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COMMENTS OF AVX CORPORATION ON DRAFT FINAL FEASIBILITY STUDY OF REMEDIAL ALTERNATIVES FOR THE ESTUARY AND LOWER HARBOR/BAY VOLUMES I-III, AUGUST 1990; ON DRAFT FINAL SUPPLEMENTAL FEASIBILITY STUDY EVALUATION FOR UPPER BUZZARDS BAY NEW BEDFORD HARBOR RI/FS NEW BEDFORD, MA, MAY 1992; ON PROPOSED PLAN, JANUARY 1992; AND ON ADDENDUM PROPOSED PLAN, MAY 1992.

SUBMITTED JULY 13, 1992

ATTACHMENT E
VOL. I

SDMS DocID 46656

Volume I of RFAS

7193 A New Jersey company arrived regularly at the Aerovox facility to pump out the stored drums and truck the waste from the Aerovox facility.

(4) Accidental Releases

(A) Hurricane

7194 On August 31, 1954, Hurricane Carol hit New Bedford, Massachusetts.

7195 As a result of the hurricane, the entire basement of the Aerovox plant became flooded to the level of the exterior windows.

7196 As many as a dozen Aroclor storage tanks each having capacities of 1,000 or 1,500 gallons were emptied of their contents during the storm.

7197 Water that was washed out of the basement during the storm was extremely "oily".

7198 The "oily" substance washed out during the hurricane contained polychlorinated biphenyls.

7199 During the hurricane, capacitor units rejected during quality control procedures were washed away from the plant during the storm to the Acushnet River mudflats and beyond.

7200 The New Bedford Fire Department, along with Aerovox Corporation employees, pumped out the flood waters from the basement at Aerovox Corporation.

7201 Aerovox Corporation sustained more than one and a half million dollars in damages in 1954 due to the hurricane.

7202 Aerovox Corporation sustained severe damages to nearly all of its departments as a result of the hurricane.

7203 Individuals claiming personal knowledge of some or all of the foregoing allegations regarding the hurricane include: Norman Goodu, Borislaw Malita, Arnold Souza, and others.

7204 Fred George worked at the plant for at least 37 years.

7205 During the hurricane in 1954, Mr. George observed that the basement was flooded and the sight glass broke on several storage tanks containing PCBs.

7206 Document D000769-D000782 is a brochure published by

Aerovox Corporation concerning the impact of Hurricane Carol on the plant.

7207 The pictures contained therein are fair and accurate representations of the event depicted.

7208 The descriptions therein of the pictures and events are true.

7209 Document D000824-D000858 is a true and accurate copy of a genuine series of statements made by employees of Aerovox Corporation concerning Hurricane Carol.

7210 The hurricane of 1954 was unavoidable and could not have been prevented.

7211 Aerovox Corporation could not reasonably have prevented inadvertent release of polychlorinated biphenyls during the 1954 hurricane.

7212 The steps Aerovox Corporation took in responding to the hurricane and its damage were reasonable.

(B) Accidental Emptying of Used Oil Storage Tank

7213 There is evidence that, if credited, would support the

Volume II of RFAS

II. EXPERTS

8000. Stephen E. Ascher is a laboratory director at Wilson Laboratories ("Wilson").

8001. Attachment Q. II. 0001 is a true and accurate description of Mr. Ascher's education, training and experience.

8002. Attachment Q. II. 0001 is a true and accurate copy of the curriculum vitae of Stephen Ascher.

8003. As laboratory director, Mr. Ascher exercises technical and administrative control for all programs within the laboratory.

8004. Mr. Ascher has a B.A. in chemistry from Kansas Wesleyan University and is a licensed professional engineer.

8005. Wilson Laboratories is certified by the states of Kansas, Oklahoma, New Jersey and California with reciprocal certification granted by several others.

8006. Wilson Laboratories is a participant in the USEPA

Superfund contract laboratory program.

8007. The laboratory also holds certification from the American Industrial Hygiene Association.

8008. As part of this certification, Wilson participates in the Proficiency Analytical Testing ("PAT") program and has excellent ratings in all areas.

8009. Wilson performed GC analyses on samples provided by Balsam Environmental.

8010. Additional facts and opinions to which Mr. Ascher is expected to testify are further detailed in the following RFAs.

8011. W. Frank Bohlen is an Associate Professor of Marine Sciences at the University of Connecticut and Coordinator of the Ocean Engineering Program.

8012. Dr. Bohlen received his Ph.D. in physical oceanography from the MIT-Woods Hole Oceanographic Institution Joint Program in 1969.

8013. Dr. Bohlen has been on the staff of the University of Connecticut since 1969, teaching and conducting

research dealing primarily with sediment transport processes in coastal areas.

8014. Attachment Q. II. 0002 is a true and accurate copy of the curriculum vitae of Dr. Bohlen.

8015. Attachment Q. II. 0002 is a true and accurate description of Dr. Bohhen's education, training and experience.

8016. Dr. Bohlen's testimony concerning the characteristics of the sediment transport system within and adjacent to New Bedford Harbor is based on field surveys conducted personally by Dr. Bohlen and his review of the variety of available studies conducted in the Harbor by other investigators and/or institutions including Summerhayes, et al, 1977, Teeter, 1987, 1988; and ASA, 1986, 1987, 1990.

8017. Regular tidal and wind wave induced resuspension of the near surface sediment layers and streamflow associated sediment supplies results in persistent transport of fine grained materials throughout the New Bedford Harbor system including the upper estuary north of the Coggeshall Street Bridge.

8018. Over the long term a significant fraction of these sediments are trapped within the harbor-estuary resulting in a net accretion of materials along the sediment-water interface at rates varying from mm to cm per year.

8019. This behavior and associated sedimentation rates appears consistent with conditions observed in numerous other similar estuarine systems in New England.

8020. A review of the variety of available project reports including Environmental Response Team, 1983, Teeter, 1987; 1988, Thibodeaux, 1989, and ASA, 1990 provides clear indication of a high degree of variability in the flux of suspended materials and associated PCBs.

8021. As a result of this high degree of variability, field observations provide the most accurate estimates

8022. This variability, however, establishes particular constraints on any field sampling or numerical modelling effort.

8023. In general, of the available field observations, those providing the longest record over the widest possible range of environmental conditions, at reasonably high sampling frequencies, are the most accurate flux calculations.

8024. From the series of studies reviewed, the ASA (1990) effort appears to most nearly satisfy these criteria.

8025. Additional facts and opinions to which Dr. Bohlen is expected to testify are further detailed in the following RFAs.

8026. Dr. Weldon S. Bosworth is a marine ecologist with a Ph.D. in zoology from Oregon University.

8027. Dr. Bosworth is President of Balsam Environmental Consultants, Inc., Salem, New Hampshire.

8028. Dr. Bosworth has over 20 years experience and training in the design, implementation and evaluation of studies dealing with environmental impact in the marine and estuarine environment.

8029. Attachment Q. II. 0003 is a true and accurate copy of the curriculum vitae of Dr. Bosworth.

8030. Attachment Q. II. 0003 is a true and accurate description of Dr. Bosworth's education, training and experience.

8031. Based on Dr. Bosworth's review of the literature, the 0.79 parts per trillion (ppt) PCB Ambient Water Quality Criteria for human health (EPA, 1980) is an unrealistic goal for PCB water column concentration in New Bedford Harbor.

8032. While global presence of PCBs in the environment usually focuses on known areas of contamination and known source areas, PCBs have long been reported in areas remote from source areas at levels in excess of 0.79 ppt.

8033. The widespread nature of PCBs in surface water is apparent in a USGS benchmark study conducted to determine baseline conditions of contaminants in surface water and sediments of the United States (Crump-Wiesner, et al 1974).

8034. Many of the sampling locations in the 37 states

involved were selected in state and national parks because they were far-removed from obvious contaminant sources.

8035. Subsequent data indicated that detectable PCB concentrations were present in many of these locations.

8036. PCB concentrations in the national survey ranged from 0.1 to 4.0 parts per billion (ppb) in surface water.

8037. Total PCB concentrations in seawater samples from the North Pacific Ocean range from 0.27 to 1.11 ppt (Tanabe & Tatsukawa, 1980).

8038. Lesser concentrations of 0.052 to 0.072 ppt have been reported in seawater samples taken near the coast of Antarctica (Tanabe, et al, 1983).

8039. PCBs have been quantified in rainfall samples collected at various locations within Canada (Strachan, 1988).

8040. Mean concentrations range up to 23 ppt at a station in Lake Superior, 3.1 ppt at a lake in northern

Saskatchewan, and 1.1 ppt at a national park in New Brunswick.

8041. There is a history of closure of shellfish beds in the Acushnet River Estuary, Clarks Cove and the New Bedford Harbor area due to chronic bacterial contamination as, for example, reflected in records maintained at the Massachusetts Division of Marine Fisheries (DMF).

8042. Such closures date from at least 1904 and have occurred frequently over at least the last 80 years as heavy sewage discharges directly into the harbor have caused contamination.

8043. The Massachusetts Department of Public Health imposed a ban on all shellfishing in the inner harbor and Acushnet River in 1925, a ban which is still in effect, as reflected in an Environmental Protection Agency (EPA) 1989 environmental impact statement concerning the New Bedford Harbor area.

8044. There is a relationship between precipitation occurring in the New Bedford area and sewage discharges from combined sewer overflows (CSOs) which have in the past discharged and continue to

discharge into the New Bedford harbor, as well as the effects of such discharges on shellfish areas and beaches.

8045. There is a relationship between increased CSO discharges and increased bacterial contamination impacting shellfish beds and beaches, particularly in the area of Clarks Cove.

8046. The findings of Camp Dresser & McKee, Inc., as reported in a CSO Facilities Plan Report, found that CSOs can contribute up to 76 percent of the biochemical oxygen demand (BOD) load for Clarks Cove and that, in the inner harbor, CSOs can contribute up to 50 percent of the BOD load.

8047. At least 38 CSOs and 130 discharge points into the harbor have been documented in previous evaluations of harbor conditions.

8048. Sewage discharges to the harbor date back to at least 1870, when a dock owner sued the city regarding a sewage discharge.

8049. Historical records reflect that industry located adjacent to the harbor has resulted in contaminants

other than sewage having been discharged into the harbor over many years and that contaminants associated with such industrial use are present today in harbor waters and sediments as a result of such practices.

8050. For example, discharges from the textile industries, Revere Copper & Brass, Star Plating and numerous other industries which have operated along the New Bedford Harbor shoreline and discharged industrial waste into the harbor waters have been identified, e.g., in CDM's "Industrial Pretreatment Program" prepared for the City of New Bedford, Summerhayes, et al., 1977.

8051. Discharges of metals, dye, cyanide and oil have also been reported, e.g., in newspapers and in a 1971 water quality study of New Bedford Harbor and Acushnet River performed by the Massachusetts Division of Water Pollution Control.

8052. Dr. Bosworth has formed an opinion concerning the impact on the harbor resulting from its long history as a commercial port.

8053. For example, discharges of oils and fuels and

flushing or cleaning of ship bilges, historically common occurrences in commercial ports, have occurred over many decades dating from well prior to the late 1940's in New Bedford Harbor.

8054. Antifouling bottom paint containing tributyl tin has also been used extensively on boats that utilize and have historically utilized the harbor.

8055. Scientific studies of New Bedford Harbor and the area have commented on the concentrations of heavy metals in both the sediment and in shellfish.

8056. These reports indicate the likely sources of metals are anthropogenic and are from within the harbor.

8057. The concentrations are so high that it was suggested in Summerhayes, et al (1977) that there is a recycling potential for metals in the harbor sediment.

8058. Sediment sampling performed in New Bedford Harbor have confirmed the elevated metal concentrations in the sediment (NUS/GZAD, 1985-86; NUS, 1985).

8059. It is Dr. Bosworth's opinion that baseline

conditions of pollution characteristic of New Bedford Harbor itself are similar to other areas within Buzzards Bay and that Buzzards Bay is the subject of a project, The Buzzards Bay Project (BBP, 1990), which was initiated in 1985 to address water quality and the health of living resources in the Bay by identifying resource management problems, by investigating the cause of problems and by recommending actions to protect against further environmental degradation.

8060. Among the problems addressed by the management plan, due out this spring, are closure of shellfish beds due to pathogen contamination, nutrient enrichment leading to problems such as algae blooms and fish kills, and contamination of finfish, shellfish and lobsters with toxic chemicals.

8061. It is Dr. Bosworth's opinion that problems of the type reported by the Buzzards Bay project are similar in nature to those affecting the Acushnet River and New Bedford Harbor and reflect a similar history of pollution due to inadequate treatment and handling of sewage, stormwater runoff and industrial wastes.

8062. This documentation of chronic, widespread pollution of New Bedford Harbor Estuary can easily account for the "stressed" character of benthic communities in the Upper Estuary of New Bedford Harbor.

8063. It is Dr. Bosworth's opinion that there has been no information presented that separates the reported or potential effects to aquatic organisms from PCBs from those effects that would accrue from the other reported chronic anthropogenic pollution to the New Bedford Harbor (i.e., sewage, heavy metals and other contaminants).

8064. A review of the character of benthic communities from other selected estuaries in the region appears to confirm this conclusion.

8065. New Haven Harbor, Thames River Estuary, Pocasset River Estuary in Buzzards Bay, Massachusetts, and Pettaquomscutt River Estuary are regional urban estuaries which are similar in many regards to New Bedford Harbor.

8066. Although there is no documentation of comparable levels of PCBs in the water and sediments, data on the benthic communities found there generally

indicate community dominance by species which have been characterized as "pollution-tolerant opportunistic" species (Grasole & Grasole 1974; McCall 1977; Rhoades, et al., 1978).

8067. Based on the data available, it is Dr. Bosworth's conclusion that the structure of the benthic communities in New Bedford Harbor does not appear to be incrementally affected by the presence of PCBs more than what would have been expected as a result of the presence of sewage and other contaminants.

8068. Dr. Bosworth reports that the benthic species composition and relative abundance in the inner New Bedford Harbor were compared to other southern New England estuaries as shown in the attached table.

8069. Estuaries selected were located close to the New Bedford area, exhibited a wide range of salinities, and had adequate benthic species data for a general comparison.

8070. Each estuary appeared to be characterized by two or three dominant species.

8071. *Streblospio benedicti* was the most widely distributed and abundant species in four of the five estuaries.

8072. Other species generally encountered in these estuaries, but at much lower densities, include *Capitella capitata*, *polydora ligni*, *Nassarius obsoletus*, *Mya arenaria*, *Mercenaria mercenaria*, *Pectinaria gouldii*, and *Eteone heteropoda*.

8073. In the study of New Haven Harbor in Connecticut, benthic samples were collected over several years and included species in inner and outer areas of the harbor (Normandeau Associates, Inc., 1979).

8074. The habitats available to benthic organism are extremely variable although several locations were located near the mouth of the Quinnipiac River.

8075. The benthic study of Thames River in Connecticut involved both dredge and grab samples in inner and outer portions of the estuary (Tolderland, 1975).

8076. The benthic data reflect a wide range of salinities.

8077. The Pocasset River is located on the eastern shore of Buzzard's Bay in Massachusetts (Sanders et al. 1965).

8078. Characteristics of the river include a small volume of water and large diurnal change in salinity.

8079. The study involved multiple benthic sampling along the salinity gradient of the estuary.

8080. A study of the Pettaquamscutt River off Narragansett Bay in Rhode Island involved benthic sampling in one general location of moderate salinity (Hyland, 1981).

8081. The study area consisted of a marsh, approximately one meter deep, which exhibited wide salinity and temperature fluctuations.

8082. Based on his review of the literature, Dr. Bosworth concludes that there is no evidence documenting histopathological effects in aquatic species from New Bedford Harbor, nor any literature establishing any cause and effect relationship between the presence of PCBs and such effects on aquatic species.

8083. The two papers reviewed in that regard are:
1) Reinisch, C.L., A.M. Charles and A.M. Stone, 1964. "Epizootic Neoplasia in Soft Shell Claims Collected from New Bedford Harbor. Hazardous Waste, Volume 1, Number 1, page 73 through 81 and
2) IEP, Inc. 1988. "Wetlands Study Report for the New Bedford Superfund Site Final Report." Section 10, pages 169 through 170.

8084. Even if there were quantitative estimates of impacts to aquatic organisms in the Upper Estuary of New Bedford Harbor due to PCBs, it would not necessarily indicate that there would be significant effects to the species population in this geographic area; that extrapolation of potential effects to a population in a limited area to population and ecosystem impacts necessitates consideration of a number of ecological and population dynamics factors.

8085. These factors include the degree to which sublethal effects moderate the ability of individual organisms to fulfill their ecological role, the numbers of affected organisms compared to the total New Bedford Harbor population and coastal

population of the affected species, and the degree to which reproductive success of species populations within the affected species ranges is diminished by reproductive failure or death of some individuals.

8086. Population dynamic characteristics such as compensatory mechanisms, as well as reproductive strategies evolved by the affected species, are more likely to be of more significance to the regional population than impacts to a relatively few organisms in a restricted environment.

8087. In order to evaluate the significance of an impact to a limited portion of a species population it is necessary to understand the source and magnitude of natural mortality and the degree to which recruitment is dependent upon dispersal of larvae from adjacent sites.

8088. The majority of potentially affected species in the New Bedford Harbor Upper Estuary have a high reproductive capacity and are dependent upon large numbers of sexual products to mitigate for high egg and larval mortality rates and that many of these species depend upon a planktonic larvae stage to

disperse them over a broad geographic range; that since the dominant species currently living or likely to be living in the New Bedford Harbor Upper Estuary after capping have a wide geographic distribution, it is his opinion that there should therefore be a continuous source for recruitment of species from adjacent areas to the Upper Estuary of New Bedford Harbor whether or not there are any localized lethal or sublethal effects to individual organisms.

8089. Based upon the evaluation of information available regarding potential bioturbation depths in the Upper Estuary (Whitlatch, 1989; Attachment C to the Balsam capping proposal, Bates 7280-7335 et seq.), it is Dr. Bosworth's opinion that a bioturbation zone depth of 20 cm should separate significant benthic biological activity from both underlying contaminated estuary sediments as well as the chemical migration barrier.

8090. This 20-cm thick layer of surficial sediment should provide an adequate sediment zone in which the large majority of bioturbation activity and significant majority of benthic species will occur.

8091. Although some species have been identified which could recolonize the Upper Estuary following completion of remedial activities that have the potential to penetrate to depths in excess of 20 cm, most individuals of these species are not likely to be found at depths greater than 10 to 20 cm.

8092. The conclusion to use 20 cm as the thickness for the bioturbation layer is also consistent with the Sturgis and Gunnison (1988) recommendation based upon their review of the potential for benthic penetration of the cap.

8093. As they state, "..in developing a final recommendation for the thickness of cap material required to prevent breaching, it is necessary to consider the frequency of occurrence as well as the burrowing depths of most of the organisms in the area.

8094. Most of the organisms in the inner harbor area burrow to depths no greater than 20 cm."

8095. Dr. Bosworth's personal observations of the sediment bedform in the Upper Estuary indicate that

there is very minimum or no relief.

8096. Dredge material containing chromium, copper, lead, mercury, and zinc in concentrations greater than 300 ppm, 400 ppm, 200 ppm, 1.5 ppm, and 400 ppm, respectively is classified as category III material in 314 CMR (9.03(3)).

8097. Sediment in areas of New Bedford Harbor exceeds these levels.

8098. Dr. Bosworth participated in the design and implementation of the 1988 and 1990 "thin layer sampling" programs in New Bedford Harbor.

8099. Dr. Bosworth his participated in developing sampling design, in particular for collection of benthic organisms.

8100. The information resulting from this sampling program is useful for the intended purpose.

8101. Dr. Bosworth reviewed information presented which is suggested to support the contention that biomagnification of PCB has been reported for food chains in the New Bedford Harbor estuary (IEP, 1988

and Sanford Ecological Services, 1988).

8102. In particular it is Dr. Bosworth's opinion that with regard to the food chain discussed in Sanford Ecological Services (1988) there was no evidence presented that supports the contention that the species selected for the study were in fact part of the same food chain; that there was no evaluation of the statistical reliability of the data resulting from the study that would permit an evaluation of the phenomenon of biomagnification; that there is no justification for concluding that any so-called "trends" mentioned in the Sanford Ecological Services (1988) report are significant; and that as reported in the IEP (1988) report "the [bioaccumulation] data lack the power to discriminate statistically significant differences between species, trophic levels, locations, or interpret linear (or nonlinear) relationships between the above"; and that these data are useful only for knowing that the species studied do bioaccumulate PCBs.

8103. The data collected in the Sanford Ecological Services (1987) benthic study has limited usefulness in providing the basis for a

quantitative evaluation of the benthic community structure, including the trends in species diversity, abundances, and distribution, as was attempted by Bellmer (1988).

8104. Dr. Bosworth has reached this conclusion based on the fact that there is no evidence that has been presented that the sample size used to collect benthic organisms, the replication of samples, the locations of the samples, or the frequency of the samples are representative of the characteristics of the benthic community being studied.

8105. The analysis of the data as presented in Bellmer (1988) does not take into consideration the use of different size sampling devices in different areas of New Bedford Harbor, that disparate taxa are lumped in calculating various descriptive statistics and species diversity indices leading to unsupported conclusions.

8106. Measures of community structure should consider both numbers of individuals and numbers of species.

8107. The failure to accurately sample the numbers of species and the abundances substantially limits

Bellmer's (1988) analysis of community structure.

8108. Data collected in Bellmer (1990) "A Wetland Analysis in a Highly Polluted Harbor, New Bedford, Massachusetts, USA" have limited usefulness in supporting the conclusions reached.

8109. The statistical reliability of the estimates of abundance in a variety of tasks within the report results in the majority of the conclusions being unsupported by the facts, in particular the data resulting from the finfish sampling and the intertidal benthic fauna sampling.

8110. The bioconcentration study has limited usefulness in providing the foundation of the conclusions reached, and that Bellmer's (1990) final statement that "more field ecological studies are needed to accurately document changes in wetlands due to contamination" is appropriate.

8111. There appears to be a lack of well-developed rationale for the sampling design employed in a variety of the aquatic and wetland studies.

8112. There is little evidence in any of the studies of

the basis for choosing sample size, replication, location, and frequency, and therefore the data resulting from the studies have limited usefulness in drawing supportable conclusions relating to the structure and function of biotic communities within the New Bedford Harbor estuarine system, or trends in relationship in the presence of contaminants with characteristics of individual organisms, populations, or communities.

8113. Additional facts and opinions to which Dr. Bosworth is expected to testify are further detailed in the following RFAs.

8114. Bruce A. Campbell is presently employed by Rizzo Associates, Inc. ("Rizzo") as a project environmental engineer.

8115. Mr. Campbell holds a master's degree in civil engineering from the University of New Hampshire and a bachelor's degree in engineering from Lafayette College.

8116. Attachment Q. II. 0004 is a true and accurate copy of the curriculum vitae of Mr. Campbell.

8117. Attachment Q. II. 0004 is a true and accurate description of the education, training and experience of Mr. Campbell.

8118. Mr. Campbell was responsible for developing a field sampling program of air, surface water and sediment core samples from the harbor.

8119. The samples from New Bedford Harbor collected by Mr. Campbell were provided to Drs. Tiedje and Quensen of Michigan State University for use in a dechlorination experiment described in the paper entitled "Dechlorination of Aroclor 1248 By Microorganisms From New Bedford Harbor Sediments," J.F. Quensen and J.M. Tiedje (April, 1990).

8120. The collection procedures used by Mr. Campbell are set forth in documents bearing Bates numbers 12232-12252.

8121. Documents Bates-numbered 12232-12252 are true and accurate copies of documents reflecting collection procedures used by Mr. Campbell.

8122. Additional facts and opinions to which Mr. Campbell is expected to testify are further detailed in the

following RFAs.

8123. William J. Carter, Jr. has been a real estate agent and appraiser since 1961.

8124. Mr. Carter has a B.A. in Economics from Providence College.

8125. Attachment Q. II. 0005 is a true and accurate copy of the curriculum vitae of Mr. Carter.

8126. Attachment Q. II. 0005 is a true and accurate description of Mr. Carter's education, training and experience.

8127. Alleged PCB contamination of surrounding waters has not affected property values in the City of New Bedford or the Town of Fairhaven.

8128. There are baseline pollution conditions which have existed over time in the New Bedford area.

8129. Mr. Carter is knowledgeable about the real estate market in Greater New Bedford, uses of harbor waters over time, the purposes and uses of particular types of housing and industry real

estate throughout Greater New Bedford, beneficial and detrimental effects on real estate prices in the area, and neighborhoods located within the City of New Bedford and the Town of Fairhaven.

8130. Mr. Carter's personal experiences with the New Bedford Harbor area north of the hurricane dike date back to his youth when he played along the waterfront.

8131. Mr. Carter has observed pollution in the harbor, particularly visually apparent sewage in the harbor.

8132. New Bedford Harbor has not been used for swimming in Mr. Carter's lifetime, except in isolated instances when youths disobeyed their parents' instructions not to swim in the harbor.

8133. In Mr. Carter's youth, the nearest beaches to the Harbor were Acushnet Park, at the southern tip of New Bedford on the east side, Hazelwood Park Beach on the west side of the point and on the Fairhaven side, Fort Phoenix Beach, (at the time a private beach) and Pope Beach.

8134. Swimming in the New Bedford Harbor area was restricted to those beaches and areas further out.

8135. No swimming has been authorized in the harbor during any period of Mr. Carter's experience with the harbor.

8136. Mostly recreational fishing has occurred from the lighthouse outward toward Buzzards Bay in the so-called outer-harbor area.

8137. No commercial fishing has been done in the inner-harbor to Mr. Carter's knowledge.

8138. There has been the substantial expansion in recreational activity in the harbor that over time.

8139. One of the city's greatest areas of expansion since 1976 has been in business, commercial and industrial waterfront activity.

8140. In 1977, the port of New Bedford was fifth among U.S. ports in the total dollar volume of commercial fish landings.

8141. In 1979, the port was fourth among U.S. ports in

total dollar volume of commercial fish landings.

8142. In 1980, the port was third among U.S. ports in total dollar volume of commercial fish landings.

8143. In 1981 and 1982, the port of New Bedford was third among U.S. ports in total dollar volume of commercial fish landings.

8144. In 1983, 1984, and 1985, the port was first in the nation in dollar volume of commercial fish landings.

8145. From 1986 to 1990, the port of New Bedford was ranked consistently near the top of the nation in dollar volume of commercial fish landings, including the number one ranking for 1989, disclosed in April, 1990.

8146. Mr. Carter is knowledgeable about the purposes and uses of housing by the people of New Bedford.

8147. During Mr. Carter's youth, in the 1930's, the central part of the city near the Acushnet River was known as the "mill blocks"; these were the Wamsutta mill blocks and the Patomska mill blocks.

8148. There was an area known as "Holy Acre" in which Italian immigrants were the majority of the population.

8149. Most New Bedford residents of Lebanese descent lived near the Common Park of the city, near the waterfront.

8150. Most properties near the waterfront were tenement houses.

8151. When the cotton mills were built in the 1900s, they provided workers with homes.

8152. Workers' living quarters extended in a row with twenty or forty tenements in the same building abutting each other.

8153. Even outside the mill blocks, the properties near the New Bedford Harbor were all or mostly multi-family units, such as two, three, four, and six-family houses.

8154. This construction existed because most of the people who worked in the cotton mills had no means

of transportation other than the public transportation so they chose to live in tenement houses near their places of employment.

8155. Most workers had no cars, and they were able to walk to these mills and work from six in the morning to six at night, six days a week.

8156. These properties were not bought or built for the purpose of enjoying the waterfront view or looking over the city harbor or at the salt water.

8157. These properties were approximately four hundred yards from the ocean because the first four hundred yards were occupied by mill buildings, both commercial and industrial.

8158. In Mr. Carter's professional experience in appraising, offering for sale, selling or otherwise dealing with the value of real estate in the Greater New Bedford Harbor area, PCBs, or concern over same, have never arisen as a factor in evaluating properties situated in Fairhaven or New Bedford.

8159. In Mr. Carter's opinion, PCBs have no effect on the

fair market value of real property in Fairhaven or New Bedford.

8160. Mr. Carter is knowledgeable about the real estate property tax rates in Fairhaven and the City of New Bedford for the years 1976-1990, and their effect on property values in the area.

8161. Property tax rates affect the selling prices of homes in the New Bedford area.

8162. Property tax rates affect the fair market value of residential properties in the New Bedford area.

8163. Assessments of residential properties affect the fair market value of properties in the New Bedford area.

8164. Mr. Carter is knowledgeable about the property valuation characteristics of the City of New Bedford.

8165. The City of New Bedford is approximately twelve-miles long from south to north and three miles wide at its widest point.

8166. Based upon Mr. Carter's experience, education, and training, the City of New Bedford is composed of nine areas or neighborhoods which have distinguishable characteristics.

8167. The City of New Bedford may be divided into nine different zones for property valuation purposes.

8168. The boundaries and characteristics of these nine zones are described in detail in Belleville's Requests For Admissions filed in this litigation on this subject.

8169. Mr. Carter is knowledgeable about the property valuation characteristics of the Town of Fairhaven.

8170. For purposes of valuation of real property, the Town of Fairhaven may be divided into five valuation zones.

8171. The boundaries and characteristics of each of these five zones, are described in detail in Belleville's Requests For Admissions filed in this litigation on this subject.

8172. Properties in Fairhaven are not comparable to

properties in New Bedford.

8173. Property values in Fairhaven and New Bedford are not comparable.

8174. Fairhaven developed as a suburban town of New Bedford.

8175. In New Bedford, the original part of the city consisted of mill blocks from the Berkshire Hathaway Mill in the south to the Acushnet Company in the north.

8176. Near the mill blocks, there was multi-unit housing.

8177. People who worked in these factories at the time would occupy homes as near as possible to their places of work.

8178. The mill blocks were built so that they would have common walls.

8179. Many houses were built in a row to shelter as many as six to nine families.

8180. In New Bedford, tenement houses are no longer being

constructed; there are only a few duplexes and fourplexes being built.

8181. Additional facts and opinions to which Mr. Carter is expected to testify are further detailed in the following RFAs.

8182. Dr. Kin Chiu is presently employed by Ceimic Corporation ("Ceimic") as the Manager of the Organic Laboratory.

8183. Dr. Chiu holds a Ph.D. in chemistry from the Massachusetts Institute of Technology, as well as a master's degree in environmental science from Rutgers University, and a bachelor's degree in chemistry from the University of Maryland.

8184. Attachment Q. II. 0006 is a true and accurate copy of the curriculum vitae of Dr. Chiu.

8185. Attachment Q. II. 0006 is a true and accurate description of Dr. Chiu's education, training and experience.

8186. Ceimic Corporation performed PCB analyses in 1989 on water samples collected from New Bedford Harbor

by Applied Science Associates, Inc. ("ASA").

8187. Dr. Chiu is knowledgeable about the preparation, extraction and analysis protocols used by Ceimic in its PCB analyses.

8188. The protocols used by Deimic are set forth in the EPA Statement of Work ("SOW") 2/88.

8189. The results of Ceimic's analyses are set forth in the documents produced by Ceimic and marked as exhibits at the deposition of Ceimic, and in defendants' documents bearing Bates numbers 1087-2364 and 5398-6859.

8190. It is Dr. Chiu's opinion that the results of Ceimic's analyses accurately reflect the amounts of PCBs found in the water samples collected by ASA using the procedures set forth in EPA SOW 2/88.

8191. Additional facts and opinions to which Dr. Chiu is expected to testify are further detailed in the following RFAs.

8192. Martin J. Coleman is a professional appraiser, and the founder of Coleman & Sons, located in Waltham,

MA.

8193. Attachment Q. II. 0007 is a true and accurate copy of the curriculum vitae of Mr. Coleman.

8194. Attachment Q. II. 0007 is a true and accurate description of Mr. Coleman's education, training and experience.

8195. Martin J. Coleman, Jr. is qualified to give an expert opinion concerning property values generally, and in the City of New Bedford and Town of Fairhaven in particular.

8196. In Mr. Coleman's opinion, no injury or damage to real estate property values in the Town of Fairhaven or the City of New Bedford has occurred due to the alleged PCB pollution of waters off the harbor front.

8197. Repeat sales analysis is a generally accepted technique for determining inflation, but not the fair market value of real property.

8198. Repeat sales analysis is not utilized by purchasers of real property to determine the fair market value

of real property.

8199. Repeat sales analysis is not utilized by banks or other entities loaning money for the purchase of real property to determine the fair market value of real property.

8200. Repeat sales analysis is not utilized by sellers of real property to determine the fair market value of real property.

8201. While repeat sales analysis may be used for determining particular inflation rates, it is not a technique that is generally accepted for determining the fair market value of real property.

8202. Repeat sales analysis is not utilized by purchasers when negotiating with sellers for the purpose of determining fair market value of real estate, except on those rare occasions where sophisticated buyers are involved in the purchase of extremely high value property.

8203. Any method utilized to determine the fair market value of real properties must be based upon arms-length transactions.

8204. Any valuation method which uses data from transactions in real property is not valid to the extent that the transactions utilized were not arms-lengh transactions.

8205. Methods of valuing real property based upon transactions which are not considered to be arms-length sales are invalid measures of real property values.

8206. Any repeat sales analysis is not accurate if it is based in whole or in part on certain of the transactions referenced in part in Belleville's Requests for Admissions 182072-182086.

8209. A transaction may not be relied upon to determine the fair market value of property if it is:

(a) A sale between members of the same family.

(b) An intra-corporate sale (sales between the corporation and its stockholders, a subsidiary, an affiliate, or corporations whose stock is held by the same or substantially identical ownership).

(c) A transaction which includes a substantial amount of machinery, equipment, inventory, or good will.

(d) A sale of a property which has been subject to fire, flood, demolition, or substantial remodeling.

(e) A sale to or from the federal, state, or any local government or any subdivision thereof.

(f) A transfer of convenience, such as to correct defects in title or to create a trust of similar entity.

(g) A sale of property conveying only a portion of the original property.

(h) A sale resulting from court order.

(i) A sale by a trustee in bankruptcy or as a result of bankruptcy proceedings.

(j) A sale of less than a one-hundred-percent interest in property.

(k) A sale of a foreclosed property or repossession of the same.

(l) A sale of property influenced by zoning changes.

Repeat sales analyses are also invalid if:

(a) The property has had a substantial physical change subsequent to the first sale.

(b) The property has had a change in use subsequent to the first sale, including sales of property for which variances have been granted.

(c) The property was sold for consideration which included the assumption of existing mortgages.

8210. The method generally used to appraise residential properties is known as the comparable sales approach to fair market value.

8211. Three approaches are generally accepted by real estate appraisers to establish the fair market value of property: reproduction approach, income approach, and comparable sales or market data approach.

8212. In the reproduction approach, the price of a lot of

land is established, then the current cost of erecting the existing structure that is on the property is established. The structure is then depreciated using the proper methods of depreciation, such as the condition of the property and the length of time it existed. The depreciation is both functional and economic. When that value is determined, it is added to the value of the land.

8213. In the income approach, the income that can be derived from the property is determined as are all the expenses that relate to the property, then the net income is capitalized at a prudent rate of return to arrive at an opinion of fair market value.

8214. The comparable sales or market data approach is generally used for residential properties.

8215. In the comparable sales approach, sales of properties deemed comparable are obtained.

8216. Comparable properties that were sold in the recent period are utilized and are compared to the subject property in terms of time, location, and conditions

of sale.

8217. After comparing the subject property with other properties and after making appropriate adjustments for differences between the properties being considered, the appraiser arrives at an opinion of fair market value.

8218. A database using sales of real property cannot be utilized to support an opinion of fair market value without complete familiarity with both the subject property and the comparable property.

8219. Without such familiarity, accurate adjustments of the comparables cannot be made and no proper and supportable opinion of fair market value can be rendered.

8220. Properties which lack comparability or similarity due to said factors as substantial differences in time, location, or zoning cannot properly be utilized to support an opinion of fair market value.

8221. National sources of real property data and statewide sources of real property data have been

shown to be unrealiable to support an opinion of fair market value of specific property, or to support trends and real estate values that can be applied to a specific property.

8222. If the market data approach is the preferred method of supporting an opinion of fair market value, the sales data must contain elements of comparability and relate to the property being appraised in terms of reasonable proximity in time, specific comparability of type of real estate, specific comparability of permitted uses under zoning laws, and comparability of location.

8223. Residential property in New Bedford is not generally considered by real estate appraisers to be comparable with non-specific residential real estate in Fairhaven.

8224. Fairhaven real estate is not used for purposes of evaluating fair-market value of New Bedford property.

8225. Statistics regarding the sale of residential real estate in the Commonwealth of Massachusetts are not valid indications of the fair-market value of

properties in the Greater New Bedford area.

8226. Statistics based upon the sale of real property outside of the Greater New Bedford are are of no value in determining whether or not there has been an increase or decrease in the fair-market value of residential real property in the Greater New Bedford area since said statistics are based upon properties that are not comparable to the properties in the New Bedford area.

8227. Based on past results and methodologies used by Dr. Mendelsohn, Mr. Coleman has concluded that the alleged "PCB even" has had no effect upon the fair-market value of properties in either New Bedford or Fairhaven.

8228. Market conditions have a strong effect on a opinion of fair market value, and thus, a local market in which the property that is being appraised is located provides the most reliable support for an opinion of fair market value being expressed.

8229. Property revaluations conducted by the Assessors of the City of New Bedford seemingly affected the fair-market value of residential properties in the

City of New Bedford.

8230. Property revaluations conducted by the Assessors of the City of New Bedford with respect to areas outside of the zones that Mr. Mendelsohn contends were affected by the presence of PCBs in New Bedford Harbor may have dramatically affected fair-market value of said properties.

8231. Additional facts and opinions to which Mr. Coleman is expected to testify are further detailed in the following RFAs.

8232. Ralph C. d'Arge is the J. Bugas Distinguished Professor of Economics at the University of Wyoming, Laramie, Wyoming.

8233. Professor d'Arge holds a Ph.D. in Economics from Cornell University.

8234. Attachment Q. II. 0008 is a true and accurate copy of the curriculum vitae of Ralph d'Arge.

8235. Attachment Q. II. 0008 is a true and accurate description of Dr. d'Arge's education, training and experience.

8236. Dr. d'Arge is an expert in the field of natural resource economics.

8237. Dr. d'Arge was the co-founder and managing editor of the Journal of Environmental Economics & Management.

8238. He was President of the Association of Environmental and Resource Economists in 1981 and received its highest honor, the distinguished service award in 1986.

8239. Dr. d'Arge has led numerous research studies on valuing attributes of the environment inclusive of the demand for water and air quality.

8240. Dr. d'Arge served for six years on the Environmental Studies Board of the National Research Council.

8241. Dr. d'Arge has formed opinions on the validity of the research design and interpretation of results of the "recreation survey" developed by Dr. K.E. McConnell and his associates.

8242. Contingent valuation models are unlikely to yield reliable results.

8243. Omitting important factors such as congestion will result in substantial biases in predicting beach attendance and identifying causes of change in beach attendance.

8244. The problems of potential survey biases have not been adequately controlled for in the formulated research design.

8245. The 3 percent discount rate used in computing damages is inappropriate.

8246. The application of a logistic growth curve for estimating future knowledge or perceptions of PCBs is inappropriate.

8247. Extreme biases can occur in contingent valuation surveys from slight changes in reference operating conditions, including hypothetical questions on changes in behavior.

8248. Causes of beach use decisions other than PCBs were not adequately analyzed, which may completely mask

the correct acceptance of the null hypothesis of no causal link between PCBs and beach use.

8249. No independent means were used to verify the demand "choke" price for beach sites where an incorrect specification may severely bias PCB impacts upward.

8250. The combined effect of these problems make the "recreation survey" a totally unreliable instrument upon which to measure natural resource damages or assess scientifically based causal relationships.

8251. Dr. d'Arge has formed an opinion as to the validity of the research design used by Dr. Mendelsohn to assert there was a negative impact on housing values caused by PCBs in and around New Bedford harbor.

8252. Since the "model is not yet in final form" and has not been provided by plaintiffs, Dr. d'Arge is unable to present a professionally sound critique or evaluation.

8253. In Dr. d'Arge's opinion, Dr. Mendelsohn's study results do not and cannot establish a causal link between changes in housing values and the

perception of higher levels of PCBs in New Bedford harbor.

8254. Additional facts and opinions to which Dr. d'Arge is expected to testify are further detailed in the following RFAs.

8255. Dr. Craig Ferris is vice president of Phenix Environmental, Inc. ("Phenix") and serves as director of environmental programs.

8256. Dr. Ferris has a B.S. in wildlife biology from Cornell University, an M.S. in wildlife biology from West Virginia University and a Ph.D. in wildlife biology from the University of Maine at Orono.

8257. Attachment Q. II. 0009 is a true and accurate copy of the curriculum vitae of Dr. Ferris.

8258. Attachment Q. II. 0009 is a true and accurate description of Dr. Ferris' education, training and experience.

8259. Dr. Ferris' areas of expertise include avian ecology.

8260. Dr. Ferris is knowledgeable about the life history, feeding behavior, and habitat utilization of the Common tern, Least tern and Roseate tern, and the potential for exposure to contaminants.

8261. Additional facts and opinions to which Dr. Ferris is expected to testify are further detailed in the following RFAs.

8262. Eric Fix is presently employed by as a senior chemist in the organic laboratory of Clean Harbors Analytical Services, Inc. ("CHAS").

8263. Mr. Fix holds a bachelor's degree in chemistry from Cornell University.

8264. Attachment Q. II. 0010 is a true and accurate copy of the curriculum vitae of Mr. Fix.

8265. Attachment Q. II. 0010 is a true and accurate description of Mr. Fix's education, training and experience.

8266. In 1987 CHAS performed PCB analyses on sediment samples collected from New Bedford Harbor by Balsam

Environmental Consultants, Inc. ("Balsam").

8267. Mr. Fix is qualified to testify regarding the preparation, extraction and analysis protocols used by CHAS in its PCB analyses.

8268. The results of CHAS' analyses are set forth in the documents produced by CHAS and marked as exhibits at the deposition of CHAS (Bates numbers M0000001-M000285), and in defendants' documents bearing Bates numbers 009001-009092.

8269. It is Mr. Fix's opinion that the results of CHAS' analyses accurately reflect the amounts of PCBs found in the sediment samples collected by Balsam.

8270. Additional facts and opinions to which Mr. Fix is expected to testify are further detailed in the following RFAs.

8271. Dr. Edward W. Garbisch is founder and president of Environmental Concern, Inc.

8272. Dr. Garbisch holds a Ph.D. in chemistry from Northwestern University and a bachelor's degree in chemistry from the University of North Carolina,

Chapel Hill, NC.

8273. Attachment Q. II. 0011 is a true and accurate copy of the curriculum vitae of Dr. Garbisch.

8274. Attachment Q. II. 0011 is a true and accurate description of Dr. Garbisch's education, training and experience.

8275. Dr. Garbisch has visited the project site and reviewed site conditions with respect to the suitability of establishing salt marsh over portions of the sediment containment cap as described in Balsam's "Remedial Action Program, New Bedford Harbor Superfund Site."

8276. Dr. Garbisch's opinion is that establishment of new salt marsh in the Upper Estuary following capping is very feasible, and that he and Environmental Concern, Inc. could successfully undertake this salt marsh establishment project.

8277. Additional facts and opinions to which Dr. Garbisch is expected to testify are further detailed in the following RFAs.

8278. Dr. Raymond D. Harbison is Director of the Center for Environmental Toxicology and Professor of Pharmacology in the School of Medicine at the University of Florida.

8279. Dr. Harbison has been Professor and Director of the Interdisciplinary Toxicology Program at the University of Arkansas for Medical Sciences and the National Center for Toxicological Research.

8280. Attachment Q. II. 0012 is a true and accurate copy of the curriculum vitae of Dr. Harbison.

8281. Attachment Q. II. 0012 is a true and accurate description of Dr. Harbison's education, training and experience.

8282. Dr. Harbison is qualified to testify as an expert on toxicology and risk assessment.

8283. Dr. Harbison received a Bachelor of Science degree from Drake University in Des Moines, Iowa in 1965 and a Master of Science Degree in Pharmacology and a Doctorate in Pharmacology and Toxicology from the University of Iowa in Iowa City, Iowa in 1969.

8284. After graduation from the University of Iowa as a United States Public Health Service trainee in the College of Medicine, Dr. Harbison joined the staff of Tulane Medical School where he was an Assistant Professor of Pharmacology and Director of the Teratology Section of the Laboratory of Environmental Medicine.

8285. Subsequently, Dr. Harbison was an Assistant Professor, then an Associate Professor of Pharmacology and Biochemistry at the Vanderbilt Medical Center in Nashville, Tennessee, and a Principal Investigator for the Center for Clinical Pharmacology and Toxicology.

8286. Dr. Harbison is a research scientist, writer, teacher, and advisor.

8287. Since 1971, Dr. Harbison's research to study the effects produced by chemicals in living systems has been funded by the National Institute of Health.

8288. Dr. Harbison has published more than 110 scientific papers in the field of toxicology.

8289. Dr. Harbison has been on the editorial board of

several scientific journals such as Fundamental and Applied Toxicology and Teratogenesis, Carcinogenesis and Mutagenesis.

8290. Dr. Harbison teaches medical students in the basic sciences of pharmacology and toxicology and graduate students in the area of toxicology.

8291. Dr. Harbison has been an advisor to the National Institute of Occupational Safety and Health, the National Institute of Environmental Health and Safety, the United States Environmental Protection Agency, the United States Department of Justice, the United States Department of Agriculture, and several State Health Departments.

8292. Dr. Harbison is qualified to testify to the discovery and historical use of PCBs in industry, commercial products, and during World War II, based on his education and the general scientific and historic knowledge of PCBs.

8293. Dr. Harbison is qualified to testify to the annual production of PCBs, their distribution in the environment, and ambient levels of PCBs in soil, water and air in different regions, including the

Great Lakes, based on general scientific and historic knowledge of PCBs.

8294. Dr. Harbison's testimony will be based upon scientific literature, his education and his experience.

8295. Dr. Harbison is qualified to testify to current allowable standards for incidental production of PCBs in soap and packaging materials, the continued use of PCBs in electrical equipment, and the various standards for PCB exposure, including those of the Food and Drug Administration, Occupational Safety and Health Administration, National Institute of Occupational Safety and Health, EPA, and the American Conference of Governmental and Industrial Hygienists, based on his education and experience and the general scientific knowledge of PCBs.

8296. This testimony will also be based upon the regulatory standards of the above agencies and the scientific literature.

8297. Based on his education and experience, scientific literature, and the Toxicant Profile for

Polychlorinated Biphenyls: New Bedford Harbor, Terra, Inc. (1989) (Toxicant Profile) (produced as part of the Administrative Record in October 1989 and also produced to plaintiffs in March 1990; see Bates Nos. 7784-8316), Dr. Harbison is qualified to testify to the chemistry of PCBs and the difference in the isomers and congeners of different Aroclors, and to the chlorination of the biphenyls and their composition in different Aroclors.

8298. In Dr. Harbison's opinion, PCB mixtures with lower average chlorine content are generally less toxic than mixtures with higher average chlorine content and that less chlorinated congeners are generally less toxic and more easily eliminated than more highly chlorinated congeners.

8299. The toxicity of PCB congeners is generally decreased by dechlorination of the para and meta positions of the molecule.

8300. Based on his education and experience and a review of scientific literature, Dr. Harbison is qualified to testify to the animal studies that caused PCBs to be designated as a human health risk.

8301. Dr. Harbison has evaluated such studies, which are described in the Toxicant Profile, and will be based on the Toxicant Profile.

8302. Dr. Harbison will evaluate the animal testing data for its current relevance in estimating acute and chronic human health effects, based on his education and experience and a review of scientific literature, including the Toxicant Profile; Samathanan, L.P., C.T. Lin and R.N. Carr. 1989; A blind reanalysis of a random subset of NCI bioassay studies: Do rats predict mice?. Fund. Appl. Toxicol., 12:191-201; Houk, V. 1989; The risk of risk assessment; Reg. Tox. and Pharm. 9:257-262; Kimbrough, R.D. 1990; Species variation and health effects of 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin, an overview (Draft); Haseman, J.K., D.D. Crawford, 1984; Results from 86 two-year carcinogenicity studies conducted by the national toxicology program, J. Tox. Environ. Health 14:621-639; Haseman, J.K. and J. E. Huff, 1987; Letter: Species correlation in long-term carcinogenicity studies, Cancer Letters 37:125-132; Haseman, J.K., E.C. Tharrington, J.E. Huff and E.E. McConnell, 1986; Comparison of site-specific and overall tumor incidence analyses for 81 recent national

toxicology program carcinogenicity studies, Reg. Tox and Pharm. 6:155-170; Squire, R. 1981; Ranking animal carcinogens: A proposed regulatory approach, Science 214:877-890; Squire, R.A. 1984; Carcinogenicity testing and safety assessment, Fund. Appl. Toxicol. 4:S326-S334; and Setlow, R.B. 1982; DNA repair, aging, and cancer. Natl. Cancer Inst Monogr; 60:249-255.

8303. Dr. Harbison is qualified to testify to recent studies of the effects of human exposure to PCBs based on his review of the studies described in the Toxicant Profile, including the Greater New Bedford Public Health Effects Study.

8304. Dr. Harbison is qualified to testify to the information provided by these studies that contrasts with animal testing data and also to the use of the information from these studies and other recent studies, including Kimbrough, R.D. 1990, for predicting human health effects, based on his education and experience and his review of animal studies and studies of human health effects.

8305. All other studies upon which Dr. Harbison will rely are described in the Toxicant Profile.

8306. Dr. Harbison has evaluated several recent scientific discoveries and their effect on the assessment of risks to human health from PCBs.

8307. This evaluation will be based on Dr. Harbison's education and experience and on scientific literature, as well as the following sources: Toxicant Profile; Harbison, R.D., James, R.C., and Roberts, S.M. August 1987. Biological Data Relevant to the Evaluation of Carcinogenic Risk to Humans, prepared for Scientific Advisory Panel, Safe Drinking Water and Toxic Enforcement Act, State of California; James, R.C. and R.D. Harbison. Assessment of the human risks to PCBs associated with the expected environmental exposures, from the Symposium Proceedings: Advances in Exposure, Health and Environmental Effects Studies of PCBs, Office of Toxic Substances, Health and Environmental Review Division, U.S. Environmental Protection Agency, Washington, D.C., 1982; Weisburger, J. and Williams, G. 1986. "Chemical Carcinogens," in Casarett and Doull's Toxicology - The Basic Science of Poisons, 3d Ed., Ed. C.D. Klaassen, M.O. Amdur, J. Doull, at 99-173.

8308. Dr. Harbison has concluded that PCBs do not interact directly with the genetic material of cells, that variability in species responses to chemicals requires a cautious and chemical- and species-specific evaluation to determine whether specific animal data can be extrapolated to man; and that effects of PCBs are dose-dependent.

8309. The presence of a chemical at a given concentration in animal tissue does not necessarily imply that the chemical has caused or will cause a toxic effect.

8310. Dr. Harbison has evaluated new knowledge that has changed the classification of cellular changes, on the basis of his education and experience and scientific literature, including Maronpot, R.R., Montgomery, C.A., Boorman, G.A., and McConnell, E.E. 1986. National Toxicology Program nomenclature for hepatoproliferative lesions of rats. Toxicologic Pathology 14:263-273.

8311. Dr. Harbison has concluded that new discoveries and evaluation of new information has led to changes in the previous classification of animal cellular changes, including a change in the definition of

hyperplastic nodules from cancer to hyperplasia that does not describe a neoplastic change.

8312. The changes in classification of animal cellular changes affect the use of animal testing data for assessing human health risks.

8313. Dr. Harbison has formed opinions about the Ambient Water Quality Criteria for PCBs (WQC) based on his education and experience, general scientific literature; the preamble to the WQC (45 Fed. Reg. 79324, Nov. 28, 1980); the National Human Adipose Tissue Survey. EPA. 1985. Baseline estimates and time trends for beta-benzene hexachloride, hexachlorobenzene, and polychlorinated biphenyls in human adipose tissue. 1970-1983. September 30, 1985. PB86-161759; The Greater New Bedford Public Health Effects Study; and the Toxicant Profile, including the studies referenced therein.

8314. Dr. Harbison has concluded that the WQC do not have a scientific basis and that risk assessment methodology has evolved in the decade since publication of the WQC so that the WQC are now inappropriate for determining the risk of harm to human health from PCBs.

8315. Dr. Harbison has identified the changes since 1980 in allowable levels of chemicals in water that are based on new discoveries and knowledge, and to other governmental standards for allowable doses of PCBs, including those of the Occupational Safety and Health Administration, the Food and Drug Administration, the National Institute of Occupational Safety and Health, the EPA, and the American Conference of Governmental and Industrial Hygienists, that are inconsistent with the WQC.

8316. The WQC are inconsistent with background levels of PCBs in human tissues based upon a comparison of human background levels of PCBs in blood and fat to doses estimated in the WQC.

8317. This conclusion is based on the National Human Adipose Tissue Survey, the Greater New Bedford Public Health Effects Study, and studies that are described in the Toxicant Profile.

8318. Dr. Harbison has evaluated the federal government's risk assessment process.

8319. Dr. Harbison has identified deficiencies and

inappropriate uses of risk assessment methodology based on his education, experience and training and on the following articles: National Research Council. 1983. Risk Assessment in the Federal Government: Managing the Process; National Academy Press. Washington, D.C.; Adam M. Finkel 1990. Confronting Uncertainty in Risk Management. A Guide for Decision Makers. A Report. Center for Risk Management. Resources for the Future. Washington, D.C. (January 1990).

8320. Data put forth as proof of the contention that PCBs in the New Bedford Harbor area caused the deaths of the two terns described in the plaintiffs' expert interrogatory answers are inconsistent or absent.

8321. Data used to support the contention that the terns died as a result of consuming fish containing PCBs include: PCB and pesticide analysis of brain tissues of the terns, PCB and pesticide analysis of the stomach contents of two terns, pathological descriptions of the terns, and personal observations of Dr. Ian Nisbet regarding tern feeding behavior.

8322. The possibility that other chemicals may have

caused the deaths has not been thoroughly investigated.

8323. Other chemicals which may induce toxicity at fairly low levels which are present in the New Bedford Harbor include lead, cadmium, and polynuclear aromatic hydrocarbons.

8324. These chemicals were not included in the analysis.

8325. The testimony summary of Dr. Nisbet states on page 119 that "the 'fingerprint' of the PCBs in these samples indicates very recent exposure to PCBs from a major source in New Bedford Harbor."

8326. The results of Dr. Nisbet's "fingerprint" analysis have not been critiqued and there has been no support presented for this statement.

8327. The scientific credibility of this statement must therefore be questioned.

8328. One unexplained piece of data is the high PCB content of the stomach contents of the two terns.

8329. The concentration of PCBs in the stomach contents

of one tern was 192 ppm and in the other tern, 212 ppm.

8330. This level is many times higher than that measured in fish taken from the New Bedford Harbor.

8331. Thus, the source of such a high level of PCBs does not appear to be from biota in the harbor.

8332. Although such evidence would indicate recent exposure to PCBs, the concentration of PCBs in the stomach contents of the tern is not in keeping with expected concentrations in biota of the harbor.

8333. Dr. Nisbet also speculates that because of the data from the two recorded deaths of terns, all of the terns in New Bedford Harbor are at risk from PCB contamination.

8334. Dr. Nisbet indicates that other birds have been similarly affected but not found because birds die and fall into the water or are consumed by scavengers.

8335. Dr. Nisbet offers no clear evidence to support these speculations.

8336. A review of these criteria for causation indicates that causation has not been adequately investigated by the plaintiffs' experts.

8337. Additional facts and opinions to which Dr. Harbison is expected to testify are further detailed in the following RFAs.

38000. Dr. Robert C. James is an associate professor at the University of Florida's Center for Environmental Toxicology.

38001. Attachment Q. II. 0013 is a true and accurate copy of the curriculum vitae of Dr. James.

38002. Attachment Q. II. 0013 is a true and accurate description of Dr. James' education, experience and education.

38003. Dr. Robert C. James received a B.S. in chemistry (1972) and a Ph.D. in Pharmacology (1977) from the University of Utah.

38004. Dr. James completed post-doctoral training in Toxicology (1979) at the Vanderbilt Medical Center.

38005. Dr. James is a member of the Society of Toxicology, the Society of Environmental Toxicology and Chemistry, and the Society for Risk Assessment.

38006. Dr. James has taught and/or developed

undergraduate, graduate, and continuing education programs at several major universities on such subjects as common medicines, pharmacology, general toxicology, industrial toxicology, governmental regulations, exposure assessment, and risk assessment.

38007. Dr. James has published extensively in the area of toxicology, primarily in the areas of chemical biotransformation, the bioactivation and detoxification of chemicals, and the role of xenobiotic metabolism in mechanisms of toxicity.

38008. Dr. James has more than ten years of academic research and teaching experience as well as environmental consulting experience.

38009. Dr. James has acted as a consultant in toxicology to major environmental and engineering consulting firms, the U.S. Dept. of Agriculture, the U.S. Environmental Protection Agency, the U.S. Dept. of the Navy, several state departments of environmental protection or public health, and state and national trade associations.

38010. As a consulting toxicologist, Dr. James has

developed and managed medical monitoring programs.

38011. Dr. James has performed qualitative and quantitative hazard assessments, exposure assessments, and risk assessments used to evaluate public health and worker safety, or to establish acceptable contaminant guidelines, for air, soil, sediments, water and building surfaces.

38012. Dr. James has critiqued and commented on such public policy matters as regulatory procedures or specific agency regulations concerning chemical contaminants, and he has provided scientific support to personal injury and class action litigation on such issues as exposure, cancer risks, chemical hazards, and the basis of expert testimony.

38013. These assessments and evaluations have dealt with PCBs, polychlorinated dibenzodioxins and dibenzofurans, phenolic compounds and chlorindated phenols, heavy metals, PAHs, nitrosamines, formaldehyde, benzene and other aromatic hydrocarbons, and numerous halogenated aliphatics (e.g., trichloroethane, carbon tetrachloride, methyl bromide, etc.).

38014. Dr. James is an Associate Professor at the University of Florida and the President of Terra, Inc., a consulting firm.

38015. Dr. James is an expert on toxicology and risk assessment.

38016. Dr. James has a historical perspective on the commercial properties of PCBs, their commercial uses, and how this ultimately led to their ubiquitous presence in the environment.

38017. Dr. James' opinion is based on his education and experience, the Toxicant Profile for Polychlorinated Biphenyls: New Bedford Harbor, Terra, Inc. (1989) (Toxicant Profile) (produced as part of the Administrative Record in October 1989 and also produced to plaintiffs in March 1990; see Bates Nos. 7784-8316); and de Voogt and Brinkman, 1989. (References to the Toxicant Profile include the references in that document.)

38018. Among the commercial properties of commercial PCB fluids were chemical stability and electrical insulation, and that as a result, they became a

major dielectric fluid in electrical transformers and capacitors from the mid-1930's through 1970's.

38019. Additional uses of these compounds included use as a plasiticizer, microscope immersion oil, hydraulic fluid, a pesticide extender, a fire retardant oil in gas transmission turbines, a sealant compound for wood and cement surfaces, a component of die casting waxes, and a component of inks and carbonless copying paper.

38020. By 1974 approximately 1.4 billion pounds of PCBs had been produced within the United States.

38021. The variety of these uses, the persistence of PCBs, and past disposal practices eventually led to the introduction of PCBs into indoor and outdoor air, indoor surfaces, surface waters, fresh and saltwater sediments, and soils.

38022. Their ubiquitous nature ultimately led to the development of allowable standards for foods, water, and the incidental production or presence of PCBs in soaps and packaging materials.

38023. As a general rule, PCBs have low vapor pressures

and water solubilities while having high octanol water partition coefficients and thus high affinities for soils and sediments.

38024. These features would be expected to limit the dose of PCBs one would receive by exposure to contaminated soils and sediments.

38025. There is empirical evidence to support this contention as set forth in the Toxicant Profile.

38026. On the basis of his education and experience, scientific literature, the Toxicant Profile, and the Hazard Evaluation for New Bedford Harbor, October 1989, by Terra, Inc. (Hazard Evaluation) (produced as part of the Administrative Record in October 1989 and also produced to plaintiffs in March 1990; see Bates Nos. 8317-8452), Dr. James has concluded that PCBs may be absorbed through the skin, lungs and gastrointestinal tract; that PCBs appear to have a biphasic distribution phase which appears to be a function of the blood flow and lipid content of the tissue; and that PCBs ultimately accumulate primarily in adipose tissue and are metabolized and eliminated at slow but measurable rates.

38027. In animal studies the toxic potency of a PCB mixture tends to increase with the average chlorine content of the mixture.

38028. There are toxicological differences between commercial PCB mixtures of 42%, 54% and 60% chlorine content.

38029. Mounting scientific evidence now indicates that the carcinogenic potential of PCBs in animals is another toxicity for which potency varies with the average chlorine content of the commercial PCB mixture.

38030. A comparison of the results of animal studies of commercial PCB mixtures with different average chlorine contents demonstrates this difference in toxicological potency.

38031. Various mechanisms (i.e., genotoxicity) may impact the assessment of the carcinogenic risks possibly associated with PCB exposure in humans.

38032. These findings have implications for regulatory decisions concerning different commercial mixtures,

including a re-evaluation of the carcinogen classification of various PCB mixtures.

38033. There are general problems associated with extrapolating human outcomes from animal toxicity data, specifically in the extrapolation of results from animal carcinogenicity studies to humans on the basis of Squire, 1981; Squire, 1984; Visek, 1988; Slaga, 1988; Clayson, 1988; Barr, 1987; Brockman and DeMarini, 1988; Tenant et al., 1987; Sanathanan et al., 1989; Barnard et al., 1989; Hoel et al., 1983; von Wittenau, 1987; Haseman et al., 1984; Haseman et al., 1986; Haseman and Huff, 1987; Ennever et al., 1987; Hart and Chang, 1983; Maronpot et al., 1986; Ennever and Rosenkranz, 1989; James, 1986a&b.

38034. Dr. James has reviewed studies of persons living in or near Michigan and the Great Lakes; Bloomington, Indiana; Jefferson, Ohio; Fairmont, West Virginia; Norwood, Massachusetts; Los Angeles Harbor (Gossett et al., 1989); New Bedford Harbor; and Paoli, Pennsylvania.

38035. Dr. James has reviewed the measured levels of PCBs in fat and serum of both "unexposed" and "exposed"

persons.

38036. Dr. James has reviewed estimates of PCB elimination rates in occupationally and environmentally exposed persons on the basis of Hazard Evaluation.

38037. Because of their relatively high daily exposure to PCBs and resulting high PCB body burdens, clinical and epidemiological studies of occupationally exposed persons (capacitor workers) provide the most relevant information concerning the possible health effects that might be attributable to lower, environmental exposures.

38038. On the basis of the Toxicant Profile and the Hazard Evaluation, reviews of clinical and epidemiological studies indicate that other than skin conditions such as dermatitis and chloracne, no significant chronic health effects have been causally associated with exposure to PCBs.

38039. In addition, Dr. James has compared the PCB levels to which workers were exposed to exposures potentially experienced by individuals exposed to PCBs in the Acushnet Estuary and Harbor Area, on the basis of the Hazard Evaluation,

the New Bedford Harbor Exposure Assessment, by Terra, Inc. (1989) (Exposure Assessment), the New Bedford Harbor Risk Assessment, by Terra, Inc. 1989 (Risk Assessment) (Exposure Assessment and Risk Assessment produced as part of the Administrative Record in October 1989 and also produced to plaintiffs in Mach 1990; see Bates Nos. 8453-8507), and his personal observations.

38040. Dr. James is qualified to testify on the fundamentals of the risk assessment process and the limitations and uncertainties associated with risk assessment on the basis of James, 1985b; Samuels and Adamson, 1985; Hart and Tutturro, 1986; Hildebrandt, 1987; Barnard, 1987; Ames, 1989a&b; Allman, 1985a&b; Shodell, 1985; Wilson, 1980; Ames, 1987; Gehring, 1989; Huber, 1987; Wilson and Crouch, 1987; Houk, 1989; Apostolou, 1990; Flamm, 1989; Park, 1989; Lowe, 1989; Cook, 1989; Higginson, 1989; Russell and Gruber, 1987; National Research Council, 1983; Office of Technology Assessment, 1981; Travis et al., 1987; Travis and Hattemer-Frey, 1988; Weisburger and Williams, 1975; Marcus and Rispin, 1988.

38041. There are different approaches typically taken by

regulatory agencies when addressing the risks posed by carcinogenic and noncarcinogenic compounds, including the recent controversial application of traditional techniques to nongenotoxic carcinogens.

38042. There is a conservative nature of risk assessment methodologies as applied to environmental contamination situations.

38043. Risk assessment methodologies can be used to establish causation or cleanup guidelines and regulatory standards.

38044. Dr. James' has personally observed the Upper Estuary on the Fairhaven side and the industrialized side of the Upper Estuary Area south of the Wood Street Bridge, Cove Area, Popes Island, and Fort Rodman Beach Areas.

38045. The likelihood of human contact with sediments in the Upper Estuary area and other features of the above-mentioned areas which may affect the potential for human exposure.

38046. On the basis of the Exposure Assessment, Dr. James is qualified to testify to the bioavailability of

PCBs present in sediment and soil via the ingestion, dermal, and inhalation routes of exposure for humans.

38047. Dr. James is qualified to testify as to volatilization of PCBs from sediments into air; the contribution of inhaled PCBs to overall human exposure; and the amount of PCBs inhaled from typical indoor environments compared to that obtained from outdoor environments, on the basis of his education and experience and the Toxicant Profile.

38048. The risk estimates associated with the baseline or "no action alternative" as well as that associated with a remedial effort based on capping specific areas can be compared to the risks associated with cleanup standards, drinking water standards, and risk associated with activities common to everyday activities.

38049. Dr. James' comparison is based on the Risk Assessment and Calabrese et al., 1989.

38050. There are discrepancies among various governmental agencies concerning the allowable exposure to PCBs.

38051. Dr. James has compared and contrasted standards and guidelines of FDA, OSHA, NIOSH, EPA, and ACGIH with safety and estimates of risk, on the basis of the Toxicant Profile and his professional experience.

38052. Additional facts and opinions to which Dr. James is expected to testify are further detailed in the following RFAs.

38053. Katherine L. Jayko is presently employed by Applied Science Associates ("ASA") as a scientist.

38054. Ms. Jayko holds a bachelor's degree in civil engineering from Ohio State University, as well as a master's degree in ocean engineering from the University of Rhode Island.

38055. Attachment Q. II. 0014 is a true and accurate copy of the curriculum vitae of Ms. Jayko.

38056. Attachment Q. II. 0014 is a true and accurate copy of Ms. Jayko's education, training and experience.

38057. ASA conducted a PCB flux study ("flux study") during 1988-1989 in New Bedford Harbor.

38058. Ms. Jayko calculated PCB mass transport data in connection with the flux study.

38059. The results of the flux study are set forth in defendants' documents bearing Bates numbers 1087-2364 and 4414-6859.

38060. It is Ms. Jayko's opinion that the PCB mass transport data calculated by ASA and set forth in documents 1087-2364 and 4414-6859 accurately reflects the transport of PCBs out of the upper New Bedford Harbor over the surveyed tidal cycles.

38061. Additional facts and opinions to which Ms. Jayko is expected to testify are further detailed in the following RFAs.

38062. Ellie Kwong is presently employed by Enseco-Erco Laboratory ("Enseco") as the Pesticides Operations Manager.

38063. Ms. Kwong holds a bachelor's degree in chemistry from Northeastern University.

38064. Attachment Q. II. 0015 is a true and accurate copy

of the curriculum vitae of Ms. Kwong.

38065. Attachment Q. II. 0015 is a true and accurate description of Ms. Kwong's education, training and experience.

38066. Enseco performed PCB analyses on water samples collected from New Bedford Harbor by Applied Science Associates ("ASA").

38067. Ms. Kwong is qualified to testify regarding the preparation, extraction and analysis protocols used by Enseco in its PCB analyses.

38068. The results of Enseco's analyses are set forth in the documents produced by Enseco and marked as exhibits at the deposition of Enseco, and in defendants' documents bearing Bates numbers 4414-5397.

38069. It is Ms. Kwong's opinion that the results of Enseco's analyses accurately reflect the amounts of PCBs found in the water samples received from ASA.

38070. Additional facts and opinions to which Ms. Kwong is expected to testify are further detailed in the

following RFAs.

38071. Ed Lawler received a B.S. in Environmental Science from the University of Massachusetts, Amherst.

38072. Attachment Q. II. 0016 is a true and accurate copy of the curriculum vitae of Mr. Lawler.

38073. Attachment Q. II. 0016 is an accurate description of Mr. Lawler's education, training and experience.

38074. Ed Lawler is employed as a Director of Project Management by NET Laboratory.

38075. NET Laboratory prepared, extracted and analyzed samples collected by Balsam Environmental Consultants in the course of Balsam's thin-layer sediment sampling program in December, 1988.

38076. It is Mr. Lawler's opinion that the samples analyzed by NET contained concentrations of PCBs as stated in the final reports included in NMF Bates Nos. 009462-010170 and 012087-012231.

38077. The procedures used to prepare the samples for laboratory analysis and to perform the laboratory

analysis are described in NMF Bates Nos. 009462-010170 and in Mr. Lawler's testimony in the course of the NET-Cambridge deposition taken on March 26, 1990.

38078. Additional facts and opinions to which Mr. Lawler is expected to testify are further detailed in the following RFAs.

38079. Jeffrey C. Myers is a founder and President of ESTOX, Inc., an environmental consulting firm.

38080. Attachment Q. II. 0018 is a true and accurate copy of the curriculum vitae of Mr. Myers.

38081. Attachment Q. II. 0018 is a true and accurate description of Mr. Myer's education, training and experience.

38082. Since 1982, Mr. Myers has been involved in the use of statistical and geostatistical techniques to evaluate the extents, concentrations and spatial patterns of contaminant substances such as heavy metals, PCBs, pesticides, acids, dioxin, and organic solvents in soils, sediments, and groundwater.

38083. Mr. Myers has performed extensive evaluations of in-situ metals content for purposes of ore reserve estimation.

38084. Mr. Myers received a B.S. in Geology from West Virginia University and a M.S. in Mining Engineering and Geostatistics from the Colorado School of Mines.

38085. Mr. Myers is the founder and current President of the Registry of Environmental Geostatistical Scientists (REGS), a professional society dedicated to applying geostatistical techniques to environmental problems.

38086. Mr. Myers has studied numerous data sets and reports of government sponsored sediment sampling programs, including but not limited to those from the 1981 EPA study, the March, April, and June 1982 USCG studies, the 1978, 1979, 1980 and 1981 DEQE studies, the 1982 and 1983 GCA/Versar studies, the 1984-1985 sampling for the Battelle Model, the 1985 Battelle/NUS study, the 1985 USACE grid sampling study, the 1985-1986 GZAD/NUS study and the 1987 USACE "Hot Spot" study.

38087. Mr. Myers has reviewed a number of data sets from defendant-sponsored sediment sampling programs, including October 1987 Balsam Upper Estuary eastern shore saltmarsh sediment sampling program, the August 1987 Balsam PCB sediment environmental variability study, the Balsam February 1988 sediment sampling program, the December 1988 Balsam Thin Layer sampling program, and the March 1990 Supplemental Thin Layer Sampling program and may testify as to his review of the same.

38088. Based upon a review of these data sets, it is Mr. Myers' opinion that the lack of planning, statistical design, and coordination among the various government-sponsored sediment and soil sampling programs severely limits the usefulness of the data for proper spatial characterization of PCB contamination in estuary and harbor sediments and wetlands soils.

38089. The use of inconsistent approaches and techniques prevents the integration of these sampling events into a meaningful and unified data set.

38090. Combining or selective use of these multiple

sampling events introduces bias to results and their subsequent interpretation.

38091. Existing sediment sample data from programs sponsored by EPA and USACE fail to show any widespread PCB contamination below 12 inches in estuary or harbor sediments.

38092. The existing data indicate that any contamination below this level is associated with a very few localized areas which exhibit relatively high concentrations in the upper 12 inches and contain coarse-grained sediment materials.

38093. The paucity of data available for characterization precludes the use of contouring and volumetric methods at levels below 12 inches.

38094. Zones reportedly exhibiting high PCB concentrations are likely to be smaller than interpolative methods imply.

38095. The soils data collected (predominantly by USACE) in wetland areas fails to show any widespread PCB contamination of the wetland soils.

38096. Existing data indicates that small, localized occurrences of PCB contamination exist and that these anomalous areas are consistent with the physical conditions and processes present in an estuarine and tidal environment.

38097. Additional facts and opinions to which Mr. Myers is expected to testify are further detailed in the following RFAs.

38098. Stephen Olko is the principal of Olko Engineering.

38099. Mr. Olko holds a bachelor's degree in civil engineering from Dartmouth College and a master's of science in civil engineering from the Thayer School of Engineering and Harvard University and has taken additional post-graduate courses at Columbia in civil engineering.

38100. Attachment Q. II. 0019 is a true and accurate copy of the curriculum vitae of Mr. Olko.

38101. Attachment Q. II. 0019 is a true and accurate description of Mr. Olko's education, training and experience.

38102. Mr. Olko has visited the project site and has concluded that conditions are very favorable for construction of the containment cap proposed by Balsam in its "Remedial Action Program, New Bedford Harbor Superfund Site" report.

38103. Mr. Olko has personal experience in all aspects of hydraulic placement and filling construction methods required to implement the containment cap.

38104. Additional facts and opinions to which Mr. Olko is expected to testify are further detailed in the following RFAs.

38105. Joseph Payne is employed as a Field Operations Manager by Normandeau Associates, Inc. in Bedford, New Hampshire.

38106. Mr. Payne has an A.A.S. in applied marine biology and over 15 years experience in field sampling in estuarine and marine environments.

38107. Attachment Q. II. 0020 is a true and accurate copy of the curriculum vitae of Mr. Payne.

38108. Attachment Q. II. 0020 is a true and accurate description of Mr. Payne's education, training and

experience.

38109. Mr. Payne participated in the collection of core samples from stations in New Bedford Harbor in a process supervised by Balsam Enviornmental Consultants, Inc..

38110. These samples were placed in labelled sample containers and were transported to Normandeau Associates laboratories for analysis of benthic organisms, grain size distribution, total organic carbon and dissolved organic carbon.

38111. Additional facts and opinions to which Mr. Payne is expected to testify are further detailed in the following RFAs.

38112. Ann Pembroke is employed as a Marine Ecologist and manager of the Biological Laboratory by Normandeau Associates in Bedford, New Hampshire.

38113. Ms. Pembroke has a B.S. in biology from Hobart and William Smith Colleges and an M.S. in marine biology from the University of Delaware.

38114. Attachment Q. II. 0021 is a true and accurate copy

of the curriculum vitae of Ms. Pembroke.

38115. Attachment Q. II. 0021 is a true and accurate description of Ms. Pembroke's education, training and experience.

38116. Ms. Pembroke has worked as a supervisor for the processing of benthic samples collected from New Bedford Harbor by Balsam Environmental Consultants, Inc. on March 12, 1990.

38117. The samples were analyzed for the presence of benthic organisms in accordance with protocols provided by Balsam Enviornmental Consultants, Inc.

38118. The laboratory procedures utilized to process the samples and identify the organisms in the samples met Normandeau Associates' Quality Control criteria.

38119. Additional facts and opinions to which Ms. Pembroke is expected to testify are further detailed in the following RFAs.

38120. John F. Quensen received a B.S. in Biology from Virginia Commonwealth University in 1971, a M.A. in

Marine Science from the College of William and Mary's School of Marine Science in 1976 and a Ph.D. in Ecology and Evolution from Purdue University in 1981.

38121. Attachment Q. II. 0022 is a true and accurate copy of the curriculum vitae of Dr. Quensen.

38122. Attachment Q. II. 0022 is a true and accurate description of Dr. Quensen's education, training and experience.

38123. Dr. Quensen presently is a Research Associate in the Department of Crop and Soil Sciences at Michigan State University.

38124. Dr. Quensen has extensive research experience in microbial degradation of TCDD, PCBs and pesticides and has co-authored a number of publications in this area, as set forth in his curriculum vitae, a copy of which is produced herewith.

38125. Together with James M. Tiedje, Ph.D., Dr. Quensen designed and conducted a laboratory experiment to determine whether PCB dechlorinating microorganisms currently exist in New Bedford Harbor sediments.

38126. The paper entitled "Dechlorination of Aroclor 1248 by Microorganisms from New Bedford Harbor Sediments" by John F. Quensen, III and James M. Tiedje (April 1990) sets forth the materials and methods used in the dechlorination experiment, including sampling sites, assay procedure, preparation of assay vessels, preparation of inoculum, and PCB addition, incubation and analysis.

38127. Dr. Quensen is qualified to testify as to the results of PCB analysis of the environmental sediment samples by capillary column GC/EC and the results of analysis (also by capillary column GC/EC) of the experimental samples.

38128. Dr. Quensen is qualified to testify concerning the relative extent of dechlorination observed in the experimental samples over the course of the experiment and to the patterns of dechlorination observed, including the preferential removal of chlorines from the meta and para positions.

38129. In Dr. Quensen's opinion, PCB dechlorinating microorganisms currently exist in New Bedford

Harbor sediments.

38130. Additional facts and opinions to which Dr. Quensen is expected to testify are further detailed in the following RFAs.

38131. George Reich is employed by Normandeau Associates, Inc. as a Laboratory Supervisor.

38132. Attachment Q. II. 0023 is a true and accurate copy of the curriculum vitae of Mr. Reich.

38133. Attachment Q. II. 0023 is a true and accurate description of Mr. Reich's education, training and experience.

38134. He has a B.A. in chemistry and over 7 years experience in analytical chemistry.

38135. Samples collected by Balsam Environmental Consultants, Inc. from New Bedford Harbor on March 12, 1990 were delivered to the Normandeau Associates, Inc. laboratory for analysis at various Normandeau Associates Laboratories for grain size distribution, total organic carbon and dissolved organic carbon.

38136. The laboratory procedures and methodology utilized for analysis of grains distribution and samples analysis met Normandeau Associates' Quality Control criteria.

38137. Additional facts and opinions to which Mr. Reich is expected to testify are further detailed in the following RFAs.

38138. Henry M. Rines is presently employed by Applied Science Associates ("ASA") as a scientist.

38139. Dr. Rines holds a Ph.D. degree in oceanography from the University of Rhode Island, as well as a Bachelor's degree in marine biology from McGill University.

38140. Attachment Q. II. 0024 is a true and accurate copy of the curriculum vitae of Dr. Rines.

38141. Attachment Q. II. 0024 is a true and accurate copy of description of Dr. Rines' education, training and experience.

38142. ASA conducted a PCB flux study ("flux study")

during 1988-1989 in New Bedford Harbor.

38143. Dr. Rines participated in the design of the sampling protocol for the flux study and in the collection of water samples from New Bedford Harbor, which samples were analyzed by Ceimic Corporation and Enseco-ERCO.

38144. The results of the flux study are set forth in "Measurements of PCB Transport From Upper New Bedford Harbor," ASA, April 18, 1990.

38145. It is Dr. Rines' opinion that the samples collected and results obtained in connection with the flux study accurately reflect the water composition of upper New Bedford Harbor for the surveyed tidal cycles.

38146. Additional facts and opinions to which Dr. Rines is expected to testify are further detailed in the following RFAs.

38147. Curt D. Rose is an aquatic biologist and toxicologist with a Ph.D. degree in aquatic ecology from the University of North Carolina at Raleigh.

38148. Attachment Q. II. 0025 is a true and accurate copy of the curriculum vitae of Dr. Rose.

38149. Attachment Q. II. 0025 is a true and accurate description of Dr. Rose's education, training and experience.

38150. Dr. Rose's scientific specialty is aquatic hazard assessment, which he has practiced during the past 20 years at various universities (including the University of Maryland's Chesapeake Biological Laboratory), EG&G, Inc. (where he directed toxicological investigations conducted by EG&G's Bionomics Aquatic Toxicology Laboratory), and ERCO/Enseco (where he established its Cambridge/Marblehead Aquatic Toxicology Laboratory).

38151. Dr. Rose currently operates his own consulting company, CDR Environmental Specialists, Inc. ("CDR").

38152. Dr. Rose's opinions are predicated upon his general training and experience in the field of aquatic hazard assessment and a recent literature-based report that he prepared entitled "Aquatic Toxicity

and Bioaccumulation Potential of PCBs in the Marine Environment - Implications for the Acushnet River Estuary".

38153. Dr. Rose is qualified to address the following issues: 1) toxicity of PCBs (and other xenobiotic constituents associated with the New Bedford Harbor area) to marine organisms; 2) potential of PCBs to bioaccumulate in marine organisms; 3) the adequacy of the U.S. Environmental Protection Agency's ("EPA's") ambient water quality criteria for marine organisms exposed to PCBs; 4) toxicological results of a study in which amphipods and fish were exposed to PCB-containing sediment collected from New Bedford Harbor (Plaintiff's Document XI.E. R-0374); and 5) biological results of a study in which estuarine mussels were transplanted at the hurricane barrier in New Bedford Harbor and at locations in Buzzard's Bay and Nantucket Sound. (Plaintiffs document "The Relationship between limpid composition and seasonal differences in the distribution of PCBs in Mytilus edulis," McDowell-Capuzzo, et al.)

38154. Toxicity of PCBs to marine organisms is typically determined in laboratory tests that are incapable

of accurately reflecting environmental conditions; biological "endpoints" measured in such tests sometimes have limited environmental significance; all biological endpoints measured in such tests must be qualified in terms of exposure time of organisms to be scientifically credible; and, in general, the results of such tests suggest that the less-chlorinated PCB Aroclors are less toxic to marine organisms (in particular, marine fishes) than the more-chlorinated Aroclors.

38155. Based on strictly physiochemical considerations, the less-chlorinated and more water-soluble PCB formations (in comparison to the more-chlorinated and less water-soluble formulations) are more likely to be available for uptake by organisms, but, if bioaccumulated, are more likely to be depurated by the organisms; there is a substantial scientific basis for concluding that PCBs do not biomagnify (i.e., pass from prey to predator) at high levels of aquatic food webs; and elevated body burdens of PCBs in organisms do not imply hazard to the organisms themselves.

38156. EPA's ambient water criteria for PCBs and marine organisms collectively address numerous

chlorobiphenyls that have increasingly been shown to exhibit disparate physiochemical and toxicological characteristics.

38157. The criteria are largely predicated upon results of bioaccumulation, as contrasted to toxicological, studies of organisms.

38158. The criteria do not encompass durational (i.e., exposure-time-related) or frequence-of-exceedance components of more contemporary EPA criteria.

38159. With regard to toxicological results of the study in which amphipods and fish (sheepshead minnows) were exposed to PCB-containing sediment from New Bedford Harbor, a causal (as compared to a correlation-based) relationship was not documented between levels of PCBs in sediment and toxicological responses of organisms.

38160. The influence of elevated levels of metals present in the sediment on toxicological responses of amphipods was not fully reported (refer to paired toxicity tests with 14% sediment from Station 12 vs. 3% sediment from Station 14).

38161. Sediment containing 66 ppm PCBs (as well as

elevated levels of other xenobiotic constituents, i.e., metals) did not deleteriously affect amphipods.

38162. Sheepshead minnows (adults) may have been exposed to sediment and associated test water under static or static-replacement conditions, which could have caused water, which was not analyzed for PCBs, to contain unrealistically high levels of the substances.

38163. Concerning biological results of the study in which estuarine mussels (obtained from Sandwich, Massachusetts) were transplanted at the hurricane barrier in New Bedford Harbor and at locations in Buzzard's Bay and Nantucket Sound, a causal relationship was not demonstrated between levels of PCBs in tissues of transplanted organisms and condition of the organisms.

38164. Unevaluated environmental differences between the area of the hurricane barrier and the two relatively distant reference areas are likely to have confounded an understanding of the factors associated with differences in condition of organisms.

38165. The absence of condition measurements for non-transplanted organisms remaining in the Sandwich estuary precludes a thorough assessment of the influence of natural factors on condition of organisms.

38166. Additional facts and opinions to which Dr. Rose is expected to testify are further detailed in the following RFAs.

38167. Donald D. Rosebrook, Ph.D. is an analytical chemist and President of EndoEnvironment, Inc., an environmental consulting firm.

38168. Attachment Q. II. 0026 is a true and accurate copy of the curriculum vitae of Dr. Rosebrook.

38169. Attachment Q. II. 0026 is a true and accurate copy of Dr. Rosebrook's education, training and experience.

38170. Dr. Rosebrook has a B.S. in Chemical Engineering from Purdue University in 1958 and a Ph.D. in Analytical Chemistry from Kansas State University in 1964.

38171. Dr. Rosebrook has over 25 years of experience in analytical method development and application in a variety of matrices, including: water; soil; sediment; sludge; plant, animal, and fish tissues; waste streams; and commercial products.

38172. Dr. Rosebrook has had extensive experience in the development and application of quality assurance/quality control plans for sampling and chemical analysis and in the performance of audits.

38173. Dr. Rosebrook is well versed in gas chromatography, gas chromatography/mass spectrometry, high performance liquid chromatography, thin layer chromatography, atomic absorption spectrometry, colorimetric and electrometric instrumentation and methods of analysis.

38174. Difficulties with the plaintiffs' data, include, but are not limited to, the following:

- The poor quality of many of the chromatograms from the Battelle Mussel Watch program sites 9 & 10.

- The improper quantitation and probable misidentification of several homologs, particularly C8 & C9, in much of the CLP data supporting the Battelle study.

- The probable effect of the large number of damaged or leaking vials containing sample extracts for the Battelle study.

- The poor agreement for PCB results between replicate samples throughout the GZA/NUS program.

- The poor chromatographic quality of the work by Laucks' Laboratories in the FIT study.

- The impact of poor resolution in the gas chromatographic studies conducted by the U.S. Coast Guard during the 1982 sediment studies.

- The use of HPLC and TLC for obtaining quantitative data on PCB's by the U.S. Coast Guard in the 1982 sediment studies.

- The miscalculation and reporting of some PCB results in the June 1986 COE report by Condike.

- The anomalies introduced by analysis of core segments from different depths as if they were truly duplicates; as found in the 1986 COE report by Condike.

- The inconsistencies of PCB congener identification between various analyses of purported portions of the same sample, during the COE 1986 study of estuary sediments and elutriate tests.

- The baseline problems with the chromatography of standards used in the 1985 COE contaminant flux investigations.

- The lack of any supporting raw data for the Revet package.

38175. There are underlying problems with study design, quality assurance/quality control, sampling, analytical chemistry, and reporting in nearly all of the studies cited by the plaintiffs.

38176. While the results of the studies are not all

unacceptable neither are they all valid and usable.

38177. Acceptance of an analytical result by EPA often occurs even though the results may contain substantial inaccuracies.

38178. Rejection of an analytical result by EPA can occur even though the reported result is quantitatively and qualitatively correct.

38179. With regard to data resulting from analysis of samples by CLP laboratories, Dr. Rosebrook has reviewed about the data packages produced in the GZA/NUS study for water and sediment and the EPA sponsored Battelle study data packages for biota, sediment and water.

38180. Dr. Rosebrook has evaluated both the PCB and other analyses, including metals, HSL compounds, PAH's and water quality parameters.

38181. There is a need for various components of a QA/QC program which have been excluded from several of the plaintiff's studies including, but not limited, to the following studies:

. DEQE from 1978-1981

- US Coast Guard 1982 sediment study
- US EPA 1981
- GCA - Versar Series 1982 & 1983
- Various biota investigations as conducted by Massachusetts DMF, DEP, DPH and the U.S.FDA.

38182. Problems with the methodology often preclude even estimates of the confidence interval.

38183. There are certain elements of any sampling program that are considered to be essential to obtaining a valid sample.

38184. Scientific integrity demands the reporting of all results from a study unless valid and specific justifications are made for all omissions.

38185. Dr. Rosebrook is well versed in database generation, maintenance and evaluation.

38186. Dr. Rosebrook evaluated the remediation database for the Livingston, LA train derailment in connection with his work for the 21st District Court of the State of Louisiana.

38187. Dr. Rosebrook generated and evaluated the database used by EPA to develop regulations for fugitive

hydrocarbon emissions.

38188. Dr. Rosebrook has reviewed extensive sections of the New Bedford Harbor database.

38189. Data within a database should be scientifically valid and consistent.

38190. The New Bedford Harbor database should be limited to more recently obtained data (i.e. past 1985) that have been carefully reviewed for consistency in collection, analysis and compilation.

38191. The New Bedford Harbor database presently includes data that were obtained prior to 1985.

38192. The New Bedford Harbor database presently contains post-1985 data that were not consistently collected, analyzed and compiled.

38193. Additional facts and opinions to which Dr. Rosebrook is expected to testify are further detailed in the following RFAs.

38194. Leonard C. Sarapas is employed as Vice President, Engineering by Balsam Environmental Consultants,

Inc. ("Balsam").

38195. Mr. Sarapas obtained a B.S. in civil engineering from the University of Kansas in 1976 and an M.S. in environmental/civil engineering from the University of Kansas in 1982.

38196. Attachment Q. II. 0026 is a true and accurate copy of the curriculum vitae of Mr. Sarapas.

38197. Attachment Q. II. 0026 is a true and accurate description of Mr. Sarapas' education, training and experience.

38198. Mr. Sarapas has been a licensed professional engineer since 1983 and is registered to practice in over 10 states.

38199. Mr. Sarapas has been directly involved in the national Superfund program since program's inception in 1980; his responsibilities have included involvement in three contracts to EPA as well as the undertaking of an RI/FS for a potentially responsible party group.

38200. Mr. Sarapas was a principal author of the October

16, 1989 draft report entitled "A Remedial Action Program, New Bedford Harbor Superfund Site."

38201. A copy of this report, with Attachments A through O was submitted by AVX Corporation as part of the Administrative Record on October 16, 1989 and was produced to the plaintiffs in March 1990 (Bates nos. 6860 to 8945).

38202. In summary, the proposed remedial alternative involves containment of contaminated Upper Estuary sediments by placement of a cap of clean sediment and geofabric over areas designated for remediation.

38203. Erosion protection and additional saltmarsh will be established to stabilize portions of the capped areas.

38204. This remedial approach was developed in response to likely adverse impacts associated with the handling and movement of large volumes of contaminated sediments.

38205. Specifically, in-place containment was selected as the basis for site remediation due to the potential

of contaminant release and migration through exposure of presently buried sediment, either to air (volatilization or wind blown dust) or to water (resuspension, volatilization and dissolution).

38206. The in-place containment remedial alternative entails integration of the use of hydraulic controls and sediment capping to remediate the New Bedford Harbor site.

38207. The initial step in this remedial alternative involves the installation of a variable wier dam at the Coggeshall Street Bridge.

38208. This structure will allow control of tidal flow through the Upper Estuary and serve to reduce estuary dynamics to allow controlled placement of the sediment cap as well as to minimize the release of contaminants from the estuary during construction.

38209. In addition to this variable wier dam, upstream hydraulic control measures will be implemented at the New Bedford Reservoir Dam, Hamlin Street Dam, and/or the Sawmill Dam; these measures will allow some added control over Acushnet River storm

discharge during remedial program implementation.

38210. The next component of this remedial system involves construction of a 140 acre sediment/geofabric containment cap over Upper Estuary sediments.

38211. Twenty-two acres of the cap will be constructed with erosion resistant material to protect portions of the containment cap from erosion during extreme surface water discharge events, as well as to provide an additional measure of safety in areas with higher report levels of polychlorinated biphenyls (PCBs).

38212. Nineteen acres of the cap will be planted with saltmarsh grass to increase stability of the cap as well as to mitigate for impacts to the Acushnet River Estuary.

38213. Based upon a review of studies performed by the U.S. Army Corps of Engineers (USACE) as well as independent evaluation of these and other data, a 45-centimeter cap has been selected as appropriate for containment of contaminants present in Upper Estuary sediments.

38214. Of this 45 centimeters, 25 centimeters will provide a chemical barrier and safety zone to contain contaminants while the upper 20 centimeters will provide a protective zone for active bioturbation (biological movement of sediment).

38215. A sandy material will be employed for cap construction because its properties will facilitate placement and will lead to rapid cap consolidation and effectiveness in containing site contaminants.

38216. Cap placement will be performed using hydraulic methods, or in northern portions of the Upper Estuary, possibly dry placement techniques.

38217. A geofabric will be installed under the clean sediment cap to prevent intermixing between the clean cap material and existing contaminated sediments.

38218. Installation of this underlying geofabric will significantly limit the resuspension of contaminated sediments during cap installation and will provide higher structural integrity to the capping system.

38219. Precedents for the implementation of capping at other sites is well established in the literature.

38220. Examples of sites where capping has been implemented include James River in Virginia, the New York Bight Mud Dump Site, and the Simpson Tacoma Kraft Company/St. Paul Waterway.

38221. At the James River, where sediments had become contaminated with kepone, EPA decided to implement a no action remedial alternative which involved natural sediment accretion.

38222. Site monitoring initiated in 1980 has shown that kepone levels in the water column have decreased to levels below the chronic water quality criteria and that kepone concentrations in surface sediments and finfish have also significantly declined, testifying to the fact that the kepone-contaminated sediments are effectively being immobilized through a natural capping process.

38223. At the New York Bight Mud Dump Site, contaminated dredge spoil capping has been studied for nearly 10 years.

38224. Results of these studies have indicated that sediment containment caps have been effective in serving as a chemical barrier and posses physical integrity when subjected to extreme hydrodynamic (hurricane) forces.

38225. At the Simpson Tacoma Kraft site, PCBs and polycyclic aromatic hydrocarbon (PAH) contaminated intertidal sediments were capped with medium-grain sand.

38226. The ability to install such a sediment containment cap over contaminated sediments was demonstrated during this project.

38227. Environmental monitoring performed to date has indicated the effectiveness of this cap in containing both PCBs and PAHs.

38228. In designing the proposed multi-media cap, the ability of the capping system to effectively contain contaminants present in Upper Estuary sediments was identified as a critical factor.

38229. To be effective, the cap must chemically isolate the underlying contaminated sediments, provide

sufficient depth so that biological activity of benthic fauna (bioturbation) does not compromise the chemical barrier, and be of sufficient depth of design so that neither erosion nor human impacts affect performance of either the "chemical barrier" or "bioturbation zone."

38230. Qualitative assessments of the significant of ten potential PCB transport mechanisms were performed based on a review of studies performed by EPA and others.

38231. As a result of this assessment, molecular diffusion and bioturbation were considered to be the two principal mechanisms responsible for the majority of PCB flux from Upper Estuary sediment to the overlying water column.

38232. Of these two mechanisms, bioturbation within the contaminated sediment is presently believed to be the primary determinant of the rate of PCB flux.

38233. By providing a cap which effectively separates the bioturbated zone from the contaminated sediment zone, diffusion becomes the primary determinant of PCB flux within the sediment.

38234. Due to the very slow nature of diffusion contaminant transport mechanisms, it was concluded that separation of bioturbation activity from contaminant-effected sediment would result in containment of PCBs in estuary sediments.

38235. An extensive evaluation was performed of benthic species and bioturbation activity which may exist in the Upper Estuary.

38236. Based on the results of this evaluation, a 20-centimeter-thick layer of surficial sediment was selected as the bioturbation zone.

38237. The conclusion to use 20 centimeters as the thickness of the bioturbation layer is also consistent with the USACE recommendations based on their review for the potential for benthic penetration of a sediment cap.

38238. Similarly, an extensive evaluation was performed to assess the thickness of the chemical barrier of the cap.

38239. Theoretical contaminant transport considered in

combination with high-resolution site specific data as well as laboratory tests performed by USACE resulted in the selection of a cap chemical barrier thickness of 25 centimeters.

38240. An analysis in 1989 of this 45-centimeter-thick cap by Thibodeaux indicated that PCB breakthrough would not occur through the cap for a period of approximately 1,000 years.

38241. Following the occurrence of PCB breakthrough, PCB flux through the entire 140 acre containment cap was estimated to be less than 300 grams per year.

38242. The extent of the containment cap would include all areas within the Upper Estuary reported to contain greater than 50 parts per million (ppm) PCBs.

38243. The analysis by Thibodeaux indicated that 99 percent of the current PCB flux from Upper Estuary sediments is attributed to sediments containing 50 ppm PCBs or greater.

38244. Thus, capping these sediments would effectively eliminate 99 percent of the current PCB flux from the Upper Estuary.

38245. First order modeling of post-remedial water quality by ASA indicated PCB concentrations in the Upper Estuary ranged from 17 to 25 nanograms per liter (ng/l), a significant reduction from current levels.

38246. In order to evaluate the acceptability of a 50 ppm PCB clean up level for remediation of Superfund sites, a review of recent post-SARA decisions by EPA at sites similar in nature to the New Bedford Harbor site was made.

38247. Based on this review, the Waukegan Harbor Superfund site located on Lake Michigan in Waukegan, Illinois was found to be most comparable to the New Bedford Harbor site.

38248. As part of a 1988 consent order, a 50 ppm PCB action level was selected as a limit for remediation in this harbor.

38249. Based in part on the similarities between the New Bedford Harbor and Waukegan Harbor sites including geography, natural resource value, public use, and contaminant nature, as well as the timeliness of

the 1988 EPA decision for cleanup of Waukegan Harbor, a 50 ppm PCB clean up level was judged to be appropriate for the New Bedford Harbor site.

38250. The in-place containment remedial alternative will be constructed utilizing proven construction techniques.

38251. Subaqueous installation of geotextile has successfully been performed internationally for over 20 years.

38252. Methods of geotextile placement have been developed which will result in minimal resuspension of bottom sediments.

38253. As previously discussed, subaqueous caps for containment of contaminated media have been constructed at numerous sites.

38254. Experience at these sites has demonstrated that such caps can be constructed without the resuspension of significant amounts of contaminated sediments.

38255. In addition, installation of geofabric prior to

placement of the sediment cap as part of the New Bedford Harbor remedial program should further reduce the potential for bottom sediment resuspension.

38256. Because proven construction means will be used to place the containment cap, and because the Upper Estuary is well suited for the installation of this type of cap, it has been estimated that the containment cap can be constructed in a period of two to three years.

38257. Construction costs have been estimated at $17 million to $19 million, which include a 30 percent contingency factor and costs for long-term site monitoring.

38258. The principle objective in performing remediation for a Superfund site is to reduce potential threats which may be posed by the site to human health and the environment.

38259. Accordingly, post-remedial risks were estimated by Terra, Inc. (Terra) for this proposed remedial alternative.

38260. Based on Terra's evaluation, post-remedial risks due to direct contact with sediments were calculated to be below the 1×10^{-5} risk level.

38261. Similarly, post-remedial risks for consumption of seafood caught solely from the Upper Estuary were calculated. Risk estimates calculated using a Terra-derived PCB cancer potency factor were 1.87×10^{-6} to 1.66×10^{-8}.

38262. Risks calculated using the EPA cancer potency factor were within the range of risks considered acceptable by EPA.

38263. Significant short-term impacts to human health were not identified relating to implementation of this remedial alternative.

38264. As discussed above, capping the Upper Estuary should result in a substantial reduction of PCB flux from Upper Estuary sediments.

38265. This will be reflected in significantly improved water quality in all regions of the estuary.

38266. PCB levels in the water column should decrease to

approximately 17-25 ng/l in the Upper Estuary and 14-31 ng/l in the Middle and Lower Harbor; this is a reduction of about 100 fold in PCB concentration in the Upper Estuary and 10 fold in the Middle and Lower Harbor, respectively.

38267. Reduction in water column PCB concentration will result in a concomitant decrease in PCB body burden of aquatic organisms; based upon bioconcentration factors calculated by Battelle, PCB levels in edible tissue of important aquatic species should decrease below the FDA limit of 2 ppm.

38268. Compliance of the in-place containment remedial alternative with applicable or relevant and appropriate requirements (ARARs) was evaluated.

38269. This evaluation indicated that this alternative would satisfy this Superfund criterion.

38270. Similarly, an assessment was performed of the remedial action to reduce the toxicity, mobility or volume of contaminants present at the New Bedford Harbor Superfund sites.

38271. As previously discussed, the proposed cap will

effectively immobilize PCBs contained in the Upper Estuary sediment for a od of approximately 1,000 years.

38272. During this period of containment, anaerobic PCB biodegradation processes demonstrated to exist within New Bedford Harbor sediment should proceed.

38273. These processes will result in the reduction of PCB mass.

38274. Accordingly, implementation of this remedial alternative should result in the reduction of toxicity, mobility and/or volume of PCBs contained beneath the cap.

38275. In summary, the in-place remedial alternative will effectively remediate PCB contamination allegedly present within the New Bedford Harbor Superfund site without the creation of significant adverse impacts.

38276. The remedial alternative can be implemented in a relatively short period of time using existing, proven construction techniques resulting in an acceptable post-remedial level of risk to human

health and the environment and would be judged as cost-effective when compared to alternatives involving dredging, disposal, and treatment of harbor sediments.

38277. The October 1989 remedial containment proposal enumerates the reference sources relied upon.

38278. Additional references which should be included are: Geotechnical Engineers, Inc., "Exploration Program, New Bedford Superfund Site, New Bedford, MA," November 1987; Bowles, Geotechnical Properties, Testing, Index Settlement, Strength Correlations, Fourth Edition; copies of non-public documents not submitted in October were submitted with defendants' answers to Expert Interrogatories.

38279. Since October 16, 1989, Balsam has further evaluated many of the technical issues involved in the in-place containment remedy.

38280. Further analysis has been performed to assess peak storm flow velocities in the Upper Estuary (probable maximum peak flow analysis beneath the Tarklin Hill Road bridge using Manning's equation), the nature and extent of sediment bioturbation (a

biological characterization program undertaken by Balsam in March 1990 which measured benthic species type, density and depth in estuary sediment further discussed below, as well as analysis of these data by Dr. Bosworth), and the small scale vertical distribution of PCBs in estuary sediment (a supplemental thin-layer sediment sampling program undertaken by Balsam in March 1990 which provided further PCB thin-layer sediment profiles of estuary sediment, further discussed below, as well as analysis of these data by Dr. Thibodeaux), the latter both having been used to better evaluate PCB flux and the effectiveness of the proposed capping remedy.

38281. The results of these further analyses support the conclusions contained in the October 1989 remedial alternative report.

38282. Mr. Sarapas was responsible for management of the design of the August 1987 sediment sampling program undertaken by Balsam as more fully described in the protocol.

38283. Mr. Sarapas directly oversaw this field sampling program, observed the field program to be in

accordance with written protocol, and that the samples collected were appropriate for the use intended.

38284. With respect to the sediment stratigraphy and bedform morphology tasks, Mr. Sarapas observed the bedform of the upper estuary to be relatively smooth and uniform, and that observed sediment stratigraphy was as reported in his field log book.

38285. Additional observation and documentation of sediment bedform and stratigraphy was conducted as part of this program by Drs. Bohlen and Bosworth.

38286. The documents that reflect the planning, conduct and sample analysis of this sampling program are listed below. Documents are referenced by title or name and Bates numbers: i.) New Bedford Harbor Sampling Program Protocol, August 17, 1987 (Bates 9094-9108); Protocol figures (Bates 9401-9403); ii.) Sarapas Field Notes (Bates 8947-8900), Bosworth Field Notes (Bates 9409-9412); iii.) Chain-of-Custody Records (Bates 9382; 9384-9386; 9109-9114; 9116-9119; 12790-12793; iv.) Reduction-Oxidation Sediment Profine Report (Bates 9416-9429) (March 14, 1990); v.) and vi.) Data Summary,

Contaminant Screening, August 1987 Sediment Sampling Program.

38287. Mr. Sarapas has reviewed the August 1987 PCB sediment environmental variability analytical data and has found the data to be acceptable for use in assessing small-scale environmental variability of PCB concentrations in estuary sediment.

38288. The radiometric analyses of August 1987 were judged to be of little utility based on the data reported to Balsam.

38289. With respect to the Balsam October 1987 Upper Estuary eastern shore saltmarsh sediment sampling program, Mr. Sarapas was responsible for management of the design of a sampling program to further characterize Upper Estuary eastern shore saltmarsh sediments, including the identification of acceptable procedures to collect these samples.

38290. Following collection of sediment samples, Mr. Sarapas reviewed field sampling procedures with Mr. Allen Walker and concluded that the actual field sampling procedures were adequate for the intended purpose.

38291. The documents that reflect the planning, conduct and sample analysis of this sampling program are listed below. Documents are referenced by title or name and Bates numbers: i.) Field Notes (Bates 9167-9171); ii.) Chain-of-Custody Record (Bates 9173-9174); iii.) Assessment of PCB in Acushnet River Upper Estuary Saltmarsh Wetlands Sediments New Bedford Harbor October 10, 1989 (Bates 7767-7783); and iv.) Wilson Laboratory Analysis Report (Bates 9166)

38292. After receipt of the PCB sediment analytical data, Mr. Sarapas reviewed these data and found them to be acceptable to meet the above stated purpose.

38293. With respect to the Balsam February 1988 sediment sampling program, Mr. Sarapas was responsible for management of the design of this program, with the objectives as described in the February 1988 protocol.

38294. Mr. Sarapas was present in the field during a portion of the sampling program, and that he observed sampling procedures to be in accordance with written sampling protocol.

38295. Additionally, Mr. Sarapas discussed with sampling team members sampling procedures employed during the previous day and concluded that these procedures were also consistent with the written sampling protocol.

38296. The documents that reflect the planning, conduct and sample analysis of this sampling program are listed below. Documents are referenced by title or name and Bates numbers: i.) New Bedford Harbor Sampling Program February 1988 Sampling Protocol, February 22, 1988 (Bates 9121-9136); ii.) Field Notes (9142-9164); iii.) Chain-of-Custody (Bates ; iv.) IT Analytical (need full reference); v.) Sampling station decision matrix report (LCS) April 19, 1990; and vi.) PCB Biotransformation Aquatic Sediments: New Bedford Harbor and Other Sites, October 16, 1989 (Bates 8534-8838).

38297. With respect to the Balsam December 1988 sediment sampling program, Mr. Sarapas was responsible for management of the design of this sampling program as described in the December 1988 protocol.

38298. Based on his familiarity with soil and sediment

sampling procedures, as well as his review of scientific literature, Mr. Sarapas prepared a written sampling protocol for collection of sediment samples as part of this field program with special consideration being given to minimizing physical disturbance of sediment samples as well as the potential for cross-contamination of sediment samples.

38299. Based on Mr. Sarapas' conversations with Mr. Allen Walker, Balsam Field Program Manager for the December 1988 sediment sampling program, Mr. Sarapas concluded that the samples submitted for PCB analysis were suitable for the intended purpose.

38300. After receipt of the PCB sediment analytical data, Mr. Sarapas performed a review of these data and concluded that the data were acceptable to meet the intended purpose, as more fully described in the protocol.

38301. The documents that reflect the planning, conduct and sample analysis of this sampling program are listed below. Documents are referenced by title or name and Bates numbers: i.) Protocol - New Bedford

Harbor Thin Layer Sediment Sampling Program December 1988 Program, December 12, 1988 (Bates 740-751); ii.) Field Notes (Bates 756-759); iii.) Daily Field Report (Bates 733-739); iv.) Chain-of-Custody Record (Bates 752-754; 12095); v.) Letter from Dr. Bohlen to Dr. Bosworth, September 12, 1988 (Bates 9406-9408); and vi.) New Bedford Harbor Thin Layer Sediment Sampling Program, August 11, 1989 (Bates 7336-7512), Attachment D.

38302. With respect to the March 1990 Balsam sampling program, Mr. Sarapas managed the development of sampling program design as described in the March 1990 protocols.

38303. As with the December 1988 sediment sampling program, the design of this program included consideration of the collection of undisturbed sediment samples from the estuary, and processing of these samples so to minimize the potential for cross contamination.

38304. Based on Mr. Sarapas' discussions with Mr. Allen Walker, the sediment samples collected as part of this sampling program were suitable for the intended purpose.

38305. The documents that reflect the planning, conduct and analysis of this sampling program are listed below. Documents are referenced by title or name and Bates numbers: i.) New Bedford Harbor Supplemental Thin Layer PCB Sediment Sampling Program March 1990, Sampling Protocol, March 9, 1990 (Bates 12835-12847); ii.) New Bedford Harbor Supplemental Thin Layer Biological and Descriptive Parameter Sediment Sampling Program March 1990, Sampling Protocol, March 9, 1990 (Bates 128781-12886); iii.) Field Notes (Bates 12829-12834); iv.) Daily Field Report (Bates 12821-12828); v.) Chain-of-Custody Records (Bates 12848-12820; 12848-12850); vi.) American Analytical Laboratory Reports; and vii. Normandeau Associates, Inc. Laboratory Reports (Bates 12851-12856).

38306. Following receipt of the PCB sediment analytical data, Mr. Sarapas performed a review of these data and concluded that the data were suitable for the use intended.

38307. Additional facts and opinions to which Mr. Sarapas is expected to testify are further detailed in the following RFAs.

38308. Nancy Seabolt received a B.S. in Chemistry from North Georgia College, and an M.S. in Chemistry from the University of Georgia.

38309. Ms. Seabolt is employed as the Technical Specialist for Gas Chromatography by IT Analytical Services ("IT").

38310. Attachment Q. II. 0027 is a true and accurate copy of the curriculum vitae of Ms. Seabolt.

38311. Attachment Q. II. 0027 is a true and accurate copy of Ms. Seabolt's education, training and experience.

38312. Ms. Seabolt is qualified to testify concerning the receipt, preparation, extraction, aliquoting and GC/EC analysis of sediment samples collected by Balsam Environmental Consultants, Inc. in February, 1988 from the Acushnet River Upper Estuary.

38313. Samples (IT Project Nos. BME 40805 and BME 40786) were analyzed by IT, first by packed column and subsequently by capillary column GC/EC analysis.

IT employed special procedures to assure the production of data for the BME 40805 and BME 40786 samples which would exhibit complete PCB chromatographic patterns with 90-95% full scale deflection for major peaks.

38314. Ms. Seabolt supervised the analysis of the samples, including the implementation of procedures necessary to generate research-grade chromatograms.

38315. A variety of mixed Aroclor standards were prepared and analyzed for use in connection with pattern identification in environmental samples.

38316. Sample extracts for IT Project No. YOK 43544 were subjected to a screening analysis by packed column GC/EC to confirm that the samples had not degraded during storage.

38317. These packed column chromatograms exhibited no pattern alterations relative to chromatograms generated by the original analyses.

38318. Additional facts and opinions to which Ms. Seabolt is expected to testify are further detailed in the following RFAs.

38319. Maurice Smith has a Doctorate in Chemistry from the University of Alabama.

38320. Attachment Q. II. 0028 is a true and accurate copy of the curriculum vitae of Dr. Smith.

38321. Attachment Q. II. 0028 is a true and accurate description of Dr. Smith's education, training and experience.

38322. Dr. Smith is President and Senior Chemist for American Analytical Laboratories, Inc.

38323. Dr. Smith personally supervised the preparation, extraction and capillary column GC/EC analysis of sediment samples collected by Balsam Environmental Consultants, Inc. from the Acushnet River Upper Estuary in March 1990 (American Analytical Project No. 2533).

38324. The samples were analyzed substantially in accordance with SW-846 Method 8080 and that, in his opinion, PCBs are present in the samples at the concentrations specified in American Analytical's report dated April 7, 1990.

38325. Additional facts and opinions to which Dr. Smith is expected to testify are further detailed in the following RFAs.

38326. Bradley S. Taylor is employed by Normandeau Associates, Inc. as the Assistant Manager of the Analytical Laboratory. Mr. Taylor has a B.A. in biology from Budnell University and over 13 years experience as a microbiologist.

38327. Attachment Q. II. 0029 is a true and accurate copy of the curriculum vitae of Mr. Taylor.

38328. Attachment Q. II. 0029 is a true and accurate description of Mr. Taylor's education, training and experience.

38329. Samples collected by Balsam Enviornmental Consultants, Inc. from New Bedford Harbor on March 12, 1990 were delivered to the Normandeau Associates, Inc. laboratory in Aiken, S.C. for total organic carbon and dissolved organic carbon analysis.

38330. Laboratory procedures and methodology utilized for

analysis of these samples met Normandeau Associates Quality Control criteria.

38331. Additional facts and opinions to which Mr. Taylor is expected to testify are further detailed in the following RFAs.

38332. Dr. Louis J. Thibodeaux is a Professor of Chemical Engineering and Director of the Hazardous Waste Research Center at Louisiana State University.

38333. Attachment Q. II. 0030 is a true and accurate copy of the curriculum vitae of Dr. Thibodeaux.

38334. Attachment Q. II. 0030 is a true and accurate description of Dr. Thibodeaux's education, training and experience.

38335. Dr. Thibodeaux has over 25 years experience in the study of the fate and transport of chemicals in the environment.

38336. Dr. Thibodeaux is qualified to testify about the effectiveness of in-situ capping of contaminated bed sediment in the Upper Estuary of New Bedford Harbor (NBH) as a mechanism to retard the movement

of PCB from the sediment to the water column, as more fully described in his study, "A Theoretical Evaluation of the Effectiveness of Capping PCB Contaminated New Bedford Harbor Bed Sediment," Bates No. 7181 to 7279, October 9, 1989, which was first produced to plaintiffs on October 16, 1989 as Attachment B to the Balsam Capping Submittal.

38337. The most important chemical transport mechanisms known to be operative in bed sediment were reviewed for significance with respect to the New Bedford Harbor PCB contamination problem.

38338. Four were identified for consideration: absorption/desorption of PCBs between solids and porewater, molecular diffusion within porewater, sediment deposition and bioturbation.

38339. Both steady-state and transient modes were considered.

38340. These processes taken together affect the transport of PCBs from the sediment to the overlying water.

38341. Molecules desorbed from sediment particles or absorbed onto particles are transported by a

combination of molecular diffusion and bioturbation.

38342. This brings the PCBs to the sediment-water interface.

38343. From here additional desorption occurs and molecules in solution move through the benthic boundary layer entering the overlying water.

38344. Fallout of relatively clean particles moves downward into the bed.

38345. This attenuates the flux by providing fresh adsorption sites and a lengthened diffusion path.

38346. Equations for the above processes are presented in his study.

38347. Thin layer sediment samples obtained from cores at two sites in the Upper Estuary (NBH-UE) were studied to better understand the in-bed transport processes.

38348. These processes are dominant in controlling the rate of PCB release to the water column.

38349. This data and other information from the site suggested that the transport of Aroclors 1242 and 1254 was occurring primarily by bioturbation processes within the top 10 cm of the sediment.

38350. A transient model was used to extract the biodiffusion coefficient for each Aroclor.

38351. The coefficients fell within a range of reported values for the New England coastal region.

38352. Deep within the sediment molecular diffusion was the observed process.

38353. This conclusion was also supported by the thin section profiles data.

38354. A steady-state flux model was developed using the above biodiffusion parameters and the benthic boundary layer resistance.

38355. Sediment PCB concentration data averaged over 30 1/2 cm depths and available for both Aroclors throughout the NBH-UE was used in the flux equation.

38356. The data was available as isopleths of PCB concentrations, Figures 1-4 in his study.

38357. Uncertainties in the values of the biodiffusion coefficient, bioturbation depth and sediment concentrations caused a large variation in the annual PCB flux rate. [Treating each Aroclor separately and summing yielded 1674 kg/y minimum and 15,500 kg/y maximum with 8569 kg/y as the average.]

38358. It was found from the flux computation exercise that 15 percent of the NBH-UE surface was relatively absorbing PCBs from the water column.

38359. It was also found that 97 percent of the PCBs were originating from 60 percent of the NBH area.

38360. An overall mass balance model was used next in an attempt at a different theoretical approach of estimating the flux.

38361. This model is based on measured Aroclor concentrations in the water column as the data base.

38362. A long-term average (i.e., yearly) approach was adopted for this steady-state model also.

38363. The model elements for the NBH-UE has three PCB fate components: flux from the sediment and evaporation to the air or flow out under the Coggeshall Bridge ("CB").

38364. A connected model for the NBH-UE had flow through CB and the hurricane barrier as the only elements.

38365. It was also calculated that 41 percent of the PCBs evaporate from the water surface into the surrounding air.

38366. A water flow-by-concentration model was used next.

38367. It is based on water flow and PCB concentration measurements in the tidal flow under the Coggeshall Street Bridge.

38368. The range of coincidence of predictions based on the above three models suggest the most probable PCB flux range is 500 to 6000 kg/y.

38369. The effectiveness of in-situ capping was considered primarily from a theoretical point of view.

38370. Although capping is widely practiced, there is no coherent theory for the process and few experimental laboratory observations.

38371. What little data there is was reviewed; none was found for hydrophobic contaminants such as PCBs.

38372. The available date was nonetheless encouraging.

38373. From the thin layer analysis it was estimated that the effective PCB biodiffusion transport coefficent near the surface, which is a particle process, is 300,000 to 900,000 times larger than the pure porewater molecular diffusion transport process occurring deeper within the sediment (greater than 15 cm).

38374. The primary theoretical objective of capping is the subjection of PCBs to a low chemical transport environment, such as exists deep with the sediment, in order that a high degree of isolation may be achieved with only very small quantitites of PCBs entering the water column.

38375. Basically, the zone inhabited by aerobic microorganisms and macrofauna will be translocated upward by the cap.

38376. These organisms will recolonize the surface layers of the cap so that the zone of bioturbation will be within the cap and away from the PCB-contaminated layers.

38377. Bed consolidation subsequent to cap replacement will force PCB-laden porewater upward.

38378. A theoretical analysis of the process suggests that PCBs which emerge will be immobilized onto the solid surfaces of the cap material after moving only a very short distance, expected to be on the order of one to two centimeters.

38379. The theoretical analysis included water advection, dispersion, molecular diffusion and adsorption of PCBs.

38380. PCB breakthrough times calculations were based on transient moloecular diffusion through a sorptive porous medium.

38381. The total cap thickness is assumed to be 45 cm.

38382. Of this 10 to 20 cm may be occupied by organisms and here, rapid PCB transport by bioturbation is assumed to occur.

38383. The remaining depth, 25 to 35 cm, is to serve as the chemical barrier.

38384. Breakthrough times were estimated for beds of this thickness.

38385. Calculations were performed for both Aroclor 1242 and 1254 with two cap materials.

38386. For a 35 cm bed with 1 percent organic matter approximately 900 years lapse prior to Aroclor 1242 breakthrough.

38387. A time period in excess of 15,000 years is required for Aroclor 1254.

38388. The cap material was assumed to be a local sand deposit.

38389. Similar long breakthrough times are expected if a clean silty sediment from the NBH is used as the cap material.

38390. New field data from thin layer cores (see Balsam Exhibit 1) indicates much higher (5-20%) organic carbon content than was assumed here.

38391. Some time period after breakthrough the steady-state PCB flux through the cap will be achieved.

38392. This is the maximum release rate.

38393. The flux equation has three chemical resistances in series and was developed in the first part of the study to address the uncapped PCB release rate.

38394. The so-called "thermodynamic solubility limit" concept applies to the capped PCBs and limits the porewater concentration to the solubility maximum in seawater.

38395. This factor further enhances the effectiveness of the chemical barrier.

38396. The isopleth concentrations and fractional areas

used above in the uncapped calculation were also used in this steady-state computation.

38397. The total PCB emission rate after capping is the sum of all Aroclors and was found to be 196 g/y (0.196 kg/y).

38398. This is very low if the present release rate is in the range of 500 to 6000 kg/y.

38399. The capping effectiveness is 99.96 percent to 99.997 percent compared to present estimates of PCB flux.

38400. Under steady-state flux condition concentration in surface sediment are calculated to be 200 ppb for Aroclor 1242 and 28 ppb for Aroclor 1254.

38401. A bench scale laboratory experiment which was conducted to simulate sediment bed capping in the Upper Estuary.

38402. This is a brief summary of a paper that is in preparation entitled: "The Efficiency of Capping Contaminated Bed Sediments in-situ--1. Lab-Scale Experiments of Diffusion/Adsorption in the Capping

Layer," X-Q, Wang, University Petroleum, Beijing, China; L.J. Thibodeaux, Kallist T. Valsaraj and D.D. Reible, Louisiana State University, Baton Rouge, Louisiana 70803. The work was performed at L.S.U. and directed by Thibodeaux.

38403. This bench scale simulation was performed to observe the transport of the hydrophobic organic compound 2,4,6 trichlorophenol ("TCP"), through a capping layer placed over a contaminated sediment inoculated with TCP.

38404. A Capping Simulator Cell ("CSC") was designed to simulate a submerged cap over a contaminated sediment.

38405. Figure 2 in Defendants' Answers to Expert Ints. shows details of the CSC.

38406. In normal operation, the bottom chamber is filled with a sample of the contaminated sediment (slurry).

38407. The top chamber is placed on and attached by screw bolts.

38408. The sediment is leveled and a wet capping sediment is carefully spread over and it is leveled to the desired depth.

38409. For simulation studies, a continuous flow of water at 5 to 75 ml/h by a peristaltic pump moves over the surface of the sediment.

38410. The outflow is collected and analyzed for its TCP content.

38411. Table 1 of Defendant's Answers to Expert Ints. contains the characteristics of the sediments used in the study. The Kp values in the last column are measured volumes.

38412. Water pH was less than or equal to 4.0 at all times so TCP was the neutral species.

38413. A batch of contaminated sediment was prepared using TCP as chemical species.

38414. Antibiotics were added to eliminate bioactivity in the sediment.

38415. The source of the sediment was University Lake on

the L.S.U. Campus, Baton Rouge, Louisiana.

38416. One of the first experiments was with an uncapped contaminated sediment.

38417. Figure 6 (id.) shows the data and the model simulation (solid line).

38418. This curve clearly displays the usual falling curve molecular diffusion transport process from a finite source.

38419. Figures 8 and 9 (id.) show the results for capping with very thin layers (6 mm for quartz and 7 mm for others).

38420. The reference to Balsam on Figure 8 refers to New Bedford Harbor sand provided to Thibodeaux by Balsam for purposes of this experiment.

38421. Initially, the flux of TCP through the clean cap material is 0.0 $mg/cm^2/s$.

38422. Quantities move from the contaminated underlayer into the clean material where sorption of TCP takes place.

38423. Eventually breakthrough occurs and TCP appears in the outflow.

38424. The rate increases with time, goes through a maximum and then decreases slowly thereafter.

38425. Table 2 (id.) summarizes the breakthrough times.

38426. In general, as the organic matter content of the sediment increases so does breakthrough time.

38427. This was expected based upon the theory of retarded diffusion for hydrophobics.

38428. Concentrations of PCB in the upper part of the sediment column are lower than those concentrations deeper in the sediment and that previous sampling by U.S. EPA and the Army Corps of Engineers was too gross to resolve this characteristic of vertical distribution.

38429. The observed distribution is consistent with his theories of PCB flux from the sediments and that this distribution indicates that over time the concentration of PCB in the upper strata of the

sediment will become even less concentrated resulting in further decrease in the flux of PCBs from the sediment.

38430. Examination of more recent thin layer coring data provides further verification of his theory.

38431. Based on a model that Dr. Thibodeaux has developed to show the simulated rate of PCB flux in an environment of continuing sediment deposition, it is likely that if PCB inputs into the Estuary and subsequently into the sediment had ceased at the end of 1972 there would be substantially less PCB flux from sediments today.

38432. The results of this model indicate that: Aroclor 1242 flux at Site FX due to PCBs discharged prior to 1973 is estimated to be about 56% of the current estimated model flux 1.49 mg/(sq. cm-yr); the Aroclor 1254 flux is about 41% of the current flux of 0.31 mg/(sq. cm-yr), although estimates are less certain for Aroclor 1254.

38433. Additional facts and opinions to which Dr. Thibodeaux is expected to testify are further detailed in the following RFAs.

38434. James M. Tiedje has a Bachelor's degree in Agronomy (science option) from Iowa State University (1964), and an M.S. (1966) and Ph.D. (1968) in Soil Microbiology from Cornell University.

38435. Dr. Tiedje is a Professor in the Department of Crop and Soil Sciences and the Department of Microbiology and Public Health, Michigan State University.

38436. Attachment Q. II. 0031 is a true and accurate copy of the curriculum vitae of Dr. Tiedje.

38437. Attachment Q. II. 0031 is a true and accurate description of Dr. Tiedje's education, training and experience.

38438. Dr. Tiedje has extensive experience in the study of anaerobic microbial degradation of halogenated aromatic compounds, including particularly PCBs, in soils and sediments.

38439. Dr. Tiedje is qualified to testify to the state of scientific knowledge concerning the *in situ* degradation of residues of chlorinated aromatic

compounds, such as PCBs, by indigenous microbial populations and the ecological factors that affect the occurrence and mechanisms of this phenomenon.

38440. Dr. Tiedje has participated in various studies addressing the anaerobic microbial dechlorination of PCBs, see, e.g., Quensen, J.F., J.M. Tiedje, and S.A. Boyd. 1988. Reductive Dechlorination of Polychlorinated Biphenyls by Anaerobic Microorganisms from Sediments. Science 242: 752-754, and the studies performed by other researchers, such as J.F. Brown, Jr.

38441. Dr. Tiedje has participated in the design and execution of the experiment described in the paper entitled "Dechlorination of Aroclor 1248 by Microorganisms from New Bedford Harbor Sediments," by J.F. Quensen and J.M. Tiedje (April 1990).

38442. The objective of experimental design was to create an appropriate and representative environment for microbiological activity.

38443. The results of the experiment in terms of assessment of the capacity of the microbiological community in New Bedford Harbor sediments to

dechlorinate PCBs.

38444. In Dr. Tiedje's opinion, PCB dechlorinating microorganisms currently exist in New Bedford Harbor sediments, and, in his opinion, anaerobic microbial dechlorination is among the mechanisms responsible for the Aroclor pattern alterations evident in chromatograms of New Bedford Harbor sediment samples.

38445. Additional facts and opinions to which Dr. Tiedje is expected to testify are further detailed in the following RFAs.

38446. Allen R. Walker is employed as a Project Engineer by Balsam Environmental Consultants, Inc. (Balsam).

38447. Mr. Walker obtained a B.S. in Engineering Technology from Norwich University in 1980 and a M.S. in Sanitary Engineering from Virginia Polytechnic Institute and State University in 1983.

38448. Attachment Q. II. 0032 is a true and accurate copy of the curriculum vitae of Mr. Walker.

38449. Attachment Q. II. 0032 is a true and accurate

description of Mr. Walker's education, training and experience.

38450. Mr. Walker has also been a licensed Professional Engineer since 1990 in the State of New Hampshire.

38451. For four sampling programs performed in New Bedford Harbor, New Bedford, Massachusetts, Mr. Walker was involved with program implementation, sample collection and sample preparation for laboratory analysis.

38452. Mr. Walker was responsible for field operations and sample collection for the Balsam October 1987 Upper Estuary eastern shore saltmarsh sediment sampling program.

38453. Mr. Walker was assisted by Mr. Sean McGrath.

38454. Soil samples were collected along six transects across the saltmarsh area.

38455. Three stations were sampled along each transect.

38456. Two samples were collected at each of these stations.

38457. The first sample designated with an A, was collected from the ground surface to 6 inches below the ground surface.

38458. The sample from this horizon was placed in a stainless steel bowl and was homogenized.

38459. The homogenized sample was then placed in a sample container, which was labeled and placed in a cooler with ice.

38460. The second sample, designated with a B, was collected below or next to the first sample from 6 to 12 inches below ground surface.

38461. This sample was similarly homogenized, contained, labeled and placed in a cooler.

38462. Prior to initiating these sampling activities Mr. Walker discussed acceptable sampling protocol to collect these samples with Mr. Leonard Sarapas.

38463. Sampling procedures were similar to previous protocol implemented by Balsam for the collection of soil samples.

38464. Sampling equipment and samplers' gloved hands were decontaminated prior to collection of each sample by washing and scrubbing with a potable water and trisodium phosphate solution followed by a potable water rinse.

38465. As stated above, following collection of samples, samples were placed in containers provided by the analytical laboratory.

38466. These sample containers were labeled and the samples placed in a cooler with ice.

38467. Following sampling activities, chain-of-custody forms were initiated which were carried with the samples during transport to the analytical laboratory by an overnight delivery service.

38468. In addition to these documents, field notes describing information such as sampling program general activities, dates, personnel and weather were kept by Mr. Walker during the sampling program.

38469. The documents that reflect the planning and

conduct of this sampling program are listed below.

38470. Documents are referenced by title or name and Bates numbers: (i) Field Notes (Bates 9167-9171); (ii) Chain-of-Custody Record (Bates 9173-9174); (iii) Assessment of PCB in Acushnet River Upper Estuary Saltmarsh Wetlands Sediments New Bedford Harbor - October 10, 1989 (Bates 7767-7783), Attachment I to the Balsam capping submittal.

38471. Mr. Walker was responsible for field operations sample collection and sample preparation with respect to the Balsam February 1988 sediment sampling program.

38472. These samples were collected from the Upper Estuary of New Bedford Harbor from an outboard boat.

38473. Samples were collected using a sediment core sampling device.

38474. This device was designed to collect samples representative of the environmental condition of the Upper Estuary.

38475. This sampling device was used to collect sediment

samples from the surface of the sediment to approximately 24 inches below the sediment surface.

38476. Prior to initiating sampling, a sampling protocol was written and carried into the field during sampling activities.

38477. Mr. Leonard Sarapas was the primary author of this sampling protocol.

38478. Mr. Walker discussed protocol with Mr. Sarapas prior to initiating sampling activities and was instructed as to the locations to collect samples by the protocol and Mr. Sarapas.

38479. A field log describing information such as general activities, dates, personnel, weather and deviations from sampling protocol were recorded during the sampling event.

38480. In accordance with the protocol, collected core samples were extruded in the field, processed in the field, placed in laboratory-prepared sample containers, labeled, and then placed in a cooler with ice.

38481. Chain-of-custody forms were initiated following sampling activities and were carried with the samples during transport to the analytical laboratory by the overnight delivery service.

38482. The documents that reflect the planning and conduct of this sampling program are listed below.

38483. Documents are referenced by title or name and Bates numbers: (i) New Bedford Harbor Sampling Program February 1988 Sampling Protocol, February 22, 1988 (Bates 9121-9136); (ii) Field Notes (9142-9164); and (iii) Chain-of-Custody Records (Bates 9137-9140).

38484. With respect to the Balsam December 1988 sediment sampling program, Mr. Walker was responsible for field operations, sample collection and sample preparation for this sampling program referred to as the Thin Layer Sediment Sampling Program.

38485. As with the Balsam February 1988 sediment sampling program, sediment samples were collected from a boat using a sediment core sampling device specifically designed for this purpose.

38486. Prior use of this sampling device indicated it should provide samples representative of the environmental condition of the Upper Estuary.

38487. Samples were collected from the sediment surface to approximately 24 inches below the sediment surface at two sampling stations.

38488. Immediately upon collection of a sample in the field, the core barrel sediment sample was capped on the bottom to prevent possible loss of sample.

38489. The core barrel sampler was then detached from the sediment core sampling device and the top of the core barrel sampler was capped with a screw plug.

38490. The core barrel sampler was then vertically stored on board the boat and packed with ice.

38491. Written sampling protocol was prepared prior to initiating sampling activities in the field.

38492. The protocol discussed collection of samples in the field and processing of samples following transport to University of Connecticut laboratory facilities.

38493. Mr. Sarapas was the primary author of the protocol.

38494. Mr. Walker reviewed, commented on and discussed protocol with Mr. Sarapas prior to initiating sampling activities.

38495. Upon completion of sampling activities on the boat, samples were transported with the cores being maintained in a vertical position to the University of Connecticut laboratory facilities in Groton, Connecticut for further processing.

38496. Further processing involved the extrusion of the sediment samples from the core barrel sampler under laboratory conditions.

38497. Upon extrusion, samples were then processed by sectioning the core sample into sections or subsamples as described in the protocol.

38498. A field log was maintained during sampling activities and also during extrusion and sectioning of sediment samples at the University of Connecticut facilities.

38499. This field log described information such as

general activities, dates, personnel, weather and deviations from protocol.

38500. At the University of Connecticut laboratory, two sediment core samples were extruded and sectioned from each two of the sampling stations.

38501. The first core sample extruded was from station FX.

38502. Core FX-1 was extruded first and sectioned according to protocol.

38503. Immediately upon sectioning a sample, the center portion of the thin-layer sample was placed in a glass container provided by the analytical laboratory, which was then labeled according to the protocol and the sample container was placed in a cooler with ice.

38504. Prior to the collection of each thin-layer subsample, decontamination of sampling equipment and samplers' gloved hands was performed as described in the protocol.

38505. Upon completion of the sectioning of core sample FX-1, core sample FX-4 was then extruded and

sectioned in the laboratory.

38506. Subsample sections from core sample FX-4 were placed in the appropriate container which contained a similar depth subsample from core sample FX-1.

38507. These similar subsamples were then homogenized to provide a representative sample of adequate sample volume for analysis for that sample horizon.

38508. A similar sample preparation process was followed for processing of the two sediment core samples from Station DR.

38509. Upon completion of sample processing, chain-of-custody forms were initiated and were carried with the samples during transport to the analytical laboratory by Mr. Walker.

38510. The documents that reflect the planning and conduct of this sampling program are listed below.

38511. Documents are referenced by title or name and Bates numbers: (i) Protocol - New Bedford Harbor Thin Layer Sediment Sampling Program December 1988 Program, December 12, 1988 (Bates 740-751);

(ii) Field Notes (Bates 756-759); (iii) Daily Field Report (Bates 733-739); and (iv) Chain-of-Custody Record (Bates 752-754; 12095).

38512. With respect to the Balsam March 1990 sediment sampling program, Mr. Walker was responsible for field operations, sample collection and sample processing for this sampling program referred to as the Supplemental Thin Layer Sediment Sampling Program.

38513. This sampling program was similar to the December 1988 Thin Layer Sediment Sampling Program previously described.

38514. However, two sampling program elements were undertaken with samples collected from four stations within the Upper Estuary.

38515. The first sampling program element involved collection of sediment samples for thin-layer PCB analyses.

38516. The second sampling program element involved the collection of sediment samples for biological species identification and abundance, grain size,

dissolved organic carbon (DOC) and total organic carbon (TOC) analyses.

38517. Written sampling protocol was prepared prior to initiating sampling activities.

38518. Mr. Sarapas and Mr. Walker were the primary authors of the protocol, with Dr. Weldon Bosworth providing guidance for development of the second sampling program element protocol.

38519. Sampling stations were selected prior to implementing the sampling activities and were noted in the protocol.

38520. Written protocol were carried into the field during sampling activities.

38521. At each of the four sediment sampling stations, up to five core samples were collected.

38522. Samples were collected using a sediment core sampling device specifically designed for this purpose.

38523. This sampling device was the same used in previous

Balsam sediment sampling programs.

38524. Sediment samples collected using this sediment core sampling device should provide representative environmental samples from the Upper Estuary.

38525. As with previous Balsam sediment sampling programs in the Upper Estuary, samples were collected from the sediment surface to approximately 24 inches below the sediment surface.

38526. To collect samples for biological species identification, Mr. Joseph Payne from Normandeau Associates, Inc. ("Normandeau") was a sampling team member.

38527. Mr. Payne's role was to process in the field samples for the biological species identification.

38528. One of the five core samples collected at each station was extruded in the field for Mr. Payne to process.

38529. This core sample was sectioned into subsamples and the subsamples sieved in the field with a 0.5 millimeter opening sieve.

38530. Following sieving of the subsamples, the material collected within the sieve was placed in a specimen jar and preserved by adding a 6 percent formalin solution.

38531. At that time, custody of the samples was then transferred to Normandeau.

38532. Sediment core samples not designated for biological analyses were stored on board the boat in a vertical position while being packed with ice.

38533. These sediment core samples were contained in core barrels which were capped on the bottom and sealed at the top with a screw plug.

38534. Upon completion of sampling activities, core samples were removed from the boat, placed in a holding container in a vertical position, repacked with ice, and secured in a van for transport.

38535. The secured core samples were then transported to the University of Connecticut laboratory facilities by Balsam personnel for further processing.

38536. Sample processing at the University of Connecticut facilities involved extrusion of the sediment samples from the core barrels and sectioning of core samples in accordance with the protocol.

38537. Mr. Walker supervised the extrusion and sectioning of the sediment samples by Balsam employees.

38538. For PCB analyses, at least one sediment core sample from each sampling station was extruded and sectioned according to protocol.

38539. The center of each subsample from the sectioning process was immediately placed into a glass container provided by the analytical laboratory which was then labeled according to the protocol and placed in a cooler with ice.

38540. For grain size analyses, one of the remaining sediment core samples from each sampling station was extruded in the laboratory and sectioned according to the protocol.

38541. The center of each subsample placed in a plastic container provided by the analytical laboratory.

38542. The sample was then labeled according to the protocol and placed in a cooler with ice.

38543. For the DOC and TOC analyses, one of the remaining sediment core samples from each sampling station was extruded in the laboratory and sectioned according to the protocol.

38544. The center of a subsample was placed in a glass container provided by the analytical laboratory.

38545. As with the other subsamples, these containerized subsamples were labeled according to the protocol and then placed in a cooler with ice.

38546. A field log describing information such as general sampling activities, dates, personnel, weather, and deviations from protocol was maintained during sampling activities.

38547. A field log of sample preparation activities was also maintained containing similar information.

38548. Upon completion of sample extrusion, sectioning and packaging, an inventory of all samples collected was performed.

38549. Samples were placed in reinforced coolers with ice to be shipped to the respective laboratories for analysis.

38550. Chain-of-custody forms were generated for each of the samples which were carried with the associated samples during transport to the analytical laboratory by an overnight delivery service.

38551. The documents that reflect the planning and conduct of this sampling program are listed below.

38552. Documents are referenced by title or name and Bates numbers: (i) New Bedford Harbor Supplemental Thin Layer PCB Sediment Sampling Program March 1990 Sampling Protocol, March 9, 1990 (Bates 12835-12847); (ii) New Bedford Harbor Supplemental Thin Layer Biological and Descriptive Parameter Sediment Sampling Program March 1990 Sampling Protocol, March 9, 1990 (Bates 12871-12886); (iii) Field Notes (Bates 12829-12834); (iv) Daily Field Report (Bates 12821-12828);and (v) Chain-of-Custody Records (Bates 12814-12820; 12848-12850).

38553. Additional facts and opinions to which Mr. Walker

is expected to testify are further detailed in the following RFAs.

38554. William Thomas Wilson received a B.A. in Biology from Vanderbilt University.

38555. Mr. Wilson has completed course work at the University of Tennessee for a Ph.D. in Chemistry.

38556. Mr. Wilson is employed as the Gas Chromatography/Mass Spectrometry Supervisor by IT Analytical Services ("IT").

38557. Attachment Q. II. 0033 is a true and accurate copy of the curriculum vitae of Mr. Wilson.

38558. Attachment Q. II. 0033 is a true and accurate description of Mr. Wilson's education, training and experience.

38559. IT's GC department analyzed by GC/MS of certain extracts prepared from sediment samples collected by Balsam Environmental Consultants, Inc. in February, 1988 from the Acushnet River Estuary (IT Project No. YOK 43544).

38560. The GC/MS analysis of the YOK 43544 extracts was conducted in two phases, each of which was specially designed to generate high resolution mass spectra, supporting homolog or congener-specific identification and determination of the relative abundance of PCB homologs or isomers in environmental residues.

38561. The first phase of GC/MS analysis in Project No. YOK 43544 involved the establishment of an identification and quantitation system derived from reference materials describing the relative abundance of the various PCB homolog groups occurring in commercial Aroclor preparations.

38562. Mass spectrometry was applied to permit the identification and relative quantitation of PCB homologs with minimal interference by congeners from other homolog groups.

38563. In Mr. Wilson's opinion, the data generated by this method produced valid results, in terms of homolog identification and quantitation.

38564. The second phase of GC/MS analysis of extracts from Project No. YOK 43544 involved the identification

and quantitation of individual PCB congeners by reference to PCB congener standards.

38565. The precise methodology employed is described in Mr. Wilson's narrative for YOK 43544, phase two (NMF Doc. No. 003069).

38566. In Mr. Wilson's opinion, the results of the phase two analyses are valid, providing maximum PCB congener peak resolution and separation.

38567. Additional facts and opinions to which Mr. Wilson is expected to testify are further detailed in the following RFAs.

38568. Anna M. Yoakum, a principal in the environmental consulting firm of Yoakum & Associates, Inc., received her Ph.D. in Analytical Chemistry from the University of Florida.

38569. Attachment Q. II. 0034 is a true and accurate copy of the curriarlum vitae of Dr. Yoakum.

38570. Attachment Q. II. 0034 is a true and accurate copy of Dr. Yoakum's education, training and experience.

38571. Prior to her retirement, in 1986, from full-time employment as a Senior Technical Consultant for International Technology Corporation in Knoxville, Tennessee, Dr. Yoakum spent the entire 30 years of her professional career as an analytical chemist.

38572. Dr. Yoakum was co-founder and Laboratory Director of Stewart Laboratories, Inc., an independent analytical testing laboratory founded in 1968 and acquired by the International Technology Corporation in 1981.

38573. While at Stewart Laboratories, Dr. Yoakum designed and directed extensive research and method development programs in the area of organic and inorganic analytical methodology relating to environmental assessments -- especially those dealing with water, effluents, biological tissues, environmental samples, hazardous waste, and air particulates.

38574. During Dr. Yoakum's 13 years as Laboratory Director, she directed over 15,000 analytical projects and served as the Project Director for 25 government contracts.

38575. Dr. Yoakum had the management responsibility for the development of a company Quality Assurance Program.

38576. Dr. Yoakum wrote the quality assurance manual and was instrumental in the implementation of the overall QA/QC plan.

38577. Dr. Yoakum is a specialist in the area of polychlorinated biphenyl (PCB) sampling and analysis.

38578. Dr. Yoakum was actively involved in all aspects of environmental sampling and analysis of PCBs from 1970 until her retirement in 1986.

38579. This involvement included the interpretation of data and preparation of reports for the analysis of PCB mixtures in complex waste samples and environmental matrices using GC and GC/MS; analytical methods development and the design of special studies including a Collaborative Testing Program for the analysis of fish and sediments; confirmation of Aroclor degradation in sediments; and an assessment of PCB transport in a river system.

38580. Dr. Yoakum's PCB project experience includes environmental evaluations, litigation support and expert testimony, PCB incinerator trial burns, analytical support of site remediation projects, sampling and analysis for emergency spill response, environmental monitoring for NPDES discharge compliance, and building contamination assessments involving PCB transformer fires.

38581. Additional facts and opinions to which Dr. Yoakum is expected to testify are further detailed in the following RFAs.

COMMENTS OF AVX CORPORATION ON DRAFT FINAL FEASIBILITY STUDY OF REMEDIAL ALTERNATIVES FOR THE ESTUARY AND LOWER HARBOR/BAY VOLUMES I-III, AUGUST 1990; ON DRAFT FINAL SUPPLEMENTAL FEASIBILITY STUDY EVALUATION FOR UPPER BUZZARDS BAY NEW BEDFORD HARBOR RI/FS NEW BEDFORD, MA, MAY 1992; ON PROPOSED PLAN, JANUARY 1992; AND ON ADDENDUM PROPOSED PLAN, MAY 1992.

SUBMITTED JULY 13, 1992

ATTACHMENT E
VOL. II

CAPSULE VERSION OF RFAs BY ROSEBROOK

GCA/VERSAR - SERIES 256-A

This series has two or three kinds of problems. The results are apt to be biased high by 30% or more, often attributable to single point calibration. In addition, used the "baseline to baseline" quantitation technique, which guarantees high results unless the samples are squeaky clean. Constancy of identification of which PCB is present is a problem and the evidence is that the laboratory can't tell them apart. Assignment of PCB i.d. to non-PCB materials is also a problem.

SAMPLE BY SAMPLE REVIEW WOULD BE REQUIRED IN ORDER TO DETERMINE ACCEPTABILITY. MANY OR MOST WOULD NOT BE ACCEPTABLE, SOME WOULD BE ACCEPTABLE WITH SUITABLE RECALCULATION, SOME FEW ARE CURRENTLY ACCEPTABLE.

GCA/VERSAR - SERIES 316-AA

The main problems with this series of analytical results appeared to be constancy of identification and reproducibility of analytical results. The laboratory apparently couldn't reproducibly assign peaks to A1242 or to A1254. Replication at low PCB concentrations (<100ppm) was extremely poor. Replication at higher PCB concentrations (>100ppm) was somewhat better but was often in the range of 50 - 100%. This is very poor replication for such high concentrations.

SAMPLE BY SAMPLE REVIEW WOULD BE REQUIRED IN ORDER TO DETERMINE ACCEPTABILITY. CALIBRATION CURVES SHOULD BE REEXAMINED. MANY VALUES MAY BE ACCEPTABLE WITH PROPER PEAK ASSIGNMENT AND RECALCULATION.

NOVEMBER 12, 1981, EPA SAMPLING OF SEDIMENTS (GRANTZ)

The sampling techniques in this study should completely invalidate it. THE RESULTS OF THE STUDY MAY SERVE AS A QUALITATIVE INDICATION THAT THERE EXIST CERTAIN POCKETS OF HIGH CONCENTRATIONS OF PCBs. JUST HOW HIGH THE CONCENTRATIONS ARE IS VERY QUESTIONABLE.

MARCH 1982; U.S. COAST GUARD SAMPLING OF SEDIMENTS

This was the first of the studies. The data show the laboratory to be out of control with wild swings in calibration data. A lack of understanding of the analysis is clearly indicated.

THESE DATA SHOULD BE COMPLETELY REJECTED.

APRIL 1982; U.S. COAST GUARD SAMPLING OF SEDIMENTS

There are several problems with this study. For the GC portion of the study these include: apparently improper drying of samples; improper GC column resulting in very poor resolution; incorrect quantitation techniques; contamination going unrecognized; laboratory contamination; poor precision; lack of a quali-

ty control program; improper calibration standards; and only selected GC/ECD data reported or used in subsequent calculations. For the HPLC and TLC portions of the study, non-selective detectors were used resulting in the loss of discrimination of sample from contamination. TLC is an improper technique for quantitative determination of PCBs (and for most anything else if alternatives are available). The averaging idea is preposterous and the criteria for selection of proper results are worse than preposterous.

THIS DATA SET HAS NO REDEEMING QUALITIES AND SHOULD BE TOTALLY REJECTED.

JUNE 1982, US COAST GUARD SEDIMENT SAMPLING

There are several problems with this study. For the GC portion of the study these include: apparently improper drying of samples; improper GC column resulting in very poor resolution; incorrect quantitation techniques; contamination going unrecognized; laboratory contamination; poor precision; lack of a quality control program; improper calibration standards; inconsistencies in the calculations; and only selected GC/ECD data reported or used in subsequent calculations.

THIS DATA SET HAS NO REDEEMING QUALITIES AND SHOULD BE TOTALLY REJECTED.

ACOE GRID STUDY

The results of the analyses of NBH core samples as presented in the Condike report are unreliable for a number of reasons including: apparent inability to develop true field replicate samples; poor choice of analytical standards; poor chromatography; apparent contamination of samples and laboratory; inattention to work by laboratory personnel; and inconsistent results of oil and grease and moisture study.

THE SAMPLE RESULTS REPORTED IN PLAINTIFFS' RFA V.B.I.(H) TABLE 1 SHOULD BE CONSIDERED ORDER OF MAGNITUDE ESTIMATES AT BEST. SOME OF THE RESULTS ARE OBVIOUSLY INCORRECT OR WORTHLESS, THESE INCLUDE I-11-2, H-12, J-10, AND J-12. SOME OF THE RESULTS MIGHT BE ACCEPTABLE BY RECALCULATING WITHOUT THE PURPORTED A1260 CONTRIBUTIONS. CONCENTRATIONS REPORTED IN SAMPLES BELOW 12" ARE NEARLY ALWAYS INCORRECT BECAUSE OF HIGH CONTAMINATION LEVELS AND THESE VALUES ARE USELESS.

MAY 1978 DEQE/LES SAMPLING

The reported methodology for this work was inappropriate for the substrate. No data and no report have been provided. There is no obvious attempt at QC measurements. No difference was reported between samples taken at different depths. Only selected results have been reported, and we have no knowledge of any of the other results.

IF RAW DATA, A REPORT, AND COMPLETE RESULTS WERE PRESENTED, SOME OF THE RESULTS COULD BE FOUND TO BE ACCEPTABLE. IN THE ABSENCE OF SUCH INFORMATION, NONE OF THESE RESULTS SHOULD BE INCLUDED IN THE NBH DATABASE.

AUGUST 1979, DEQE/LES SAMPLING OF SEDIMENTS

The selection of samples and reporting of data may be considered to be incoherent in that no justification has been made for selection or for the very selective reporting of results. Since most of the low PCB level samples have been ignored, the reporting should be considered to be intentionally misleading and professionally unethical. Again little is known about the preparation and analytical methodology and we have no raw data and no idea of the QC, if any.

IF RAW DATA, A REPORT, AND COMPLETE RESULTS WERE PRESENTED, SOME OF THE RESULTS COULD BE FOUND TO BE ACCEPTABLE. IN THE ABSENCE OF SUCH INFORMATION, NONE OF THESE RESULTS SHOULD BE INCLUDED IN THE NBH DATABASE.

SEPTEMBER 30, 1980 DEQE/LES SAMPLING OF SEDIMENTS

There has been a complete loss of the chain of custody information. The selection of samples and reporting of data may be considered to be incoherent in that no justification has been made for selection or for the very selective reporting of results. Since most of the low PCB level samples have been ignored, the reporting should be considered to be intentionally misleading and professionally unethical. Again little is known about the preparation and analytical methodology and we have no raw data and no idea of the QC, if any.

IF RAW DATA, A REPORT, AND COMPLETE RESULTS WERE PRESENTED, SOME OF THE RESULTS COULD BE FOUND TO BE ACCEPTABLE. IN THE ABSENCE OF SUCH INFORMATION, NONE OF THESE RESULTS SHOULD BE INCLUDED IN THE NBH DATABASE.

1982 AND 1984? SAMPLING BY STATE LABORATORY INSTITUTE

Chromatograms of the 1982 samples did not contain retention time information. Single point calibration curves were used which severely restricts the accuracy of the analyses. Chromatograms of the 1984 samples indicate that the systems were out of control and retention times varied widely.

1982 RESULTS CAN BE ACCEPTED AS ESTIMATES. 1984 RESULTS SHOULD BE REJECTED AS INVALID AND CANNOT BE RETRIEVED OR RECONDITIONED.

MASSACHUSETTS DIVISION OF MARINE FISHERIES

Analyzed lobster samples from 1976 until the late 1980's. The early work is not acceptable from a standpoint of the quality of the chromatography or the method of calibration and calculation. Beginning in 1986, the chromatography improves dramatically and the calibrations improve. At this point it is not possible to categorically reject the results, but the method of calculation is still somewhat suspect.

POST 1986 RESULTS MAY BE ACCEPTABLE DEPENDING ON A REVIEW OF EACH OF THE INDIVIDUAL CALCULATIONS.

1979 - 1981 US FOOD AND DRUG ADMINISTRATION

The chromatographic resolution appeared to be very poor and that introduces substantial inaccuracies into the quantitation. The amount of QC appears to be very limited but not enough information was available to discern this. Single point calibration curves were used in every case only for A1254. Qualitative analysis is not adequately supported.

IN THE ABSENCE OF ADEQUATE SUPPORTING INFORMATION, THESE RESULTS MUST BE REJECTED. IF THE UNDERLYING DATA WERE AVAILABLE FOR REVIEW ON A CASE BY CASE BASIS, SOME OF THE RESULTS COULD BE ACCEPTABLE BUT THERE IS NO WAY TO KNOW THAT.

DMF/LES SAMPLING - NOVEMBER 1976

Little information and no raw data have been provided to allow evaluation of this data. Experience with other data from these organizations, from this time period suggests that the results not be accepted on face value.

IN THE ABSENCE OF ADEQUATE SUPPORTING INFORMATION, THESE RESULTS MUST BE REJECTED. IF THE UNDERLYING DATA WERE AVAILABLE FOR REVIEW ON A CASE BY CASE BASIS, SOME OF THE RESULTS COULD BE ACCEPTABLE BUT THERE IS NO WAY TO KNOW THAT.

DMF/LES SAMPLING OF LOBSTERS - MARCH 28, 1979

Little information and no raw data have been provided to allow evaluation of this data. Experience with other data from these organizations, from this time period suggests that the results not be accepted on face value.

IN THE ABSENCE OF ADEQUATE SUPPORTING INFORMATION, THESE RESULTS MUST BE REJECTED. IF THE UNDERLYING DATA WERE AVAILABLE FOR REVIEW ON A CASE BY CASE BASIS, SOME OF THE RESULTS COULD BE ACCEPTABLE BUT THERE IS NO WAY TO KNOW THAT.

DMF/LES SAMPLING OF LOBSTERS - APRIL 20, 1979

Little information and no raw data have been provided to allow evaluation of this data. Experience with other data from these organizations, from this time period suggests that the results not be accepted on face value.

IN THE ABSENCE OF ADEQUATE SUPPORTING INFORMATION, THESE RESULTS MUST BE REJECTED. IF THE UNDERLYING DATA WERE AVAILABLE FOR REVIEW ON A CASE BY CASE BASIS, SOME OF THE RESULTS COULD BE ACCEPTABLE BUT THERE IS NO WAY TO KNOW THAT.

EPA - ERLN LOBSTER FLOUNDER STUDY

While we had only marginal time to evaluate this study, several points are obvious: the method was still being developed during and after the analysis of samples; the spike and recovery information was apparently obtained long after the actual analyses and after additional method development work occurred. The methodology had never been validated and may still not be validated.

WHILE THE OBJECTIONS ARE LARGELY PROCEDURAL, THEY ARE SERIOUS FLAWS IN THIS STUDY. WE WILL NEVER BE ABLE TO DETERMINE THE ACCEPTABILITY OF THE RESULTS BECAUSE THE METHOD DEVELOPMENT WORK WAS NOT COMPLETE AT THE TIME OF THE ANALYSIS. THESE DATA SHOULD NOT BE ACCEPTED.

CAPUZZO STUDY

No raw data was available for review and no data was cited in the plaintiffs' RFAs. The medium for analysis, mussels, produce extremely cluttered chromatograms and cleanup and chromatographic interpretation become very difficult. We have no basis for judging the acceptability of these results, and plenty of reason by virtue of the experience of others, to doubt the validity of the results.

IF THE RAW DATA IS PROVIDED FOR REVIEW, SOME OR ALL OF THESE RESULTS MIGHT BE FOUND TO BE ACCEPTABLE.

BROWNAWELL DISSERTATION

The raw data showed the baselines of the chromatograms to be unstable; both early and late eluting contamination was obvious; and the blanks were contaminated. We do not have enough information to evaluate the calibration procedures.

NONE OF THE INDIVIDUAL PROBLEMS IS SO SEVERE AS TO CALL FOR REJECTION OF THE ENTIRE SET OF RESULTS. THE RESULTS SHOULD BE INDIVIDUALLY VALIDATED AND UNTIL SUCH VALIDATION THE RESULTS MUST BE VIEWED WITH SUSPICION.

HANSEN STUDY

There is considerable question as to the validity of the conclusions in the Hansen study. This is because of the variability of PCB in the media analyzed. There is also a question regarding the identity of the Aroclor measured during the study.

THE INDIVIDUAL RESULTS OF THE HANSEN STUDY MAY OR MAY NOT BE ACCURATE. INDIVIDUAL VALIDATION OF THE ANALYSES WOULD BE REQUIRED.

NBH DPW SEWER STUDY (1986)

Identification of the Aroclors was obviously very wrong, no raw data were provided however.

THESE RESULTS SHOULD BE REJECTED.

BATTELLE/SAIC SEDIMENT SAMPLING

Many of the results of the analysis of this sample set were invalidated by substantially changing GC conditions between preparation of the calibration curves and the analyses of the samples. Other results should be rejected because of high noise levels (sufficient to make visual identification of the PCBs difficult or impossible). No process blanks are available and no surrogates were used. Many samples fell outside of the calibration levels.

RESULTS OF 42 ANALYSES AFFECTED BY CHANGING GC CONDITIONS SHOULD BE REJECTED. RESULTS FROM SAMPLES AFFECTED BY HIGH NOISE LEVELS SHOULD BE REJECTED. SAMPLES WITH RESULTS OUTSIDE OF THE CALIBRATION LIMITS SHOULD BE CONSIDERED AS ESTIMATES. ALL OTHER RESULTS NEED TO BE INDIVIDUALLY VALIDATED.

ACOE - TEETER FLUX

The analytical data generated for this study is fatally flawed. There is massive contamination through the solutions analyzed for this project, i.e., the standards, the blanks, the calibration solutions, and the samples are all contaminated. The source appeared to be in the DBC solution but other contamination is also evident. The laboratory appears to be contaminated. It would appear that the chromatograms were never serious scrutinized by a qualified analyst.

In addition to the contamination problems, the GC methodology is very amateurish. The temperature programming is probably too rapid to utilize the separation capabilities of the capillary column. The sample size is much too large. Column is obviously overloaded. Nobody cared.

THERE IS NO WAY TO RECOVER ANY USEFUL INFORMATION FROM THESE DATA. CONTAMINATION OVERWHELMS EVERYTHING. THE DATA FROM THESE STUDIES SHOULD NOT BE USED FOR ANY PURPOSE.

EPA ERLN - SEAWATER

Samples nos. 7846, 7847, 7849, 7856, and 7857 were analyzed 19 days after the calibration curve was prepared. This is contrary to every EPA environmental analysis guideline and common sense.

THE RESULTS FOR THE SAMPLES IDENTIFIED ABOVE SHOULD BE REJECTED. WE ARE UNABLE TO JUDGE THE VALIDITY OF THE OTHER ANALYSES.

ACOE BELLMER WETLANDS - COE-NED/AQUATEC, YORK, CAA

Many of the results of these analyses may be biased high because of high surrogate recoveries. The high recoveries are indicative of high levels of contamination.

THE INDIVIDUAL RESULTS FROM SAMPLES WITH RECOVERIES OUTSIDE OF THE EPA LIMITS SHOULD BE CLOSELY SCRUTINIZED AND EVALUATED FOR ACCEPTANCE.

ACOE BELLMER WETLANDS - IEP/ENSECO (Sediment)

Samples from Area 9, high and low marsh, are contaminated and needed to cleaned up. Some of the standards are contaminated. A1248/A1254 was a poor choice of standards and does not represent the aroclors in the sample.

ALL OF THE RESULTS NEED TO BE INDIVIDUALLY VALIDATED. A1248 RESULTS ARE MEANINGLESS. RESULTS MAY BE BIASED HIGH.

ACOE BELLMER WETLANDS - IEP/ENSECO (tissues)

There are several problems with these analyses. The standards are contaminated; the blanks for the mussels are contaminated; the mussel and mummichog samples contain significant interferences; mummichog analyses suffer from loss of resolution; integrator setting preclude accurate peak discrimination.

THE UTILITY OF THIS DATA SET IS LIMITED TO A QUALITATIVE DETERMINATION OF PRESENCE OR ABSENCE OF PCB'S.

ACOE BELLMER WETLANDS - SES/RAI (tissues)

These results have less than 1 significant figure of precision. They can be considered to be estimates valid to within ± one order of magnitude. Different sets of peaks were chosen for quantitation depending on the sample; even consecutive samples might use different peaks. Standards only run once for 60 samples. No use of internal standards. Gull fat analysis shows massive contamination. Packed column data is illegible and no other copies exist.

THE RESULTS HAVE NO QUANTITATIVE REALITY. UNDER NO CONDITION SHOULD THEY BE USED BY ANYONE FOR ANY PURPOSE. PLAINTIFFS CAN PROVIDE NO FURTHER INFORMATION.

AVERETT COMPOSITES

There is a lot of trouble with this data set including: inconsistencies in identification of congeners; inconsistencies in the presence or absence of congeners; inconsistencies in reporting concentrations of aroclors and total PCBs. Extremely poor analytical procedures for chromatography; i.e., no evidence of quality control; inadequate sample preparation and cleaning; inaccurate and improper preparation of standards; and misidentification of congeners and uncertainty of identification of congeners even in the standards.

THESE RESULTS ARE TRULY WORTHLESS. UNDER NO CONDITION SHOULD THEY BE USED BY ANYONE, FOR ANY PURPOSE.

N.B. SEWER GRIT STUDY 1987

No backup data are available. The system could not be characterized by the approached used in this study.

NOTHING CAN BE SAID ABOUT THE INDIVIDUAL RESULTS SINCE WE KNOW NOTHING ABOUT HOW THEY WERE OBTAINED. PLAINTIFFS CAN PROVIDE NO FURTHER INFORMATION.

ACOE/NUS FIT - Laucks

Chromatograms show extensive contamination of the standards and the blanks, which increases with time. This alone should disqualify the results. Chromatography is poor with discontinuities (counted as peaks) and negative excursions of the baseline. Matrix interference obscures the DBC. Misidentification of aroclors (A1254 not reported)

RESULTS NOT USABLE IN ANY FASHION. QUALITATIVE USE ALSO IMPROPER BECAUSE OF CONTAMINATION.

ACOE/REVET - Hot Spot

By Mr. Taylor's admission, impurities in the samples caused the samples to require dilution for chromatography. High levels of impurities were indicated in many samples (#'s in the RFA). Interferences were reported in many samples (#'s reported in the RFA). Surrogate diluted out in many samples.

ACOE analyses included in this RFA showed typical ACOE problems. These included: improper integrator settings; single point calibration; contamination of the blank; poor GC resolution; no internal standard and no surrogate; unstable GC instrumental parameters; and variable response factors.

I WOULD ADVISE NOT USING THE REVET RESULTS OR AT BEST CONSIDERING THEM TO BE ESTIMATES. ACOE RESULTS SHOULD DEFINITELY NOT BE USED.

BATTELLE/GCA - HOT SPOT

This data set contains several problems, including: transcription errors for 2 samples (AC328 and 329); impurities causing high bias (AC324-326 and AC334-335); poor resolution causing high bias (AC332, 336, 338-344); and deteriorating standard causing very high bias for samples run on June 9, 1985.

GREAT CAUTION SHOULD BE EXERCISED WITH THIS DATA. SOME OF IT MIGHT BE SALVAGEABLE BY RECALCULATION. CURRENT LIMITATIONS SHOULD BE NOTED - BIAS COULD BE 2-4X.

BATTELLE/AQUATEC: WATER

These results may occasionally contain false positives and may occasionally be biased high. Specific conditions facilitate the problems and these are generally linked to low concentrations either in the actual sample or in the extracted as quantitated. Occasional problems with the blanks exacerbate difficulties with low concentrations.

OVERALL THIS IS A PRETTY GOOD DATA SET.

BATTELLE/AQUATEC: FILTERS

There are problems with contaminated filters. These would have introduced PCBs and other contaminants into the samples at the source. In some cases, the amount of non-PCB contaminant introduced is too great to be effectively removed by the cleanup process. Data validation (NUS) indicated about 10% of the data should be rejected because recovery of the surrogate was outside of the contract limits.

THIS DATA NEEDS TO BE CONSIDERED ON A CASE BY CASE BASIS. SOME OF IT IS BIASED HIGH AND BECAUSE OF CONTAMINATION FROM PCBs IN THE FILTER PAPERS CANNOT BE CORRECTED. OTHER DATA MAY BE USED IF ESTIMATES OF BIAS ARE MADE AND INCORPORATED INTO THE DATA SET. RECOVERY PROBLEMS CAN PROBABLY BE HANDLED.

BATTELLE/AQUATEC: SEDIMENT

The data set evidences a variety of problems and these brought individually in the RFA itself. It appears that two of the samples were spiked and their identity confused with the unspiked sample. Other problems include presence of interferences in some of the samples, sample too concentrated to be properly chromatographed, and especially in the percent solids. Some of the samples were purported to be only a very low percent solids. Results from these will be biased very high.

RESULTS FROM SAMPLE NUMBERS NAMED IN OUR RFA SHOULD NOT BE USED. OTHER RESULTS ARE ACCEPTABLE.

AQUATEC INC. RATIOMETRIC DISTRIBUTION YOAKUM

THE EFFECT OF NOT CONSIDERING REMOVAL AND FORMATION OF PCB CONGENERS DUE TO AEROBIC REDUCTIVE DECHLORINATION IS REAL BUT WOULD HAVE LITTLE EFFECT IN THIS CASE.

BATTELLE MUSSEL WATCH - Site 9.

One half of the raw data for this study was missing and could not be provided by the plaintiffs. Data, which was provided, showed the cleanup to be inadequate to allow either qualitative or quantitative analysis of PCBs. Coupled with inadequate cleanup is the fact that the samples, as chromatographed, were far too concentrated. Response factors for standards varied as much as 25% between the assay of two standards. Remember that results are reported on a wet weight basis.

RESULTS NOT TO BE TRUSTED AND CANNOT BE RECLAIMED.

BATTELLE MUSSEL WATCH - Site 10.

One half of the raw data for this study was missing and could not be provided by the plaintiffs. Data, which was provided, showed the cleanup to be inadequate to allow either qualitative or quantitative analysis of PCBs. Coupled with inadequate cleanup is the fact that the samples, as chromatographed, were far too concentrated. Response factors for individual congeners varied as much as 360% within the initial calibration run. Blank spike recoveries usually very high indicating inability to distinguish spike from background. Intrayear, intersample results vary by an order of magnitude. Remember results reported on a wet basis.

RESULTS NOT TO BE TRUSTED AND CANNOT BE REHABILITATED.

BATTELLE MUSSEL WATCH - Site 11.

One half of the raw data for this study was missing and could not be provided by the plaintiffs. Data, which was provided, showed the cleanup to be inadequate to allow either qualitative or quantitative analysis of PCBs. Many data sheets are illegible. Commentary regarding calibrations from sites 9 and 10 is equally applicable here. Inter and intra year results are not consistent on a congener basis.

RESULTS ARE MORE REALISTIC THAN FOR SITES 9 & 10 BECAUSE THE LEVEL OF INTERFERENCE IS LOWER.

NUS/GZAD - PEI/PEDCO AF170-175; AE801-824

Something seems to be missing here, we don't have a definitive discussion of contamination of the blanks. A large solvent tail precludes accurate analysis of A1242. Adequate GC/MS confirmation is lacking.

ALL RESULTS SHOULD BE CONSIDERED TO BE TENTATIVE.

NUS/GZAD - GCA

Individual samples as noted in the text of our RFA have defects that should exclude them from the data base. Sulfur interferences cause problems in the quantitation of most of the samples because GCA used a baseline to baseline technique for quantitation. This approach is extremely sensitive to impurities in the sample.

THE RESULTS WILL BE BIASED HIGH TO VERY HIGH DEPENDING ON THE LEVEL OF SULFUR IMPURITIES. RESULTS FOR INDIVIDUAL SAMPLES COULD BE REHABILITATED BY A REALISTIC QUANTITATION APPROACH. SOME OF THE RESULTS MIGHT STILL BE TENTATIVE.

NUS/GZAD - YORK AE501-518; 545 & 546

The samples from this data set were obviously causing serious contamination of the instrumentation. Cross contamination of columns causes inaccurate qualitative and quantitative analysis. Standards run after samples were also exhibiting contamination. We do not know how the quantitation was accomplished except that single peaks have been used for the basis of quantitation.

THESE RESULTS ARE HIGHLY SUSPECT AND SHOULD NOT BE CONSIDERED UNLESS THEY ARE INDIVIDUALLY VERIFIED.

NUS/GZAD - S-CUBED AF110-119; AF201-215

Agreement between field duplicates was poor. Surrogate recoveries were usually above the advisory limits.

MOST IF NOT ALL RESULTS ARE BIASED HIGH. RESULTS MAY BE USED ONLY IF CONSIDERED AS ESTIMATES. PROBABLY COULD BE REHABILITATED.

NUS/GZAD - ETC AE825-838; AF216-226

There were several serious problems with this data set, including: calibration checks; high surrogate recoveries; major breakdown of DDT and Endrin; major impurity peaks - present as unresolved lumps; single point calibrations with wide ranges of reported concentrations in the samples; instrument contamination; sulfur interference; peaks falling outside of the retention time windows. NUS said all results were estimates.

NONE OF THESE RESULTS SHOULD BE CONSIDERED AS BEING DESCRIPTIVE OF THE SITUATION IN NBH OR AS A BASIS FOR OTHER WORK. SOME OF THE VALUES MAY BE REHABILITATED.

NUS/GZAD - ERCO AF264 - AF264MSD plus an ERCO blank

The blanks were contaminated, apparently with non-PCB materials however, their concentrations were substantial. Calibration curves (2 point) were prepared after the samples were analyzed. Relative response from the two points were averaged and used for calculating the results. This is little different than a single point calibration except that it implies that response does not change at all with concentration. Some of the reported concentrations were below the quantitation limit. The number of peaks used for quantitation is unclear. Baseline to baseline approach was used for area determination.

THERE WILL BE A HIGH BIAS TO ALL OF THE RESULTS, THE EXTENT OF WHICH DEPENDS ON THE LEVEL OF CONTAMINATION OF THE SAMPLES. IT APPEARS THAT THERE IS ENOUGH INFORMATION TO REHABILITATE THE RESULTS. THIS DATA SHOULD NOT BE USED WITHOUT INDIVIDUAL VALIDATION.

NUS/GZAD - AQUATEC AF234-258

There were really three major problems with this data. The calibration information could not be reproduced. The integration method was baseline to baseline and there was severe sulfur contamination. The negative excursions of the GC trace were handled by assuming a negative baseline. This latter problem happened primarily in the A1254 region of the chromatogram.

NONE OF THESE RESULTS CAN BE USED AS IS. CORRECTIONS MIGHT BE MADE IN SOME OF THE BASELINE TO BASELINE PROBLEMS TO REHABILITATE THE DATA.

NUS/GZAD - YORK AF284-313

NUS recommended that all PCB values be approximated. The blanks were contaminated. As with the previous batch, the instrumentation was being contaminated with the carryover from the samples, causing DBC to shift outside of its retention time window. Interpretation of A1254 was inconsistent. Confirmations and interpretations were inconsistent.

NONE OF THESE RESULTS CAN BE USED AS IS. REHABILITATION IS NOT CERTAIN.

NUS/GZAD - ERCO AF314-315; AF393-400; AE851-865

A baseline to baseline approach to quantitation was used as before. As before several results were reported that were below the predetermined quantitation limits. Quantitation of aroclors was not made against the standards run during the initial calibration. As before an average response factor was used and was based on standards run after the sample analyses were complete.

RESULTS FROM AF314-315; AF393-396; AE851-852; AE855-857; & AE860, 863 & 864 SHOULD NOT BE USED. SOME OF THESE RESULTS MAY BE REHABILITATED. ALL OTHER RESULTS ARE SUSPECT.

NUS/GZAD - CAA AE866-872; AF176-179

NUS found a chromatographic interference with DBC making determination of relative retention times impossible. They made all PCB values estimates. Baseline to baseline quantitation techniques were used even when peaks were unresolved, which introduces a high bias. Blanks were contaminated and no corrections were made. Quantitation method is somewhat unusual and suspect.

NONE OF THESE RESULTS SHOULD BE USED BEFORE THEY ARE INDIVIDUALLY EXAMINED AND VALIDATED.

NUS/GZAD - ERCO AF180-187

NUS rejected all results because of calibration and quantitation problems. Baseline to baseline integration techniques were used but it not possible to trace the location of the baseline. There were unresolved peaks and offscale peaks and they still used the baseline to baseline technique. Many of the reported results are below the predetermined quantitation limit.

NONE OF THESE RESULTS ARE USABLE. SOME OF THE DATA MAY BE REHABILITATED IF PEAKS ARE ON SCALE AND NEW BASELINES CAN BE DRAWN.

NUS/GZAD - PEI AF538-543; AF801-819

A version of the baseline to baseline integration method was used even though there was a pretty serious interference and loss of resolution.

THE RESULTS OF THESE ANALYSES WERE BIASED HIGH. RESULTS SHOULD NOT BE USED WITHOUT A DATA VALIDATION ON A SAMPLE BY SAMPLE BASIS.

ERLN PREDICTING BIOACCUMULATION YOAKUM

There was no description of the extraction procedure. Most GC traces did not have retention times. Many GC traces have offscale peaks including the internal standard. Not all GC traces were provided. Concentration calculations were not demonstrated nor can we verify the calibration curves. Response factors were found to vary by as much as 65% between consecutive samples.

ANN RECOMMENDED CONSIDERING THE RESULTS TO BE INVALID.

ERLN/SAIC SAMPLING

Reference soils for samples 5B - 9B, 12B, and 14B were not extracted at the same time as the samples which negates any value they may have had. Extracts of samples 12B and 14B were analyzed up to 4 months after extraction allowing plenty of time for loss of solvent and the corresponding high bias to the result. Extracts 1A - 10A, 12C, 13A and 14A were analyzed 7 months after extraction, potentially introducing the high bias. Samples 12C, 13A, and 14A were reanalyzed 9 months after extraction. The instrument was not always tuned and calibrated according to EPA specs prior to obtaining spectra of the subject samples.

The reports have taken a great deal of liberty with what was done as compared to what should have been done. There is no

evidence that an internal injection standard was added to each extract or that it was ever even prepared. Reconstructed ion chromatograms indicate an inadequate cleanup. MS parameters were changed between calibration and sample runs for 12C, 13A, and 14A which would invalidate these data completely. Surrogate recoveries were not monitored and the RICs do not show the presence of either surrogate in the samples.

Correct analytical procedure was often ignored, poor analytical practices were incorporated into routines.

NONE OF THESE RESULTS CAN BE TRUSTED OR REHABILITATED.

BATTELLE MUSSEL WATCH - PHASE 1 FINAL REPORT

The final report contains information that documents the overall variability of the methodology and in particular the variability of samples from sites 9 and 10. Recovery information is presented that demonstrates its high bias and the acceptability of that to the government. The difficulty in producing valid results is very apparent here.

BATTELLE MUSSEL WATCH - PHASE 2 FINAL REPORT

The final report contains information that documents the overall variability of the methodology. The interim reference materials may be good for much of the study but have little relation to the contaminants found at Buzzards Bay. The report reinforces the impressions of the validity of the results of samples from sites 9 and 10.

BATTELLE MUSSEL WATCH - PHASE 3 FINAL REPORT

The final report contains information that documents the extreme variability of many aspects of the methodology. This includes results obtained on the interim reference materials. There was a very poor rate of confirmation for many of the congeners indicating that several of them (low end and high end) should never be trusted. The acceptable range of recoveries was stated to be 3X, i.e., 50-150%. The HPLC cleanup was not demonstrated to be equivalent to the standard Mussel watch cleanup.

BATTELLE MUSSEL WATCH - PHASE 4 DRAFT FINAL REPORT

The HPLC cleanup was used and the method was declared validated but no proof of this was offered. This report claims A1248 is present in the Site 10 samples. Again results have been reported on a dry weight basis.

BATTELLE MUSSEL WATCH - STEINHAUER MEMORANDUM

Details problems they were having in the early phases of the Mussel watch program, including: validation of methodology; calibration tracking; terrible recoveries; GC recovery standards not used; and blanks not analyzed.

The data should be considered preliminary. Chromatographic quality on four samples is considered to be poor. Insufficient raw data were provided for data validation.

COMMENTS OF AVX CORPORATION ON DRAFT FINAL FEASIBILITY STUDY OF REMEDIAL ALTERNATIVES FOR THE ESTUARY AND LOWER HARBOR/BAY VOLUMES I-III, AUGUST 1990; ON DRAFT FINAL SUPPLEMENTAL FEASIBILITY STUDY EVALUATION FOR UPPER BUZZARDS BAY NEW BEDFORD HARBOR RI/FS NEW BEDFORD, MA, MAY 1992; ON PROPOSED PLAN, JANUARY 1992; AND ON ADDENDUM PROPOSED PLAN, MAY 1992.

SUBMITTED JULY 13, 1992

ATTACHMENT E
VOL. III

Volume III of RFAS

[redacted]

Analytical Chemistry -- Glossary of Terms

1.	A1242, A1254, etc. -	A short hand notation for Aroclor No. _____.
2.	Acceptable for Inclusion in the Site Data Base -	A fact or finding, the accuracy of which is sufficient to qualify for acceptance by all parties for inclusion in the site data base.
3.	Accuracy -	The relation of the measured result to the true result.
4.	BN -	Bates Number
5.	Baseline -	On a chromatogram, the level of signal produced when no peaks are supposed to be eluding from the gas chromatographic column.
6.	Baseline to Baseline -	Quantitation approach wherein unresolved peak areas are calculated as if the peak of interest began and ended at the baseline. This is accomplished by dropping perpendiculars from the valleys adjacent to and on either side of the peak maximum to the baseline of choice.
7.	Bleed or Bleeding -	Continual elution of unchromatographed (unseparated) materials from the GC column.
8.	Confidence Interval -	Usually expressed as a 95% confidence interval. That interval about the result of a measurement into which a repeated measurement will fall, 95% of the time. An overall measure of the reproducibility of a measurement.
8.	Contaminant -	A foreign material found in a standard or sample. One that is introduced from outside the sample matrix.
9.	Data Base -	A compilation of related data.
10.	Elevated Baseline -	On a chromatogram, a baseline above that baseline which existed before the sample was injected.

11. Elute -	In chromatography, the process of moving through the chromatographic system.
12. Estimate -	A value that is not sufficiently accurate to be a true representation of the quantity being measured.
13. Impurity -	A foreign material found in a standard or sample. One that originates at the source of the material.
14. Interferent -	A material that has chromatographic properties such that it potentially interferes with the chromatography of a desired material or with the interpretation of a chromatogram.
15. Internal Standard -	A reference material added to a sample in a known amount to provide a reference against which to measure recovery or instrument response.
16. Negative Dips or Peaks -	In chromatography, movement of the baseline below zero. Can be caused by unstable instrumentation or by compounds with unique properties. An undesirable occurrence.
17. Non-resolved or Unresolved Materials -	Materials that have not been separated by the GC into distinct peaks.
18. Overloading -	Injection of more material into the GC than the column can separate. Usually results in poor resolution of the peaks and a temporarily elevated baseline.
19. ppb -	parts per billion.
20. ppm -	parts per million.
21. Pattern Recognition -	A technique which relies upon recognition of distinctive features or patterns produced upon analyses. Applied to PCB analysis with reference to the distinctive grouping of GC peaks produced by a given Aroclor.

22. Percent Recovery -	The percent of a spike that can be recovered from the matrix into which it was added. This is indicative of the percent of naturally occuring materials that are being recovered.
23. Precision -	The reproducibility of a measurement or result.
24. Retention Time -	The time between the injection of a sample into a GC and the maximum of the peak representing the compound of interest.
25. Retention Time Shift -	The increment of time between when a compound is expected to elute from a GC and the time that the compound actually elutes.
26. Retention Time Window -	The time interval about the retention time within which the retention time can vary and still meet specifications.
27. Rising Baseline -	On a chromatogram, a baseline whose distance above zero increases substantially as a function of time. Usually indicative of a poorly conditioned GC column or unresolved material bleeding out of the gas chromatograph.
28. Significant Figures -	An indicator of the precision of any given result. Equal to the number of significant figures in the least precise measurement.
29. Single Point Calibration Curve -	A calibration curve based on the measurement of the response from a standard or standards run at a single concentration. Uses, zero (i.e. zero response for zero concentration) for the second point and draws a calibration curve that is a straight line beginning at zero and extending through the single measured point.
30. Spike -	To add a known quantity of a compound of interest to a sample.

31. Standard Reference Material (SRM) - A homogeneous sample of material containing the compound(s) of interest, distributed by the EPA. There is a consensus mean and the coefficient of variation and 95% confidence limits are accurately known.

32. Surrogate - A reference material with a property or properties similar to those same properties in the compound of interest; usually added to a solution to allow estimation of the behavior of the compound of interest under a given set of circumstances.

33. Tail, Tailing - On a chromatogram, the gradual return to baseline of the chromatographic signal after a gc peak elutes. Usually indicates the material is not suitable for chromatography on the chosen column or that the GC conditions are improper.

34. Unstable Baseline - On a chromatogram, a baseline that wanders around for no apparent reason. May dip below zero.

0061y

GCA/Versar series 256-A Samples
(Plaintiffs RFA V.B.I.a)

1. There is no indication of a statistical approach to the sampling design.

   1.a. There is no evidence that sampling site locations were selected on the basis of a grid, or series of transects, or that random sampling techniques were employed.

      1.a.1. This is an example of haphazard sampling.

   1.b. The results are inherently unsuitable for drawing any inferences concerning the distribution of PCBs within the estuary or harbor areas.

2. The sampling device used was inappropriate

   2.a. If samples, stratified by depth, were necessary/desirable, a coring device, not a grabsampler, should have been used.

   2.b. The Van Veen sampler cannot give discrete subsamples representing 0-4 cm and 4-8 cm depth. ("Grab samples, unlike the corers described in Method 11-2, are not capable of collecting undisturbed samples" (EPA 1983).)

   2.c. This deviation from accepted practice has a substantive effect; the data presented as depth-differentiated are meaningless.

   2.d. The effect is confirmed by statistical analysis of the data, which shows that there is no significant difference in PCB concentration by supposed "depth" of subsample.

3. Sampler cleaning procedures used in the field (R 0002) were inadequate.

   3.a. Sampler was rinsed with sea water between samples

      3.a.1. Good practice is to use a fresh, clean sampler for each sample.

      3.a.2. Sea water is not an acceptable way of removing organic residues.

   3.b. Minimum acceptable is to clean device <u>thoroughly</u> between samples.

3.b.1. Minimum would be combination of soapy water, clean water, then solvent rinse between samples. (EPA 1979, 1980, 19890a, 1980c, 1982, ASTM, 1977).

3.c. The practice used in the field may have caused significant cross-contamination of samples between stations.

3.c.1. The lack of sampler decontamination could turn an ND into an apparent positive, if a clean site were sampled immediately after a contaminated one.

3.c.2. It is unlikely that the quantity of sediment remaining in the sampler would be sufficient to cause a dirty site to appear "clean," by diluting the contaminated soil to below the PCB detection limit.

3.d. The effect of cross contamination is <u>overestimation</u> of the extent of PCB contamination.

4. No field duplicates were collected (R 0002).

4.a. Lack of field duplicate samples is a violation both of accepted practice (EPA 1979, 1979a, 1980, 1982) and of GCA's own quality assurance protocols as specified in the work plan for this task (Attachment R 0002, Section 8.3.4. "QC measures proposed for this project include the collection of replicate samples...")

4.b. Lack of field duplicate samples makes it impossible to determine the precision of the overall sampling and analysis procedures.

5. The use of hand compass and visual sightings to assign latitude and longitude to sampling site locations provides only an approximate location on the site.

5.a. The method used is not sufficiently accurate to allow sites in this study to be co-located with respect to those from other studies.

6. At 11 of 66 stations, the desired 10 cm vertical sampling was not accomplished because "excess shells, stones, or vegetation interfered with completely filling the sampling compartment."

6.a. These incidents of "non-response" would tend to <u>upwardly</u> bias the results, because stony sediments would most probably have lower loadings of total organic materials (and thus of PCBs).

7. QC data show that Aroclor identifications were made incorrectly and inconsistently both within and between laboratories. (R 0002 pp. 16-18)

7.a. Example: On an EPA PCBs in Sediment QC sample, GCA #24178, Versar reported Aroclor 1248. EPA designation is mixture of 1242 and 1254.

7.b. Example: On blind duplicate samples, GCA #24160 and #24183, Versar reported only 1248 in one aliquot and only 1242 in the other.

7.c. Example: On several samples, Versar reported Aroclor 1248; GCA analyzed a different aliquot of the same sample and reported a mixture of 1242(1016)/1254.

7.d. For almost all of the Series 256A samples, the report lists the "PCB found" as Aroclor 1248 or a mixture of 1248 and 1254.

7.d.1. Aroclor 1260 was also reported to have been found in some samples.

7.e. The Aroclor identifications reported are unreliable.

7.e.1. Misidentification of Aroclors causes the quantitation to be inaccurate.

8. There are serious problems with some aspects of the quantitation.

8.a. It is evident that in some samples, quantitation was done using single point calibration.

8.b. The calculations for a subset of the Series 256A samples are shown at BN 2-1364.

8.b.1. These samples were quantitated by comparing the sum of areas of 5 peaks in the sample with the sum of areas of 5 corresponding peaks in <u>either</u> a 1.0 ppm or a 2.5 ppm Aroclor 1248 standard.

8.b.2. An example is shown at BN 2-1330 to 2-1331; the 0.50, 0.56, 0.60, 0.72, and 0.80 peaks were summed to get the area of 418527 shown for Sample 3519 at BN 2-1364.

8.c. Use of a single point calibration is not an accepted practice. Use of a 5- or 6- point

31. Standard Reference Material (SRM) - A homogeneous sample of material containing the compound(s) of interest, distributed by the EPA. There is a consensus mean and the coefficient of variation and 95% confidence limits are accurately known.

32. Surrogate - A reference material with a property or properties similar to those same properties in the compound of interest; usually added to a solution to allow estimation of the behavior of the compound of interest under a given set of circumstances.

33. Tail, Tailing - On a chromatogram, the gradual return to baseline of the chromatographic signal after a gc peak elutes. Usually indicates the material is not suitable for chromatography on the chosen column or that the GC conditions are improper.

34. Unstable Baseline - On a chromatogram, a baseline that wanders around for no apparent reason. May dip below zero.

0061y

GCA/Versar series 256-A Samples
(Plaintiffs RFA V.B.I.a)

1. There is no indication of a statistical approach to the sampling design.

   1.a. There is no evidence that sampling site locations were selected on the basis of a grid, or series of transects, or that random sampling techniques were employed.

      1.a.1. This is an example of haphazard sampling.

   1.b. The results are inherently unsuitable for drawing any inferences concerning the distribution of PCBs within the estuary or harbor areas.

2. The sampling device used was inappropriate

   2.a. If samples, stratified by depth, were necessary/desirable, a coring device, not a grabsampler, should have been used.

   2.b. The Van Veen sampler cannot give discrete subsamples representing 0-4 cm and 4-8 cm depth. ("Grab samples, unlike the corers described in Method 11-2, are not capable of collecting undisturbed samples" (EPA 1983).)

   2.c. This deviation from accepted practice has a substantive effect; the data presented as depth-differentiated are meaningless.

   2.d. The effect is confirmed by statistical analysis of the data, which shows that there is no significant difference in PCB concentration by supposed "depth" of subsample.

3. Sampler cleaning procedures used in the field (R 0002) were inadequate.

   3.a. Sampler was rinsed with sea water between samples

      3.a.1. Good practice is to use a fresh, clean sampler for each sample.

      3.a.2. Sea water is not an acceptable way of removing organic residues.

   3.b. Minimum acceptable is to clean device <u>thoroughly</u> between samples.

3.b.1. Minimum would be combination of soapy water, clean water, then solvent rinse between samples. (EPA 1979, 1980, 19890a, 1980c, 1982, ASTM, 1977).

3.c. The practice used in the field may have caused significant cross-contamination of samples between stations.

3.c.1. The lack of sampler decontamination could turn an ND into an apparent positive, if a clean site were sampled immediately after a contaminated one.

3.c.2. It is unlikely that the quantity of sediment remaining in the sampler would be sufficient to cause a dirty site to appear "clean," by diluting the contaminated soil to below the PCB detection limit.

3.d. The effect of cross contamination is <u>overestimation</u> of the extent of PCB contamination.

4. No field duplicates were collected (R 0002).

4.a. Lack of field duplicate samples is a violation both of accepted practice (EPA 1979, 1979a, 1980, 1982) and of GCA's own quality assurance protocols as specified in the work plan for this task (Attachment R 0002, Section 8.3.4. "QC measures proposed for this project include the collection of replicate samples...")

4.b. Lack of field duplicate samples makes it impossible to determine the precision of the overall sampling and analysis procedures.

5. The use of hand compass and visual sightings to assign latitude and longitude to sampling site locations provides only an approximate location on the site.

5.a. The method used is not sufficiently accurate to allow sites in this study to be co-located with respect to those from other studies.

6. At 11 of 66 stations, the desired 10 cm vertical sampling was not accomplished because "excess shells, stones, or vegetation interfered with completely filling the sampling compartment."

6.a. These incidents of "non-response" would tend to <u>upwardly</u> bias the results, because stony sediments would most probably have lower loadings of total organic materials (and thus of PCBs).

7. QC data show that Aroclor identifications were made incorrectly and inconsistently both within and between laboratories. (R 0002 pp. 16-18)

7.a. Example: On an EPA PCBs in Sediment QC sample, GCA #24178, Versar reported Aroclor 1248. EPA designation is mixture of 1242 and 1254.

7.b. Example: On blind duplicate samples, GCA #24160 and #24183, Versar reported only 1248 in one aliquot and only 1242 in the other.

7.c. Example: On several samples, Versar reported Aroclor 1248; GCA analyzed a different aliquot of the same sample and reported a mixture of 1242(1016)/1254.

7.d. For almost all of the Series 256A samples, the report lists the "PCB found" as Aroclor 1248 or a mixture of 1248 and 1254.

7.d.1. Aroclor 1260 was also reported to have been found in some samples.

7.e. The Aroclor identifications reported are unreliable.

7.e.1. Misidentification of Aroclors causes the quantitation to be inaccurate.

8. There are serious problems with some aspects of the quantitation.

8.a. It is evident that in some samples, quantitation was done using single point calibration.

8.b. The calculations for a subset of the Series 256A samples are shown at BN 2-1364.

8.b.1. These samples were quantitated by comparing the sum of areas of 5 peaks in the sample with the sum of areas of 5 corresponding peaks in <u>either</u> a 1.0 ppm or a 2.5 ppm Aroclor 1248 standard.

8.b.2. An example is shown at BN 2-1330 to 2-1331; the 0.50, 0.56, 0.60, 0.72, and 0.80 peaks were summed to get the area of 418527 shown for Sample 3519 at BN 2-1364.

8.c. Use of a single point calibration is not an accepted practice. Use of a 5- or 6- point

calibration curve in PCB analysis has been standard since 1979 (EPA 1979).

8.d. Further, plaintiffs own data show that in this case, the use of a single point calibration is inaccurate.

8.d.1. Calculated response factors (1.07 vs. 0.81 x 10^{-6}) that differ by 31% for the two standard concentrations are shown at BN 2-1364.

8.d.2. The calibration curve is either non-linear or does not pass through zero.

8.e. If a single point calibration is used, the calibration concentration must be as close as possible to that of the sample.

8.e.1. If the 2.4 ppm calibration, instead of the 1.0 ppm, had been used for Sample 3519, a PCB concentration of 4.4 ug/g, instead of 5.8 ug/g, would have been calculated.

9. In those instances where a multi-point calibration curve was used, there were also errors in the quantification.

9.a. An example of the A 1248 calibration curve used to quantify Sample #3534 is found at BN 2-1369.

9.a.1. The handwritten notation at the top of BN 2-1369 clearly indicates that the calibration curve was based on the sum of areas of 5 selected peaks (the so-called 1242 C, D, and E and 1254 A peaks plus the peak with RRT = 0.80).

9.b. The areas of the same 5 peaks in the sample chromatogram, then, should be summed and compared to the calibration curve.

9.b.1. For Sample #3534, the sum of the 5 indicated peaks comes to 570,640 area counts (BN 2-1472).

9.b.2. Versar used a value of 763, 475 area counts when attempting to quantify A 1248 in this sample.

This overestimates the concentration by 33% (BN 2-1367).

9.c. This is not an isolated example; Sample #3530 (BN 2-1464) shows the same discrepancy; 801,754 area counts were used for calculation (BN 2-1367), when 614,501 area counts are the sum of the 5 designated peaks.

10. It is also not possible to trace the procedures Versar used to determine the raw areas used to calculate the "1254" concentrations reported for these samples.

10.a. The "raw area" listed next to 1254 at BN 2-1367 for samples 3530 and 3534 is not the sum of the areas for "1254 peaks B, C, and D" (BN 2-1472 and 2-1464).

10.a.1. The total raw area quantified for sample 3530, for example, is shown at BN 2-1367 as 1,445,683 (801,754 for A 1248 and 643,929 for A 1254).

10.a.2. The summed areas of the designated peaks at BN 2-1364 is only 960,919.

10.a.3. 484,864 counts of raw area are unaccounted for.

11. The procedure used for quantitation of the Series 256A samples is not reliable.

11.a. In each of the specific examples examined, the reported numbers are high, by at least 30%.

11.b. Versar chose a calibration technique incorporating a presumed baseline at zero for the A1242 peaks in both the standard and the sample.

11.b.1 This technique invariably leads to high results unless (a) the standard is contaminated, or (b) the sample contains <u>no</u> non-PCB materials.

11.b.2 The high bias introduced by this technique is illustrated by a comparison of the calibration for A1242 at BN 2-0265 and the chromatogram of sample 5007 at BN 2-0283.

11.b.2.a The chromatogram of sample 5007 shows that large areas attributed to A1242 are in reality due to unresolved non-PCB materials.

11.b.3 The misquantitation occurs very frequently.

12. The work plan states that the GCA task would include "high resolution gas chromatography/mass spectrometry on selected sample extracts to permit speciation of individual chlorobiphenyl isomers." (Document No. R-0001 § 6.2.7.)

12.a. There is no evidence in the report, the RFA, or the underlying attachments that GC/MS was applied to the Series 256A samples.

12.b. The Versar laboratory was not provided with a copy of the work plan and was not aware that GC/MS confirmation was required (Carkhuff evidentiary hearing testimony, at 2-44).

12.c. The GC/MS confirmation is important when, as here, the samples apparently were not close matches to Aroclor patterns.

13. The report states that the method of Webb and McCall was used if the laboratory did not identify a good Aroclor pattern match.

13.a. That method specifies that PCBs are to be quantified peak-by-peak, using the appropriate response factor for each peak; then the individual peak quantities are summed to get the total PCB content.

13.b. Testimony was presented in the evidentiary hearings that the results for the Series 256A samples were recalculated according to the method of Webb and McCall. (Carkhuff at 2-45, 46)

13.c. Review of the attachments to the Government's RFAs finds no direct evidence for quantification according to the Webb and McCall procedure for data produced by the plaintiffs for the Series 256A samples.

13.c.1. This was confirmed in testimony in the evidentiary hearings (Gary Hunt, February 6, 1990).

13.d. There is evidence that the <u>sum of the intensities of selected peaks</u> in Aroclor standards vs. the total concentrations of the Aroclor was used to perform the calibration (BN 2-1364).

13.d.1. The summed areas of the corresponding peaks in the samples were used to

calculate a concentration of Aroclor (SN 2-1268, 2-1364).

13.d.2. This method is considered less accurate than the procedure of Webb and McCall for PCBs that do not match an Aroclor pattern (Carkhuff testimony, evidentiary hearings, February 6, 1990).

14. The results of interlaboratory analyses of replicate aliquots as presented below, show that precision is marginal or unacceptable.

Sample	Versar Result, ppm		GCA Result, ppm	
24157	A1248	280	A1242	290
			A1254	160
			Total	450
24161	A1248	840	A1242	280
			A1254	280
			Total	560
24162	A1248	270	A1242	700
			A1254	130
			Total	830
24167	A1248	240	A1242	230
			A1254	100
			Total	330
24180	A1248 & 1254	6	A1242	1.6
			A1254	1.6
			Total	3.2
25185	A1248 & 1254	170	A1242 (1016)	77
			A1254	120 (or)
			A1248	170
			Total	197
24229	A1248 & 1254	1	A1242 (1016)	8.3
			A1254	9.0
			Total	17

14.a. The interlaboratory and intralaboratory results imply that the results obtained are unreliable beyond, <u>at most</u>, one significant figure.

15. With very few exceptions, the data tabulated for the supposed 0-4 cm (0-2 in.) depth and the supposed 4-8 cm (2-4 in.) depth are the same within the precision limits demonstrated above.

15.a. No inferences regarding stratification with depth can be inferred from these data.

15.b. The data cannot be used to support an inference that the PCB distribution is homogeneous over the top 8 cm.

15.b.1. It is probable that homogenization was an unintentional consequence of using Van Veen type of grab sampler.

15.c. The Series 256A data should not be reported as differentiating between 0-4 cm and 4-8 cm depths.

16. The PCB concentrations reported should be rejected since the uncertain identifications imply inaccurate quantification and since quantifications were not performed correctly.

17. Because of the lack of statistical sampling design, unreliable identifications and poor precision of replicates, these results should not be included in the NBH database.

0056y

GCA/VERSAR SERIES 316-AA SAMPLES

(Plaintiffs' RFA No. V.B.i(b))

1. There is no evidence that GCA/Versar Series 316-AA samples were collected according to a statistical survey design.

   1.a. The importance of statistical procedures in selecting sampling locations (and in fact in all aspects of environmental measurement) was well recognized by EPA at the time of the Series 316AA sampling (EPA 1979a, 1980, 1982, 1982a).

   1.b. The procedure of sampling along transects could represent one element of a survey design. However, there is no indication of the basis for selection of transects/stations and no assertion that proper random sampling techniques were applied. (EPA 1982, 1982a).

      1.b.1. There is evidence of judgmental sampling in that transects I and II are not parallel to transects III, IV and V.

      1.b.2. No rationale is presented as to why five transects were considered adequate for sampling.

   1.c. No information is provided regarding how station locations were selected or if all "pre-selected" sites were sampled.

   1.d. Any use of these data to extimate PCB distributions in the estuary sediments may (most likely will) sites were sampled.

2. The subsamples submitted to Versar are reported to have been "preselected."

   2.a. If the criteria for subsample selection were not carefully designed and followed, an additional source of bias would be introduced.

      2.a.1. No description is provided on the criteria used for selection.

   2.b. There was an element of subjectivity and/or non-response in the selection of strata for analysis, especially in the case of the deeper strata.

2.b.1. A 0-1' stratum was analyzed for all cores; a 5.5-6.5' stratum for most cores; and strata below 6.5' for about half of the cores.

2.c. Although the coring device was capable of generating cores up to 24" long, data for sediments deeper than 10" are reported for only about one half of the stations and only for stations located on transects 3, 4 and 5.

2.c.1. The deeper sediments typically have lower PCB levels.

2.c.2. Missing samples cause <u>over</u>estimation of the volumetric extent of contamination.

2.d. Since the reason for not obtaining cores is most probably the presence of low-organic content sandy or rocky sediments, the sediments that could not be sampled would likely be even lower in PCB content than silty sediments at comparable depths.

3. The polycarbonate core liners (sleeves) were described as "pre-cleaned."

3.a. The cleaning method was not specified.

3.b. No evidence was presented that blank liners were assayed to confirm cleanliness with respect to potential PCB, phthalate (plasticizer), or any other contamination.

3.c. EPA protocols specify that materials must be demonstrated to be free from interferences under the conditions of the analysis by running method blanks. (EPA 1979, 1980, 1980c, 1982)

3.d. The sleeves were reportedly rinsed with sea-water prior to use.

3.d.1. EPA protocols specify that sample containers must not be prewashed with sample before collection. (EPA 1979, 1979a, 1980c, 1982)

3.d.2. In Series 316-AA, the issue is not cross-contamination between sites, but possible contamination of the sediment by the corer itself or by the seawater.

4. The laboratory used an EPA standard gas chromatographic method (EPA 1979) for analysis of sample extracts.

4.a. The record shows no evidence that the identifications of presumed PCBs were confirmed by an independent method (Webb 1973, EPA 1979, 1980, 1982, 1980c, ASTM 1981).

4.b. This is a violation of recommended practice and of the work plan for the GCA/Versar sampling: "Conduct high resolution gas chromatography/mass spectrometry on selected sample extracts to permit speciation of individual chlorobiphenyl isomers." (Document number R 0001, Attachment para. 6.2.7)

5. The report (document number R 0007) states that "samples which resembled but did not strictly match an Aroclor pattern were analyzed using the method of Webb and McCall."

5.a. The underlying documentation reveals many samples that did not strictly match Aroclor patterns but that were quantified by comparing summed areas of samples with an Aroclor standard curve.

5.b. EPA rejected data submitted on February 28, 1983 for these samples on basis that Versar quantitated the unknowns using the summation of PCB peaks method for samples identified as mixtures 1242 and 1254. (Attachment XI.9 to June 1986 RFAs)

5.c. Versar was required by EPA to recalculate the samples using Webb and McCall. (Attachment XI.9 to June 1986 RFAs).

5.d. EPA did not verify that the recalculations were performed correctly. (Attachment XI.9 to June 1986 RFAs).

5.e. When sample concentrations were recalculated using Webb and McCall, the reported concentrations were generally <u>lower</u> than the values obtained by the sum of the peaks method. <u>e.g.</u>, 107 ppm became 76 ppm; 266 ppm, 200 ppm; 227 ppm, 170 ppm. (2 0559 and 2 0488 to 2 0491)

5.f. Versar recalculated only for samples that had originally been identified as mixtures of Aroclors. Versar not use Webb and McCall for samples originally quantified against a single Aroclor. (Example: Compare 2 0559 with 2 0488)

6. The use of a hand compass and visual sightings to assign latitude and longitude to sampling site locations provides only an approximate location of the site.

6.a. The GCA/Versar report (Document No. VB R 007) notes that the sample locations "are <u>not considered accurate to the hundredths place</u> [emphasis added], as reported, but can be used to demonstrate the relative locations of the sampling stations."

6.b. Since GCA/Versar admits that the latitude and longitude assignments are not accurate to ±0.01', it is highly misleading that they assign to various Series 316AA stations coordinates that are <u>identical</u> (to ±0.01' of latitude and longitude) to those that they had previously assigned to Series 256A stations (e.g., Latitude 41°39.97', Longitude 70°55.13' was assigned to both Station 17 in Series 316AA (January 1983) and to Station 1 in Series 256A (August 1982)).

6.c. Since GCA didn't know exactly where they were either time, they cannot be allowed to imply that they sampled the same location on two occasions.

6.d. The method used to assign coordinates to sample locations is not sufficiently accurate to allow sites in this study to be co-located with respect to those from other studies, including those from the August 1982 GCA/Versar Series 256A study.

7. **QC data indicate inconsistency in making identification of PCB Aroclors present in the samples.**

7.a. Example: In one EPA QC sample (GCA Number 28855) containing Aroclor 1242, Versar reported the presence of both 1242 and 1254.

7.b. Example: In analyzing a pair of blind duplicate samples (GCA Number 28940, submitted to Versar under two different EPA 316AA-XX numbers) Versar reported 1242 & 1254 in one aliquot, and 1242, 1254, 1260 in the other.

7.c. The inability to consistently identify the PCBs present in QC samples means that the Aroclor designations reported for the field samples are suspect.

8. Review of some of the chromatographic data in the attachments to the plaintiffs' RFAs suggests that Aroclor assignments for field samples were also made inconsistently.

8.a. In contrast to Series 256A, where 1248 was reported most frequently, a mixture of 1242 and 1254 was reported for most of the samples in this 316AA series.

8.b.1. It is not obvious that the pattern(s) called 1242/1254 in 316AA differ significantly from those called 1248 in. 256A.

8.b. Specific peaks in each Aroclor were used in creating calibration curves for that Aroclor, whether alone or in mixtures. (BN 2-0500, 2-0502, 2-1360)

8.c. In quantifying Series 316AA sample results, the areas of these five (Aroclor 1242, 1248) or four (Aroclor 1254, 1260) peaks were summed and compared to the total area of the same peaks in the calibration standards.

8.c.1. BN 2-0570 and 2-0751 are a computer integration print-out and a chromatogram for sample 7992, which was identified as "1242."

8.c.2. Comparison to BN 2-0501 shows that this peak pattern is <u>not</u> similar to that of Aroclor 1242. A pattern with the most intense peak at RRT of 0.7 and moderate intensity peaks at both longer and shorter RRTs is more characteristic of 1242/1254 mixtures (BN 2-04534).

8.d. Another example of inconsistent identification is shown in BN 2-0531.

8.d.2. Comparison of BN 2-0531 to BN 2-0751 shows that Sample 7999 has <u>less</u>, not <u>more</u>, relative intensity of the characteristic 1254 peaks and <u>more</u>, not <u>less</u>, of the characteristic 1242 peaks.

8.d.3. It is inconsistent to report the PCBs in sample 7999 as if they were more highly chlorinated than those in sample 7992.

8.d.4. It is also unclear what rationale was used in concluding that the pattern observed for Series 316AA sample 7999, "1242 & 1254" was qualitatively different from what had been called "1248" in Series 256A.

8.e. BN 2-0532/2-0533 shows a further example of apparent incorrect identification.

8.e.1. This sample (Versar number 8000) was reported to contain "Aroclor 1254."

8.e.2. Comparison with Figure BN 2-0503 shows that the sample is relatively rich in the early eluting peaks considered characteristic of 1242 and does <u>not</u> match the 1254 pattern (BN 2-0503).

8.e.3. This sample has moderate intensities of peaks found in both 1242 and 1254 and should have been quantified against an appropriate mixture of standards.

8.f. The Aroclor designations reported for the samples should be disregarded.

8.f.1. These designations do <u>not</u> accurately describe the PCB composition of the samples, but merely indicate which Aroclor calibration standard(s) were (somewhat arbitrarily) chosen to quantify results for each sample.

8.f.2. The lack of a proper Aroclor calibration standard guaranteed the inaccuracy of the quantification.

9. **The reproducibility of the overall sampling and analysis can be estimated from the results of the analysis of field replicate cores.**

9.a. The field replicate data reported by Versar are:

Sample	Aroclor Reported	Concentration	RPD
10 0-1"	1242 & 1254	100	66%
11 0-1"	1242	30	
16 0-1"	1242 & 1254	340	
17 0-1"	1242 & 1254	240	34%
16 5.5-6.5"	1242 & 1254	1600	
17 5.5-6.5"	1242 & 1254	1400	13%
16 10-12.5"	1242 & 1254	540	
17 10-13"	1242 & 1254	190	93%
21 0-1"	1242 & 1254	790	
22 0-1"	1242 & 1254	1600	68%
21 5.5-6.5"	1242 & 1254	150	
22 5.5-6.5"	1242 & 1254	25	139%
21 10-13"	1242, 1254 & 1260	11	
22 10-13"	1242 & 1254	3	114%
21 13-17.75"	1242 & 1254	5	
22 13-17.75"	Not reported		

9.b. These tabulated data show, again, that Aroclor identifications are not made consistently for replicate samples.

9.c. Except for stations 16 & 17, the results show that the quantitative results are quite variable for replicate cores.

10. There is considerable uncertainty in both qualitative and quantitative data reported for this series.

10.a. The results should not be regarded as reliable to two significant figures, as reported, when the field replicate sample data do not agree within <u>one</u> significant figure. (EPA 1979a)

11. The results of the Series 316AA sampling and analysis must be viewed with suspicion.

11.a. None of the Series 316AA results should be included in the NBH data base.

1685L

NOVEMBER 12, 1981 EPA SAMPLING OF SEDIMENTS

Plaintiffs' RFA V.B.I.(d)

1. The procedures used to select sampling locations were highly subjective.

   1.a No sampling plan had been developed prior to arrival on site on the sampling day.

   1.b Collective subjective judgment was used to select sampling locations after arrival on site. (Grantz testimony at transcript 1-15, line 6ff)

   1.c Plaintiffs' RFAs indicate that visual and olfactory clues were taken into consideration.

   1.d Stated purpose was to see if PCBs could be found; "went looking for PCBs." (Grantz testimony at transcript 1-16, lines 23 and 24).

   1.e The importance of statistical design in environmental measurements programs was well known by 1981. (EPA 1979a, 1980)

   1.f The judgmental sampling undoubtedly introduced a positive bias into the results.

2. The method of accessing sample sites introduced a high probability of cross-contamination.

   2.a A wooden plank was used to access the sampling sites.

   2.b The sediments were described as "extremely mucky."

   2.c There is no representation that the personnel, plank, or other sampling equipment was decontaminated between sites.

   2.d The time interval between sampling stations (5 to 10 minutes; Exhibit E to Grantz affidavit of July 9, 1986) was insufficient to allow any meaningful decontamination.

   2.e It is highly probable that some sediment was transported from one station to the next by the procedures used.

3. The technique used to collect the samples was unreliable for collecting a representative sample.

   3.a A steel scoop was used to excavate the sampling site. (Grantz testimony at 1-17, line 8) The possibility of

contamination across depths when using such a device is high.

3.b Manual excavation using a scoop cannot provide an undisturbed sample of sediment at depth.

3.c The depth of the excavation was not measured, but estimated based on the sampler s hand (Grantz testimony at 1-18, line 12).

3.d A wooden tongue depressor was the sampling device used for actual sample collection both at the surface and at depth.

3.d.1 This approach is not capable of providing a representative sample.

3.e At depth, the same tongue depressor was used both the scrape the side of the hole "to remove contamination" (Grantz at 1-17, line 18) and to collect the sample.

3.e.1 This would have introduced cross-contamination.

3.f A tongue depressor cannot give a representative sample over a 2" depth interval, especially not in a 5-minute sampling interval.

4. No field duplicates were collected.

4.a Plaintiffs' RFAs at V.B.i.(d) 4c. lists 19 samples, all different (no duplicates).

5. No laboratory duplicates were analyzed for this set.

5.a Versar reports results for only laboratory duplicate (sample number 74173, laboratory number 7365) but this is not one of the 19 samples listed at RFA V.B.i.(d)13.

5.b There is no way to estimate the uncertainty of the sampling and analysis results.

6. The quality of the laboratory analysis is essentially irrelevant when the sampling program is as severely flawed as this one was.

7. The data serve no purpose except to illustrate that it is possible to find sites that have high, but highly localized, PCB levels.

8. The results of the EPA 1981 sampling have no relevance to the question of a real or vertical distribution of PCBs in the Acushnet Estuary sediments.

9. The results of this study should not be included in the NB # data base.

1716L

MARCH 1982 U.S. COAST GUARD SAMPLING OF SEDIMENTS

Plaintiffs' RFA V.B.I.(e)

1. The USCG laboratory had no experience in determination of PCBs by GC/ECD prior to March 1982. (Bentz testimony at hearing, February 6, 1990).

   1.a EPA guidelines recommended that PCB/pesticide analyses be performed only by experienced residue analysts. (EPA 1979, EPA 1982)

2. The USCG laboratory's inexperience with the GC/ECD method for PCBs is reflected by errors in application of the method.

   2.a The laboratory staff relied on an assertion that their detector "had a million-fold dynamic range" as the basis for using 100, 50 and 20 ppm standards for calibration and quantification of samples that did not necessarily fall in that concentration range. (BN 6-0056)

   2.b The laboratory found that their GC/ECD system gave "little response" for a standard diluted to 2 ppm.

   2.b.1 This shows that they did not have an effective 50-fold linear range (BN 6-0056).

   2.c The laboratory analyzed samples that were well outside of the range of the calibration standards.

   2.c.1 April 15 calibration had area counts of 4.5 to 8.8 x 10^6 for 1254 (BN 6-0079), versus BN 6-0081.

   2.c.2 April 15 samples had area counts from 0.34 to 9.7 x 10^6.)

   2.d As late as April 15, 1982, the laboratory was still not in control with respect to precision of replicate analyses.

   2.d.1 BN 6-0081 shows the following results for replicate analyses of Soxhlet-extracted samples:

   Sample #7 656 ppm, 978 ppm
   Sample #9 1312 ppm, 3646 ppm
   Sample #12 1161 ppm, 834 ppm

3. None of the results from the March 1982 sampling of sediments should be included in the NBH database.

APRIL 1982 U.S. COAST GUARD SAMPLING OF SEDIMENTS

Plaintiffs' RFA V.B.I.(f)

1. There is no evidence that the work was carried out according to a statistical sampling design.

   1.a No explanation is provided concerning selection of sampling locations.

   1.a.1 There is no evidence that a grid or transect system was used.

   1.b The importance of statistical procedures in selecting sample locations (and in fact in all aspects of environmental measurement) was well recognized by EPA at the time of the USCG sampling. (EPA 1979a, 1980, 1982, 1982a).

   1.c It is not possible to assess whether these studies represent judgmental or haphazard sampling from the information available.

   1.d The data cannot be used to estimate PCB distribution in the harbor because of a lack of statistical sampling design.

2. A significant number of the planned samples for sediments at lower depths were not obtained.

   2.a Sediments representing depths greater than 12" were obtained at only 2 of 12 locations.

   2.a.1 "Hard sand and rocky bottom" prevented the planned collection of samples from the western side of the Acushnet River inside and outside the hurricane barrier.

   2.b Contrary to plan, samples were collected from the eastern side of the river only (Document R 0019).

   2.c The implied reason for non-collection is physical resistance to corer penetration.

   2.c.1 The under-represented sediments were most probably rocky, shelly, or sandy materials with low organic content and thus lower PCB content than more silty sediments.

   2.d The inability to collect planned samples introduced an upward bias into the volumetric aspects of the data set.

3. Samples were collected using plastic push tubes capable of collecting up to 28" of sediment.

   3.a The procedures used for cleaning the plastic push tubes are not described.

   3.b EPA documents available at the time of this USCG sampling clearly delineate cleaning procedures for equipment used in sample handling and require that the absence of contamination be confirmed by analysis of blanks. (EPA 1979, 1980, 1980a, 1980c, 1982.)

4. The report (R 0019) indicates that two samples (cores) per site were collected.

   4.a However, these cores were not treated as field replicates.

   4.a.1 Slices representing a specified depth interval from each of the three cores at a given station were mixed (composited) prior to analysis.

   4.a.2 The exception is Station 7, where one "core" was so short that only a 0-1" sample could be retrieved for analysis.

   4.a.2.a This sample was analyzed separately from the 0-1" layer of the replicate station 7 core.

   4.a.3 Only one short core (4") was collected at station 12.

   4.b It is good practice to obtain field replicates as part of routine quality control procedures. (EPA 1979, 1979a, 1980, 1982)

   4.c In the absence of field replicates, no estimate can be made of the overall data quality (precision).

5. The sample preparation procedures used are not consistent with standard EPA or ASTM methods in place at the time.

   5.a The samples are reportedly "air dried at a temperature of 25-35°C inside the Mobile Laboratory by passing warm dry air over the wet sediment samples" (R 0019) prior to extraction.

   5.b No record exists of determination of the % moisture in the samples either before or after the "drying."

   5.c The results reported are thus not reliable on either a <u>wet weight</u> (because the samples were "dried") or on a <u>dry weight</u> (because moisture loss may not have been

complete and residual moisture was not determined) basis.

5.c.1 Such results not comparable to values reported in other studies, which are usually specified as either "wet" or "dry" weight basis.

5.d EPA procedures in effect at the time of the USCG sampling (e.g., EPA 1979a) were to take separate sample aliquots for moisture determination soon after receipt of the samples, drying to constant weight at 105°C.

5.d.1 The percent solids are then calculated for the sample.

5.d.2 A second representative aliquot of the sample is then taken for extraction and analysis and the results corrected arithmetically to a dry weight basis (using the % solids determination).

6. The GC/ECD procedure gave inferior chromatographic resolution.

6.a A 2-foot, 3% OV-101 packed column was used for the GC/ECD analysis.

6.b This gives grossly inferior resolution of complex PCB mixtures compared to the 6-foot columns that represented good packed column technology at the time. (Webb 1973, ASTM 1978, EPA 1979, 1980, 1980c, 1980b, 1982)

6.c The analysis of Aroclor standards (e.g. BN 6-0359) showed very short retention times and lack of baseline resolution for an Aroclor 1254 standard.

6.c.1 When resolution is this poor, it is impossible to identify potentially interfering substances present in the sample but absent from the Aroclor standards.

6.c.2 The result is over-estimation of the PCB content of the samples.

7. No attempt was made to quantify only those sample peaks that were also present in the Aroclor standard.

7.a. The sum of the areas of all sample peaks with retention times between about 0.3 min and about 10.5 min was typically taken as the area for quantification against an Aroclor 1254 standard.

7.b Peaks that were noticed by the analyst as electronic "glitches" (e.g., the 9.02 min peak in BN 6-0473 and 6-0474/5) were subtracted from the total area prior to quantification.

7.c On some occasions, a peak recognized by the analyst as a "contaminant" (e.g., the 5.56 min peak in BN 6-0432) was excluded from the total area prior to quantification.

7.d On other occasions (e.g., 5.82 minute peak in BN 6-0458), a corresponding "contaminant" peak was quantified as a PCB.

8. Aroclor 1254 was the only PCB used for quantification.

8.a There is no documentation that Aroclor 1254 was a good "match" for sample peak patterns.

8.b No chromatograms were provided to demonstrate that the pattern of peaks in the samples were a close match to those of Aroclor 1254.

8.b.1 This is contrary to good practice at the time, in which PCBs are quantified using the Aroclor or mixture of Aroclors that provide the best match.

8.c The method of Webb and McCall (peak-by-peak quantitation) is the standard of practice when thee is no good Aroclor fit. (Webb 1973, FDA 1977, ASTM 1981, EPA 1982).

8.d Many sample extracts were analyzed at concentrations too dilute to allow identification of peak patterns (fingerprints). (See, e.g., BN 6-0474/5; 6-9458; 6-0432.)

8.d.1 Errors are greatly magnified under these conditions.

8.e Peaks present in the sample but absent from the Aroclor standard were uncritically quantitated as if they were PCBs (e.g., BN 6-0474/5).

9. Multiple dilutions of the same sample extract were frequently analyzed by GC/ECD. (BN 6-0095 to 6-0118).

9.a Replicate dilutions of the same sample gave inconsistent results, indicating errors in preparation of dilutions.

9.a.1 BN 6-0473 purports to show the chromatogram of sample No. 21, 5.5-6.5" depth, diluted 1:13.5.

9.a.2 BN 6-0474/5 purports to show the chromatogram of the same sample, diluted 1:54.

9.a.3 The patterns of peaks in these two chromatograms differ substantially, indicating that they do <u>not</u> represent simply different dilutions of the same exact.

9.a.3.a At least one of these chromatograms contains peaks due to extraneous material (laboratory contamination).

9.a.4 The quantitative data for BN 6-0473 indicate a sample concentration of about 2000 ppm.

9.a.4.1 The result calculated for BN 6-0474/5 is 200 ppm.

9.a.4.2 This is further evidence that, at least, BN 6-0473 is contaminated.

10. The procedures used to prepare sample dilutions were idiosyncratic.

10.a Standard procedure is to use volumetric glassware (syringes, pipettes, and volumetric flasks) to prepare dilutions as necessary.

10.b The April 1982 sampling study employed an auto pipet to add 0.04 mL portions of sample to various quantities of solvent. (BN 6-0092).

10.c This is an inherently imprecise procedure.

11. There is no evidence that even a minimal program of routine QC was implemented.

11.a BN 6-0092 to 6-0115 shows that the USCG made at least 138 sequential sample injections over a 14-day period without injecting a single calibration standard and only a single blank.

11.b Standard practice at the time would have been to analyze standards and blanks on a <u>daily</u> basis (EPA 1979, 1980b, 1980c, 1982).

11.c The data set should be rejected on its face for the lack of QC.

12. The calibration standards did not span the range of concentrations observed for the samples

12.a Area counts for the standards were in the range of 3 million to 22 million. (BN 6-0092, 6-0115).

12.b Area counts for the samples were as low as 0.006 million (BN 6-0096).

12.c Reported sample concentrations outside of the calibration standard range are unreliable.

13. The record (BN 6-0092) shows that some of the computed PCB concentrations were high by more than 20%.

13.a No corrections in the calculated values were made. (Jadamec evidentiary hearing testimony at 1-73 ff)

14. A high degree of selectivity was used in reporting GC/ECD data.

14.a When multiple analyses of the same sample extract dilution were performed, sometimes the results were averaged and sometimes one or more values were rejected. (Compare R 0017 with BN 6-0092 to 6-0115.)

14.b Example, sample No. 4, bottom, was analyzed 3 times by GC/ECD over the period May 11 to May 13, 1982.

14.b.1 A value of 6.5 ppm was calculated for the undiluted extract.

14.b.2 Values of 3.9 ppm and 16.5 ppm were calculated for replicate analyses of a 1:10 dilution (labelled "too dilute" in BN 6-0095).

14.b.3 The value of 16.5 ppm was arbitrarily selected for inclusion in R 0017.

14.c Example, sample No. 9, middle, was analyzed three times by GC/ECD between May 11 and May 20, 1982.

14.c.1 The computed concentrations, all for 1:505 dilutions, were 12,785 ppm, 29,282 ppm, and 30,963 ppm.

14.c.2 The 30,963 ppm was reported in R 0017.

15. Two additional analysis methods, TLC and HPLC were applied to the April 1982 samples.

16. There was generally poor agreement among the GC/ECD, TLC, and HPLC results. (R 0017)

16.a TLC and HPLC are primarily qualitative analysis techniques.

16.b For this sample set, TLC and HPLC were used as methods of quantification of PCBs. (R 0015, R 0017, and Jadamec testimony at evidentiary hearing).

16.c The HPLC analysis used a non-selective method (UV absorption at 254 nm) for detection and quantification.

16.d The TLC analysis used a non-selective method (UV absorption at 235 nm) for detection and quantification.

16.e Both HPLC at 254 nm and TLC at 235 nm are subject to interference from a wide range of sample contaminants other than PCBs.

16.e.1 Non-chlorinated hydrocarbons are potential interferences.

17. The HPLC and TLC results were generally a factor of two or more higher than the GC/ECD results. (R 0017)

17.a The TLC result was higher than GC for 42 of 97 samples (43%).

17.b The HPLC results was higher than GC for 70 of 97 samples (72%).

17.c The range between the highest and lowest value was greater than a factor of 2 for 70 of 97 samples (72%).

18. Subjective judgment was employed in determining whether/how to average the results of the three analytical procedures (Jadamec/Bentz testimony at evidentiary hearings; Jadamec declaration in plaintiffs' joint response (p 83 ff)).

18.a The arithmetic mean of the results of three analyses was reported for fewer than one-half of the samples (45 of 98 samples, Jadamec p 83)

18.b For 11 of 98 samples the GC result "averaged" was itself an average of multiple injections (Jadamec, p 83).

18.c For other samples, one or more results were arbitrarily excluded from the average (Jadamec p 84-85).

18.d For one sample, no TLC or HPLC results were reported (R 0017).

18.d.1 A value of 27 ppm from the GC/ECD analysis was apparently (Jadamec, p 85-86) divided by three to generate a "consensus average" of 9 ppm.

19. The "averaging" procedures do not reflect any rational scientific criteria for agreement among techniques.

19.a For example, for sample #6, middle, a value of 90 ppm (TLC) was dropped and values of 400 ppm (GC) and 350 ppm (HPLC) averaged.

19.b For sample No. 12, middle, values of 36 (GC), 67 (TLC), and 680 (HPLC) were averaged even though there was a twenty-fold difference between the high and low values.

20. The results of the TLC, GC, and HPLC analyses for these April 1982 sediment samples are unreliable and untrustworthy both individually and as so-called "consensus averages."

20.a The results reported by the USCG represent the product of unsound and arbitrary thought coupled with inexperience, lack of quality control, and a less-than-desirable level of laboratory skills.

21. None of the results of the USCG should be included in the NBH data base.

1714L

U.S. COAST GUARD JUNE 1982 SEDIMENT SAMPLING
Plaintiffs' RFA V.B.i.(g)

1. There is no evidence that the work was carried out according to a statistical sampling design.

   1.a No explanation is provided concerning selection of sampling locations; there is no evidence that a grid or transect system was used.

   1.b The importance of statistical procedures in selecting sampling locations was well recognized by EPA at the time of the USCG sampling. (EPA 1979a, 1980, 1982, 1982a)

   1.c The available information (Jadamec evidentiary hearing testimony at 1-93, line 14 ff) indicates that this study involved judgmental sampling.

   1.d The data cannot be used to estimate PCB distribution in the harbor because of a lack of statistical sampling design.

2. It is not possible to ascertain whether the plastic tubes used for sampling were a source of PCB or other contamination in the analyses.

   2.a Samples were collected using plastic push tubes capable of collecting up to 28" of sediment.

   2.b EPA documents available at the time of this USCG sampling clearly delineate cleaning procedures for equipment used in sample handling and require that the absence of contamination be confirmed by analysis of blanks. (EPA 1979, 1980, 1980a, 1980c, 1982.)

3. There were a significant number of uncollected samples for sediments at lower depths.

   3.a Sediments representing depths greater than 12" were obtained at only 2 of 12 locations.

   3.b In addition, "hard sand and rocky bottom" prevented the planned collection of samples from the western side of the Acushnet River inside and outside the hurricane barrier.

   3.c Contrary to plan, samples were collected from the eastern side of the river only. (Document R 0019)

   3.d Since the implied reason for non-collection of samples is physical resistance to corer penetration, the under-represented sediments were probably rocky, shelly, or sandy materials with low organic content

and probably lower PCB content than more silty sediments.

3.e The omission of samples thus introduced an upward bias into the data set.

4. The report (R 0019) indicates that two samples (cores) per site were collected.

4.a These samples were not treated as field replicates.

4.b Slices representing a specified depth interval from each of the three cores at a given station were mixed (composited) prior to analysis.

4.c The exception is Station 7, where one "core" was so short that only a 0-1" sample could be retrieved for analysis.

4.c.1 This sample was analyzed separately from the 0-1" layer of the replicate Station 7 core.

4.d Also, only one short core (4") was collected at station 12.

4.e It is good practice to obtain field replicates as part of routine quality control procedures. (EPA 1979, 1979a, 1980, 1982)

4.3.1 In the absence of these samples, no estimate can be made of the overall data quality (precision).

5. The sample preparation and analysis procedures are cross-referenced to document R 0015 (USCG April 1982 sampling).

5.a No references are provided in that report to document the procedures used for sample preparation and analysis.

5.b The procedures used are not consistent with standard EPA or ASTM methods in place at the time.

5.c Not only were the methods used non-standard, they were sub-standard for the time.

5.c.1 The samples were reportedly "air dried at a temperature of 25-35°C inside the mobile laboratory by passing warm dry air over the wet sediment samples" (document no. R 0019) prior to extraction.

5.c.1.a No record exists of determination of the % moisture in the samples either before or after the "drying."

5.c.2 The results reported by USCG are not reliable on either a wet weight (because the samples were "dried") or on a dry weight (because moisture loss may not have been complete and residual moisture was not determined) basis.

5.c.2.a The results are not comparable to values reported in other studies, which are usually specified as either "wet" or "dry" weight basis.

5.c.3 EPA procedures in effect at the time of the USCG sampling (e.g., EPA 1979a) were to take separate sample aliquots for moisture determination soon after receipt of the samples, drying to constant weight at 105°C. The percent solids are then calculated for the sample. A second representative aliquot of the sample is taken for extraction and analysis and the results corrected arithmetically to a dry weight basis using the % solids number).

5.c.4 No attempt was made to ascertain whether the "warm, dry air" used in the mobile laboratory was PCB-free.

5.c.4.a Contamination of samples by pollutants in ambient air is not uncommon in field (mobile) laboratories.

6. The Chromatographic method used was incapable of providing good resolution of PCBs.

6.a A 2-foot, 3% OV-101 column was used for the GC/ECD analysis.

6.b This gives grossly inferior resolution of complex PCB mixtures compared to the 6-foot columns that represented good packed column technology at the time. (Webb 1973, ASTM 1978, EPA 1979, 1980, 1980c, 1980b, 1982)

7. Documents R 0019 states that a hexane/acetone mixture "was used to extract all sediment samples and was used in the determination of PCB levels by the three analytical techniques described in reference (a)." (Reference (a) is Document R 0015).

7.a The rest of the documentation suggests that these June samples were analyzed by GC only.

8. Data generated using non-standard methods, when standard methods are readily available and could have been implemented using the laboratory s existing equipment (GC/ECD), should not be considered in an adjudicatory or regulatory proceeding.

9. For the June 1982 sampling, the Coast Guard rejected the results of TCL and HPLC analyses. (Jadamec evidentiary hearing testimony at 1-95)

   9.a The reading/recording system for the TLC analysis was diagnosed as "malfunctioning."

   9.b The HPLC system was diagnosed as having a leaky injector.

   9.c The HPLC system was being operated as "a training ground for a new operator."

10. Aroclor 1254 was the only PCB used for quantification.

   10.a No chromatograms were provided to demonstrate that the pattern of peaks in the samples were a close match to those of Aroclor 1254.

   10.b This is contrary to good practice at the time, in which PCBs are quantified using the Aroclor or mixture of Aroclors that provide the best match.

   10.c The method of Webb and McCall (peak-by-peak quantification) is the standard of practice when there is no good Aroclor fit. (Webb 1973, FDA 1977, ASTM 1982, EPA 1982)

   10.d The quantitative data must be challenged as inaccurate on this basis alone.

11. There was no intent to obtain accurate estimates of the absolute quantity of PCBs present in the samples.

   11.a The intent was to determine the <u>relative</u> concentrations of PCBs between sample locations. (Jadamec evidentiary hearing testimony at 1-88,89; 1-105.)

   11.b The reported PCB concentrations are, at best, useful only <u>relative</u> to other samples analyzed in the same study.

   11.c The results of this sampling could not be compared with those from any other study even if the chromatography had been acceptable.

12. There is no evidence that the USCG implemented even a minimal program of routine QC.

12.a The record (document 6-0116) shows that the USCG made at least 29 sequential sample injections over a 2-day period without injecting a single calibration standard or blank.

12.b Standard practice at the time would have been to analyze standards and blanks on a daily basis. (EPA 1979, 1980b, 1980c, 1982).

12.c The data set should be rejected on its face for the lack of QC.

13. The CG/ECD data reported in this study must be rejected.

13.a The procedures used to prepare sample dilutions were idiosyncratic.

13.a.1 Standard procedure is to use volumetric glassware (syringes, pipettes, and volumetric flasks) to prepare dilutions as necessary.

13.b The USCG apparently perpetuated the practice used in the April 1982 sampling study of suing an auto pipet to add 0.04 mL portions of sample to various quantities of solvent.

13.c This practice is an inherently imprecise procedure.

13.d Document BN 6-0116 reports no data for different dilutions of the same extract, so it is not possible to determine whether the problems associated with the April 1982 sample dilutions were perpetuated.

13.e There was no evidence that the standard practice of summing only peaks that are present in the standards was used.

13.e.1 Marginal notes in Document BN 6-0116 suggest the analyst used arbitrary judgment in deciding which peaks to exclude from the total area.

13.f The calibration standards did not span the range of concentrations observed for the samples.

13.f.1 Area counts for Aroclor 1254 standards (Document 6 0115) were in the range of 8 million to 16 million.

13.f.2 Sample quantification results were reported for areas much less than 1 million (some as low as 0.3 million!)

13.f.3 This is bad practice. (ASTM 1977, EPA 1979, 1980b, 1980c, 1982)

14. There are major inconsistencies between the data tabulated in BN 6-0116 and those reported in Table 1 of Document R 0019.

14.a The data in BN 6-0116 are footnoted as "without correction for sample moisture."

14.b The differences between BN 6-0116 and R 0119 apparently do not reflect a correction to a dry weight basis.

14.b.1 Such correction would not be consistent with the stated method of sample preparation in which the samples were dried prior to extraction.

14.b.2 No mention is made of % moisture determinations.

14.c It is impossible for a sample to have less than 0% moisture.

14.c.1 The dry weight basis result can never be <u>lower</u> than the wet weight result.

14.c.2 The results in R 0019 are below those in BN 6-0116 for several samples (#2, 5.5-6.5"; #3, 5.5-6.5; #6, 8-9"; #9, 01"; #10, 0-1").

14.d It is impossible to determine how the BN 6-0116 values were "corrected" to arrive at the numbers in R 0019.

15. The June 1982 sampling data have no value or utility for the purpose of assessing the nature and extent of PCB contamination in sediments of the Acushnet Estuary.

15.a Samples were not collected according to a statistical design.

15.b Analyses were not performed using standard methods.

15.c The methods that were used were implemented in an unsound and arbitrary manner (GC).

15.d There was no attention to QC.

15.e The Aroclor identifications are not supported by chromatograms in the attachment documents.

16. None of the results of USce June 1982 sampling should be included in the NBH data base.

0058y

ACOE GRID (1985)

Plaintiffs' RFA V.B.i.h — Condike

1. Between August 20, 1985, and September 17, 1985, personnel from the New England Division of the U.S. Army Corps of Engineers (COE) collected core samples of bottom sediments from 143 locations within the upper Acushnet River Estuary, New Bedford, Massachusetts.

2. The cores were divided into segments according to depth and purportedly were analyzed for PCB's and oil & grease, according to procedures contained in the report "New Bedford Harbor Superfund Site, Acushnet River Estuary Study" by Brian J. Condike US COE June 1986. BN P01337 to P01536. (Referred to as the Condike report)

3. The results of analyses purportedly were summarized in Table IX of the Condike report.

   3.a Comparison of Table IX as presented in the Condike report and Table 1 as presented in Plaintiffs' RFA V.B.i.(h). reveals that 61 samples were missing from the table in Plaintiffs' RFA presentation of PCB results.

   3.b Table IX also reports results of oil and grease analyses for most samples.

4. Raw data for the GC analyses of the samples shown in Table 1 of RFA V.B.i.h. purporedly are contained within BN 75020-75294.

   4.a These data indicate that the PCB analyses were run without the use of internal standards or surrogates.

      4.a.1 This practice decreases the probability of correct quantitative and qualitative analyses.

   4.b These data show that no attention was paid to pattern recognition when interpreting chromatograms of samples containing low levels of PCB's.

      4.b.1 There is apparent random assignment of peaks to A1254 or A1260 when peak intensity is low.

4.b.2 There is no basis for assigning any of the peaks in sample G29-1, 15-27" segment, to a specific Aroclor.

4.b.3 The chromatographic peaks appear to indicate that serious degradation has occurred.

4.c Samples that appear to be extremely concentrated in PCB's, such as I-11-2 (12-24") and J-10 (0-12") have been characterized as containing 60-85% A1260.

4.c.1 Broad peaks, up to 8 minutes wide, have been assigned to A1260 primarily because they are late eluting.

4.c.2 There is no sound basis for reporting the presence of any A1260.

4.d Sample H-12, 12-24" is reported to contain 3740 ppm of PCB's.

4.d.1 The correct value (BN 75049) is 3740 ppb or 3.74 ppm of PCB's.

4.e Notebook pages contained in BN 75020 to 75294 reflect very poor record keeping procedures.

4.e.1 Many entries are illegible.

4.e.2 Many entries are overwritten and not initialed.

4.e.3 No Data Correction sheets exist.

4.f Generally, "concentrated" samples are not run at a dilution sufficient to allow review of the chromatogram.

5. Data for sample G-18 (0-12") and the quality control analyses of G-18, G-18 (0-12") replicate, and G-18 (0-12") spike are given in Otis Exh. 49.

5.a G-18 (0-12") was reported to contain 398 ppm of PCBs.

5.a.1 Visual examination of the chromatogram and the computer printout indicates that approximately 25% of the PCB was believed to be due to A1260.

5.a.2 Approximately 65% of the purported A1260 is represented by one of a group of wide, low, nondescript, late eluting peaks with a retention time of 39.4 minutes.

5.a.2(a) The closest peak in the A1260 standard has retention time of 40.2 minutes.

5.a.2(b) The peak at 39.4 minutes is not due to PCB's.

5.b G-18 (0-12") replicate was reported to contain 227 ppm of PCB's.

5.b.1 Visual examination of the chromatogram and the computer printout indicates that integration and assignment of retention times stopped at approximately 19 minutes.

5.c G-18 (0-12") spike was prepared by spiking a G-18 (0-12") sample with 500 ppm of A1260.

5.c.1 G-18 (0-12") spike was reported to have been analyzed with 68 percent recovery of the spike.

5.c.2 Using an average of 312 ppm PCB's, as reported in the Condike report, the spiked sample should have contained (0.68 x 500 + 312) = 652 ppm of total PCB's.

5.c.3 According to the computer printout, the distribution of the PCB's in the spiked sample was 1536/1713 or 90% A1260 (or 587 ppm A1260) nearly all of which was assigned from a single broad poorly defined peak.

5.d Given the incongruity that a sample spiked with 500 ppm of A1260 will have nearly all of the A1260 undergo metamorphosis into material eluting as a single broad band, the appearance of large amounts of A1260 in any of the samples must be rejected.

5.e Because the presence of large amounts of late eluting material is not due to A1260, the PCB concentration is dramatically overstated in all samples in which it is reported.

6. RFA V.B.i.h. Table 1 alleges sample H-12 (0-12") to have the lab i.d. No. of 0043A and that the PCB concentration is 8,370.0

6.a The actual lab i.d. No. for sample H-12 (0-12") is 0042A.

6.b The PCB concentration reported in the Condike report is 8370 which implies 100 times less accuracy than the RFA.

6.c The actual PCB concentration for sample H-12 (0-12") is approximately 2320 ppm when the contribution from the broad late eluting peak at 39.8 minutes attributed to A1260, is removed.

6.d BN 75051 indicates the dilution factor for this sample was 100X.

6.e BN 75050 indicates the dilution factor for this sample was 1000X.

6.f Using the information presented in BN 75051 and rejecting the contribution from the A1260 39.8 minute peak, the concentration of PCB's in H-12 (0-12") is 232 ppm.

7. When analyzing EPA SRM's, 10-20% of the total PCB reported is attributed to Aroclors other than those that should be in the sample, i.e. SRM's contain either A1242 or A1242 and A1254 but no A1260.

7.a A1260 is reported by the COE Run #580 on 10/28/85 for EPA Gr 1 sample.

7.b The Condike report usually overstates the PCB content of SRM's.

7.c The Condike Report usually overstates the PCB content of samples yielding chromatograms similar to those from SRM's.

8. RFA V.B.i.h. 50-52a alleges that the oil sheen seen in photographs V.B. R0063, R0064, R0065 and R0066 is due to "PCB laden fluids"

8.a PCB's are a component of the oil and grease in a sample.

8.b Photographs R0063 to R0065 are of core sediment from grid square I-11, which has been alleged to contain 10% less oil and grease than total PCB content.

8.b.1 Since oil and grease includes total PCB's these measurements are incorrect.

8.c Photograph R0066 is of core sediment collected in grid square G-17 which has been alleged to contain >4% oil and grease and only 1147 ppm of PCB's.

8.d The core sediments would have an oily sheen from the oil and grease even if PCBs were absent.

9. In the chromatogram of the standard mixture run on 2/14/86 (chromatogram #1218) the peaks have been manually reassigned.

9.a The broad late eluting peaks were reported as A1260.

9.b The 4 large late eluting peaks had approximate retention times of 21, 26, 31 and 40 minutes.

9.b.1 The ratio of the concentration contributions represented by these peaks was approximately 20:13:16:13

9.b.2 The ratio of the areas of these peaks was approximately 11:5:18:20

9.c The chromatogram of I-11-2 (12-24") was chromatogram #1245.

9.c.1 The reported ratio of concentrations described for I-11-2 is now 75:5:50:500

9.c.2 The ratio of peak areas, however, continues to be 11:5:18:20.

9.d Thus, the calculation of concentration contributions is incorrect.

9.e The results of this analysis should be rejected.

10. Early work (i.e. 10/24/85) did not use peaks above 26 minutes for quantitation.

10.a The peak area ratio information from run #543 was approximately 1:1.06:2.36:1.76 the four large late eluting peaks referenced above.

10.b The peak area ratio for run #564 for these peaks was approximately 1:1:1.5:1.4.

10.c Runs #543 and #564 were of the same standard.

10.d Substantial fluctuations in response thus are obtained with the same standard.

10.d.1 Because it was obtained with standards, this fluctuation of ±25% is illustrative of the best accuracy that was obtained in the laboratory.

11. On 11/26/85, the COE laboratory obtained the chromatogram #759.

11.a This chromatogram is of an EPA sample known to contain only two of the Aroclors, A1242 and A1254, and those in a 7:6 ratio.

11.b COE found the following ratios of the indicated aroclors:

1242	10.5
1254	6
1260	6.5

11.c Results from the COE laboratory are not reliable.

12. Chromatogram #859 is alleged to be representative of I-11-1 (0-13").

12.a This chromatogram (BN 75124) and the digital printout (BN 75125) show, at best, minimal contribution purported to be from A1260 (8% A 1260 peaks)

12.b Chromatogram #801 is alleged to be representative of I-11-1 (13-24").

12.b.1 This chromatogram (BN 75126) and its printout (BN 75127) purport to show approximately 11% A1260 peaks and most of that contribution comes from early (<20 min) eluting peaks.

12.c Replicates and replicate spikes represented in BN 75128 to 75131 are consistent.

13. Chromatogram #1247 shown in BN 75146 with printout BN 75147 is alleged be I-11-2 (0-12").

13.a Chromatogram #1245 shown in BN 75152 with printout BN 75153 is alleged to I-11-2 (12-24").

13.b These chromatograms (1245 and 1247) bear no resemblance to the I-11-1 group referenced above (859 and 801).

13.b.1 These chromatograms are supposed to be from field replicates.

14. The chromatograms #1245 and 1247 are representative of the chromatograms obtained during 2/86.

14.a This suggests that the chromatograms obtained during 2/86 are heavily contaminated and that the standardization/calibration procedure has broken down.

14.b All of this data is invalid.

14.c The data for samples I-11-2; H-12; J-10 and J-12 are invalid.

15. The chromatograms #801 (BN 75126) for I-11-1 (13-24") and #859 (BN 75124) for I-11-1 (0-13") dated 12/2-5/85, are entered in a notebook record dated 11/26/85 (BN 75122).

15.a That notebook shows evidence of obliteration of entries (as opposed to single line indications of error), without attribution.

15.b The data from the notebook shown in BN 75122 should be rejected because of obviously altered documentation.

16. According to the Condike report, COE obtained subsamples of the cores by drawing a polystyrene spoon "longitudinally down the center of split core over the depth segment of interest."

16.a Obtaining subsamples of a split core by the indicated method will introduce a bias depending on the direction of travel of he spoon.

16.a.1 The samples will not be representative of the core.

16.b Obtaining subsamples of a split core by the indicated method will not yield a representative sample because the depth of penetration of the spoon (toward the core wall) cannot be accurately controlled.

16.b.1 The amount of spillage out of the sides of the spoon cannot be accurately controlled and thus the amount of sample from any increment of depth is not controlled.

17. According to the Condike Report "[s]ubsamples for chemical analysis were air-dried at ambient temperature . . . ." "The air-dried samples were hand-ground with a porcelain mortar and pestle." The dried and ground samples were then stored in their original respective polypropylene containers at room temperature (Condike report p. 20).

17.a Since the air-drying at ambient temperature was not complete, aliquots of the subsamples were taken for moisture determination. Table V reportedly lists the resultant moisture contents after this air drying process.

17.a.1 Table V indicates (Condike report p. 21) that I-11-1 (0-13") still contained 57% moisture <u>after</u> air drying.

17.a.2 57% moisture after air drying for 72 hours is an untenable result both because of its absolute value and because of its relationship to values from similar samples.

17.b There is no correlation between moisture after drying and alleged PCB content for the entries in Table V.

17.c Table V indicates that I-11-2 (0-12") still contained 28.3% moisture after air drying.

17.d I-11-1 and I-11-2 are field replicates and should contain similar amounts of moisture before and after drying.

17.e The percent moisture result is used to calculate the fraction of solids in the sample.

17.e.1 The fraction of solids is used to calculate the concentration of PCBs on a dry weight basis.

17.e.2 When the percent moisture is biased high, the fraction of solids will be biased low, and the amount of an analyte on a dry weight basis will be biased high.

18. The accuracy of the results of any analysis, on a wet or dry weight basis, are dependent on the representativeness of the sample.

18.a The sample results reported in Plaintiffs' RFA V.B.i.(h). Table 1 are not based on samples with demonstrated representativeness.

18.b The sample results reported in this table, aside from any other considerations, are order of magnitude estimates based on the potential errors in determining dry weight.

Bottom Line re: Condike data?

19. The results of the analyses of NBH core samples as presented in the Condike report are unreliable for a number of reasons including: apparent inability to develop true field replicate samples; poor choice of analytical standards; poor chromatography; apparent contamination of samples and laboratory; inattention to work by laboratory personnel; and inconsistent results of oil and grease and moisture study.

1365L

May 1978 DEQE/LES Sampling

Plaintiffs RFA V.B.i.(j)

AVX RFAs to Plaintiffs

1. No formal report of this sampling and analysis project has been provided.

   1.a There are no descriptions of the sampling plan design, sampling site location methods, sampling devices and procedures, procedures used to prevent cross contamination between samples, sample storage (duration/conditions) or chain of custody, laboratory procedures for sample preparation and analysis, or quality control.

   1.b In the absence of a formal report, it is impossible to establish that sampling and analysis conformed to standards of good practice.

2. There is no evidence that the work was carried out in according to a statistical sampling design.

   2.a The sampling sites are reported to have been "preselected by DEQE," (plaintiffs' RFA, V.B.i.(j) 1.a.).

      2.a.1 The basis for the selection is not stated.

   2.b There is no evidence that a grid or transect system was used or that the necessary element of randomness was introduced into the sampling site selection.

   2.c Different "depths" were selected for analysis from different samples.

   2.d There is no evidence that this selection process was made according to objective criteria or design.

   2.e It is impossible to determine the degree to which judgmental or haphazard sampling introduced bias into the data.

3. The procedure cited for sample preparation (V.B.i.(j)9.) is FDA 1977, Section 212.13a.

   3.a This procedure is specifically indicated for multi-residue pesticide determination in "non-fatty foods, high moisture content, other than eggs."

3.b It is less appropriate for sediments than the procedure for exhaustive extraction of organochlorine residues given in Section 253 of the same manual.

4. There is no evidence in the record that the sample clean-up procedures described in the FDA manual as important for PCB analysis was applied.

4.a The lack of sample clean-up techniques could have caused interferrences in the analysis that led to <u>high</u> reported values.

5. There seems to have been minimal or no quality control associated with this sampling and analysis effort.

5.a No field replicate samples were generated. No mention in made of conventional laboratory QC: blanks, spikes, replicates, standard reference materials, calibration standards.

5.b The quality of the data cannot be assessed.

6. The data provided in the record (Documents 7 0080 through 7 0083) consist only of a table (barely legible) of results that are purported to be ppm (dry weight basis) of PCBs as 1254.

6.a No supporting data (chromatograms, calibration curves, % moisture values, calculations, etc.) are provided.

6.a.1 The validity of these results cannot be evaluated.

No confidence can be placed in these results, since the procedures used to generate them cannot be traced.

7. The DEQE collected and analyzed approximately 40 samples (BN 7-0086/0087).

7.a The plaintiffs' RFA (V.B..i(j) 14.a.) reports results only for 7 selected sample extracts.

7.b The reported values range from 7.2 to 31.6 ppm.

7.c Most of the omitted values are less than 10 ppm.

7.d Selective reporting of results, without an explanation and justification for what has been omitted is contrary to scientific principals and might even be considered unethical.

8. No information is provided to indicate how sampling sites were determined and located (by hand) on the map.

8.a Sampling sites cannot be co-located on a map with those from other studies.

9. The reported results show no substantial differences between "upper" and "lower" level sediments collected from a given location.

10. The plaintiffs' RFA is misleading when it states: "On May 8 and 10, 1978, (DEQE) collected seven (7) samples of sediments in the Acushnet River Estuary and south of the hurricane barrier." (V.B.i.(j).1)

10.a On May 8 and 10, 1978, DEQE collected <u>twenty three (23)</u> samples, many of which were subdivided into multiple samples prior to analysis.

11. At V.B.i.(j) 9., the Government asserts that the procedures used by LES represent "accepted preparatory methods for gas chromatography."

11.a The cited FDA methods were not generally "accepted" procedures for extraction of PCBs from sediments.

12. At V.B.I.(j) 14., the Government states that the data listed are "true and accurate" representations of the PCBs present in each sample. No claim for accuracy can be made in the absence of QC data.

13. In the absence of appropriate documentation including chromatographic data, none of the results of the study should be included in the NBH data base.

August 1979 DEQE/LES Sampling of Sediments

Plaintiffs' RFA V.B.i.(k)

1. The files contain no formal report of this sampling and analysis project.

   1.a There are no descriptions of the sampling plan design, sampling site location methods, sampling devices and procedures, procedures used to prevent cross contamination between samples, sample storage (duration/conditions) or chain of custody, laboratory procedures for sample preparation and analysis, or quality control.

   1.b In the absence of a formal report, it is impossible to establish that sampling and analysis conformed to standards of good practice.

2. There is no evidence that the work was carried out in according to a statistical sampling design.

   2.a The sampling sites are reported to have been "the same locations where samples were collected by DEQE personnel in May 1978." (plaintiffs' RFA, V.B.i.(k) 1.a.)

   2.b There is no basis for inferring that accurate methods were used to define the sampling site locations on either occasion.

      2.b.1 They cannot be claimed to be "the same".

   2.c There is no evidence that a grid or transect system was used or that the necessary element of randomness was introduced into the sampling site selection.

   2.d Also, different "depths" were selected for analysis from different samples.

      2.d.1 There is no evidence that this selection process was made according to objective criteria or design.

   2.e It is impossible to determine the degree to which judgmental or haphazard sampling introduced bias into the data.

   2.f It is <u>not</u> established that these are the same sites sampled in 1978.

3. No information is provided concerning sample preparation or analysis methods applied to these samples.

   3.a The lack of sample clean-up techniques could have caused inferences in the analysis taht led to <u>high</u> reported values.

4. There seems to have been minimal or no quality control associated with this sampling and analysis effort.

   4.a No field replicate samples were generated.

   4.b No mention is made of conventional laboratory QC: blanks, spikes, replicates, standard reference materials, calibration standards.

   4.c The quality of the data cannot be assessed.

5. The data provided in the record (BN 7-0071 to 7-0073 and 7-0086, 7-0087) include copies of laboratory notebook pages showing % moisture, wet and dry weights of samples extracted, and "mg/Kg PCBs as 1254."

   5.a One sample, 22A (0-1.5"), is listed as "1260."

   5.b As no supporting data (chromatograms, calibration curves, % moisture values, calculations, etc.) are provided, the validity of these results cannot be evaluated.

   5.c No confidence can be placed in these results, since the procedures used to generate them cannot be traced.

6. The DEQE collected and analyzed 39 samples. (BN 7-0086 to 7-0087)

   6.a The plaintiffs' RFA (V.B.i.(k)2.) reports results only for 7 selected sample extracts.

   6.b The reported values range from 11.3 to 72.7 ppm

   6.c Most of the omitted values are less than 10 ppm, and many are less than 1 ppm.

   6.d Selective reporting of results, without an explanation and justification of what has been omitted, is contrary to scientific principles and might even be considered unethical.

7. No information is provided to indicate how sampling sites were determined and located (by hand) on the map.

7.a At V.B.i.(k) 1.a Plaintiffs assert that locations were "the same as in 1978. This cannot be supported, given the (in)accuracy of the site location documentation.

7.b Sampling sites cannot be co-located on a map with those from other studies.

8. At V.B.i.(k) 15.a., the Government states that the data listed are "true and accurate summaries of the concentrations of PCB which were found to be present and were present" in each sample.

8.a No claim for accuracy can be made in the absence of QC data.

9. In the absence of appropriate documentation including chromatographic data, none of the results of the study shall be included in the NBH data base.

September 30, 1980 DEQE/LES Sampling of Sediments

Plaintiffs' RFA V.B.i.(1)

1. The files contain no formal report of this sampling and analysis project.

   1.a There are no descriptions of the sampling plan design, sampling site location methods, sampling devices and procedures, procedures used to prevent cross contamination between samples, sample storage (duration/conditions) or chain of custody, laboratory procedures for sample preparation and analysis, or quality control.

   1.b In the absence of a formal report, it is impossible to establish that sampling and analysis conformed to standards of good practice.

2. There is no evidence that the work was carried out in according to a statistical sampling design.

   2.a There is no evidence that a grid or transect system was used or that the necessary element of randomness was introduced into the sampling site selection.

   2.b The importance of statistical design in environmental measurements was acknowledged by EPA at the time of sampling. (EPA 1979a, 1980)

3. The sampling sites are reported to have been "the same stations where samples had been collected on August 13, 1979 and August 14, 1979." (Note. DEQE 1979 shows 1979 sampling dates as August 13th and 15th, not 13th and 14th.) (plaintiffs' RFA, V.B.i.(1) 1.a)

   3.a There is no basis for inferring that accurate methods were used to define the sampling site locations on either occasion.

      3.a.1 They cannot be claimed to be "the same."

   3.b Also, different "depths" were selected for analysis from different samples.

      3.b.1 There is no evidence that this selection process was made according to objective criteria or design.

   3.c It is impossible to determine the degree to which judgemental or haphazard sampling introduced bias into the data.

4. The underlying documents (BN 7-0007 through 7-0012) list the collector, date of collection, and date of receipt of these samples as "unknown." (See example exhibit in Figure 1.)

4.a This represents a substantial breach in the chain of custody for these samples.

5. There is no information in the supporting documents (BN 7-0071 to 7-0073) about the date(s) on which samples collected on August 13 and 15 were extracted.

5.a The RFA states that sample numbers 3353, 3374, and 3415 were extracted and analyzed January 23-30, 1981. (V.B.i.(1) 5.a. and 7.)

5.b This exceeds the recommended EPA 7 day holding time for extraction and 30-40 day holding time for analysis of PCB. (EPA 1979, 1979a, 1980c)

6. No information is provided concerning sample preparation or analysis methods applied to the samples.

6.a The lack of sample clean-up techniques could have caused interferences in the analysis that led to high reported values.

7. There seems to have been minimal or no quality control associated with this sampling and analysis effort.

7.a No field replicate samples were generated.

7.b No evidence is presented for analysis of conventional laboratory QC: blanks, spikes, replicates, standard reference materials, calibration standards.

7.c The plaintiff's RFA does state (V.B.i.(1)8.) that "...the LES laboratory used the following measures to assure the reliability and accuracy of sample analysis results: standards, spiked samples, duplicates, and replicates."

7.c.1 None of the QC results are reported in the RFA or underlying documents BN 7-0007 to 7-0012 and BN 7-0124 to 7-0136.

7.c.2 The quality of the data cannot be assessed.

8. The data provided in the record (BN 7-0136 to 7-0138) include tables showing % moisture, "PCB Aroclors (mg/Kg-Wet Weight as 1016 and 1254," and "total PCB (mg/Kg dry weight)."

8.a As no supporting data (chromatograms, calibration curves, calculations, etc.) are provided, the validity of these results cannot be evaluated.

8.b There is no evidence in the record to support the Aroclor designations reported.

9. There are internal inconsistencies in the documents.

9.a For example, BN 7-0136 shows that the DEQE found 2.6 and 118 ppm (wet weight), respectively, of Aroclor 1254 in the 0-4" samples from stations 1 and 1A. BN 7-0124 indicates that it was Aroclor 1248 that was found in these samples.

9.b No confidence can be placed in these results, since the procedures used to generate them cannot be traced.

10. The DEQE collected and analyzed 64 samples from 24 stations (Table 1).

10.a The plaintiffs' RFA (V.B.i.(k) 2.) reports results only for 3 selected sample extracts.

10.b The reported values range from 16.4 to 29.5 ppm

10.c Most of the omitted values are less than 10 ppm, and many are less than 1 ppm.

10.d Selective reporting of results, without explanation and justification of what has been omitted is contrary to scientific principles and could in some cases be construed as unethical.

11 No information is provided to indicate how sampling sites were determined and located (by hand) on the map.

11.a Sampling sites cannot be co-located on a map with those from other studies.

12. At V.B.i.(k) 14.a., the RFA states that the data listed are "true and accurate summaries of ...the Aroclors in mg/Kg wet weight identified in the sample, and the concentration of total PCBs in mg/Kg-dry weight found in each sample."

12.a No claim for accuracy can be made in the absence of QC data.

12.b There is no evidence to indicate that the reported Aroclor designations are correct.

13. In the absence of appropriate documentation including chromatographic data, none of the results of this study should be included in the NBH data base.

1982 and 1985 SAMPLING BY STATE LABORATORY INSTITUTE
Jamaica Plain, Massachusetts

Plaintiffs RFA V.B.iii.(a)

1. Eleven sites were preselected from a set of previously designated sites.

   1.a No criteria for selection of those specific sites have been provided.

   1.b Absent a statistically-based sampling plan that includes an element of randomness (probability sampling), the data cannot be used to characterize the general characteristics of the lobsters in the harbor.

2. The analyses used a single point calibration curve.

   2.a Single point calibrations are not accurate beyond ±10% of the weight of PCBs injected.

   2.b Few samples contained a mass of PCB within ±10% of that used for calibration.

3. The chromatograms of the 1982 samples contain no supporting information such as retention times.

   3.a Chromatograms of standards were not provided.

   3.b There is no documentation for blanks or spikes.

      3.b.1 Results of QC analyses have not been provided in any form.

4. The chromatograms (BN 0-0200 to 0-0240) from the analyses of Spring 1984 lobsters show the GC conditions to be out of control.

   4.a Retention times vary between each pair of consecutive analyses.

5. The chromatograms (BN 0-0240 to 0-0263) from the analysis of Autumn 1984 lobsters A1254 standards indicate a very substantial loss of resolution.

   5.a The loss of resolution is more obvious in the samples than in the standards for these samples.

   5.b The samples are overloading an already underperforming column.

   5.c The mass of PCB's in the samples is much different than that in the standards.

5.d No QC data have been provided.

6. Results of the 1982 samples should be considered to be estimates.

7. None of the results of the analyses of the 1984 samples should be included in the NBH data base.

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MASSACHUSETTS DIVISION OF MARINE FISHERIES (MDMF)
Sampling of Biota

Plaintiffs' RFA V.B.iii.(b)

1. It is not evident that the sampling plan was a statistical design based on probability sampling.

   1.a Biota sampling locations were chosen from two different sets of "pre-determined" locations.

   1.b In 1976, sampling sites were selected from an EPA Region I set of locations. (V.B.R-0300).

   1.c In 1979 and thereafter, sampling locations were selected from a new set of locations developed by MDMF. (V.B.R-0300)

   1.d During each of the sampling trips, a small subset of the entire set of locations was sampled.

   1.e It is not clear how or why these locations were sampled and others excluded.

   1.f Absent a statistical design, the biota data cannot be presumed to represent the overall condition of the biota in New Bedford Harbor.

2. The Food and Drug Administration (FDA) Pesticide Analytical Manual - Volume I (PAM) (Document V.B.R-0310) was cited as the reference method for analyzing New Bedford Harbor biota samples.

3. The supporting documentation provided in the attachments to the plaintiffs' RFAs for the MDMF sampling and analysis is insufficient to document full compliance with the specified FDA method.

   3.a The injection log entry documents are generally not dated and not sufficient to check the accuracy of concentration calculations.

   3.b These documents also give little evidence of injection of QC samples (e.g., blanks and spikes) or of calibration standards.

   3.c The chromatograms provided are poor quality reproductions and provide little insight into the reliability of either quantitative or qualitative determinations.

   3.d The analytical reports are merely summary sheets of the concentration data.

3.e No information in the attachments indicates how the chromatographic data were used to derive PCB or Aroclor concentrations.

4. The documents that are available for analyses prior to 1985 include some sheets for a so-called "injection log" (BN 8-0070 to 8-0074).

4.a These sheets are undated.

4.b Insufficient information is provided to allow the numbers on these sheets to be correlated with the underlying chromatograms.

5. The documents available for analyses prior to 1985 include some chromatograms (BN 8-0041/0042, 8-0051 to 8-0069).

5.a The chromatograms provided are poor quality reproductions.

5.b It is possible, however, to determine that chromatographic resolution was very poor in many instances.

5.c Peaks are not resolved from each other or from a background of unresolved material.

5.d In a number of examples (e.g., BN 8-0042, 8-0052, 8-0060 and others), the peaks are off-scale.

5.d.1 The samples extracts are for too concentrated.

5.e Off-scale peaks make recognition of peak profiles and thus identification of the Aroclor present, if any, difficult.

5.f The "fit" to Aroclor 1254 cannot be confirmed.

5.g Off scale peaks are generally outside of the calibration range.

5.h Off-scale peaks often indicate overload of the chromatographic column and/or detector.

6. It has been indicated that the method of Webb and McCall would be used for quantitation.

6.a There is no evidence that the Aroclor standards employed were the specific lot numbers to which the method of Webb and McCall is applicable.

6.b The calculation sheets (BN 8-0190 to 8-0192) imply that the quantification was done on a peak-by-peak basis, as in Webb and McCall.

6.c The method of Webb and McCall specifies that each Aroclor peak is to be separately quantitated and the results summed to estimate the total PCB content.

6.d From the calculation sheets, it appears that for the 1985 and 1986 samples, a few selected individual peaks were used to obtain separate estimates of the total PCB content, and that these results were then <u>averaged</u> to get the value reported in the tables.

6.e This is not the Webb and McCall procedure as published.

7. For the 1976-1984 analyses, a single calibration level (approximately 5 ppm) was used for quantification.

7.a The FDA Pesticide Manual recommends the use of a multi-point calibration curve.

7.b Although two calibration standard injections were used, both represented essentially the same quantity of Aroclor 1254 (5.52 and 4.7 ng injected).

7.b.1 This is not multipoint calibration.

7.c The FDA Manual requires that, if a single calibration level is used, the response for the calibration standard be within ±25% of the response for the sample.

7.c.1 For these analyses, the response for the standard was substantially higher than that for the sample (BN 1-0190 to 1-0192).

8. The calculation sheets indicate that the results of analysis of two different dilutions of sample P-273 differed by a factor of two.

8.a The 1:5 dilution (BN 8-0190) gave estimates of 2.3 ppm and 2.6 ppm.

8.a.1 These values are closest to the calibration curve.

8.b The 1:25 dilution (BN 8-0191) gave estimates of 4.52 ppm and 5.49 ppm.

8.c The reported value for this sample was 3.8 ppm, the mean of the four values cited above.

8.d This type of averaging is wrong.

9. For the Spring and Fall 1985 analyses, the extraction logs (BN 8-0134/0135) and chromatograms (BN 8-0233 to 8-0381) indicate that some blanks, spikes, and laboratory duplicates were analyzed.

9.a It has not been possible to confirm that these QC samples are responsive to the requirements of the FDA PCB method.

10. For the Spring and Fall 1985 analyses, a peak-by-peak method of quantification method was used.

10.a. Four peaks were selected and used to calculate separate estimates of the ng of PCB as Aroclor 1254 (see, e.g., BN 8-0236).

10.b The four estimates were then averaged and converted to units of concentration in the sample.

10.c The four separate estimates frequently varied widely (e.g., 3.4 to 13.2 ng in BN 8-0236 and 1.7 to 8.1 ng in BN 8-0262).

10.d This is an indication that the peak pattern was <u>not</u> a good match to Aroclor 1254, the PCB used for quantification.

10.e Both the quantitative measurements (concentrations) and qualitative designations (Aroclor 1254) are completely unreliable.

11. The Spring, 1986 lobster data were analyzed in the same fashion and the results subject to the same limitations, as the 1985 samples.

11.a For the May, 1986 sampling, the laboratory analyzed lobsters from only 6 of the 11 locations that were sampled.

12. The Cat Cove lobster data have been selectively included in the RFAs.

12.a Results that have been omitted from the RFAs include:

May 1982 (BN 0-0272 to 0-0275)
October 1982 (BN 8-0093)
November/December 1908 (BN 8-5021 to 8-5024)
July/August 1980 (BN 8-0090 to 8-0091)
October/November 1981 (R-0243, 8-5028 to 5033)
March 1982 (BN 8-5034 and R-0238).

13. Several of the lobster samples analyzed in the Cat Cove Laboratory were actually samples split with other laboratories (e.g., FDA-Boston).

13.a These are not always correctly identified as split samples, which suggests that there were a larger number of independent measurements than actually occurred.

14. The Cat Cove data for other biota were also selectively included in the plaintiffs' RFAs.

14.a Data omitted from the RFAs include shellfish and finfish data for samples collected from 1976 to 1986: BN 8-0088, 8-0089, 8-0091, 8-0094 and R-0027.

15. Results obtained by MDMF have been based on incorrectly conducted laboratory procedures.

16. Some results reported by MDMF have been obtained with the use of invalid calculations.

17. None of the pre 1986 results obtained by the MDMF and reported in plaintiffs' RFA V.B.iii(b) should be included in the NBH database.

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1979-1981 UNITED STATES FOOD AND DRUG ADMINISTRATION (FDA)
Lobster Sample Analyses

Plaintiffs' RFA V.B.iii.(c)

1. The FDA Boston laboratory analyzed samples collected from a subset of previously designated sampling sites.

   1.a It is not clear how the subsets were selected.

   1.b Some sites were sampled more than once, and others once only, during the 1979-1981 period.

   1.c Since there is no evidence that the sampling sites were chosen with an element of randomness (probability sampling), the data from these analyses cannot be taken as representative of the general condition of lobsters in New Bedford harbor.

2. The number of lobsters collected and analyzed was variable.

   2.a When only one lobster was collected at a location, it was analyzed as a separate sample.

   2.b When multiple lobsters were collected from a location, a composite sample was prepared.

   2.c The results for single lobster samples are not directly comparable to those for composite samples.

3. Samples collected in August 1979 were quantitated against a single point injection of Aroclor 1254.

   3.a Single point calibrations are inherently limited to a very narrow range.

   3.b The chromatograms for this set (BN 11-014 through 11-024) are poor quality photoreproductions.

   3.c There is no evidence that blanks or other QC samples were analyzed along with the samples.

   3.d Samples were quantified by a sum of the peaks approach, even though the peak pattern was not necessarily a good match to the Aroclor 1254 standard.

      3.a.1 Points falling outside of ±10% of the calibration point must be viewed with great suspicion.

4. Samples collected in October and December, 1979 were also quantitated against single injections of Aroclor 1254.

   4.a The chromatograms for this set (BN 11-142 through 11-148) are poor quality photoreproductions.

4.b Samples were quantitated by a sum-of-the-peaks approach versus Aroclor 1254, even though there was not necessarily a good match to the Aroclor pattern.

4.c There is evidence of a reagent blank, but no other QC samples other than standards.

5. Samples collected in June 1981 were also quantitated against single injections of Aroclor 1254 (BN 11-305 to 11-321).

5.a Injection volumes (e.g, 3.1, 3.6, 4.9 uL) were not standard and it is unknown how precise the volumes were.

5.b Due to the poor quality of the photoreproduction, it is not possible to compare the peak distribution for the samples with the Aroclor pattern.

5.c At least some samples (BN 11-312) appear to be poor matches with the standard (BN 11-311).

6. The Aroclor 1254 designation and quantitative concentrations for these samples are not adequately supported.

6.a No confirmational analyses are apparent.

7. None of the results from this study should be included in the NBH database.

0068y

DMF/LES SAMPLING - NOVEMBER 1976

Plaintiffs' RFA V.B.iii.(d)

1. There is no information concerning the procedure used to select sampling locations.

   1.a Absent a statistically-based sampling plan that includes an element of randomness (probability sampling) the data cannot be used to characterize the general characteristics of the biota in the harbor.

2. No supporting chromatographic data to substantiate these results have been provided.

   2.a It is not possible to evaluate the reliability of the quantitative or qualitative PCB determinations.

   2.b There is no evidence that confirmatory analyses have been performed to verify PCB identifications.

3. Documents BN 7-0108 to 7-0110 and BN 7-0143 to 7-0147 do not provide sufficient information to evaluate the method of sample storage.

   3.a If samples are not adequately refrigerated or frozen, samples could decompose prior to analysis, resulting in potentially inaccurate determinations.

4. Documents BN 7-0108 to 7-0110 and BN 7-0143 to 7-0147 do not provide sufficient information to evaluate the method of PCB identification or quantification.

5. No QC sample data to support the reported sample concentrations have been provided.

6. Absent supporting information and raw data, the results of this study should not be included in the NBH data base.

0069y

DMF/LES SAMPLING OF LOBSTERS - APRIL 20, 1979

Plaintiffs' RFA V.B.iii.(f)

1. There is no information concerning the procedure used to select sampling locations.

   1.a Absent a statistically-based sampling plan that includes an element of randomness (probability sampling) the data cannot be used to characterize the general characteristics of the lobsters in the harbor.

2. There is no information concerning the method and duration of sample storage.

   2.a Documents BN 7-0112 and 7-0114 list the date of collection of samples 551169 through 551174 as "Fall-1978".

   2.b This is inconsistent with the representation (Plaintiffs' RFA V.B.iii.(f) 1) that these samples were collected on April 20, 1979.

3. There is no evidence to support the use of Aroclor 1248 as the quantitation standard.

   3.a Previous DMF/LES lobster samplings had reported PCBs as Aroclor 1254.

   3.b There is no basis for determining whether the peak pattern for the April 20, 1979 samples was different from that observed in previous samplings.

4. No chromatographic data, calculation sheets, or QC data have been provided.

   4.a The accuracy of the qualitative and quantitative data is unknown.

5. Absent any documentation to determine the quality of the analytical work, none of these results should be considered for inclusion in the NBH data base.

0071y

Plaintiff's Request for Admission

AVX - 5/90

Volume VI, Section. E. Report B

(Attachment 13-0001 - 13-0022)

PCB Congeners in American Lobster, Homarus Americanus, and Winter Flounder, Pseudopleuronectes Americanus, from New Bedford Harbor, Massachusetts

1. The analytical approach used by the EPA Environmental Research Laboratory, Narragansett (hereinafter ERLN) for the 1987 Lobster/Flounder Study incorporated custom analysis methods.

   1.a. The custom analysis methods do not constitute agency approved test procedures.

2. When custom methods are developed, their employment must depend on either a positive result from collaborative testing and method validation studies; or provision of the raw data for peer review.

   2.a. The ERLN methodology was not subjected to any type of method validation

   2.b. The raw data has not been provided for peer review.

      2.b.1. No evaluation of data quality is possible.

   2.c. The analytical data supporting the dry weight determinations has not been provided for the samples in this study.

      2.c.1. Without these documents, the validity of the underlying data supporting the contentions of Tables 2, 6, 7 and 8 cannot be determined.

      2.c.2. It is common practice to report biota data as mg/kg (ppm) on a wet weight.

      2.c.3. Reporting of ERLN results on a dry weight basis is not understood since samples were processed as wet tissues.

2.c.4. It is especially misleading to report congener data as ng/g on a dry weight basis.

2.c.4.a. These units magnify the apparent concentration by an approximate factor of 7500.

3. The Congeners BZ138 and BZ180 are used to estimate Aroclor 1254 in the biota samples.

3.a. Use of these congeners will overestimate the A1254 content of biota samples

3.a.1. Both 138 and 180 are preferentially concentrated by bioaccumulation.

4. A written quality assurance project plan (QAPP) must be prepared and implemented for a "monitoring and measurement" project.

4.a. This is an EPA requirement.

4.b. The QAPP document should describe the procedures used to document precision, accuracy, and completeness of environmental measurements.

4.c. No evidence was provided, for either the total PCB analyses or the congener specific analyses, to indicate that a QAPP was developed and implemented for the project.

5. A project specific QAPP should require, at a minimum, laboratory duplicates of both lobster and flounder to determine the precision of the data.

6. A project specific QAPP should require, at a minimum, the analysis of fortified (spiked) samples to validate the sensitivity and accuracy of the analyses.

7. A project specific QAPP should require, at a minimum, generation of standard calibration curves to evaluate and verify instrument linearity.

8. A project specific QAPP should require, at a minimum, GC/MS confirmation analysis to evaluate the column chromatographic separation efficiency and to verify the removal of potential co-eluting congeners during the separation.

9. The congener specific procedure used by ERLN is a nonvalidated custom approach that does not have wide spread acceptance in the scientific community.

9.a. Data validation through a QAPP represents accepted practice.

9.b. Accepted practices were not followed.

10. One standard was used for the quantitation of the specific congeners.

10.a. This is considered unacceptable practice.

10.b. EPA method 8080 and the most recent CLP protocols require the use of multiple (3 or 5) calibration standards.

10.c. Instrument linearity cannot be evaluated based on a single point calibration.

10.c.1. Injected masses more than ± 10 percent different than the standard must be rejected.

11. The plaintiffs' RFAs refer to a spike and recovery study at XII.E.B.(23).

11.a. Data supporting the spike and recovery; study was requested from the plaintiffs

11.b. The spike and recovery data provided by the plaintiff was generated through studies conducted in April 1989.

11.b.1. The Lobster/Flounder study report was issued in December 1988.

11.c. The actual 1988 spike and recovery data was never provided.

12. The accepted practice in the field of environmental analysis (any other reputable analytical chemistry endeavor) is to complete all method development and method validation testing prior to the analysis of actual samples.

12.a. It is evident from entries in the laboratory notebook (BN 13-1010 to 13-1020) that no standard operating procedure was developed for the study.

12.a.1. The entire approach was one of trial and error.

12.a.2. The first notebook entry indicates that the study had been underway for four weeks before records were kept.

12.b. Data recorded on BN 13-1454 indicates that column separations were still being evaluated on 10/25/88.

12.b.1. The study samples were analyzed between 9/27/88 and 10/3/88. (BN 13-1021 to 13-1386).

13. Selected chromatographic data were provided for the congener specific analyses.

13.a. Standard, verifiable chromatographic and integrator hard copy displays were not provided.

13.b. When PCB quantitation relies on automated peak area/height measurements in conjunction with automated peak identifications by retention time relative to an internal standard, verification of system performance is essential.

13.c. Retention indices are best confirmed by visually matching sample chromatograms to appropriate standard chromatograms.

13.d. Quantitations should be confirmed by independent measurement of selected peak heights from samples and standards.

13.e. Other detection and elimination should be verified.

13.f. When reconstructed, computer generated chromatograms are relied upon for data generation, a comparison should be made between the selectively manipulated chromatograms and the chromatograms representing the actual detector response of both the sample and standards for determining absolute differences.

13.g. It has been alleged that full integrator output was never generated.

13.g.1. Full integrator output information was never made available to the defendants in any form.

14. The results of the lobster/flounder study represent the results of an experiment in progress.

14.a. The data from this study should not be incorporated into the NBH data base.

0100y

DMF/LES SAMPLING OF LOBSTER - MARCH 28, 1977

Plaintiffs' RFA V.B.iii.(e)

1. There is no information concerning the procedure used to select sampling locations.

   1.a Absent a statistically-based sampling plan that includes an element of randomness (probability sampling) the data cannot be used to characterize the general characteristics of the biota in the harbor.

2. The number of lobster samples collected and analyzed in this sampling is unclear.

   2.a Document R-0028 reports that three lobsters were collected at Station B on March 28, 1977.

   2.b The plaintiffs' RFAs (V.B.iii.(e)) state that a lobster was collected from this site on this date.

   2.c Attachment BN 7-0099 reports only one value for Station B.

   2.d No chain of custody documents have been provided.

   2.e The defendant cannot determine whether the reported value is for a composite sample, or for one of the three samples collected.

3. The plaintiffs have selectively reported data.

   3.a Document R-0028 gives a result for PCBs in lobsters collected from <u>five</u> stations (A through E).

   3.b Only the results for stations A and B are included in the plaintiffs' RFAs.

4. Absent supporting data (laboratory notebooks, chromatograms, calculation sheets, QC data), it is not possible to evaluate the reliability of the qualitative identifications of PCBs or of the quantitative results (concentrations).

5. Selective discarding (or reporting) of data is an attempt to unjustifiably bias the results of a study.

6. A number of serious defects have been noted in data submitted by the plaintiffs from other studies.

   6.a Given the rate at which problems have been found in other studies, the results of the current study should not be considered for inclusion in the NBH data base unless the underlying data can be produced for review.

Capuzzo Study
Plaintiff's RFA's XI.E.3. (5580-5595)

1. No raw data have been produced for the chemical analysis of PCB's in mussels.

2. The RFA does not refer to any attachments containing or purported to contain any raw data from chemical analyses.

3. Mussels are proposed as indicators of the degree and type of pollutants in a given area because they are believed to be efficient filter feeders.

   3.a If mussels are useful indicators of pollution, the analysis of prepared extracts of mussels will reveal large numbers of chemicals.

4. A larger number of chemicals in a prepared extract will yield a more complex chromatogram than a lesser number of chemicals.

   4.a More complex chromatograms usually contain more coeluting materials.

   4.b More complex chromatograms are more difficult to interpret.

   4.c As complexity and difficulty increase, the probability of errors in interpreting chromatograms increases.

   4.f Raw chromatographic data from the Battelle Mussel Watch Program at site 10 are indicative of the difficulties and complexities encountered in mussel extracts. (72-1153 to 72-1235)

5. AVX has had no opportunity to review the quality of the raw data supporting Plaintiff's RFA attachment XI.E.R-0375.

   5.a Results based on this mussel data should not be made a part of the NBH data base.

1498L

BROWNAWELL DISSERTATION

Plaintiffs RFA's XI.E.3 (5543-5579)

1. With rare exception, the Bates numbers on RFA attachments 5-0742 to 5-1115 are illegible.

2. With rare exception, the handwritten labels on the chromatograms contained in 5-0742 to 5-1115 are illegible.

3. Ast 59-S sample 27-30 cm of 3-24-83 BN (5-1074) is highly contaminated.

   3.a Blank runs (BN 5-1078 to 5-1085) substantial contamination.

4. Raw chromatographic data found at BN5-0790 to BN 5-1115 contains examples of the following problems:

   4.a The base line is below zero on the recorder (BN 5-1109 and others).

   4.b Sulfur contamination (5-0805, 5-0798 and others).

   4.c Oil contamination (5-0975, 5-1005 and others).

   4.d Other late eluting contamination; possibly phthalates (BN 5-1075, 5-0984 and others).

   4.e Early eluting contamination (BN 5-1075 and others).

   4.f Contaminated blanks (BN 5-1083, 5-0923 and others).

5. We have very little information on the standards. It is not sufficient to facilitate a judgment of the quality of the calibrations.

6. We have not been provided any of the raw data used to assign retention times to the individual congeners.

7. From the standpoint of the raw chromatographic data, there is sufficient evidence of problems, that while the results are not totally invalidated, the results should be interpreted with great caution.

HANSEN STUDY

Plaintiff's RFA XI.E.3 (5636-5740) XII.E.(U)

1. The PCB content in eggs of exposed fish varied widely between fish within those exposed to sediment from a given station.

   1.a The raw data from Station 7 illustrate the degree of variation that may be encountered.

   1.b The extract of some of the eggs from Station 7 contained PCB levels too low to be accurately quantitated by the techniques used in the Hansen Study.

   1.c The PCB concentration in the extracts of the eggs associated with NBH 14 sediments vary by approximately a factor of 6.

2. RFA XI.E.3 (5723-24) claims isomers of PCB's with 8 and 9 chlorines are present at NBH 14.

   2.a Pruell, Exhibit 23, purports to present the results of a more sensitive analysis of station 12 and 14 samples.

   2.b Pruell Ex. 23 reports Cl-8 and Cl-9 as non detectable.

3. Table 2 of XI R-0874 claims A1254 concentration (at NBH-12) in 3 replicates sediment samples is 256, 193, and 245 ppm.

   3.a Table 4 of XI.E. R-0374 claims total PCB concentration (at NBH-12) in the same 3 replicate sediment samples is 210, 180, 270 ppm.

   3.b A 1254 concentration cannot be greater than the total PCB concentration.

   3.c The data in these tables are wrong.

4. The chart showing the PCB chlorine number for station 12B replicates A, B, C is different from the same type of chart for A1254.

   4.a This difference between charts means that there is a substantial amount of A1242 in the sediment from Station 12B.

4.b There is nearly as much A1242 as A1254 in the sediment from Station 12B.

4.c The analog chromatograms of the extracts No. 3099-3101 verify the presence of lower chlorinated homologs.

5. RFA XI.E.3 (5716-5717) contain information about purported levels of PCBs in fish and eggs.

5.a The RFAs imply that levels of 142 and 107 ppm of PCB's were the maximum levels of PCB's and that they were in fish exposed to sediments from NBH-14.

5.b Levels of total PCB's in fish exposed to sediments from NBH-14 were a maximum of 860 ppm.

5.c Levels of A1254 in fish exposed to sediments from NBH-14 were a maximum of 107 ppm.

5.d Levels of A1254 in fish exposed to sediments from NBH-12 were a maximum of 142 ppm.

5d.1 NBH-12 is further from the AVX facility than NBH-14.

5d.2 Levels of A1254 in tissues of fish exposed to NBH sediments do not correlate well with sediment source location as a function of distance from AVX.

5.e Eggs from fish exposed to sediments from station NBH-14 are purported to contain 67.2 ppm of PCB's.

5e.1 Eggs from fish exposed to sediments from NBH-14 were found to contain 67.2 ppm of A1254 by the only PCB analysis reported in XI R-0374.

5e.2 The eggs from fish exposed to sediments from NBH-14 should contain total PCB levels higher than 67.2 ppm.

6. The results of all PCB analyses are erroneous.

7. Conclusions based on teh results of the PCB analyses will be erroneous.

8. The "Hansen Study" should not be admitted into evidence.

1499L

NBH DPW Sewer Study (1986)

Plaintiff's RFA XI.E. (5768-5790)

1. Attachment to Plaintiff's RFA XI.E.R. 0362 & 3063 is a report of analysis performed on "sludge material" by Clean Harbors Analytical.

   1.a. The samples were analyzed for PCB's.

   1.b. The samples were submitted by Environmental Solutions.

   1.c. The samples were identified as being from New Bedford sewers.

2. No raw data were submitted to substantiate the analytical results.

3. The report claims to have identified and quantitated PCB's in 8 sludge samples.

   3.a. Two of the samples were purported to contain A1232.

4. Plaintiffs' have no evidence that New Bedford capacitor manufacturing concerns used A1232.

   4.a. Any A1232 contamination could not have come from the Aerovox plant.

5. Because of the absence of raw data, the qualitative or quantitative accuracy of the claimed results cannot be determined.

1597L

Battelle/SAIC Sediment Sampling

Plaintiff's RFA XII.E. Summaries
Attachment XII.E.R-0399

1. Samples from Attachment XII.E.R.-0399 were analyzed from 11/3/86 to 11/20/86.

2. Chromatograms indicate that a five (5) point calibration curve was run for these samples.

   2.a. Data (McGrath Deposition Exhibit 181 pp. 606-625) report only four points of a calibration curve.

   2.b. No summary data exists for the initial calibration curve.

   2.c. No summary data exists for comparing daily standard responses with the initial calibration curve.

3. On 11/12/86 the gas chromatograph (GC) conditions were changed.

   3.a. The conditions from 11/3/86 to 11/12/86 were: Start 40°C hold for 3 min then ramp at 10°C per minute to 282°C then hold.

   3.b. On 11/12/86 the GC conditions for the daily standard were: Start 40°C hold for 3 min then ramp at 10°C per minute to 282°C then hold.

   3.c. On 11/12/86 the GC conditions for samples were: Start at 80°C hold 1 min then ramp at 20°C per minute to 160C then ramp to 310°C at 3°C per minute.

      3.c.1. Samples affected by the GC condition change were: Sample no's 109, 113, 118, 119, 120, 127, 136, 148, 149, 150, and 177

   3.d. From 11/14/86 to 11/20/86 the GC conditions were: Start at 80°C hold 1 min then ramp at 20°C per minute to 160°C then ramp to 310°C at 3°C per minute.

      3.d.1. No new initial calibration curve was run for the new GC conditions.

3.d.1.a. Sample concentrations were calculated using the response factors from the daily calibration standard.

3.d.2. Samples affected by the GC condition change were: Sample no s 4, 8, 9, 12, 13, 14, 15, 18, 19, 24, 25, 34, 35, 36, 37, 39, 41, 42, 43, 48, 50, 51, 52, 53, 59, 66, 67, 72, 73, 104, 178, 179, 180, 181, 183, 184, 185, 186, 187, 188, 191, and 192.

3.f. From the initial calibration curve run on 11/3/86 to the daily standard run on 11/17/86 retention times shifted approximately 20 to 30 seconds for all analytes (McGrath Deposition Exhibit 181 p. 614 vs. p. 654).

3.f.1. The percent difference for the relative response factors between the initial calibration curve run on 11/3/86 to the daily standard run on 11/17/86 was approximately 30% for the first six chlorination levels. All results for samples analyzed on 11/17/86 are biased high.

4. No extraction blank data is available.

4.a. Contamination of sample extracts is therefore unknown.

5. No surrogates were monitored for any samples.

5.a. Extraction efficiencies for these samples are not known.

6. No evidence is available to discern if multiple peaks for a chlorination levels were monitored (for example, sample No. 13 McGrath Deposition Exhibit 181 pp. 62-67).

7. The highest calibration level was 50 ug/ml for chlorination levels 1, 2, and 3 100 ug/ml for chlorination levels 4, 5, and 6, and 150 ug/ml for chlorination levels 7, 8, and 10 (McGrath Deposition Exhibit 181 pp. 606-625).

7.a. Samples which had apparent chlorination levels above these should have been diluted and reanalyzed.

7.a.1. As an example, Sample No. 56 (McGrath Deposition Exhibit 181 pp. 266-271) should have been diluted to be within the calibration range.

8. Many of the reconstructed ion chromatograms have noise levels so high that individual PCB peaks are not discernable.

8.a. Example, in sample No. 66 the internal standards cannot be seen (McGrath Deposition Exhibit 181 p. 320).

8.b. Example, for sample No. 13 (McGrath Deposition Exhibit 181 pp. 62-67), the quantitation report indicates high levels of PCB's (i.e levels in the thousands) but in the reconstructed ion chromatogram, no distinguishable peaks are seen.

8.c. This high noise level indicates that the clean-up procedure for these samples was inadequate.

9. At a minimum, the results of the 42 analyses affected by the changing GC conditions should be excluded from the NBH data base.

9.a. Results of samples analyzed wherein the noise level was high should be excluded from the NBH data base.

9.b. All other results should be considered estimates.

0062y

ACOE - TEETER FLUX

(Plaintiffs RFA XII.E.(A); XII E.4a, 4b)

1. In 1986, the U.S. Army Corps of Engineers conducted a study reported as "New Bedford Harbor Superfund Project, Acushnet River Estuary Engineering Feasibility Study of Dredging and Dredged, Material Disposal alternatives. Report 2 - Sediment and Contaminant Hydraulic Transport Investigations," - hereinafter referred to as COE Report 2.

2. The GC data for PCB's was obtained with a single point calibration curve.

   2.a.1 Single point calibrations are inherently inaccurate because they presume a linear response that passes through zero, and the ECD does not perform that way.

3. The COE analytical methodology utilized a capillary GC column.

   3.a. The column temperature and rate of programming were such that the standards eluted in approximately 1/2 to 1/3 of the normal time.

   3.b. This programming rate resulted in inadequate separation for qualitative and quantitative accuracy.

   2.c. This programming rate resulted in a characteristically poor baseline that will detract from qualitative and quantitative accuracy.

   3.d. The COE approach also incorporated overloading of the GC column with sample.

4. **Table 4 in COE, Report 2 purported to represent measured values of PCB's associated with composite suspended samples at Coggeshall St. Bridge.**

   4.a. The A1242 standard is shown in BN 12-1143.

   4.a.1. The GC column is tremendously overloaded by the injection. This standard cannot be used to evaluate the concentration of A1242 in samples.

4.b. The A1242 and A1254 concentrations in both the 6 Mar 86 ebb & flood composites are purported to be at sub ppb levels.

4.b.1. The chromatograms of samples have an unstable baseline (BN 12-1151 to 12-1156).

4.b.2. The chromatograms of samples have an elevated baseline reflecting non-resolved materials that are continually eluting.

4.b.3. Later eluting peaks (>16 minutes) are beginning to tail in some of the samples.

4.b.4. Significant contamination is present as exemplified by the GC peaks at 16.32 minutes and 23.22 minutes.

4.b.4.(a) The source of contamination includes the DBC solution plus unknown other sources.

4.c. The chromatogram presented in BN 12-1156 is purported to be that of the surrogate, dibutylchlorendate (DBC).

4.c.1. The chromatogram presented in BN 12-1156 is characteristic of a highly contaminated solution.

4.c.2. DBC is a relatively minor component in this solution.

4.d. The DBC chromatography was not reproducible. See BN 12-1150 vs BN 12-1156(7).

4.e. Given the conditions under which the chromatograms were obtained and the evidence of substantial contamination it is not possible to accurately quantitate the level of PCB's claimed by the COE.

4.f. The flux data from 3/6/86 is not correct.

5. The chromatographic data for the March 1986 floatable samples was obtained from analyses beginning on 4/15/86.

5.a. The standards run at the beginning of April 15, 1986 are contaminated.

5.b. The standards are contaminated to the extent that PCB's are not the primary materials in the solutions.

5.c. The chromatograms of floatable samples from the March 1986 sampling indicate the samples are contaminated with some of the same contaminants as the standards.

5.c.1. The chromatograms of floatable samples from the March 1986 sampling indicate the presence of additional interferents.

6. The chromatographic data for the April 1986 floatable samples are located at BN 12-1570 to 12-1589 and BN 12-1667 to 12-1676.

6.a. The table on BN 12-0099 presents results purported to have come from the analyses of the April 1986 floatable samples.

6.b. Visual examination of the chromatograms for sample no. 92122 - 92124 reveals that peaks being used for quantitation do not fit any typical Aroclor pattern and that they are indistinguishable from background contamination and instrument noise as shown by the chromatogram of sample #92116B. (BN 12-1570 to 12-1571; BN 12-1587 to 12-1590; BN 12-1670 to 12-1671)

6.c. Examination of the data for the April, 1986 floatable samples reveals no quantifiable level of PCB in any of the samples.

6.d. The April 1986 floatable samples do not contain measurable amounts of PCB's.

6.e. Laboratory solutions of DBC appear to be heavily contaminated.

7. The analog chromatographic data for both the ebb and flood samples of April 1986 show them to be heavily contaminated (BN 12-1678 to 12-1685) with non PCB materials.

7.a. Some of chromatographic peaks reported to show the presence of A1242 and A1254 are unresolved shoulders on peaks due to impurities.

7.b. The areas of the resolved peaks in the two chromatograms (ebb and flood extracts) that might be assigned to either A1242 or A1254, appears to be approximately equal.

7.c. All of the major peaks in the chromatograms of the ebb & flood extracts are from non-PCB materials.

7.c.1. The extracts of the samples for ebb and flood composites contain little, if any, PCB's.

7.c.2. If the samples contain any PCB's, PCB contaminations in the ebb and flood samples are indistinguishable.

7.d. The PCB concentrations reported in Table 4 (located at BN 12-0098) for the April 1986 samples are incorrect.

7.d.1. This data should not be included in the NBH database.

7.e. Any flux calculations based on the April 1986 PCB concentrations will be incorrect.

8. The calculations of PCB concentrations in the ebb and flood samples of April 1986 were documented in BN 12-1756 to 12-1762.

8.a. Ebb sample 92114 was calculated to have a 95% confidence interval of approximately ± 100% (relative) for A1254.

8.b. Ebb sample 92114 was calculated to have a 95% confidence interval of approximately ± 110% (relative) for A1242.

8.c. Ebb sample 92114D (duplicate) was found to have a 95% confidence interval of approximately ± 105% (relative) for A1254.

8.c.1. The calculated levels of A1254 in 92114 and 92114D were .0007 and .0003 ppm respectively.

8.c.2. Only the higher of the two values was used in calculating PCB flux.

8.d. Ebb sample 92114D was found to have a confidence interval of approximately ± 130% (relative) for A1242.

8.e. Flood sample 92115 was calculated to contain 0.0014 ppm of A1254. (BN 12-1761).

8.e.1. A transcription error resulted in this being reported as 0.0004 ppm.

8.f. Flood sample 92115 was calculated to contain 0.0004 ppm of A1242. (BN 12-1762).

8.f.1. A transcription error resulted in this being reported as 0.0001 ppm.

8.g. Flood sample 92115 was calculated to have a 95% confidence interval of approximately ± 210% (relative) for A1242.

8.h. The reported A1242 value for sample 92115 and its associated confidence interval are entirely contained within the confidence interval for sample 92114.

8.i. The A1242 concentrations in the ebb and flood samples are not statistically different.

8.j. Rerun of sample no. 92115 purportedly gave an A1242 concentration of 0.0009 ppm (BN 12-652A).

8.j.1. This is a higher concentration of A1242 than was originally reported in #92114D.

8.j.2. This result verifies the conclusion that the A1242 concentrations in the ebb and flood samples are not different.

9. The chromatographic data for the ebb and flood composite of June 1986 is given in BN 12-1856 to 12-1861.

9.a. The chromatogram of the blank for this sample set reveals the presence of massive contamination.

9.b. The analog chromatogram of the A1242 standard at BN 12-1811 reveals the presence of large quantities of contamination.

9.b.1. The areas of the peaks in the standard, used for calculating concentrations of Aroclors in the samples, vary by as much as a factor of 3 between the initial and final standard runs.

9.c. The chromatograms of the ebb and flood composite sample extracts verify the presence of large amounts of non-PCB contamination.

9.d. The results of the analyses of the ebb and flood composite extracts of June 1986 should not be made a part of the NBH data base.

10. The chromatographic data for the floatable samples from June 1986 sampling (samples 92494-92505) are found at BN 12-1821 to 12-1855 and BN 12-1897 to 12-1898.

10.a. All of the samples in this data set show gross contamination.

10.a.1. The source of much of the contamination is the DBC spiking solution.

10.a.2. The remainder of the contamination is due to (a) inadequate cleanup, (b) miscellaneous contamination from laboratory preparation, or (c) dirty GC supplies or apparatus.

10.b. The chromatogram of sample 92494 as located at BN 12-1824 is useless for qualitative or quantitative determination of PCB's.

10.b.1. The chromatograms of sample 92494 (BN 12-1897 to 12-1898) indicate the presence of massive amounts of impurity.

10.b.2. The most obvious peak assignable to the impurity has retention time 16.403.

10.b.3. The large increase in the baseline is due to a very large unresolved group of compounds.

10.c. There is no discernable difference between chromatograms that are purported to show PCB's and those that are purported to show no PCB's.

10.d. The results of these analyses should not be included in the NBH data base.

10.c. PO 3751 purports to be a similar mixture to PO 3774 but shows four additional medium strong peaks.

10.d. PO 3755 purports to be a mixture of congeners 97 & 143 but the chromatograms has 3 addition peaks of lesser intensity.

10.e. The retention times of the 2 major peaks have been manually adjusted apart (for reporting) in PO 3755 and others.

10.f. PO 3759 purported to be chromatogram of congener #170, shows no major peak in the area of the expected retention time which is >30 minutes. [Ref. Ericson p. 191 determined from information in this ref. and PO 3757].

10.g. PO 3766 according to the log sheet (PO 3713), is the chromatogram of congeners 44, 143, and 170.

10.g.1. According to the labels on the chromatogram, this sample contained congeners 44, 82, and 143 along with an resuspended lump following the alleged 143 peak.

10.h. PO 368 according to the log sheet (PO 3713), is the chromatogram of congeners 82 and 105.

10.h.1. According to the labels on the chromatogram, this sample contained congener 82 and an unresolved lump peaking at about 26.5 min.

11. COE Report 2 discusses the sampling of resuspended sediment in the form of floatables and of suspended particulates.

11.a. The samples were analyzed in the same manner as previously discussed floatables and water samples.

11.a.1. The analyses of these samples encountered the same problems with contamination as were identified above with respect to the various ebb and flood samples.

11.b. The results of March 31, 1986 resuspended sediment sampling are presented in Tables 14 and 15 of COE Report.

11.c. The correlation between laboratory sample numbers and the designation in Tables 14 and 15 of the COE report is given below:

Lab No.	COE Rept 2 Descrip		
91990	GRID G17	1225 EST	Suspended
91991	GRID G17	1230 EST	Suspended
91992	GRID G17	1242 EST	Suspended
91993	GRID J8	1046 EST	Suspended
91994	GRID J8	1102 EST	Suspended
91996	Grid G17	1232 EST	Floatable
91997	Grid G17	1241 EST	Floatable
91998	Grid J8	1012 EST	Floatable
91999	Grid G17	1224 EST	Floatable

11.d. Samples (lab #) 91991 and 91992 were suspended samples taken 12 minutes apart on 31 March 1986 at G17.

11.d.1. Samples 91991 and 91992 are purported (BN 12-0103) to have essentially identical PCB concentrations.

11.d.2. Samples 91991 and 91992 have markedly different chromatograms BN 12-1316 & BN 12-1402.

11.d.3. Sample 91992, run on the confirmation column, gives a chromatogram similar to that on the primary column.

11.d.4. On the print-out of the confirmatory data (BN 12-1486), the notation 91992 has been crossed out and the handwritten notation 1016 has been entered.

11.d.5. The chromatogram in question does not resemble that which might be obtained from A1016.

11.d.6. Results from sample 91992 are not reliable.

11.e. The chromatograms of samples 91990 & 91991 are similar, however, the chromatogram of sample 91991 has a large number of potentially interfering peaks due to contaminants.

11.e.1. Results from sample 91991 are not reliable.

11.f. The chromatographic data for samples 91993 and 91994 are presented in BN 12-1371 to 12-1375.

11.f.1. The chromatographic data for samples 91993 and 91994 demonstrate that both samples are contaminated.

11.f.2. The effect of the contamination is to give falsely high results.

11.f.3. Results from samples 91993 and 91994 are not reliable.

11.g. The chromatographic data for samples 91996 and 91998 are presented as BN 12-1270 to 72 and 12-1274 to 76.

11.g.1. The raw chromatographic data for samples 91996 and 91998 demonstrate that both samples were very contaminated.

11.g.2. The effect of the contamination is to give falsely high results.

11.g.3. Results from samples 91996 and 91998 are not reliable.

11.h. Sample extracts of 91997 and 91999 overloaded the G.C. column.

11.h.1. The overloading precludes any quantitation.

11.h.2. If reanalyses occurred, the chromatograms were not provided.

11.h.3. The results of these analyses are invalid.

11.h.4. The results of these analyses should not be included in the NBH database.

12. No portion of the analytical results presented in COE Report 2 should be considered for inclusion in the NBH Data Base.

13. No portion of the calculated information (e.g., PCB flux) presented in the COE Report 2 and based on the analytical results, should be included in the NBH data base.

1433L

EPA ERLN Seawater

Plaintiff's RFA's XII.E.G and XII.E.7(a)

1. The EPA's raw data relating the analysis of water samples collected in NBH in March 1988 was purported to be presented at BN 15-6001 to 15-6107.

1.a Laboratory notebook entries at BN 16-6028, 16-6030, 16-3034, 16-6046 and 16-6047 made on April 12, 1988, indicated that sample nos. 7846, 7847, 7849, 7856, and 7857 were to be run at some future date.

1.b Laboratory notebook entries at BN 16-6032, 16-6036, 16-6040, 16-6042, 16-6044, 16-6038, 16-6048 to 16-6050 indicate that the calibration standards were run on the GC on March 31 and April 1, 1988.

1.c Documentation indicates that curve fitting for the calibration standards occurred on April 1, 1988 (BN 1508172).

1.d The chromatograms of sample nos. 7846, 7847, 7849, 7856 and 7857 carry a date of April 19, 1988.

1.d.1 The chromatograms were obtained 19 days after the calibration curve was prepared.

1.d.2 The calibration curve must be verified no less than once every 10 hours according to EPA protocols for the CLP program.

1.d.2.a Not verifying the calibration curve for 19 days is an extremely serious violation of EPA protocols.

1.e Results obtained for PCB's in samples no. 7846, 7847, 7849, 7856, and 7857 are invalid.

1.e.1 The above results should not be included in the NBH data base.