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ATTACHMENT D

NEW BEDFORD HARBOR
THIN LAYER SEDIMENT
SAMPLING PROGRAM

DRAFT

NEW BEDFORD HARBOR THIN LAYER SEDIMENT SAMPLING PROGRAM

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Balsam Project 6292:1206

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NEW BEDFORD HARBOR THIN LAYER SEDIMENT SAMPLING PROGRAM

1.0 INTRODUCTION

Following a review of existing data characterizing New Bedford Harbor sediments, it was determined that additional sediment quality data would permit better definition of the vertical distribution of PCBs and heavy metals in New Bedford Harbor sediment. As such, a sampling program to allow more accurately estimation of the rate of PCB and heavy metal flux was designed and implemented. This sediment sampling program was prepared by Dr. W. Frank Bohlen of the University of Connecticut and Balsam Environmental Consultants, Inc. (Balsam), and was subsequently undertaken under the direction of Balsam.

2.0 FIELD PROGRAM IMPLEMENTATION

During the week of December 12, 1988, Balsam and University of Connecticut personnel implemented the sample collection phase of this thin layer sediment sampling program. Prior to implementation of the field program, written protocol were developed for the conduct of this work. A copy of these protocol is included as Appendix A.

In developing these sampling protocol, two depositional regimes were identified as preferred sampling stations. One sampling station was to be located at an area in or adjacent to the so called "hot spot" area located east and southeast of the Aerovox, Inc. facility. The location of this sampling station, designated as Station FX, is shown on Figure 1.

The second preferred sampling area was to be located in an area of above average sediment deposition with moderately elevated PCB sediment concentrations. The southwestern cove of the upper estuary was selected as the location for this second sampling station. The sampling station selected to represent this sediment depositional regime, designated as Station DR, is also shown on Figure 1.

Following collection of sediment core samples from the two designated sampling stations, samples were transported by field sampling personnel to University of Connecticut laboratory facilities for further processing. Activities at the University of Connecticut laboratory included sectioning of samples into one to four centimeter thick subsections which were then delivered to an analytical laboratory for chemical analysis. Sample subsectioning protocol are included as part of Appendix A.

Following completion of sample subsectioning and labeling, samples were personally delivered to Cambridge Analytical Associates, Inc. (CAA) for chemical analysis of PCBs, mercury, chromium, copper, lead and zinc.

3.0 PROGRAM RESULTS

PCB and heavy metal analyses were performed on forty-four (44) sediment samples collected from the two sampling stations within the upper estuary, as well as additional quality assurance/quality control (QA/QC) samples. Analytical results for analysis of the twenty-two (22) sediment samples from each of Stations FX and DR are summarized in Tables 1 and 2; Table 1 presents results of PCB analyses, and Table 2 presents results of metals analyses. Analytical reports received from CAA are included as Appendix B.

Initial review of PCB analyses performed as part of this thin layer sediment sampling program indicate significant vertical stratification of PCBs in upper estuary sediments. In particular, the series of vertical subsection samples located in the vicinity of the area referred to as the "hot spot" indicated PCBs to be primarily present in the upper 12 inches (approximately 30 centimeters) of sediment, with only very low concentrations of PCBs (less than 1 part per million (ppm)) present at depths greater than 12 inches. It is also significant to note that the upper subsection samples collected from Station FX (i.e., 0-6 centimeters) were lower in PCB concentration than those collected from the 6-12 centimeter interval. The existing EPA sediment analytical database for the upper estuary, which is based primarily on 12-inch sediment intervals, may overestimate surficial sediment PCB concentrations in areas where elevated PCB concentrations are reported present in estuary sediments. As an example, the calculated weighted average total PCB concentration for the 0 to 12 inch sediment interval at Station FX is 3,060 ppm as shown in Table 3. However, as shown in Table 1, the surficial sediment (0 - 1 cm) at Station FX was reported to contain 1,600 ppm of PCB, or approximately half of the weighted average total PCB concentration calculated for the 0 to 12 inch sediment interval. Similar PCB depositional trends were also observed in the sample collected from the Station DR.

The weighted average PCB concentration was calculated in order to allow data from the thin layer sediment sampling program to be compared to existing analytical data. PCB weighted average concentrations were estimated for the 0 to 6 inch, 6 to 12 inch, and 0 to 12 inch sediment intervals at both stations FX and DR utilizing the thin layer sediment sampling analytical data. The weighted-averaging technique provides for weighting of each PCB concentration by the magnitude of the depth interval (1 cm to 4 cm) with which it was associated. To make these calculations, the following equation was used:

$$c = \frac{c_1 \times d_1}{d_t} + \frac{c_2 \times d_2}{d_t} + \frac{c_3 \times d_3}{d_t} + \ldots + \frac{c_i \times d_i}{dt}$$

where:
- c = average concentration over depth d_t
- c_i = discrete sample concentration for depth interval d_i
- d_i = discrete depth interval
- d_t = total depth interval

Thus, a PCB concentration from a 4 centimeter sediment interval sample was weighted twice as much as a PCB concentration from a 2 centimeter sediment interval sample. These estimates are presented as Table 3. Review of these estimates indicate that the majority of PCB present in the vicinity of sampling stations FX and DR is within the upper 6 inches of sediment.

In reviewing heavy metal analysis performed on samples from stations DR and FX, similar types of trends were also noted, although the depths of contamination and magnitude of concentration decline varied. As an example, a review of the chromium, copper, lead and zinc analytical data for Station FX showed moderate metals concentrations in surficial and near surface sediment samples (up to 6 centimeters in depth) as compared to somewhat deeper sediment samples (the 6 to 28 centimeter depth interval), and markedly reduced concentrations as sediment sample depth increased.

4.0 ANALYTICAL DATA ASSESSMENT

As a means to evaluate the performance of the analytical laboratory as well as field protocol, a series of quality control (QC) samples were submitted to CAA. A total of six blind QC samples consisting of two duplicate sediment samples, two duplicate sediment control samples, one blank water sample, and one wash water sample were submitted as part of the QA/QC program. Duplicate and control sediment samples were submitted to evaluate the ability of the laboratory to reproduce analytical results. Control samples were also submitted to the analytical laboratory to evaluate their ability to quantify constituent concentrations in samples. A blank sample was submitted to the analytical laboratory to evaluate possible introduction of extraneous contamination to the sample by the analytical laboratory, whereas the wash water sample was submitted to evaluate possible contamination introduction to samples due to sampling protocol or inadequate sampling equipment decontamination.

The two duplicate sediment samples were selected from locations believed to contain differing levels of PCBs and metals. A duplicate sample of subsection sample FX-32 was selected as a lower concentration duplicate sediment sample, where as a duplicate sample of subsection sample DR-6 was submitted as a sample believed to contain moderate levels of PCBs.

A large volume of homogenized Long Island sediment currently maintained by the University of Connecticut which had previously been analyzed for lead, zinc and copper was selected as a suitable source for sediment control samples. These samples were designated as DR-56 and DR-60.

As a source of blank water, the University of Connecticut provided Balsam with distilled water from the University of Connecticut distillation unit which obtains its water from the Groton, Connecticut public water supply. Finally, as a field

control or wash water sample, Balsam collected a sample of wash water used as a final rinse for sediment sampling equipment while in the field.

Based on a review of analytical QA/QC program results summarized in Table 4, PCB sediment analytical data were judged to be reliable with the exception that low levels of PCB reported present in samples may be attributed to laboratory contamination. Zinc, copper, chromium and lead sediment analytical data were judged to be approximate in nature; in addition, low levels of these metals reported present in sediment samples may be attributed to laboratory contamination. Mercury analytical data were judged to be acceptable as reported.

5.0 SUMMARY

The results of this thin layer sediment sampling program indicate the presence of marked vertical stratification of both PCBs and heavy metals in New Bedford Harbor sediments. Significant data have been gathered regarding vertical stratification of these constituents in estuary sediments, as well as a better means to estimate actual surficial contaminant concentrations in estuary sediments utilizing sediment analytical data for larger sediment intervals (e.g. 0-6 inches or 0-12 inches).

TABLE 1
NEW BEDFORD HARBOR
THIN LAYER SEDIMENT SAMPLING PROGRAM
PCB ANALYSES

SAMPLE DESIGNATION	SAMPLE DEPTH(cm)	AROCLORS 1242/1016(ppm)	AROCLOR1254(ppm)
FX - 1	0 - 1	1,300	300
FX - 2	1 - 2	1,100	230
FX - 3	2 - 3	1,800	350
FX - 4	3 - 4	2,900	390
FX - 6	4 - 6	3,300	480
FX - 8	6 - 8	5,600	740
FX - 10	8 - 10	6,300	900
FX - 12	10 - 12	5,700	870
FX - 14	12 - 14	2,600	1,400
FX - 16	14 - 16	3,700	1,400
FX - 20	16 - 20	1,300	1,200
FX - 24	20 - 24	480	1,000
FX - 28	24 - 28	28	260
FX - 32	28 - 32	3.8	27
FX - 36	32 - 36	0.1	0.09
FX - 40	36 - 40	0.08	0.02
FX - 44	40 - 44	0.12	0.02
FX - 48	44 - 48	0.22	0.04
FX - 52	48 - 52	0.32	0.04
FX - 56	52 - 56	0.45	0.08
FX - 60	56 - 60	ND(0.01)	ND(0.01)
FX - 64	60 - 64	ND(0.1)	ND(0.1)

Notes:
1) All concentrations are in milligrams per kilogram (ppm) dry weight basis.
2) ND (-) means not detected (at instrument detection limit).

TABLE 1 (CONTINUED)

SAMPLE DESIGNATION	SAMPLE DEPTH(cm)	AROCLORS 1242/1016(ppm)	AROCLOR 1254(ppm)
DR - 1	0 - 1	160	61
DR - 2	1 - 2	210	80
DR - 3	2 - 3	160	59
DR - 4	3 - 4	130	50
DR - 6	4 - 6	140	64
DR - 8	6 - 8	210	95
DR - 10	8 - 10	170	87
DR - 12	10 - 12	140	58
DR - 14	12 - 14	110	49
DR - 16	14 - 16	90	54
DR - 18	16 - 18	49	34
DR - 20	18 - 20	23	12
DR - 22	20 - 22	6.8	2.5
DR - 24	22 - 24	4.1	0.92
DR - 26	24 - 26	0.4	0.14
DR - 28	26 - 28	1.2	ND(0.1)
DR - 30	28 - 30	ND(0.02)	ND(0.02)
DR - 32	30 - 32	ND(0.05)	ND(0.05)
DR - 36	32 - 36	ND(0.05)	ND(0.05)
DR - 40	36 - 40	ND(0.05)	ND(0.05)
DR - 44	40 - 44	ND(0.05)	ND(0.05)
DR - 48	44 - 48	ND(0.05)	ND(0.05)

Notes:
1) All concentrations are in milligrams per kilogram (ppm) dry weight basis.
2) ND (-) means not detected (at instrument detection limit).

TABLE 2
NEW BEDFORD HARBOR
THIN LAYER SEDIMENT SAMPLING PROGRAM
METALS ANALYSES

SAMPLE DESIGNATION	SAMPLE DEPTH (cm)	CHROMIUM (ppm)	COPPER (ppm)	MERCURY (ppm)	LEAD (ppm)	ZINC (ppm)
FX - 1	0 - 1	890	1,300	1.98	680	1,900
FX - 2	1 - 2	860	1,200	1.88	660	2,000
FX - 3	2 - 3	840	1,200	1.89	590	1,600
FX - 4	3 - 4	860	1,200	1.59	630	1,900
FX - 6	4 - 6	1,000	1,400	1.72	750	2,500
FX - 8	6 - 8	1,600	2,300	2.46	1,200	4,100
FX - 10	8 - 10	1,200	1,900	2.49	920	3,600
FX - 12	10 - 12	1,800	3,000	3.08	1,200	5,500
FX - 14	12 - 14	1,400	2,800	2.97	1,100	4,000
FX - 16	14 - 16	660	1,400	1.53	560	1,900
FX - 20	16 - 20	530	1,800	2.61	1,000	3,300
FX - 24	20 - 24	260	1,100	1.60	730	3,200
FX - 28	24 - 28	280	1,700	2.29	990	4,000
FX - 32	28 - 32	99	800	2.66	510	2,200
FX - 36	32 - 36	35	560	2.31	390	1,500
FX - 40	36 - 40	27	270	2.15	240	490
FX - 44	40 - 44	23	130	2.58	100	150
FX - 48	44 - 48	28	61	0.443	52	86
FX - 52	48 - 52	24	14	<0.136	<14	43
FX - 56	52 - 56	29	21	<0.207	25	67
FX - 60	56 - 60	22	7.8	<0.195	<20	54
FX - 64	60 - 64	23	7.3	<0.206	20	51

Notes:

1) All concentrations are in milligrams per kilogram (ppm) dry weight basis.

2) Total metals concentrations are reported.

3) "<" means not detected at the level indicated.

TABLE 2 (CONTINUED)

SAMPLE DESIGNATION	SAMPLE DEPTH (cm)	CHROMIUM (ppm)	COPPER (ppm)	MERCURY (ppm)	LEAD (ppm)	ZINC (ppm)
DR - 1	0 - 1	860	1,300	1.50	380	2,000
DR - 2	1 - 2	900	1,400	1.47	420	2,100
DR - 3	2 - 3	810	1,300	1.25	350	2,400
DR - 4	3 - 4	360	570	0.906	300	870
DR - 6	4 - 6	710	1,100	1.34	390	1,600
DR - 8	6 - 8	730	1,300	1.09	470	1,700
DR - 10	8 - 10	680	1,200	1.15	490	1,600
DR - 12	10 - 12	540	980	1.14	350	1,500
DR - 14	12 - 14	670	670	0.691	290	930
DR - 16	14 - 16	310	700	1.14	290	900
DR - 18	16 - 18	420	910	1.08	890	1,100
DR - 20	18 - 20	78	350	0.589	280	610
DR - 22	20 - 22	26	160	0.268	84	240
DR - 24	22 - 24	12	130	0.312	98	280
DR - 26	24 - 26	2.9	54	0.245	38	110
DR - 28	26 - 28	<2.3	24	0.118	21	71
DR - 30	28 - 30	<2.4	20	<0.122	25	40
DR - 32	30 - 32	<2.5	6.5	<0.126	31	13
DR - 36	32 - 36	<2.4	7.0	<0.109	<12	9.2
DR - 40	36 - 40	4.1	5.6	<0.122	<12	8.9
DR - 44	40 - 44	3.6	5.5	<0.120	<12	8.0
DR - 48	44 - 48	<2.4	4.3	<0.121	<12	6.0

Notes:

1) All concentrations are in milligrams per kilogram (ppm) dry weight basis.

2) Total metals concentrations are reported.

3) "<" means not detected at the level indicated.

TABLE 3
NEW BEDFORD HARBOR
THIN LAYER SEDIMENT SAMPLING PROGRAM
ESTIMATED PCB CONCENTRATIONS

STATION FX

INTERVAL		CONSTITUENT	
		AROCLORS 1242/1016 (ppm)	AROCLOR 1254 (ppm)
inches	cm		
0 - 6	0 - 15	3,900	760
6 - 12	15 - 30	730	750
0 - 12	0 - 30	2,300	760

STATION DR

INTERVAL		CONSTITUENT	
		AROCLORS 1242/1016 (ppm)	AROCLOR 1254 (ppm)
inches	cm		
0 - 6	0 - 15	150	67
6 - 12	15 - 30	17	10
0 - 12	0 - 30	85	39

Notes:
1) All concentrations are in milligrams per kilogram (ppm) dry weight basis.
2) PCB concentrations shown are weighted average values.

TABLE 4

QUALITY CONTROL DUPLICATE AND BLANK SAMPLES

SAMPLE DESIGNATION	AROCLORS 1242/1016 (ppm)	AROCLOR 1254 (ppm)	CHROMIUM (ppm)	COPPER (ppm)	MERCURY (ppm)	LEAD (ppm)	ZINC (ppm)
FX-68 (Duplicate of FX-32)	3.2	22.3	92	980	2.62	620	2,500
FX-32	3.8	27	99	800	2.66	510	2,200
DR-52 (Duplicate of DR-6)	210	82	780	1,300	1.27	460	2,000
DR-6	140	64	710	1,100	1.34	390	1,600
DR-56 (Sediment control)	ND(0.1)	ND(0.1)	51	85	0.33	70	170
DR-60 (Sediment control)	ND(0.2)	ND(0.2)	41	82	0.314	77	140
FW-1 mg/l (Water blank)	0.029	0.011	0.093	0.054	<0.0002	0.08	0.110
DRW-2 mg/l (Wash water)	ND(0.0001)	ND(0.0001)	0.015	0.011	<0.0002	0.19	0.018

Notes:

1) All sediment concentrations are in milligrams per kilogram (ppm) dry weight basis. All water concentrations are in milligrams per liter (ppm).

2) Total metals concentrations are reported.

3) ND (-) means not detected (at instrument detection limit).

4) "<" means not detected at the level indicated.

APPENDIX A

D R A F T

NEW BEDFORD HARBOR
THIN LAYER SEDIMENT
SAMPLING PROGRAM
DECEMBER 1988 SAMPLING PROTOCOL

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December 12, 1988
Balsam Project 6292:840

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NEW BEDFORD HARBOR
THIN LAYER SEDIMENT SAMPLING PROGRAM
DECEMBER 1988 SAMPLING PROGRAM

1.0 INTRODUCTION

In support of work currently being performed for Nutter, McClennen & Fish and the defense counsel to evaluate conditions and environmental mechanisms existing at the New Bedford Harbor Superfund site, W. Frank Bohlen, Ph.D., has prepared a proposal to better describe small-scale vertical distribution of sediment column PCBs and heavy metals. Balsam Environmental Consultants, Inc. (Balsam) reviewed this proposal and recommends proceeding with the scope of work presented with some modifications. Data obtained from this sampling program should provide much higher resolution information regarding small-scale vertical distribution of contaminants in New Bedford Harbor sediments.

Balsam has developed a sampling program to collect data allowing further assessment of small-scale vertical distribution of sediment column PCBs and heavy metals proposed by Dr. Bohlen. This sampling program is to be undertaken during the week of December 12, 1988.

To establish standard sampling practices prior to initiation of this sampling effort, sampling protocol have been developed for tasks proposed to be completed under this sampling program. These protocol are presented in the remainder of this document.

D R A F T

2.0 SAMPLE COLLECTION

Sediment core samples will be obtained to provide data for the assessment of the occurrence of PCBs and heavy metals vertically in the sediment column of New Bedford Harbor. The metals to be evaluated are: mercury, chromium, copper, lead and zinc. A general protocol has been developed for the collection of sediment samples to provide data for this study.

Sediment core samples will be obtained using 3-inch-diameter Schedule 80 PVC core barrel samplers. The samplers were constructed with tapered cutting heads to allow sample collection with minimal sample disturbance and to increase sample recovery. The core barrel samplers will be installed on sampler extensions to allow pushing or driving of the sampler into marine sediments to a depth of up to 24 inches. After the sampler has been advanced 18 to 24 inches or to refusal, whichever occurs first, the sampler will be slowly withdrawn from the sediments and retrieved on board the sampling vessel.

Collection of sediment samples will be performed from boats equipped to conduct aquatic sediment sampling. Vessels will be equipped with all necessary equipment required for collection of sediment samples, pumps and apparatus to be used during equipment decontamination, appropriate safety gear for over-water sampling efforts, and electronic navigational equipment to permit accurate determination of sampling locations. Following the retrieval of a sediment sample, the sample will be frozen by placing it in a cooler with dry ice, or kept on ice to maintain samples near 4 degrees Centigrade. Samples not frozen will be kept in an upright position to maintain integrity. Determination of sample handling procedures will be based on field observations. In all cases, sample recovery will be measured to quantify the amount of sample recovered as compared to the depth to which the sampler was advanced.

3.0 SAMPLE HANDLING AND TRANSPORT

This protocol describes methods for handling samples in the field and sample transport to laboratories for analyses. Sample handling protocol will be initiated immediately after the retrieval of sediment samples on board the sampling vessel.

Upon retrieval of a sediment sample from the harbor, the base of the core tube sampler will be capped to prevent loss of sediment from the open end of the sampler. After capping the base of the sampler, the sample tube will be washed with sea water to remove sediments adhering to the outside of the sample tube. This washing process will allow easier handling of the sample and minimize potential sample cross-contamination. Following initial cleaning of the sampling equipment, the water column above the sample will be drained to minimize disturbance of the sample surface. The core barrel sampler will be removed from the remainder of the sampling device to allow further processing of the sample. As previously discussed, sample recovery will be measured for all sediment core samples collected.

The sample will then be secured either in an upright position or frozen with both ends securely plugged or capped. Identification of the sample will occur by labeling the core barrel according to prescribed protocol. Samples to be frozen will be wrapped with packing material, enclosed in a plastic bag and placed in a cooler filled with dry ice to await further processing. Samples not frozen will be placed in plastic bags and packed with ice during storage and transportation. The sample bags will also be labeled according to prescribed protocol.

A minimum of three samples will be collected from two sampling locations to provide an adequate sample volume. The first location will be in an area

reported to have some of the most elevated PCB sediment concentrations. The other sampling location will be in an area with above average sedimentation rates with moderately elevated PCB concentrations relative to the study area. Samples from each location will be collected as close as possible to each other to reduce variability.

Following collection and securing of all samples, samples will be transported to facilities at the University of Connecticut for further processing under the direct supervision of the sampling team. Here, the PVC core barrel sampler will be cut and split open exposing the core sample, or the sample will be extruded from the core barrel. The core sample will then be placed onto a pre-cleaned surface and sliced into thin layer subsamples. Subsamples will be sliced from the core sample using stainless steel utensils or wire. Sliced subsamples will then be placed on a flat, pre-cleaned surface and the exterior edge of the subsample which had been in contact with sidewalls of the barrel core sampler will be removed to reduce cross-contamination of the vertical profile. The remaining portion of the subsample will then be retained as a discrete subsample or interval of the vertical profile. This procedure will be performed for each sample to be subsectioned from the two sampling locations.

Subsamples of the vertical profile will be obtained in the following manner for the elevated PCB concentration sampling location:

Starting from the surface of the core sample, subsamples will be removed from the core sample in the following centimeter (cm) thicknesses:

0 - 1 1 - 2 2 - 3 3 - 4	4 1-cm samples

4 - 6	
6 - 8	
8 - 10	6 2-cm samples
10 - 12	
12 - 14	
14 - 16	
16 - 20	
20 - 24	
24 - 28	
28 - 32	
32 - 36	12 4-cm samples
36 - 40	
40 - 44	
44 - 48	
48 - 52	
52 - 56	
56 - 60	
60 - 64	
	Total = 22 samples

Subsamples from the second sampling location (within a sedimentation regime) will be collected as follows:

Starting from the surface of the core sample, subsamples will be removed from the core sample in the following cm thicknesses:

0 - 1	
1 - 2	4 1-cm samples
2 - 3	
3 - 4	

4 - 6	
6 - 8	
8 - 10	
10 - 12	
12 - 14	
14 - 16	
16 - 18	14 2-cm samples
18 - 20	
20 - 22	
22 - 24	
24 - 26	
26 - 28	
28 - 30	
30 - 32	
32 - 36	
36 - 40	4 4-cm samples
40 - 44	
44 - 48	
	Total = 22 samples

Following sectioning of subsamples and removal of perimeter surfaces, subsamples from each of the cores collected at a sampling station from the same vertical interval will be transferred to a pre-cleaned container or sample container to allow homogenization of each subsample interval and to obtain an adequate sample volume for chemical analysis. Following homogenization, the samples will be transferred to pre-cleaned glass, sample containers, if necessary, provided by the analytical laboratory to provide a sample amount of at least 25 grams. Tools utilized to section and homogenize samples will be acid washed and rinsed with distilled water prior to preparation of each subsection. The sample containers will then be labeled according to prescribed protocol and prepared for shipment. Samples will be stored on ice and maintained near 4 degrees Centigrade prior to and during transportation to the analytical laboratory. Cambridge Analytical Associates, Inc. has been selected as the

analytical laboratory.

A uniform and comprehensive sample designation and management protocol has been developed for all samples which are to be processed by the analytical laboratory. To assist in keeping a record of sampling activities, a sampling log will be maintained and document, on a daily basis, the personnel involved in sampling activities, weather, general sampling activities, and a detailed description of samples collected each working day. In addition to a sampling log, sample chain-of-custody will be maintained from the time of sample collection through sample shipment to the analytical laboratory.

Immediately following completion of sample preparation, each sample will be labeled. Sample labeling will include assigning each sample a unique designation number including the project location, sample station, sample type and sample depth, as appropriate. In addition, sample collection time and sampling personnel will also be noted on the sample label.

Samples which are to be shipped to the outside analytical laboratory will be packaged in reinforced coolers. As previously discussed, samples will be shipped on ice to maintain these samples near 4 degrees Centigrade. At the time of sample shipment, Balsam personnel will transfer chain-of-custody to the receiving agent, place the completed chain-of-custody form in the shipping container, and seal the shipping container. Sample shipment will be conducted by overnight courier or personally by sampling team personnel.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance/Quality Control (QA/QC) considerations have been incorporated throughout the development of this sampling program. Examples of QA/QC considerations included in the program are sample tracking and chain-of-custody documentation, as well as equipment decontamination procedures, discussed later in this document.

In addition to sampling protocol QA/QC efforts, further QA/QC efforts will be undertaken to evaluate performance of outside analytical laboratories. The analytical laboratory selected for sample analysis under this sampling program has been evaluated in terms of its current QA/QC practices. The laboratory selected to conduct PCB and metal chemical analyses on sediment samples has implemented pre-established QA/QC protocol including the analysis of blank samples, duplicate samples, spiked samples, and reference material samples.

To further address analytical laboratory accuracy and precision, Balsam has elected to submit additional samples to the analytical laboratory conducting PCB and metal analyses. These additional samples will include blank blind duplicate samples to allow assessment of analytical precision and reproducibility. Approximately 15 percent of all samples submitted to the analytical laboratory selected to perform PCB analyses on sediment samples will consist of QA/QC samples.

5.0 DECONTAMINATION PROTOCOL

To minimize potential cross-contamination of sediment samples, sampling equipment utilized during the conduct of the sampling program will be decontaminated in accordance with the following protocol.

Prior to arrival at the site, all sampling equipment will be decontaminated using potable water and soap. Following cleaning, core barrel samplers will be packaged in plastic containers to prevent soiling during transport to the project site.

All sampling equipment will be decontaminated prior to collection of each sample using the following protocol. Samplers will be rinsed with potable water to wet equipment surfaces, followed by an acid wash. Equipment will then be rinsed with potable water. In addition to cleaning sampling equipment utilized during this sampling program, all personnel involved in the collection or handling of samples will be required to wash their gloves prior to the handling of each new sample.

Prior to sectioning core samples into subsamples at the University of Connecticut facilities, all utensils, surfaces and mixing bowls which may come in contact with samples will be decontaminated using potable water and soap. These utensils and surfaces will then receive a mild acid wash followed by a potable water rinse. To minimize potential cross-contamination of sediment subsamples, this procedure will be followed for any utensils or surfaces which are involved in sectioning subsamples following completion of a subsample and prior to initiating sectioning of a new subsample.

DRAFT

6.0 HEALTH AND SAFETY PROTOCOL

Health and safety protocol have been developed based upon the reported presence of anthropogenic compounds in New Bedford Harbor sediments. Widely varying concentrations of Aroclors 1016, 1242 and 1254, as well as varying concentrations of numerous heavy metals, including copper, zinc, nickel, lead, chromium and mercury, and polycyclic aromatic hydrocarbons (PAHs) have been reported present in the sediment; low concentrations of other EPA Hazardous Substance List organic compounds have also been reported present in New Bedford Harbor sediments.

Based upon an evaluation of the types and concentrations of compounds present in New Bedford Harbor water and sediments, the primary routes of exposure are expected to be direct contact and ingestion. A review of the physical properties of compounds present in New Bedford Harbor media in combination with consideration of the concentrations of those compounds present does not indicate inhalation of vapors or contaminated particles to be a significant exposure pathway.

Based upon this expected exposure assessment, a modified EPA Level C health and safety protocol was selected for the conduct of this sampling program. This level of protection must be maintained by all personnel directly involved with sample collection. Protective equipment to be worn by sampling personnel is as follows:

- **Outer Garment.** To provide protection against direct contact with contaminated sediments, rubber rainsuits will be worn by all sampling personnel. Rainsuits have been selected for use as compared to disposable coveralls due to their durability and superior ability to shed

water and soil. A disposable inner Tyvek suit will also be worn beneath the rainsuit to provide additional protection during personnel decontamination and disrobing.

- **Gloves**. Nitrile gloves will be worn by personnel involved with the collection and retrieval of sediment samples. Thin-layer surgical gloves may be worn by personnel documenting sediment sample collection or visually characterizing sediment samples.

- **Boots**. Neoprene rubber boots will be worn by all sampling personnel.

- **Eye Protection**. Goggles or approved safety glasses shall be worn by all personnel involved in the collection and handling of sediment samples.

- **Respiratory Protection**. Dust masks shall be used by all personnel involved in the collection or processing of sediment samples. The sole purpose of dust mask use during this project is to prevent accidental ingestion of harbor sediments.

In addition to the use of protective clothing to maintain the health and safety of sampling personnel, rules have been developed regarding sampling personnel conduct for the period of this program. Eating, drinking, smoking, or chewing of tobacco or gum is prohibited during sample collection or processing activities. Restricted activities presented above may be performed only in designated areas after appropriate personnel decontamination has been conducted. Food intended to be consumed on board will be maintained in a designated clean area to prevent accidental contamination.

Running, jumping or horse play will not be allowed by any sampling personnel during sampling or sample processing activities. Personal flotation devices will be assigned to each sampling team member and will be utilized by that member during sampling efforts.

At the completion of a work day, each sampling team member will undertake thorough cleaning of reusable safety equipment and disposal of expendable safety equipment. Following this decontamination procedure, the individual will shower as soon as possible after returning to shore as a further precautionary measure.

APPENDIX B

ANALYTICAL REPORTS

R E P O R T T O

Balsam Environmental Consult.
59 Stiles Road
Salem, NH 03079

Attn: Mr. Allen Walker

Work ID: New Bedford Harbor Study:PRP
P.O. No.: 6292
Work Order: 88-12-153

Cambridge Analytical Associates
Environmental Division
1106 Commonwealth Avenue
Boston MA 02215

Received: 12/13/88

REPORT
01/24/89 08:34:13

Work Order # 88-12-153

REPORT TO: Balsam Environmental Consult.
59 Stiles Road
Salem, NH 03079

ATTEN: Mr. Allen Walker

CLIENT: BALSAM SAMPLES: 21
COMPANY: Balsam Environmental Consult.
FACILITY:

WORK ID: New Bedford Harbor Study:PRP
TAKEN: By A. Walker & D. Cohen
TRANS: Hand Deliver
TYPE: Soil/Aqueous
P.O. #: 6292
INV. #: 18137

PREPARED BY: Cambridge Analytical Assoc.
Environmental Division
1106 Commonwealth Avenue
Boston, MA 02215

ATTEN:
PHONE: 617-232-2207

Edward A. Lawler
CERTIFIED BY

CONTACT LAWLER

This report is approved for release by the following staff:
Laboratory Director: Michael Delo
Inorganic Laboratory:
Organic Laboratory:

Previously Reported on 01/16/89.

SAMPLE IDENTIFICATION

01	FX-1
02	FX-2
03	FX-3
04	FX-4
05	FX-6
06	FX-8
07	FX-10
08	FX-12
09	FX-14
10	FX-16
11	FX-20
12	FX-24
13	FX-28
14	FX-32
15	FX-36
16	FX-40
17	FX-44
18	FX-48
19	FX-52
20	FX-56

TEST CODES and NAMES used on this report

CR_I_S	Chromium (Cr)-ICP
CU_I_S	Copper (Cu)-ICP
DIGSOL	Acid digestion-soil-SW846
EXPCBS	PCB ext-soil-SW846-3540
HG_CVS	Mercury (Hg)-cold vapor
PB_I_S	Lead (Pb)-ICP
PCB_S	PCBs-soil-SW846
ZN_I_S	Zinc (Zn)-ICP

CAA

Received: 12/13/88

REPORT
01/24/89 08:34:13

Work Order # 88-12-153

	SAMPLE IDENTIFICATION
20	FX-56
21	FX-60

SAMPLE Sample Id	Test:CR_I_S ug/g (dry wt)	Test:CU_I_S ug/g (dry wt)	Test:DIGSOL date complete	Test:EXPCBS extraction date	Test:HG_CVS ug/g (dry wt)
01 FX-1	890	1,300	12/28/89	12/19/88	1.98
02 FX-2	860	1,200	12/28/88	12/19/88	1.88
03 FX-3	840	1,200	12/28/89	12/19/88	1.89
04 FX-4	860	1,200	12/28/88	12/19/88	1.59
05 FX-6	1,000	1,400	12/28/88	12/19/88	1.72
06 FX-8	1,600	2,300	12/28/88	12/19/88	2.46
07 FX-10	1,200	1,900	12/28/88	12/19/88	2.49
08 FX-12	1,800	3,000	12/28/88	12/19/88	3.08
09 FX-14	1,400	2,800	12/28/88	12/19/88	2.97
10 FX-16	660	1,400	12/28/88	12/19/88	1.53
11 FX-20	530	1,800	12/28/88	12/19/88	2.61
12 FX-24	260	1,100	12/28/88	12/19/88	1.60
13 FX-28	280	1,700	12/28/88	12/19/88	2.29
14 FX-32	99	800	12/28/88	12/19/88	2.66
15 FX-36	35	560	12/28/88	12/19/88	2.31
16 FX-40	27	270	12/28/88	12/19/88	2.15
17 FX-44	23	130	12/28/88	12/19/88	2.58
18 FX-48	28	61	12/28/88	12/19/88	0.443
19 FX-52	24	14	12/28/88	12/19/88	<0.136

REPORT
Results By Test

SAMPLE Sample Id	Test:CR_I_S ug/g (dry wt)	Test:CU_I_S ug/g (dry wt)	Test:DIGSOL date complete	Test:EXPCBS extraction date	Test:HG_CVS ug/g (dry wt)
20 FX-56	29	21	12/28/88	12/19/88	<0.207
21 FX-60	22	7.8	12/28/88	12/19/88	<0.195

SAMPLE Sample Id	Test:PB_I_S ug/g (dry wt)	Test:ZN_I_S ug/g (dry wt)
01 FX-1	680	1,900
02 FX-2	660	2,000
03 FX-3	590	1,600
04 FX-4	630	1,900
05 FX-6	750	2,500
06 FX-8	1,200	4,100
07 FX-10	920	3,600
08 FX-12	1,200	5,500
09 FX-14	1,100	4,000
10 FX-16	560	1,900
11 FX-20	1,000	3,300
12 FX-24	730	3,200
13 FX-28	990	4,000
14 FX-32	510	2,200

REPORT
Results By Test

SAMPLE Sample Id	Test:PB_I_S ug/g (dry wt)	Test:ZN_I_S ug/g (dry wt)
15 FX-36	390	1,500
16 FX-40	240	490
17 FX-44	100	150
18 FX-48	52	86
19 FX-52	<14	43
20 FX-56	25	67
21 FX-60	<20	54

SAMPLE ID **FX-1** SAMPLE # **01** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S	ZN_I_S
890	**1,300**	**12/28/89**	**12/19/88**	**1.98**	**680**	**1,900**
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)	ug/g (dry wt)

Received: 12/13/88 Results by Sample

SAMPLE ID FX-1 FRACTION 01A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	1,300
Aroclor 1248	
Aroclor 1254	300
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	4

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID **FX-2** SAMPLE # **02** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S **860** ug/g (dry wt)	**CU_I_S** 1,200 ug/g (dry wt)	**DIGSOL** 12/28/88 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 1.88 ug/g (dry wt)	**PB_I_S** 660 ug/g (dry wt)
ZN_I_S **2,000** ug/g (dry wt)					

Received: 12/13/88

REPORT
Results by Sample

Work Order # 88-12-153

SAMPLE ID **FX-2** FRACTION **02A** TEST CODE **PCB_S** NAME **PCBs-soil-SW846**
Date & Time Collected **12/12/88** Category **SOIL**

Analysis Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	1,100
Aroclor 1248	
Aroclor 1254	230
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	4

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID **FX-3** SAMPLE # **03** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S **840** ug/g (dry wt)	**CU_I_S** 1,200 ug/g (dry wt)	**DIGSOL** 12/28/89 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 1.89 ug/g (dry wt)	**PB_I_S** 590 ug/g (dry wt)
ZN_I_S **1,600** ug/g (dry wt)					

Received: 12/13/88

REPORT
Results by Sample

Work Order # 88-12-153

SAMPLE ID FX-3 FRACTION 03A TEST CODE PCB_8 NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	1,800
Aroclor 1248	
Aroclor 1254	350
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	4

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID **FX-4** SAMPLE # **04** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S **860** ug/g (dry wt)	**CU_I_S** 1,200 ug/g (dry wt)	**DIGSOL** 12/28/88 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 1.59 ug/g (dry wt)	**PB_I_S** 630 ug/g (dry wt)

ZN_I_S **1,900** ug/g (dry wt)

Received: 12/13/88 Results by Sample

SAMPLE ID FX-4 FRACTION 04A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	2,900
Aroclor 1248	
Aroclor 1254	390
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	20

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID FX-6 SAMPLE # 05 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 1,000 ug/g (dry wt)	CU_I_S 1,400 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/19/88 extraction date	HG_CVS 1.72 ug/g (dry wt)	PB_I_S 750 ug/g (dry wt)

ZN_I_S 2,500 ug/g (dry wt)

Received: 12/13/88

REPORT
Results by Sample

Work Order # 88-12-153

SAMPLE ID FX-6 FRACTION 05A TEST CODE PCB_8 NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	3,300
Aroclor 1248	
Aroclor 1254	480
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	20

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID **FX-8** SAMPLE # **06** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S 1,600 ug/g (dry wt)	**CU_I_S** 2,300 ug/g (dry wt)	**DIGSOL** 12/28/88 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 2.46 ug/g (dry wt)	**PB_I_S** 1,200 ug/g (dry wt)

ZN_I_S 4,100 ug/g (dry wt)

Received: 12/13/88

REPORT
Results by Sample

Work Order # 88-12-153

SAMPLE ID FX-8 FRACTION 06A TEST CODE PCB_8 NAME PCBs-soil-8W846
Date & Time Collected 12/12/88 Category SOIL

Analysis Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	5,600
Aroclor 1248	
Aroclor 1254	740
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	40

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID **FX-10** SAMPLE # **07** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S 1,200 ug/g (dry wt)	**CU_I_S** 1,900 ug/g (dry wt)	**DIGSOL** 12/28/88 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 2.49 ug/g (dry wt)	**PB_I_S** 920 ug/g (dry wt)

ZN_I_S 3,600 ug/g (dry wt)

Received: 12/13/88

REPORT
Results by Sample

Work Order # 88-12-153

SAMPLE ID FX-10 FRACTION 07A TEST CODE PCB_8 NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	6,300
Aroclor 1248	
Aroclor 1254	900
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	40

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID **FX-12** SAMPLE # **08** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S **1,800** ug/g (dry wt)	**CU_I_S** 3,000 ug/g (dry wt)	**DIGSOL** 12/28/88 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 3.08 ug/g (dry wt)	**PB_I_S** 1,200 ug/g (dry wt)

ZN_I_S **5,500** ug/g (dry wt)

Received: 12/13/88 Results by Sample

SAMPLE ID FX-12 FRACTION 08A TEST CODE PCB_8 NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	5,700
Aroclor 1248	
Aroclor 1254	870
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	40

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID FX-14 SAMPLE # 09 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S
1,400	2,800	12/28/88	12/19/88	2.97	1,100
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)

ZN_I_S
4,000
ug/g (dry wt)

Received: 12/13/88

REPORT
Results by Sample

Work Order # 88-12-153

SAMPLE ID FX-14

FRACTION 09A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	2,600
Aroclor 1248	
Aroclor 1254	1,400
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	40

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID **FX-16** SAMPLE # **10** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S 660 ug/g (dry wt)	**CU_I_S** 1,400 ug/g (dry wt)	**DIGSOL** 12/28/88 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 1.53 ug/g (dry wt)	**PB_I_S** 560 ug/g (dry wt)

ZN_I_S 1,900 ug/g (dry wt)

SAMPLE ID **FX-16** FRACTION **10A** TEST CODE **PCB_8** NAME **PCBs-soil-SW846**
Date & Time Collected **12/12/88** Category **SOIL**

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	3,700
Aroclor 1248	
Aroclor 1254	1,400
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	40

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID **FX-20** SAMPLE # **11** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S 530 ug/g (dry wt)	**CU_I_S** 1,800 ug/g (dry wt)	**DIGSOL** 12/28/88 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 2.61 ug/g (dry wt)	**PB_I_S** 1,000 ug/g (dry wt)

ZN_I_S 3,300 ug/g (dry wt)

Received: 12/13/88 Results by Sample

SAMPLE ID **FX-20** FRACTION **11A** TEST CODE **PCB_S** NAME **PCBs-soil-SW846**
Date & Time Collected **12/12/88** Category **SOIL**

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	1,300
Aroclor 1248	
Aroclor 1254	1,200
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	40

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID **FX-24** SAMPLE # **12** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S **260** ug/g (dry wt)	**CU_I_S** 1,100 ug/g (dry wt)	**DIGSOL** 12/28/88 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 1.60 ug/g (dry wt)	**PB_I_S** 730 ug/g (dry wt)

ZN_I_S **3,200** ug/g (dry wt)

SAMPLE ID FX-24 FRACTION 12A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	480
Aroclor 1248	
Aroclor 1254	1,000
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	4

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

Work Order # 88-12-153

SAMPLE ID **FX-28** SAMPLE # **13** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S 280 ug/g (dry wt)	**CU_I_S** 1,700 ug/g (dry wt)	**DIGSOL** 12/28/88 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 2.29 ug/g (dry wt)	**PB_I_S** 990 ug/g (dry wt)

ZN_I_S 4,000 ug/g (dry wt)

Received: 12/13/88

REPORT
Results by Sample

Work Order # 88-12-153

SAMPLE ID FX-28 FRACTION 13A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	28
Aroclor 1248	
Aroclor 1254	260
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	4

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID FX-32 SAMPLE # 14 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 99 ug/g (dry wt)	CU_I_S 800 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/19/88 extraction date	HG_CVS 2.66 ug/g (dry wt)	PB_I_S 510 ug/g (dry wt)

ZN_I_S 2,200 ug/g (dry wt)

SAMPLE ID FX-32 FRACTION 14A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	3.8
Aroclor 1248	
Aroclor 1254	27
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.4

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID **FX-36** SAMPLE # **15** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S 35 ug/g (dry wt)	**CU_I_S** 560 ug/g (dry wt)	**DIGSOL** 12/28/88 date complete	**EXPCBS** 12/19/88 extraction date	**HG_CVS** 2.31 ug/g (dry wt)	**PB_I_S** 390 ug/g (dry wt)

ZN_I_S 1,500 ug/g (dry wt)

Received: 12/13/88 Results by Sample

SAMPLE ID FX-36 FRACTION 15A TEST CODE PCB_S NAME PCBs-soil-S#846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	0.1
Aroclor 1248	
Aroclor 1254	0.09
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.01

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID **FX-40** SAMPLE # **16** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **SOIL**

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S
27 ug/g (dry wt)	270 ug/g (dry wt)	12/28/88 date complete	12/19/88 extraction date	2.15 ug/g (dry wt)	240 ug/g (dry wt)

ZN_I_S
490 ug/g (dry wt)

Received: 12/13/88 Results by Sample

SAMPLE ID FX-40 FRACTION 16A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	0.08
Aroclor 1248	
Aroclor 1254	0.02
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.01

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID FX-44 SAMPLE # 17 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 23 ug/g (dry wt)	CU_I_S 130 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/19/88 extraction date	HG_CVS 2.58 ug/g (dry wt)	PB_I_S 100 ug/g (dry wt)
ZN_I_S 150 ug/g (dry wt)					

Received: 12/13/88 Results by Sample

SAMPLE ID FX-44 FRACTION 17A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	0.12
Aroclor 1248	
Aroclor 1254	0.02
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.01

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID FX-48 SAMPLE # 18 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S
28	61	12/28/88	12/19/88	0.443	52
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)

ZN_I_S
86
ug/g (dry wt)

Received: 12/13/88

REPORT
Results by Sample

Work Order # 88-12-153

SAMPLE ID **FX-48** FRACTION **18A** TEST CODE **PCB_S** NAME **PCBs-soil-SW846**
Date & Time Collected **12/12/88** Category **SOIL**

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	0.22
Aroclor 1248	
Aroclor 1254	0.04
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.01

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID FX-52 SAMPLE # 19 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 24 ug/g (dry wt)	CU_I_S 14 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/19/88 extraction date	HG_CVS <0.136 ug/g (dry wt)	PB_I_S <14 ug/g (dry wt)
ZN_I_S 43 ug/g (dry wt)					

Received: 12/13/88 Results by Sample

SAMPLE ID FX-52 FRACTION 19A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	0.32
Aroclor 1248	
Aroclor 1254	0.04
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.01

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID FX-56 SAMPLE # 20 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 29 ug/g (dry wt)	CU_I_S 21 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/19/88 extraction date	HG_CVS <0.207 ug/g (dry wt)	PB_I_S 25 ug/g (dry wt)
ZN_I_S 67 ug/g (dry wt)					

Received: 12/13/88 Results by Sample

SAMPLE ID FX-56 FRACTION 20A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	0.45
Aroclor 1248	
Aroclor 1254	0.08
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.01

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID FX-60 SAMPLE # 21 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 22 ug/g (dry wt)	CU_I_S 7.8 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/19/88 extraction date	HG_CVS <0.195 ug/g (dry wt)	PB_I_S <20 ug/g (dry wt)
ZN_I_S 54 ug/g (dry wt)					

SAMPLE ID FX-60 FRACTION 21A TEST CODE PCB_S NAME PCBs-soil-8W846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/4/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.01

(a) - Concentrations less than the detection limit are left blank

TEST CODE **CR_I_S** NAME **Chromium (Cr)-ICP**

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Chromium is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE **CU_I_S** NAME **Copper (Cu)-ICP**

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Copper is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE **DIGSOL** NAME **Acid digestion-soil-SW846**

Method Description: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Section 4.1.3.
Additional references: EPA. 1982. Test Methods for Evaluating Solid Waste-Physical/Chemical Methods. SW-846. EPA/Office of Solid Waste,

TEST CODE **DIGSOL** NAME **Acid digestion-soil-SW846**

Washington, DC.

Method Description: A 1.0-g aliquot of dried and ground sample is transferred to an acid-washed beaker. Following addition of 10 ml of 1:1 Instra-analyzed nitric acid, the sample is placed on a hot plate and refluxed for 10 min. without boiling. After cooling, a 5-ml portion of concentrated acid is added and the sample is refluxed for 30 min. After sample has cooled a second time 2-ml of deionized water is added, followed by 3 ml of 30 % hydrogen peroxide, and the sample is refluxed until digestion is complete (generally indicated by a yellow color). Additional hydrogen peroxide is added until no change in sample composition is observed (not more than 10-ml hydrogen peroxide). For furnace AAS determinations, the sample is diluted to 100 ml with distilled, deionized water so that the final acid concentration is 0.5 %. For flame AAS and ICP determinations, and for furnace determinations of Sb and Sn, the final dilution is performed with 1:1 HCl (5 ml/100 ml of solution). Insoluble material is removed by filtering or settling.

TEST CODE HG_CV8 NAME Mercury (Hg)-cold vapor

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 245.5-Mercury in Sediment (manual cold vapor technique).
Additional References: EPA. 1982. Test Methods for Evaluating Solid Waste. SW-846-Second edition. (Update No. 1-April 1984). EPA/Office of Solid Waste, Washington, DC. Method 7471-Mercury in Solid or Semi-solid Waste (manual cold-vapor technique).

Method Description: Mercury is determined in soils, sediments, bottom deposits, and sludges by digestion of sample in aqua regia for 2 min at 95 C, followed by oxidation with potassium permanganate and potassium persulfate. Mercury in the digested sample is then measured by cold vapor atomic absorption spectrophotometry on a SpectroProducts Hg-3 analyzer.

Quality Control Procedures: Instrumental calibration is performed by analyzing a blank and four or more working standards. Accuracy of working standards is verified by analysis of an independent check standard. With each batch of 10 samples and for each different matrix, one matrix spike and one duplicate analysis are performed.

TEST CODE **PB_I_S** NAME **Lead (Pb)-ICP**

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Lead is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE **PCB_S** NAME **PCBs-soil-SW846**

Method Reference: U.S. EPA, 1982. Test Methods for Evaluating Solid Waste-Physical/Chemical Methods. Second Edition. SW-846. EPA/Office of Solid Waste, Washington, D.C. Method 8080, test method for organochlorine pesticides and PCBs.

Method Description: The analytes in a solid sample are isolated and concentrated by solvent extraction. The extract is injected into into a gas chromatograph (GC) where the analytes are separated and detected with an electron capture detector (ECD).

Quality Control Procedures: Instrument response is calibrated every twelve hours using EPA traceable standard reference solutions. Analytes are quantified using the external standard method. Surrogate standard compounds are added to every sample to monitor method performance. Additional quality control includes the analysis of replicates, matrix spikes, duplicate matrix spikes, and blanks.

TEST CODE **ZN_I_S** NAME **Zinc (Zn)-ICP**

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

REPORT
Test Methodology

TEST CODE ZN_I_S NAME Zinc (Zn)-ICP

Method Description: Zinc is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

8812194

CHAIN-OF-CUSTODY RECORD

BALSAM
ENVIRONMENTAL CONSULTANTS, INC.
59 STILES RD.
SALEM N.H., 03079

2/4

PROJECT NAME: NBH - Thin Layer Sampling

PROJECT ADDRESS:

PROJECT NO.: 6242

SAMPLERS (SIGNATURES): William R. Walsh, Daniel K. Cahoon

I.D. NUMBER	SAMPLING LOCATION	DATE	TIME	SAMPLE TYPE: SOIL	WATER	OIL	AIR	BULK	NO. OF CONTAINERS	ANALYSES	COMMENTS
FX-40		12/12/88		X					-1-	PCB's	
FX-44		↓		↓					↓	&	Homogenize
FX-48										Metals	samples
FX-52										(Hg, Cr, Cu, Pb, Zn)	prior
FX-56										↓	to
FX-60											analysis
FX-64											
FX-68											
											Shipped/packaged
DR-1											with
DR-2											ICE
DR-3											
DR-4											
DR-6											
DR-8		↓		↓					↓	↓	

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
William R. Walsh	12/14/88	6:40 pm			
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LABORATORY BY:	DATE:	TIME:
			Edward A. Hawk	12/14/88	6:40pm

METHOD OF SHIPMENT: Hand

AIRBILL (OR SHIPPING INVOICE) NUMBER:

8812175

CHAIN-OF-CUSTODY RECORD

BALSAM
ENVIRONMENTAL CONSULTANTS, INC.
59 STILES RD.
SALEM N.H., 03079

3/4

PROJECT NAME	PROJECT NO.	SAMPLERS (SIGNATURES)
NBH - Thin Layer Sampling	6272.	Ellen P. Walton Daniel A Cahen
PROJECT ADDRESS		

I.D. NUMBER	SAMPLING LOCATION	DATE	TIME	SAMPLE TYPE: SOIL	WATER	OIL	AIR	BULK	NO. OF CONTAINERS	ANALYSES	COMMENTS
DR-10		12/12	PM	X					-1-	PCBs & Metals (Hg, Cr, Cu, Pb, Zn)	Homogenize sample prior to analysis
DR-12											
DR-14											
DR-16											
DR-18											
DR-20											
DR-22											
DR-24											Shipped/packaged with ICE
DR-26											
DR-28											
DR-30											
DR-32											
DR-36											
DR-40											
DR-44											

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
Ellen P. Walton	12/14/88	6:40 pm			
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LABORATORY BY:	DATE:	TIME:
			Edward P. Fowler	12/14/88	6:40pm

METHOD OF SHIPMENT: By Hand

AIRBILL (OR SHIPPING INVOICE) NUMBER:

8812193

CHAIN-OF-CUSTODY RECORD

BALSAM
ENVIRONMENTAL CONSULTANTS, INC.
59 STILES RD.
SALEM N.H., 03079

4/4

PROJECT NAME: NBH - Thin Layer Sampling

PROJECT ADDRESS:

PROJECT NO.: 6292.

SAMPLERS (SIGNATURES): William R. Wallace Daniel K Cahoon

I.D. NUMBER	SAMPLING LOCATION	DATE	TIME	SAMPLE TYPE: SOIL	WATER	OIL	AIR	BULK	NO. OF CONTAINERS	ANALYSES	COMMENTS
DR-48		12/14/88		X					-1-	PCB's	Homogenize Samples
DR-52		↓		↓					↓	*	prior to analysis
DR-56										Metals	
DR-60										(Hg, Cr, Cu, Pb, Zn)	
										↓	
FW-1		12/12/88			X				2		Not Sea water
DRW-2		12/14/88			X				2		" " "
											Shipped/Packaged
											with
											TCE

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
William R. Wallace	12/14/88	6:40 pm			
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LABORATORY BY: Edward R. Martin	DATE: 12/14/88	TIME: 6:40pm

METHOD OF SHIPMENT: By Hand

AIRBILL (OR SHIPPING INVOICE) NUMBER:

EEA

R E P O R T T O

Balsam Environmental Consult.
59 Stiles Road
Salem, NH 03079

Attn: Mr. Allen Walker

Work ID: New Bedford Harbor Study:PRP
P.O. No.: 6292
Work Order: 88-12-194

Cambridge Analytical Associates
Environmental Division
1106 Commonwealth Avenue
Boston MA 02215

Received: 12/15/88

REPORT

Work Order # 88-12-194

01/20/89 15:53:27

REPORT TO: Balsam Environmental Consult.
59 Stiles Road
Salem, NH 03079

ATTEN: Mr. Allen Walker

CLIENT: BALSAM SAMPLES: 19
COMPANY: Balsam Environmental Consult.
FACILITY:

WORK ID: New Bedford Harbor Study:PRP
TAKEN By: A. Walker & D. Cohen
TRANS: Hand Deliver
TYPE: Soil/Aqueous
P.O. #: 6292
INVOICE: under separate cover

PREPARED BY: Cambridge Analytical Assoc.
Environmental Division
1106 Commonwealth Avenue
Boston, MA 02215

ATTEN:
PHONE: 617-232-2207

Edward A. Lawler
CERTIFIED BY

CONTACT LAWLER

This report is approved for release by the following staff:
Laboratory Director: Richard P. Deberry
Inorganic Laboratory:
Organic Laboratory:

SAMPLE IDENTIFICATION

02	FX-64
03	FX-68
04	DR-1
05	DR-2
06	DR-3
08	DR-4
09	DR-6
10	DR-8
11	DR-10
12	DR-12
13	DR-14
14	DR-16
15	DR-18
16	DR-20
17	DR-22
18	DR-24
19	DR-26
20	DR-28
21	DR-30

TEST CODES and NAMES used on this report

CR_I_S	Chromium (Cr)-ICP
CU_I_S	Copper (Cu)-ICP
DIGSOL	Acid digestion-soil-SW846
EXPCBS	PCB ext-soil-SW846-3540
HG_CVS	Mercury (Hg)-cold vapor
PB_I_S	Lead (Pb)-ICP
PCB_S	PCBs-soil-SW846
ZN_I_S	Zinc (Zn)-ICP

CAA

REPORT
Results By Test

Work Order # 88-12-194

SAMPLE Sample Id	Test:CR_I_S ug/g (dry wt)	Test:CU_I_S ug/g (dry wt)	Test:DIGSOL date complete	Test:EXPCBS extraction date	Test:HG_CVS ug/g (dry wt)
02 FX-64	23	7.3	12/28/88	12/20/88	<0.206
03 FX-68	92	980	12/28/88	12/20/88	2.62
04 DR-1	860	1,300	12/28/88	12/20/88	1.50
05 DR-2	900	1,400	12/28/88	12/20/88	1.47
06 DR-3	810	1,300	12/28/88	12/20/88	1.25
08 DR-4	360	570	12/28/88	12/20/88	0.906
09 DR-6	710	1,100	12/28/88	12/20/88	1.34
10 DR-8	730	1,300	12/28/88	12/20/88	1.09
11 DR-10	680	1,200	12/28/88	12/20/88	1.15
12 DR-12	540	980	12/28/88	12/20/88	1.14
13 DR-14	670	670	12/28/88	12/20/88	0.691
14 DR-16	310	700	12/28/88	12/20/88	1.14
15 DR-18	420	910	12/28/88	12/20/88	1.08
16 DR-20	78	350	12/28/88	12/20/88	0.589
17 DR-22	26	160	12/28/88	12/20/88	0.268
18 DR-24	12	130	12/28/88	12/20/88	0.312
19 DR-26	2.9	54	12/28/88	12/20/88	0.245
20 DR-28	<2.3	24	12/28/88	12/20/88	0.118
21 DR-30	<2.4	20	12/28/88	01/10/89	<0.122

Received: 12/15/88

REPORT

Work Order # 88-12-194

Results By Test

SAMPLE Sample Id	Test:PB_I_S ug/g (dry wt)	Test:ZN_I_S ug/g (dry wt)
02 FX-64	20	51
03 FX-68	620	2,500
04 DR-1	380	2,000
05 DR-2	420	2,100
06 DR-3	350	2,400
08 DR-4	300	870
09 DR-6	390	1,600
10 DR-8	470	1,700
11 DR-10	490	1,600
12 DR-12	350	1,500
13 DR-14	290	930
14 DR-16	290	900
15 DR-18	890	1,100
16 DR-20	280	610
17 DR-22	84	240
18 DR-24	98	280
19 DR-26	38	110
20 DR-28	21	71
21 DR-30	25	40

REPORT
Results by Sample

SAMPLE ID FX-64 SAMPLE # 02 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 23 ug/g (dry wt)	CU_I_S 7.3 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS <0.206 ug/g (dry wt)	PB_I_S 20 ug/g (dry wt)
ZN_I_S 51 ug/g (dry wt)					

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID FX-64 FRACTION 02A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.1

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID FX-68 SAMPLE # 03 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 92 ug/g (dry wt)	CU_I_S 980 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 2.62 ug/g (dry wt)	PB_I_S 620 ug/g (dry wt)

ZN_I_S 2,500 ug/g (dry wt)

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID FX-68

FRACTION 03A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	3.2
Aroclor 1248	
Aroclor 1254	22.3
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	1

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-1 SAMPLE # 04 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 860 ug/g (dry wt)	CU_I_S 1,300 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 1.50 ug/g (dry wt)	PB_I_S 380 ug/g (dry wt)
ZN_I_S 2,000 ug/g (dry wt)					

Received: 12/15/88 Results by Sample

SAMPLE ID DR-1 FRACTION 04A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 1/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	160
Aroclor 1248	
Aroclor 1254	61
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	1

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-2 SAMPLE # 05 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S
900	1,400	12/28/88	12/20/88	1.47	420
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)

ZN_I_S
2,100
ug/g (dry wt)

SAMPLE ID DR-3 SAMPLE # 06 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S	ZN_I_S
810	1,300	12/28/88	12/20/88	1.25	350	2,400
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)	ug/g (dry wt)

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-2

FRACTION 05A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	210
Aroclor 1248	
Aroclor 1254	80
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	1

(a) - Concentrations less than the detection limit are left blank

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-3

FRACTION 06A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	160
Aroclor 1248	
Aroclor 1254	59
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	1

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-4 SAMPLE # 08 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 360 ug/g (dry wt)	CU_I_S 570 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 0.906 ug/g (dry wt)	PB_I_S 300 ug/g (dry wt)
ZN_I_S 870 ug/g (dry wt)					

Received: 12/15/88 Results by Sample

SAMPLE ID DR-4 FRACTION 08A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	130
Aroclor 1248	
Aroclor 1254	50
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	1

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-6 SAMPLE # 09 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S	ZN_I_S
710	1,100	12/28/88	12/20/88	1.34	390	1,600
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)	ug/g (dry wt)

Received: 12/15/88 Results by Sample

SAMPLE ID DR-6 FRACTION 09A TEST CODE PCB_8 NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	140
Aroclor 1248	
Aroclor 1254	64
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	5

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-8 SAMPLE # 10 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S
730	1,300	12/28/88	12/20/88	1.09	470
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)

ZN_I_S
1,700
ug/g (dry wt)

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-8 FRACTION 10A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	210
Aroclor 1248	
Aroclor 1254	95
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	5

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-10 SAMPLE # 11 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 680 ug/g (dry wt)	CU_I_S 1,200 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 1.15 ug/g (dry wt)	PB_I_S 490 ug/g (dry wt)
ZN_I_S 1,600 ug/g (dry wt)					

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-10 FRACTION 11A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	170
Aroclor 1248	
Aroclor 1254	87
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	5

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-12 SAMPLE # 12 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 540 ug/g (dry wt)	CU_I_S 980 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 1.14 ug/g (dry wt)	PB_I_S 350 ug/g (dry wt)
ZN_I_S 1,500 ug/g (dry wt)					

Received: 12/15/88 Results by Sample

SAMPLE ID DR-12 FRACTION 12A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	140
Aroclor 1248	
Aroclor 1254	58
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	5

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-14 SAMPLE # 13 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 670 ug/g (dry wt)	CU_I_S 670 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 0.691 ug/g (dry wt)	PB_I_S 290 ug/g (dry wt)

ZN_I_S 930 ug/g (dry wt)

Received: 12/15/88 Results by Sample

SAMPLE ID DR-14 FRACTION 13A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	110
Aroclor 1248	
Aroclor 1254	49
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	5

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID DR-16 SAMPLE # 14 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 310 ug/g (dry wt)	CU_I_S 700 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 1.14 ug/g (dry wt)	PB_I_S 290 ug/g (dry wt)
ZN_I_S 900 ug/g (dry wt)					

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-16 FRACTION 14A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	90
Aroclor 1248	
Aroclor 1254	54
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	5

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID DR-18 SAMPLE # 15 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 420 ug/g (dry wt)	CU_I_S 910 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 1.08 ug/g (dry wt)	PB_I_S 890 ug/g (dry wt)

ZN_I_S 1,100 ug/g (dry wt)

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-18 FRACTION 15A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	49
Aroclor 1248	
Aroclor 1254	34
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	5

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-20 SAMPLE # 16 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S	ZN_I_S
78	350	12/28/88	12/20/88	0.589	280	610
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)	ug/g (dry wt)

Received: 12/15/88 **Results by Sample**

SAMPLE ID DR-20 FRACTION 16A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	23
Aroclor 1248	
Aroclor 1254	12
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	1

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-22 SAMPLE # 17 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S	ZN_I_S
26	160	12/28/88	12/20/88	0.268	84	240
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)	ug/g (dry wt)

REPORT

Work Order # 88-12-194

Received: 12/15/88

Results by Sample

SAMPLE ID DR-22 FRACTION 17A TEST CODE PCB_S NAME PCBs-soil-SW846

Date & Time Collected 12/12/88 Category SOIL

Analysis Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	6.8
Aroclor 1248	
Aroclor 1254	2.5
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.1

(a) - Concentrations less than the detection limit are left blank

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-22 FRACTION 17A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	6.8
Aroclor 1248	
Aroclor 1254	2.5
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.

VOID
reissued

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-24 SAMPLE # 18 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 12 ug/g (dry wt)	CU_I_S 130 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 0.312 ug/g (dry wt)	PB_I_S 98 ug/g (dry wt)
ZN_I_S 280 ug/g (dry wt)					

Received: 12/15/88 Results by Sample

SAMPLE ID DR-24 FRACTION 18A TEST CODE PCB_8 NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	4.1
Aroclor 1248	
Aroclor 1254	0.92
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.1

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-26 SAMPLE # 19 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 2.9 ug/g (dry wt)	CU_I_S 54 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 0.245 ug/g (dry wt)	PB_I_S 38 ug/g (dry wt)
ZN_I_S 110 ug/g (dry wt)					

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-26 FRACTION 19A TEST CODE PCB_8 NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	0.4
Aroclor 1248	
Aroclor 1254	0.14
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.1

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID DR-28 SAMPLE # 20 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S <2.3 ug/g (dry wt)	CU_I_S 24 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/20/88 extraction date	HG_CVS 0.118 ug/g (dry wt)	PB_I_S 21 ug/g (dry wt)

ZN_I_S 71
ug/g (dry wt)

REPORT

Work Order # 88-12-194

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Received: 12/15/88

Results by Sample

SAMPLE ID DR-28

FRACTION 20A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	1.2
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.1

(a) - Concentrations less than the detection limit are left blank

REPORT

Work Order # 88-12-194

Received: 12/15/88

Results by Sample

SAMPLE ID DR-30 FRACTION 21A TEST CODE PCB_S NAME PCBs-soil-SW846

Date & Time Collected 12/12/88 Category SOIL

Analysis Completed: 01/10/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.02

(a) - Concentrations less than the detection limit are left blank

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-194

SAMPLE ID DR-30 FRACTION 21A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis Completed:

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	

VOID
reissued

(a) - Concentrations less than the detection limit are left blank

TEST CODE CR_I_S NAME Chromium (Cr)-ICP

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Chromium is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE CU_I_S NAME Copper (Cu)-ICP

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Copper is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE DIGSOL NAME Acid digestion-soil-SW846

Method Description: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Section 4.1.3.
Additional references: EPA. 1982. Test Methods for Evaluating Solid Waste-Physical/Chemical Methods. SW-846. EPA/Office of Solid Waste,

TEST CODE DIGSOL NAME Acid digestion-soil-SW846

Washington, DC.

Method Description: A 1.0-g aliquot of dried and ground sample is transferred to an acid-washed beaker. Following addition of 10 ml of 1:1 Instra-analyzed nitric acid, the sample is placed on a hot plate and refluxed for 10 min. without boiling. After cooling, a 5-ml portion of concentrated acid is added and the sample is refluxed for 30 min. After sample has cooled a second time 2-ml of deionized water is added, followed by 3 ml of 30 % hydrogen peroxide, and the sample is refluxed until digestion is complete (generally indicated by a yellow color). Additional hydrogen peroxide is added until no change in sample composition is observed (not more than 10-ml hydrogen peroxide). For furnace AAS determinations, the sample is diluted to 100 ml with distilled, deionized water so that the final acid concentration is 0.5 %. For flame AAS and ICP determinations, and for furnace determinations of Sb and Sn, the final dilution is performed with 1:1 HCl (5 ml/100 ml of solution). Insoluble material is removed by filtering or settling.

TEST CODE HG_CVS NAME Mercury (Hg)-cold vapor

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 245.5-Mercury in Sediment (manual cold vapor technique).
Additional References: EPA. 1982. Test Methods for Evaluating Solid Waste. SW-846-Second edition. (Update No. 1-April 1984). EPA/Office of Solid Waste, Washington, DC. Method 7471-Mercury in Solid or Semi-solid Waste (manual cold-vapor technique).

Method Description: Mercury is determined in soils, sediments, bottom deposits, and sludges by digestion of sample in aqua regia for 2 min at 95 C, followed by oxidation with potassium permanganate and potassium persulfate. Mercury in the digested sample is then measured by cold vapor atomic absorption spectrophotometry on a SpectroProducts Hg-3 analyzer.

Quality Control Procedures: Instrumental calibration is performed by analyzing a blank and four or more working standards. Accuracy of working standards is verified by analysis of an independent check standard. With each batch of 10 samples and for each different matrix, one matrix spike and one duplicate analysis are performed.

TEST CODE **PB_I_S** NAME **Lead (Pb)-ICP**

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Lead is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE **PCB_S** NAME **PCBs-soil-SW846**

Method Reference: U.S. EPA, 1982. Test Methods for Evaluating Solid Waste-Physical/Chemical Methods. Second Edition. SW-846. EPA/Office of Solid Waste, Washington, D.C. Method 8080, test method for organochlorine pesticides and PCBs.

Method Description: The analytes in a solid sample are isolated and concentrated by solvent extraction. The extract is injected into into a gas chromatograph (GC) where the analytes are separated and detected with an electron capture detector (ECD).

Quality Control Procedures: Instrument response is calibrated every twelve hours using EPA traceable standard reference solutions. Analytes are quantified using the external standard method. Surrogate standard compounds are added to every sample to monitor method performance. Additional quality control includes the analysis of replicates, matrix spikes, duplicate matrix spikes, and blanks.

TEST CODE **ZN_I_S** NAME **Zinc (Zn)-ICP**

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

REPORT
Test Methodology

TEST CODE ZN_I_S NAME Zinc (Zn)-ICP

Method Description: Zinc is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

8812194

CHAIN-OF-CUSTODY RECORD

BALSAM
ENVIRONMENTAL CONSULTANTS, INC.
59 STILES RD.
SALEM N.H., 03079

2/4

PROJECT NAME: NBH - Thin Layer Sampling
PROJECT ADDRESS:
PROJECT NO.: 6242
SAMPLERS (SIGNATURES): William R. Walsh, Daniel K. Cahn

I.D. NUMBER	SAMPLING LOCATION	DATE	TIME	SAMPLE TYPE: SOIL	WATER	OIL	AIR	BULK	NO. OF CONTAINERS	ANALYSES	COMMENTS
FX-40		12/12/88		X					~1-	PCB's & Metals (Hg, Cr, Cu, Pb, Zn)	Homogenize samples prior to analysis
FX-44											
FX-48											
FX-52											
FX-56											
FX-60											
FX-64											
FX 68											
											Shipped/packaged with ICE
DR-1											
DR 2											
DR-3											
DR-4											
DR-6											
DR-8											

RELINQUISHED BY: William R. Walsh — DATE: 12/14/88 — TIME: 6:40 pm
RECEIVED BY: — DATE: — TIME:

RELINQUISHED BY: — DATE: — TIME:
RECEIVED BY: — DATE: — TIME:

RELINQUISHED BY: — DATE: — TIME:
RECEIVED FOR LABORATORY BY: Edward A. Fawcett — DATE: 12/14/88 — TIME: 6:40pm

METHOD OF SHIPMENT: By Hand
AIRBILL (OR SHIPPING INVOICE) NUMBER:

EA

881215

CHAIN-OF-CUSTODY RECORD

BALSAM
ENVIRONMENTAL CONSULTANTS, INC.
59 STILES RD.
SALEM N.H., 03079

3/4

PROJECT NAME: NBH - Thin Layer Sampling

PROJECT ADDRESS:

PROJECT NO.: 6272

SAMPLERS (SIGNATURES): Ellen R. Walker Daniel A Cahen

I.D. NUMBER	SAMPLING LOCATION	DATE	TIME	SAMPLE TYPE: SOIL	WATER	OIL	AIR	BULK	NO. OF CONTAINERS	ANALYSES	COMMENTS
DR-10		12/12/88		X					-1-	PCB's & Metals (Hg, Cr, Cu, Pb, Zn)	Homogenize sample prior to analysis
DR-12											
DR-14											
DR-16											
DR-18											
DR-20											
DR-22											Shipped/packaged with JCE
DR-24											
DR-26											
DR-28											
DR-30											
DR-32											
DR-36											
DR-40											
DR-44											

RELINQUISHED BY: Ellen R. Walker	DATE: 12/14/88	TIME: 6:40 pm	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED FOR LABORATORY BY: Edward A. Fowler

DATE: 12/14/88 TIME: 6:40pm

METHOD OF SHIPMENT: By Hand

AIRBILL (OR SHIPPING INVOICE) NUMBER:

EMA

R E P O R T T O

Balsam Environmental Consult.
59 Stiles Road
Salem, NH 03079

Attn: Mr. Allen Walker

Work ID: New Bedford Harbor Study:PRP
P.O. No.: 6292
Work Order: 88-12-195

Cambridge Analytical Associates
Environmental Division
1106 Commonwealth Avenue
Boston MA 02215

Received: 12/15/88

REPORT

Work Order # 88-12-195

02/08/89 13:30:21

REPORT TO: Balsam Environmental Consult.
59 Stiles Road
Salem, NH 03079

ATTEN: Mr. Allen Walker

CLIENT: BALSAM SAMPLES: 10
COMPANY: Balsam Environmental Consult.
FACILITY:

WORK ID: New Bedford Harbor Study:PRP
TAKEN: By A. Walker & D. Cohen
TRANS: Hand Deliver
TYPE: Soil/Aqueous
P.O. #: 6292
INV. #: 18238

PREPARED BY: Cambridge Analytical Assoc.
Environmental Division
1106 Commonwealth Avenue
Boston, MA 02215

ATTEN:
PHONE: 617-232-2207

CERTIFIED BY:

CONTACT: LAWLER

This report is approved for release by the following staff:
Laboratory Director: Michael F. Delaney
Inorganic Laboratory:
Organic Laboratory:

This report has been corrected to show the true value for Zinc in Sample DR-52 and for Chromium, Copper and Zinc in Samples FW-1 and DRW-2.

Previously Reported on 01/20/89.

SAMPLE IDENTIFICATION

01	DR-32
02	DR-36
03	DR-40
04	DR-44
05	DR-48
06	DR-52
07	DR-56
08	DR-60
09	FW-1
10	DRW-2

TEST CODES and NAMES used on this report

CR_I_A	Chromium (Cr)-ICP
CR_I_S	Chromium (Cr)-ICP
CU_I_A	Copper (Cu)-ICP
CU_I_S	Copper (Cu)-ICP
DIGSOL	Acid digestion-soil-SW846
DIG_AQ	Acid digestion-aqueous-EPA
EXPCBA	PCB ext-aqueous-EPA 608
EXPCBS	PCB ext-soil-SW846-3540
HG_CVA	Mercury (Hg)-cold vapor
HG_CVS	Mercury (Hg)-cold vapor
PB_I_A	Lead (Pb)-ICP
PB_I_S	Lead (Pb)-ICP
PCB_A	PCBs-aqueous-EPA 608
PCB_S	PCBs-soil-SW846
ZN_I_A	Zinc (Zn)-ICP
ZN_I_S	Zinc (Zn)-ICP

Received: 12/15/88

REPORT
Results By Test

Work Order # 88-12-195

SAMPLE Sample Id		Test:CR_I_A mg/l	Test:CR_I_S ug/g (dry wt)	Test:CU_I_A mg/l	Test:CU_I_S ug/g (dry wt)	Test:DIGSOL date complete
DR-32	01		<2.5		6.5	12/28/88
DR-36	02		<2.4		7.0	12/28/88
DR-40	03		4.1		5.6	12/28/88
DR-44	04		3.6		5.5	12/28/88
DR-48	05		<2.4		4.3	12/28/88
DR-52	06		780		1,300	12/28/88
DR-56	07		51		85	12/28/88
DR-60	08		41		82	12/28/88
FW-1	09	0.093		0.054		
DRW-2	10	0.015		0.011		

SAMPLE Sample Id		Test:DIG_AQ date complete	Test:EXPCBA extraction date	Test:EXPCBS extraction date	Test:HG_CVA mg/l	Test:HG_CVS ug/g (dry wt)
DR-32	01			12/21/88		<0.126
DR-36	02			12/21/88		<0.109
DR-40	03			12/21/88		<0.122
DR-44	04			12/21/88		<0.120
DR-48	05			12/21/88		<0.12[illegible]
DR-52	06			12/21/88		1.27

SAMPLE ID DR-44 SAMPLE # 04 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S	ZN_I_S
3.6	5.5	12/28/88	12/21/88	<0.120	<12	8.0
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)	ug/g (dry wt)

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-195

SAMPLE ID DR-44 FRACTION 04A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/08/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.05

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

Work Order # 88-12-195

SAMPLE ID DR-48 SAMPLE # 05 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S <2.4 ug/g (dry wt)	CU_I_S 4.3 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/21/88 extraction date	HG_CVS <0.121 ug/g (dry wt)	PB_I_S <12 ug/g (dry wt)
ZN_I_S 6.0 ug/g (dry wt)					

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-195

SAMPLE ID DR-48

FRACTION 05A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/08/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.05

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

Work Order # 88-12-195

SAMPLE ID DR-52 SAMPLE # 06 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 780 ug/g (dry wt)	CU_I_S 1,300 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/21/88 extraction date	HG_CVS 1.27 ug/g (dry wt)	PB_I_S 460 ug/g (dry wt)
ZN_I_S 2,000 ug/g (dry wt)					

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-195

SAMPLE ID DR-52 FRACTION 06A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/08/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	210
Aroclor 1248	
Aroclor 1254	82
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	1

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-56 SAMPLE # 07 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S 51 ug/g (dry wt)	CU_I_S 85 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 01/06/89 extraction date	HG_CVS 0.330 ug/g (dry wt)	PB_I_S 70 ug/g (dry wt)
ZN_I_S 170 ug/g (dry wt)					

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-195

SAMPLE ID DR-56 FRACTION 07A TEST CODE PCB_S NAME PCBs-soil-S7846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/09/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.1

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-60 SAMPLE # 08 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S	ZN_I_S
41	82	12/28/88	12/21/88	0.314	77	140
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)	ug/g (dry wt)

Received: 12/15/88 Results by Sample

SAMPLE ID DR-60 FRACTION 08A TEST CODE PCB_8 NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/08/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.2

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID **FW-1** SAMPLE # **09** FRACTIONS: **A,B**
Date & Time Collected **12/12/88** Category **AQUEOUS**

CR_I_A **0.093** mg/l	**CU_I_A** 0.054 mg/l	**DIG_AQ** 12/28/88 date complete	**EXPCBA** 12/22/88 extraction date	**HG_CVA** <0.0002 mg/l	**PB_I_A** 0.08 mg/l

ZN_I_A **0.110** mg/l

Received: 12/15/88 Results by Sample

SAMPLE ID FW-1 FRACTION 09A TEST CODE PCB_A NAME PCBs-aqueous-EPA 608
Date & Time Collected 12/12/88 Category AQUEOUS

Analysis
Completed: 1/9/89

COMPOUND	ug/L(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	29
Aroclor 1248	
Aroclor 1254	11
Aroclor 1260	
DETECTION LIMIT	0.5

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID DRW-2 SAMPLE # 10 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category AQUEOUS

CR_I_A 0.015 mg/l	CU_I_A 0.011 mg/l	DIG_AQ 12/28/88 date complete	EXPCBA 12/22/88 extraction date	HG_CVA <0.0002 mg/l	PB_I_A 0.19 mg/l
ZN_I_A 0.018 mg/l					

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-195

SAMPLE ID DRW-2 FRACTION 10A TEST CODE PCB_A NAME PCBs-aqueous-EPA 608
Date & Time Collected 12/12/88 Category AQUEOUS

Analysis Completed: 1/9/89

COMPOUND	ug/L(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
DETECTION LIMIT	0.1

(a) - Concentrations less than the detection limit are left blank

TEST CODE CR_I_A NAME Chromium (Cr)-ICP

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Chromium is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE CR_I_S NAME Chromium (Cr)-ICP

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Chromium is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE CU_I_A NAME Copper (Cu)-ICP

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

TEST CODE **CU_I_A** NAME **Copper (Cu)-ICP**

Method Description: Copper is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer or Jarrell-Ash Model 975 simultaneous plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE **CU_I_S** NAME **Copper (Cu)-ICP**

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Copper is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE **DIGSOL** NAME **Acid digestion-soil-SW846**

Method Description: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Section 4.1.3.
Additional references: EPA. 1982. Test Methods for Evaluating Solid Waste-Physical/Chemical Methods. SW-846. EPA/Office of Solid Waste, Washington, DC.

Method Description: A 1.0-g aliquot of dried and ground sample is transferred to an acid-washed beaker. Following addition of 10 ml of 1:1 Instra-analyzed nitric acid, the sample is placed on a hot plate and refluxed for 10 min.

TEST CODE DIGSOL NAME Acid digestion-soil-SW846

without boiling. After cooling, a 5-ml portion of concentrated acid is added and the sample is refluxed for 30 min. After sample has cooled a second time 2-ml of deionized water is added, followed by 3 ml of 30 % hydrogen peroxide, and the sample is refluxed until digestion is complete (generally indicated by a yellow color). Additional hydrogen peroxide is added until no change in sample composition is observed (not more than 10-ml hydrogen peroxide). For furnace AAS determinations, the sample is diluted to 100 ml with distilled, deionized water so that the final acid concentration is 0.5 %. For flame AAS and ICP determinations, and for furnace determinations of Sb and Sn, the final dilution is performed with 1:1 HCl (5 ml/100 ml of solution). Insoluble material is removed by filtering or settling.

TEST CODE DIG_AQ NAME Acid digestion-aqueous-EPA

Method Description: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Section 4.1.3.
Additional references: EPA. 1982. Test Methods for Evaluating Solid Waste-Physical/Chemical Methods. SW-846. EPA/Office of Solid Waste, Washington, DC.

Method Description: A 100-ml aliquot of sample is transferred to an acid-washed beaker. Following addition of 3 ml of concentrated Instra-analyzed nitric acid, the sample is placed on a hot plate and evaporated to near-dryness without boiling. After cooling, another 3-ml portion of acid is added, followed by 2 ml of 30 % hydrogen peroxide, and the sample is reluxed until digestion is complete (generally indicated by a yellow color). Additional acid is added until no change in sample composition is observed. The sample is again taken to near-dryness. For furnace AAS determinations, the sample is diluted to 100 ml with distilled, deionized water so that the final acid concentration is 0.5 %. For flame AAS and ICP determinations, and for furnace determinations of Sb and Sn, the final dilution is performed with 1:1 HCl (5 ml/100 ml of solution). Insoluble material is removed by filtering or settling.

TEST CODE HG_CVA NAME Mercury (Hg)-cold vapor

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 245.1-Mercury (Manual Cold Vapor Technique).
Additional References: EPA. 1982. Test Methods for Evaluating Solid Waste. SW-846-Second edition. (Update No. 1-April 1984). EPA/Office of Solid Waste, Washington, DC. Method 7470-Mercury (Manual Cold-Vapor Technique).

Method Description: Mercury is determined in drinking, surface and saline waters,as well as domestic and industrial wastes by digestion of sample in sulfuric and nitric acids, followed by oxidation with potassium permanganate and potassium persulfate. Mercury in the digested sample is then measured by cold vapor atomic absorption spectrophotometry on a SpectroProducts Hg-3 analyzer.

Quality Control Procedures: Instrumental calibration is performed by analyzing a blank and four or more working standards. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibration is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Matrix spikes and duplicates are analyzed at a frequency of 10 %.

TEST CODE HG_CVS NAME Mercury (Hg)-cold vapor

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 245.5-Mercury in Sediment (manual cold vapor technique).
Additional References: EPA. 1982. Test Methods for Evaluating Solid Waste. SW-846-Second edition. (Update No. 1-April 1984). EPA/Office of Solid Waste, Washington, DC. Method 7471-Mercury in Solid or Semi-solid Waste (manual cold-vapor technique).

Method Description: Mercury is determined in soils, sediments, bottom deposits, and sludges by digestion of sample in aqua regia for 2 min at 95 C, followed by oxidation with potassium permanganate and potassium persulfate. Mercury in the digested sample is then measured by cold vapor atomic absorption spectrophotometry on a SpectroProducts Hg-3 analyzer.

Quality Control Procedures: Instrumental calibration is performed by analyzing a blank and four or more working standards. Accuracy of working standards is verified by analysis of an independent check standard. With each batch of 10 samples and for each different matrix, one matrix spike and one duplicate analysis are performed.

TEST CODE **PB_I_A** NAME **Lead (Pb)-ICP**

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Lead is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE **PB_I_S** NAME **Lead (Pb)-ICP**

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Lead is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE **PCB_A** NAME **PCBs-aqueous-EPA 608**

Method Reference: U.S. EPA, 1984. Methods for Organic Analysis of Municipal and Industrial Wastewater. Appendix A. 40CFR Part 136. Federal Register, Vol. 49, No. 209. Method 608, test method for Organochlorine Pesticides and PCBs.

Method Description: The analytes in an aqueous sample are isolated and

TEST CODE PCB_A NAME PCBs-aqueous-EPA 608

concentrated by solvent extraction. The extract is injected into into a gas chromatograph (GC) where the analytes are separated and detected with an electron capture detector (ECD).

Quality Control Procedures: Instrument response is calibrated every twelve hours using EPA traceable standard reference solutions. Analytes are quantified using the external standard method. Surrogate standard compounds are added to every sample to monitor method performance. Additional quality control includes the analysis of replicates, matrix spikes, duplicate matrix spikes, and blanks.

TEST CODE PCB_S NAME PCBs-soil-SW846

Method Reference: U.S. EPA, 1982. Test Methods for Evaluating Solid Waste-Physical/Chemical Methods. Second Edition. SW-846. EPA/Office of Solid Waste, Washington, D.C. Method 8080, test method for organochlorine pesticides and PCBs.

Method Description: The analytes in a solid sample are isolated and concentrated by solvent extraction. The extract is injected into into a gas chromatograph (GC) where the analytes are separated and detected with an electron capture detector (ECD).

Quality Control Procedures: Instrument response is calibrated every twelve hours using EPA traceable standard reference solutions. Analytes are quantified using the external standard method. Surrogate standard compounds are added to every sample to monitor method performance. Additional quality control includes the analysis of replicates, matrix spikes, duplicate matrix spikes, and blanks.

TEST CODE ZN_I_A NAME Zinc (Zn)-ICP

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Zinc is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

TEST CODE ZN_I_A NAME Zinc (Zn)-ICP

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

TEST CODE ZN_I_S NAME Zinc (Zn)-ICP

Method Reference: EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA-600-4/79-020 (Revised March 1983). EPA/EMSL, Cincinnati, Ohio. Method 200.7-Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.

Method Description: Zinc is determined by inductively coupled argon plasma emission spectroscopy on a Jarrell-Ash Model 2000 sequential plasma spectrometer.

Quality Control Procedures: The instrument is calibrated using a blank and a 10 ppm standard. Accuracy of the working standards is verified by analysis of an independent EPA or NBS reference standard, and calibraton is checked every 10 samples during the run. Procedural blanks are prepared with each batch of samples. Duplicates and matrix spikes are analyzed at a frequency of 10 %.

REPORT
Results By Test

SAMPLE Sample Id	Test:DIG_AQ date complete	Test:EXPCBA extraction date	Test:EXPCBS extraction date	Test:HG_CVA mg/l	Test:HG_CVS ug/g (dry wt)
07 DR-56			01/06/89		0.330
08 DR-60			12/21/88		0.314
09 FW-1	12/28/88	12/22/88		<0.0002	
10 DRW-2	12/28/88	12/22/88		<0.0002	

SAMPLE Sample Id	Test:PB_I_A mg/l	Test:PB_I_S ug/g (dry wt)	Test:ZN_I_A mg/l	Test:ZN_I_S ug/g (dry wt)
01 DR-32		31		13
02 DR-36		<12		9.2
03 DR-40		<12		8.9
04 DR-44		<12		8.0
05 DR-48		<12		6.0
06 DR-52		460		2,000
07 DR-56		70		170
08 DR-60		77		140
09 FW-1	0.08		0.110	
10 DRW-2	0.19		0.018	

SAMPLE ID DR-32 SAMPLE # 01 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S	ZN_I_S
<2.5	6.5	12/28/88	12/21/88	<0.126	31	13
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)	ug/g (dry wt)

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-195

SAMPLE ID DR-32 FRACTION 01A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/08/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.05

(a) - Concentrations less than the detection limit are left blank

REPORT
Results by Sample

SAMPLE ID DR-36 SAMPLE # 02 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S <2.4 ug/g (dry wt)	CU_I_S 7.0 ug/g (dry wt)	DIGSOL 12/28/88 date complete	EXPCBS 12/21/88 extraction date	HG_CVS <0.109 ug/g (dry wt)	PB_I_S <12 ug/g (dry wt)
ZN_I_S 9.2 ug/g (dry wt)					

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-195

SAMPLE ID DR-36 FRACTION 02A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/08/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.05

(a) - Concentrations less than the detection limit are left blank

SAMPLE ID DR-40 SAMPLE # 03 FRACTIONS: A,B
Date & Time Collected 12/12/88 Category SOIL

CR_I_S	CU_I_S	DIGSOL	EXPCBS	HG_CVS	PB_I_S
4.1	5.6	12/28/88	12/21/88	<0.122	<12
ug/g (dry wt)	ug/g (dry wt)	date complete	extraction date	ug/g (dry wt)	ug/g (dry wt)

ZN_I_S
8.9
ug/g (dry wt)

Received: 12/15/88

REPORT
Results by Sample

Work Order # 88-12-195

SAMPLE ID DR-40 FRACTION 03A TEST CODE PCB_S NAME PCBs-soil-SW846
Date & Time Collected 12/12/88 Category SOIL

Analysis
Completed: 01/08/89

COMPOUND	ug/g-dry(a)
Aroclor 1016	
Aroclor 1221	
Aroclor 1232	
Aroclor 1242	
Aroclor 1248	
Aroclor 1254	
Aroclor 1260	
Aroclor 1262	
DETECTION LIMIT	0.05

(a) - Concentrations less than the detection limit are left blank