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ATTACHMENT I

ASSESSMENT OF PCB
IN ACUSHNET RIVER
UPPER ESTUARY SALTMARSH
WETLANDS SEDIMENTS
NEW BEDFORD HARBOR

(2397D)

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ASSESSMENT OF PCB IN ACUSHNET RIVER UPPER ESTUARY SALTMARSH WETLANDS SEDIMENTS NEW BEDFORD HARBOR

DRAFT

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October 10, 1989
Balsam Project 6292.03:1275

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ASSESSMENT OF PCB IN ACUSHNET RIVER UPPER ESTUARY SALTMARSH WETLANDS SEDIMENTS NEW BEDFORD HARBOR

1.0 EXECUTIVE SUMMARY

The purpose of this report is to present concentration trends of Polychlorinated Biphenyls (PCBs) in saltmarsh wetlands sediments of the Acushnet River Upper Estuary. This report is based on a review of data collected by the United States Army Corps of Engineers (USACE), IEP, Inc. (IEP), and Sanford Ecological Services, Inc. (Sanford).

Past field investigations, which included sediment sampling in the upper estuary saltmarsh, suggest a general trend of decreasing PCB concentration in saltmarsh sediments from north to south. This trend is consistent with PCB concentration trends generally observed in aquatic upper estuary sediments. In northern areas of the saltmarsh, PCB concentrations reportedly ranged from 550 parts per million (ppm) to 2.57 ppm. PCB concentrations in southern areas of the saltmarsh reportedly ranged from 60 ppm to 0.84 ppm. In addition, PCB sediment concentration decreases laterally with distance from the mudflats or open water inland. Furthermore, past data from wetlands sediments suggest a decreasing trend with depth vertically in soil. An average of 212 ppm of PCBs was found in sediment collected from the top 0-12 inch interval, 23 ppm of PCBs in sediment collected from 12-24 inches and an average of 10 ppm in sediment collected from the bottom 24-36 inch interval (USACE, 1985). A parallel sediment quality study performed by Balsam Environmental Consultants, Inc. (Balsam) indicated a similar trend in PCB vertical distribution, although lower average PCB concentrations were found to be present. The comparatively higher USACE average PCB sediment concentrations were attributed to one stratum at which elevated atypical PCB concentrations were observed.

Finally, structural characteristics due to physiographic phenomena of the wetlands appear to result in another trend of PCB sediment concentration throughout the estuary wetlands. Several tidal creeks, mosquito ditches and drainage ditches, both natural and man-made, exist in the upper estuary. These creeks and ditches serve as pathways for material transfer between the upper estuary and the wetlands, and, because of this, PCB concentrations tend to be higher in proximity to them.

2.0 EXISTING DATA REVIEW

Several studies have been conducted to evaluate conditions of the Acushnet River Upper Estuary, but few have focused precisely on sediment quality in the eastern shore estuary saltmarsh. In August-October 1985, the USACE sampled sediment from 72 stations within the Acushnet River Upper Estuary. Twenty-one of those stations were located within the saltmarsh area. Samples were collected at 1-foot intervals to a depth of up to 3 feet and analyzed for PCBs. Results are presented in Figure 1.

Balsam collected sediment samples from eighteen stations within the saltmarsh area during an investigation conducted in October 1987. During this program, sediment samples were collected from intervals of 0 to 6 inches and 6 inches to 12 inches at each of the eighteen stations along six east-west transects. Results for these sample analyses are presented in Figure 2.

Using these two data sets as a basis, an evaluation of the occurrence of PCBs in upper estuary saltmarsh sediments was made. In addition, reports prepared by IEP (IEP, 1988) and Sanford Ecological Services (SES, 1988) describing New Bedford Harbor site wetlands were also consulted to obtain a better understanding of the physiographic nature of the wetlands.

3.0 PCB CONCENTRATION TRENDS

The USACE 1985 sediment sampling program reported a wide range of PCB concentration present in saltmarsh sediments; a closer review of these data indicates the presence of a widespread vertical distribution trend of PCB concentration. PCB concentrations ranged from non-detectable levels to 1900 ppm in surface sediment (0-12 inches), non-detectable to 104 ppm in mid-level sediments (12-24 inches), and from 0.84 ppm to 45 ppm in deeper sediments (24-36 inches). At all stations where sediment sampling was performed to a depth of greater than 12 inches, PCB concentrations in the 0 to 12-inch interval were equal to or greater than in the 12-24 inch interval. A summary of these USACE PCB analytical data are presented in Table 1.

Balsam (1987) documented similar decreasing PCB concentration trends. At nearly all stations, the upper 0-6 inch interval contained the highest concentrations of PCBs. PCB concentrations ranged from non-detectable levels to 517 ppm in the 0-6 inch interval. PCB contamination in the deeper sediment, 6-12 inches, ranged from non-detectable levels to 99.4 ppm. A summary of these data is presented in Table 2.

The results of the USACE (1985) also suggest decreasing PCB concentrations from northern areas of the saltmarsh to the south with the exception of sediment collected from one area apparently within a tidal creek (i.e., Station K-13). This trend is supported by data generated by the Balsam sediment sampling program. PCB concentrations in the north ranged from 550 ppm to 2.57 ppm, and from 161 ppm to non-detected in the south.

There is also a trend of decreasing sediment PCB concentration with distance from the open water across the saltmarsh, with the exception of samples collected from a tidal creek area. Similar west-east PCB trends were also reported in the study conducted by IEP (1988) of New Bedford Harbor area and Upper Estuary wetlands. Sediments were collected from stations within both

low marsh areas and high marsh areas for comparative reasons. Highest PCB sediment concentration were reported in areas closest to open water, typically, the low marsh stations, with the exception of the occurrence of high marsh stations located at or near ditches or creeks.

In addition to the above mentioned areal PCB concentration trends, the most significant trend identified in Upper Estuary saltmarsh sediments appears to be related to the physiography of the saltmarsh. The eastern shore Upper Estuary wetlands contains a network of tidal creeks and man-made drainage ditches. The extent of this surface water drainage network was described in USACE (1988) and has been summarized and presented as Figure 3. This drainage network serves as a major water and sediment transport pathway between the Upper Estuary and the saltmarsh, with the drainage network acting as a sediment depositional area.

Highest PCB concentrations (1,900 ppm and 517 ppm, respectively) were associated with sediment samples collected in close proximity to a major tidal creek within the saltmarsh. Precise sediment sampling locations for the USACE saltmarsh sediment sampling program were not found in the USACE data report. However, a comparison between the USACE wetlands sample location plan and the USACE saltmarsh topographic base maps consistently showed that samples with elevated PCB concentrations were collected from areas containing tidal creeks or drainage ditches. Although less clear, it is possible that relatively higher PCB sediment concentrations in southern portions of the saltmarsh (i.e., Stations K-20 and L-20 with 60 ppm and 49.4 ppm, respectively) may be related to sampling from man-made drainage ditches as compared to adjacent sediment samples with much lower PCB concentrations (Stations K-19 and L-19 with 0.69 ppm and non-detectable PCB levels, respectively).

Results of the Balsam sampling showed a strong correlation between PCB concentration and proximity to a tidal creek; PCB sediment concentrations in excess of 100 ppm were reported in samples collected in close proximity to a

tidal creek, while PCB concentrations reported in those samples collected further from the banks of the tidal creeks were typically less than 10 ppm.

As previously discussed, the IEP (1988) report also reported the presence of a similar PCB concentration trend in saltmarsh sediments. Low marsh areas which include the majority of the drainage ditches and tidal creeks contain relatively higher PCB concentrations as compared to high marsh areas.

4.0 REFERENCES

Condike, Brian J., U. S. Army Corps of Engineers, 1986. New Bedford Harbor Superfund Site Acushnet River Estuary Study. Draft.

IEP, Inc. 1988. Wetland Study Report for the New Bedford Superfund Site: Final Report. Prepared for the United States Army Corps of Engineers.

Sanford Ecological Services, Inc., 1988. New Bedford Harbor Superfund Project Wetland Assessment. Prepared for United States Army Corps of Engineers.

United States Army Corps of Engineers, 1987. New Bedford Massachusetts Engineering Feasibility Study - Topographic Survey.

TABLE 1

1985 USACE SEDIMENT SAMPLING PROGRAM
ACUSHNET RIVER UPPER ESTUARY SALTMARSH WETLANDS
POLYCHLORINATED BIPHENYL ANALYSES

	TOTAL PCBs (PPM)		
GRID #	(0-12")	(12-24")	(24-36")
L5	550	--	--
M5	440	J3.1	6.2
N6	6.8	--	--
N7	2.57	--	--
N8	500	104	45
M8	16	R1.1	--
K12	66	7.2	J0.84
K13	1900	20.9	9
K14	161	--	--
L14	ND	ND	0.18
K15	ND		
K16	1.53	--	--
K17	0.15	--	--
K18	NR	NR	NR
J19	39	J0.37	J1.3
K19	0.69	--	--
L19	ND	ND	--
K20	60	--	--
L20	49.4	--	--
M22	NR	ND	--
L23	NR	NR	NR
L25	1.5	--	--
M26	0.24	--	--
L27	NR	NR	NR

NOTES:

1. ND means not detected at method detectable level (MDL).
2. NR means not reported.
3. Data reported in milligrams per kilogram (mg/kg) or parts per million (PPM).
4. Blank entry means no sample collected from that depth interval.
5. R means data rejected per NUS data validation.
6. J means data value is approximate per NUS data validation.

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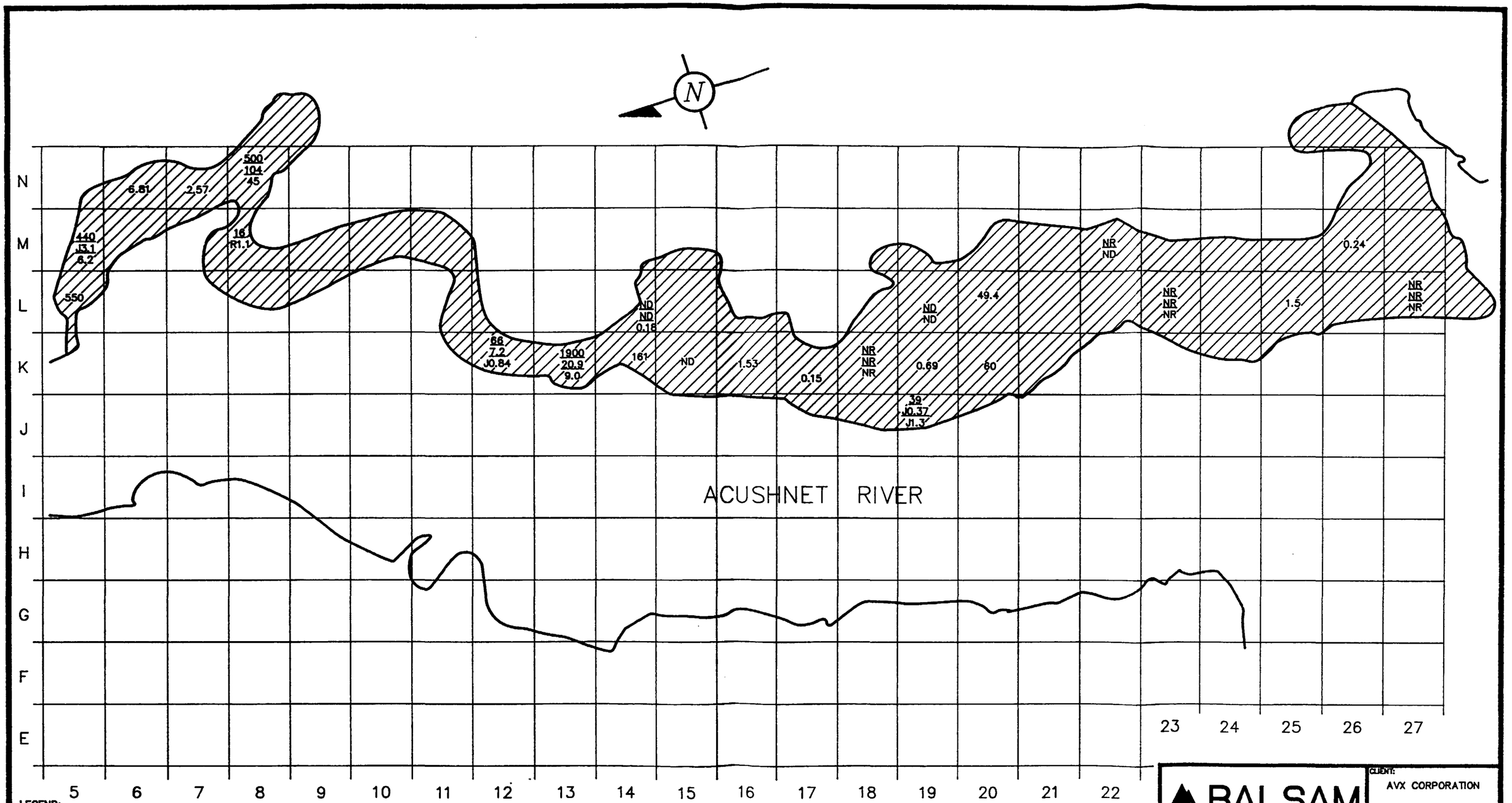
TABLE 2

1987 BALSAM SEDIMENT SAMPLING PROGRAM
ACUSHNET RIVER UPPER ESTUARY
SALTMARSH WETLANDS SEDIMENTS
POLYCHLORINATED BIPHENYL ANALYSES

Vertical Transect South (1) to North (7)		Horizontal Transect - West (1) to East (3) 1	2	3
1	A	3.3	1.1	1.5
	B	ND	ND	1.9
2	A	5.4	0.5	ND
	B	2.1	1.5	ND
3	A	3.4, 8.1*	8.5	0.8
	B	1.1	ND	ND
5	A	17.7	161.0	517.0
	B	ND	6.2, 1.4*	99.4
6	A	153.0	121.0, 164.0*	97.1
	B	5.0	1.1	1.5
7	A	6.4	2.2	1.4
	B	3.7, 14.2*	ND	1.0

NOTES:

1. ND means not detected at method detectable level (MDL) equal to 0.5 ppm.
2. Data reported in milligrams per kilogram (mg/kg) or parts per million (ppm).
3. A samples obtained from 0 to 6 inch soil depth.
4. B samples obtained from 6 to 12 inch soil depth.
5. * indicates duplicate sample analysis.
6. Sampling conducted on October 22, 1987.



LEGEND:

0"–12" / 12"–24" / 24"–36" = TOTAL PCB CONCENTRATION (PPM)

R = DATA REJECTED PER NUS DATA VALIDATION

J = VALUE REPORTED IS APPROXIMATE

NR = NOT REPORTED

ND = NONE DETECTED

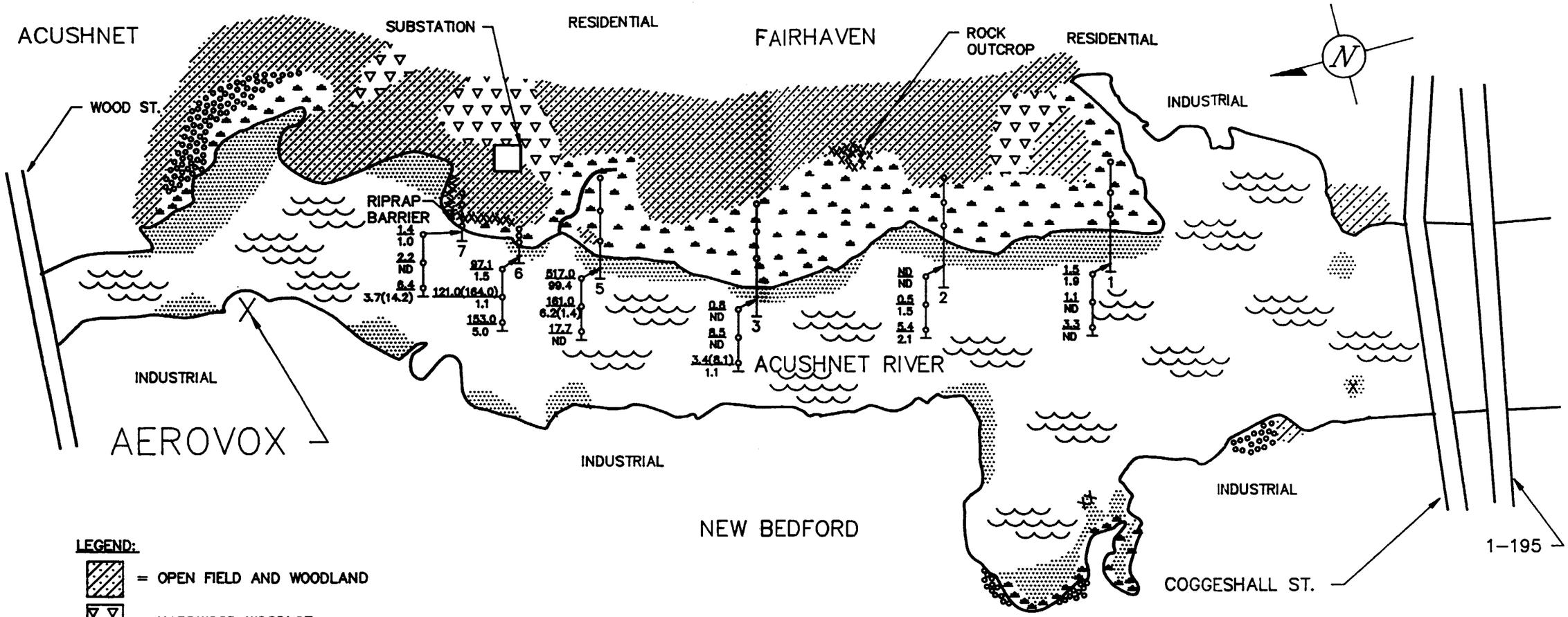
= WETLANDS

NOTES:

1. SOURCE: USACE SEDIMENT CORE SAMPLING NEW BEDFORD HARBOR SUPERFUND PROJECT (1985)
2. DATA USED HAVE BEEN VALIDATED AND QUALIFIED BY NUS ACCORDING TO EPA DATA VALIDATION GUIDELINES AND HAVE BEEN USED WITHOUT FURTHER VERIFICATION.

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

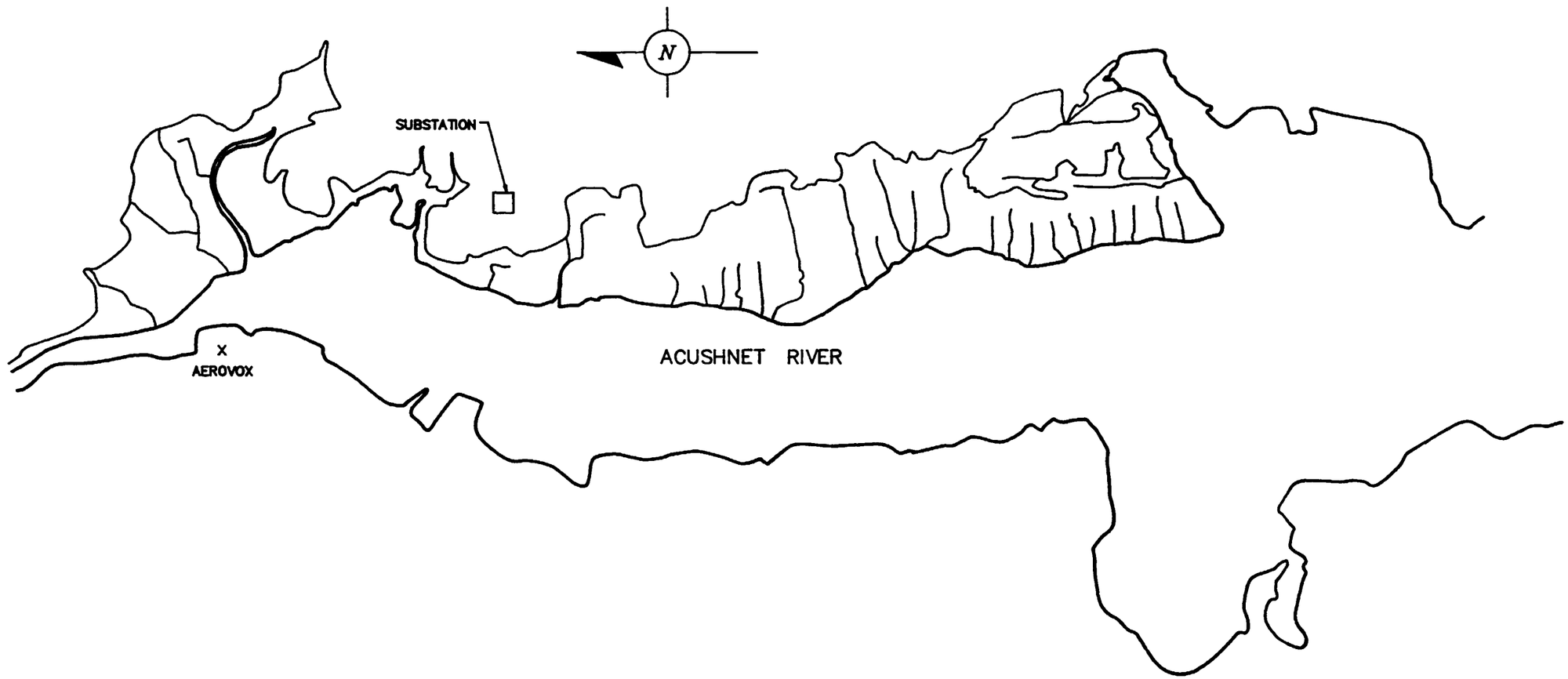
CLIENT: AVX CORPORATION			
TITLE: 1985 USACE SEDIMENT SAMPLING SALTMARSH AREA			
DATE: 10/6/89	DRAWN: D.J.P.	CHECKED: T.E.S.	PROJECT: UPPER ESTUARY SALTMARSH EVALUATION
SCALE: NTS	FILE NO: 6292we1	APPROVED: L.C.S.	FIGURE NO: FIG. 1 / PROJECT NO: 6292.03



LEGEND:

- = OPEN FIELD AND WOODLAND
- = HARDWOOD WOODLOT
- = SALT MARSH
- = PHRAGMITES
- = TIDAL FLAT (MEAN LOW WATER–MEAN SEA LEVEL)
- = WATER COVERAGE (AT MEAN LOW WATER)
- X X = ROCKS
- 3 2 1 = TRANSECT (-o- SAMPLE LOCATION)
- 0"–6" / 6"–12" = TOTAL PCB CONCENTRATION (PPM)
- ( ) = DUPLICATE ANALYSIS

BALSAM ENVIRONMENTAL CONSULTANTS, INC. 59 STILES RD. SALEM, N.H. 03079			CLIENT: AVX CORPORATION	
			TITLE: 1987 BALSAM UPPER ESTUARY MARSH INVESTIGATION	
DATE: 10/6/89	DRAWN: D.J.P.	CHECKED: T.E.S.	PROJECT: UPPER ESTUARY SALTMARSH EVALUATION	
SCALE: 1"=540'	FILE NO: 6292we2	APPROVED: L.C.S.	FIGURE NO: FIG. 2	PROJECT NO: 6292.03



SOURCE:

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION
CORPS OF ENGINEERS, WALTHAM MA. OCT. 1987.
NEW BEDFORD, MA., ENGINEERING FEASIBILITY STUDY

BALSAM ENVIRONMENTAL CONSULTANTS, INC. 59 STILES RD. SALEM, N.H. 03079			CLIENT: AVX CORPORATION	
			TITLE: UPPER ESTUARY SALTMARSH DRAINAGE NETWORK	
DATE: 10/10/89	DRAWN: D.J.P.	CHECKED: T.E.S.	PROJECT: UPPER ESTUARY SALTMARSH EVALUATION	
SCALE: 1"=540'	FILE NO: 6292we3	APPROVED: L.C.S.	FIGURE NO: FIG. 3	PROJECT NO: 6292.03