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August 23, 1991

Mr. Francisco A. La Greca
Remedial Project Manager
U.S. Department of the Navy
Northern Division
Naval Facilities Engineering Command
U.S. Naval Base, Building 77-L
Philadelphia, PA 19112

Re: Remedial investigation at the Naval Education and Training Center (NETC)
Newport, Rhode Island
TRC Project No. 6760-N81

Dear Mr. La Greca:

Enclosed are copies of the overheads presented at the July 11 meeting of the Technical Review Committee at the NETC in Newport, Rhode Island. Kristen Wall of your office had asked that we provide these illustrations. Please contact us if you have any questions regarding them.

Sincerely,

Eric L. Butler, Ph.D.

Enclosures

NOAA NATIONAL STATUS AND TRENDS MUSSEL WATCH PROGRAM

ANALYTICAL PROTOCOLS FOR TRACE ORGANICS AND METALS

Developed/refined over 6 year period by

NIST (NBS)
NAF
EPA
Battelle

Methods now used by

EPA EMAP Program
NOAA Mussel Watch Program
NOAA Benthic Surveillance
Various State agencies (MASS, DE, NJ)
EPA OWOW (formerly OMEP)

- *Strict Quality Control Program*

  Field Protocols
  Chain-of-Custody
  Laboratory SOPs
    - Surrogates (Organics)
    - Instrument calibration criteria
    - Standard Reference Materials
    - Site triplicates (all samples)
    - Solvent blanks/checks
    - Procedural Blanks

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NOAA NATIONAL STATUS AND TRENDS MUSSEL WATCH PROGRAM

ANALYTICAL PROTOCOLS FOR TRACE ORGANICS AND METALS

Methods needed for low-level detection of organics and metals in marine and estuarine samples

Examples of approximate MDLs (μg/kg)

	CLP	Mussel Watch Methods
PAH[a]	330 (Method 8270)	1-5
PCB[a]	30-70 (Method 8080)	5-10
Metals	~500 (wide range) (Method 6010—ICP)	~25 (wide range)

[a]CLP Contract Required Quantitation Limit

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ANALYTICAL PROTOCOLS FOR TRACE ORGANICS AND METALS

Current Method Detection Limits (dry weight basis)

Analyte(s)	Sediment	Biological Tissues
PAH	1-5 μg/kg	20-30 μg/kg
Pesticides	0.02-0.1 μg/kg	1-3 μg/kg
PCB	5-10 μg/kg	10-20 μg/kg
Metals	0.01-10 μg/g	0.01-10 μg/g

Target Compound List Criteria

Anthropogenic origins (or indicators of man's activities)
Environmentally stable
Bioconcentrated
Unambiguously identified and measured

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TABLE 3.1. ORGANIC COMPOUNDS AND TRACE METALS TARGETED IN PHASE 5.

Polynuclear Aromatic Hydr carbons
Naphthalene
2-Methylnaphthalene
1-Methylnaphthalene
Biphenyl
2,6-Dimethylnaphthalene
Acenaphthylene
Acenaphthene
2,3,5-Trimethylnaphthalene
Fluorene
Phenanthrene
Anthracene
1-Methylphenanthrene
Fluoranthene
Pyrene
Benz(*a*)anthracene
Chrysene
Benzo(*b*)fluoranthene
Benzo(*k*)fluoranthene
Benzo(*e*)pyrene
Benzo(*a*)pyrene
Perylene
Indeno(1,2,3-*c,d*)pyrene
Dibenz(*a,h*)anthracene
Benzo(*g,h,i*)perylene

Trace Metals
Aluminum (Al)
Silver (Ag)
Arsenic (As)
Cadmium (Cd)
Chromium (Cr)
Copper (Cu)
Iron (Fe)
Mercury ((Hg)
Nickel (Ni)
Lead (Pb)
Selenium (Se)
Tin (Sn)
Zinc (Zn)

Polychlorinated Biphenyls[a]
2,4'-Cl2(8)
2,2',5-Cl3(18)
2,4,4'-Cl3(28)
2,2',3,5'-Cl4(44)
2,2',5,5'-Cl4(52)
2,3',4,4'-C14(66)
3,3',4,4'-C14(77)
2,2',4,5,5'-Cl5(101)
2,3,3',4,4'-Cl5(105)
2,3',4,4',5-Cl5(118)
3,3',4,4',5-C15(126)
2,2',3,3',4,4'-Cl6(128)
2,2',3,4,4',5'-Cl6(138)
2,2',4,4',5,5'-Cl6(153)
2,2',3,3',4,4',5-Cl7(170)
2,2',3,4,4',5,5'-Cl7(180)
2,2',3,4',5,5',6-Cl7(187)
2,2',3,3',4,4',5,6-C18(195)
2,2',3,3',4,4',5,5',6-Cl9(206)
Decachlorobiphenyl-Cl10(209)

Pesticides
Hexachlorobenzene
Lindane
Heptachlor
Aldrin
Heptachlorepoxide
∝-Chlordane
trans-Nonachlor
Dieldrin
Mirex
o,p'-DDD
p,p'-DDD
o,p'-DDE
p,p'-DDE
o,p'-DDT
p,p'-DDT

Butyltins
Tributyltin
Dibutyltin
Monobutyltin
Tetrabutyltin

[a] Isomer numbers indicated in parentheses according to Mullin *et al.* (1984).

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TRACE ORGANICS ANALYTICAL STRATEGY

PAH Compounds

Low Molecular Weight (2- to 3-ring PAH): Fossil Fuel Inputs

High Molecular Weight (3- to 5-ring PAH): Pyrogenic inputs

Analysis by GC/MS in the selected ion monitoring mode (SIM)

PCB

Analysis by individual congener (rather than Aroclor formulation)

18 Environmentally persistent congeners used for quantitation
- representative Cl_2 through Cl_{10} congeners)

Optional quantitation by Aroclor formulation

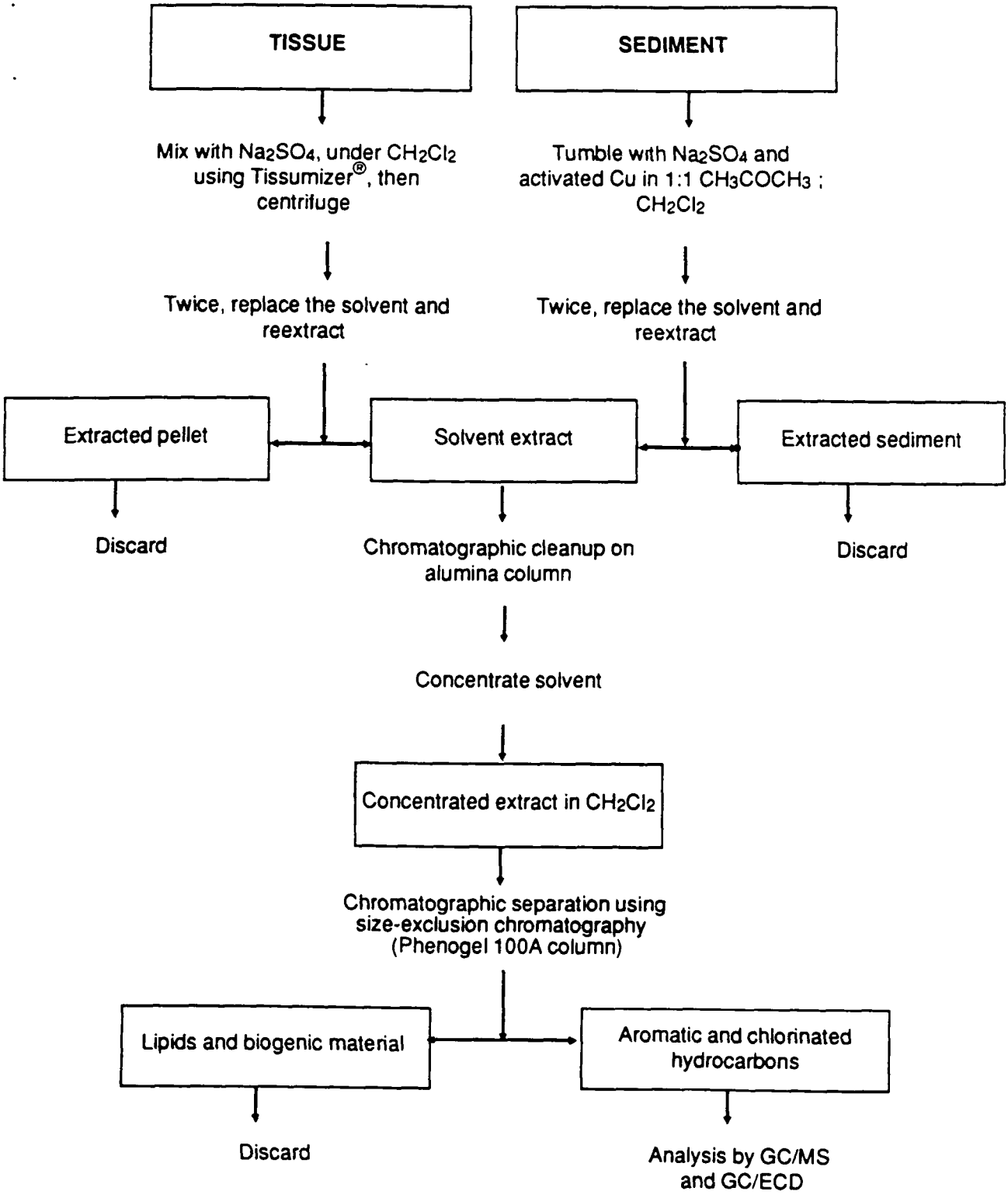

FIGURE 3.1. SUMMARY OF THE ANALYTICAL PROCEDURES FOR TRACE EXTRACTABLE ORGANIC ANALYTES (MODIFIED FROM NOAA, 1985)

NOAA NATIONAL STATUS AND TRENDS MUSSEL WATCH PROGRAM

TRACE METALS ANALYTICAL STRATEGY

Major Metals (Fe, Al, Si, Mn)

Used for trace metal calculating source ratios (e.g., Cu/Al)

Determine amount(s) or sediment material in gut of bivalves

Trace Metals (Ag, As, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Sn, Zn)

Tracers of anthropogenic activity

Distribution of "background" levels of trace metals in uncontaminated areas

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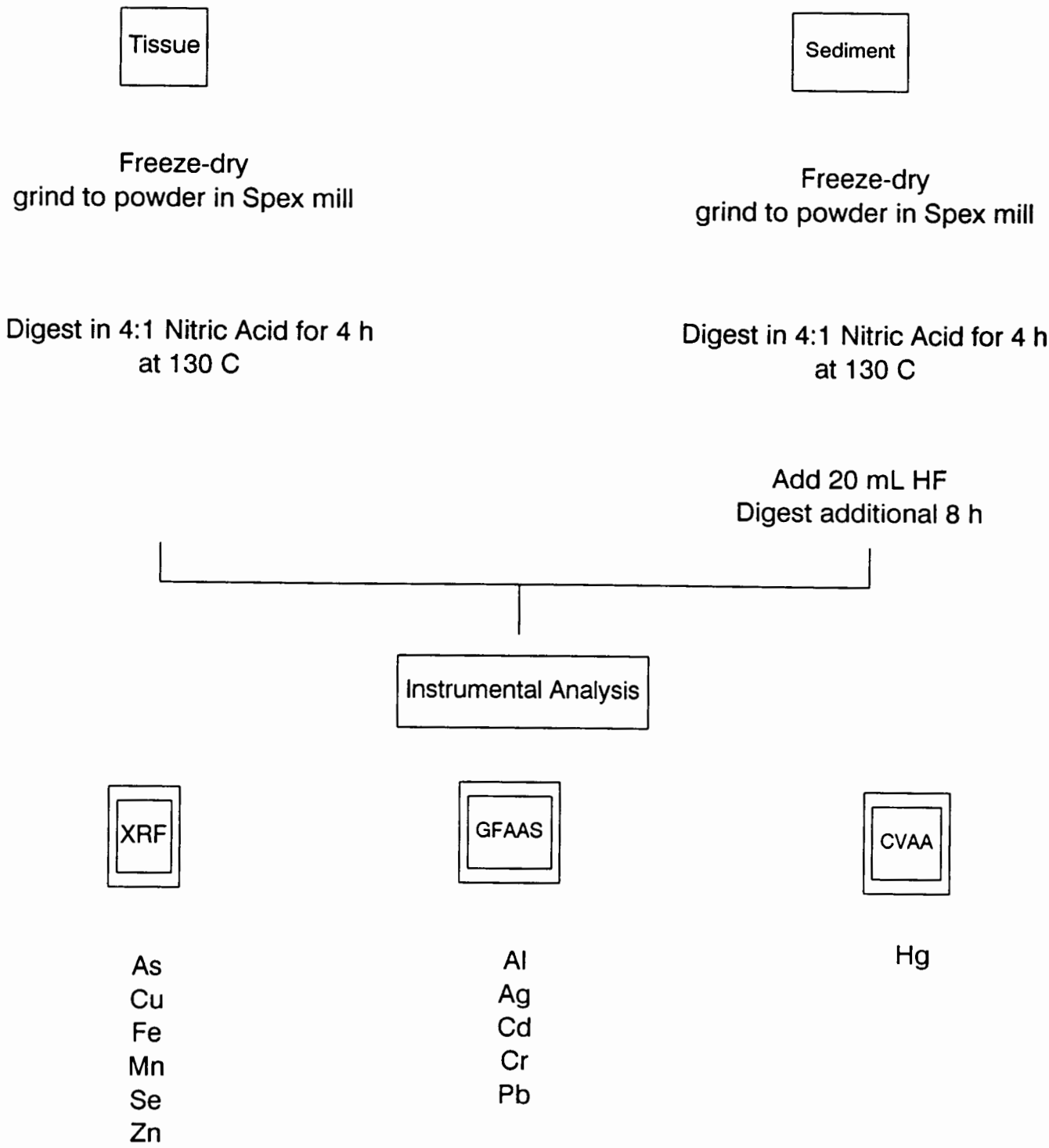

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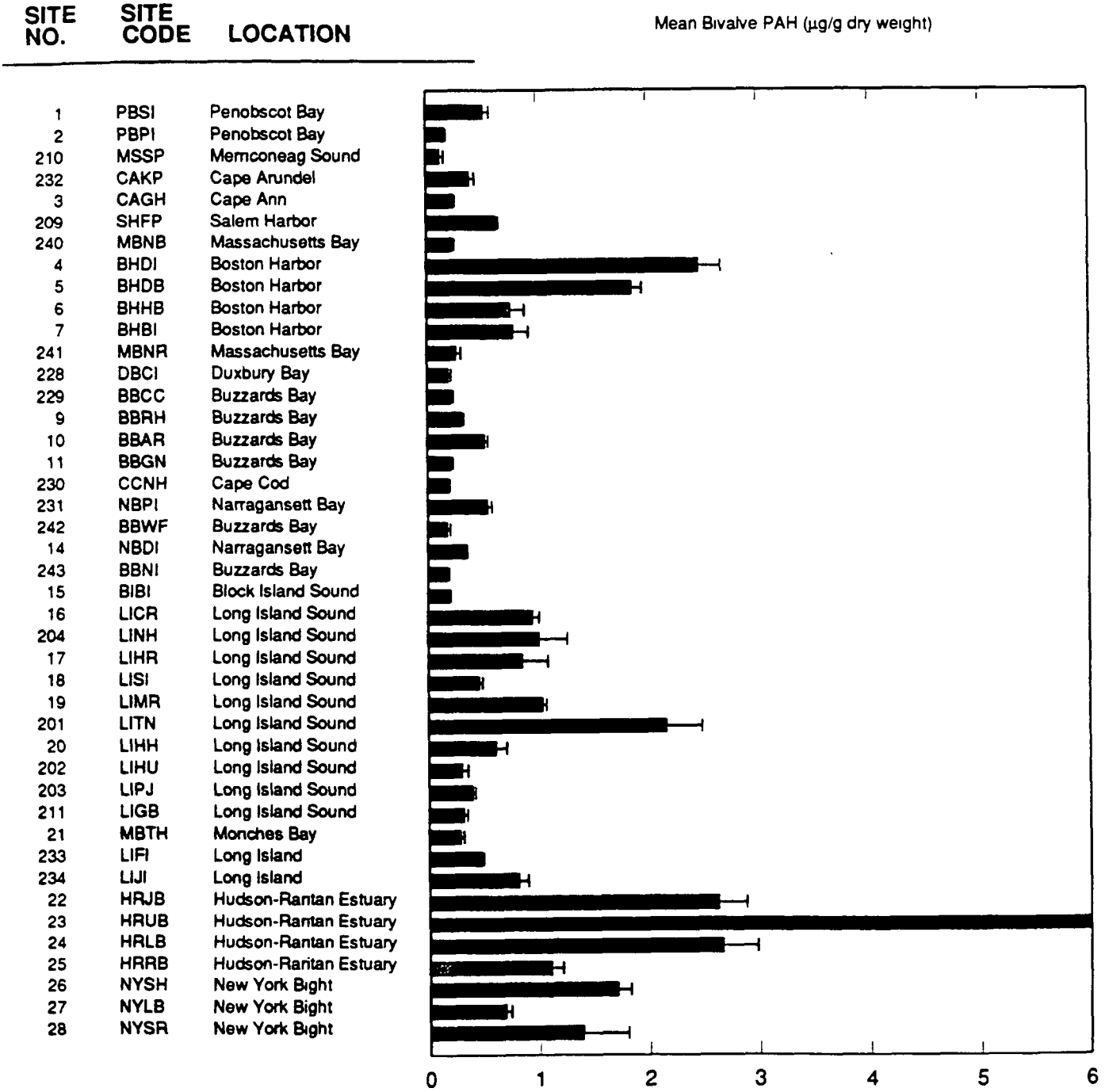


FIGURE C.1. PHASE 5 MEAN TOTAL POLYNUCLEAR AROMATIC HYDROCARBON (PAH) CONCENTRATIONS (WITH STANDARD DEVIATIONS) IN BIVALVES AT EAST COAST SITES.

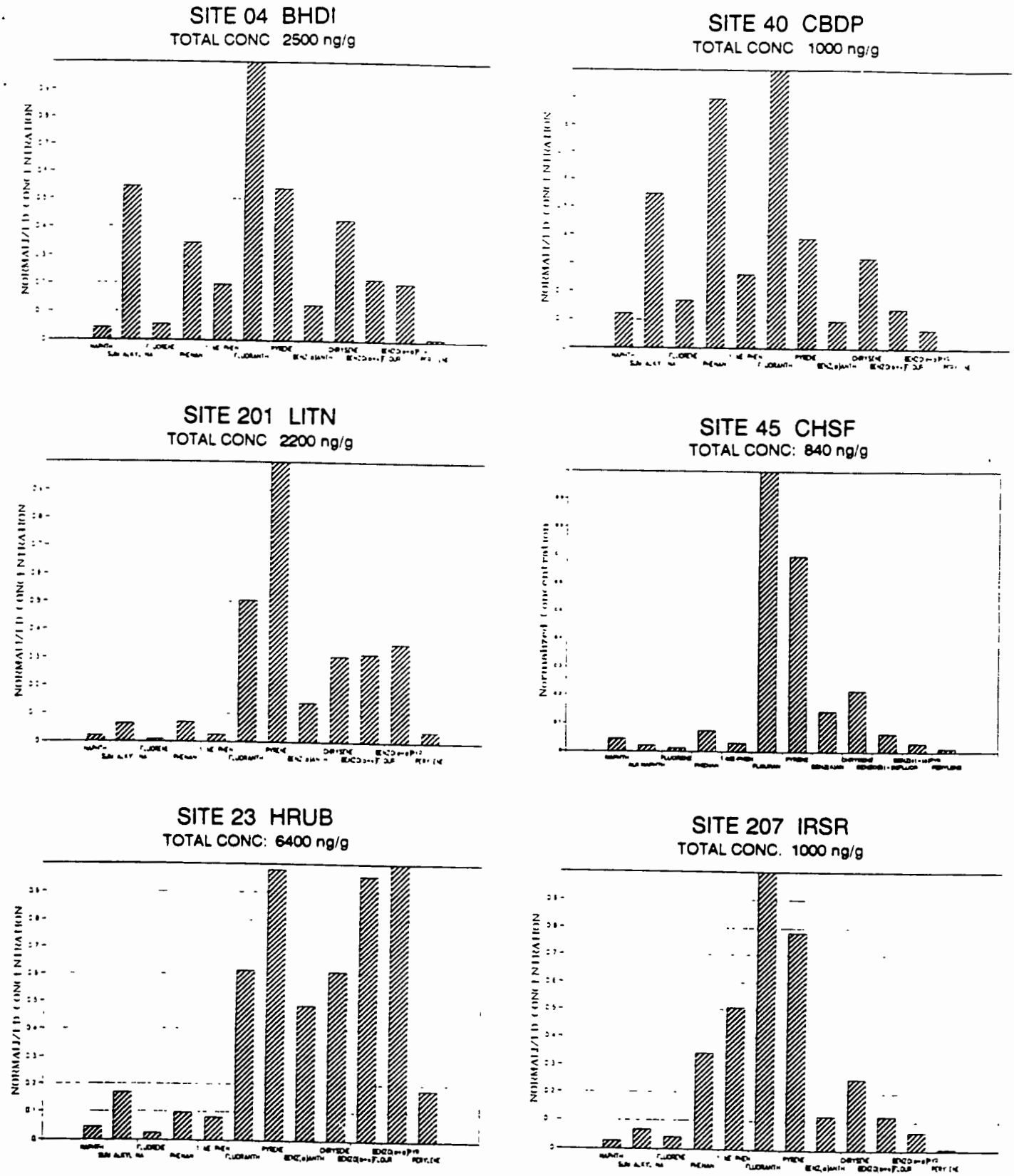


FIGURE 8.3 BIVALVE PAH DISTRIBUTIONS (NORMALIZED) FROM EAST COAST INDUSTRIAL AREAS

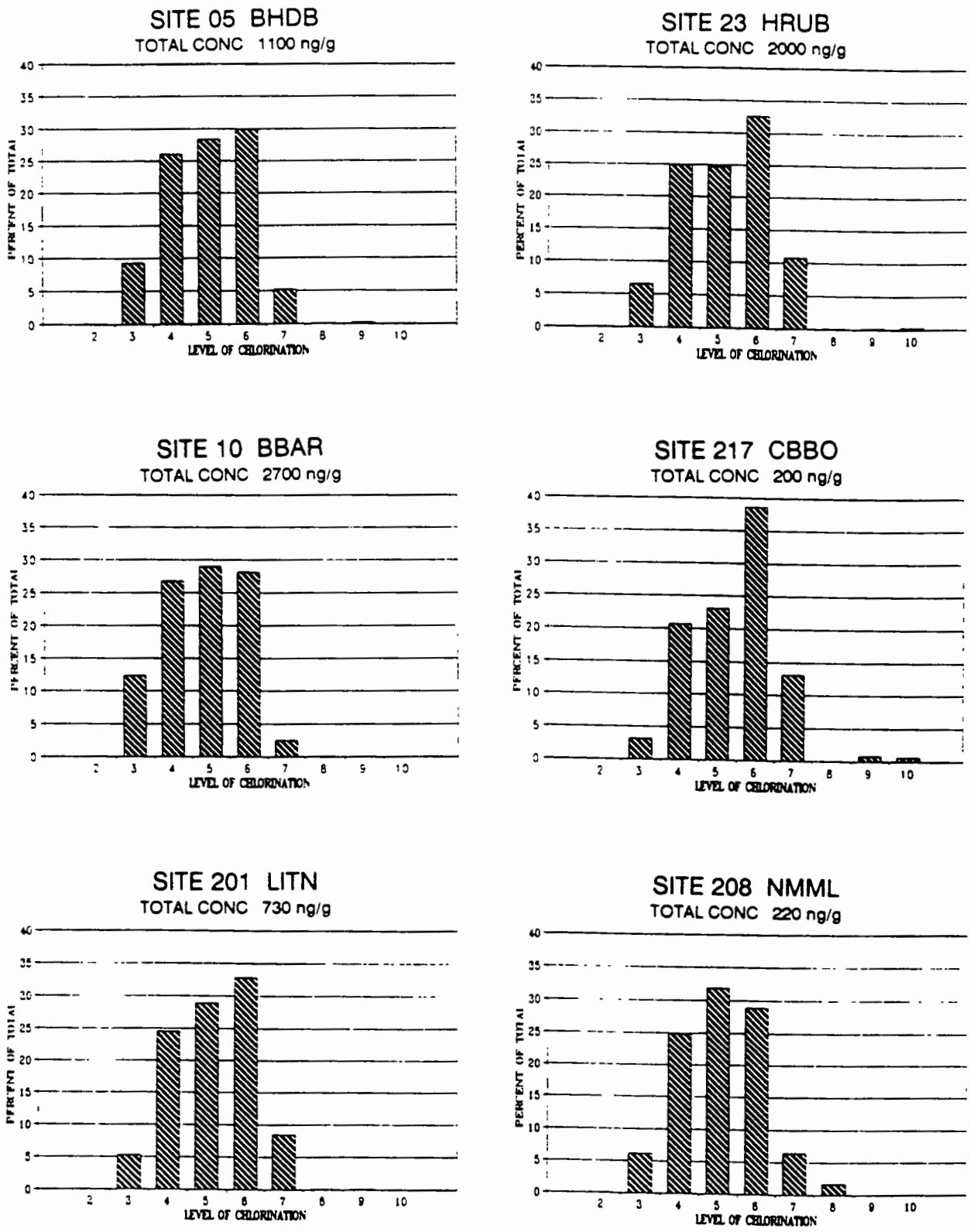


FIGURE 8.8 BIVALVE PCB DISTRIBUTIONS FROM EAST COAST INDUSTRIAL AREAS

SITE NO.	SITE CODE	LOCATION
1	PBSI	Penobscot Bay
2	PBPI	Penobscot Bay
210	MSSP	Merrconeag Sound
232	CAKP	Cape Arundel
3	CAGH	Cape Ann
209	SHFP	Salem Harbor
240	MBNB	Massachusetts Bay
4	BHDI	Boston Harbor
5	BHDB	Boston Harbor
6	BHHB	Boston Harbor
7	BHBI	Boston Harbor
241	MBNR	Massachusetts Bay
228	DBCI	Duxbury Bay
229	BBCC	Buzzards Bay
9	BBRH	Buzzards Bay
10	BBAR	Buzzards Bay
11	BBGN	Buzzards Bay
230	CCNH	Cape Cod
231	NBPI	Narragansett Bay
242	BBWF	Buzzards Bay
14	NBDI	Narragansett Bay
243	BBNI	Buzzards Bay
15	BIBI	Block Island Sound
16	LICR	Long Island Sound
204	LINH	Long Island Sound
17	LIHR	Long Island Sound
18	LISI	Long Island Sound
19	LIMR	Long Island Sound
201	LITN	Long Island Sound
20	LIHH	Long Island Sound
202	LIHU	Long Island Sound
203	LIPJ	Long Island Sound
211	LIGB	Long Island Sound
21	MBTH	Monches Bay
233	LIFI	Long Island
234	LIJI	Long Island
22	HRJB	Hudson-Raritan Estuary
23	HRUB	Hudson-Raritan Estuary
24	HRLB	Hudson-Raritan Estuary
25	HRRB	Hudson-Raritan Estuary
26	NYSH	New York Bight
27	NYLB	New York Bight
28	NYSR	New York Bight

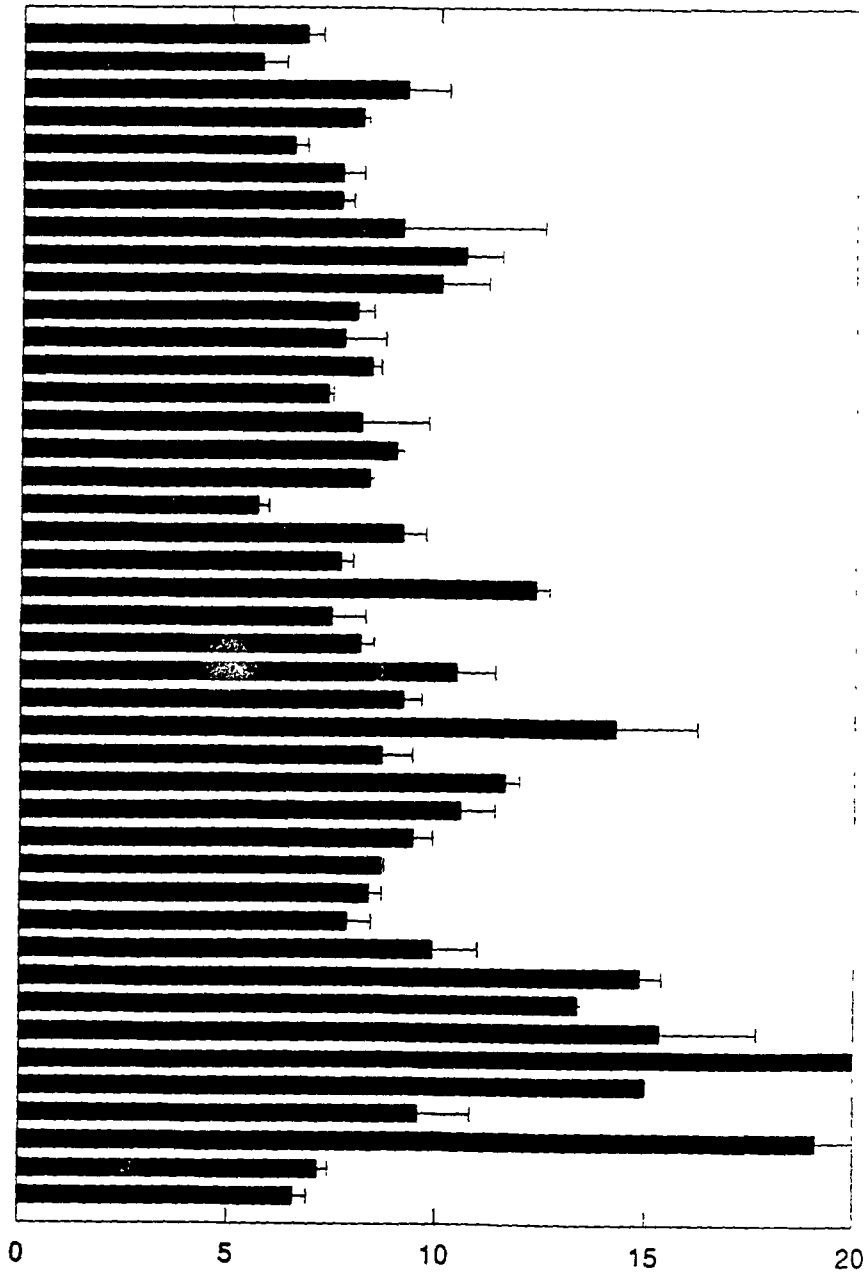


FIGURE C.9. PHASE 5 MEAN COPPER (Cu) CONCENTRATIONS (WITH STANDARD DEVIATIONS) IN BIVALVES AT EAST COAST SITES.

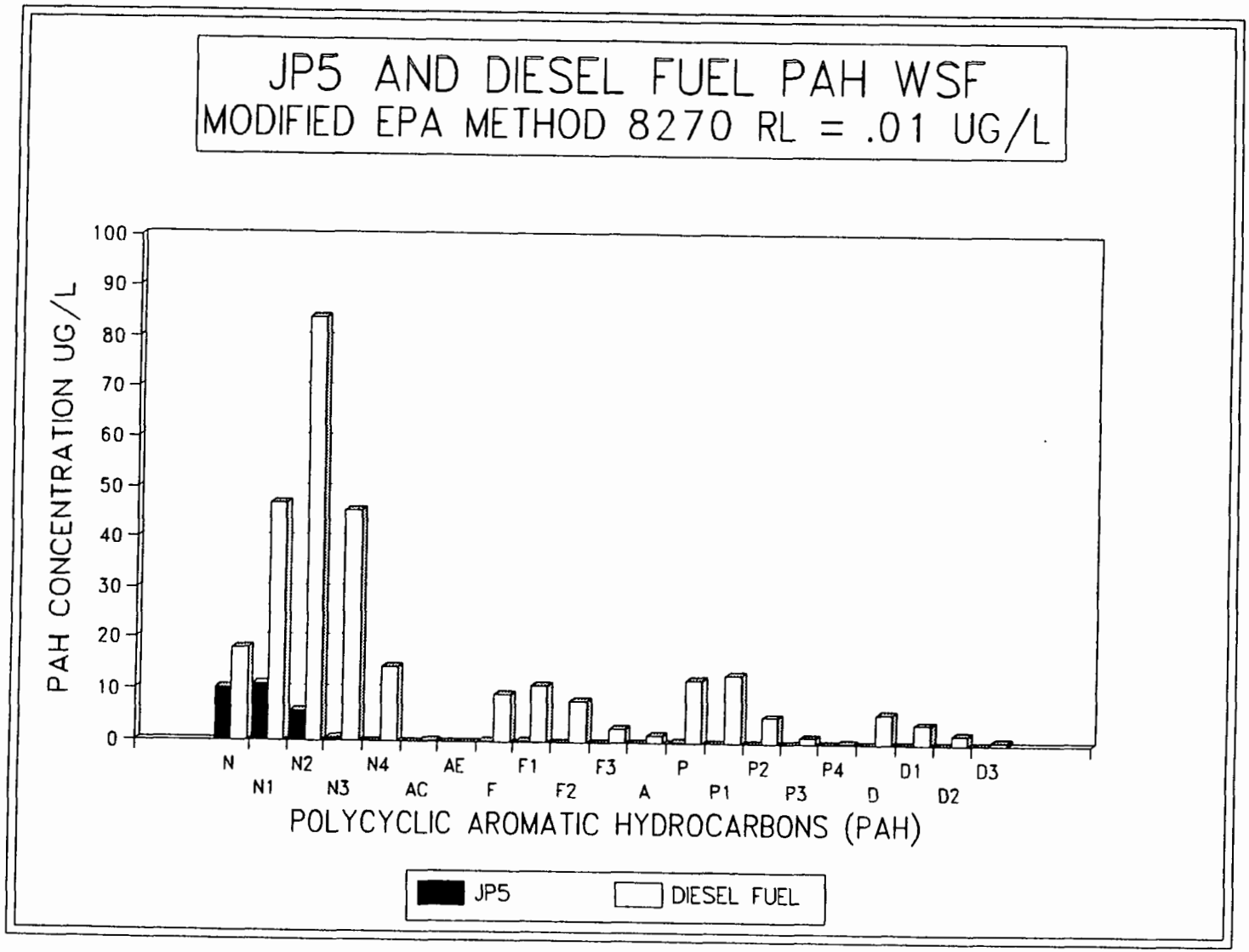
TABLE 1. PETROLEUM FINGERPRINTING ANALYTE LIST

Polycyclic Aromatic Hydrocarbons	Saturated Hydrocarbons: Normal Alkanes	Saturated Hydrocarbons: Branched Alkanes	Saturated Hydrocarbons: Cyclic Alkanes
naphthalene	n-C7	pristane	triterpanes (m/e 191)
C1-naphthalenes	n-C8	phytane	steranes (m/e 217)
C2-naphthalenes	n-C9		
C3-naphthalenes	n-C10		
C4-naphthalenes	n-C11		
acenaphthylene	n-C12		
acenaphthene	n-C13		
fluorene	n-C14		
C1-fluorenes	n-C15		
C2-fluorenes	n-C16		
C3-fluorenes	n-C17		
phenanthrene	n-C18		
anthracene	n-C19		
C1-phenanthrenes	n-C20		
/anthracene	n-C21		
C2-phenanthrenes	n-C22		
/anthracenes	n-C23		
C3-phenanthrenes	n-C24		
/anthracenes	n-C25		
C4-phenanthrenes	n-C26		
/anthracenes	n-C27		
dibenzothiophene	n-C28		
C1-dibenzothiophenes	n-C29		
C2-dibenzothiophenes	n-C30		
C3-dibenzothiophenes	n-C31		
fluoranthene	n-C32		
pyrene	n-C33		
C1-fluoranthenes	n-C34		
/pyrenes	n-C35		
benzo(a)anthracene	n-C36		
chrysene			
C1-chrysene			
C2-chrysene			
benzo(b)fluoranthene			
benzo(k)fluoranthene			
benzo(a)pyrene			
dibenzo(a,h)anthracene			
benzo(g,h,i)perylene			
indeno(1,2,3-cd)pyrene			

Sediment Detection Limits
PAH = 10 ug/kg dry weight
Total Oil = 10 mg/kg dry weight
Alkanes = 0.1 mg/kg dry weight

Water Detection Limits
PAH = 10 ng/L
Total Oil = 50 ug/l
Alkanes = 0.2 ug/l

The highlighted PAH compounds represent the 16 priority pollutant list.
TPAH=sum of all target PAH analytes



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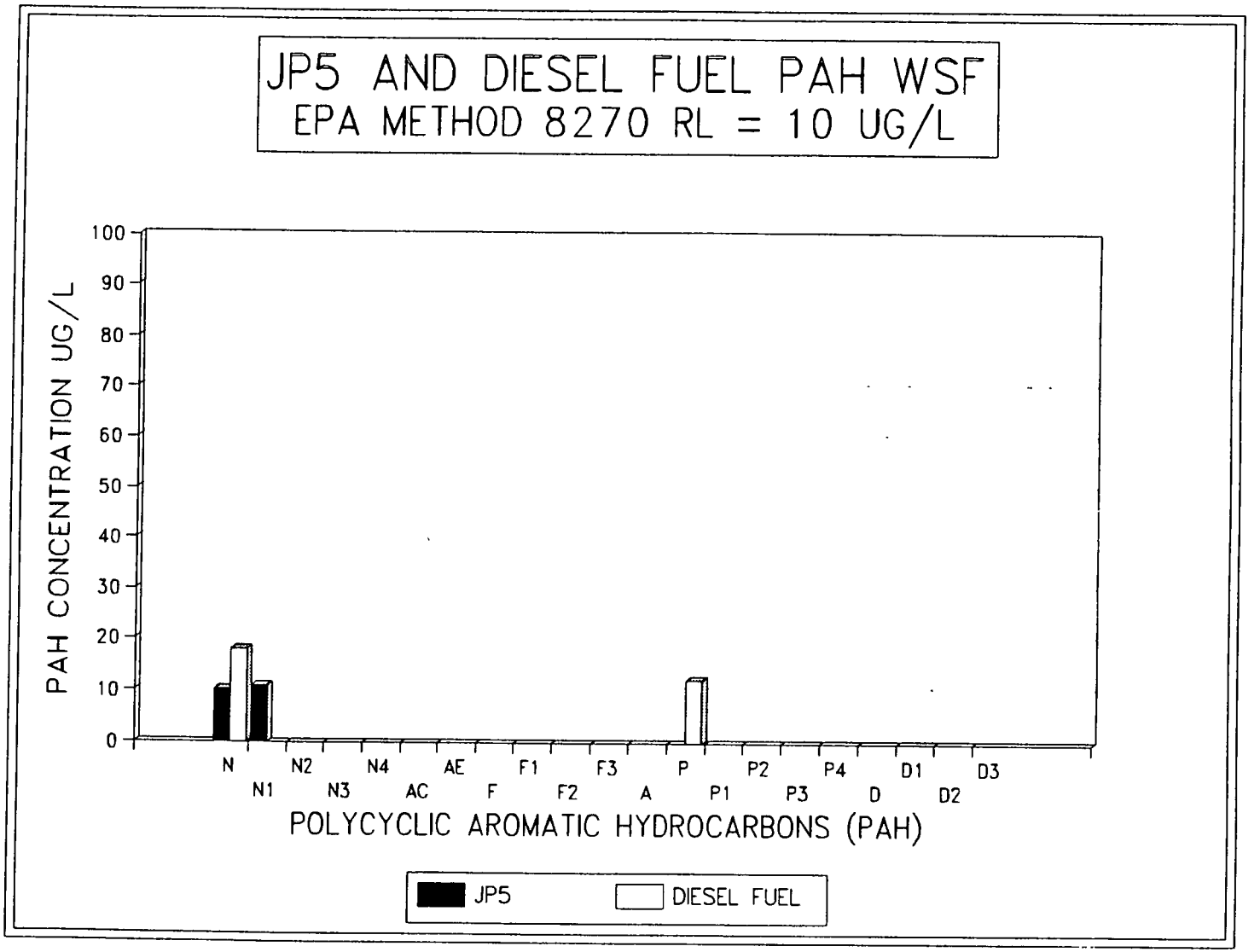

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OIL STANDARD ANALYSIS
PAH ANALYSIS-FUEL OIL #6

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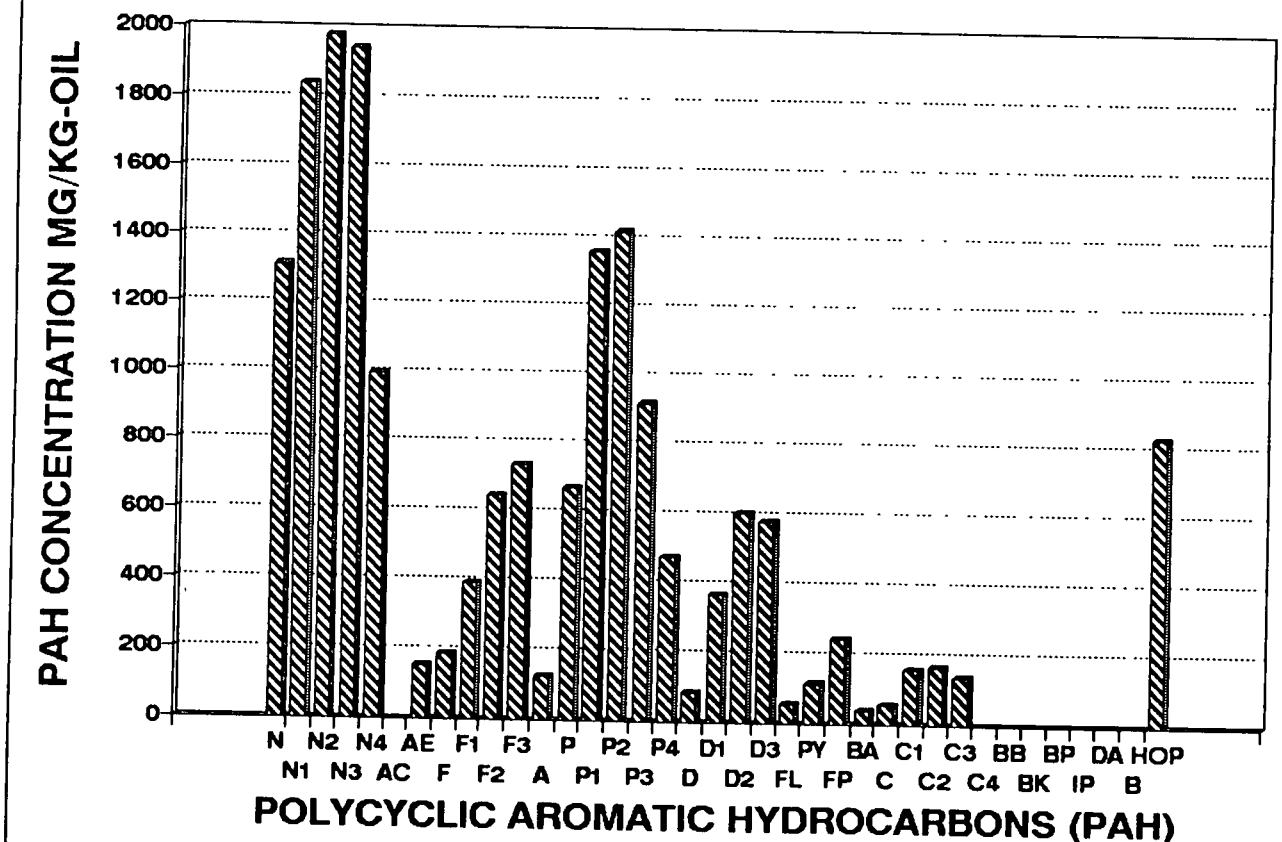

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OIL STANDARD ANALYSIS
PAH ANALYSIS-CREOSOTE OIL

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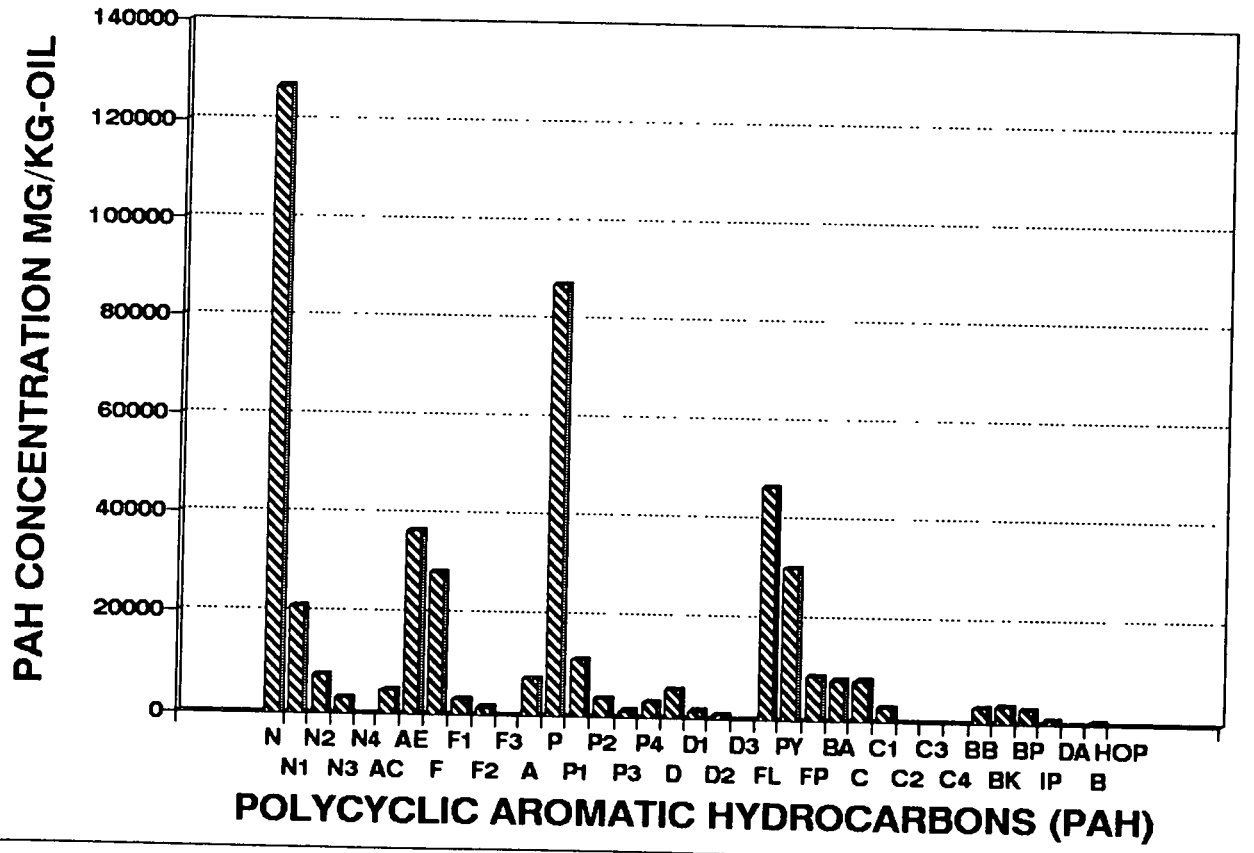

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OIL STANDARD ANALYSIS
PAH ANALYSIS-FUEL OIL #6 WSF

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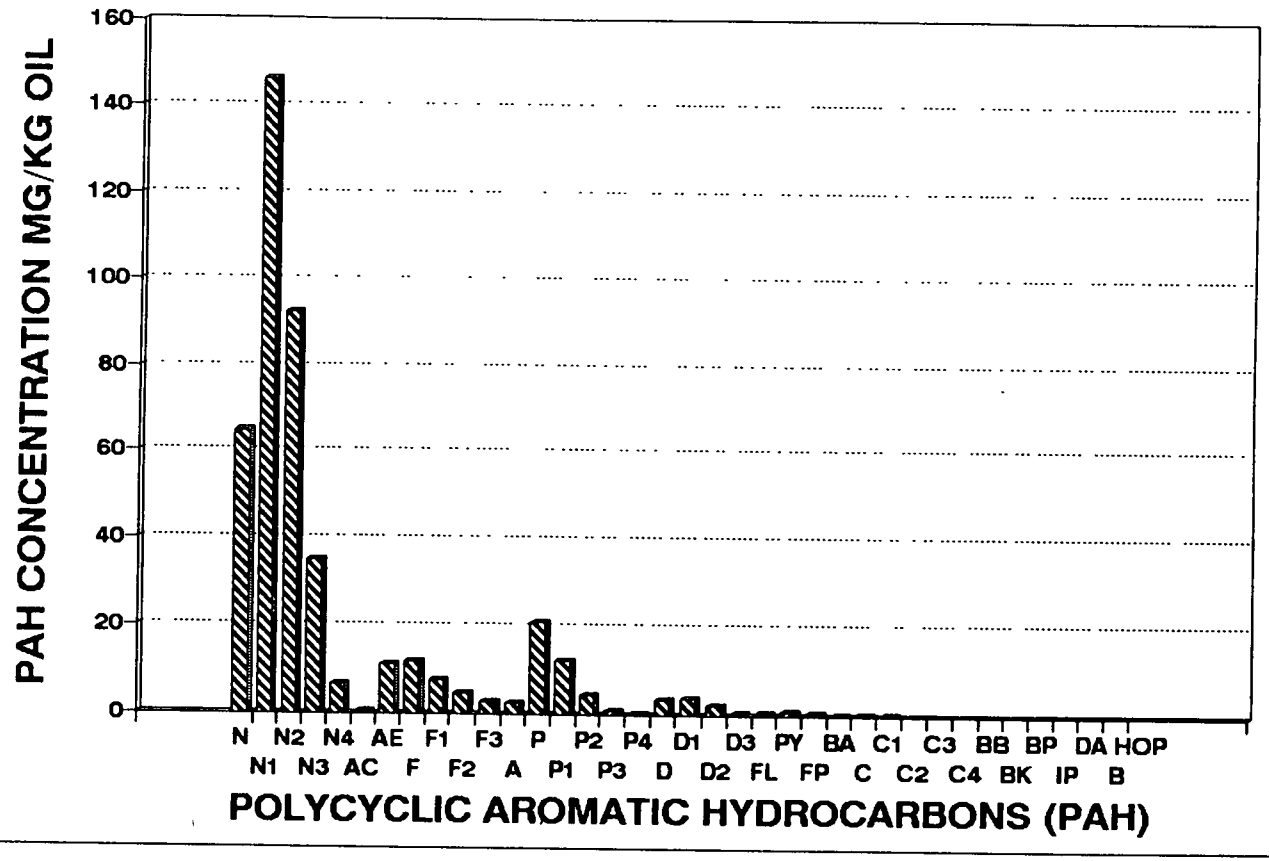

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