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Memorandum

To: Scott Alfonse and Cheryl Henlin, City of New Bedford
From: David M. Sullivan, LSP CHMM, TRC Environmental Corporation
CC: Jeffrey Saunders, TRC Environmental Corporation
Subject: Proposed Nemasket Lots Investigation Approach
Date: March 3, 2010

The following outlines the proposed technical approach for initiating an environmental investigation of the Nemasket Street Lots. The approach proposed herein is an initial step in an iterative approach to the evaluation of this portion of the Parker Street Waste Site (PSWS). An iterative approach is consistent with prior environmental investigative activities undertaken by TRC Environmental Corporation (TRC), where available data were used to help define the initial stages of environmental investigation. Subsequent stages of investigation, where warranted, will be further defined by the incremental data collected from each investigative effort and will be designed to address specific data gaps, test hypotheses, or evaluate risk, as determined necessary for the investigation at that time.

Nemasket Technical Approach

The data collection described herein is an interim step toward the implementation of a remedy for the subject parcels. TRC will plan, implement and oversee the clearing and investigative work at the Nemasket Street lots (the former Bethel AME property). The Nemasket Street lots parcel identifications are summarized below and illustrated on Figure 1.

069 0092	069 0093
069 0086	069 0100
069 0088	069 0099
069 0091	069 0097

Clearing. The City of New Bedford (City) is prepared to perform clearing at the Nemasket Street lots to the degree necessary to facilitate access for geophysics equipment and a backhoe or excavator for test pit inspections of the subsurface. No additional disturbance of the subsurface is proposed

(i.e., no grubbing) as part of the clearing activity. An appropriately qualified contractor will be retained to clear small vegetative growth from the area using power equipment (a vehicle mounted brush hog). Larger growth will be addressed with chainsaws (manual labor). All vegetation will be cut/removed flush to the ground surface.

Dust monitoring and dust suppression consistent with soil removal work conducted by TRC at other areas of the Parker Street Waste Site (PSWS) will be implemented as a precaution to monitor and minimize/mitigate potential nuisance conditions.

All vegetation will be removed from the site for disposal as solid waste or managed through off-site composting, subject to appropriate regulatory approval. Alternatively, the vegetative matter may be chipped and spread on the lots to stabilize exposed surfaces.

Geophysics. Prior to test pit exploration of the Nemasket Street lots, TRC will oversee the implementation of a combined Ground Penetrating Radar (GPR) and Electromagnetic Induction (EMI) investigation of the parcels. The purpose of this investigation is to help locate medium to large buried metallic objects. The geophysics contractor will employ an SIR System-3000 and/or SIR System-2000 GPR unit with multiple antennas (depending upon the application/conditions). The systems have a real-time display and collection of data is recorded on a flash card which is downloaded and edited after the survey is completed. Real-time data acquisition will allow the marking of detected items in the field. For the EMI investigation, an EM Profiler EMP-400 electromagnetic induction tool will be utilized that will also provide real-time data collection allowing the marking of detected subsurface anomalies.

The results of the GPR/EMI investigation will be evaluated and anomalies warranting further investigation will be evaluated by test pit exploration.

Test Pit Exploration. The number of test pits to be excavated will depend in part on the results of the geophysics investigation.

The test pit excavation conducted previously at the site generally measured approximately 2-feet wide by 8-feet long and, if feasible, test pits were excavated until native soil material (e.g., peat material) was encountered (i.e., approximately 7 to 9-feet below grade). A similar protocol will be followed at the Nemasket Street lots unless site data/conditions require an alternative approach.

The soil will be removed from each test pit in approximately 1-foot flights. The material will be temporarily stockpiled on polyethylene sheeting for observation. As each flight is removed, the material will be examined using hand tools and identifiable or potentially identifiable fill material will be segregated, field documented and photographed by TRC's field geologist/engineer. A subset of the identifiable or potentially identifiable material, where identified, will be retained for further expert forensic analysis. TRC will evaluate and log the geologic character of the soil samples consistent with the Burmeister (1958) method (consistent with the PSWS soil boring program conducted prior by TRC).

Air monitoring will be performed using a combination of real-time dust monitoring upwind and downwind of the work area. The dust monitoring will consist of TSI Dustrak™ units (or equivalent) equipped with size-selective inlet for particles of 10 micrometers in diameter or less (PM10). Background samples will be collected for at least 15 minutes at each location prior to the start of site activities and the dust monitoring instruments will be zeroed daily before use and at the end of the day. Data will be logged at 60-second intervals and monitored periodically by field personnel. Data will be downloaded daily. In addition, volatile organic compound (VOC) air monitoring will be

performed using a photo-ionization detector (PID) to monitor for the presence of VOCs within the work area breathing zone.

Following completion, each test pit will be immediately backfilled with the stockpiled material, taking care to minimize mixing of horizons. All excavated material will be returned to the original test pit location. Each test pit will be subsequently surveyed by Land Planning, Incorporated of Hanson, Massachusetts. The locations will be plotted on an aerial photograph obtained from the Massachusetts Geographic Information System, and may also be incorporated into line drawings of the area.

Soil Sampling. No soil borings are proposed at this time. The City proposes to design a soil boring program to evaluate and initially delineate impacts from waste disposal activity that is guided by the results of the geophysics work, as well as the results of prior soil sampling conducted by BETA.

During the test pit investigation, TRC will conduct field screening of soil samples based on visual and olfactory observations, jar headspace readings using an appropriate calibrated PID, and professional judgment. Screening will be conducted consistent with TRC Standard Operating Procedures (SOPs) and general industry practice. TRC field investigators may collect soil samples for analysis to supplement the findings of the test pit program. Sample decisions will be based on professional judgment in consultation with the Licensed Site Professional (LSP). Where a soil sampling decision is made, one or more of the following analytical methods will be utilized for soil analysis, consistent with prior work conducted by TRC at the PSWS:

- Polychlorinated biphenyls (PCBs) as Aroclors by SW-846 Method 8082
- Polyaromatic hydrocarbons (PAHs) by SW-846 Method 8270C
- Massachusetts Contingency Plan (MCP) Metals/Hg – antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, thallium, vanadium, zinc and mercury by SW-846 Methods 6010B/7471A.

In addition, soil sampling may include the following analysis for dioxins and PCB congeners, consistent with TRC's recommended technical approach for dioxins at the PSWS (see Attachment A).

- Chlorinated dioxin/dibenzofuran congeners by SW-846 Method 8290 to evaluate the presence/absence of these compounds
- PCB congeners by SW-846 Method 1668A to establish a basis for correlation and to evaluate the potential presence of PCB dioxin-like congeners.

As a contingency, TRC is prepared to submit soil samples for VOC analysis contingent upon the results of field screening and professional judgment. TRC will notify the City when such judgments are made. The following analytical method will be specified in such an event:

- VOCs by Method SW-846 Method 8260B.

We look forward to discussing this memorandum with you at your earliest convenience.

ATTACHMENT A

RECOMMENDED TECHNICAL APPROACH FOR DIOXIN EVALUATION

PARKER STREET WASTE SITE, NEW BEDFORD, MASSACHUSETTS

March 2, 2010

Introduction

TRC Environmental Corporation (TRC) prepared this Recommended Technical Approach (RTA) document for the following purposes:

1. To document an initial evaluation of the potential for the presence of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), collectively referred to as dioxin compounds, at various portions of the Parker Street Waste Site (PSWS);
2. To highlight available dioxin (e.g., PCDDs/PCDFs) compound soil analytical data collected from the Keith Middle School (KMS) portion of the PSWS by a prior consultant; and
3. To provide a suggested framework for further data collection.

The PSWS is located in the general vicinity of New Bedford High School (NBHS), Keith Middle School (KMS) and Walsh Field in New Bedford, Massachusetts. The PSWS is a listed site regulated under the Massachusetts Contingency Plan (310 CMR 40.0000), tracked under primary Release Tracking Number (RTN) 4-15685, and is also regulated under the United States Environmental Protection Agency (EPA) through the Toxic Substances Control Act (TSCA; 40 CFR Part 761 et.seq.) where regulated concentrations of polychlorinated biphenyls (PCBs) are present. Please see attached Figure 1 for a map illustrating geographic features identified in this RTA Document.

Summary

TRC recommends the collection of soil and fill samples for dioxin compound analysis from the PSWS, in collaboration with the Office of Research and Standards (ORS) of the Massachusetts Department of Environmental Protection (MassDEP) and EPA, to evaluate the potential presence of dioxin compounds, estimate the potential risk posed by the presence of any detected dioxin compounds, and assess the relationship between any detected dioxin compounds and potential precursor compounds and other contaminants. TRC proposed framework for data collection is described herein.

Note that based upon the available evidence, TRC does not believe that sampling for dioxin compounds south of Parker Street, particularly at the Walsh Field and former Keith Junior High School (KJHS) portion of the PSWS, is warranted. This is based on the absence of significant concentrations of precursor compounds¹ (i.e., chlorinated organic compounds such as PCBs, chlorobenzenes and chlorophenols) and site-specific historical information. This history indicates that waste disposal activities at Walsh pre-date the disposal of dioxin compound precursors such as polychlorinated biphenyls (PCBs) and the intensive use of such precursor compounds by the City of New Bedford industrial base. However, other portions of the PSWS include chemical contaminants, principally PCBs, which could serve, under appropriate conditions, as precursors to dioxin compounds.

¹ Precursors are foundation molecules to dioxin compound formation from which PCDDs/PCDFs can form from the thermal breakdown and molecular rearrangement of precursor ring compounds, which are defined as chlorinated aromatic hydrocarbons that have a structural resemblance to the PCDD/PCDF molecules.

Background Information on Dioxin

PCDDs and PCDFs are tricyclic aromatic compounds with similar chemical and physical properties. They are ubiquitous in the environment² (EPA, 2006). However, they do not generally occur naturally³, nor are they intentionally produced. PCDDs/PCDFs also result as incidental by-products from processes that manufacture or use chlorine containing chemicals.⁴ There are 75 positional isomers of PCDDs and 135 positional isomers of PCDFs (ECH 88, 1989). The term “dioxin-like” includes congeners of PCDDs and PCDFs having chlorine atoms in the 2, 3, 7, and 8 positions on the molecule, and certain coplanar-substituted polychlorinated biphenyls (PCBs). The term “dioxin-like” refers to the fact that these compounds have similar chemical structure and physical-chemical properties and invoke a similar toxic response (EPA, 2006).

Because of the hydrophobic nature and resistance to metabolism of dioxin-like chemicals, they tend to persist and bioaccumulate in the fatty tissues of animals and humans. Consequently, the principal route of chronic population exposure is through the dietary consumption of animal fats, fish, shellfish, and dairy products. Dioxin-like compounds are persistent in soils and sediments, with environmental half-lives ranging from years to several decades (EPA, 2006).

Evaluation of Available Information

The following provides an evaluation of available information on PSWS disposal activity, site history/timeline, available PSWS dioxin data, distribution of detected compounds, and dioxin precursor compounds and burning activity.

Disposal Activity

Much of the information about disposal activities at the PSWS is derived from visible information such as aerial photographs that show the progression of deposition across the area. Additional information is available from newspaper accounts.

Generally, municipal waste was disposed of east of Hathaway Boulevard, and industrial waste was disposed of west of Hathaway Boulevard, although municipal wastes and construction debris such as large boulders were also disposed of west of Hathaway Boulevard. During the time period when the disposal activity took place, the municipal waste was not necessarily separated from industrial waste so trash trucks could have picked up a mix of wastes.

² The major identified sources of environmental releases of dioxin-like compounds are grouped into six broad categories: combustion sources, metals smelting, refining and process sources, chemical manufacturing sources, natural sources, and environmental reservoirs (EPA, 2006). Some of the major known sources of atmospheric impacts by PCDDs/PCDFs are industrial activities in which a combustion process is involved (Abad et al., 2002). Burning of domestic refuse in backyard burn barrels has emerged as the largest source of dioxin emissions to the U.S. environment (EPA, 2006). Consequently, atmospheric deposition represents a source of PCDDs/PCDFs onto the surface of soils. In addition, the presence of PCDDs/PCDFs on vegetation surfaces is due to the retention of PCDDs/PCDFs by direct deposition of airborne particles or absorption of vapor-phase contaminants, including those attributable to evaporation from soils (Abad et al., 2002).

³ The evidence for the widespread existence of natural sources of dioxin compounds is quite weak. Recent studies suggest that PCDDs/PCDFs can form under certain environmental conditions (e.g., composting) from the action of microorganisms on chlorinated phenolic compounds. Similarly, PCDDs/PCDFs have been reported to form during photolysis of highly chlorinated phenols. Certain clays used in ceramics (e.g., ball clay) are believed to have become impacted by dioxin as a result of natural processes, but the source of the impacts remains unknown. Some have suggested that volcanoes may be a natural source, though there is no reliable evidence that volcanoes produce and emit significant amounts of dioxin during eruptions (EPA, 2006).

⁴ PCDDs/PCDFs can be formed as an unintentional byproduct where chlorine reacts with organic chemicals with similar structural features to dioxins under high temperatures.

Trash and ash were used to fill in the swampy wetland areas that originally comprised the site and were eventually spread for redevelopment. Wastes disposed included tires, industrial wastes, bottles, rusted cars, coal ash, curbing, big boulders, cement, cans, batteries, ash, trees, and tanned leather.

As discussed below, wastes disposed of at Walsh Field tend to be older than those at present-day New Bedford High School (NBHS) based on aerial photographic analysis.

Distribution of Detected Compounds

The compounds detected at the PSWS generally consist of PCBs, heavy metals, and polyaromatic hydrocarbons (PAHs). A “picture” of the geographic distribution of the impacts in soil has emerged from the nearly 3,000 soil samples collected for chemical analysis from the PSWS (exclusive of the investigative work conducted at KMS by others). Some compounds are relatively ubiquitous and some are found in only a portion of the site.

Ubiquitous contaminants include lead and PAHs. Lead is found across the PSWS including Walsh Field, NBHS, and some residential and commercial properties evaluated to date.

Other contaminants have very limited geographic distribution. For example, arsenic was detected in surface soil at the two baseball diamonds at Walsh Field, but not elsewhere at similar depths and concentrations.

Overall contaminant distribution patterns have also been identified, with Parker Street serving as a geographic “dividing line”.

South of Parker Street. To the south of Parker Street (i.e., Walsh Field and the former Keith Junior High School [KJHS]), heavy metals such as lead, cadmium and arsenic as well as PAHs are commonly detected. However, PCBs are not detected at concentrations of significance south of Parker Street. For example, prior to the work conducted at the site by TRC, a previous consultant collected 69 soil samples from Walsh Field for PCB analysis, primarily from depth sequences within the contaminated fill. Most of the results were non-detect, with the highest PCB concentration detected in Walsh Field soil at 0.19 mg/kg. Other organic contaminants are generally not found in soil samples collected south of Parker Street. Based on risk evaluations conducted to date, risk-contributing compounds south of Parker Street generally include lead, cadmium, and arsenic, with lesser contributions by some PAHs, dibenzofuran (non-chlorinated), acenaphthylene, and diesel range organics.

North of Parker Street. To the north of Parker Street (i.e., NBHS, KMS, and some residential properties), contaminants such as barium and PCBs are more prevalent. Risk-contributing chemicals to the north of Parker Street, using the NBHS campus as an example, include PCBs, cadmium, lead, benzo(a)pyrene, dibenz(a,h)anthracene, benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, arsenic, barium, cadmium, chromium, and lead, with prevalence varying by location. (Recently, volatile organic compounds (VOCs) have come under evaluation at NBHS, also.)

Site History/Timeline

Apparent impacts at the PSWS are evident as early as 1936 based on a review of aerial images. In 1961, the disposal activity had stopped and the site had vegetative cover probably due to Corp of Engineers grading of the site about 1960 to create the Liberty Gardens. In 1963, the site continued to have a vegetative cover. By 1971, the construction of NBHS was in progress. Fill material displaced by the construction of the NBHS was deposited to the west of Hathaway Boulevard at the location of the KMS (which also appears to have been impacted by PSWS-related waste management practices).

Walsh Field athletic areas are also depicted in the earliest available aerial photographs, including 1936. Walsh Field appears as a fully developed and maintained athletic complex in the 1950s. The absence of significant concentrations of PCBs (< 0.19 mg/kg) in Walsh Field soil/fill and evidence of the early development of the athletic complex relative to PSWS disposal activity suggest that waste deposition at Walsh Field pre-dated the disposal of significant quantities of PCBs.

Available PSWS Dioxin Data

On October 15, 2009, KMS dioxin compound soil data were provided to TRC by EPA in tabulated form. TRC's initial review of the tabulated dioxin compound data noted the following:

- Results for a number of samples expressed as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) Toxic Equivalents (TEQs) (see attached tables) exceed the Method 1 S-1 soil cleanup standard of 20 picograms per gram (pg/g) or parts per trillion (ppt). However, the concentrations presented are not alarming from a risk assessment perspective as they would correspond to less than a 1 in 100,000 cancer risk for a residential exposure scenario. Additional information is needed to determine the representativeness of the data (e.g., biased-high, low, etc.).
- The TCDD TEQs (last column in the multi-page table) appear to have been calculated using the 1998 World Health Organization (WHO) toxicity equivalency factors (TEFs) for dioxin compounds. MassDEP has developed TEFs (MassDEP, 1991) that differ from those developed by the WHO. ORS will likely want the MassDEP TEFs or updated WHO TEFs (van den Berg, 2006) used to calculate the dioxin TEQs. However, WHO only developed TEFs for dioxin/dibenzofuran congeners with chlorines in the 2, 3, 7 and 8 positions (those congeners included in the tabulated data). MassDEP has developed TEFs for all dioxin/dibenzofuran congeners, even those that do not have chlorines in each of the 2, 3, 7 and 8 positions.

TRC notes further that congener/isomer-specific analyses data (if available) can be used to examine PCDD/PCDF profiles found in soils. Profiles represent a valuable tool in identifying precursor compounds (e.g., thermal formation) as well as potential sources of PCDDs/PCDFs. In addition, congener/isomer-specific data (e.g., actual PCDD/PCDF concentrations found in soil samples) and not TEF-weighted data can be used for comparison to PCDD/PCDF concentrations found in soils both in the US and worldwide. Such comparisons allow us to place PSWS data in perspective and answer the question: How do PCDD/PCDF data in PSWS soils compare to global background concentrations?

Given the fate and transport behavior of dioxin compounds, which in large part is very similar to PCBs and PAHs (strong tendency to partition to solid phases, very low water solubility and very low volatility), TRC does not believe that the remedial approaches proposed for the PSWS (i.e., prevent exposure) will be significantly affected.

Precursor Compounds and Burning Activity

Dioxin compounds may be formed as part of a burning/combustion process under appropriate conditions. The presence of ash at the PSWS suggests the presence of burned materials.

The available soils data indicate that PCBs are the only PCDD/PCDF precursor compounds at PSWS. The available analytical data provide no indication of the presence of any other chlorinated organic compounds with the potential to serve as dioxin precursors in significant concentrations. This is based on analysis for VOCs, semivolatile organic compounds (SVOCs), pesticides, and PCBs conducted by the prior consultant and TRC.

The highest concentrations of PCBs detected at PSWS have been detected at KMS, the KMS wetland, the Nemasket Street Lots (former Bethel AME parcels), and some residential locations. For example, PCBs detected in excess of 100 milligrams per kilogram (mg/kg) have been detected in soil samples collected from the following locations:

- KMS (pre-remediation)
- Nemasket Street Lots (Former Bethel AME parcels)
- 101 Greenwood Street

PCBs in excess of 50 mg/kg have been detected at the following locations:

- 128 Ruggles Street
- 102 Greenwood Street
- NBHS (two locations)

Anecdotal evidence indicates that products of waste burning, whether on-site or waste that had been burned/incinerated off-site, were disposed of at the PSWS. Subsequent filling and grading activity is likely to have displaced the impacts of burning activity (such as the transfer of fill material from the vicinity of the NBHS building to the KMS grounds). Based upon the history of the area that indicates some waste burning, it would be expected that select metals, as well as PAHs, would be present at elevated concentrations in the ash due to the burning of trash. Hence, the presence of enriched metals and PAH concentrations (as well as PAH profiles) could be another indicator of waste combustion. The presence of elevated concentrations of PCBs (see above samples) in combination with elevated concentrations of pyrogenic PAHs and selected metals could serve as useful chemical criteria for identifying candidate sites where soil samples would be collected to undergo PCDD/PCDF analyses.

Conclusions

- Dioxins are unlikely to be present in Walsh Field fill and soil because deposition at Walsh Field pre-dated the disposal of PCB wastes at the PSWS. Absent combustion activity in the presence of chlorinated organic precursor compounds such as PCBs, dioxin compound formation is not expected to be an important process at this location.
- Dioxin compound precursors at the PSWS are principally associated with PCBs. The available analytical data provide no indication of the presence of any other chlorinated organic compounds in significant concentrations.

- The highest concentrations of PCBs have been detected at KMS (pre-remediation), the Nemasket Street Lots, a few residential parcels, and localized areas on the NBHS campus.
- Artifacts of burning (the presence of ash, metal enrichment, and PAHs) are generally ubiquitous in fill material at the PSWS. However, the combination of burning artifacts (ash, metals enrichment, and PAHs) and precursor chemicals (e.g., PCBs) is found to the north of Parker Street.

Recommendations

TRC recommends the following activities:

- The collection of soil and fill samples for dioxin compound analysis from select locations at the PSWS. These data would be used for the following:
 - Evaluate the presence of dioxin compounds at the PSWS.
 - Estimate the potential risks posed by the presence of measured concentrations of PCDDs/PCDFs.

In developing an investigation program for an area targeted for PCDD/PCDF soil sampling, TRC will review relevant soil data from the area focusing principally on metals results, PAH and SVOC data, and PCB (homolog or aroclor) results to develop a process for sample selection. As noted above, artifacts of burning include the presence of ash, metal enrichment, and PAHs. Soil samples with elevated results, in particular those with concentrations greater than regulatory limits for PCBs and/or PAHs and/or metals may be used to identify a population of samples for potential PCDD/PCDF analyses. The specifics of the sampling program will be tailored to the specifics of each area targeted for evaluation.

References

- Abad et al, 2002 Abad, E; Adrados, A; Caixach, J; et al. (2002) Dioxin abatement strategies and mass balance at a municipal waste management plant. *Environ. Sci. Technol.* 36:92-99.
- ECH 88, 1989 International Programme on Chemical Safety, Environmental Health Criteria 88, *Polychlorinated dibenzo-para-dioxins and Dibenzofurans*, Published under the joint sponsorship of the United Nations Environment Programme, the International Labour Organisation, and the World Health Organization. World Health Organization, Geneva. 1988
- EPA, 2006 *An Inventory of Sources and Environmental Releases of Dioxin-Like Compounds in the United States for the Years 1987, 1995, and 2000*. National Center for Environmental Assessment, Office of Research and Development, U.S. Environmental Protection Agency, Washington, DC 20460. EPA/600/P-03/002F November 2006.

MassDEP, 1991 Re-evaluation of the Toxicity Equivalency Factors for Dioxins and Dibenzofurans. Office of Research and Standards. Massachusetts Department of Environmental Protection. October 1991.

Vallero, 2003 *Engineering the Risks of Hazardous Waste*. Butterworth-Heinemann, 2003.

Van den Berg, M. et al., 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. *Toxicol. Sci.* 93(2):223-241. October 2006.

TABLE X
SUMMARY OF SOIL ANALYSES FOR
CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS
 McCoy Field
 New Bedford, Massachusetts

Sample ID	2,3,7,8-TCDD pg/g		TCDD TEQ	1,2,3,7,8-PeCDD pg/g		TCDD TEQ	1,2,3,4,7,8- HxCDD pg/g		TCDD TEQ	1,2,3,6,7,8- HxCDD pg/g		TCDD TEQ	1,2,3,4,6,7,8- HpCDD pg/g		TCDD TEQ
TCDD TEF _{DTP-WHO98} ---->	1			1			0.1			0.1			0.01		
Q4-A & B	0.2	U	0.1	0.3	U	0.15	1.4	J	0.14	6.2	0.62	5.2	0.52	117	1.17
Q16 A & B	<i>0.8</i>	J	0.8	2.2	J	2.2	3.4	J	0.34	16.8	1.68	10.2	1.02	629	6.29
Q24 A & B	1.4	J	1.4	3.6	J	3.6	6.7		0.67	44.2	4.42	23.5	2.35	1790	17.9
Q37 A, B, & C	<i>0.68</i>	J	0.68	2.1	J	2.1	3.6	J	0.36	9.3	0.93	9	0.9	237	2.37
Duplicate 11	2.8		2.8	6		6	5.2		0.52	34.1	3.41	24.1	2.41	1310	13.1
Duplicate 13	0.95	J	0.95	3.2	J	3.2	2.6	J	0.26	9	0.9	7.9	0.79	146	1.46
Q6-Embankment A & B	0.66	J	0.66	2.5	J	2.5	2.3	J	0.23	8	0.8	7	0.7	129	1.29
Q11-Embankment A &	0.4	J	0.4	1.8	J	1.8	2.2	J	0.22	5.8	0.58	6	0.6	106	1.06
Arithmetic Mean			0.97			2.69			0.34		1.67		1.16		5.58
Maximum			2.8			6			0.67		4.42		2.41		17.9
Method 1 S-1 Soil standard			4			4			4		4		4		4
Method 1 S-2 Soil standard			6			6			6		6		6		6
Method 1 S-3 Soil standard			20			20			20		20		20		20
Upper Concentration Limit			200			200			200		200		200		200

pg/g = picograms per grams (parts per trillion).
 U = Undetected at quantitation limit presented.
 J = Estimated concentration below calibration range.
 C = Value reported from confirmatory analysis.
 D = Value reported from dilution analysis.
 X = Interference from diphenyl ethers.
 Value in italics = Estimated most probable concentration (EMPC)

TABLE X
SUMMARY OF SOIL ANALYSES FOR
CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS
 McCoy Field
 New Bedford, Massachusetts

Sample ID	1,2,3,4,6,7,8,9-OCDD pg/g	TCDD TEQ	2,3,7,8-TCDF pg/g	TCDD TEQ	1,2,3,7,8-PeCDF pg/g	TCDD TEQ	2,3,4,7,8-PeCDF pg/g	TCDD TEQ	1,2,3,4,7,8-HxCDF pg/g	TCDD TEQ	1,2,3,6,7,8-HxCDF pg/g	TCDD TEQ
TCDD TEF _{DTP-WHO₉₈} ---->	0.0001		0.1		0.05		0.5		0.1		0.1	
Q4-A & B	1260	0.126	8.2 C	0.82	0.1 U	0.0025	14.7	7.35	93.7	9.37	33.3	3.33
Q16 A & B	4690 D	0.469	11.1 C	1.11	0.1 U	0.0025	11.5	5.75	36.5	3.65	17	1.7
Q24 A & B	12160 D	1.216	15.7 C	1.57	0.1 U	0.0025	16.3	8.15	44.2	4.42	18.9	1.89
Q37 A, B, & C	3020	0.302	5.2 C	0.52	0.08 U	0.002	5.6	2.8	23.7	2.37	9.9	0.99
Duplicate 11	10210 D	1.021	18.4 C	1.84	0.2 U	0.005	19.3	9.65	51.9	5.19	22.2	2.22
Duplicate 13	1400	0.14	13 C	1.3	0.1 U	0.0025	17.6	8.8	34.4	3.44	16.8	1.68
Q6-Embankment A & B	1190	0.119	11.2 C	1.12	0.6 U	0.015	9.9	4.95	29.6	2.96	13.5	1.35
Q11-Embankment A &	1640	0.164	5.3 C	0.53	0.05 U	0.00125	5.8	2.9	11.4	1.14	6.2	0.62
Arithmetic Mean		0.44		1.10		0.004		6.29		4.07		1.72
Maximum		1.22		1.84		0.015		9.65		9.37		3.33
Method 1 S-1 Soil standard		4		4		4		4		4		4
Method 1 S-2 Soil standard		6		6		6		6		6		6
Method 1 S-3 Soil standard		20		20		20		20		20		20
Upper Concentration Limit		200		200		200		200		200		200

pg/g = picograms per gram
 U = Undetected at quantitati
 J = Estimated concentration
 C = Value reported from con
 D = Value reported from dil
 X = Interference from diphei
 Value in italics = Estimated r

**TABLE X
SUMMARY OF SOIL ANALYSES FOR
CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS
McCoy Field
New Bedford, Massachusetts**

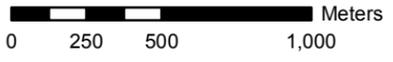
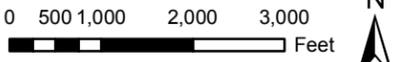
Sample ID	2,3,4,6,7,8- HxCDF pg/g	TCDD TEQ	1,2,3,7,8,9- HxCDF pg/g	TCDD TEQ	1,2,3,4,6,7,8- HpCDF pg/g	TCDD TEQ	1,2,3,4,7,8,9- HpCDF pg/g	TCDD TEQ	1,2,3,4,6,7,8,9- OCDF pg/g	TCDD TEQ	Sample Total TCDD pg/g	Lab sheet TEQs pg/g
TCDD TEF _{DFP-WHO98} ---->	0.1		0.1		0.01		0.01		0.0001			
Q4-A & B	19.1	1.91	<i>5.8</i> X	0.58	76.3	0.763	27.3	0.273	156	0.0156	27.2	28.7
Q16 A & B	16.4	1.64	<i>7.5</i> X	0.75	172	1.72	12.1	0.121	276	0.0276	29.3	32.6
Q24 A & B	20.2	2.02	<i>8.6</i> X	0.86	346	3.46	20.3	0.203	1320	0.132	54.3	64.6
Q37 A, B, & C	8.4	0.84	<i>4.2</i> XJ	0.42	99.7	0.997	8.2	0.082	220	0.022	16.7	18.6
Duplicate 11	22.4	2.24	<i>10.4</i> X	1.04	310	3.1	18.2	0.182	628	0.0628	54.8	61.6
Duplicate 13	20.9	2.09	<i>10.9</i> X	1.09	108	1.08	8.5	0.085	128	0.0128	27.3	27.1
Q6-Embankment A & B	14.8	1.48	<i>10.1</i> X	1.01	88.8	0.888	6.2	0.062	100	0.01	20.1	20.2
Q11-Embankment A & B	8.5	0.85	<i>3.8</i> XJ	0.38	45.6	0.456	3.3 J	0.033	58.4	0.00584	11.7	12.4
Arithmetic Mean		1.63		0.77		1.56		0.13		0.036	30.2	33.2
Maximum		2.24		1.09		3.46		0.27		0.132	54.8	64.6
Method 1 S-1 Soil standard		4		4		4		4		4	4	
Method 1 S-2 Soil standard		6		6		6		6		6	6	
Method 1 S-3 Soil standard		20		20		20		20		20	20	
Upper Concentration Limit		200		200		200		200		200	200	

pg/g = picograms per gram:
 U = Undetected at quantitati
 J = Estimated concentration
 C = Value reported from con
 D = Value reported from dilu
 X = Interference from diphe
 Value in italics = Estimated r



FIGURE 1
SITE LOCATION MAP

NEW BEDFORD, MASSACHUSETTS



Basemap: U.S.G.S. 7.5 Minute Topographic Quadrangles
New Bedford South (1977) New Bedford North (1979)

