

Letter Health Consultation

ACUSHNET RIVER ESTUARY
NEW BEDFORD, MASSACHUSETTS

**Prepared by the
Massachusetts Department of Public Health**

JANUARY 15, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

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MEMORANDUM

TO: Mayor Scott Lang, City of New Bedford

FROM: Suzanne Condon, Associate Commissioner
Director, Bureau of Environmental Health

CC: Marianne DeSouza, New Bedford Health Department
Kristin Decas, New Bedford Harbor Development Commission
Matthew Morrissey, New Bedford Economic Development Council

RE: Acushnet River Estuary

DATE: December 30, 2009

BACKGROUND AND STATEMENT OF ISSUES

This memorandum is a follow up to our meeting on June 2, 2009, when you requested that the Massachusetts Department of Public Health Bureau of Environmental Health (MDPH/BEH) evaluate the City's plans to introduce organized crew rowing activities to the Acushnet River Estuary and Upper New Bedford Harbor, in relation to potential environmental health concerns. We understand that this is a component of a long-term plan to revitalize New Bedford's waterfront. In response to your request, MDPH/BEH reviewed the risk assessment report prepared for the City by University Research Engineers & Associates, Inc. In addition, MDPH/BEH reviewed analytical results of surface water samples collected to evaluate potential impacts of combined sewer overflows (CSOs) and stormwater outflow pipes on the water quality of the proposed rowing courses within the Acushnet River Estuary and Upper Harbor (see Figure 1). This memorandum summarizes the results of MDPH/BEH's evaluation.

DISCUSSION

Review of Risk Assessment Report

MDPH/BEH reviewed the *Risk Characterization* report completed on July 3, 2008, by Dr. Barbara Callahan of University Research Engineers & Associates, Inc. Widespread

contamination of sediments with polychlorinated biphenyls (PCBs) and metals (cadmium, copper, and lead) has been documented in the Acushnet River Estuary, New Bedford Harbor, and Buzzard's Bay. Cleanup of the sediments is ongoing and is anticipated to continue over the long-term. The risk assessment evaluated potential risks to human health posed by using the Acushnet River Estuary for organized crew rowing activities prior to the conclusion of the cleanup (Callahan 2008).

This risk assessment is focused on evaluating exposure concerns for adults and youths participating in crew rowing activities between the Wood Street Bridge and the Coggeshall Street Bridge (i.e., the Acushnet River Estuary; see Figure 1). It assumes that crew rowers enter and exit their boats from a floating dock, eliminating direct contact with contaminated sediments at the river bottom (Callahan 2008). Although this risk assessment restricts its evaluation to the Acushnet River Estuary, its conclusions can also be applied to areas of the Upper Harbor located south of the Coggeshall Street Bridge due to the fact that PCB concentrations have been documented to be lower in New Bedford Harbor than the Acushnet River Estuary. Thus, the risk assessment is sufficiently conservative (protective) to be applied to crew rowing in areas of the Upper Harbor site as well.

Surface Water

Surface water quality data characterizing the Acushnet River Estuary area are available from the 1990s but recent surface water sampling data are limited to samples collected during dredging activities, and hence are not representative of concentrations when dredging is not occurring (e.g. average of 14 ppb during dredging). The risk assessment evaluated, in a qualitative way, opportunities for ingesting surface water while rowing. Based on interviews with rowers, Dr. Callahan assumed that rowers will ingest limited quantities of surface water due to spray from rough water or carrying the boat after it has been removed from the water. In addition, information gathered during the interviews indicated that capsizing is highly unusual and entrance and exit into sculls is generally from loading docks. Thus, based on this qualitative assessment of possible ingestion of water as well as the unlikely event of capsizing (and hence ingestion of water following capsizing), Dr. Callahan concluded that opportunities for exposure to PCBs in surface water due to ingestion of the water were not likely to result in health effects.

MDPH/BEH had previously evaluated possible health concerns from incidental ingestion of surface water in New Bedford Harbor. In a 1995 Public Health Assessment (PHA) conducted by MDPH/BEH for the New Bedford Harbor National Priority List (NPL) site, MDPH/BEH reviewed the available surface water data, including data from the Acushnet River Estuary, that showed PCB concentrations ranging from 0.1 to 1.0 parts per billion (ppb) along the extent of the proposed rowing course. The PHA concluded that health effects were not expected from accidental ingestion of harbor waters while swimming. Opportunities for exposure are expected to be lower while rowing versus swimming. Thus, based on current and historical data and the fact that rowers would most likely ingest very small amounts of water while rowing, MDPH/BEH agrees with the risk assessment conclusion that opportunities for exposure to surface water while rowing are unlikely to result in health effects.

Sediment

The risk assessment conducted by Dr. Callahan also focused on possible health effects due to the potential exposure of rowers via dermal contact with PCB-containing sediment suspended in surface water, as well as incidental ingestion of the sediment through hand-to-mouth contact.

The risk assessment assumed that sediment suspended in surface water would remain in contact with the rowers' skin for a longer period of time than surface water itself. Thus, any sediment would remain on the skin long enough for constituents to be absorbed into the body and long enough for incidental ingestion via hand-to-mouth contact to occur.

In order to estimate the concentration of PCBs in surface water for purposes of the risk assessment, 197 sediment samples collected from below the mean low water line in the Acushnet River Estuary were evaluated. The estimated surface water concentration of PCBs was calculated by combining two measures: the PCB concentration in sediment in the Estuary area and measurements of total suspended solids (TSS). Although the arithmetic mean total PCB concentration in the sediment samples was 512 parts per million (ppm), the risk assessment used a more conservative (protective) sediment concentration to evaluate health risk based on the 99% upper confidence limit of the arithmetic mean of the samples (1,114 ppm). For TSS, the risk assessment used TSS measured 30 minutes after dredging was completed in the estuary. This concentration was thought to represent equilibrium conditions in the estuary (Callahan 2008). The TSS measured after the remedial activities and used in these calculations was 16 milligrams sediment per liter of water (mg/L). A surface water concentration for PCBs was then calculated by multiplying the sediment concentration (1,114 mg/kg) by the TSS concentration (16 mg/L) and then using a conversion factor of 10^{-6} kg/mg. The resulting estimated surface water concentration for PCBs was 0.018 ppm, or 18 ppb.

The risk assessment relied on standard U.S. Environmental Protection Agency (EPA) assumptions to estimate exposures to adult or youth rowers assuming 18 ppb PCBs in surface water. This is comparable to the average concentration of PCBs detected in unfiltered surface water samples collected during dredging activities of 14 ppb (Battelle 2007-2009). Rowers were assumed to use the course 100 days a year for 10 years. Standard assumptions for body weights of adults and youth, as well as absorption of PCBs into the body via skin contact and ingestion of sediment were used. Based on these exposure assumptions and on the estimated surface water concentration (18 ppb), the risk assessment concluded that "no significant risk exists for rowers at this site" (Callahan 2008).

MDPH/BEH believes that appropriate and conservative assumptions were used throughout the risk assessment, and for the narrow focus of the document, its conclusion appears reasonable. MDPH/BEH also has experience evaluating exposure to PCBs related to recreational activities in the Housatonic River area of western Massachusetts. In 1997, MDPH/BEH prepared a report evaluating serum PCB levels among residents not occupationally exposed to PCBs but who canoed on the Housatonic River (MDPH 1997). PCBs have been detected in surface sediments in the Housatonic River at average concentrations ranging from 0.23 ppm in Reach 1 to 372 ppm in Reach 3 (prior to dredging) (MDPH 2008). Results of comparing individuals who canoed on the River with those who did not indicated no difference between the populations. These findings indicate that canoeing on the Housatonic River did not contribute to higher serum PCB levels and hence, did not result in health concerns (MDPH 1997).

The risk assessment by Dr. Callahan restricted its evaluation of contaminants to PCBs and did not include an evaluation of exposure to metals detected in sediment. As part of MDPH/BEH's review, MDPH/BEH calculated exposure doses for maximum concentrations of cadmium (70 ppm), copper (70 ppm), and lead (1,554 ppm) detected in sediments (ATSDR 2005; MDPH 1995). To evaluate if exposure to constituents in sediments could result in adverse health effects,

MDPH/BEH calculated exposure doses using the same exposure scenario as the risk assessment. The calculated exposure doses were less than available health-based guidelines from ATSDR. Also, under the same exposure conditions described above, the exposure doses would not result in an unusual cancer risk. Therefore, MDPH/BEH determined that under the same exposure scenario assumed by the risk assessment, exposures to the maximum concentrations of metals-contaminated sediment are unlikely to result in adverse health effects.

Review of New Bedford Acushnet River Estuary Rowing Course Bacteria Sampling

MDPH/BEH staff also reviewed results of bacteria analyses of surface water samples collected from the Acushnet River Estuary along the proposed Acushnet River rowing course (Table 1 and Figure 1). Data were not collected from the Upper Harbor rowing course (the site of the temporary course). The samples were collected by Apex, an environmental consulting firm hired by the City of New Bedford, at six locations along the proposed course and two locations that represented areas considered to be background. According to the information from Apex and the joint Massachusetts Department of Environmental Protection, U.S. Environmental Protection Agency, and ENSR International document, *Final Pathogen TMDL for Buzzards Bay Watershed* (March 2009), this area of the Acushnet River Estuary receives discharge from combined sewer overflows (CSOs) and stormwater outflow pipes. The samples along the proposed course were collected near locations of known CSOs, while the samples representing background areas were collected upstream and downstream of the proposed course.

CSOs collect surface runoff and sewage in one pipe to send to a wastewater treatment plant. However, after some rainfall or snow melt events, CSOs may release some contents directly into a surface water body, in this case, the Acushnet River Estuary. CSOs have thresholds of rainfall (both total rainfall and intensity of rainfall) after which direct release can be expected, but field sampling is required to calculate a threshold for each CSO. Stormwater outflow pipes discharge, untreated, water from storm drains that drain streets, parking lots, and other impervious surfaces. After a period of dry weather, the amount of potentially disease-causing organisms (such as certain bacteria and viruses) can accumulate on these surfaces and subsequent rain events can carry these organisms into the River. No information was available on the location of these stormwater outflow pipes or what areas they drain.

The surface water samples were collected during four discrete events: during dry weather and after rainfall of 0.5", 1.9", and 5.8" within the prior 24-hours. The samples were analyzed for the bacteria Enterococci and Fecal Coliform. Massachusetts requires that marine bathing beaches be sampled for Enterococci and shellfish areas be sampled for fecal coliform. The presence of elevated levels of these organisms indicates the presence of fecal pollution. Because use of the water for rowing is most closely analogous to use of water for swimming, we evaluated the Enterococci results and compared them to the bathing beach standard. Given that there is no standard for fecal coliform in bathing water, it will not be further evaluated.

The bathing water standard for Enterococci in a single sample is 104 colony forming units per 100 milliliter of water (cfu/100 ml). This standard is meant to be applied at bathing beaches, but it can be a useful tool in evaluating water quality data for other recreational use situations. The standard was not exceeded in the samples collected after dry weather and 0.5" of rain. The standard was exceeded in the samples collected from the six course locations and the

downstream background location after 1.9" of rain, and samples from all course and background locations exceeded the standard after 5.8" of rain.

As expected, the data indicate that the quality of the water deteriorates after a significant rain event. Although the data suggest rainfall somewhere between 0.5" (maximum intensity of 0.37 inch/hour) and 1.9" (maximum intensity of 0.7 inch/hour) within 24 hours results in elevated Enterococci levels, some data gaps remain. It would be important to determine at what quantity or intensity of rainfall the CSOs are affected, as the water quality will deteriorate after any CSO event, and that may be an important factor in determining whether and when to prohibit rowing due to bacteria. In addition, it is unclear what impact the tide may have had on the samples, as no data were available on the time of sample collection. If this area is heavily influenced by the tide, an incoming tide would tend to keep the bacteria in the River, while an outgoing tide would tend to flush it out. Thus, we cannot make specific recommendations about rainfall amounts that would necessitate closing the Acushnet River rowing course or the length of the closure based upon the limited data available. However, as we discussed on November 19, 2009, we have developed a sampling plan that encompasses both the Acushnet River and Upper Harbor courses (see Attachment A) that if implemented would gather the necessary information to make recommendations for both courses. MDPH/BEH staff would be able to provide technical assistance on the implementation of the plan.

CONCLUSIONS/RECOMMENDATIONS

ATSDR requires that overarching conclusion category statements be used to summarize findings of a health consultation. Conclusion category statements are selected from site-specific conditions such as the degree of public health hazard based on the presence and duration of human exposure, contaminant concentration, the nature of toxic effects associated with site-related contaminants, presence of physical hazards, and community health concerns. Based on a careful review, MDPH/BEH concurs with the conclusion of the risk assessment by Dr. Callahan, that for rowers entering and leaving crew boats from a floating dock, it is unlikely that incidental ingestion of or dermal contact with surface water or sediment suspended in surface water would harm people's health. MDPH/BEH also evaluated concentrations of metals in sediment under the same exposure assumptions and concluded that exposure opportunities to metals in sediment suspended in surface water are also unlikely to harm people's health. This conclusion is supported by our experience in the Housatonic River area of western Massachusetts, where people who canoed on the river did not have higher serum PCB levels. Please note that MDPH/BEH's review only pertains to the specific scenario of crew rowing described above. Additional evaluations will be necessary if remedial dredging activities occur within or in close proximity to the rowing course or for any future plans to expand recreational uses of the Acushnet River Estuary or Upper Harbor, for example swimming, activities that young children may participate in, or activities that would involve accessing the water directly from the shoreline such as canoeing or kayaking.

Bacterial data for the Acushnet River course appear to be insufficient to adequately evaluate in terms of a possible threshold above which rowing and other recreational uses the water should be suspended. MDPH/BEH has developed a sampling plan that would direct the collection of sufficient water quality data for the Acushnet River and Upper Harbor courses in order to best assess issues associated with health risk and/or preemptive closures related to rain events. As discussed, we would be happy to work with you and your team to evaluate additional data.

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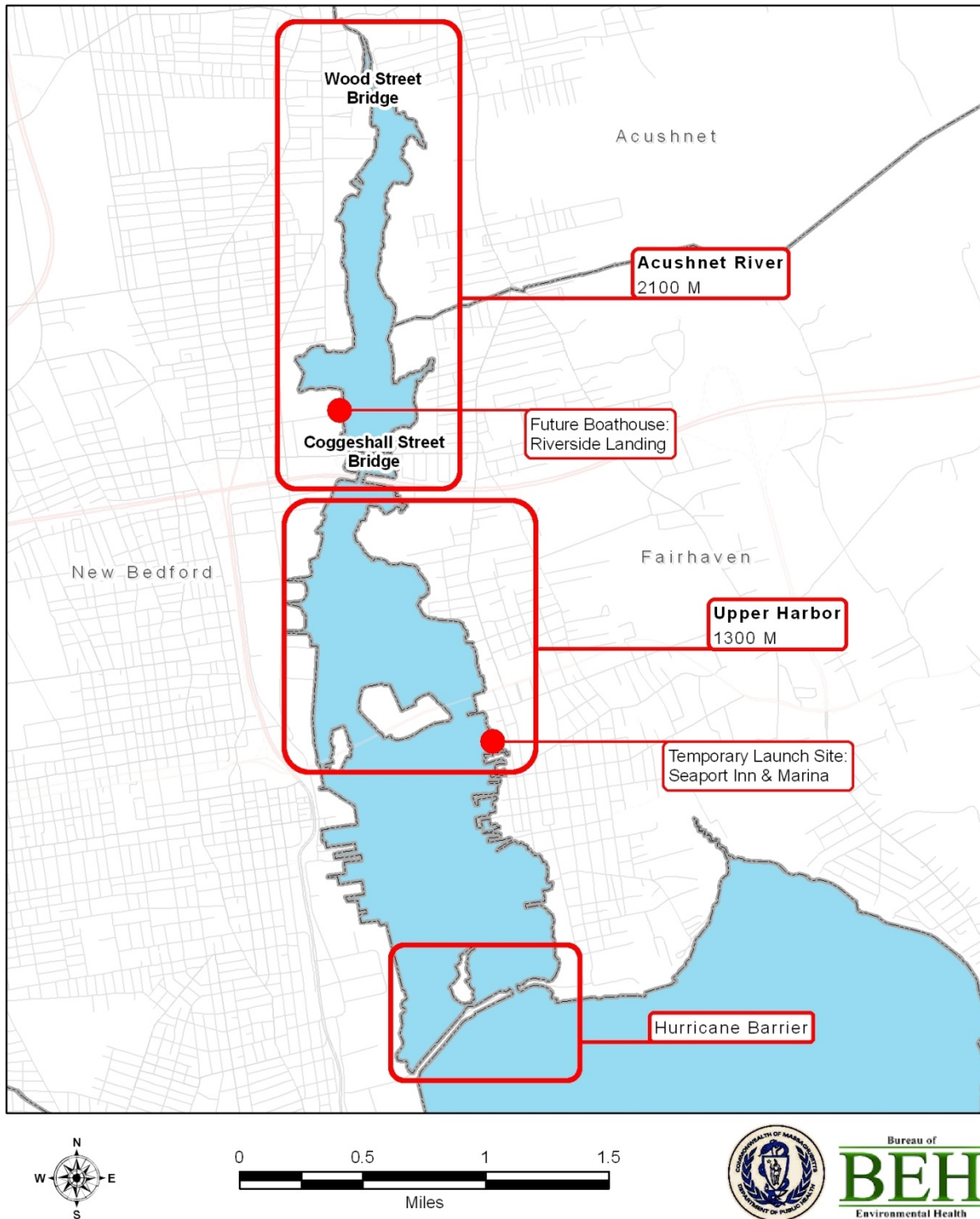
Table 1: New Bedford Acushnet River Estuary Rowing Course Enterococci Sampling Data

Date	Rainfall Within Prior 24 hrs.	Highest Rainfall Intensity In/hr	NBH- 01*	NBH- 02*	NBH- 03*	NBH- 04*	NBH- 05*	NBH- 06*	NBH- BN*	NBH- BS*	Bathing Water Standard*
5/16/08	0	0	20	41	10	20	10	20	20	31	104
7/23/08	0.5"	0.37	20	20	41	20	20	20	63	20	104
7/25/08	1.9"	0.7	110	240	170	140	200	130	41	220	104
8/12/08	5.8"	3.2	8700	12000	9200	11000	14000	20000	13000	13000	104

*- Data reported in colony forming units per 100 milliliter of water

Data taken from Upper Harbor Rowing Course Feasibility Evaluation by Apex Companies

Figure 1 Area of Proposed Rowing Courses



Attachment A

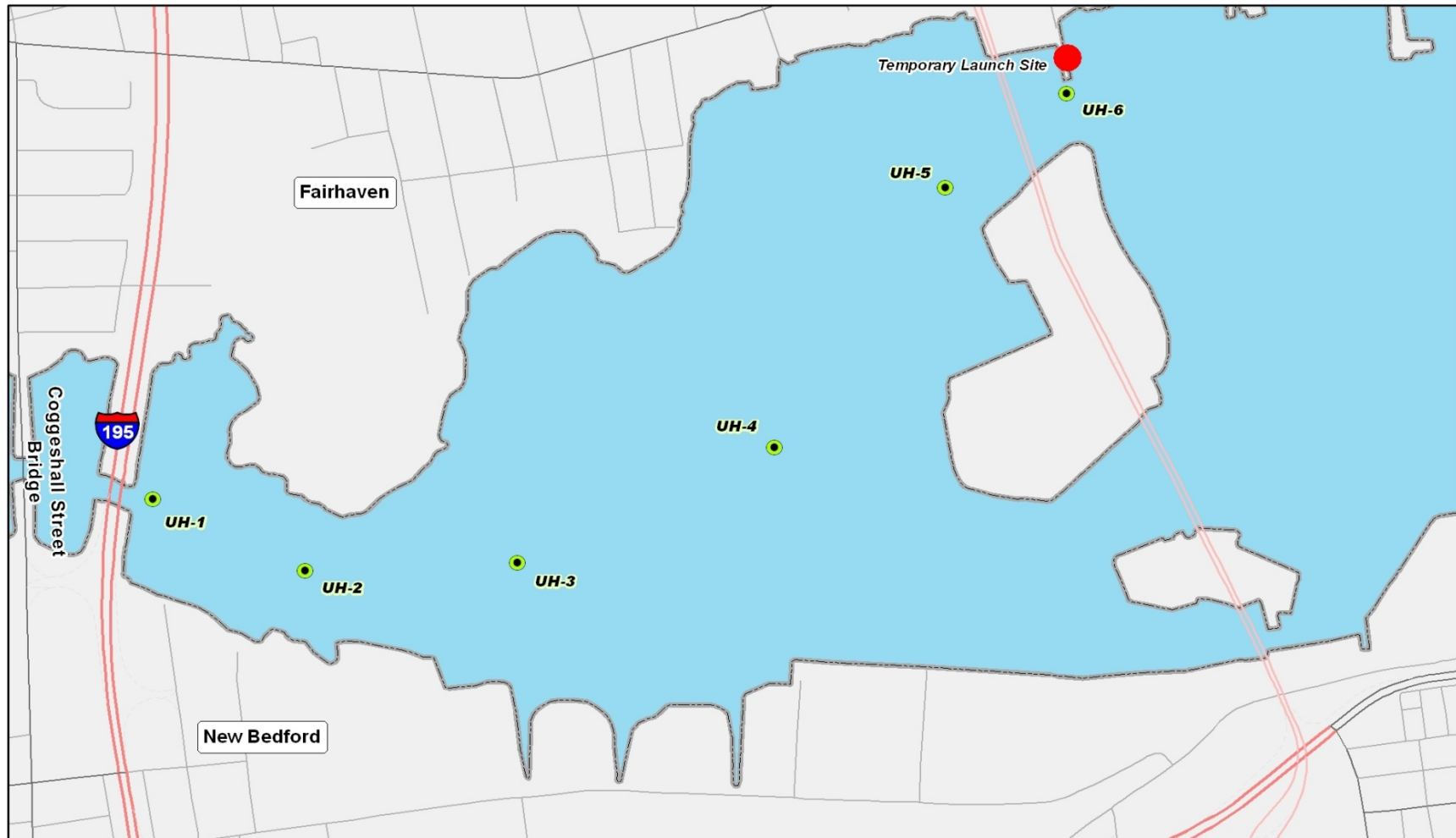
New Bedford Acushnet River and Upper Harbor Rowing Course Bacteria Sampling Plan

The purpose of this sampling plan is to determine the amount and intensity of rainfall that contributes to combined sewer overflows (CSOs) located in the area of proposed rowing courses along the Acushnet River and Upper Harbor. The nature and extent of bacteria released by the CSOs into the river will aid in establishing a health-based sampling frequency. The sampling plan can be implemented in two phases because the course along the permanent rowing facility will not be immediately operable. The first phase involves sampling along the course for the temporary rowing facility in the Upper Harbor while the next phase involves sampling along the course for the to-be-built rowing facility in the Acushnet River.

To determine the rainfall amount and intensity that causes one or more CSOs to activate, a rain gauge should be purchased and placed near the midpoint of the CSOs (approximately Lafayette Street for the temporary course and Manomet Street for the permanent course) that are located along each of the two rowing courses (this type of gauge typically costs approximately \$200.00). After each rainfall, the CSOs should be checked to determine if they were activated. Over time, the information on rates and amount of rainfall can be compared to CSO activation such that a simple predictive model can be developed. It will also allow New Bedford officials to proactively close the rowing course prior to CSO discharges and prevent public health impacts.

To determine the length of time bacteria remain at elevated levels in the river after a CSO discharges, water samples need to be collected during two tidal cycles after a CSO discharge. The samples should be collected after rain has ceased and between 1 hour before and 1 hour after the next tide (ex. if high tide is at 10:57 AM, collect samples between 9:57 AM and 11:57 AM) and again within the two hour time frame of the next corresponding tide (i.e., collect during one low tide and one high tide). We have identified six sampling points along the Upper Harbor rowing course (see Figure 1) and eight sampling points along the temporary rowing course (see Figure 2). All the water samples should be analyzed for *Enterococcus*. In order to collect sufficient data, this sampling plan should be implemented approximately five times and the data should then be evaluated to determine if sufficient data exists to develop the predictive model of the nature and extent of bacteria released.

Figure 1 Sampling Plan for Upper Harbor Rowing Course



● **Sampling Locations**

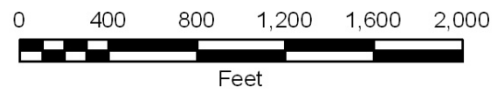



Figure 2 Sampling Plan for Acushnet River Rowing Course



 **Sampling Locations**

0 500 1,000 1,500 2,000 2,500

Feet

Bureau of
BEH
Environmental Health

Certification

The Massachusetts Department of Public Health prepared this Letter Health Consultation, New Bedford Superfund Site – Acushnet Estuary, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). At the time this Health Consultation was written, it was in accordance with the approved methodologies and procedures. Editorial review was completed by the Cooperative Agreement partner.

A handwritten signature in black ink, appearing to read "Paul G. De..." followed by a long horizontal flourish.

Technical Project Officer, Cooperative Agreement Team, CAPEB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

A handwritten signature in black ink, appearing to read "Paul W. Garbino" with a long vertical flourish extending downwards.

Team Leader, Cooperative Agreement Team, CAPEB, DHAC, ATSDR