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COMPREHENSIVE PCB CLEANUP FOR NEW BEDFORD HARBOR

The United States Environmental Protection Agency ("EPA") has just announced its proposal for a first stage of the New Bedford Harbor Superfund Site cleanup. EPA's recommendation includes dredging and incineration of sediments containing PCBs from a five-acre area in the Acushnet River Upper Estuary. Concurrent with EPA's remedial investigation/feasibility study (RI/FS), AVX Corporation (AVX) has been reviewing material made available through EPA describing the New Bedford Harbor Superfund Site, and has been undertaking independent studies to allow further evaluation of feasible remedial approaches for the site. Based on its investigations, AVX believes that there is no need to proceed with phased remediation, beginning with dredging a so-called "hot spot," prior to implementation of a overall solution. If there is to be a harbor cleanup, the preferred remedial alternative is one which comprehensively addresses polychlorinated biphenyl (PCB) sediment contamination in New Bedford Harbor.

Based on the data produced through the EPA RI/FS, as well as independent studies, AVX, with the assistance of a team of nationally recognized environmental experts, has developed such a remedial alternative. AVX and its consultants have met with EPA and the Greater New Bedford Environmental Community Work Group (CWG) to discuss this remedial alternative. After consultation with EPA, AVX is presenting the details of this remedial alternative to the public to allow the public a full opportunity to compare the harbor remedial alternative developed by AVX to the Hot Spot remedy currently being proposed by EPA. Comments received by EPA during the current public comment period for the proposed Hot Spot remedy will influence EPA's decision on how to proceed with remediation for the New Bedford Harbor Superfund Site.

SUMMARY DESCRIPTION OF NEW BEDFORD HARBOR IN PLACE CONTAMINANT CAPPING REMEDIAL ALTERNATIVE

Studies performed throughout the New Bedford Harbor area report contamination of harbor sediments by PCBs, heavy metals and polycyclic aromatic hydrocarbons (PAHs). Further review of data produced indicates that of the approximately 950 acre New Bedford Harbor site (from north of the

Hurricane Barrier to south of the Wood Street Bridge), a very substantial percentage of PCBs (90 ± percent) reported present in harbor sediments is located in the Acushnet River Upper Estuary, an area of approximately 189 acres.

In light of this information, the development of a remedial alternative which focused on the area containing the majority of the PCBs present at the New Bedford Harbor site was judged to be appropriate. Furthermore, a remedial alternative which would decrease risks and costs of dredging, handling, and subsequent disposal, treatment, incineration or storage of contaminated sediments and which would minimize environmental exposure to contaminants was considered a desirable alternative to remedial programs involving dredging. On this basis, a remedial alternative concept was developed for the New Bedford Harbor site which focused on in place containment of contaminated sediments present in the Acushnet River Upper Estuary.

The in place containment of sediments present in the Acushnet River Upper Estuary involves placement of a geofabric and clean sediment cap over designated areas, subsequent planting of a salt marsh over portions of the cap, and construction of an erosion resistant zone to carry Acushnet River flow through the capped area. This remedial alternative effectively immobilizes sediments with the highest reported levels of PCBs, minimizes transport of these contaminated sediments, minimizes the need for major engineering design and construction, limits future potential exposure to these contaminated sediments, and mitigates impacts to the salt marsh by creation of additional wetlands/marsh.

The initial step in this remedial alternative involves the installation of a variable weir dam at the Coggeshall Street Bridge. This dam will allow control of tidal flow through the upper estuary and serve to reduce estuary dynamics to allow controlled placement of the sediment cap, as well as to minimize the release of contaminants from the estuary during construction. This hydraulic control structure will consist of a steel sheetpile or wooden sheeting wall incorporating three weir openings. These weirs will be used to control water level in the upper estuary as well as reducing the tidal dynamics of the estuary. Additionally, existing up-stream dams will be used to moderate Acushnet River flow during cap construction.

A geofabric will then be installed over portions of the estuary which will be capped in order to prevent erosion and mixing of sediments with cap material as fill is laid over these sediments. In addition, this geofabric will increase the integrity of the sediment containment system. The entire area of the upper estuary to be capped will be overlain with a geofabric prior to the placement of fill material.

The next component of the sediment capping system involves placement of fill over the upper estuary sediments. Based upon an evaluation of PCB flux from upper estuary sediments, 70 percent of the upper estuary sediments produce

approximately 99 percent of all current PCB flux from the upper estuary. This portion of the estuary, which roughly corresponds to the area with reported PCB levels of 50 parts per million (ppm) or greater, constitutes approximately 135 acres of the 189-acre upper estuary. On this basis, capping of this portion of the upper estuary will meet program objectives of sufficiently reducing risks to human health and the environment.

Based upon a review of studies performed by the U. S. Army Corp of Engineers (USACE), as well as independent evaluation of these and other data, a 45-centimeter-thick cap has been selected as appropriate for containment of contaminants present in upper estuary sediments. Of this 45-centimeter thickness, 25 centimeters will provide a chemical barrier and safety zone to contain contaminants, and the upper 20 centimeters will provide a bioturbation (biological movement of sediment) protection zone. A sandy material with slight amounts of clays and silts will be employed for cap construction due to the ease of placement and properties of this material, which lead to rapid consolidation.

Cap placement will be performed using hydraulic methods or, in the northern portions of the upper estuary, dry placement techniques. Placement of a 45 centimeter cap over 70 percent (135 acres) of the upper estuary will require approximately 300,000 cubic yards of sandy fill material.

In certain northern portions of the upper estuary, elevated flow rates and velocities associated with peak storm discharge from the Acushnet River may occur. In order to prevent the sediment containment cap from scouring (erosive) forces associated with such discharges, a portion of the northernmost upper estuary will be protected by the placement of stone and/or geoweb over the sediment cap. An area of approximately 20 acres will be covered in this manner to protect the sediment cap from erosion.

Placement of the cap material in some nearshore areas will result in the creation of additional shoreline wetland areas. Thus, as a final element of this remedial alternative, newly created intertidal areas within the upper estuary will be developed into a cord grass (Spartina alterniflora) salt marsh through planting of seeds or seedlings. In addition, environmental and aesthetic quality will be enhanced through planting upland vegetation in selected areas of the cap to screen the view of factories located on the west bank as well as to provide a higher level of integrity to upland portions of the cap.

Prior to field implementation of this remedial alternative, recent research and literature associated with degradation of PCBs will be examined for applicability to remediation of New Bedford Harbor sediments. This information may provide a framework for incorporation of a sediment amendment or modification program which would enhance the rate of PCB biodegradation already occurring in estuary sediments. If judged to be feasible, such a program would likely be implemented prior to the placement of fill material over existing estuary sediments.

REMEDIAL CONTAINMENT CAP EFFECTIVENESS

Consistent with the requirements of federal and state Superfund laws and regulations, a series of goals and objectives were identified in development of this remedial alternative. These general objectives were then refined to address specific conditions present at the New Bedford Harbor Superfund site and the greater New Bedford area. The principal remedial action program goals utilized as a basis for development of this remedial approach are:

1. Protection of human health and the environment;

2. Protection of environmental resources;

3. Minimization of site disturbance and contaminant release;

4. Cost effectiveness;

5. Consistency with legal requirements; and

6. Use of proven technology which would allow rapid remedial implementation.

This capping alternative addresses and fulfills each of these identified program goals. By physically containing the vast majority of PCBs present at the New Bedford Harbor site and eliminating 99 percent of the current PCB discharge from the upper estuary, implementation of this remedial program will result in a significant reduction of risk to both public and environmental receptors, and will support enhancement of existing environmental resources. Because site sediments are not disturbed during remedial program implementation, contaminant releases which result in increased adverse impacts and risks to the public and environment could be eliminated. The combination of previously proven engineering methods and environmental restoration techniques into an innovative approach for remediation of the estuary will allow for initiation of cleanup construction activities without the need for further extensive studies.

Based upon a review of existing site data, two principal PCB exposure routes have been identified for the New Bedford Harbor site. These routes are direct contact with PCB-contaminated sediment and consumption of fish containing PCBs. By capping sediment in the upper estuary which contain PCBs at concentration of 50 ppm or more, the potential for direct contact between human receptors and sediments with elevated concentrations of PCBs is virtually eliminated from the site. Additionally, through capping of sediments with 50 ppm or greater PCB in the upper estuary, the current PCB flux rate from the upper estuary to the remainder of harbor should be reduced by approximately 99 percent. This reduction of PCB flux from the upper estuary is

expected to result in a significant reduction of PCB exposure to environmental receptors, which will also result in lower PCB concentrations in biota within the site area.

PERMANENCE OF REMEDIAL SYSTEM

Extensive studies have been undertaken to assure that this capping system will be permanent. The selection and sizing of each component of the capping system has been made with this objective in mind. Actions or activities which may affect cap permanence have been identified and placed within two categories: 1) estuarine hydrodynamics and 2) public activities. Studies have been conducted to address the activities identified within these two broad categories. A summary is presented below.

Hydrodynamic Regime Effects

Detailed hydrodynamic studies have been undertaken by both EPA and AVX consultants. The results of these studies indicate that the upper estuary is a relatively shallow basin with restricted water circulation. In addition, these studies indicate that the upper estuary is a sediment depositional area, meaning that sediments tend to deposit within the upper estuary over time. As such, the dynamics of this area do not cause net sediment transport from the upper estuary. Because the upper estuary is relatively protected, and because tidal flow is restricted by the hurricane barrier, Route 6 bridge, I-195 bridge and Coggeshall Street Bridge, the forces associated with tides and winds within the upper estuary were not judged to be significant in terms of transporting sediment from the upper estuary to other parts of the harbor.

Comprehensive studies of the Acushnet River have also been performed by AVX. These studies describe flow from the Acushnet River during extremely high precipitation events. Based upon the results of these studies, design and sizing of the cap have been performed to assure long-term stability of the cap during these infrequent but intense periods of river flow.

Surface water run-off into the upper estuary also has been examined as a potential mechanism which could affect the permanence of the containment system. However, because the containment cap has been designed to withstand significant discharges from the Acushnet River, surface water erosion forces should not significantly affect the cap.

In summary, hydrodynamic forces examined were not found to pose a threat to the permanence of the cap. In areas where a significant erosive forces could exist, the cap has been designed to withstand these possible but rare occurrences. Furthermore, because the upper estuary a sediment depositional area, the thickness of the cap could be expected to increase with time.

Public Activities

Three public activities were identified as possibly impacting the permanence of the containment cap. These activities are: 1) beachcombing, 2) shellfishing, and 3) recreational boating.

A large amount of intertidal sandy area will be created as a result of cap construction. Because environmental conditions will be significantly improved in the upper estuary following construction activities, it is feasible that beachcombing could occur over portions of the capped areas. However, because the capping system has been designed with sediments which will rapidly consolidate, foot traffic over capped portions of the upper estuary should not result in any significant impact to the cap.

Shellfishing has been identified as the most likely intrusive activity to occur in the upper estuary following completion of this remedial program. The majority of this shellfishing is expected to occur within the upper 20 centimeters of the cap, with some limited digging extending to a depth of 30 centimeters. Disturbance of the cap through shellfishing at depths of more than 30 centimeters is expected only on an infrequent basis. In instances where shellfishing does proceed to depths greater than 30 centimeters, the geofabric will be encountered, preventing direct contact between the person shellfishing and the underlying estuary sediments. Burrows and holes created in the sediment by shellfishing will be self-healing due to the nature of sediments selected for construction of the cap and tidal action. Disturbances of the cap are expected to be repaired through tidal action and transport of sediments into the depressions within a few tidal cycles.

Recreational boating has also been identified as a possible public activity which could effect cap permanence, principally through anchoring of vessels and prop wash. Because the upper estuary is relatively shallow in nature, large vessels are not expected to travel into this portion of the harbor. Those smaller vessels which do travel into the upper estuary and anchor would be expected to create little disturbance to the cap. Although slight depressions in the cap may be created when vessel anchors are removed, these areas should be self-healing because of the same forces which will refill depressions made during shellfishing.

Recreational vessels which venture into the upper estuary may produce some limited prop wash. However, because the sediment cap will be composed of primarily sandy sediment, little prop wash is expected from this boat traffic. In instances where vessels venture into very shallow waters, the likelihood of motor or prop damage is greater than the occurrence of significant sediment cap disturbance. As such, recreational boating is not expected to have a significant effect on the permanence of the proposed remedial system.

In summary, consideration has been given to numerous activities which may effect the permanence of the sediment containment cap. Based on studies performed by EPA and AVX consultants, the cap has been designed to assure

that natural forces will not affect the permanence of the cap. Although human activities which result in disturbance to the cap may occur, these activities should be self-healing within a period of a few tidal cycles.

IN-SITU BIODEGRADATION OF PCBS

Studies performed at the New Bedford Harbor Site demonstrate widespread and extensive microbial biodegradation of PCBs. Biodegradation of PCBs within New Bedford Harbor sediments is caused by naturally occurring anaerobic (not requiring oxygen) microorganisms which degrade the PCBs. Studies performed to date demonstrate that these anaerobic microorganisms, which are especially active in the upper estuary, remove chlorine from PCB within harbor sediments, resulting in reduction of toxicity of this PCB. Installation of a cap over portions of the upper estuary is not expected to affect this rate of PCB degradation by these naturally occurring microorganisms.

REMEDIAL COST AND SCHEDULE

Cost estimates have been prepared to implement this proposed in place capping remedial alternative. These estimates indicate the cost of this program will be approximately $15 million. This remedial program, which is estimated to cost approximately the same amount as the EPA preferred Hot Spot remedial program, is exceptionally cost-effective. Compared to the EPA Hot Spot remedial program, it provides a comprehensive solution to PCB contamination throughout the harbor area, whereas the Hot Spot remedial program addresses only a five acre portion of the upper estuary.

Because this proposed capping remedial alternative utilizes a combination of proven construction methods, little additional study is necessary prior to preparation of final plans for remedial program implementation. Therefore, following acceptance of this remedial program for harbor remediation, final design and selection of a remedial contractor could be completed during 1990. The estimated time to construct the capping system is less than two years so that completion of remediation for the harbor is possible during 1992, assuming rapid approval of this remedial approach.

ADDITIONAL INFORMATION AND COMMENTS

Because the proposed contaminant capping alternative has been released to the public only recently, and because individuals may have questions or comments regarding this approach for New Bedford Harbor cleanup, AVX is willing to present this remedial alternative to other groups. Additionally, AVX is extremely interested in receiving public comment on this proposed plan.