RETURN TO 1998 ROD AR INDEX

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

New Bedford Harbor
4.9
Rod II

**MEMO**

**Date:** October 11, 1996

**From:** David Dickerson, New Bedford Harbor Site RPM DD
Cindy Catri, New Bedford Harbor Site Attorney DD (for)

**To:** David Pincumbe, Ann Williams, Jane Downing, Larry Brill
Frank Ciavattieri, Paul Craffey

**Subject:** **New Bedford Harbor Superfund Site - Proposed TMDL for Copper, and Other Issues Related to the Proposed ROD 2 Water Treatment Plants**

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The purpose of this memo is to summarize a proposed phased TMDL (total maximum daily load) approach for the establishment of copper discharge limits for the above-referenced treatment plants. This approach can be revised as necessary based on further discussions and development. Also included is a discussion of a potential ban on ANY new discharges to New Bedford Harbor, as well as the proposed ROD 2 discharge requirements for cadmium, chromium, lead and PCBs (polychlorinated biphenyls).

1. <u>The TMDL Process Applied to New Bedford Harbor</u>

For the sake of background, the proposed $116 million ROD 2 remedy calls for, among other things, dredging of PCB- and heavy metal-contaminated sediments, placement of the dredged sediments in shoreline CDFs (confined disposal facilities), passive dewatering of the placed sediments and treatment of the decanted seawater before discharge back to New Bedford Harbor. The areas proposed for dredging and the locations of the CDFs are shown in Figure 1 attached. The degree of PCB and total metals contamination in the upper and lower harbor are shown in Figures 2, 3, 4 and 5. Surficial copper levels in the upper harbor are shown in Figure 6.

The establishment of acceptable copper discharge limits has been an issue at this site due to the elevated instream copper concentrations above the acute water quality criteria (WQC) of 2.9 ppb. A graphic display of these instream copper levels for the Coggeshall Street bridge area is shown in Figure 7: the annual average for these concentrations from April 1994 to April 1995 is 5.6 ppb (std. dev. = 2.05 ppb, n=78).

Since the instream copper levels are consistently above WQC, §402 of the Clean Water Act (CWA) requires discharge limits for copper equal to the WQC (i.e., 2.9 ppb) as a strategy to

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Superfund Site

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reverse the ongoing water quality degradation. In addition, CERCLA §121(d)(2)(A) requires compliance with WQC when the criteria are relevant and appropriate to the remedy, as they are here to the discharge. These requirements would necessitate an outlay of approximately $15 million for reverse osmosis (RO) technology above and beyond the $27 million required for treatment without RO, which during the ROD 1 "hot spot" operations consistently treated to levels below 5 ppb copper (at least after the plant shake down period - see Figure 8). Thus in a nutshell the CWA would require $15 million for the treatment of wastewater from 5 to 2.9 ppb copper for discharge to a waterbody with an average of 5.6 ppb copper. The environmental benefit given this amount of economic outlay has been brought into question, most recently by the national remedy review board, especially since the discharge is a necessary requirement for overall water quality improvement in the long run.

A secondary but contributing issue is the close-to-detection-level concentrations under discussion: the region recognizes 2.5 ppb as the lowest enforceable detection level for copper. Also problematic is the fact that there is no guarantee that RO technology would be able to meet a 2.9 ppb copper requirement for a saline "wastewater." Pilot testing using representative waste streams would be required to determine the actual level of copper reduction that could be expected.

Moving to the TMDL concept, as stated in applicable guidance it is a regulatory tool per section 303(d) of the CWA used to achieve water quality standards. The implementing regulations are described as having the flexibility to use TMDLs in a wide variety of situations, including waterbodies with contaminated sediments, where reductions in nonpoint and/or point source loadings are required to achieve compliance with ambient WQC. Since it appears to mesh nicely with the New Bedford Harbor situation, the TMDL concept was raised during recent discussions with the NPDES permitting program for potential application with ROD 2.

Although the main rationale for the ROD 2 dredging is to reduce sediment and water column PCB levels, it is fair to assume based on the best data we have that reductions in water column copper will also occur. This assumption is based on the fact that the highest areas of sediment copper in the upper harbor - in fact almost the entire upper harbor - will be dredged to a depth of 2 feet below existing levels. The degree of heavy-metal contamination in the current 2 to 3 foot sediment horizon (i.e., the post-dredging surficial layer) is significantly lower than in the current surficial layer (see Figure 9, compared to figure 3). Professional judgements of this type are consistent with the TMDL approach, especially for non-point sources. Thus it seems that the TDML approach offers a potential regulatory resolution to the copper discharge limit issue.

More specifically, a *phased* TMDL process could conceivably be used to allow for interim remedial point source discharges slightly above the copper WQC, but below the background copper levels, while efforts are made to remove a potentially significant non-point source (i.e., the contaminated sediments). Per the phased approach, water quality monitoring would be included in this effort to determine the extent of instream copper reductions as a result of dredging. This monitoring information could then be used by the state and federal permitting programs to determine if reductions in copper loadings from other watershed point sources, or even other nonpoint sources, would be required.

A preliminary attempt has been made to quantify some of the mass loadings involved in this copper TMDL. These initial calculations indicate that roughly 2,000 times more copper will be permanently removed from the sediment/water system than is temporarily discharged back to that system during dredging operations: the containment of sediments in the CDFs will permanently sequester approximately 255,000 kg (561,000 lb) of copper, while the 7 to 8 years of treatment plant discharge with an average of 5 ppb copper would return approximately 116 kg (256 lb) (see Attachment 1 for calculations). From a strictly water quality standpoint it is inappropriate to compare these numbers directly since not all of the sediment copper would be released to the water column. From an overall ecosystem perspective, however, it does give a sense of the overall benefit of the proposed TMDL approach, since a) copper in the sediments if not dredged would be recycled to a certain extent through the combined actions of storm-induced sediment resuspension, bioturbation, desorption and bioaccumulation and b) the proposed less-than-background interim discharge will contribute to reductions in instream copper levels.

It is worth noting that, at 17 of the 27 stations in Figure 6, the current surficial copper levels are greater than 500 ppm, compared to an ERM (Effects Range - Medium, Long et al, 1993) level of 270 ppm. This ERM is an informal screening tool for marine and estuarine sediments above which adverse biological effects would frequently be expected (36 of 43 (83.7%) of studies above this level for copper showed a biological effect).

2. <u>The Potential Ban of ANY New Discharges to the Harbor</u>

Another equally important issue is the NPDES permit program regulation which appears to present an absolute bar to new discharges to water exceeding WQC unless there is a completed TMDL determination in place and it is clear that there are sufficient remaining load allocations for the new discharge and all existing discharges are on a compliance schedule. 40 CFR 122.4. Discussions with Headquarters are underway to determine how this provision will impact the discharges to New Bedford Harbor since the phased TMDL approach will still not resolve the issue completely.

This Region has applied this provision only once to a discharger at Great Diamond Island in Maine where there was a fecal coliform discharge problem. The discharger eventually moved the discharge pipe to the other side of the island to an area in compliance with WQC to comply with a strict reading of the regulation. Another interpretation of the regulation, agreed to by both Headquarters and the Region, would consider a discharger in compliance with this regulation if the discharge was at AWQC (or detection levels) at the end of the pipe (no dilution allowed). Given the copper AWQC of 2.9 ppb and the detection level of 2.5 ppb, this interpretation, while helpful for other pollutants, is not helpful for copper.

3. Proposed Limits for the Other Contaminants of Concern

For the sake of completeness, the proposed discharge requirements **in ug/l** for the other ROD 2 contaminants of concern as well as copper are listed below:

| Parameter | Monthly Average | Daily Maximum |
|---|---|---|
| PCBs | 0.71 | 1.3 |
| Cadmium | 6.0 | 9.0 |
| Chromium | 7.1 | 12.8 |
| Copper | 5.0 | 14.0 |
| Lead | 4.8 | 8.5 |

A graphical presentation of these limits and their context in terms of WQC and background conditions are shown in Figures 10 and 11. The monthly average and daily maximum limits for cadmium, chromium and lead are all below the respective chronic WQC. The copper limits, as discussed above, are based on the performance discharge data from the hot spot treatment plant. The PCB limits are based on the summed detection levels of various Arochlors (thus the PCB limits are essentially "compliance levels" consistent with the 9/13/93 NPDES Permit Policy Memo from E.K. McSweeney).

4. The Need for Quick Turnaround

The Superfund program very much appreciates the NPDES program's assistance in this matter, and looks forward to developing this issue further to our joint satisfaction. However, since this copper discharge issue is one of the last issues to be resolved before finalization of the formal ROD 2 "Proposed Plan" (currently scheduled for October 21), the Superfund program would appreciate comment and/or approval of the phased TMDL approach as soon as possible. Thanks again for your help, I can be reached at 573-5735 if you have any questions in this regard.

Enc.

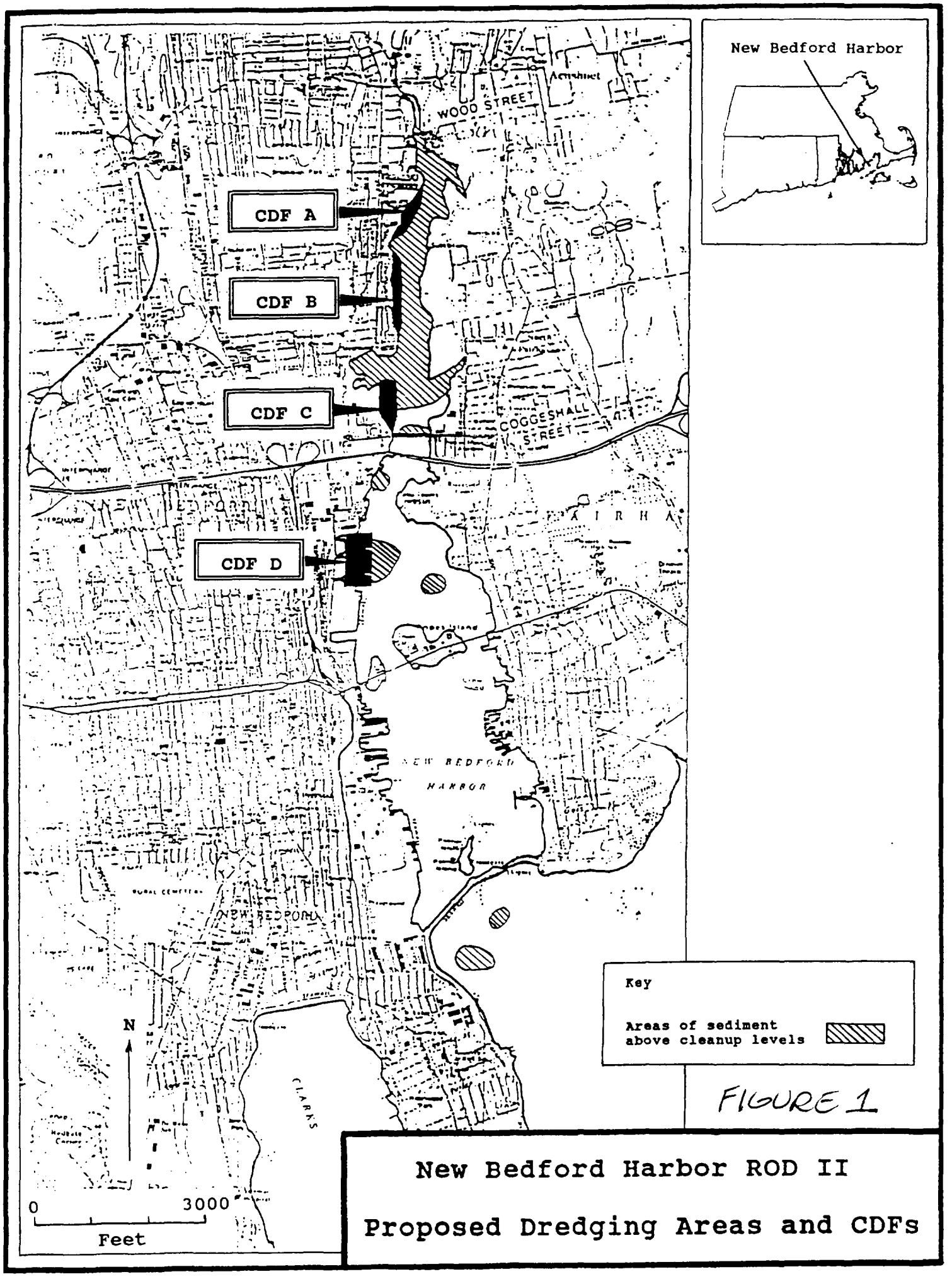
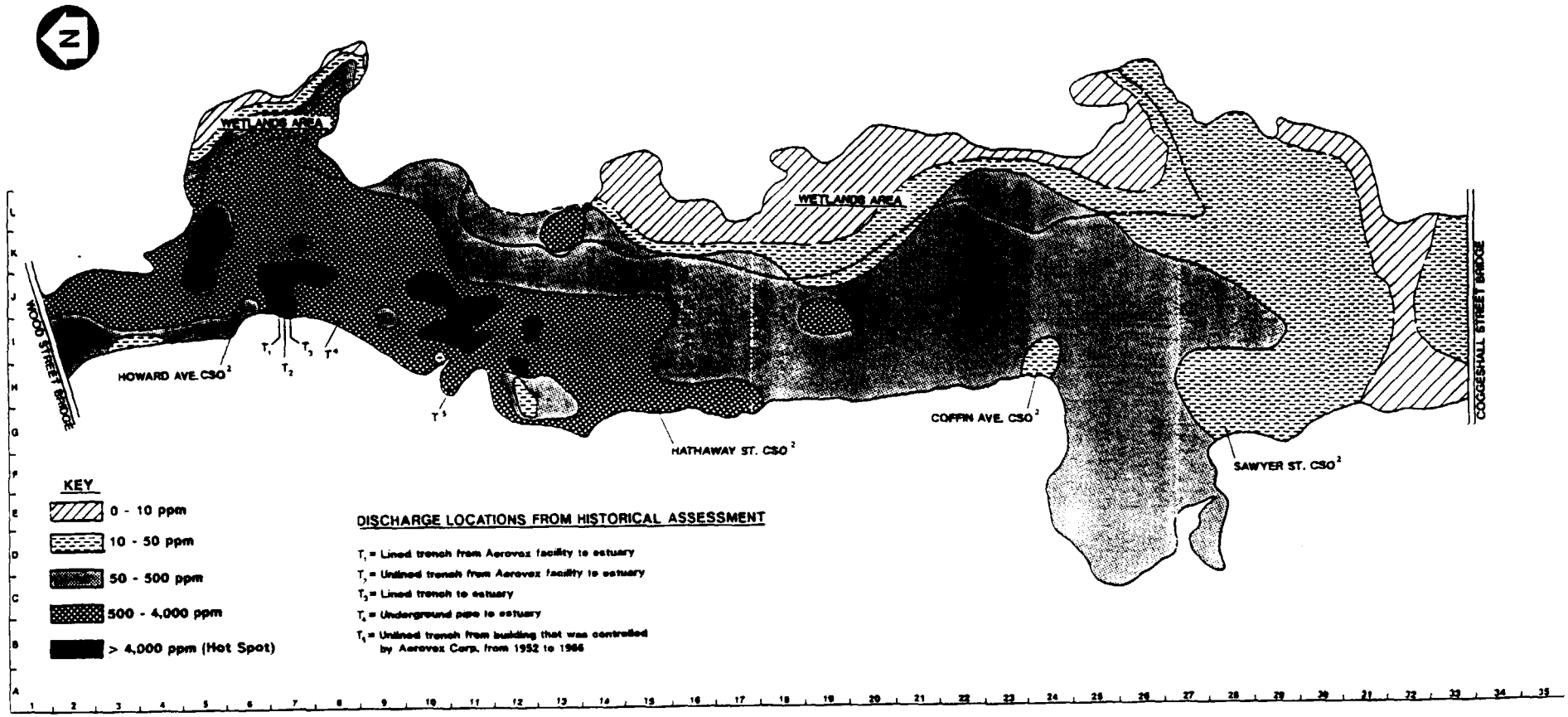



FIGURE 1

New Bedford Harbor ROD II

Proposed Dredging Areas and CDFs

FIGURE 2




REFERENCES

1. Historical Assessment of Aerovox - PCB Related Facility - New Bedford, Massachusetts.
2. Combined Sewer Overflow (CSO) locations from City of New Bedford sewer system map.

~~Figure 5.~~

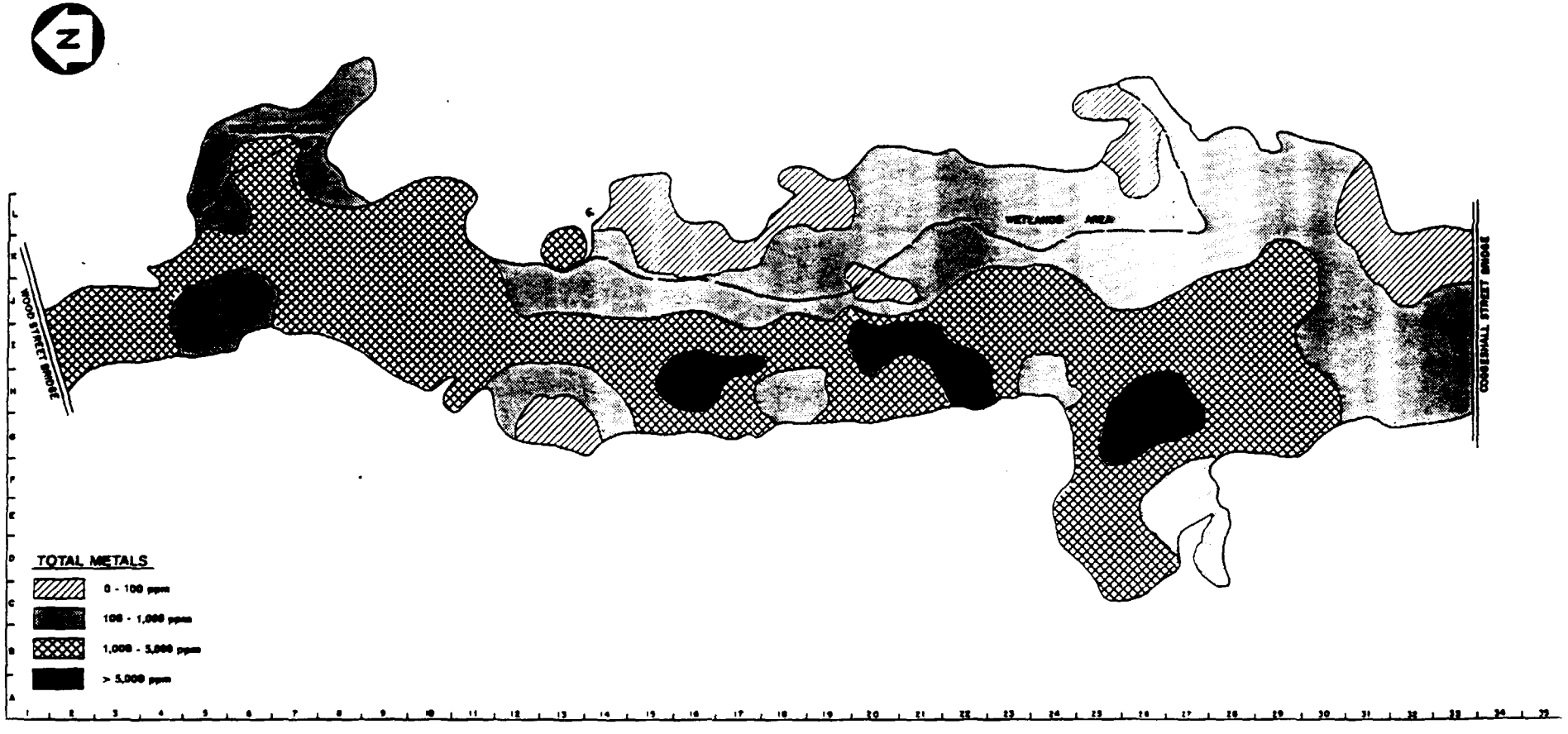
INTERPRETATION OF TOTAL PCB CONCENTRATIONS *
DEPTH: ZERO TO 12 INCHES
ESTUARY AND LOWER HARBOR AND BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR

* SUM OF AVAILABLE AROCHLOR DATA

0 400 800 1200 FEET

4959-25

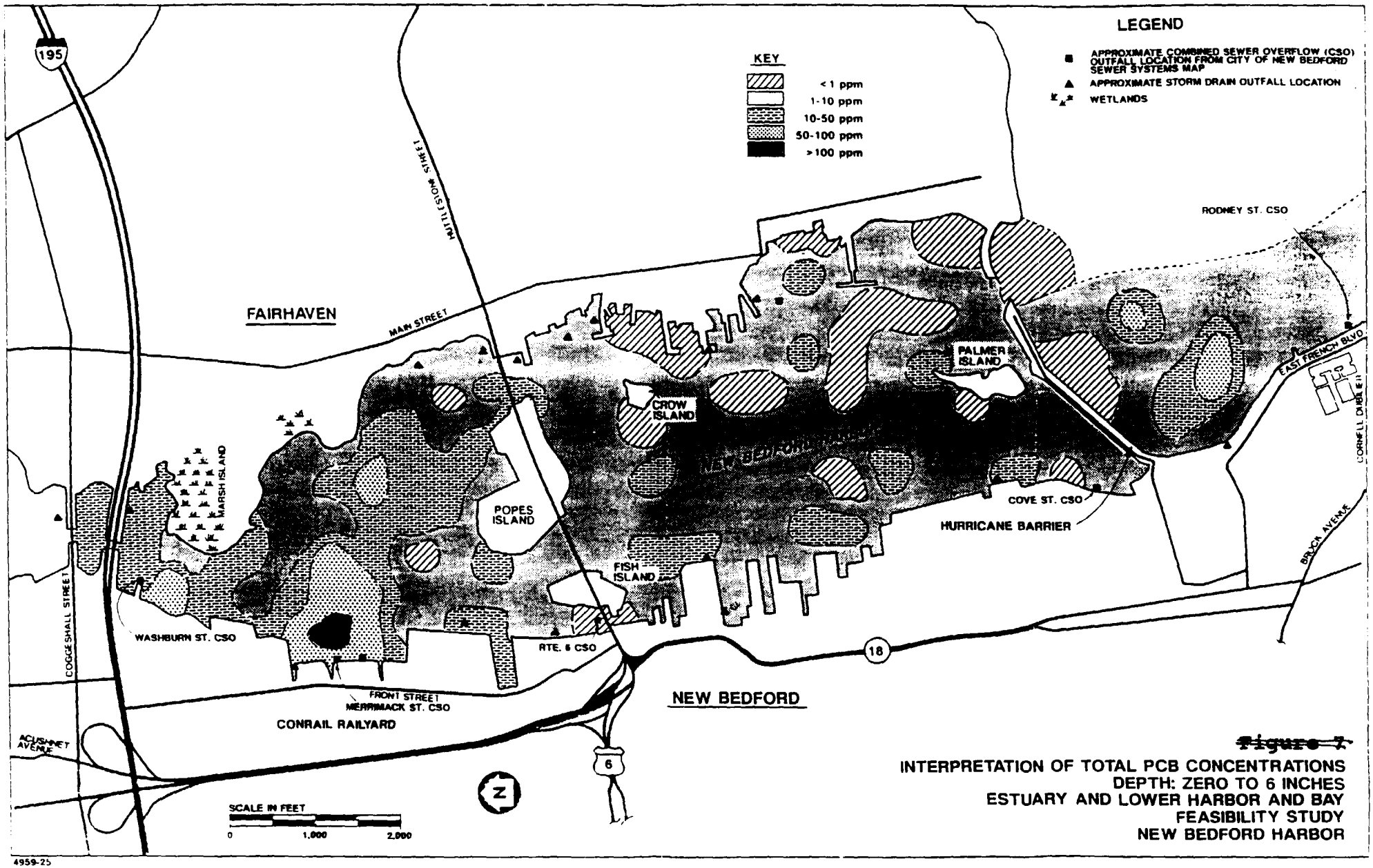
FIGURE 3




0 600 1200 FEET
300

~~Figure 6~~

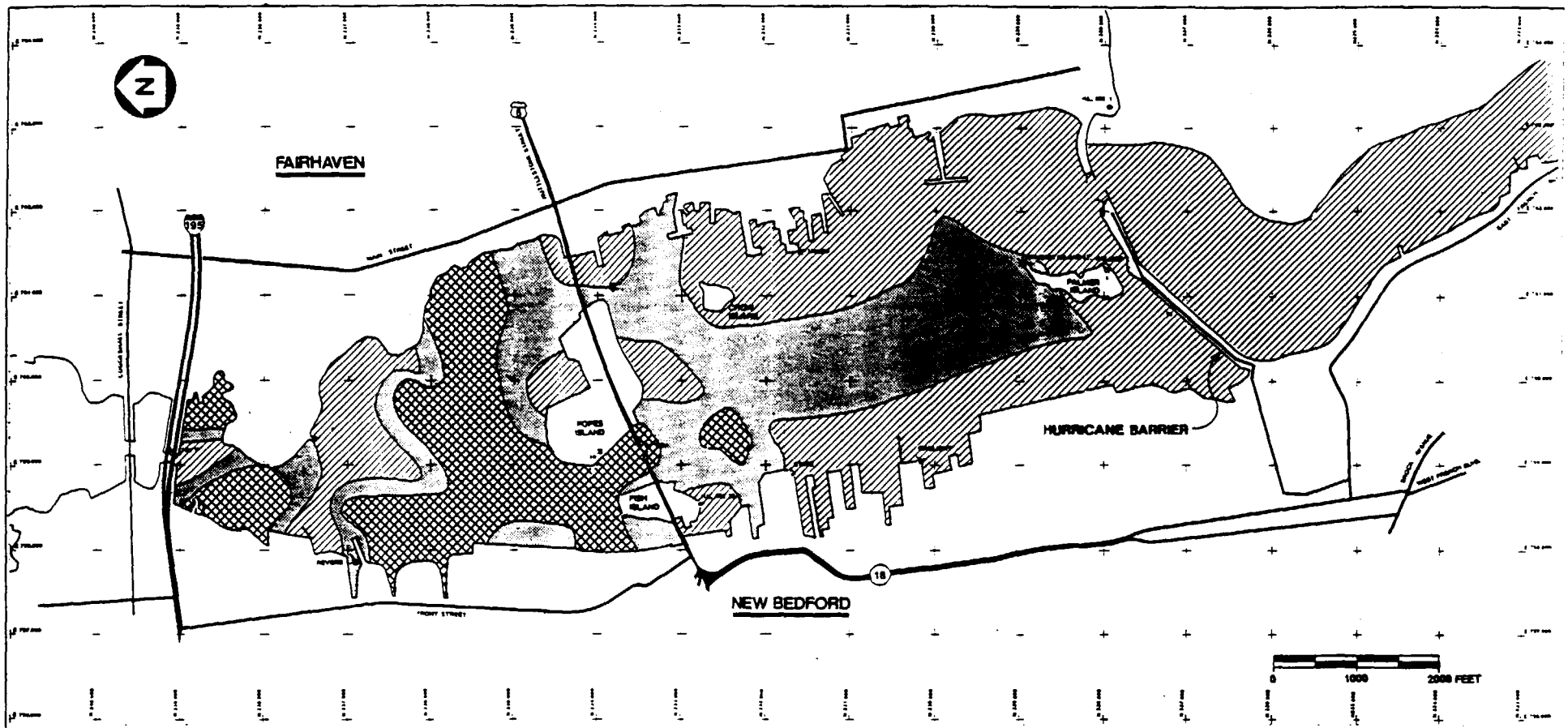
INTERPRETATION OF TOTAL METALS CONCENTRATIONS
(CADMIUM, COPPER, CHROMIUM, LEAD)
DEPTH: ZERO TO 12 INCHES
ESTUARY AND LOWER HARBOR AND BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR




~~Figure 7~~

INTERPRETATION OF TOTAL PCB CONCENTRATIONS
DEPTH: ZERO TO 6 INCHES
ESTUARY AND LOWER HARBOR AND BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR

FIGURE 4




KEY

- 0 - 500 ppm
- 500 - 1000 ppm
- >1000 ppm

FIGURE 5

FIGURE ~~6~~ 5

INTERPRETATION OF TOTAL METALS CONCENTRATIONS, ZERO TO 6 INCHES
(CADMIUM, CHROMIUM, COPPER, AND LEAD)
LOWER HARBOR AND BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR

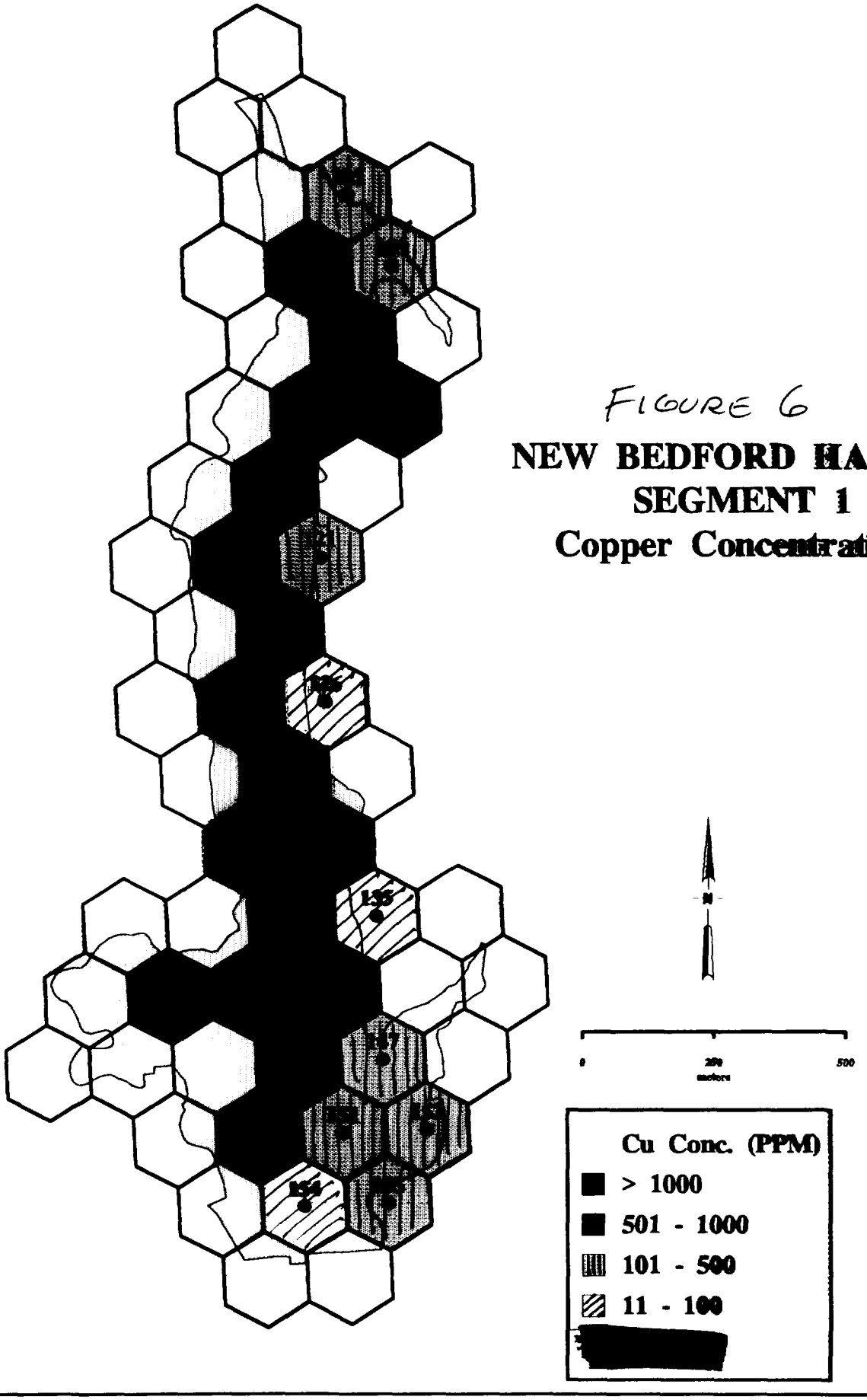


FIGURE 6
NEW BEDFORD HARBOR
SEGMENT 1
Copper Concentrations
N
0
250
500
meters
Cu Conc. (PPM)
> 1000
501 - 1000
101 - 500
11 - 100

FIGURE 7

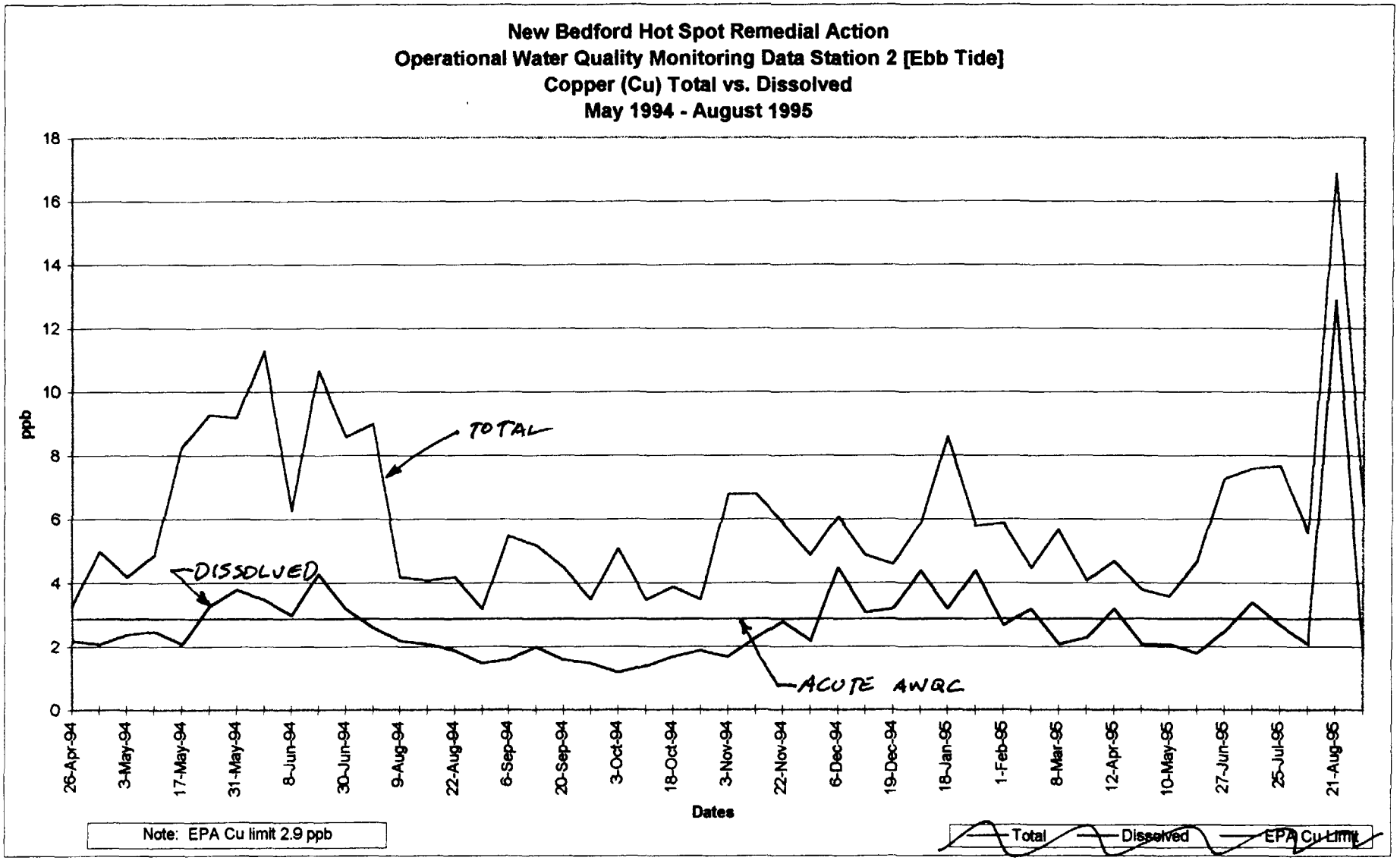

New Bedford Hot Spot Remedial Action
Operational Water Quality Monitoring Data Station 2 [Ebb Tide]
Copper (Cu) Total vs. Dissolved
May 1994 - August 1995
ppb
18
16
14
12
10
8
6
4
2
0
TOTAL
DISSOLVED
ACUTE AWQC
26-Apr-94
3-May-94
17-May-94
31-May-94
8-Jun-94
30-Jun-94
9-Aug-94
22-Aug-94
6-Sep-94
20-Sep-94
3-Oct-94
18-Oct-94
3-Nov-94
22-Nov-94
6-Dec-94
19-Dec-94
18-Jan-95
1-Feb-95
8-Mar-95
12-Apr-95
10-May-95
27-Jun-95
25-Jul-95
21-Aug-95
Dates
Note: EPA Cu limit 2.9 ppb
Total
Dissolved
EPA Cu Limit

FIGURE 8

# Hot Spot Tmt. Plant Copper Discharges

New Bedford Harbor Superfund Site

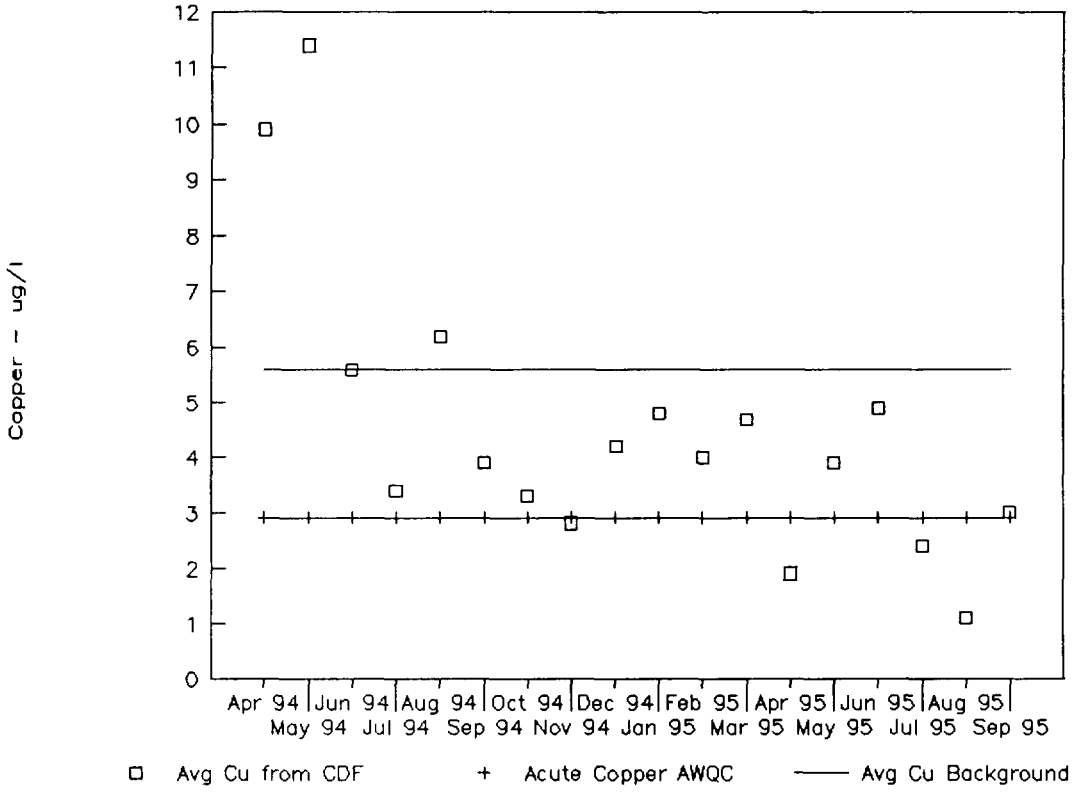


FIGURE 9

INTERPRETATION OF TOTAL METALS CONCENTRATION:
(CADMIUM, COPPER, CHROMIUM, LEAD
DEPTH: 24 TO 36 INCHE
ESTUARY AND LOWER HARBOR AND BA
FEASIBILITY STUD
NEW BEDFORD HARBO

FIGURE 10

New Bedford Harbor Superfund Site

Proposed ROD 2 Metal Limits

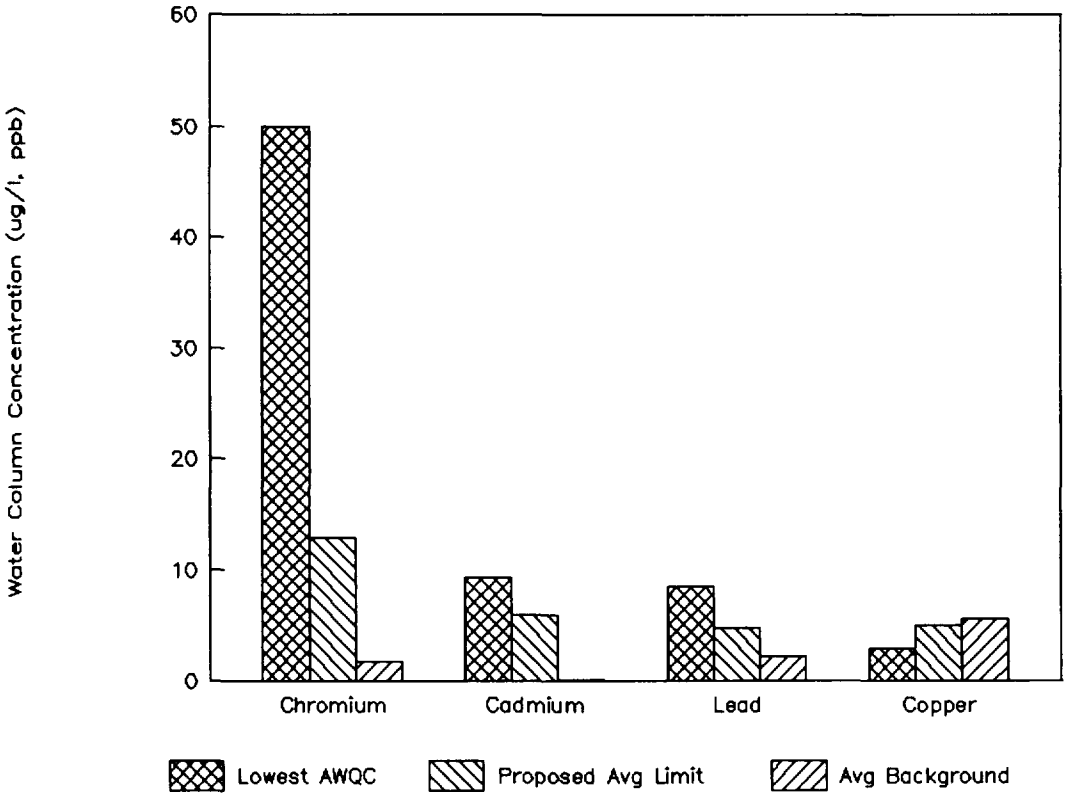
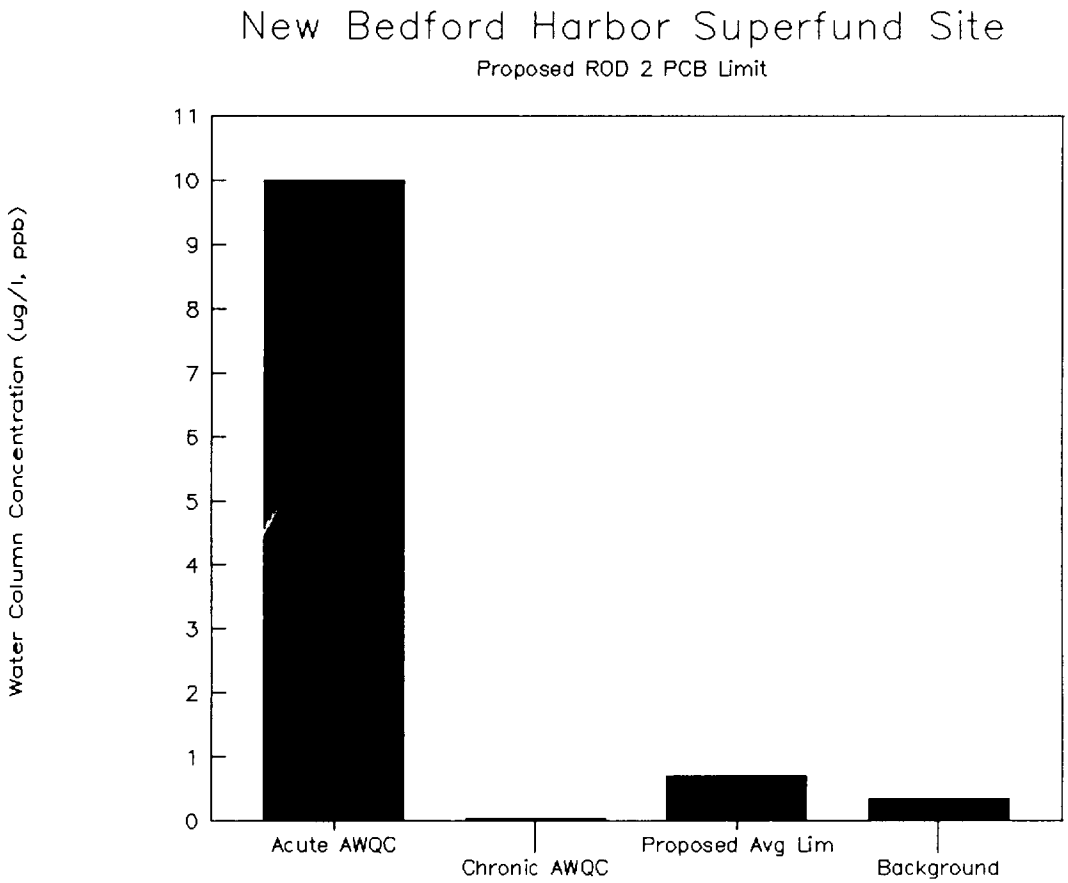


FIGURE 11


New Bedford Harbor Superfund Site
Proposed ROD 2 PCB Limit
Water Column Concentration (ug/l, ppb)
11
10
9
8
7
6
5
4
3
2
1
0
Acute AWQC
Chronic AWQC
Proposed Avg Lim
Background

N.B. Harbor
10/11/96
DYD
1/2

# ATTACHMENT 1

1. Mass of Copper Sequestered Per ROD 2

a. Upper Harbor

- 0-12" Layer 588 ppm (Tbl 3-1 8/90 FS)
- 12-24' Layer 100 ppm (assumed conc.)

- assume avg. Cu conc = 344 ppm (ug/g)
- volume of sediments = 528,000 $yd^3$

$$Mass_{Cu} = \frac{344\ ug}{g} \cdot 528{,}000\ yd^3 \cdot \frac{1.4\ tons}{yd^3} \cdot \frac{2000\ lb}{ton} \cdot \frac{453.6\ g}{lb} \cdot \frac{g}{10^6\ ug} \cdot \frac{kg}{10^3\ g}$$

= 231,000 kg (~500,000 lb)

b. Lower Harbor

- 0-12" Layer only: Marsh Island - 300 ppm Cu
  Pops Island - 492 ppm Cu

- use 396 ppm Cu average

- sediment volume = 48,000 $yd^3$

$$Mass_{Cu} = \frac{396\ ug}{g} \cdot 48{,}000\ yd^3 \cdot \frac{1.4\ tons}{yd^3} \cdot \frac{2000\ lb}{ton} \cdot \frac{453.6\ g}{lb} \cdot \frac{g}{10^6\ ug} \cdot \frac{kg}{10^3\ g}$$

≅ 24,000 kg (53,000 lb)

Attachment 1 (con'd)

N.B. Harbor
10/11/96
DTD
2/2

1. Mass of Copper Sequestered (con'd)

c. Total Copper Removed

$(231{,}000 + 24{,}000)\,kg = \underline{\underline{255{,}000\ kg}}$ (561,000 lb)

2. Mass of Copper Discharged From ADD 2 Plants

- 2 MGD
- 7 years (all 4 plants won't run for 8 years)
- 5 ug/l Cu avg

$$Mass_{Cu} = \frac{2\cdot 10^6\ gal}{day} \cdot \frac{7\cdot 365\ days}{} \cdot \frac{4.546\ l}{gal} \cdot \frac{5\ ug}{l} \cdot \frac{\cancel{lb}}{\cancel{453.6\ g}} \cdot \frac{g}{10^6\ ug} \cdot \frac{kg}{10^3\ g}$$

$= \underline{\underline{116\ kg}}$ (256 lb)