8.4.2

U.S. Environmental Protection Agency, Region I - New England

Memorandum

Date: January 28, 1998

From: David Dickerson, Remedial Project Manager DD

To: File

Re: New Bedford Harbor Superfund Site - Round 2 of Long Term Ecological Monitoring

Attached is an informational poster describing the initial results of the second round of the long term monitoring (LTM) effort for the subject Superfund site. A larger version of this poster was used by EPA Narragansett to present its findings at the November 1997 SETAC (Society for Environmental Toxicologists and Chemists) conference. In a phone conversation with Dr. Skip Nelson on January 23, 1998, Skip emphasized the following points:

1. Some amount of resuspension and redistribution of sediment PCBs occurs naturally in the harbor (due to storm events, etc.). The degree to which the LTM program measures this natural variability won't be ascertained until the third monitoring round (currently scheduled for 1999 or 2000, just prior to the start of ROD 2 dredging), since the hot spot dredging occurred between rounds one and two;

2. Any impacts from the hot spot dredging were limited primarily to the upper harbor;

3. The changes from 1993 to 1995 in program indicators was relatively minor;

4. The dominant benthic species patterns, which show a classic case of ecological stress (few dominants, with those being small, short lived opportunistic species) in the upper harbor, were very similar from 1993 to 1995;

5. TOC-normalizing is most important when evaluating remedial options for the outer harbor, since the sediment PCB levels there are comparatively low. The sediment PCB levels in the upper and lower harbor, on the other hand, are high enough to negate any ameliorating effect (i.e., decreased bioavailability) due to sediment organic carbon. This may not be the case, however, for the outer harbor, and TOC-normalizing should be considered for this area.

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Rec'd 12/17/97 DTD

PRE- AND POST-DREDGING AT A MARINE SUPERFUND SITE: COMPARISON OF EXPOSURE, HABITAT, AND ECOLOGICAL INDICATORS.

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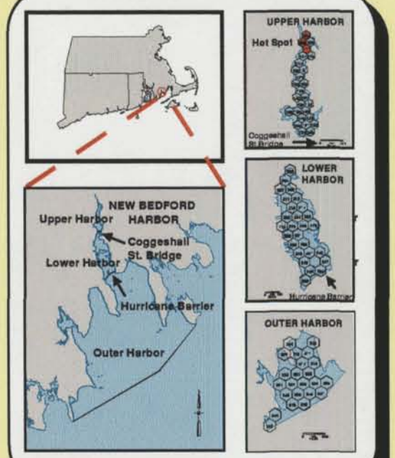
ABSTRACT

New Bedford Harbor (NBH), MA, is a marine Superfund site due to severely PCB-contaminated sediments. Prior to initial remedial activities, a comprehensive long-term monitoring program was developed to assess the effectiveness of dredging at this site, both spatially and temporally. Pre-remedial baseline sediment sampling consisted of quantifying a suite of exposure indicators (PCBs, metals, sediment toxicity), habitat indicators (TOC, AVS, grain size) and ecological indicators (benthic community indices) at each of 72 stations along a gradient from the severely contaminated upper estuary to Buzzards Bay. Recently, the first phase of remediation was completed, dredging of a five acre "Hot Spot," and the full suite indicators were measured again. Pre- and post-dredging comparisons were made for each indicator and are presented in GIS format. This approach will be used during each remedial phase, as well as after completion of all remedial activities, to assess ecological recovery at this Superfund site.

BACKGROUND

- Long-term monitoring program (30 years) designed to assess the effectiveness of remedial activities at the New Bedford Harbor (NBH) Superfund site:
  - Probabilistic sampling design (72 stations)
  - Quantifies areal extent & magnitude of changes in exposure and effects indicators
  - Data synthesis & presentation in GIS-based format
- Sediments collected before any remedial activities (1993) to establish baseline conditions
- First post-remedial sampling conducted immediately after initial "Hot Spot" dredging (1995)
- Spatial and temporal results presented:
  - In tabular format: selected variables, averaged by segment
  - In GIS format (inverse distance weighting): two examples presented
  - In graphical format: dominant species abundance (species that comprise 75% of total abundance)

STUDY SITE

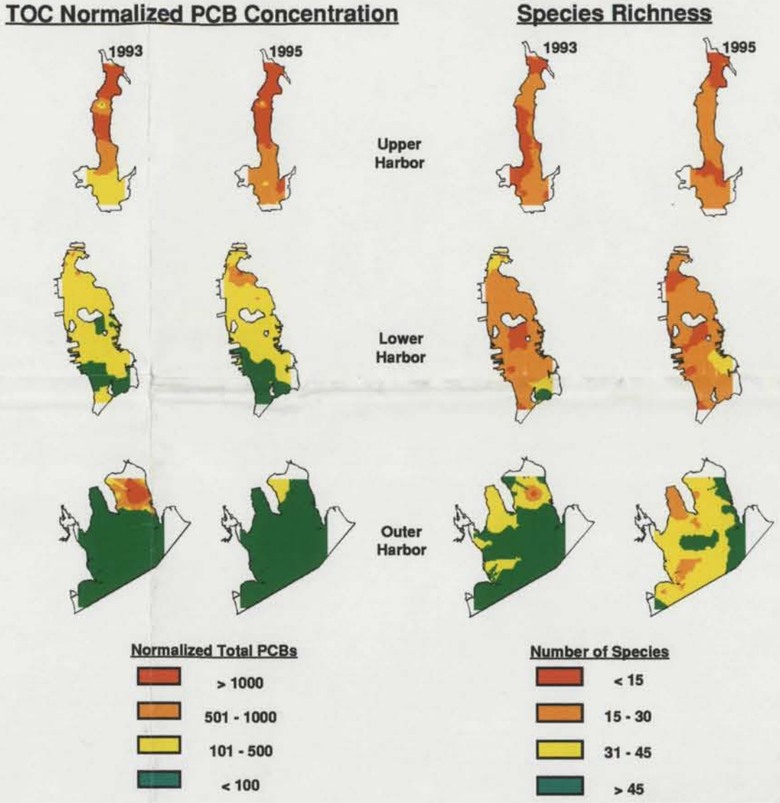


RESULTS: Selected Variables

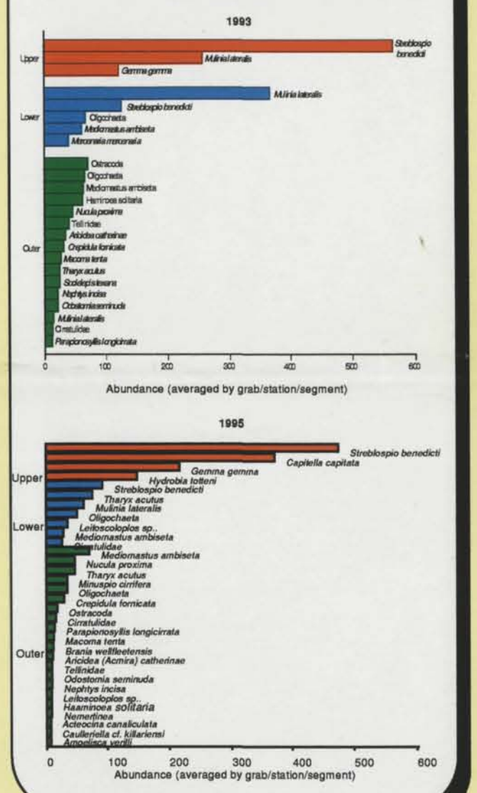
Comparison of New Bedford Harbor Long-Term Monitoring Indicators pre- (1993) and post- (1995) remedial dredging. Shown are each indicator mean (blue) and standard deviation (red) for each of the three harbor segments.

Indicator	Year	Upper Harbor n=24		Lower Harbor n=25		Outer Harbor n=23	
Total PCBs (ug/g)	'93	94.1	99.8	7.67	7.30	0.833	1.62
	'95	124	156	9.25	7.74	0.449	0.625
Total PCBs (ug PCB/g OC)	'93	1109	963	210	193	162	553
	'95	1900	2140	236	256	36	43.6
Copper (ug/g)	'93	612	376	454	461	19.5	19.2
	'95	841	465	547	545	26.3	30.3
Cadmium (ug/g)	'93	84.8	139	12.4	38.6	0.283	0.334
	'95	9.28	7.12	2.20	1.81	0.199	0.300
Lead (ug/g)	'93	267	158	129	93.2	18.2	14.0
	'95	346	220	161	106	23.5	18.8
Total Organic Carbon (%)	'93	7.2	4.2	4.7	2.7	1.3	1.1
	'95	5.8	3.4	3.4	2.0	1.0	0.82
Sediment Toxicity (% Survival)	'93	57	30	70	35	93	23
	'95	24	31	50	39	89	16
Species Richness (Number)	'93	16	6.2	25	12	57	16
	'95	16	4.3	20	8.5	41	14

RESULTS: GIS Format



RESULTS: Graphical



CONCLUSIONS

- Increased contaminant concentrations (e.g., PCBs, Cu) in 1995 were observed primarily in the upper harbor.
  - Corresponding increases in short-term acute sediment toxicity also were measured in the upper harbor.
- Smaller increases in 1995 contaminant concentrations and sediment toxicity occurred in lower harbor depositional areas
- Over the entire study area, longer-term biological indicators (species richness and abundance) showed little or no change attributable to remedial activities.
  - Because sampling occurred immediately after remediation, the time frame may have been insufficient for longer-term indicator responses to occur.
- Comparison of the initial two sampling events for this 30-year monitoring plan was effective at determining short-term changes in measured indicators. Future sampling will provide a better assessment of the overall ecological recovery at this site.