

DATE December 22, 1982

SUBJECT Draft Interim Report for USCG - ERT Study on PCB's in New Bedford Harbor. *51721*

FROM Royal J. Nadeau, Acting Chief
Environmental Impact Section
Environmental Response Team
TO Addressees

Attached is a copy of a draft of an Interim Report on the efforts to date of the USCG-ERT addressing the problem of contaminated sediments in the Upper New Bedford Harbor. Also enclosed is Study Proposal for additional work that you all felt would be worthwhile to clarify some of the observations made during the September 21 tide cycle.

Any additions or corrections would be appreciated, particularly if you have some further suggestions for the additional study effort. As you know, Captain Ireland wants to make a report to the RRT by mid-February, therefore there is a sense of urgency for you to respond. You can relay your comments in writing or directly by telephone to me by January 4th as the investigators are meeting on January 5th to finalize logistics to carry out the work.

Addressees:

- Gerry Sotolongo Region I Remedial
- Edward Conley Region I ES Div.
- John Conlon Region I Emergency Response
- Carl Eidam Region I Emergency Response
- Dr. Tom Spittler Region I ES Div.
- Richard Jadamec USCG R&D Center
- Captain R. Barry Eldridge USCG First District, Boston
- Captain George Ireland COTP-Providence

ERT INTERIM REPORT

DRAFT

TITLE: PCB's in New Bedford, MA. Harbor

Date: December 18, 1982

Background:

The results of a survey conducted by the COTP Providence of the sediments in the Acushnet River adjacent to the Aerovox properties revealed the presence of high concentrations of PCB's throughout the sampling area (>1,000 ppm) and extremely high concentrations (>10,000 ppm) in the area directly adjacent to Aerovox.

One of the main concerns of the RRT that met in August 1982 was that the PCB's may be leaching out of these sediments at such a rate as to create and maintain a threat to the water quality of New Bedford Harbor and Buzzards Bay. The RRT recommended that a short term study be conducted to determine:

- (1) Partition coefficients for PCB's being released from the contaminated sediments into the overlying waters.
- (2) A net movement, if any, of PCB's from the highly contaminated sediments to the Lower New Bedford Harbor area.

APPROACH

A two pronged approach was formulated and instigated through a combined EPA and USCG to carry out these studies.

Laboratory Effort: The purpose of this portion of the studies was to characterize the phenomena of PCB's being released by the sediments to the incoming water of each tide through the generation of a partition coefficient for intact samples collected along a concentration gradient of PCB contamination. Only the uppermost layer of sediments were used for these tests as this is the layer that is likely to be contributing PCB's to the water column.

DRAFT

Worst Case Leaching Test

A worst case leaching test was performed using a test procedure similar to the one developed for the Section 103 permit program for discharging dredged materials. This procedure involves the mixing of sediment in water and is representative what possibly occurs within the top layer of sediments during periods of high flow e.g., after a storm event.

Approximately 240 grams of surface sediments from three locations in the tide flats adjacent to Aerovox were placed into three separate glass carboys. These carboys were placed on magnetic stirrers after having 15.1 liters of Mystic River seawater added as diluent. The water sediment mixture was stirred at a rate set so that only a slight vortex was observed.

After two hours, the stirring was stopped and an aliquot sample (zero time- T_0) was extracted by siphon and analyzed for Total

Suspended Solids and PCB's. The sample was filtered through a glass fiber filter (.45u pore size). Total Organic Carbon analysis was also performed on the mixed liquor sample.

~~The above procedure was repeated~~ at 30 minutes (T₃₀), 60 minutes (T₆₀) and 120 minutes (T₁₂₀) time intervals.

DRAFT

Quiescent Testing

Another portion of the laboratory studies addressed the movement of PCB's from contaminated sediments during more quiescent, low turbulent condition without agitation. In this portion, another set of sediment samples collected from the same locations as for the worst-case leaching tests were placed in the center of one-gallon unused paint which had been washed with detergent and water, followed by a distilled water rinse, then rinsed with pesticide grade acetone with a final rinse with distilled water.

Water from the Mystic River of comparable salinity to New Bedford Harbor was again used as a diluent and was added very slowly into the paint cans making sure that the sediments were not disturbed. Enough water was added until there was approximately one inch of water covering the sediment layer. The cans were then covered with aluminum foil and allowed to stand undisturbed for 24 hours.

After 24 hours, the water from the paint can was slowly siphoned out into glass containers, making sure that the sediments were not disturbed. All excess water was drained off the sediments and a portion of the top layer was removed and air dried. These sediments were then analyzed for PCB's content. The water samples were then analyzed for PCB's and total organic carbon.

FIELD EFFORTS

DRAFT

Tidal Cycle Monitoring

The field effort mainly concentrated on monitoring a full tidal cycle (September 21, 1982) beginning at 0630 EDST through 1930 EDST at the Coggeshall Bridge. This location is the first bridge on the Acushnet River south of the Aerovox facility. Water samples were collected hourly for particulate and non-particulate PCB content. Flow measurements coupled with tide height readings were taken at regular intervals, with more readings made near tide change. Turbidity measurements were made on the water samples to note any correlation with total suspended solids content.

Synoptic Survey

A synoptic water sampling survey was performed at 1430 EDST to characterize the water at specific locations in the Upper Harbor/ Acushnet River area. Water samples were collected from the outflow of the Mill Pond, Wood Street bridge, Acushnet River (south of Aerovox)

Coggeshall Street bridge, and Nun Buoy #9 (south of Interstate 195 bridge). The same parameters were measured on these samples as for the tidal cycle study.

ANALYTICAL METHODOLOGY (supplied by Richard Jadamac, Analytical Chemistry Group, USCG R&D Center thru Captain K.D. Urfer, Commanding Officer)

All suspended sediment samples, contained on glass fiber filters, were extracted with 4 ml of spectroquality hexane (containing 2% acetone). This extraction step was performed using sonification (5 minute duration) to totally pulverize the glass fiber filters. Based on our studies, the efficiency of extraction using sonification (as compared to Soxhlet techniques) is approximately 75-80%. The centrifuged extracts of these samples were analyzed by gas chromatographic (electron capture detection), and high performance liquid and thin-layer chromatographic techniques. The aqueous samples were extracted with four 20ml portions of spectroquality hexane. The hexane extracts from each liquid extraction were combined and concentrated to a final volume of 3 ml. These samples were then analyzed by the same analytical techniques.

DRAFT

RESULTS

A Technical Debriefing was held on December 16th at EPA Region I Regional Laboratory in Lexington, MA. where the results and difficulties encountered during the conduct of the studies were presented to interested EPA and Coast Guard personnel. A synopsis of this meeting is presented here in lieu of a full report which will be forthcoming upon completion of all ERT-USCG studies.

Field Efforts: During both the flood and ebb portion of the tidal cycle monitored, the particulate PCB content was greater than the non-particulate content. There was not an obvious difference in the non-particulate phase between the tide phases. However, there was a very obvious difference in the concentration of particulate PCB's with the flood phase showing a consistently higher amount (10X difference) compared to the ebb phase.

The mass balance of PCB's in the Upper Harbor was jeopardized by the theft of a briefcase containing critical calculations for the cross-section area of the channel under the Coggeshall Bridge.

The synoptic survey revealed the presence of low level contamination of the non-particulate phase in the Mill Pond outfall (.36 - 1.50 ppb). This same level of contamination in the non-particulate phase was present in the water samples collected from the other sampling locations. High levels of particulate PCB's were noted in the water samples collected at the locations immediately north (25.92 ppb) and south (21.34 ppb) of the contaminated tidal flats.

Laboratory Efforts: The worst case leaching tests revealed that the bulk of PCB contaminated sediments settled out of suspension during the first thirty minutes with a residual amount remaining in the water column after 120 minutes. The amount remaining in suspension was dependent on the original concentration of the parent sediment used in the carboy. The greater amount remaining after 120 minutes corresponded with the highest concentration of PCB's in the sediments.

During the quiescent tests, PCB's leached from the surface of the sediments into the overlying water. The rate, expressed as amount per area per day was dependent on the original concentration in the sediments; the highest sediment concentration leached out more PCB's within the 24 hour test period.

DISCUSSION

DRAFT

Field Studies

An interesting phenomena that was observed during the tidal cycle was a reversal of tide flow during both the flood and ebb phases. For approximately fifteen minutes during peak flow periods, the tide flow reversed. Another observation was that the flood phase lasted longer than the ebb (seven hour flood versus five hour ebb) at the Coggeshall Bridge.

The above observations coupled with the higher concentrations of particulate PCB's during the flood phase raises some question as to how representative the conditions present on September 21 may have been. Being that there is a paucity of physical oceanographic information for New Bedford Harbor in general and the Upper Harbor in particular, it is not easy to evaluate the observations made on September 21 as being representative or not.

The presence of low level contamination in the Mill Pond which is more than ten feet higher in elevation than the tidal reach raises some interesting questions as to the source of PCB's to the Mill Pond. It is possible that airborne PCB's coupled with contaminated storm water runoff could be responsible.

Laboratory Studies

During the agitation period of the worst case leaching test, oil was released forming a film on the surface particularly in the carboys which contained the most contaminated sediment. This observation coincides with what was observed while collecting these sediments. An oil film rose to the surface when the core sampler was pushed into the contaminated sediments, indicating that upon a slight disturbance the entrained oil could easily be dislodged from the sediments.

The presence of an oil phase adds another complexity which must be taken into consideration when extrapolating the results for evaluating mitigative activities for the contaminated sediments. In reality, some of the PCB's leaching from the sediments may be in the oil phase as well as being absorbed on to the particulates. The presence of finely dispersed oil could affect both the particulate PCB and non-particulate phase of PCB's in the water column as it is likely that some oil could pass through the glass fiber filters, providing a plausible explanation for the partition coefficients to be greater than those reported in the literature.

DRAFT

PCB'S IN NEW BEDFORD HARBOR ADDENDUM STUDIES

Joint USEPA-ERT and USCG Effort

DRAFT

Background

The Technical Task Group that met on Thursday, December 16th indicated that the observations made during the tidal cycle study might be anomalous and needed further verification. A major recommendation was that additional studies be made to investigate the water mass characteristics in the Coggeshall Bridge area to evaluate:

- A. The mixing patterns in the water moving in and out of Upper New Bedford Harbor at the Coggeshall Bridge
- B. Net movement of PCB's in the Upper Harbor over more than a single tide cycle.
- C. How representative was the tide cycle monitored on September 21 as to PCB transport and movement in New Bedford Harbor.

These further efforts would be accomplished in time for consideration by the RRT which will be convened to recommend future appropriate removal actions.

APPROACH

A concerted effort will be required within the month of January to meet the time constraints identified above. Logistical problems associated with these studies will be more intense requiring a well thought out plan of action to surmount the problems of working over water in subfreezing temperatures. Added safety precautions will be required to protect the investigators and samplers.

Time Period

The second week in January (January 10 thru 14) is targeted to complete the field efforts with the following week (January 17 thru 21) as backup in the event unforeseen problems arising. Intense laboratory effort for analyses of the samples collected will occur during the following weeks. Data assembly and interpretation will occur during the week following the completion of the analytical effort. Therefore, a report to Captain Ireland for presentation to the RRT will be ready during the first week in February.

Study Parameters

DRAFT

Most of the parameters required to address the problem being investigated are physical. These measurements are made with state-of-the-art instrumentation ranging from simple temperature determinations to more sophisticated optical character determination using a transmissometer. With an emphasis on measuring the physical

nature of the water mass, fewer samples will be required than were for the original work. Instead of samples taken hourly during the tide cycle, samples will be collected at specific times of each tide phase e.g. mid-flow and near-slack periods. PCB movement can be determined in the water mass using the same procedures as used in the September effort.

Equipment and Special Support Needs

Considering the cold weather period expected for the sampling period, a heated shelter will be required on-site for the investigators. This same facility will be useful for readying sampling containers and equipment for the next round of sampling. Certain sample preparation procedures could also be accomplished e.g. filtration to separate the particulate from non-particulate phase. The USCG Mobile Laboratory would likely fulfill these aforementioned requirements.

Certain special instruments could not be acquired for the September effort but are needed for this effort. Special efforts will be required on the part of both the Coast Guard and EPA to fulfill this need.

A meeting of the EPA and Coast Guard investigators to finalize logistics will take place on January 5th at COTP-Providence.

DRAFT