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January 14, 1985

Mr. Gerry Sotolongo, Project Officer
U.S. Environmental Protection Agency
Waste Management Division (HWM-1907)
J.F.K. Federal Building
Boston, MA 02203

Re: New Bedford Harbor

Dear Mr. Sotolongo:

On behalf of Federal Pacific Electric Company, I am submitting the attached comments on the draft Feasibility Study of remedial action alternatives for the Acushnet River Estuary, a portion of the New Bedford Harbor site for which EPA is considering remedial action under the Comprehensive Environmental Response, Compensation and Liability Act.

The attached comments are extensive. They contain an abundance of detailed recommendations and critical insights into the technical aspects of the proposed remedial action alternatives. These technical comments are set forth in Part 2 of our document. They point out that, on several basic features and on a great many specific details, substantial improvement in the Feasibility Study is required before it would meet acceptable standards to serve as part of the foundation for decision making by the Agency, especially on remedial measures of such significant environmental importance and cost. We hope that these comments will be carefully reviewed by EPA and will be of assistance to the Agency in progressing with its work concerning New Bedford Harbor.

The attached comments also contain, as Part 1 thereof, a summary of our concerns at the most fundamental level that EPA's approach toward making final decisions on remedial actions for the Acushnet River Estuary on a "Fast Track" basis is unsound as a matter of policy and legally invalid.

The Agency must first decide whether or not it intends to make its decisions concerning these remedial action alternatives on the basis that shortcuts in the established official procedures for evaluation of remedial options are justified, either because circumstances present an "immediate and significant risk of harm" or because the remedial measures themselves constitute "initial remedial measures." If the Agency does not intend to rely on either one or the other of those two justifications for taking shortcuts through the normal evaluation procedures set forth in the National Contingency Plan, then the Agency must establish and follow a pattern of activity which would constitute compliance with those procedures. The approach followed to date by EPA in its efforts to deal with the New Bedford Harbor situation reflects, in our view, a serious--and potentially tragic--failure to develop a logical and valid basis for decision making.

We are unable to identify any plausible justification for the cutting of corners implicit in the Agency's initial decision to determine on a "Fast Track" basis what remedial action should be carried out regarding the Acushnet River Estuary. At the same time, it is absolutely clear that the Agency has not followed the essential procedures that apply in the absence of such justification. In particular, the total failure to complete a Remedial Investigation in advance of the Feasibility Study constitutes an omission of the most central feature of all in the orderly approach prescribed by the National Contingency Plan.

The consequences of EPA's failure to establish a valid approach to this important question are already serious. They will become more serious as this matter progresses. They create a danger that EPA will decide to implement measures that would be dangerous to environmental values and wasteful of financial resources. If the EPA continues down the Fast Track, its proposals most likely will be derailed before the Agency reaches its destination. We are hopeful that this entire subject will be accorded an intensive and thoughtful reevaluation.

Sincerely yours,

John Quarles

John Quarles

Enclosure

# COMMENTS ON THE DRAFT FEASIBILITY STUDY OF REMEDIAL ACTION ALTERNATIVES, ACUSHNET RIVER ESTUARY ABOVE THE COGGESHALL STREET BRIDGE, NEW BEDFORD SITE, BRISTOL COUNTY, MASSACHUSETTS

Submitted by Federal
Pacific Electric Company

January 15, 1985

# PART I -- LEGAL ANALYSIS

# PART I

## LEGAL ANALYSIS

### INTRODUCTION

A draft Feasibility Study ("FS") for the Acushnet River Estuary has been prepared for the Environmental Protection Agency ("EPA") by outside consultants to provide the basis for making a "fast-track" decision on remedial action for certain "toxic hot spots" in that portion of New Bedford Harbor. A Feasibility Study is but one of the studies called for under the Remedial Action Master Plan ("RAMP") for the New Bedford area, which was listed as a site on the National Priority List in 1981. Although the RAMP also provides for a remedial investigation of New Bedford Harbor, a decision on remediation of the Estuary is proposed to be made prior to the remedial investigation's completion.

By "fast-tracking" a final agency decision on remedial measures for the Acushnet River Estuary prior to completing the remedial investigation, the EPA will violate the Comprehensive Environmental Response, Compensation and Liability Act of 1980 ("CERCLA") and the National Contingency Plan ("NCP") promulgated thereunder. The draft FS prepared by EPA's contractors for fast-tracking a remedial determination was not designed to, nor does it, provide the technical basis required for reaching a final decision on the appropriate remedial response in the Acushnet

River Estuary. Were it not for EPA's "fast-tracking" the remedial decision for the Estuary, this technical information, or at least a significant portion, would eventually be provided as a result of the ongoing remedial investigation. By commencing a feasibility study and selecting a clean-up remedy for the Estuary prior to completing the remedial investigation, EPA is violating CERCLA and the NCP.

Although the omission of the required investigation is by far the most serious failing in EPA's current approach, other deficiencies also exist. The draft FS itself has numerous gaps and weaknesses. Moreover, EPA is violating the requirements of the National Environmental Protection Act ("NEPA") by failing to prepare an Environmental Impact Statement ("EIS") in connection with the major remedial activities under consideration for the Estuary. Similarly, numerous other federal and state statutes must be complied with before any final remediation of the Estuary may be undertaken. These requirements are fully set forth in the legal analysis and comments on the draft FS separately submitted by Cornell-Dubilier Electronics Company. As established therein and in these comments, a final agency decision on a remedial action plan for the Estuary absent compliance with all applicable statutory requirements can only result in a legally unsupportable administrative decision.

## ARGUMENT

### I. EPA's FAST-TRACKING OF A REMEDIAL DECISION FOR THE ACUSHNET RIVER ESTUARY VIOLATES CERCLA AND THE NCP BECAUSE THE DRAFT FEASIBILITY STUDY DOES NOT PROVIDE THE BASIS FOR MAKING A REASONED REMEDIAL DECISION

CERCLA 1/ authorizes EPA 2/ to undertake response measures to prevent or minimize releases of hazardous substances that cause a present or potential substantial danger to public health or welfare or the environment. 42 U.S.C. § 9604(a). EPA's response may include both short-term removal actions or longer-term remedial actions consistent with the NCP. 3/ CERCLA defines "removal actions" as primarily short-term limited responses that may be necessary to prevent, minimize, or mitigate damage to public health or welfare or the environment. 4/

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1/ Publ. L. No. 96-510, 94 Stat. 2767, codified at 42 U.S.C. §§ 9601-9657.

2/ Section 115 of CERCLA authorizes the President to delegate responsibility for administering the Act, 42 U.S.C. § 9615. By means of Executive Order 12316, the administration of CERCLA was delegated to the U.S. Environmental Protection Agency. 46 Fed. Reg. 9901 (Jan. 30, 1981).

3/ The National Contingency Plan was promulgated July 16, 1982. 47 Fed. Reg. 31180 (July 16, 1982), as amended, 40 C.F.R. Part 300.

4/ Examples given in CERCLA of removal actions include security fencing, provision of alternate water supplies, and temporary evacuations of threatened citizens. 42 U.S.C. § 9601(23).

"Remedial actions" are primarily longer-term responses "consistent with a permanent remedy." 5/

A. The NCP Governs the Selection of a Remedial Action and Requires that the Remedial Investigation be Completed Prior to the Undertaking of the Feasibility Study.

CERCLA itself does not state how appropriate remedial responses are to be chosen. Section 104 provides, however, that EPA, as the President's delegate, must act "to remove or arrange for the removal of, and provide for remedial action relating to such hazardous substance, pollutant or contaminant, consistent with the national contingency plan...to protect the public health and welfare or the environment. . . ." 42 U.S.C. § 9604(a)(1)(B) (emphasis added). Section 105 directs EPA to establish procedures and standards for responding to releases of hazardous substances, pollutants, and contaminants in the NCP, which was first promulgated pursuant to the Federal Water Pollution Control Act. 42 U.S.C. § 9605. The NCP promulgated by EPA in 1982 thus governs remedial actions taken under CERCLA. See 47 Fed. Reg. 31180 (July 16, 1982), 40 C.F.R. Part 300.

CERCLA's legislative history demonstrates that Congress intended that the revised NCP, by requiring an analysis of the nature of hazardous releases, their actual effects on the ecosystem and the relative benefits of alternative remedial

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5/ This term encompasses such activities as storage and confinement of hazardous substances by means of dikes and clay covered trenches, and neutralization of active compounds and dredging. 42 U.S.C. § 9601(24).

measures, would ensure that the chosen remedial action would be environmentally sound and cost-effective. Senate Comm. on Environment and Public Works, 1 Legislative History of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, at 689, 690 (Comm. Print 1983). In promulgating the NCP, EPA included appropriate procedures to comply with Congress' intent. The NCP establishes seven phases for discovering and assessing hazards of contamination to the public and the environment, determining whether there is a need for remedial action, and assessing the technical and economic feasibility of alternative remedial responses. 40 C.F.R. Part 300, Subpart F.

Under the NCP, EPA must undertake a thorough remedial investigation "to determine the nature and extent of the problem presented by the release," including "sampling and monitoring, as necessary, and the gathering of sufficient information to determine the necessity for and proposed extent of remedial action." 40 C.F.R. § 300.68(f) (emphasis added). See also id. at § 300.68(e). This investigation must be conducted prior to the development and initial screening of remedial alternatives. Id. at § 300.68 (g) and (h). 6/ EPA, in "fast-tracking" its

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6/ Indeed, former EPA Administrator Ruckelshaus testified before a subcommittee of the U.S. House of Representatives Committee on Energy and Commerce that the "completion of the RI [remedial investigation] is the sine qua non for either private party or Fund financed remedial action." Statement of former Administrator Ruckelshaus, U.S. EPA, before the Subcommittee on Commerce, Transporation and Tourism, Committee on Energy & Commerce, U.S. House of (continued) decision on the remedial action to be taken in the Acushnet River Estuary, has omitted this crucial information-gathering step and has proceeded instead to develop and screen alternative remedial actions based in part upon assumptions, rather than facts, about the nature and extent of contamination -- the very issue the remedial investigation is designed to address. 7/

"Fast-tracking" is not a mere procedural defect. The draft FS is fundamentally flawed as the basis for a decision on remedial action for the Estuary, since it does not provide information essential to evaluate the location within the Estuary of the hazardous substances in issue, their actual effects on the ecosystem, and the risks associated with their presence in that system. Such information is legally and substantively essential to determining the "extent of the problem" and the "necessity for and proposed extent of remedial action" under section 300.68(f), both prerequisites to developing remedial alternatives under sections 300.68(g) and (h) of the NCP.

Section 300.68(e) sets forth the criteria that should be assessed in determining the proposed extent of remedial action as required by section 300.68(f). Section 300.68(e)(2) lists

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Representatives, March 15, 1984.

7/ As originally envisioned by EPA, the decision to "fast-track" would "limit only the time element, not the content, of the remedial process." RAMP at 7. The draft FS, however, fails to fulfil either EPA's commitment or, more importantly, the NCP's requirements.

the following points of inquiry regarding source control remedial actions:

- The extent to which substances pose a danger to public health, welfare or the environment, including such factors as population at risk, amount and form of the substance present, hazardous properties of the substance, hydrological factors, and climate;
- The extent to which substances have migrated or are contained by either natural or manmade barriers;
- The experience and approaches used by governments to address similar releases in other areas;
- Environmental effects and welfare concerns.

The Workplan for the New Bedford site and the RAMP both recognize that answers to these inquiries are essential to a understanding of the dynamics of the Harbor and the behavior of the contaminated sediments and their uptake in the foodchain. EPA's decision to go forward in determining a remedial program for the Estuary before such data are available will likely result in a remedial program that is neither environmentally sound nor cost-effective.

Although the lack of data on key points in the draft FS is discussed fully in the accompanying technical analysis, the following example is illustrative of the document's fundamental weakness. The RAMP recognized that "recent data on contamination of the estuary by metals . . . are meager." RAMP at 17. To address this deficiency, the RAMP promised that "[a]dditional sampling and analysis for heavy metals will be conducted to further delineate the problem." Id. That analysis, however, has not been completed.

Similarly, further sampling and analysis have not been completed regarding PCB distribution within the Estuary. Because PCB and heavy metal distribution has not been adequately evaluated, no selective treatment, containment, or removal of those substances is proposed. Instead, the draft FS treats the entire Estuary as one "hot spot," and proposes dredging that entire area -- 202 acres -- to a depth of three feet. By refusing to collect or to await the data necessary to develop the most selective cost-effective remedial plan, EPA risks not getting it right the first time.

B. The Acushnet River Estuary does not Pose an Immediate and Significant Risk and Therefore EPA Cannot Forego Conducting A Remedial Investigation In Its Effort To "Fast-Track" The Remedial Decision

The seven phase plan set forth in the NCP establishes an evaluation scheme based on the type of release under consideration. 40 C.F.R. Part 300, Subpart F. The conduct of a remedial investigation is excused where expedited action is necessary to remove an "immediate and significant risk of harm to human life or health or to the environment." 40 C.F.R. § 300.65. Such action is authorized to address harm emanating from exposure to acutely toxic substances, contamination of a drinking water supply, fire and/or explosion, or similarly acute situations. Id.

The draft FS' observation that the Estuary presents an "immediate risk" to the environment and the public health is unsupportable. As more fully set forth in the accompanying technical comments, the FS limits its consideration of the risks presented, if any, to a nonspecific discussion about routes of PCB transport and atmospheric environments. The document includes no technical basis for reaching conclusions on some of even the most basic issues: the routes of exposure, the population affected by the transported chemicals, and the nature and duration of the effects. Judged by EPA's own standards -- the recently published proposed guidelines for conducting exposure assessments -- the so-called "risk assessment" in the FS is woefully inadequate. 49 Fed. Reg. 46204 (Nov. 23, 1984).

Not only does the draft FS fail to establish that an immediate risk exists, it in fact contains information that argues forcefully against such a conclusion. For example, the document contains information that establishes a 70% decline in ambient air PCB levels over the period from 1978 to 1982 downwind of the Estuary. While there are no national limits for non-occupational exposure to ambient air PCBs, the levels of PCBs downwind from the Estuary fall within the acceptable range set by municipalities such as Philadelphia and New York. Moreover, there is evidence that PCBs in the Estuary are being buried by natural sedimentation and that body burdens of PCBs in lobsters in the outer Harbor are declining with time. Finally, EPA's own remedial timetable, whereby remedial activities would not be undertaken in the Estuary until Spring 1985 at the earliest, underscores the fact that no emergency situation exists so as to excuse the completion of the remedial investigation. 8/

As EPA stated in the preamble to the NCP, "(w)here the threat is immediate, evaluation actions are limited in order that rapid response can be taken. As the threats become less immediate the Plan allows more extensive evaluation." 47 Fed. Reg. 31181 (July 16, 1982). Since the situation that exists in the Estuary is not an emergency, EPA's "fast-tracking" of the remedial decision violates the provisions of CERCLA and the NCP that require the Agency to carefully analyze the nature and extent of the hazard prior to proposing remedial alternatives.

C. The Evaluation in the Draft Feasibility Study of the Proposed Remedial Alternatives Is Grossly Inadequate

An additional critical weakness in the draft FS is the inadequacy of EPA's analysis of the relative benefits of the remedial alternatives. As set forth in detail in the accompanying technical comments, there are a number of technical oversights, errors and omissions in the draft FS that have serious implications regarding the effectiveness of the proposed

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8/ Given the lack of evidence that an immediate risk of harm exists in the Estuary, a finding of "imminent and substantial endangerment" under section 106 of the Act would likewise not be supportable. *See* 42 U.S.C. § 9606.

remedial actions and their environmental and public health effects.

One of the chief inadequacies is the insufficient consideration given to the effects of dredging contaminated sediments on the ecosystem. 9/ The FS fails to adequately address the special problems from a water treatment standpoint due to the potentially large fraction of PCBs that are likely to be released from sediments during dredging. Nor does the document consider in sufficient detail whether the proposals it does put forth, such as silt curtains, would be effective as a means of controlling sediment dispersion, particularly where a substantial fraction of PCBs may be released and transported within oil films and as very fine fractions.

Errors or oversights of the type documented in the accompanying technical comments could lead to substantial cost-overruns, and could have unintended harmful effects on the environment and public health. 10/ Particularly where, as in the

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9/ Moreover, no comparison at all is made with EPA's prior dredging experience in the Hudson River and Waukegan Harbor. This failure to consider the limited experience EPA already has with PCB removal violates the express directions of the NCP. See, e.g., 40 C.F.R. § 300.68(e)(2)(iv).

10/ It should be noted that the RAMP concluded, even before the Feasibility Study for the Estuary was undertaken, that "[i]t is expected that these highly contaminated sediments [in the Estuary] will be dredged." RAMP at 30. EPA Regional Administrator Michael R. Deland recently confirmed that dredging is EPA's preferred option. EPA Region I Press Release, "EPA Reopens Public Comment Period On PCB Cleanup Options; Announces Its Preferred Options." Yet, the draft
(continued)

instant case, there is no imminent environmental hazard or risk to the public health, there is no justification for EPA's proposed rush into enormously risky and expensive engineering projects whose benefits have not been amply demonstrated.

D. The Remedial Measures Under Consideration Do Not Constitute "Initial Remedial Measures"

The NCP provides that "initial remedial measures" may commence before the final selection of an appropriate remedial action "if such measures are determined to be feasible and necessary to limit exposure or threat of exposure to a significant health or environmental hazard and if such measures are cost-effective." 40 C.F.R. § 300.68(e)(1). The NCP contains a list of factors to be used in determining whether to take initial remedial measures and gives examples of measures that might be appropriate, such as signs, fences and dikes. None of the factors are present in the Estuary, and the alternative remedies being considered in the FS are of a totally different nature and magnitude. Those alternatives constitute ultimate remedies, not mere "initial remedial measures."

EPA has not characterized the alternatives proposed in the draft FS as initial remedial alternatives, and indeed has taken steps to disassociate itself from such a characterization. The draft RAMP released for public comment in 1983

FS does not prioritize the remedial options it discusses. It thus would appear that EPA already has reached a decision on what action to take in the Estuary, the basis of which was not disclosed in either the RAMP or the draft FS.

asserted that the PCB "hot spots" in the upper area of the Acushnet River Estuary would be "the focus of initial remedial measures over the next 6-12 months." Section 1.2, final paragraph. Criticism of EPA's characterization of the costly dredging program anticipated for the Estuary as an "initial remedial measure" presumably resulted in the change effectuated. The final RAMP states that "[t]hese PCB hot spots will be the focus of a feasibility study over the next 6-12 months." RAMP at 5, § 1.2 (final paragraph) (emphasis added). The characterization of remedial activities such as dredging as "initial remedial measures" could not be justified in the past, and cannot be justified now so as to excuse the requirement of a remedial investigation.

CONCLUSION

No circumstances exist that justify EPA "fast-tracking" a decision on remedial action for the Estuary if that accelerated process would abrogate official procedures established by law to assure the soundness of such a decision. To be more specific, there is no justification in the circumstances of this case for EPA to cut corners in the selection of a remedial plan by preparing a feasibility study before completion of the remedial investigation. EPA must comply with the provisions of the NCP which require that the studies undertaken as part of the remedial investigation of the Harbor be completed in order to determine the extent of exposure to PCB-contaminated sediments and the extent of clean-up necessary to remove the hazard. By "fast-tracking" the Feasibility Study, EPA is violating the NCP and CERCLA.

# PART II -- TECHNICAL ANALYSIS

# PART II

# TECHNICAL ANALYSIS

## Technical Contributors

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## EXECUTIVE SUMMARY

Based upon a review of the Draft Feasibility Study prepared by NUS, it is our opinion that the document does not provide an adequate basis for supporting a "fast track" approach for removing, treating, or containing PCBs currently present in the sediments of the upper Acushnet River. In fact, much of the information presented in the report argues against the wisdom of such an approach. Two basic conclusions that we reached upon reviewing the report, the reference material that supports it, and other information available to us on the fate and effects of PCBs are:

1. There is no technical basis for supporting the contention that the existing situation represents an "imminent hazard" which requires a rapid response in the development and implementation of a remedial action alternative. Rather, efforts should be spent in completing the studies that are underway so that agency personnel have the information necessary to develop a cost-effective approach that would minimize damage to other components of the marine system.
2. There are a number of significant technical oversights, errors, or omissions in the report that have potentially serious implications with regard to the effectiveness of the proposed alternative remedial actions or the environmental/public health effects of

these actions. While it is recognized that by its very nature a "fast track" program may have to proceed with inadequate information, some of the data gaps, oversights, and assumptions could lead to substantial unanticipated problems if particular alternatives are implemented. Inasmuch as the current situation is one that has not been shown to pose an imminent hazard, we strongly recommend that EPA and its contractor NUS address the critical information gaps so that an appropriate and technically sound solution can be identified and implemented.

While there are a number of technical comments provided in our document a few are worth highlighting:

- While a number of references have been made by NUS to the immediate risks posed by PCBs, there has been no risk assessment and the evaluation of risks was based solely upon unsupported subjective judgements concerning processes in the marine system and the possible fate and effects of the chemicals.
- The study fails to recognize that water quality conditions in the upper Acushnet River were deteriorated for many years prior to the introduction of PCBs. The area was closed to the taking of shellfish 20 years prior to the first use of PCBs by the capacitor manufacturing companies. Biological

conditions in the upper estuary cannot be related to the presence of PCBs, and there is no basis for assuming that "beneficial" changes will occur following implementation of remedial actions.

- The sources, transport, and fate of PCBs in the Acushnet River/Harbor system are poorly defined.
- There are important errors in the presentation and interpretation of oceanographic processes.
- EPA studies and observations have indicated that a substantial fraction of PCBs may be released and transported within oil films and as very fine fractions. This may pose special problems for handling the dredged material, i.e., large quantities of PCBs could be released directly to the water column and not adequately retained within the sedimentary material. If this should occur, one consequence could be the increased contamination of lower reaches of the estuary, New Bedford Harbor, and possibly Buzzards Bay.
- The cost estimates are at a very preliminary level. There are a number of assumptions and uncertainties within each. Therefore it can be expected that costs will increase significantly as the designs of alternatives are firmed up. Consequently, the costs presented in the NUS report should be viewed as very rough, underestimates. Costs for the various

alternatives cannot be compared because performance criteria have not been adequately developed.

- The report prepared by NUS does not describe the environmental or public health impacts of the existing situation or the proposed alternatives. Such an assessment should be an integral part of judging and comparing alternatives.

A responsible remedy directed at contamination in the upper estuary might be possible and might provide a cost-effective solution to contamination in the harbor as a whole. However, the proper information must be gathered and evaluated in order that technically sound approaches can be developed. A "fast-track" approach runs the risk of missing a cost-effective and well-targeted solution and resulting in greater harm to the environment.

Comments on the NUS Document

Draft Feasibility Study of Remedial Action Alternatives
Acushnet River Estuary Above Coggeshall Street Bridge,
New Bedford Site, Bristol County, Massachusetts

A. Comments on Basic Objectives of Overall Remedial Action Program for the PCB Hot-Spot Areas of the Acushnet River Estuary

The NUS document outlines three basic objectives for the remedial action program as it relates to hot-spots. Comments on each of these objectives are presented below.

Objective 1: "Decrease immediate risk to public health due to hazard associated with direct contact with contaminated mud flats and sediments, uptake of PCBs through ingestion of contaminated fish and shellfish, and respiratory inhalation of PCBs in volatile and particulate forms."

. There has been no quantification of this risk, and it is simply presumed that it is significant enough to warrant fast-track remedial actions. No data have been presented to support the contention that there is an "immediate" risk. NUS concedes, as it must, that there is no acute hazard, and the risks of chronic PCB exposure typically are calculated over a postulated 70-year life time.

There is no supporting information on the degree to which the public has access to or utilizes the mud flats, and no information is presented on the degree to which the public is taking fish and shellfish from the area for consumption. The report does not consider the fact that areas have already been closed to fishing, and the effectiveness of these closures has not been evaluated.

Further, in addition to reducing real or perceived public health risks by enforcing closures, access to contaminated mud flats could be limited by constructing fences. The NUS report does not consider this option. Closures, fence construction, and similar measures are temporary actions that could reduce potential risks in the short-term. They would provide the time needed to conduct the studies, now underway, to identify the important PCB sources, transport routes, food chain links, etc., necessary to provide the information used in quantifying risks and identifying appropriate remedial actions. In this regard, it should be noted that EPA's yardstick even for requiring testing under TSCA is "widespread" or "serious" harm, and the former requires >100,000 people exposed at a risk level of $1x10^{-5 \text{ or } 6}$, while the latter requires >100 to 1,000 people exposed at a level of $1x10^{-2 \text{ or } 3}$. NUS has done no risk assessment of the type EPA and other federal agencies require.

While it is acknowledged that risk assessment procedures are still being developed, there are basic kinds of information that should have been considered and included in the assessment of risks. Risk assessments commonly have been performed by such groups as the National Academy of Science, World Health Organization, industry, municipalities (e.g., New York City concerning the ocean disposal of sewage sludge) and EPA. Indeed, EPA has developed approaches and guidelines for implementing risk assessment procedures. These or similar generic risk assessment procedures should have been used by NUS to provide the technical basis needed for assessing the current situation and effectiveness of remedial measures. Several of the general procedures developed by EPA are presented below as examples.

Most recently EPA published its proposed guidelines for conducting exposure assessments. 49 Fed. Reg. 46204 (November 23, 1984). The guidelines were developed as part of a broad guidelines development program under the auspices of the Office of Health and Environmental Assessment (OHEA) within the agency's Office of Research and Development. Consonant with the role of OHEA's Exposure Assessment Group (EAG) as the agency's senior health committee for exposure assessment, the guidelines were developed by an agency-wide working group. While the publication of the proposed guidelines follows publication of NUS's Draft Feasibility Study, the general approach and information presented in the guidelines have been discussed within EPA for some time and have been utilized in the preparation of various risk assessments. EPA notes that "[t]his document, by laying out a set of questions to be considered in carrying out an exposure assessment, should help avoid inadvertant mistakes of omission."

The key components of an exposure assessment beyond an assessment of sources include the following as outlined in the EPA guidelines:

Exposure Analysis and Environmental Fate
- Transport and Transformation
- Identification of Principal Pathways of Exposure Predicting Environmental Distribution

Monitored or Estimated Concentration Levels
- Summary of Monitoring Data
- Estimation of Environmental Concentrations
- Comparison of Concentration Estimates with Monitoring Data

Exposed Populations
- Human Populations
  - Population size and characteristics
  - Population location
  - Population habits
- Nonhuman Populations
  (same as above)

Integrated Exposure Analysis
- Calculation of Exposure
  - Identification and characterization of the exposed population and critical elements of the ecosystem; pathways of exposure
- Human Dosimetry and Monitoring
- Development of Exposure Scenarios and Profiles
- Evaluation of Uncertainty

The recognition of the importance of considering critical pathways and factors in estimating the risks posed by chemicals in the environment is reflected in the EPA's efforts toward model development. For example, the EPA has developed the Exposure Analysis Modeling System (EXAMS) to predict fate of chemical compounds in natural waters. EXAMS is designed for use in the practical situations encountered by EPA program offices, particularly the Office of Toxic Substances, in evaluating potential risks to human health and the environment associated with the releases of toxic organic chemicals. The logical basis for EPA's EXAMS effort, in outline, is as follows:

- To estimate the exposure of organisms to a chemical in an environment, the concentration of the chemical in that environment must be known.
- A chemical's concentration in an environment is a result of its behavior and its load to the environment.
- Behavior of a chemical in an environment is a result of the coaction of properties of the chemical and the environment.
- The coaction can be expressed mathematically using quantitative descriptions of the properties of the chemical and the environment.

EPA, through its marine laboratory at Narragansett, RI, has developed a Hazard Assessment Methodology for assessing the fate and effects of wastes in marine environments and this could provide a framework for assessing risks associated with PCBs in New Bedford Harbor. The methodology has been applied to ocean disposal at the deep water dumpsite off New Jersey as well as to the disposal of radioactive waste into the sea. The methodology incorporates procedures which have come to be recognized as basic to performing a technically sound risk assessment.

There are several technical questions asked in an ocean hazard assessment as outlined by EPA. Several of these relate directly to the consideration of risks posed by PCBs in the Acushnet River and New Bedford Harbor. These include: Where will the waste (material) go if released at a particular time and place? What may it encounter along the way? What will be the consequences of each encounter? How might it change in the process? Where will it end up and in what form? How long will it remain there in that form? What living resources may encounter it there? What will the consequences of that encounter be?

These questions are addressed by the components of the ocean hazard assessment. These include the following:

1. Site Characterizations: This includes pertinent physical, chemical and biological information about the site.

2. Waste Characterization: This includes information on the physical and chemical characteristics of the material. Such information would include physical properties which control contaminant partitioning, bioavailability, and dispersive characteristics, chemical properties which affect toxicity, and the potential that the chemicals could generate chemical residues which influence the degree of hazard to marine biota and directly or indirectly to man. Information necessary to determine physical dispersion and fate of the wastes includes densities, particle sizes, sedimentation rates, suspension and resuspension potentials, partitioning, and rates of chemical decay. Together with site characterization information these data make

it possible to estimate the transport and dispersion of waste in and around the site and thus to evaluate the likelihood of exposure of living marine resources in the area.

3. Exposure Assessment: Exposure assessment is the determination of likelihood that the pollutant at sea will contact the resource which is to be protected, and the concentration, frequency, and duration of that contact. Exposure assessment involves the collection and synthesis of information on pollutant sources with information on the physical, chemical, and biological processes which affect the transport, transformation, and fate of contaminants in the system. Mathematical models can be used as a framework for this synthesis. (We note that the EXAMS model described above is an example of an exposure assessment model and that EPA has contracted for exposure assessment modeling of PCBs in New Bedford Harbor. However, the fast track program is proceeding without the benefit of such information.)

4. Effects Assessment: In the effects portion of the hazard assessment EPA notes they are seeking functional relationships between exposure conditions and biological effects. The appropriateness of test data depends on the situation. In general such tests might include acute and chronic toxicity, tissue residues of

pollutants, biostimulation of nuisance species, teratogenicity, mutagenicity, carcinogenicity, and structural or functional changes in the whole ecosystem.

5. Hazard Assessment: Hazard assessment itself is the collection and synthesis of the above information. It is the combination of exposure assessment and effects assessment.

Finally, an extensive data base does exist on the toxicity of PCBs and the hazards they pose in the environment. In fact, the EPA has recently summarized much of this information for PCBs in a risk assessment framework addressing, "Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Response to Individual and Class Petitions for Exemptions." 49 Fed. Reg. 28154 (July 10, 1984).

It is clear from the information presented above that there are generally accepted approaches or frameworks which NUS could have employed for considering information on the fate and effects of chemicals in the environment and assessing the risks posed by these chemicals. However, other than providing a qualitative discussion, NUS has not made an effort to assess the risks posed by the existing conditions or to evaluate the effectiveness of remedial actions in reducing these risks. We strongly recommend that NUS carry out such an analysis so that the effectiveness of the various alternatives can be judged on a firm technical basis.

Given that an assessment of risks has not been performed, what then is the technical basis for concluding that there is an immediate risk or imminent hazard? EPA appears to assert three pieces of information on which this is based: (1) that there are highly contaminated sediments in the upper Acushnet River; (2) that a study by EPA's Emergency Response Team (EPA-ERT) has suggested that PCBs are being transported down river past the Coggeshall Bridge; and (3) that ambient air levels of PCBs are elevated.

None of these observations alone or collectively provide information on the level of risk posed by the current situation (e.g. immediate vs. long-term). As noted above, an assessment of risks requires consideration of exposure routes, populations that might be affected by transported chemicals, and the nature and duration of effects. The information presented by NUS suggests there are potential sources of PCBs in the New Bedford area. However, NUS has not conducted any analysis which would serve to establish if there potential sources pose immediate or even long-term risks to human health and the environment.

Most commonly, immediate risks or imminent hazards are associated with the following kinds of situations as described in the National Contingency Plan:

1. Human, animal or food chain exposure to acutely toxic substances. (Note here the emphasis on acute toxicity-PCBs are not considered to be acutely toxic.)
2. Contamination of a drinking water supply. (Again, this is not the situation in the River or Harbor.)
3. Fire and/or explosion.
4. Similarly acute situations.

Not only has the presence of an immediate risk or imminent hazard has not been demonstrated for PCBs in the Acushnet River or New Bedford Harbor, some of the available observations and information even argue against this notion. For example, even though it is recognized that direct contact with PCBs on the mudflats probably does not represent an acute hazard, the likelihood that this occurs at all is small because access to these areas is greatly limited by the presence of industrial complexes.

Actions have already been taken to break the food chain link by closing the river and harbor to fishing. These actions are similar to those taken in the James River (Kepone contamination) and Hudson River (PCB contamination). NUS has not discussed the effectiveness of these measures in reducing immediate risks. In any case, there is evidence that PCBs in the upper river are being buried by natural sedimentation and that body burdens of PCBs in lobsters in the outer harbor are declining with time. Again, these observations tend to argue against the contention that an immediate risk or imminent hazard exists. This is not to say that actions should not be taken to reduce risks of PCB exposure but that such actions should be based on a sound and carefully considered approach to the overall PCB contamination situation within the New Bedford site.

NUS has also pointed out that PCB levels in air are elevated. They also note that concentrations have declined over the period from 1978 to 1982. Samplers downwind of the estuary indicated PCB levels in 1982 of 93 and 76 ng per $m^3$ for aroclors 1242/1016 and 4.5 ng per $m^3$ for aroclor 1254. While there are no national standards or guidelines for PCBs in ambient air (i.e. non occupational exposure), state and city agencies have proceeded to establish or propose guidelines. For example, the Philadelphia guideline for PCBs in the atmosphere is 180 ng per $m^3$, while in New York State the acceptable level of PCBs in ambient air around facilities applying for permits is 1,600 ng per $m^3$. Based upon these guidelines the levels of PCBs in air downwind from the estuary would be judged to be acceptable. In any case, they certainly do not indicate the presence of an imminent hazard.

. The link between PCB contamination in the upper estuary and in the air has not been made. A recent EPA study showed the highest ambient air concentrations of PCBs at the former dump site at Sullivan's Ledge, about two miles west of the Acushnet River. Metcalf & Eddy (1983) identified the possibility of land-based contamination as an area where there were significant data gaps. Given the possibility of relatively more important land-based sources of PCB to air, the proposed extremely costly remedial actions in the upper estuary may not even have a significant effect on PCB concentrations in the air. It may be more likely that remedial actions taken on land (e.g., paving over of source areas), would have a greater effect on PCB concentration in the air. In any event, as already noted, PCB levels in air downwind of the estuary (1982 measurements) would be judged to be acceptable by standards and guidelines currently in place in some U.S. states & cities. They certainly do not support the contention that there is an "immediate risk".

Objective 2: "Decrease the impacts on aquatic and terrestrial organisms and resources within the upper harbor that have been impacted by high levels of the chemicals. The elevated levels and the impacts on the public health and welfare associated with contaminated animal and plant communities will continue until the contaminants are removed from the food chain and plants."

. The objective suggests that impacts have occurred as a result of the presence of chemicals. No information has been presented to support this. The description of impacts on aquatic biota on pp. 3-6 through 3-8 does not distinguish between the upper estuary and the harbor. NUS describes the upper estuary as having "little living benthic macrofauna", and mentions only the migration of alewives in connection with the upper estuary.

. The report overlooks the fact that the upper estuary has long been closed to the taking of fish and shellfish due to deteriorated water qualtiy. These closures occurred over 20 years prior to the period when PCBs began to be used by Aerovox and Cornell-Dubilier. Water quality conditions have been poor, but these cannot be related specifically to PCBs. Because of combined sewer overflows and other point and non-point discharges into the upper estuary, it is entirely possible, if not probable, that water quality conditions would still be unsuitable for the taking of fish and shellfish in the upper estuary even after the proposed remedial actions are implemented.

. The discussion of impact on terrestrial biota by NUS on pp. 3-8 and 3-9 is entirely speculative. NUS admits that there are no data on PCBs or metals in the saltwater marshes of the eastern shore, but goes on to assume high levels of contamination, stress on wetland vegetation and bioaccumulation in terrestrial fauna. There is no basis for the assumption of stress on the vegetation in the saltwater marshes and no valid criteria established for determining stress. The low diversity of plant species is too vague for use as a criterion because saltwater marshes are areas of low species diversity even in the absence of stress. NUS does not identify any "fish-eating birds, waterfowl, and other terrestrial animals that feed in the Acushnet River Estuary and mud flat or wetland areas." Therefore, the possibility that some remedial measures will reduce the impact of PCB contamination on such species is speculative. In contrast, NUS acknowledges that all of its proposed remedies would have an adverse impact on the marshes.

. The objective suggests that elevated levels (of PCBs) will continue until the contaminants are removed from the food chain and plants. No information is presented on established food chain links as they relate to PCB transfer. In fact, this matter is presently being studied by EPA's contractors for New Bedford Harbor at considerable expense. It would be appropriate to await the results of these studies in order to identify any important links and, therefore, to be able to take appropriate action.

. The report appears to ignore the observation that the contaminated sediments are being covered naturally with cleaner sediments. The importance of these natural processes in reducing PCB levels has not been evaluated by NUS. In addition, other natural processes, including biodegradation and photolysis, will tend to reduce the amount of PCBs in the marine environment over time. Thus, the report ignores the fact that "no action" is not "no remedy" and that at least selective treatment, dredging or containment might be possible.

Objective 3: "To decrease the potential for contaminant migration from the hot-spot areas to other less contaminated or uncontaminated areas. If left unremediated, the contaminants will spread until a greater portion of the aquatic community becomes unfit or unavailable for the food chain and, ultimately, for human consumption. The progressive movement of contaminated sediments and surface waters from the upper estuary into New Bedford Harbor also exacerbates the current water quality problems and related socioeconomic problems in these downstream water bodies."

. Several of the key remedial actions being considered by EPA and their contractor NUS involve dredging a substantial quantity of sediment in the upper Acushnet River in order to remove PCBs from the estuarine/marine environment. It is acknowledged that there is very little information on the sources, nature, transport, and fate of PCBs in this system and this makes it difficult to evaluate the effectiveness of proposed remedial actions or the environmental consequences of these actions. However, observations made by EPA suggest that remedial actions involving dredging should be approached with extreme caution. The reasons for this are developed below.

A study conducted by the EPA's Emergency Response Team ("EPA-ERT") during 1982 and 1983 revealed that most PCBs present in the water column during a storm event were either dissolved or associated with either surface oil films or very fine materials. (Note the report refers to a fraction that is finer than 6.5 microns but water samples were filtered through a 0.45 micron pore filter - either represents fine material). At a meeting among defendants, their consultants, EPA, and NUS, Gerry Sotolongo of EPA reported that the sediments of the mud flats contained oils which were released as a visible sheen when disturbed.

Extensive mud flats occur along the western shore of the upper Acushnet River and these are exposed to the discharge of permitted systems, combined sewer overflows, and non-point sources. Thus, these as well as other sedimentary environments within the system have had an opportunity to build up accumulations of oils and other contaminants. However, the mud flats would be particularly prone to accumulating contaminants contributed to the system via nearshore discharges and runoff.

The oils present in the sediments could serve as a carrier for the PCBs which are lipophilic and have a tendency to become concentrated in oily materials. PCBs are also known to have a high affinity for fine sedimentary material on which the chemicals become adsorbed. However, the results of the EPA-ERT study together with the observations of Mr. Sotolongo suggest that PCBs may be released from the sediments and transported in the water in association with oils. The occurrence of PCBs in the surface oil films and fine fractions came as a surprise to EPA as acknowledged by Mr. Sotolongo at the meeting.

The EPA-ERT study was done during a storm event and thus there was probably considerable discharge of storm water to the nearshore areas of the Acushnet River. Oils carried into the system with this discharge could also have been important in mobilizing and transporting PCBs in the sediments of the shallow and intertidal areas.

The major implication of the above observations insofar as dredging alternatives are concerned is that the PCBs may not remain associated with the sedimentary material (primarily silt) but may be released from the sediments with the oil or as very fine particles (less than silt-size particles). Silt curtains would be largely ineffective in retaining the material released to the water column during dredging and the PCBs so released would be able to move through the marine system. In short, a large fraction of the PCBs could be released to and remain within the marine environment if dredging alternatives are implemented. Because of the potentially large fraction of PCBs that might be released from sediments, PCBs that are gathered during dredging would pose special problems from a water treatment standpoint and this would need to be taken into account in designing the water treatment system.

A large release of PCBs during dredging operations could result in the widespread dispersal of these chemicals in the river, New Bedford Harbor, and Buzzards Bay. If the chemicals are mobilized with the oils and can't be retained by the silt curtains a potential outcome of the remedial actions involving large-scale dredging is the increased contamination of larger areas of the estuary. Associated with this is the possibility of increasing body burdens of PCBs in fish and shellfish.

Because of the potential consequences of large-scale dredging, there are several areas that should be addressed before EPA moves toward a final recommendation of a remedial action.

1. EPA should extend its studies to provide additional data on the nature of the PCBs in the upper estuary,

*i.e.*, are they easily mobilized, are they associated with oils, how are they distributed spatially and with depth, at what concentrations and in what form do they occur in the water column during storm and non-storm periods?

2. If PCBs are readily mobilized from sediments and if dredging will result in the release of a significant fraction of these chemicals to the environment, then EPA should consider remedial actions that involve containment (*i.e.*, in-situ isolation of selected hot spots) and/or limited dredging. Studies carried out as suggested above would serve to delineate the hot spot areas that should be the focus of the remedial measures. Biodegradation technologies should not be dismissed too early. There is considerable research in this area now and an assessment should be made of the cost-effectiveness of technologies that may be developed over the next several years.

It is recognized that the above recommendations involve a departure from the current EPA approach to resolving the New Bedford PCB contamination problem. However, the consequences of miscalculation are serious and the information available to us at this time strongly suggests that the approach be reassessed.

. The EPA-ERT study found high PCB concentrations at upper water levels and associated with freshwater discharge. This is an indication that there may be several, distinguishable sources of PCBs that should be targeted for investigation and possible remedial action. The EPA-ERT study mentions tidal flats as potential sources of PCBs and surface runoff as a mechanism for transport of PCBs into the upper estuary; the location of these tidal flats are not identified, however. In addition to tidal flats, supratidal areas subject to runoff are another potential source of PCBs. (Known sources of this type have already been capped). PCBs may also enter the upper estuary directly through freshwater input. The EPA report refers to an earlier EPA study in September, 1982 which revealed low level contamination of freshwater input to the Acushnet River, even during clear weather conditions. It is possible that this source of PCBs is even greater during storm conditions. The NUS draft feasibility study does not discuss these potential sources of PCBs which are mentioned in or inferred from the EPA-ERT study. This omission may mean that significant sources of PCBs are overlooked since they lie at the edges of the upper estuary or even outside the bounds of the investigation area. This would open the possibility of recontamination and remediation of the upper estuary, especially if the proposed target level of 1 ppm is accepted. A *full discussion of PCB* sources to the upper estuary should be presented in the NUS study.

The high concentration of PCBs observed by the EPA-ERT in surface oil slicks indicates that this may be a major transport mechanism for PCBs. The source of this contaminated oil, mechanisms for its release into the water column and methods to prevent its migration are not detailed in the NUS draft feasibility study.

. While net PCB transport may be seaward during storm events, the EPA-ERT's methodology is flawed in several respects. Specifically:

1) PCB transport calculations for the duration of the January storm are too high by a factor of nearly 3, because the calculated volume transport presented in Table 5 of the EPA-ERT report is nearly 3 times too high based on the area of the estuary and the measured tide range of 4.5 feet. Both of these are reasonably accurate measurements as compared to the transport measurements derived from current meter data obtained during the study.

2) PCB transport calculations based on average flow and average concentration lead to a large uncertainty in the transport estimate for the measurement period. There is considerable variability in each of these data sets. The large uncertainty which results is typical of situations where the calculated product is the result of "small differences in large numbers."

3) the extrapolation to annual PCB transport is totally without foundation; no estimate is possible with the data presented. The EPA extrapolation is based on a

January storm event and no basis is provided for extrapolation beyond the measurement period. It should be noted that conditions during this storm probably were responsible for an unusually high resuspension of bottom sediments.

. The NUS report has not considered any seasonal or annual trends in PCB concentrations in biota (in particular, lobsters) in the outer harbor. Data collected by the Massachusetts Division of Marine Fisheries suggests that there is a seasonal pattern in PCB levels in lobsters (higher in the summer, lower in the winter), and that there has been a decline in the mean concentrations over time.

. It should be noted that natural burial of contaminated sediments and declines in body burdens of Kepone occurred in the James River and may possibly be occurring for PCBs in New Bedford. The possibility that PCB levels are declining with time, which is not discussed by NUS, calls into question the assertion that, "If left unremediated, the contaminants will spread until a larger portion of the aquatic community becomes unfit or unavailable for the food chain and ultimately for human consumption."

B. Level of Clean-up to be Achieved

In order to plan appropriate remedial measures involving removal, containment or treatment of chemicals in the environment, it is necessary to establish technically sound targets or goals. With regard to New Bedford Harbor, one of the most important "targets" is the appropriate level of clean-up to be achieved. The level chosen will have specific environmental, engineering and economic implications for remedial alternatives. In fact, selection of a target level affects the range and feasibility of remedial alternatives. Thus, target concentrations should be selected with care and should be technically defensible. If data are uncertain, then it is prudent to consider the implications and remedial measures associated with several possible target levels as, for example, was done by Malcolm Pirnie, Inc. in their report on New Bedford prepared for the Massachusetts Division of Water Pollution Control.

NUS has identified a sediment PCB concentration of 1 ppm as an appropriate target for ensuring that PCB concentrations in fish and shellfish are reduced and/or maintained below the FDA action level of 2 ppm. The "technical" basis for their judgment appears to be "since the FDA limit is 2 ppm, the sediment concentration should be less than that." The implied relationship ignores much of the research, analyses, and modeling efforts carried out by EPA, other government agencies, and academic institutions.

Without understanding the relationships that exist between PCBs in sediments and those in tissues of organisms, any target level is, at best, arbitrary. NUS has subcontracted with the Battelle Institute to perform the PCB transport modeling and it, in turn, has subcontracted with HydroQual to conduct the PCB food chain modeling. Results of these EPA-sponsored modeling efforts are not yet available, and, therefore, the critical "up front" work has not been completed. In light of this, the selection of any target level of PCBs in sediments at this time must be viewed not only as arbitrary, but extremely premature and wasteful of funds. It should be further noted that undesirable environmental effects may result from the selection of a target level that is too low as well as for a level that is too high. The lower the level, the more the environment may be disturbed by remedial measures, one consequence of which is the possible environmental release of larger quantities of PCBs.

The key relationships governing the behavior of organic pollutants in aquatic ecosystems and their use in risk assessment have been reviewed by Zitco (1979). These include: 1) transport between water and air; 2) transport between water and sediment; and 3) transport between water and biota. Zitco examined some of the mathematical relationships involving these processes and noted that the main parameters that need to be considered are the respective distribution coefficients (e.g., Henry's constant, the adsorption coefficient, and the bioconcentration factor). These, in turn, are related to concentrations of organics in specific compartments of the system. None of these processes are discussed in the NUS document with regard to identifying appropriate target concentrations for PCBs in sediments.

Hydrodynamic (e.g., flushing) processes in estuarine systems also can govern the relationships between concentrations of organics in sediments and organisms. This was examined recently by Connor (1984). He observed that when the fish/sediment ratios for the same compounds (including PCBs) from different areas are compared, there is a correlation between the residence time of water in the area and the fish/sediment ratio. Lakes have higher ratios than poorly-flushed coastal areas, which, in turn, have higher ratios than well-flushed coastal areas. Connor noted that the dependence of these bioconcentration measures on flushing time could indicate that surface sediments are not in equilibrium with fish lipid pools. NUS did not consider the importance of hydrodynamic/flushing processes in arriving at a target sediment level for PCBs.

In addition to the key processes cited above, possible food chain relationships must also be considered when evaluating the fate of PCBs in aquatic systems in order to estimate the target concentrations in fish. For example, Thomann and Connolly (1984) developed an age-dependent food chain model of PCB transport in Lake Michigan and concluded that transfer of PCBs through the food chain was the major contributor to observed PCB concentrations in Lake trout; a simple empirical correlation between octanol-water partitioning of PCB and bioconcentration of PCBs failed to reproduce the observed concentrations in fish. Thomann and Connolly also utilized the model to estimate the target concentrations in water necessary to reduce concentrations in fish. NUS has not considered these relationships for New Bedford Harbor.

As previously noted, various models have been developed to describe the fate of contaminants in sediments, water and biota. For example, EPA has developed the Exposure Analysis Modeling Systems (EXAMS) to predict fate of chemical compounds in natural waters (Lassiter et al., 1976).

Although the EPA recognizes the importance of these relationships and the utility of modeling, these have not been considered by NUS in identifying PCB target concentrations. The lack of a sound technical basis for this component of the fast-track program is surprising, inasmuch as fairly extensive and expensive modeling efforts are planned. In addition, various EPA accepted risk assessment methods could be employed. For example, TSCA's policy might help establish food chain end point standards for recreational exposure.

C. Project Setting (Section 2 of FS)

This section of the draft FS provides general background information. Below are a limited number of specific comments on section 2 of the NUS report.

- The NUS report lacks adequate descriptions and graphical presentations of key geographical features identified in the text of the report. Such items include:

- the hot-spot area defined by NUS as a Acushnet River estuary bounded by the Coggeshall Street Bridge and the Tarkiln Hill Bridge;
- natural estuarine features such as channel areas, mudflats, and wetland areas;
- man-made features of the estuary such as the hurricane barrier, the North and South Terminals, the Aerovox plant, the Cornell-Dubilier plant, and the New Bedford Waste Water Treatment plant.
- locations of areas where dredging has occurred and where dredged material has been deposited (both onshore and offshore).

Graphic presentation of these features will help provide an understanding of the spatial relationships between present areas of PCB accumulation and potential impact areas. Adequate base maps for this purpose are available from the USGS in the form of quadrangle sheets of New Bedford North and New Bedford South and modified sheets portraying some of these features have been published by the Massachusetts Coastal Zone Management (Weaver, 1982).

. The report does not present land use and development maps. It is not possible to assess adequately the impacts of various remedial action alternatives on harbor land use without land use maps. Land uses should be identified by category: residential, industrial, tidal marsh, etc. Compatability with existing and planned land use is an integral feature of environmental assessment which the NUS report does not adequately address.

There are several factual errors in the description of tides presented in the NUS report.

- The tide is incorrectly characterized as diurnal. In fact, the tide is semidiurnal with a period of 12.4 hours.
- The estimate of the tidal prism volume of the upper estuary is too high by a factor of 2.
- The estimate of the flushing time of the estuary is incorrect owing to the error in the tidal prism volume.
- The reference to NOAA (1981) is not cited in the reference list.

The tidal prism is properly defined as the intertidal volume--the volume of water between mean low water and mean high water--and is calculated by multiplying the area of the estuary by the tidal range. Assuming that the area of the estuary given by NUS (202 acres) is correct, the tidal prism is about 33 million cubic feet rather than the 65,664,000 cubic feet reported. Their error may have resulted from a misinterpretation of their definition of the tidal prism -- "the volume of water which flows into and out of a basin in the course of a complete flood/ebb cycle." This volume may have been counted twice, once at flood and again at ebb.

The lack of complete references in the draft report make it difficult to verify the data presented and the conclusions reached by NUS. This is a problem throughout the report, but specifically in Section 2 the reference to NOAA (1981) is missing and no references are given for Table 2-1.

. The discussion of circulation on p. 2-12 is superficial and inadequate for the reasons stated below. Important characterizations of the study area are omitted and assertions about some of the flow characteristics are unreferenced. Data gaps are not identified.

The NUS report states on page 2-12 that flow patterns within New Bedford Harbor and the Acushnet River estuary are primarily controlled by forces in Buzzards Bay and the approaches to the harbor. In fact, the only external control from these areas is in the flow through the opening in the hurricane barrier which is affected by tidal forcing, storm surge and atmospheric pressure effects. The pattern of flow within the hurricane barrier is obviously controlled in a major way by topographic steering and frictional effects. The pattern of flow in the estuary and harbor are of obvious importance in determining the dispersal of contaminants, and a major effort is under way by EPA to develop a computer model of circulation and sediment transport. In addition, river runoff can be an important factor in the dispersion of contaminants.

The NUS report provides no technical basis for the expectation of a counter-clockwise circulation in Buzzards Bay, either by direct observation or by reference to the conclusions of others. In fact, Summerhayes et al. (1977) expect a clockwise circulation during periods of highest winds, which are usually from the WNW or NNW. The implication of this or any circulation pattern in Buzzards Bay is not made clear.

The NUS report states that the tidal flow field in Buzzards Bay cannot resuspend much sediment. This is an over simplification and, for example, is probably not true off Round Point and East Island where tidal velocities reach 46 to 50 cm/sec (Summerhayes et al., 1977; see also Moore, 1963, and Eldridge Tide and Pilot Book, 1976).

. The sections on the environmental setting of terrestrial and aquatic biota are not presented to the level of detail necessary to judge the potential effects of remedial action upon the existing environment. On page 2-16, section 2.5.1, reference should be made to the appropriate data sources and vegetation maps of the terrestrial environment should be included.

D. Problem Assessment (Section 3 of Draft FS)

Some of the comments related to problem assessment have been presented under objectives (Part A of the Technical Analysis) inasmuch as there exists a lack of data and rigorous analysis to support the three basic objectives for the hot-spot FS. Two major deficiencies are: 1) relative contributions of various sources of PCBs to the marine environment have not been assessed; and 2) no information was provided on sources or levels of environmental/public health risks associated with PCBs and how these would be mitigated by the hot-spot remedial action program. Additional comments related to problem assessment are presented below.

. The remedial action master plan (RAMP) prepared for the EPA by Roy F. Weston (1983), as well as a report prepared by the U.S. National Ocean and Atmospheric Administration (Mayer et al., 1982), called for the following items (among others) to be included in the feasibility study:

- types and distributions of contaminant residues in sediments, soils, surface waters, groundwaters, air and biota;
- identified pathways, rates of migration, and mass balance calculations for PCBs and other contaminants present; and
- actual, imminent or potential hazards to the environment or to public health and welfare.

In addition, the RAMP recommended that requirements for further data needed in the evaluation were to be continuously identified.

The draft FS has not adequately addressed these three areas, nor has it identified significant data gaps. Accordingly, there is an insufficient technical basis upon which to make any well-reasoned decision regarding remedial actions. Moreover, the lack of an adequate technical basis has led to serious deficiencies in the evaluation of remedial action alternatives as described below.

The no-action alternative is improperly named and inadequately described. This is due, in part, to a lack of the following critical pieces of information: detailed description of particular source areas for PCBs; evaluation of the probability of transport or remobilization from those areas; definitions of the physical, chemical and biological pathways to target populations; and an assessment of the risks posed to those populations. These pieces of information are critical because the so-called "no action" alternative is really "no intervention", i.e., no human alteration of natural processes. Enough detail is available in the recent literature to begin this evaluation, but significant data gaps, especially in defining pathways, do exist. The draft FS fails to take advantage of the available data, and by not identifying important data gaps, gives the false impression that the problem is defined well enough to continue with the evaluation of the no-action alternative. It should be noted that consideration of "no action" may limit the analysis of prudent remedial measures. For example, limited dredging or containment could be considered. A more complete assessment of the "no action" alternative would provide the needed baseline against which the benefits (e.g., restored resources) associated with the various alternative remedial actions could be judged.

The inadequate description of the distribution of existing PCB-contaminated sediments has led to an increase in the scope of the dredging alternatives far beyond the hot-spots targeted in the RAMP. The graphical presentations of the distribution of PCB-contaminated sediments (Figures 3-1 and 3-2 in the NUS report) are biased because:

- samples are purported to represent large areas of the estuary, much larger than is statistically supported;
- the maximum concentrations in these overly-large areas are presented, inflating the estimates of contamination; and
- a significant portion of the estuary (~30%) has been sampled less frequently than the rest of the estuary and PCB concentrations there are relatively undefined (Metcalf & Eddy, 1983).

The targets for removal - 50, 10, and 1 ppm - do not relate in any way with hot-spots, and have led to the conclusion that the entire estuary north of the Coggeshall Street Bridge should be removed under the dredging alternatives. Smaller target areas related to hot-spots were not considered among the alternatives, and, therefore, the feasibility study is not comprehensive. These smaller targets would require less area for storage and would cause less of an impact on the environment than the suggested alternatives.

A general clean-up to the level of 1 ppm must consider the migration of PCBs into and out of the estuary in the form of mass balance calculations. At levels on the order of 1 ppm, the estuary would be subject to recontamination from surrounding land and harbor areas. The effectiveness of dredging to achieve this target level cannot be assessed until the probability of recontamination is considered.

The RAMP called for a fast-track feasibility study to evaluate alternatives for clean-up of hot-spots in the Acushnet River estuary. The NUS feasibility study does not identify any hot-spots. Instead, the FS obscures the extreme variability in the PCB concentration in sediments across the estuary by a statistical presentation which is designed to reduce the apparent spatial variability, to increase affected areas, and to increase the apparent level of contamination. Significant data gaps, which affect the estimates of the amount of sediments to be dredged, are not identified.

The Metcalf & Eddy report (1983) describes the extreme variability in PCB concentrations in the sediments of the estuary and cautions that averaging over areas even as small as 2500 $m^2$ (50 m x 50 m) tends to smooth out the variability. The NUS report presents statistics covering even larger areas than in the Metcalf & Eddy report and does not identify the lack of definition of the hot-spots as a data gap. Using such large areas tends to expand estimates of the contaminated areas into possibly clean areas, inasmuch as the Metcalf & Eddy report (1983) states that even near the hot-spots, there are areas where PCB concentrations are non-detectable. The level of detail in the distribution of PCBs is not sufficient to differentiate areas where natural deposition is covering contaminated sediment (possibly eliminating them as targets for remedial action) or areas which might be a ready source of PCBs in the environment (such as tidal mud flats). Because of this lack of discrimination, the target for removal has been expanded to the entire estuary.

The NUS statistics on PCB distribution in sediments are also biased because there is no detail on contaminant concentrations at levels higher than 500 ppm. As a result, areas with PCB concentrations of over 100,000 ppm are grouped with areas of 500 ppm. NUS does not present any reason why it consideres 100,000 ppm equivalent to 500 ppm, but those reasons should be explicitly stated. Given the lack of such reasons, the groupings of PCB concentrations (i.e., in half-log intervals) presented in the Metcalf & Eddy report should be retained to provide a range of target concentrations for evaluation of remedial action alternatives.

A third reason the statistics are biased is the use of the maximum concentration within an area to represent the entire area. The use of maximum concentrations needs to be fully justified considering the extreme variability in PCB concentrations reported by Metcalf & Eddy (1983) and the very low sampling densities. The statistical treatment is not described in the NUS feasibility study, itself, and no other document is referenced as an explanation. There is no reason presented why the level of detail available in the Metcalf & Eddy report is reduced for the feasibility study.

• The NUS feasibility study does not adequately consider data gaps in the statistics. Metcalf & Eddy (1983) describe a 1-kilometer stretch of the estuary as undersampled and where the PCB concentrations in the sediment are relatively undefined. This section represents roughly 30% of the area of the entire estuary. This area is mentioned in Section 3 of the NUS report, but is under-reported as 0.25 mi (0.4 kilometer) and is not presented as a significant data gap. In fact, NUS gives this area equal weight in its preparation of maps of PCB distribution in sediments (Figures 3-1 and 3-2).

• The NUS feasibility study does not present information which could be used to estimate the total amount of PCBs present in the estuary, the proportion of hot-spots to clean areas in the estuary, or the contaminated areas which are likely to contribute to contaminant migration and, thus, to pose potential risks to public health, public welfare, and the environment. The various alternatives cannot be adequately evaluated because no specific source areas are identified. Remedial action alternatives are not adequately addressed because the quantity of contaminated material cannot be accurately determined, and the amount of PCBs removed from the estuary or isolated from the environment cannot be estimated.

. On p. 3-1, the NUS report describes highly contaminated mudflat areas as directly causing public health risks. These mudflat areas are not described anywhere in the report as to their location, spatial extent, or degree of contamination. Given the high degree of contamination of these mudflats alluded to by the NUS report, the hydraulic environment in the intertidal zone (exposed at low tide), and the presumed potential for direct human contact, the NUS report does not adequately address these specific target areas for remedial action. Such specific targeting may very well be more cost-effective than the removal or isolation of all the surficial bottom sediment in the upper Acushnet River estuary, but was not considered as an alternative in the NUS report.

. On p. 3-3, the NUS report states that transport of contaminated sediment will increase the likelihood of resolubilization since the sediment and water will not be in equilibrium, and that is why control of sediment transport and dispersal is a critical aspect of remedial action. NUS does not quantify sediment transport processes in the upper estuary, so the importance of sediment transport as a pathway relative to other transport media (such as in surface oil films) cannot be determined.

. On p. 3-4, the NUS report describes the data set on PCB contamination as adequate for the purposes of assessment. NUS has not critically evaluated the data, nor identified significant data gaps which have been previously identified in such reports as Metcalf & Eddy (1983) and Malcolm Pirnie (1982). Metcalf & Eddy (1983) classified data as reliable if the quality assurance for the analysis was complete or if the analysis was performed by a State-certified laboratory. The adequacy of the data for *interpretation is left to the user. Metcalf & Eddy are careful* in their use of the "reliable" data base, and present the following caution in interpreting the extreme variability seen in the sediment data base:

> "This wide range in concentration may be due to nonhomogeneity in the occurrence of PCBs in bottom sediments, or to variability in the analysis."

And later:

> "Variations in PCB concentrations may also be due to inconsistency in the analysis."

NUS does not show that they considered these cautions and how these characteristics of the data quality affect the suitability of using maximum concentrations to represent PCB distributions. Using maximum concentrations when the possibility of sample error is present is likely to lead to an unrecoverable bias in the PCB distribution.

. The NUS description of air contamination on pp. 3-5 and 3-6 is deficient in a number of respects:

- It does not consider the significance of the observed decline in PCB concentration.
- The GCA (1984) report is not cited in the reference list, making it difficult to verify the description presented.
- The locations of air sample stations at Burt School, Brooklawn Park, C&W Welding, and Acushnet Nursing Home are not presented graphically in the report so that the proximity to the upper estuary can be determined.
- The link between contamination in the upper estuary and in the air at the sample stations has not been investigated or made by NUS. Metcalf & Eddy (1983) cite a recent EPA Study which shows that the highest ambient air concentrations of PCBs occur at the former dump site at Sullivan's Ledge, about 2 miles west of the Acushnet River estuary; they also identify land-based contamination as an area in which there may be a significant data gap. Given these possible sources of PCBs to air, remedial action in the upper estuary may have no effect on PCB concentrations in air.

. The discussion of impact on terrestrial biota by NUS on pp. 3-8 and 3-9 is entirely speculative. NUS admits that there are no data on PCBs or metals in the saltwater marshes of the eastern shore, but goes on to assume high levels of contamination, stress on wetland vegetation and bioaccumulation in terrestrial fauna. NUS assumes a hydraulic connection with contaminated sediments which would lead to migration of PCBs toward the saltwater marshes, but does not describe this connection at all. There is no basis for the assumption of stress on the vegetation in the saltwater marshes and no valid criteria established for determining stress. The low diversity of plant species is too vague for use as a criterion because saltwater marshes are areas of low plant species diversity even in the absence of stress. NUS does not identify any "fish-eating birds, waterfowl, and other terrestrial animals" that feed in the Acushnet River Estuary and mudflat or wetland areas.

. The vertical distributions of PCB concentrations were not presented by NUS, and the natural capping of contaminated sediments by cleaner sediments is not described. Identifying areas which are less susceptible to resuspension is important in determining a cost-effective remedial action program. The assumption by NUS that all contaminants at all depths within the upper estuary are available for resuspension is not supported by any data and is not likely to be true given the overall depositional character of the upper estuary.

If dredging is to be considered as a remedial action alternative, then the depth to the target concentration must be known in order to provide reliable estimates of the volume of dredge material and the cost of dredging. Almost all of the sediment data in the upper estuary are from shallow cores and surface grab samples which do not provide this information. Estimates of sedimentation rates presented by NUS are derived from measurements in New Bedford harbor and may differ significantly in local areas such as the western cove and near the Coggeshall Street Bridge; therefore, these average rates should not be used to estimate the depth of contamination over the entire upper estuary.

- NUS does not explain how the PCB concentrations presented in Figures 3-1 and 3-2 were determined. NUS should have presented, at a minimum, the following statistics so that the representativeness of the distribution could be evaluated: the number of individual samples in each zone, the area of each zone, the variability within each zone given by the standard deviation or maximum-minimum range, the range of depths sampled, and the variation of concentration with depth.
- The level of detail in the distribution of PCBs in sediments is greatly reduced from that available in recent literature (Metcalf & Eddy, 1983; Malcolm Pirnie, 1982) and is inadequate to describe the problem in the upper estuary. The upper Acushnet River is described by Metcalf & Eddy (1983) as an area with extremely variable PCB concentrations; Figure 3-2 of the NUS report, however, depicts the PCB distribution in that area as uniform with concentrations above 500 ppm.

. On p. 3-12, NUS mentions that sediments with the highest concentration of PCBs are 4 to 8 cm deep and have been covered over with cleaner sediments, probably since the end of PCB discharges to the estuary in 1977. NUS does not present any discussion of how this affects the availability of PCBs for resuspension. The effectiveness of natural capping must be determined as part of the feasibility study; NUS has presented no evidence of what natural processes will lead to resuspension of contaminated sediments in areas of natural capping, the frequency of occurrence of those events, and, thus, the effectiveness of natural capping.

. On p. 3-12, NUS refers to maps which show higher concentrations of PCBs in the surface sediments than in deeper sediments in the outer portions of the harbor. These maps are not presented in the body of the NUS report, nor are they referenced in another report.

. The NUS report does not adequately consider data gaps previously identified by Metcalf & Eddy (1983), especially:

- critical pathways and fates;
- physical processes responsible for transport and fates of sediments;
- present distribution of PCBs and redistribution; and
- mobilization from sediments to the water column.

. The lack of a comprehensive metals data base does not allow the proper evaluation of waste handling procedures for the dredging alternative. According to the Metcalf & Eddy report (1983), "Other available metals data should be obtained and incorporated into the system... It will be especially important in evaluating cleanup alternatives (e.g., dredging) to know where and to what extent heavy metals are present in the estuary, as they may be more easily mobilized in the water column, may influence chemical reactions, and can also be extremely toxic." The text of the NUS report does not present any description of the metals distribution beyond a simple statement of where the samples were taken and the distribution of metals in the figures suffers from the same statistical inadequacies as the PCB distributions.

- NUS does not identify the source of the statistics they present on contamination of the water column (section 3.2.5, p. 3-13). NUS does not distinguish samples taken above the Coggeshall Street Bridge in the fast-track target area from below the bridge. The level of 6.1 mg/l Aroclors 1248/1254 is too high by a factor of 1000: it should be 6.1 ug/l.

- On p. 3-22, NUS admits that the present data base is not directed towards health and environmental risk assessments and that "the assessment is mainly based on the expected behavior of the particular contaminants in the general site environment." NUS does not present sufficient data to establish the expected behavior of PCB contaminants in the upper estuary.

- On p. 3-26, NUS assumes that a significant portion of the tidal estuary is exposed at low tide. This is not necessarily true. In the case of the upper estuary, less than 10% of the total area is composed of mud flats exposed at low tide (based on examination of USGS quadrangle sheet for New Bedford North). The accessibility of these areas for direct contact by humans and the degree of contamination in these areas are addressed nowhere in the NUS report.
- On p. 3-29, NUS describes heavy metals as immobilized and their solubilities as low. This does not explain the results of the report of Summerhayes, et al. (1977) which estimated that 25% of the total metal input to the harbor has reached Buzzards Bay. Also, removal of metal sulfides (which do have low solubilities) from an anoxic environment increases the probabilities of remobilization.
- On pp. 3-31 through 3-36, NUS does not explain which harbor land use and development plans are related to the upper estuary. It seems that none are associated with the target area, therefore the effectiveness of the remedial action alternatives appears negligible in this area.

E. <u>Engineering Feasibility Criteria</u>

The lack of engineering feasibility criteria for judging remedial action alternatives is considered to be a significant weakness of the draft FS. Such criteria should have been established and presented in Sections 4 through 7 of the FS. While general technical guidance is given (e.g., "proven performance record"), no specific design bases, either of a technical nature or relating to performance or regulatory requirements, are given for selecting or evaluating remedial action. As such, the report is more of a "concept" report than a feasibility study.

Engineering feasibility criteria would typically include the following categories:

- Seismic conditions.
- Surface hydrology -- flood, hurricane surge, and tidal conditions.
- Soil engineering properties of subsurface and fill materials.
- Land use compatability criteria.
- Containment capabilities.
- Design life.
- Cost estimate accuracy range.
- Land use and development planning criteria.

Additional comments related to engineering criteria are given below.

- The report states that technologies must meet National Contingency Plan criteria, i.e., be proven technologies in the application intended. These criteria do not appear to be uniformly applied in judging the remedial technologies. The criteria are more strictly applied in some areas than in others (Appendix B, p. 5-7).

- The criteria used to evaluate technologies are limited, especially in the sense of using cost as a criterion in eliminating technologies before development of remedial action alternatives. A seemingly less cost-effective technology can be incorporated into an overall cost-effective remedial action alternative. Cost as an evaluation criterion has been applied at an inappropriately early stage of evaluation.
- Limits on acceptable costs have not been presented, and the costs of technologies eliminated as being too expensive are not stated.
- The report states that an average cleanup to 1 ppm will be achieved by all alternatives. However, it does not describe the ability of each technology to meet this cleanup requirement. For example, the concentration of the residual PCBs left after sediments suspended during the various dredging operations have settled is not addressed.
- The report uses time as a criterion to evaluate technologies (6-1). However, limits on what constitutes an unacceptable time frame are not stated.
- Little to no discussion of the possible effects remedial action measures will have on the mobility of contaminants is made, and this should be a criterion.
- The effects of federal and state-regulated requirements on the various alternatives have not been adequately addressed. The Resource, Conservation & Recovery Act (RCRA) also specifies that

the bottom of a chemical waste landfill be at least 50 feet above the historical high water table. Disposal sites below the 100-year flood plain may also be a problem.

- Seismic conditions are not addressed. Since any engineered embankments or caps will potentially be affected by earthquake shaking, some provision should be made to provide the basic necessary input in their design. Seismic design criteria taken directly from local building codes might be appropriate in this situation. Some discussion of those codes as applied in the New Bedford area would be appropriate. Alternate methods for developing design criteria such as historic intensity and published probabilistic hazard assessments have proved helpful at other sites and could be included at New Bedford.

- Hydrologic design criteria for remedial action alternatives have not been clearly established. A combination of flood, hurricane surge and tidal conditions should be considered in the formulation of these criteria. It appears that NUS has considered only flood events (a 100-year flood event) in the design of the alternatives. Hurricane surge and tidal influence have not been considered. Until these hydrologic events are considered, engineering feasibility evaluations from the hydrology perspective of remedial action alternatives cannot be made.

F. <u>Lack of Adequate Data Base for Assessing Engineering Requirements</u>

The conceptual engineering presented in the draft FS is not founded on reliable data. In fact, the report makes repeated references to the lack of data. This is particularly significant where basic design parameters are unknown, e.g., subsurface conditions, performance of fill materials, or surface and groundwater hydrology. Uncertainties at this conceptual stage will lead to redesign and substantial modification in the next stages. There are a number of items which will require definition. Otherwise, modification and large, unanticipated increased costs will result. These are:

1) Additional dredging will involve additional costs for moving and storing the contaminated material.

2) Different subsurface conditions, material properties, extremal events, and performance criteria will lead to more substantial engineered structures and concommitant increased costs.

3) A quality control program must be implemented to record what has been achieved (this is essential if a clear defensible record is to be made).

Information sources are listed in the draft FS (Appendix B); however, no hard data are included in the report to permit an independent evaluation of whether or not the area has been adequately sampled to ascertain accurately the extent of contamination. Additional comments related to the lack of critical data are presented below.

. For subsurface conditions, the draft FS relied on six borings at the location of the Coggeshall Street Bridge embankments and five borings in and near the coves on the western shore of the estuary. Published data were used to describe the contamination of the area both laterally and in depth. However, reservations were expressed about the validity of the data relating to subsurface geological conditions. This lack of adequate and representative subsurface data is a significant deficiency. It results in a feasibility design with little engineering basis and has significant performance and cost implications.

Before cost-effectiveness can be evaluated, it will be necessary to:

- Carry out additional exploration and laboratory testing to determine engineering properties of the subsurface soils for design.
- Determine the depths and lateral distribution of contamination.
- Revise design concepts for remedial action to conform to actual conditions.

Additional testing for design purposes should include index property tests, undrained shear strength, consolidation testing, and possibly consolidated drained triaxial compression tests. Costs of these programs have apparently not been included.

- Although a map (p. 3-10) showing PCB concentrations in the harbor area is presented, the report does not present either existing data listing PCB and metal concentrations, or maps showing sample location. These items are important in order to determine if the area has been characterized well enough to identify the "hot-spot" areas for the purpose of selecting and comparing remedial action alternatives.
- The lack of data to confirm the extent of contamination hinders the determination of appropriate remedial action measures, i.e., ensuring that remedial action alternatives can address all contaminants present and of concern, and that the remedial actions are properly designed and costed. By limiting the number of technologies that can be considered for development of alternatives, the report ignores combinations of technologies that may be both cost-effective and technically sound.
- Again, perhaps due to a lack of information, the report does not discuss remedial action alternatives conducted in conjunction with harbor improvements to limit costs.
- Lack of engineering data is identified where appropriate for each engineering alternative (Part G of Preliminary Comments).

G. Engineering Review of Remedial Action Alternatives

The various alternatives proposed by NUS were reviewed with regard to their design, feasibility and costs. It is recognized that the design of alternatives is still at a conceptual stage. However, information presented in the NUS document on feasibility and costs is likely to guide EPA in making decisions regarding the selection of an alternative. Thus, it is essential that the supporting information be reasonably sound. Although there may be other more viable or more focused alternatives than those identified by NUS, EPA's "fast-track" strategy and attitude effectively precludes identification or evaluation of additional alternatives. Our comments, therefore, are directed specifically at the alternatives proposed by NUS.

Important considerations when evaluating alternatives are costs and effectiveness. In Section G.1 we provide some general comments on the cost estimates provided by NUS. Comments on the design effectiveness of the various alternatives are presented in Section G.2.

G.1 General Comments on Cost Estimates

- Because the remedial actions are sketched with no definitive engineering design basis and because of the marked lack of site data, considerable re-engineering and cost estimating may be necessary. As will be noted in the engineering comments, the concepts are inadequate in a number of areas. Redesign has significant cost impacts. Because of these inadequacies, the costs as estimated are probably low and will be driven up as engineering is firmed up. For example, the sediment disposal control as shown on Figure 7-3 may need to be changed to reflect engineering concerns to have cellular construction with 26-foot to 30-foot sheet piles and the cells filled with glacial till. This change would increase the cost approximately 2-1/2 times NUS' cost for all schemes. This is a good illustration of the potential cost impact of redesign.

- We note that in some cases the cost information is particularly weak. For example, the cost estimates for construction of the upland disposal site and transportation of the dredged material are problematical and highly speculative at this time. A site has not been chosen, nor are candidate site conditions presented. As such, the potential costs of developing such a site are wide ranging. In addition, for this alternative, land costs are not included.

G.2 Comments on the Engineering Designs of the Alternatives Proposed by NUS

Based on discussions with EPA, it appears that two of the alternatives, "Dredging with Disposal in a Partially Lined in Harbor Containment Site" and, "Dredging with Disposal in an Upland Containment Site" are currently favored by EPA over the other alternatives. Therefore, comments are presented on these two alternatives first.

Dredging with Disposal in a Partially Lined In-Harbor Containment Site

Geotechnical Conditions

- The life of the membrane as a barrier to migration relative to the length of time PCBs remain a hazard is not addressed. This is a key criterion for evaluating the design and feasibility of this alternative.

Hydrologic Considerations

- It is not obvious why the top of the containment embankment in this alternative is two feet higher than that for the channel embankment in the alternative, "Hydraulic Control with Sediment Capping." It seems that the latter represents a more flow restrictive scheme. Thus, water surface elevation should be higher for the Hydraulic Control alternative, leading to a higher embankment height. Exact bathymetric data for the estuary would be needed to resolve this inconsistency. It is not clear if cross sections of the estuary were used, if a water surface profile calculation was performed to determine the required embankment height, or if wave runup has been included in the overall design consideration.

- No design criteria or method of analysis were given relative to the development of riprap protection of the embankment. The ripraps will be subject to wave and current actions resulting from high wind, tidal flushing and flood flows. No engineering data were given by NUS to allow an independent assessment of the adequacy of riprap cover for withstanding the individual and combined actions of these various physical stresses.

Design Engineering Considerations

- It is proposed that sediment dispersal would be controlled by constructing a sheet pile wall and by using silt curtains. For constructing the sheet pile wall, information on subsurface soil conditions and the engineering properties of the soil are required for design. A cellular cofferdam should be considered as a substitute for the double wall cofferdam shown, as individual cells could be constructed from adjacent cells, thus eliminating the problem of supporting construction equipment. Overturning, sliding and interlock tension should be checked but are probably not a problem if the sheet piles are driven deeply enough.

Silt curtains would reduce the quantity of silt leaving the area but would not eliminate it. Thus, some fraction of PCBs associated with silt will escape.

Perhaps of greater significance is the ability to control the dispersion of PCBs released during dredging but associated with either very fine material or with oil films. Observations made by EPA personnel indicate that a substantial fraction of PCBs might be released in this form, and for these, silt curtains will probably not be effective. It is reasonable to expect that PCBs released to the water column during dredging will be able to be transported to the lower reaches of the estuary and New Bedford Harbor. Thus, if no provision is made to control the PCBs associated with oil films or very fine fractions (none is included in this or any other of the dredging alternatives), then it is possible, if not probable, that implementation of this alternative or any other of the dredging alternatives as currently designed would result in increased contamination of the lower reaches of the estuary, the harbor, and possibly Buzzards Bay.

NUS has indicated that the embankment of the permanent containment structure would have a slope of 2.5 to 1. Based on the information presented, this could be too steep for the proposed membrane supporting a sand layer. The friction coefficient of liner material embankment and foundation strength will be key factors in determining an appropriate slope and must be considered in the design of an embankment. If it is too steep, and the slope has to be reduced, costs and adverse environmental impacts could increase drastically.

Placement of the liner on a 1-foot thick sand layer and covered by a 1-foot sand layer on the embankment slopes will require dewatering of the containment. If the foundation consists of sandy materials, this could require drawing down the water table to maintain stability of the bottom. This is an additional large cost item. Further, transition zone or filter fabric will be required below riprap on the outer slopes, another large cost.

Water collected along with the dredging operation will have to be treated to remove PCBs to an "acceptable" level prior to discharge back into the system. NUS has proposed a water treatment plant but has not indicated where it would be located. It will be necessary to size the treatment plant to take care of the water quantities involved. No analysis has been presented to size this facility, a basic design consideration and significant to the cost estimate. It may also be necessary to conduct pilot studies to ascertain the effectiveness of the proposed water treatment plan for the particular remedial action chosen. In addition, as mentioned above, a substantial fraction of the PCBs may be released from the dredged sediment as components of oil films or very fine materials. NUS has not assessed the implications of such releases for the design of the facility. If a substantial amount of petroleum oils are present in the sediments, they will have to be handled by the treatment system (e.g., activated carbon) in order for the system to be effective in treating the PCB oils. This could be a very large cost item.

The design of the containment cap for the permanent disposal area needs to be reviewed and redesigned to take care of burrowing animals, tree roots, frost penetration, settlement and erosion. Consideration may also have to be given to leachate collection and treatment within the containment.

Dredging with Disposal in an Upland Containment Site

This alternative is similar to the previous one except that the permanent containment would be an upland landfill. The comments presented above for dredging and sediment control apply here as well.

Perhaps one of the most difficult aspects of implementing this alternative would be the selection and permitting of a land disposal site for PCBs. At present, a site has not been identified and tremendous public pressure can be anticipated against new sites that might be identified in Massachusetts or elsewhere in the New England area. For example, even though sites meeting criteria for disposal of PCB contaminated sediment from the Hudson were found in New York State, the program was not implemented, in part, due to public pressure.

If the PCB contaminated soil from New Bedford has to be trucked a great distance in order to be disposed of on land at an approved site, then this will have to be accounted for in the costs. At present this is unknown.

Dredging with Disposal in a Lined In-Harbor Containment Site

This is the same as the alternative involving disposal in a partially lined In-Harbor site except that the containment is fully lined. Reference is made by NUS to well points for dewatering. Until the subsurface conditions are known, the feasibility of using well points cannot be determined.

Hydraulic Control with Sediment Capping

Geotechnical Considerations

- Assuming the net flux of sediments is from the river, this alternative could incorporate natural sedimentation process to help reduce costs. The NUS does not describe the life of the cap relative to the length of time PCBs will be considered a potential hazard.

Hydrologic Considerations

- The sheet piling barrier across the bridge opening will effectively reduce the efficiency of the tidal flushing. It has not been demonstrated analytically that stagnant water conditions upstream of the barrier would not occur. Stagnant water conditions would lead to oxygen depletion, poor water quality, and a loss of biota.

- The presence of this sheet piling barrier will also create a backwater condition which could increase the water surface profile along the channel during the design flood event (presumed to be 100-year flood). This water surface profile would be different from that along the estuary under the existing condition (Table 2.1 of NUS report) . It was not clear how the top of dike evaluation of +8 msl, given in Figure 7-5 of the NUS report, was derived. As stated earlier, proper hydrologic design criteria have yet to be established taking into consideration a combination of flood, hurricane and tidal conditions that are reasonably characteristic of this area.
- Water depth over the PCB contaminated area in the estuary under Mean Low Water (MLW) conditions is about six feet or less. This water depth would be further reduced by the capping of the sediment. Tide induced current and/or wind waves over this shallow water could render the capping inoperative, reexposing the contaminated sediment.
- No design criteria or method of analysis were given relative to the development of riprap protection of the embankments. The ripraps will be subject to wave and current actions resulting

from high wind, tidal flushing and flood flows. No engineering data were given to allow an adequate review to determine if a three-foot riprap cover would be sufficient to withstand these individual actions or a combination of these actions.

Design Engineering Considerations

- The embankment heights need to be verified based on hydraulic studies of the channel. If the NUS-selected evaluations are low, there will be a considerable impact on volumes of embankment and, thus, costs.
- The design to permit tidal fluctuations does not appear to have been adequately engineered. Permitting overtopping of the embankments and permitting tidal fluctuations could lead to significant erosion of the embankments and capping.
- For the embankment design, a 4-foot blanket of sand is shown. The location where the contaminated products of excavation will be placed as this blanket is constructed is not addressed. The embankments are apparently low, but with the soft foundation soils it will be necessary to determine that the embankments are stable and

ascertain that they meet criteria acceptable within the profession. Underwater fill is proposed and, based on the information presented, it may be weak, so embankment slopes will most probably be flatter than shown thus leading to additional quantities and increased costs. An allowance must be made for settlement of the embankments with time. This will increase earthwork quantities. In addition, filter fabric should be extended across the channel beneath the riprap to protect the underlying material from being washed out. This is an additional cost item that would need to be considered.

- The borrow areas for capping contaminated sediments, for the sand blanket beneath embankments and for the glacial till should be identified more completely as this could significantly impact costs. In addition, the construction methods for placing the capping should be better defined. The report indicates that the cap will be hydraulically placed but does not give details. The shallow depth of water may make this procedure difficult. The placement procedures may also cause significant disturbance to the soft harbor sediments.

Dredging with In-Harbor Subsurface Cells

Geotechnical Considerations

- Although it is stated (pg.2-2, 2-5) that limited test boring information is available, the report assumes that there is a minimum of 10 feet of "soft silts or soft sandy silts" that can be easily dredged. It is also assumed that these sediments are present throughout the estuary and that the underlying potentially coarser materials are not contaminated by either PCBs or trace metals. Although these conditions probably exist at places in the estuary, given the available data it is uncertain whether these conditions are everywhere present. For example, it is possible that less than 10 feet of soft sediment overlies rock or coarser sediment along the banks and in the upper reaches of the estuary. Because streams drop their heavier loads first, the sediments may be considerably coarser in these areas and may also be contaminated.
- The text states (pg. 2-6, 2-23) that redeposited, contaminated sediments will be buried by at least 3 feet of clean sediments. It also states that no sediments will be buried in the deeper portions of the estuary near the Coggeshall Street Bridge

because of the potential for scour of the cap. This potential exists elsewhere, especially where the Acushnet River enters the estuary. The potential of this river to erode the estuarine sediments during high flows is not addressed.

- The report states (pg. 2-30) that cleanup of heavy metals will concomitantly be achieved although the extent of metal contamination is not described in the Feasibility Study.

Hydrology Considerations

- Flow in the Acushnet River is not planned to be controlled during construction. In order to perform the type of civil construction contemplated, the river flow would need to be diverted or otherwise contained. This is a significant deficiency in the concept as described. Incorporation of river flow control into the construction plan not only requires major engineering revision, but also may have significant cost impacts.
- Reference is made to scour near Coggeshall Street Bridge, but the potential for scour should be investigated for the entire site during flood periods in the river and during storms.

Design Engineering Considerations

- The same comments made previously about the sheet piling apply here. The backfill must be pervious so that only sandy and gravelly types of till would be appropriate in addition to rockfill.
- Subsurface conditions must be determined in order to find out what materials exist and also to find out if the materials to be used for capping are suitable and are uncontaminated.
- The physical characteristics/engineering properties are not known for the upper 3 feet of sediments nor for the next 3-10 feet. The sediments are characterized as "black organic silt and silty sands . . . and most likely exist in a very loose to loose condition . . . (pg. 2-19, Draft Feasibility Study)." Based on this general description, it is likely to be most difficult to place a covering over the sediments removed from the upper 3 feet, even after partial dewatering. Until the physical characteristics of the sediments are known and the placement of a cover can be examined regarding "constructibility," the feasibility of this plan must be questioned.
- The embankment slopes may be too steep and this must be checked as mentioned previously.

- The embankment fill cannot be compacted with rollers until the fill is above water level. This means the lower part of the temporary containment embankment will consist of underwater fill that will be uncompacted. This will affect embankment slopes.
- Dredge cuts in the cells are to be at 10 horizontal to 1 vertical. This is probably unnecessarily flat.
- The location of the water treatment plant is not given.

Incineration of PCB-Contaminated Sediments

Design Engineering Considerations

- The initial screening of alternatives carried out by NUS has been a rather vague, non-quantitative procedure. No basic information is presented regarding design criteria, equipment sizes, quantities of material to be treated, or other data which would document the suitability of the various conclusions. In particular, if incineration was utilized for treating only the most highly contaminated sediments, then the quantity to be treated in this manner would be much less and this would have important implications for the design of the incinerator. However, NUS has adopted an "all or nothing" approach to considering alternatives. It may be more appropriate to consider a combination of approaches targeted at particular sources of contamination.

It should also be noted that the City of New Bedford may eventually need to consider an incinerator for disposal of hazardous waste and sludge. Some consideration should have been given to this possibility and the implications it may have for disposing of sediment containing high concentrations of PCBs.

- Apparently, the only fluid bed incineration technology considered was Rockwell International's, using catalysts at temperatures much below 2000°F. This technology was properly rejected as being developmental. However, there are several equipment vendors with fluid bed units which operate at "conventional" temperatures of 2000+°F for PCB incineration. While none of this type unit has been permitted for commercial PCB destruction, tests show that destruction efficiencies are high enough for PCB service.
- The argument (page 3-2, last paragraph) would be more convincing if some values were given, e.g., sediment volume to be incinerated, capacity of a

"mobile unit," and capacity of a stationary facility.

- Several comments are made regarding the fate of heavy metals, which may be present in the sediments. Emissions to the atmosphere are presented as a possible risk but then it is off-handedly mentioned that they can be scrubbed from incinerator stack gases. Their presence in the incinerator residue is presented as a greater hazard than in the sediments, but we are not convinced this is so. Since the sediments are predominantly inorganic, no appreciable concentration of metals will occur as a result of incineration.
- The estimate of six years to incinerate one million cubic yards is reasonable, but it would be more convincing to present the basis of the calculation i.e., moisture content, size (heat duty) of the incinerator and the fuel requirements.
- In the discussion of risks, the possible failure of monitoring equipment and subsequent undetected emissions of PCBs or PCB partial combustion products was not considered. There are many possible risks in all alternatives which were not

mentioned, no doubt because they were judged to be "negligible" or to cause "negligible" effects if they did occur. If risks are to be used as a basis for eliminating an alternative, some estimate should be made of probable effects, and the chance they will happen.

<u>Disposal at an Existing, Out of State Landfill</u>

Geotechnical Considerations

1. Unsupported geologic evidence is presented (pg. 4-1) to disqualify the area surrounding New Bedford Harbor from use as an upland disposal site. If the area is not suitable for containment of wastes, geologic maps, ground water elevations and similar data should be presented to support that conclusion.

2. The report states (pg. 4-4) that removal of the sediments will create a high level of activity for about four years and that this activity will have a detrimental effect on the community. This would also be true for disposal at an upland site and for Alternative 5, where cell construction and dredging will disturb the community and will not result in the complete removal of contaminated materials. In summary, the report has not applied the potential environmental effects and public

reaction criteria equally to all alternatives but has used the criteria in a way to eliminate seemingly undesired alternatives.

H. Environmental/Public Health Impacts of the Various Alternatives

A major deficiency in the NUS document is the lack of analysis of the environmental and public health impacts of the various alternatives, including the "no-action" alternative. Without this analysis it is not possible to judge adequately the benefits or risks of the alternatives.

Certainly the focus of the alternatives proposed by NUS is the removal and/or containment of PCBs in the upper Acushnet River. However, even for the "no-action" alternative - the baseline situation - NUS presents no estimates of either the short-term or long-term environmental and public health impacts. Discussion of these is limited to a qualitative description of possible transportation routes. As noted in Section A of our comments, no information is presented which supports the contention that there is an imminent hazard or endangerment to the environment or public health. Indeed, no risk/exposure assessment has been conducted by NUS at all.

Each of the alternatives poses potentially serious risks which should be assessed in order to provide a sound basis for comparing one alternative to another. Some of the possible impacts that should be treated in greater detail by NUS include:

1. The potential for release of substantial amounts of PCBs during dredging operations and the subsequent fate and effects of these chemicals. It has been noted that a large fraction of the PCBs may occur in association with oil films and fine materials and that there may be problems with dredging and containing these materials.
2. The impacts of existing conditions and alternatives on the levels of PCBs in air in the vicinity of the river and what significance this has for public health.
3. The impacts of physical alterations of the river on circulation, water quality, and biota. The possibility of producing stagnant conditions with resulting deteriorated water quality above the sheet piling barrier should be addressed.
4. The loss of ecological habitat and resource damage associated with the various alternatives should be evaluated. In particular, some of the alternatives will have substantial impacts on wetlands and tidal marshes. These habitats are considered particularly valuable in coastal marine systems inasmuch as they support a variety of animals and are important in the energy flow of natural marine systems. While it is fairly obvious that some of the proposed alternatives will have detrimental impacts on these habitats, NUS has provided no information that indicates that the

existing situation is impacting these same environments. Again, they speculate upon possible impacts but the data do not support their qualitative interpretations.

Above we have highlighted some of the more critical areas that should have been addressed by NUS with regard to evaluating the impacts of the alternatives. We consider these evaluations as essential for judging and comparing the alternatives, and EPA always requires them for other, major projects, even for projects which are much less environmentally intrusive and risky. Specifically, the NUS document lacks much of the information and analyses that would be required in an Environmental Impact Statement.

The stated purpose of an EIS is to provide a full and fair discussion of significant environmental impacts and to inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment. A major part of the EIS process is the cooperative consultation among federal, state, and local agencies to identify areas of concern, additional data needs and to formulate programs to address these. Whether or not consultation with the various interested agencies, especially local ones, has occurred is not discussed in the draft FS. This omission raises questions that would normally be addressed in an EIS, such as:

The relationship of the proposed action to land use plans, policies and controls (federal, state, and local) and to applicable pollution control and hazardous waste legislation.

The relationship of the proposed action to other activities and further actions in the region.

To the fullest extent possible, agencies normally prepare draft EIS's concurrently with and integrated with environmental impact analyses and related surveys and studies required by the Fish and Wildlife Coordination Act (16 U.S.C. Sec. 661 et seq.), the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470 et seq.), the Endangered Species Act of 1973 (16 U.S.C. Sec. 1531 et seq.), and other environmental review laws and execution orders. The draft FS does not indicate that this was done.

A draft EIS also usually lists all federal permits, licenses, and other entitlements which must be obtained in implementing the prepared action. The draft FS does not do this.

The overriding concern in this proposed action is the risk to public health and safety. There are a number of inadequacies in the draft FS that prevent the quantification of this risk and thus the proper evaluation of the various alternatives identified. These inadequacies include the following:

1. Meteorology. More information is needed to establish the norms and extremes of weather conditions (especially, monthly, seasonal and annual measurements

of wind, temperature, relative humidity, precipitation and extreme weather conditions such as hurricanes.) These factors can have an effect on public safety. For example, wind direction and strength will be important in evaluating population risk due to wind-blown contaminated particles from storage piles.

2. Hydrology. Factors such as bathymetry, tides, circulation patterns, freshwater flow and sources, salinity, and temperature in the estuary are not adequately described. These are needed to evaluate the potential impacts of the various alternatives inasmuch as hydrologic conditions will affect the transport of chemicals as well as the integrity of containment structures.

3. Biological Interrelationships. Basic interrelationships in the estuarine ecosystem are not well described and are needed to adequately evaluate the alternative actions from a risk assessment standpoint. Understanding the food web, sources and transmittal mechanisms of PCB's and heavy metals, lateral extent of the potential food web contamination, potential sources of human contamination and its potential significance is necessary for evaluating the alternatives.

4. Demography. The population size, distribution and composition in the vicinity of the Acushnet River estuary should be more fully described. This information is necessary for evaluating the risks associated with the various alternatives, because the degree of risk depends in part upon the population exposure.
5. Land Use. Current and expected patterns of utilization of land resources are not adequately described. Consequently, proper evaluation of the proposed alternatives in relation to present and projected land use is not possible.
6. Natural Hazards. The potential effects of material hazards such as floods, earthquakes, heavy fog, hurricanes and other storms are not adequately projected in the design and risk evaluation of the various alternatives.
7. Accident Analysis. Serious environmental impacts could occur through process failure or accidents such as dike failure or transportation accident. The associated public health and environmental risks were not adequately evaluated in considering the alternatives.
8. Mitigation. A major consideration in an EIS is potential mitigation measures to minimize impacts. These were not discussed to any significant extent in the draft FS.

9. Growth-Inducing Impacts. Growth-inducing impacts of the various alternatives were not discussed.

10. Other topics receiving minimum treatment include recreational use and historic and archaeological considerations.

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