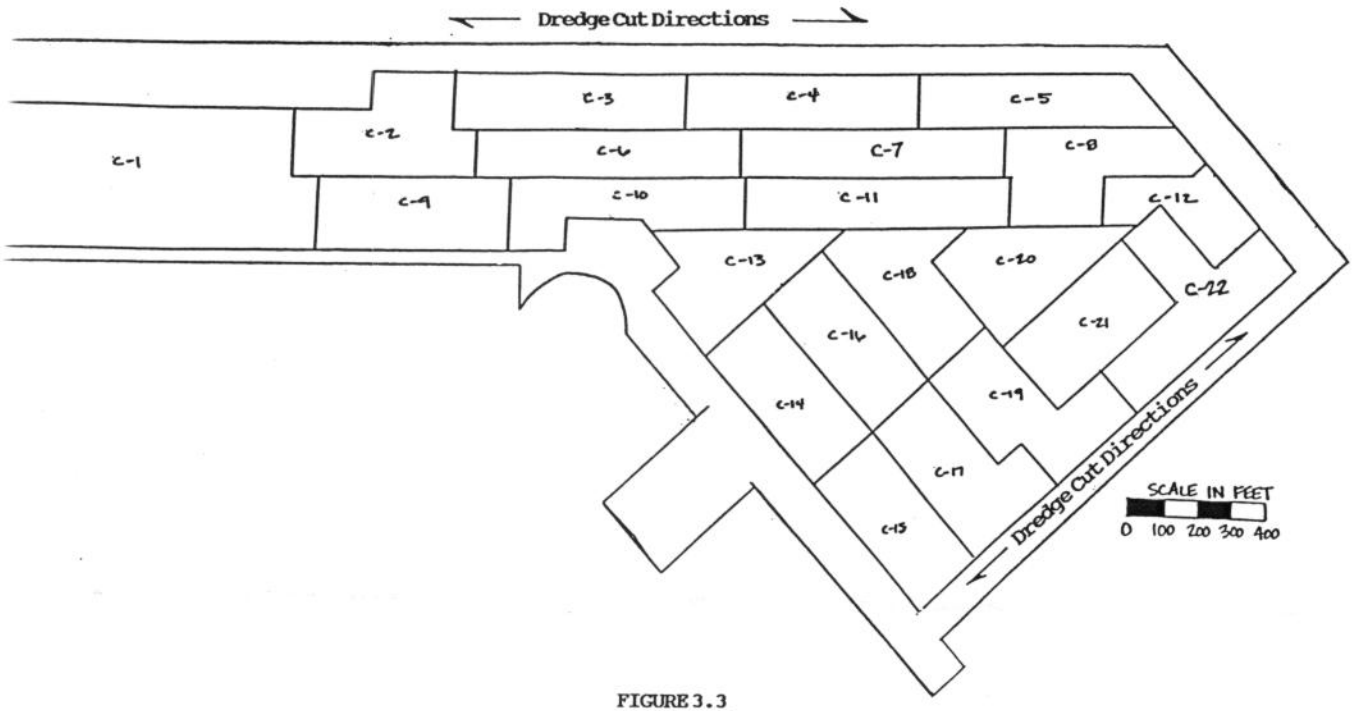


FIGURE 3.3
Surface Composites

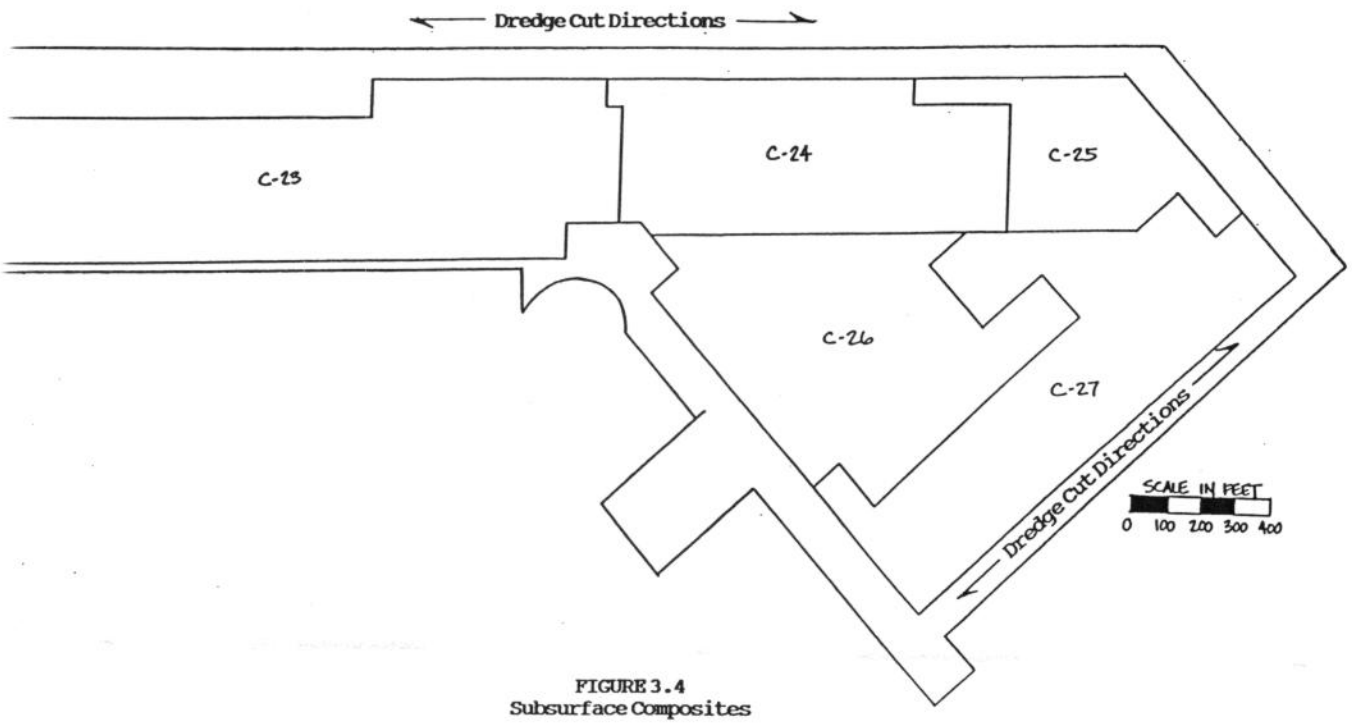


FIGURE 3.4
Subsurface Composites

Surface sediment compositing was determined by combining three core samples each representing 5333 cubic yards for a total of 16,000 cubic yards per composite. Subsurface samples were composited such that approximately 6 core sections each representing 8000 cubic yards be combined for a total of 48,000 cubic yards. Details of the surface and subsurface compositing schemes are identified in Table 3.1 and visually identified in Figures 3.3 and 3.4.

Table 3.1 Compositing Scheme

Compositing of Top 4 Feet of Dredge Prism

PSDDA Reference Code	Surface Samples Number (Top 4 Feet)			Volume Represented (YD^3)
C-1	1	2	3	16,000
C-2	4	5	15	16,000
C-3	6	7	8	16,000
C-4	9	10	11	16,000
C-5	12	13	14	16,000
C-6	16	17	18	16,000
C-7	19	20	21	16,000
C-8	22	23	34	16,000
C-9	24	25	26	16,000
C-10	27	28	29	16,000
C-11	30	31	32	16,000
C-12	34	35		11,000
C-13	36	37	44	16,000
C-14	38	39	40	16,000
C-15	41	42	43	16,000
C-16	45	46	47	16,000
C-17	48	49	50	16,000
C-18	51	52	53	16,000
C-19	54	55	56	16,000
C-20	57	58	61	16,000
C-21	59	60	62	16,000
C-22	63	64	65	16,000

APPENDIX B

Compositing of Subsurface Dredge Prism Sediments

PSDDA Reference Code	Subsurface Sample Numbers						Volumes Represented (yd^3)
C-23	2B	5B,C	6B,C	7B,C	16B	27B	48,000
C-24	8B,C	9B,C	10B,C	11B	19B	21B	48,000
C-25	12B,C	13B,C	14B,C	22B	23B	35B	48,000
C-26	36B 47B	37B	38B	39B	40B,C	45B	56,000
C-27	41B,C	42B	43B	49B	59B	65B	46,700

Based on the above, the following sample collection and compositing program is proposed:

Surface Sediments

A total of 65 sediment bore locations (representing 5333 cubic yards each) will be sampled. Composites for laboratory analyses will consist of three core sections from these locations. Each composite will represent approximately 16,000 cubic yards.

Subsurface Sediments

A total of 31 sediment bore locations coinciding with surface boring locations will be collected. Core sections representing approximately 48,000 cubic yards of sediment will be combined to form each composite sample. Subsurface samples are grouped to allow the entire depth of subsurface dredge cuts to be included in the same composite sample. There will be no separation of multiple 4 foot vertical layers of a dredging MU into different composite samples. This is in anticipation that the dredger will want to complete dredging to the required depth at each set-up location for the most efficient and cost effective operation. Additionally, core sections making up each composite have been grouped such that the sampling contractor is able to collect the samples quickly enough to meet the PSDDA analytical sediment holding time protocols.