

**Mount Hope Bay Sewer Interceptor Project  
Site Investigation Report  
Tiverton, Rhode Island**

*Prepared for*

Town of Tiverton  
343 Highland Road  
Tiverton, RI 02878

Starwood Tiverton, LLC  
1793 Main Road  
Tiverton, Rhode Island 02878

*Prepared by*

EA Engineering, Science, and Technology, Inc.  
2350 Post Road  
Warwick, Rhode Island 02886

Project No. 14016.02  
Revision: FINAL  
March 2003

## 1.0 INTRODUCTION

This Site Investigation Report has been prepared in accordance with Section 7.0 of the Rhode Island Department of Environmental Management (RIDEM) *Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases* (“Remediation Regulations”) (March 1993, as amended August 1996). EA Engineering, Science, and Technology, Inc. (EA) has prepared this Site Investigation Report on behalf of the Town of Tiverton, Rhode Island and Starwood Tiverton, LLC. The purpose of this site investigation has been to delineate the extent of soil contamination on Town owned property in the area between the intersection of Bay and Judson Streets and the intersection of Bay and Foote Streets and State Avenue in Tiverton, Rhode Island. The contaminated soil was previously discovered during excavation activities associated with the Mount Hope Bay Sewer Interceptor Project.

Figure 1 is a site locus for the study area. Figure 2 is a detailed site plan including all soil boring locations. Figure 3 contains the approximate location of the Environmental Land Usage Restriction (ELUR) proposed for the study area. Appendix A includes the prior submittals to RIDEM regarding contamination uncovered at the Mount Hope Bay Sewer Interceptor Project Site, including the Notification of Release and the Emergency and Short-Term Response Report. Appendix B contains photographs from site investigation activities occurring on 29 and 31 October, 1 and 14 November, and 18 December 2002. Appendix C includes all boring logs from soil borings advanced in the study area. Certificates of analysis from soil samples analyzed for semi-volatile organic compounds and total cyanide are included in Appendix D. Certificates of analysis from the groundwater sample collected and analyzed for the same parameters are included in Appendix E.

## CONTENTS

	<u>Page</u>
1. INTRODUCTION .....	1
2. DESCRIPTION OF RELEASE, SITE CONDITIONS, AND RECEPTORS .....	2
2.1 Site Description.....	2
2.2 Site History.....	2
2.3 Surrounding Receptors.....	3
2.4 Description of Release.....	3
3. INVESTIGATION GOALS .....	4
4. SUBSURFACE INVESTIGATION .....	5
4.1 Soil .....	5
4.1.1 Soil Sampling .....	5
4.1.2 Soil Analytical Results.....	5
4.1.2.1 29 October – 1 November 2002.....	5
4.1.2.2 14 November 2002.....	6
4.1.2.3 18 December 2002 .....	7
4.2 Ground Water .....	8
4.2.1 Ground-Water Sampling .....	8
4.2.2 Ground-Water Analytical Results .....	8
5. REMEDIAL ALTERNATIVES .....	9
5.1 Remedial Alternative No. 1: Removal Action .....	9
5.2 Remedial Alternative No. 2: Environmental Land Usage Restriction.....	10
APPENDIX A: PRIOR SUBMITTALS TO RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT	
APPENDIX B: SITE PHOTOGRAPHS	
APPENDIX C: BORING LOGS	
APPENDIX D: CERTIFICATES OF ANALYSIS FROM SOIL SAMPLES	
APPENDIX E: CERTIFICATES OF ANALYSIS FROM GROUND-WATER SAMPLES	

## **2.0 DESCRIPTION OF RELEASE, SITE CONDITIONS, AND RECEPTORS**

A description of the release, site conditions, and surrounding receptors is provided below.

### **2.1 SITE DESCRIPTION**

The study area encompasses approximately 1.5 acres located within 500 ft of the Sakonnet River in Tiverton, Rhode Island. Topography is characterized by a slight slope to the west. The study area is located at the foot of a steep hill to the east. There are no surface water bodies located within the study area. Locations of subsurface investigation activities included the following Town of Tiverton public roadways: Bay Street, Judson Street, Hooper Street, Canonicus Street, Hilton Street, Chase Street, Foote Street, and State Avenue.

Surrounding land usage is predominantly residential, with commercial/residential usage to the north at Bay Street and State Avenue. Commercial businesses in this area include an auto repair facility and a fuel terminal. The Fall River Wastewater Treatment Facility is located less than 0.5 mi to the north on Bay Street. Inactive, former Conrail tracks run north south along the entire length of the study area, approximately 50 ft to the west.

During site investigation activities, groundwater was determined to be between 3 ft below ground surface to greater than 12 ft below ground surface across the study area. The direction of groundwater flow is assumed to be west by northwest based upon surface topography. No barriers to groundwater flow were encountered at the site. Soil at the site is characterized as fill overlying coastal sand deposits. Merrimac-Urban land complex and Udorthents-Urban land complex cover the study area, but the study area was expected to contain more fill, as all boring locations were on paved roadways. Bedrock at the site is characterized as Sachuest Arkose, a sandstone and conglomerate interbedded with phyllite.

### **2.2 SITE HISTORY**

Information was gathered regarding the site history during a review of historical aerial photographs from 1939 to 1995 at the Rhode Island Statewide Planning Office. Land use in the area of Bay Street in North Tiverton was primarily agricultural in 1939, and residential development was already in place along Bay Street and its side streets, including Foote Street. Judson Street was agricultural land that extended to Canonicus Street. Development of Judson Street did not occur until after 1981.

According to the aerial photographs, the Inland Fuel Terminal has been present at 25 State Avenue since at least 1939. The two largest and southernmost tanks were constructed between 1951 and 1965, increasing the facility to its present capacity of 25 million gallons. The Conrail tracks were present in all of the historical aerial photographs reviewed, with significant re-vegetation beginning prior to 1981. The Fall River Wastewater Treatment Facility was constructed between 1939 and 1951, with major tank additions occurring by 1981.

### **2.3 SURROUNDING RECEPTORS**

The study area is bounded to the north by residential/commercial development, including the Fall River Wastewater Treatment Facility, to the east by residential development, to the south by an area of undeveloped land followed by residential development, and to the west by the Rhode Island Department of Transportation Rail Right-of-Way followed by undeveloped land and the Sakonnet River. The Sakonnet River is a major surface water body that empties into Mount Hope Bay. Although area groundwater is zoned as GA/GAA, all residences in the immediate vicinity of the site are served by Town water. There are no Wellhead Protection Areas located within 500 ft of the site.

## 2.4 DESCRIPTION OF RELEASE

During excavation of soils along Bay Street in August 2002 for the Mount Hope Bay Sewer Interceptor Project, contamination was discovered in the form of petroleum-impacted soils. The odor of petroleum and a sheen on groundwater were observed during construction activities. Soils from this area were designated as unsuitable for backfill due to structural concerns and were transported to two temporary staging areas on Kaufman and Last Streets. A Notification of Release for these locations was filed with RIDEM on 2 October 2002, and an Emergency and Short-Term Response Action was completed to address these releases during the months of September through November 2002. The Notification of Release and the Emergency and Short-Term Response Report are included as Appendix A.

Based on a review of RIDEM records, historical aerial photographs, and state and federal databases, no information exists regarding the origin of this contamination. Records reviewed for Whitney's Auto Repair (110 Bay Street) and Inland Fuel Terminals, Inc. (25 State Avenue) indicated their status as Small Quantity Generators of Hazardous Waste under the Resource Conservation and Recovery Act (RCRA) but did not reveal any spill records. The Fall River Wastewater Treatment Facility reported an oil spill in April 2001, but this type of spill is not expected to have caused the widespread contamination along Bay Street.

Anecdotal evidence cited a diesel fuel spill and fire occurring in the 1970s at the Inland Fuel Terminal that resulted in the evacuation of the surrounding neighborhood. No further information on this incident was found pursuant to requests to the Town of Tiverton (Town Clerk, Library, and Department of Public Works), the Tiverton Fire Department, and the office of the Sakonnet Times. Anecdotal evidence also exists that suggests that historic fill operations were conducted along Bay Street and Judson Street. ***EA is currently working with Town of Tiverton personnel in an effort to assemble and review all historic information existing in the Town files relating to the alleged filling activities in and around the study area.***

### 3.0 INVESTIGATION GOALS

This investigation was conducted to establish the limits on Town owned property of the soil contamination previously uncovered along Bay Street. These soils exhibited semi-volatile organic compounds (SVOCs) exceeding the RIDEM Residential Direct Exposure Criteria (RDEC) and Industrial/Commercial Direct Exposure Criteria (I/CDEC), a concern in a residentially zoned neighborhood. Concerns about historic filling operations along Bay and Judson Streets also dictated the addition of total cyanide to the sampling program proposed in EA's Site Investigation Work Plan for the project.

As part of this investigation, a groundwater sample was collected for SVOC and total cyanide analyses from a 10-in. PVC pipe located at Sewer Manhole 8. This data was collected to determine the appropriate method of handling dewatered groundwater encountered during excavation of the Mount Hope Bay Sewer Interceptor.

EA is working with the Town of Tiverton to delineate the extent of SVOC and cyanide contamination on Town-owned property in the Bay Street area. This investigation will assist the Town in developing a strategy to address the soil contamination discovered within the study area, and prepare an ELUR to address future intrusive activities conducted in the areas in and around Bay Street.

## 4.0 SUBSURFACE INVESTIGATION

### 4.1 SOIL

#### 4.1.1 Soil Sampling

A total of 47 soil borings were performed during this investigation. Prior to the beginning of intrusive activities, all proposed soil borings were cleared for utilities by calling Dig Safe. Five days of subsurface investigation were undertaken to completely characterize and delineate the contamination on Town owned property in and around the Bay Street area: 29 and 31 October, 1 and 14 November, and 18 December 2002. Soil borings were advanced using a truck-mounted Geoprobe. Soils were logged and screened in 4-ft acetate sleeves. Soil borings along the proposed path of the Mount Hope Bay Sewer Interceptor (Bay Street, Foote Street, and State Avenue) were advanced to 12 ft below grade in order to assess contamination within the limits of future excavation. Soil borings along the side streets were generally advanced to 8 ft below grade to encompass the depth of contaminated material previously observed in borings along Bay Street.

Samples were collected from all boring locations at the depth interval exhibiting the highest visual/olfactory and flame ionization detector (FID) screening results in each boring. These soils were collected in 8-oz glass jars and were kept under 4°C pending submittal to an analytical laboratory. Upon completion of all soil borings, a total of 13 soil samples (including a field duplicate sample) were sent to a certified analytical laboratory for SVOC analysis by U.S. Environmental Protection Agency (EPA) Method 8270 and total cyanide analysis by EPA Method 9010. Two soil samples were collected from the source material, and the remaining (compliance) soil samples were selected from borings believed to be outside the limits of contaminated soil based upon visual/olfactory and FID screening results.

#### 4.1.2 Soil Analytical Results

##### 4.1.2.1 29 October - 1 November 2002

A total of seven soil samples were collected between the dates of 29 October and 1 November 2002. The following compliance samples revealed no evidence of SVOC or cyanide contamination above RIDEM RDEC: Hooper-1, Canonicus-1, Bay-16, and Foote-1. These samples were expected to be clean based upon field observations and screening results.

Regarding the remaining three soil samples, Hilton-1 contained SVOC contamination above RIDEM RDEC for benzo(k)fluoranthene and chrysene. The two samples collected to represent the fill material, Judson-2 and Bay-5, contained several exceedances of the RIDEM I/CDEC, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Table 4.1 below illustrates the concentrations of all analytes detected in the soil samples collected during the first round of soil boring advancement, which took place between the dates of 29 October through 1 November 2002.

TABLE 4.1 ANALYTICAL RESULTS FOR 10/29/02-11/01/02 SAMPLING ACTIVITIES

Analyte Detected (ppm)	Judson-2	Hooper-1	Bay-5	Canonicus-1	Hilton-1	Foot-1	Bay-16	RIDEM RDEC	RIDEM I/CDEC
Cyanide	<b>1,130</b>	ND	12	7	48	ND	ND	200	10,000
2-Methylnaphthalene	<b>428</b>	ND	0.674	0.130	ND	ND	ND	123	10,000
Anthracene	<b>78</b>	ND	0.948	ND	ND	ND	ND	35	10,000
Benzo(a)anthracene	<i>73.5</i>	ND	<b>2.86</b>	ND	0.352	ND	ND	0.9	7.8
Benzo(a)pyrene	<i>451</i>	ND	<b>2.57</b>	ND	0.247	ND	ND	0.4	0.8
Benzo(b)fluoranthene	<i>452</i>	ND	<b>2.91</b>	ND	0.885	ND	ND	0.9	7.8
Benzo(g,h,i)perylene	ND	ND	<b>1.09</b>	ND	ND	ND	ND	0.8	10,000
Benzo(k)fluoranthene	<b>56.4</b>	ND	<b>2.18</b>	0.0933	<b>0.935</b>	ND	0.112	0.9	78
Chrysene	<b>62.9</b>	ND	<b>2.90</b>	ND	<b>0.535</b>	ND	ND	0.4	780
Dibenzo(a,h)anthracene	<i>82.4</i>	ND	<b>0.535</b>	ND	ND	ND	ND	0.4	0.8
Fluoranthene	<b>201</b>	ND	5.28	ND	0.959	ND	ND	20	10,000
Fluorene	<b>89.9</b>	ND	0.771	ND	ND	ND	ND	28	10,000
Indeno(1,2,3-cd)pyrene	<i>14.1</i>	ND	<b>1.08</b>	ND	ND	ND	ND	0.9	7.8
Naphthalene	<b>1,570</b>	ND	2.97	0.715	0.912	ND	0.243	54	10,000
Phenanthrene	<b>305</b>	ND	2.45	ND	ND	ND	ND	40	10,000
Pyrene	<b>131</b>	ND	5.48	ND	1.51	ND	0.078	13	10,000

NOTES:  
**Bold** indicates exceedance of RIDEM RDEC.  
*Italicized* indicates exceedance of RIDEM I/CDEC.  
ND = Non-detect.  
See Appendix C for a complete set of boring logs completed during this investigation.

#### 4.1.2.2 14 November 2002

Based upon soil sample results from the first round of invasive activities, further locations were chosen for an additional day of Geoprobe activities. Chase Street, which was not adequately marked for utilities before the first round of soil borings, along with locations further east along Judson Street and Hilton Street, were investigated on 14 November 2002 with the intention of finding the easternmost limits of the contamination discovered during sewer excavations. Soils were again analyzed for SVOCs and total cyanide.

Two borings advanced on Chase Street, at 100 and 200 ft from the Bay Street intersection, revealed evidence of contamination through visual/olfactory and FID screening. Analytical results from Chase-3, advanced to 12 ft below ground surface 300 ft east of the Bay Street intersection, exhibited no exceedances of RIDEM RDEC. Analytical results from Hilton-2, advanced 100 ft east of Hilton-1, exceeded RIDEM RDEC for benzo(b)fluoranthene (1.28 ppm) and chrysene (0.551 ppm), despite the absence of visual/olfactory or FID indicators of contamination. The duplicate sample collected at Hilton-2 also exhibited an exceedance of RIDEM RDEC for benzo(k)fluoranthene, not found in the original sample.

On Judson Street, borings were continued at 100 ft intervals, beginning 100 ft east of the previously advanced Judson-2. At Judson-8, samples were collected from the 0.5 to 1.5-ft interval. No FID or

visual/olfactory clues indicated the presence of contamination. However, analytical results revealed the presence of benzo(a)pyrene (0.585 ppm) and chrysene (0.603 ppm) above RIDEM RDEC. Table 4.2 below summarizes the concentrations of all analytes detected during the second round of Geoprobe investigation taking place on 14 November 2002.

TABLE 4.2 ANALYTICAL RESULTS FOR 11/14/02 SAMPLING ACTIVITIES

Analyte Detected (ppm)	Chase-3	Hilton-2	(Hilton-2) DUP-01	Judson-8	RIDEM RDEC
Cyanide	6.4	69	43	ND	200
Acenaphthylene	ND	0.165 J	0.172 J	ND	23
Anthracene	ND	ND	ND	0.193 J	35
Benzo(a)anthracene	ND	0.270 J	0.266 J	0.617	0.9
Benzo(a)pyrene	ND	0.197 J	0.167 J	<b>0.585</b>	0.4
Benzo(b)fluoranthene	ND	<b>1.280</b>	<b>1.020</b>	0.577	0.9
Benzo(k)fluoranthene	ND	0.883	<b>0.978</b>	0.611	0.9
Chrysene	ND	<b>0.551</b>	<b>0.534</b>	<b>0.603</b>	0.4
Fluoranthene	ND	0.232 J	0.194 J	1.040	20
Phenanthrene	ND	0.107 J	0.092 J	0.820	40
Pyrene	ND	0.563	0.456	1.870	13

NOTES:  
**Bold** indicates exceedance of RIDEM R-DEC.  
J = Detected below Method Reporting Limit; estimated value.  
ND = Non-detect.  
See Appendix C for a complete set of boring logs completed during this investigation.

#### 4.1.2.3 18 December 2002

Based upon the results of soil sampling conducted on 14 November 2002, additional soil borings were completed at locations east of Hilton-2 and Judson-8 on 18 December 2002. As in the previous investigations, soil borings were advanced to 8 ft below ground surface. Sample intervals were selected based upon FID screening results. Soil samples collected were again analyzed for SVOCs and total cyanide.

Soil samples sent for laboratory analysis were collected from Hilton-7 (350 ft east of Hilton-2) and Judson-9 (100 ft east of Judson-8). Benzo(a)pyrene was detected at a level slightly exceeding the RDEC (0.405) in the sample collected from Hilton-7. The boring logs from Hilton Street reveal a thinning fill layer beneath the asphalt, ranging from 1 ft at Hilton-2 to a few inches at Hilton-7. The nature of the fill layer in an easterly direction on Hilton Street suggests a gradual decrease in thickness approaching the absence of the fill layer east of Hilton-7.

## 4.2 GROUNDWATER

### 4.2.1 Groundwater Sampling

On 5 November 2002, groundwater was sampled from a 10-in. PVC pipe at Sewer Manhole 8, the location at which contamination was first discovered during sewer excavation. Groundwater was collected using a dedicated 1.66-in. polyethylene bailer. An SVOC sample was collected in two 1-liter amber, unpreserved bottles, and a total cyanide sample was collected in a 1-liter polyethylene bottle and preserved with sodium hydroxide (NaOH). These samples were kept under 4°C and submitted to a certified analytical laboratory.

#### **4.2.2 Groundwater Analytical Results**

Groundwater analytical results revealed neither SVOC nor cyanide impact to site groundwater from the contaminated soil. These results confirmed that contractors would implement no containment or treatment of groundwater during the dewatering activities associated with the sewer interceptor excavation and installation. Certificates of Analysis for this groundwater sample are included as Appendix E.

## 5.0 REMEDIAL ALTERNATIVES

Based on the results of this Site Investigation, two remedial alternatives are proposed for the Town of Tiverton property in and around Bay Street: (1) excavation and disposal of impacted soil, and (2) an ELUR to be placed on the impacted area. Further discussion is presented to better define the requirements and effectiveness of the proposed remedial alternatives.

The following criteria were incorporated into the evaluation of remedial alternatives for the site:

- Ability to prevent the exposure of residents and site workers to contaminated soil
- Ability to remediate soil to RIDEM RDEC standards
- Cost effectiveness
- Concerns related to the everyday use of the property as public roadways and the heavy concentration of nearby residences.

### 5.1 REMEDIAL ALTERNATIVE NO. 1: REMOVAL ACTION

One alternative to address this soil contamination is to quantitatively establish the extent of contamination in and around the Bay Street area and initiate a removal action to excavate all soils contaminated above the RDEC. Soil would be screened and submitted to a certified analytical laboratory for confirmatory analysis to ensure that all impacted material had been removed. This would eliminate all possibility of risk to residents or workers in the area. Following removal, soil would be transported to a licensed facility for disposal. The timeframe of this action would likely be several years, but this option would require no further action following the removal.

This alternative poses several significant problems. Although the soil exceeds the RDEC for several analytes, the presence of 0.3 to 1.0 ft of asphalt over these soils within the Town-owned streets has prevented the possibility of exposure to these soils. A groundwater sample collected within the area of impacted soils contained no SVOCs or cyanide above method detection limits. No residents in the immediate vicinity of or downgradient from this contaminated soil are served by private drinking water wells. The Town of Tiverton supplies potable water to all residents in the area.

An excavation project of this size would be prohibitively expensive, and would likely result in increased exposure to the material by residents and workers through working conditions and wind-borne contaminants.

### 5.2 REMEDIAL ALTERNATIVE NO. 2: ENVIRONMENTAL LAND USAGE RESTRICTION

Another method to address the contamination would be to establish an ELUR for the study area in and around Bay Street. This would involve establishing guidelines on any future invasive activities within the extent of contaminated material. Such guidelines would include the following:

- Personnel performing intrusive activities within the study area must read and sign the site-specific Safety, Health and Emergency Response Plan
- Air monitoring should be performed during excavation activities
- Contaminated soil encountered during excavation activities should be segregated from clean material in cases where the material can not be reused as backfill
- Following excavation and backfilling activities, the asphalt roadway must be replaced to its original specification to prevent exposure to any impacted soil.

EA recommends the establishment of an ELUR for the Town owned property within study area. This method allows for the most practical method for preventing direct exposure to the material, while at the same time providing a process for performing intrusive activities in the roadways. The ELUR would be recorded in the land records of the Town of Tiverton, and annual inspections of the restricted areas are required to ensure the structural integrity of the cap.

EA also recommends that the Town of Tiverton notify the residents in and around the study area of the preliminary results of this investigation. The letter should indicate that the Town is working closely with the RIDEM Office of Waste Management to develop a strategy to address the fill material found beneath the streets in and around Bay Street.