DRAFT ANALYSIS OF BROWNFIELDS CLEANUP ALTERNATIVES

FORMER PAYNE CUTLERY SITE
295 PHILLIPS AVENUE
NEW BEDFORD, MASSACHUSETTS

MASSDEP RTN 4-15373

Prepared for:

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1.0 INTRODUCTION

TRC Environmental Corporation (TRC) prepared this Analysis of Brownfields Cleanup Alternatives (ABCA) report for the former Payne Cutlery site located at 295 Phillips Avenue New Bedford, Massachusetts (the "Site") on behalf of the City of New Bedford (the "City") as part of the City's Brownfields Cleanup Program funded by the United States Environmental Protection Agency (EPA).

1.1 Purpose

TRC was retained by the City to prepare an ABCA, a Massachusetts Contingency Plan (MCP) remedial work plan, bid specifications, and to oversee and document the results of remedial activities at the Site. The purpose of this ABCA is to evaluate and document practicable alternatives for remediating the Site to limit exposure of Site contaminants to nearby residents.

This document is intended to satisfy the EPA requirement for an analysis of alternatives under the EPA Brownfields Cleanup Grant Program in accordance with the *Brownfields Cleanup Grant Major Tasks* checklist dated June 2011. A separate document will be prepared to satisfy the requirements for an Immediate Response Plan Modification under Section 310 CMR 40.0424 (2) of the MCP.

In accordance with EPA requirements, a Draft ABCA has been prepared and has been made available for public comment for a period of 30 days, November 16 through December 15, 2012. A public meeting on the Draft ABCA will be held on Tuesday, November 27, 2012, from 6:00 PM to 7:00 PM at the Buttonwood Park Senior Center and Warming House.

1.2 Scope of Work

This document presents an evaluation of feasible remedial alternatives to address chlorinated VOC contamination in groundwater and soil vapors in the vicinity of the site. Requirements of the analysis included the following:

- Identifying the objectives of the environmental response action and providing an analysis of cleanup alternatives;
- Documenting that the contamination meets the need for an environmental response action;
- Providing information pertaining to the Site background; threats to public health and/or the environment posed by the Site; enforcement activities; and projected costs; and
- Identifying the proposed action, and explaining the rationale for its selection.

Upon approval by EPA of the Draft ABCA, the selected cleanup alternative will be implemented by the City under an IRA Plan Modification.

2.0 BACKGROUND

2.1 Site Location and Description

The Site consists of a vacant 3.3-acre parcel located in an industrial and residential area of New Bedford, Massachusetts. A former 100,000 square-foot one-to-two story brick building formerly occupied the Site until it was demolished in September/October 2000. The Site is currently vacant with no structures, and is surrounded by a chain-link fence. The Site is relatively flat with a slight downward slope in a southerly direction. The Site is reportedly covered by a fill layer two-to-four feet thick consisting of asphalt, brick and concrete demolition debris from the former structures on the Site. A Site location map is presented in Figure 1. The general Site layout is presented in Figure 2, which also summarizes the results of recent groundwater investigation activities.

The Site has a long history of industrial use dating from the early 1900s when it was developed for cotton fabric milling operations. New Bedford Cotton Mills Corporation purchased the Site in 1909 and occupied the Site until 1930 when Hoosac Mills Corporation purchased the Site. Farr Instruments, Incorporated purchased the Site in 1959, then four years later in 1963, Payne occupied the Site until 1988 for manufacturing shears and manicure implements. During this time, Site activities included cold pressing of steel, metal grinding, degreasing of metal with trichloroethene (TCE), as well as chromium and nickel electroplating. After Payne filed for bankruptcy in 1988, the Site was used for a number of activities, including a hazardous materials storage business and an auto body repair facility. In 1992 and 1993, EPA supervised removal of hazardous materials at the Site including containers that were reportedly in a deteriorated state and some leaking and overturned drums.

2.2 **Summary of Site Assessment Activities and Results**

There have been two reportable release events at this property, one involving petroleum impacts and the other involving chlorinated solvents. Other contaminants related to historical activities at Payne Cutlery may also be present. This ABCA addresses chlorinated volatile organic compound (VOC) in groundwater and potential exposures to chlorinated VOC vapors in indoor air.

Two Massachusetts Department of Environmental Protection (MassDEP) Release Tracking Numbers (RTNs) are associated with the Site. The first RTN (4-00404) is associated with a reported release of petroleum-based oil in April 1987. The second RTN (4-15373) is associated with a reported release of TCE in March 2000, which warranted the performance of an Immediate Response Action (IRA) at the Site under the MCP.

The extent of chlorinated VOC concentrations in groundwater, soil vapors, and indoor air is illustrated in Figures 2, 3, and 4. Figure 2 shows concentrations of chlorinated VOCs in groundwater extending from the southern edge of the former Payne site south along Brook Street. Concentrations of chlorinated VOCs are highest at the intersection of Brook Street and Coffin Avenue and appear to diminish significantly as groundwater flows south along Brook Street and away from the Former Payne Cutlery site. Notably, available data characterize only the shallow groundwater conditions in this area. There have been no investigations to determine whether chlorinated VOCs are present in bedrock groundwater.

Figure 3 shows of chlorinated VOCs concentrations that appear to be associated with Payne Cutlery activities (including TCE, and perchloroethene [PCE]) to be present in soil vapors beneath Taber Mill, but not in the vicinity of nearby residences[1]. Figure 4 presents recent and historical (circa 2001) measurements of VOCs present in indoor air. In the 2012 investigation activities, indoor air measurements were not conducted in residences because soil vapor concentrations were not observed at significant concentrations in these areas. Soil vapor concentrations beneath the Taber Mill elderly housing facility were sufficiently elevated to suggest a possible exposure pathway within this facility (see Figure 3), therefore indoor air samples were collected in Taber Mill. No significant concentrations of chlorinated VOCs were measured in samples collected from the occupied areas of Taber Mill.

2.3 Land Use and Potential Receptors

A portion of the site is currently occupied by a parking lot. The remainder of the Site is vacant and there are no on-Site workers. The entire Site is either paved or restricted by a chain link fence. Therefore, the Site is not currently open to potential trespassers (including children).

Land use in the vicinity of the site includes single-family residential, multiple family residential, commercial, light industrial, and a multiple unit elderly housing facility. Based on 2011 census data for New Bedford, Massachusetts (www.census.gov), the total population in New Bedford is 95,183 people. The population density for the approximate 20 square-mile area of the City is 4,759 people per square mile and the population within a ½ mile radius of the Site is estimated to be 3,741.

There is no documentation identifying private drinking water wells located on-Site or in the immediate vicinity of the Site. The Site and properties in the surrounding area are serviced by the municipal water and sewer system. Based on review of on-line MassDEP Priority Resource Map data available from Massachusetts Geographic Information System (MassGIS), the Site is not located within a Current or Potential Drinking Water Source Area. There are no institutions, surface waters, wetlands, drinking water supplies or Areas of Critical Environmental Concern located within 500 feet of the Site.

Flow of shallow groundwater with chlorinated VOCs extends south along Brook Street and appears to diminish significantly with distance from the Former Payne Cutlery site (see Figure 2). It is possible that groundwater with chlorinated VOCs is intercepted by one or more of the subsurface sanitary drains or storm drains in this area. If so, there could be potential exposures at the outfall of one or more of these utilities.

Historically, chlorinated VOCs have also been measured in soil vapors and indoor air in some of the structures adjacent to the former Payne Cutlery site. Recent testing has shown that soil vapor

[1] An exception to this is the detection of PCE in soil vapor sample 6-Oneko-1 during the June 2012 sampling activities. This PCE detection is not regarded to be associated with Payne Cutlery activities. However, further assessment is required.

concentrations in the vicinity of nearby residences do not represent a human health risk. However, soil vapor concentrations beneath the Taber Mill elderly housing facility are at sufficient concentrations to suggest a possible exposure pathway within this facility (see Figure 3). No chlorinated VOCs were measured in samples collected from the occupied areas of Taber Mill, however these samples were collected during warm weather conditions. Cold weather conditions generally represent worst case conditions for soil vapor migration to indoor air.

2.4 Site Characteristics

Land across the former Payne Cutlery Site is generally flat, but surrounding areas are relatively hilly. Ground surface elevation drops significantly to the south of the site. Groundwater appears to slope across the Site to the south/southeast, down Brook Street. Depth to groundwater historically ranges from 8 to 12 feet below grade. The Site is within the New England Coastal Drainage Basin.

Historical USGS maps show a brook running north to south across the former Payne Cutlery site and down Brook Street. Some time prior to 1900, this brook was routed to a 30-inch conduit and directed to a pond located south of Dean Street. The conduit was eventually incorporated into the City sewer system and now carries sanitary wastewater to the City wastewater treatment facility.

Site overburden consists primarily of medium-grained sands and fine-to-medium gravels beneath a layer of fill ranging from two-to-four feet thick. According to previous reports, the Site is also underlain by a light gray, medium-grained granite of the Alaskitic Formation. Auger refusal was encountered in several borings between 14.5 and 30 feet below grade. Depth to bedrock near the intersection of Brook Street and Coffin Avenue appears to be between 15 and 20 feet below grade.

2.5 Conceptual Site Model

Hazardous substances formerly used and stored on the Site are consistent with metal plating and finishing operations and manufacture of rubber and plastic. Chlorinated VOCs, the focus of this ABCA, appeared to be associated with metal finishing processes. Figure 2 shows the former location of TCE drums north of the intersection of Coffin Avenue and Brook Street. Although the recent groundwater sample from CGW-17 did not exhibit significant concentrations of chlorinated VOCs, it is reasonable to conclude that the source of TCE observed in groundwater south of the Payne Cutlery site was a TCE release in the southern portion of the Site.

The concentration of TCE in shallow groundwater appears to diminish significantly from 44,000 ug/L in CGW-8 (located at the intersection of Coffin Avenue and Brook Street) to 1,800 ug/L in TRC-4, located approximately 100 feet to the south. Ground water flow beneath Brook Street is expected to follow the pathway of the former brook, which is also the path of a 30-inch drain line. The limited extent of chlorinated VOCs in shallow groundwater suggests a possible diversion either to bedrock fractures or to a subsurface utility.

TCE concentrations measured in groundwater (44,000 ug/L in a recent sampling event and 89,000 ug/L in 2000) suggest that TCE may be present, or may have once been present in the environment as a dense non-aqueous phase liquid (DNAPL). If so, TCE may be present in bedrock fractures and may have migrated beyond the limits indicated by the shallow monitoring well data represented in Figure 2. Potential migration to bedrock has not been explored to date.

TCE concentrations in shallow groundwater exceed MassDEP GW-2 criteria (30 ug/L) indicating a potential for TCE to transform to vapor phase then migrate to indoor air. Soil vapor concentrations have been measured to screen for potential migration of chlorinated VOC vapors to indoor air. As shown in Figure 3, concentrations of TCE and related chlorinated VOCs in soil vapors were below the screening thresholds recommended by MassDEP in the locations[2] tested except for one location beneath Taber Mill. These results are considered sufficient to dismiss the need for indoor sampling in nearby structures except Taber Mill.

Indoor air testing performed in June 2012 detected TCE and related compounds in a sample collected from the basement of Taber Mill. A low concentration of TCE (below the 0.8 ug/m3 Indoor Air Threshold Value recommended by MassDEP) was detected in a sample collected from an occupied first floor area. Intrusion of soil vapors to indoor air is expected to be greater during colder weather; therefore the recent sample results are not sufficient to dismiss the possibility of vapor intrusion at Taber Mill.

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A soil gas sample collected adjacent to 6 Oneko Street had a tetrachloroethylene (PCE) concentration above soil vapor screening levels in a June 2012 sample. PCE has not been measured in groundwater in this portion of the site.

3.0 ALTERNATIVES ANALYSIS

3.1 Remedial Action Objective and Cleanup Goals

The objective of remediation at the Site is to eliminate the potential for chlorinated VOCs to migrate to indoor air. Permanent MCP Site closure that would achieve a condition of No Significant Risk cannot be achieved within the timing and budgetary constraints of the City's EPA grant, however exposure control and reduction of source area concentrations is feasible.

Two general approaches were considered to eliminate potential exposures to chlorinated VOCs in indoor air: 1) remediate shallow groundwater in the vicinity of Taber Mill to a level where the potential threat of chlorinated VOC intrusion to indoor air has been eliminated; and 2) prevent migration of vapors present in the basement and crawl space beneath Taber Mill to occupied areas of that facility.

3.2 Identification of Remedial Alternatives

Several potential alternatives were evaluated for addressing the chlorinated VOCs in groundwater and potential intrusion of chlorinated VOC vapors into indoor air. From that evaluation, TRC identified a limited number of practicable remedial alternatives that could be implemented at the Site based on available Site data and TRC experience. The "No Action" alternative was also included as part of the evaluation to establish a basis for conducting remedial actions at the Site. All scenarios will require applicable MCP regulatory submittals and shall be performed in accordance with applicable MCP deadlines. The potential remedial scenarios incorporate anticipated project timing and budget limitations associated with the EPA grant. The remedial alternatives identified for consideration under this alternatives analysis include:

1. *No action*
2. *Control of Vapor Exposures via Modification of Existing Ventilation System at Taber Mill*
3. *Groundwater Remediation via Chemical Oxidation or Reduction*
4. *Combination of Ventilation System Modification at Taber Mill and Limited Groundwater Remediation via Chemical Oxidation*

3.3 Evaluation and Comparison of Remedial Alternatives

Each remedial alternative identified above was first evaluated to determine whether it could eliminate potential exposures to chlorinated VOCs in indoor air. None of the alternatives are regarded to be sufficient to achieve a condition of No Significant Risk within the timing and budget constraints of the project funding. Therefore, the short term objective has been adjusted to selection of an alternative that will eliminate the potential for vapor exposures to occupants of Taber Mill and reduce concentrations in groundwater to the extent practical.

Those alternatives that were deemed capable of eliminating potential exposures to chlorinated VOCs in indoor air were further evaluated utilizing the comparative evaluation criteria specified at 310 CMR 40.0858 of the MCP. These criteria include: effectiveness, short- and long-term reliability, difficulty of implementation, cost, potential risks and timeliness. The cost estimates presented in this document are rough estimates that were prepared solely for the relative comparison of the identified alternatives and should not be used as design-level estimates. A table comparing the estimated costs for each alternative is provided as Table 1. A description of each alternative and the results of the comparative analysis are presented in the following subsections.

Remedial Alternative #1: No Action

This alternative involves no remedial actions and maintains current Site conditions. Under the No Action alternative, there would remain the potential that chlorinated VOCs present in soil vapors beneath Taber Mill would migrate to indoor air in an occupied area. The No Action alternative will not eliminate the vapor intrusion exposure pathway, which is the primary objective of this remedial action. Therefore, the No Action alternative will not be evaluated further with respect to the comparative evaluation criteria.

Remedial Scenario #2 – Control of Vapor Exposures via Modification of Existing Ventilation System at Taber Mill

The Taber Mill elderly housing facility is an approximately 41,000 square foot renovated mill building. The majority of the building has a crawl space with a dirt floor, making subslab venting inappropriate. However the basement and crawl space are served by a ventilation system consisting of 13 vents and two fans. The fans operate in spring, summer, and fall, but the vents are closed and the fan is shut off during the winter. The portion of the basement/crawl space that is adjacent to groundwater with elevated chlorinated VOC concentrations represents approximately half of the 21,000 square foot footprint and includes four vents and both fans.

This remedial alternative would modify the existing ventilation system utilizing the existing outdoor air intakes and providing a single exhaust fan to provide a constant negative pressure throughout the potentially affected area of the basement and crawl space. The portion of the basement/crawl space at risk for indoor air intrusion would be segregated from the rest of the basement/crawl space by construction of a vertical barrier wall (the proposed location of this wall is indicated on Figure 5). Assuming an average height of 5 feet (basement and crawl space) and a 20,000 ft^2 ventilation zone, a ventilation rate of 1 air change per hour could be achieved with a flow of 1,700 cfm (cubic feet per minute).

Additional ventilation system modifications could include: 1) insulating the ceiling of the basement/crawl space with a spray-on insulation; 2) heating the basement/crawlspace; and 3) sealing all of the vents while maintaining a small air flow, creating a negative pressure in the basement/crawlspace. Insulation of the ceiling was determined to be relatively unfavorable due to cost (at $2.50 per square foot for materials and labor, insulating the 20,000 ft^2 area would cost $50,000). Supplemental heat could be provided by modifying the existing hot water system, but this approach would represent an increased operating cost to Taber Mill. The third option, reducing the air flow would be the least costly of the three options. In order to hedge against possible heat loss with the third option, heat recovery units are recommended.

The intake vents would be provided with a plenum with electronically controlled motorized dampers to control the amount of flow through each. The exhaust fan would be provided with a variable speed Electronically Commutated Motor (ECM) motor, allowing the air volume to be easily adjusted with a speed dial to provide balancing. The fan would be located in the basement area and would be ducted through a stack fastened to the exterior of the building to 8 feet above the roof. The plenums and the exhaust ductwork would be aluminum due to the moisture levels to prevent corrosion. The exhaust stack would be approximately 70 feet tall when measured from the base at ground level.

During the warmer months, the fan would run continuously to provide 1 air change per hour to the space. The air volume would be adjusted with a speed dial to provide balancing. In the winter months, the flow rate could be reduced to the extent possible which will still provide a negative pressure in the basement and crawl space. If insulation is installed on the ceiling of the basement and crawl space, it may not be necessary to reduce air flow during the winter months.

Final design of and ventilation system modifications would require review and approval by Taber Mill personnel.

The costs associated with this alternative are summarized in Table 1. For this cost estimate, it is assumed that the ceiling of the ventilation zone is insulated because that option would be expected to require less maintenance.

Remedial Scenario #3 – Groundwater Remediation via Chemical Oxidation or Reduction

Chemical oxidation can achieve significant reduction of contaminant mass within the $195,000 budget and five month performance period remaining under the EPA grant. Under this remedial scenario, a chemical oxidant would be injected in the zone with the highest concentrations of chlorinated VOCs in shallow groundwater. Complete elimination of the contaminant mass is not a realistic objective. However, a significant reduction of contaminant concentrations in shallow groundwater could significantly reduce the probability that chlorinated VOCs will migrate to indoor air.

Several chemical oxidants or chemical reductants have had success with chlorinated VOC contamination, including permanganate, persulfate, Fenton’s reagent, and zero valent iron (a reductant). Persulfate is regarded to be risky in locations with subsurface infrastructure because of a corrosive effect on metals. Fenton’s can be exothermic if significant pockets of organic carbon are encountered. Zero valent iron would require monitoring over a period of several years. Permanganate was selected as an oxidant that has a relatively rapid reaction time and does not present a potential threat to subsurface infrastructure or nearby residents.

The permanganate injection alternative would feature injection of a permanganate slurry in a 7,000 square-foot treatment zone located on the southern edge of the Payne property and including locations within Coffin Avenue (see Figure 5). Up to 70 injection points would be applied in the treatment area based upon a 5-ft. radius of influence. The material will be distributed in the treatment zone (2-15 ft. bgs) using approximately 2-foot injection intervals.

The potassium permanganate concentration in the treatment zone, with no reaction and full dispersion within the treatment zone, would be designed to be about 500 ppm, which is regarded to be sufficient to oxidize the expected 40 ppm contaminant concentration of TCE in groundwater.

The appropriate amount of permanganate would be based on an estimated stoichiometry plus an excess oxidant for the reaction period. A preliminary estimate of oxidant demand indicates that up to 60,000 gallons of a 5% (50,000 ppm) solution of pre-mixed potassium permanganate would be applied. This calculation would be refined following evaluation of Soil Oxidant Demand (SOD) results from soil samples collected in the source area.

TRC would employ integrated direct push technology (DPT) injection whereby the potassium permanganate would be pumped through the direct push rods. The injections would be performed in 2-foot intervals in a bottom-up method while maintaining appropriate flows and pressures. Once the injection is complete at each interval, the injection assembly would be retracted upward to the next injection interval. This process would be repeated until the entire treatment zone is addressed at that location. The injection portion of this task (30 to 50 injection points) is expected to be performed in three to five days.

During and subsequent to the injection, samples will be collected from a manhole connected to the sanitary sewer that is located adjacent to the proposed injection zone. If significant intrusion of permanganate to the sewer is detected and if this presents a problem to the City wastewater treatment operation, a neutralization compound can be introduced.

Two post-injection groundwater monitoring events would be recommended to measure contaminant reduction in the source area and at selected downgradient locations and confirm that the permanganate additive is no longer present in the environment.

The costs associated with this alternative are summarized in Table 1. In developing this cost estimate, the scale of the treatment zone was adjusted to inject the maximum amount of oxidant allowed within the available budget.

Remedial Scenario #4 – Combination of Ventilation System Modification at Taber Mill and Limited Groundwater Remediation via Chemical Oxidation

This option is a combination of Alternative #2 and Alternative #3, with the Chemical Oxidation scenario scaled back to accommodate the budget required for ventilation system modifications. The ventilation system modifications would reduce air flow and add two heat exchange units.

The costs associated with this alternative are summarized in Table 1. In developing this cost estimate, the scale of the permanganate injection treatment zone was adjusted to approximately 3,500 ft^2, the maximum scale allowed within the available budget after consideration of the ventilation system modification budget.

3.4 Discussion of Comparative Evaluation Criteria

This Section presents a relative comparison of remedial alternatives (Alternatives #2, #3, and #4). A remedial alternative evaluation matrix that compares each alternative based on these criteria is provided as Table 2.

Effectiveness – Alternatives #2 and #4 will both achieve exposure control. Alternative #3 might achieve exposure control in time, but that is not certain. None of the Remedial Alternatives considered will be sufficient to achieve a Permanent Solution under the MCP, 310 CMR 40.1000. Alternative #2 will not achieve or approach a permanent solution to the shallow groundwater contamination. Alternatives #3 and #4 will reduce contamination in the source area and may approach a permanent solution to the shallow groundwater contamination at the site.

Reliability – Alternatives #2 and #4 will both achieve exposure control with equal reliability. Alternatives #3 and #4 will both achieve some (undetermined) degree of source removal. In-situ chemical oxidation relies on direct contact with the contaminated soil. Alternatives #3 and #4 therefore have some uncertainty with regards to reliability since there may be some variability in the soil that may prevent or limit the distribution of the reagents.

Difficulty of Implementation – Modifications to the ventilation system (Alternatives #2 and #4) would be relatively easy to implement. Chemical injections (Alternatives #3 and #4) would be somewhat more difficult, although the challenges faced would not be new to an experienced contractor. These alternatives require the use of specialized equipment, handling of reactive (oxidizing) chemicals, and more intensive post-implementation monitoring. Injection of chemicals in the vicinity of subsurface utilities will also require prior identification of utilities and prior clearance of each hole to a depth consistent with known or suspected utilities.

Cost-Benefit – Alternatives #3 and #4 are designed to expend all of the available funds under the grant to maximize source removal. Alternative #2 might be completed without expending all of the funds under the EPA grant.

Potential Risks – The potential short-term and long-term risks associated with each of the three alternatives are considered low to moderate. Modifications to the ventilation system (Alternatives #2 and #4) would have little to no associated risk. Potential short term risks for chemical oxidation (Alternatives #3 and #4) would be moderate due to concerns over worker health and safety while working with chemical reagents which are strong oxidizers. There is also a risk of intrusion into subsurface utilities, which will need to be monitored closely.

Timeliness – All of the options have been designed to be completed within the short time allowed under the EPA grant, therefore none of the Remedial Alternatives has an advantage under this criterion.

3.5 Selection of Remedial Alternative

The No Action Alternative (Remedial Alternative #1) was included in this analysis for comparative purposes only and is not a feasible alternative because it does not meet the remedial action objectives.

Remedial Alternatives #2, #3, and #4 were evaluated to address exposure control and, to the extent practical, source removal. Alternatives #2 and #4 will both achieve exposure control. Alternative #3 might achieve exposure control in time, but that is not certain. Alternatives #3 and #4 will both achieve some degree of source removal, with less removal achieved under Alternative #4.

Remedial Alternative #4 combines the exposure control effectiveness of Alternative #2 with some of the source removal benefits of Alternative #3. Therefore, Alternative #4 has been recommended as the preferred remedial alternative.

3.5.1 Green and Sustainable Remediation Measures

The selected remediation measures will be evaluated to identify means of reducing energy consumption, reducing waste generated, or otherwise improving the utilization of non-renewable resources.

TABLES

Table 1
Cost Summary of the Remedial Alternatives Proposed in the ABCA
Former Payne Cutlery, 295 Phillips Avenue, New Bedford, Massachusetts

Remedial Alternative	Approximate Line Item Cost	Approximate Total Cost
Remedial Alternative #2. Control of Vapor Exposures via Modification of Existing Ventilation System at Taber Mill		
Reporting and Regulatory filings	$26,000	
Ventilation System Modifications	$39,500	
Insulation	$52,500	
Total - Remedial Alternative #2		$118,000
Remedial Alternative #3. Groundwater Remediation via Chemical Oxidation		
Reporting and Regulatory filings	$26,000	
Permanganate Injection (estimated 7,000 ft^2 injection zone)	$157,000	
Post-Injection Performance Monitoring	$12,000	
Total - Remedial Alternative #3		$195,000
Remedial Alternative #4. Combination of Ventilation System Modification at Taber Mill and Limited Groundwater Remediation via Chemical Oxidation		
Reporting and Regulatory filings	$26,000	
Ventilation System Modifications	$39,500	
Heat Recovery Units	$10,500	
Permanganate Injection (estimated 3,500 ft^2 injection zone)	$107,000	
Post-Injection Performance Monitoring	$12,000	
Total - Remedial Alternative #4		$195,000

Table 2
Remedial Alternative Evaluation Matrix
Former Payne Cutlery Site, 295 Phillips Avenue
New Bedford, Massachusetts

Remedial Action Alternative	Comparative Evaluation Criteria*:	Comparative Effectiveness - Control of Potential Indoor Air Exposures	Comparative Effectiveness - Source Removal	Comparative Reliability	Comparative Difficulty of Implementation	Comparative Cost	Comparative Implementation Risks	Comparative Benefits	Comparative Timeliness	Notes
#1	No action	Low	Low	Low	Low	Low	High	Low	Low	The No Action alternative will not prevent exposure to Site contaminants.
#2	Control of Vapor Exposures via Modification of Existing Ventilation SystemSystem at Taber Mill	High	Low	High	Low to Moderate	Low	Low	Moderate	High	This alternative would be very effective for exposure control but would not reduce source concentrations. The projected cost is lower than the projected cost for Alternatives #3 and #4. Implementation risk is low. The benefits for this alternative may be lower than those of Alternative #3 or #4 since source removal is not addressed. Timeliness of alternatives #2, #3 and #4 are essentially the same.
#3	Groundwater Remediation via Chemical Oxidation	Low to Moderate	Moderate to High	Moderate	Moderate	Moderate	Low to Moderate	Moderate	High	This alternative would be not likely to be effective for short term exposure control but it would reduce source concentrations and could eliminate exposures in the long term. The projected cost is equal to the cost for Alternative #4. The implementation risk is moderate. Timeliness of alternatives #2, #3 and #4 are essentially the same.
#4	Combination of Ventilation System Modification at Taber Mill and Limited Groundwater Remediation via Chemical Oxidation	High	Moderate	High	Moderate	Moderate	Low to Moderate	Moderate - High	High	This alternative would be very effective for exposure control and would also reduce source concentrations. The projected cost is equal to the cost for Alternative #3. Implementation of the chemical oxidation remedy would have a moderate risk. Timeliness of alternatives #2, #3 and #4 are essentially the same.

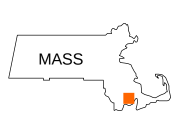
* Effectiveness - the ability of the remedy to treat, destroy, detoxify, reuse, or recycle contaminants at the Site, and achieve a Permanent Solution under the MCP.
Reliability - the degree of certainty that the remedy will be successful over the short- and long-term timeframes.
Difficulty of Implementation - comparative difficulty in terms of technical complexity, integration with facility operations, monitoring requirements, and material and labor availability.
Relative Costs - Costs in terms of remedy design and implementation.
Implementation Risks - comparative risks posed by the Site to workers, the community, and the environment during and after remedy implementation.
Benefits - the comparative benefits of the alternative including the provision for productive Site reuse, restoration of natural resources, and other non-pecuniary benefits.
Timeliness - the relative time for the alternative to eliminate uncontrolled hazardous material and achieve cleanup objectives for the Site.

FIGURES

BASE MAP IS A PORTION OF THE FOLLOWING 7.5' X 15' USGS TOPOGRAPHIC QUADRANGLE: NEW BEDFORD NORTH, MA, 1979

0 1000 2000 3000

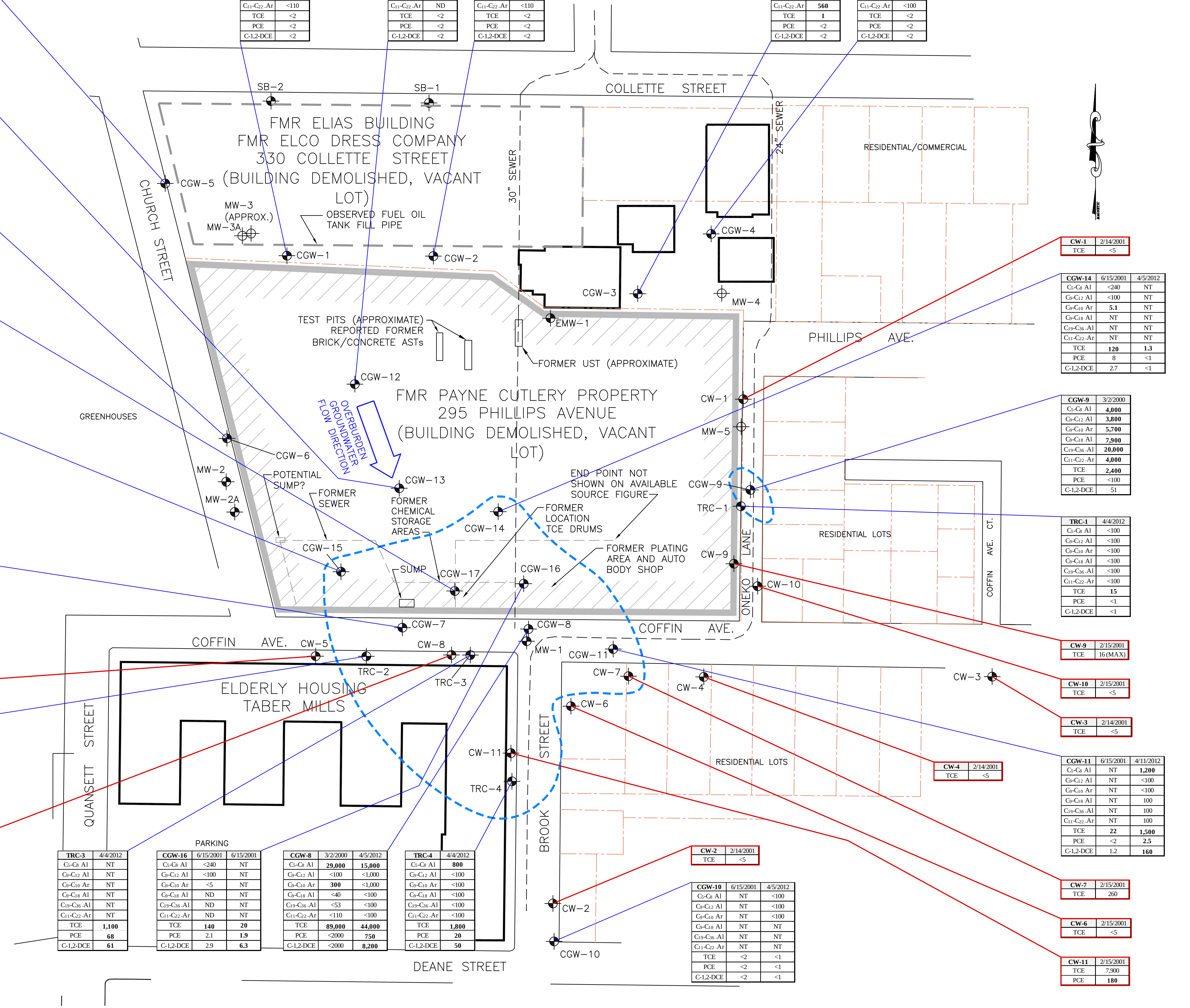
scale in feet



QUADRANGLE LOCATION

FORMER PAYNE CUTLERY 295 PHILLIPS AVENUE NEW BEDFORD, MASSACHUSETTS	
LOCUS MAP	
TRC — Wannalancit Mills 650 Suffolk Street Lowell, Ma. 01854 (978) 970-5600	**FIGURE 1**
Drawn: HWB / **Checked: DS**	**SCALE: AS SHOWN** **Date 9/06/05**

T:\E_CAD\47284\Payne ASTM Phase I\Payne-TOPO.ppt



CGW-5	3/2/2000
C_5-C_8 Al	<240
C_9-C_{12} Al	<100
C_9-C_{10} Ar	<70
C_9-C_{18} Al	<31
C_{19}-C_{36}-Al	<42
C_{11}-C_{22}-Ar	<88
TCE	<2
PCE	<2
C-1,2-DCE	<2

CGW-13	6/15/2001
C_5-C_8 Al	<2,400
C_9-C_{12} Al	**1,300**
C_9-C_{10} Ar	**320**
C_9-C_{18} Al	ND
C_{19}-C_{36}-Al	ND
C_{11}-C_{22}-Ar	ND
TCE	**15 J**
PCE	<20
C-1,2-DCE	<20

CGW-6	3/2/2000
C_5-C_8 Al	<240
C_9-C_{12} Al	<100
C_9-C_{10} Ar	<70
C_9-C_{18} Al	NT
C_{19}-C_{36}-Al	NT
C_{11}-C_{22}-Ar	NT
TCE	<2
PCE	<2
C-1,2-DCE	<2

CGW-17	6/15/2001	4/5/2012
C_5-C_8 Al	**3,000**	<100
C_9-C_{12} Al	<100	<100
C_9-C_{10} Ar	**17**	<100
C_9-C_{18} Al	ND	NT
C_{19}-C_{36}-Al	ND	NT
C_{11}-C_{22}-Ar	ND	NT
TCE	**8,700**	**11**
PCE	**110**	<1
C-1,2-DCE	**240**	**1.1**

CGW-15	6/15/2001	4/5/2012
C_5-C_8 Al	<240	NT
C_9-C_{12} Al	<100	NT
C_9-C_{10} Ar	<5	NT
C_9-C_{18} Al	ND	NT
C_{19}-C_{36}-Al	ND	NT
C_{11}-C_{22}-Ar	ND	NT
TCE	**94**	**3.5**
PCE	<2	<1
C-1,2-DCE	<5.5	<1

CGW-7	3/2-10/2000
C_5-C_8 Al	**950**
C_9-C_{12} Al	<100
C_9-C_{10} Ar	<70
C_9-C_{18} Al	<45
C_{19}-C_{36}-Al	<60
C_{11}-C_{22}-Ar	<70
TCE	**2,100**
PCE	46
C-1,2-DCE	<20

CW-5	2/15/2001
TCE	<5

TRC-2	4/4/2012
C_5-C_8 Al	**130**
C_9-C_{12} Al	<100
C_9-C_{10} Ar	<100
C_9-C_{18} Al	<100
C_{19}-C_{36}-Al	<100
C_{11}-C_{22}-Ar	<100
TCE	**240**
PCE	**18**
C-1,2-DCE	**56**

CW-8	2/15/2001
TCE	15,000
PCE	**140**

CGW-1	3/2/2000
C_5-C_8 Al	<240
C_9-C_{12} Al	<100
C_9-C_{10} Ar	<70
C_9-C_{18} Al	<38
C_{19}-C_{36}-Al	<51
C_{11}-C_{22}-Ar	<110
TCE	<2
PCE	<2
C-1,2-DCE	<2

CGW-12	6/15/2001
C_5-C_8 Al	<240
C_9-C_{12} Al	<100
C_9-C_{10} Ar	**5.4**
C_9-C_{18} Al	ND
C_{19}-C_{36}-Al	ND
C_{11}-C_{22}-Ar	ND
TCE	<2
PCE	<2
C-1,2-DCE	<2

CGW-2	3/2/2000
C_5-C_8 Al	<240
C_9-C_{12} Al	<100
C_9-C_{10} Ar	<70
C_9-C_{18} Al	<38
C_{19}-C_{36}-Al	<51
C_{11}-C_{22}-Ar	<110
TCE	<2
PCE	<2
C-1,2-DCE	<2

CGW-3	3/2/2000
C_5-C_8 Al	<240
C_9-C_{12} Al	**240**
C_9-C_{10} Ar	**200**
C_9-C_{18} Al	**410**
C_{19}-C_{36}-Al	<51
C_{11}-C_{22}-Ar	**560**
TCE	**1**
PCE	<2
C-1,2-DCE	<2

CGW-4	3/2/2000
C_5-C_8 Al	<240
C_9-C_{12} Al	<100
C_9-C_{10} Ar	<140
C_9-C_{18} Al	<56
C_{19}-C_{36}-Al	<48
C_{11}-C_{22}-Ar	<100
TCE	<2
PCE	<2
C-1,2-DCE	<2

CW-1	2/14/2001
TCE	<5

CGW-14	6/15/2001	4/5/2012
C_5-C_8 Al	<240	NT
C_9-C_{12} Al	<100	NT
C_9-C_{10} Ar	**5.1**	NT
C_9-C_{18} Al	NT	NT
C_{19}-C_{36}-Al	NT	NT
C_{11}-C_{22}-Ar	NT	NT
TCE	**120**	**1.3**
PCE	8	<1
C-1,2-DCE	2.7	<1

CGW-9	3/2/2000
C_5-C_8 Al	**4,000**
C_9-C_{12} Al	**3,800**
C_9-C_{10} Ar	**5,700**
C_9-C_{18} Al	**7,900**
C_{19}-C_{36}-Al	**20,000**
C_{11}-C_{22}-Ar	**4,000**
TCE	**2,400**
PCE	<100
C-1,2-DCE	51

TRC-1	4/4/2012
C_5-C_8 Al	<100
C_9-C_{12} Al	<100
C_9-C_{10} Ar	<100
C_9-C_{18} Al	<100
C_{19}-C_{36}-Al	<100
C_{11}-C_{22}-Ar	<100
TCE	**15**
PCE	<1
C-1,2-DCE	<1

CW-9	2/15/2001
TCE	16 (MAX)

CW-10	2/15/2001
TCE	<5

CW-3	2/14/2001
TCE	<5

CW-4	2/14/2001
TCE	<5

CGW-11	6/15/2001	4/11/2012
C_5-C_8 Al	NT	**1,200**
C_9-C_{12} Al	NT	<100
C_9-C_{10} Ar	NT	<100
C_9-C_{18} Al	NT	100
C_{19}-C_{36}-Al	NT	100
C_{11}-C_{22}-Ar	NT	100
TCE	**22**	**1,500**
PCE	<2	**2.5**
C-1,2-DCE	1.2	**160**

CW-2	2/14/2001
TCE	<5

CGW-10	6/15/2001	4/5/2012
C_5-C_8 Al	NT	<100
C_9-C_{12} Al	NT	<100
C_9-C_{10} Ar	NT	<100
C_9-C_{18} Al	NT	NT
C_{19}-C_{36}-Al	NT	NT
C_{11}-C_{22}-Ar	NT	NT
TCE	<2	<1
PCE	<2	<1
C-1,2-DCE	<2	<1

CW-7	2/15/2001
TCE	260

CW-6	2/15/2001
TCE	<5

CW-11	2/15/2001
TCE	7,900
PCE	**180**

TRC-3	4/4/2012
C_5-C_8 Al	NT
C_9-C_{12} Al	NT
C_9-C_{10} Ar	NT
C_9-C_{18} Al	NT
C_{19}-C_{36}-Al	NT
C_{11}-C_{22}-Ar	NT
TCE	**1,100**
PCE	**68**
C-1,2-DCE	**61**

CGW-16	6/15/2001	6/15/2001
C_5-C_8 Al	<240	NT
C_9-C_{12} Al	<100	NT
C_9-C_{10} Ar	<5	NT
C_9-C_{18} Al	ND	NT
C_{19}-C_{36}-Al	ND	NT
C_{11}-C_{22}-Ar	ND	NT
TCE	**140**	**20**
PCE	2.1	**1.9**
C-1,2-DCE	2.9	**6.3**

CGW-8	3/2/2000	4/5/2012
C_5-C_8 Al	**29,000**	**15,000**
C_9-C_{12} Al	<100	<1,000
C_9-C_{10} Ar	**300**	<1,000
C_9-C_{18} Al	<40	<100
C_{19}-C_{36}-Al	<53	<100
C_{11}-C_{22}-Ar	<110	<100
TCE	**89,000**	**44,000**
PCE	<2000	**750**
C-1,2-DCE	<2000	**8,200**

TRC-4	4/4/2012
C_5-C_8 Al	**800**
C_9-C_{12} Al	<100
C_9-C_{10} Ar	<100
C_9-C_{18} Al	<100
C_{19}-C_{36}-Al	<100
C_{11}-C_{22}-Ar	<100
TCE	**1,800**
PCE	**20**
C-1,2-DCE	**50**

LEGEND:

LABORATORY DATA SUMMARY

COMPOUND NAMES — WELL ID — SAMPLE DATE

COMPOUND NAMES	CGW-7	3/2-10/2000
C_5-C_8 ALIPHATICS	C_5-C_8 Al	**950**
C_9-C_{12} ALIPHATICS	C_9-C_{12} Al	<100
C_9-C_{10} AROMATICS	C_9-C_{10} Ar	<70
C_9-C_{18} ALIPHATICS	C_9-C_{18} Al	<45
C_{19}-C_{36}-ALIPHATICS	C_{19}-C_{36}-Al	<60
C_{11}-C_{22}-AROMATICS	C_{11}-C_{22}-Ar	<70
TRICHLOROETHENE	TCE	**2,100**
TETRACHLOROETHENE	PCE	46
CIS-1,2-DICHLOROETHENE	C-1,2-DCE	<20

COMPOUND ABBREVIATION

BOLD = COMPOUND DETECTED

CONCENTRATION FOUND ug/L

AQUEOUS HEADSPACE GC SCREENING DATA SUMMARY

COMPOUND NAMES — SAMPLE ID — SAMPLE DATE

COMPOUND NAMES	CW-8	2/15/2001
TRICHLOROETHENE	TCE	15,000
TETRACHLOROETHENE	PCE	**140**

CONCENTRATION FOUND ug/L

BOLD = COMPOUND DETECTED

MASSDEP REGULATORY THRESHOLDS

COMPOUND NAMES		SCREENING VALUE (ug/L)
C_5-C_8 ALIPHATICS	C_5-C_8 Al	3,000
C_9-C_{12} ALIPHATICS	C_9-C_{12} Al	5,000
C_9-C_{10} AROMATICS	C_9-C_{10} Ar	7,000
C_9-C_{18} ALIPHATICS	C_9-C_{18} Al	5,000
C_{19}-C_{36}-ALIPHATICS	C_{19}-C_{36}-Al	no standard
C_{11}-C_{22}-AROMATICS	C_{11}-C_{22}-Ar	50,000
TRICHLOROETHENE	TCE	30
TETRACHLOROETHENE	PCE	50
CIS-1,2-DICHLOROETHENE	C-1,2-DCE	100

GC– GAS CHROMATOGRAPHY
<–NOT DETECTED AT REPORTING LIMIT PROVIDED
J– ESTIMATED
NT– NOT TESTED
ND– NON–DETECT (REPORTING LIMIT NOT PROVIDED)
(ug/L)– MICROGRAMS PER LITER
MCP– MASSACHUSETTS CONTINGENCY PLAN

LABORATORY DATA BOX CONNECTOR
SCREENING DATA BOX CONNECTOR
APPROX. 30 ug/L TCE CONTOUR (GW–2)
DELINEATES BOUNDARY OF FORMER PAYNE CUTLERY PROPERTY. HASH MARKS ARE ON INSIDE OF PROPERTY BOUNDARY.
EXISTING MONITORING WELL
LOT LINES
APPROX. LOCATION OF SEWER LINE
APPROX. LOCATION OF FORMER SEWER LINE

NOTES:
1. BASE MAP WAS DIGITIZED FROM A COPY OF AN UNDATED PLAN ENTITLED "SITE PLAN" PREPARED BY CYGNUS GROUP OF SOUTHBOROUGH MA. FIG 2 ORIGINAL SCALE 1"=50'.

APPROXIMATE GRAPHIC SCALE
0' 50' 100' 200'

SITE PLAN WITH GROUNDWATER SAMPLING RESULTS

FORMER PAYNE CUTLERY
295 PHILLIPS AVE, NEW BEDFORD, MA

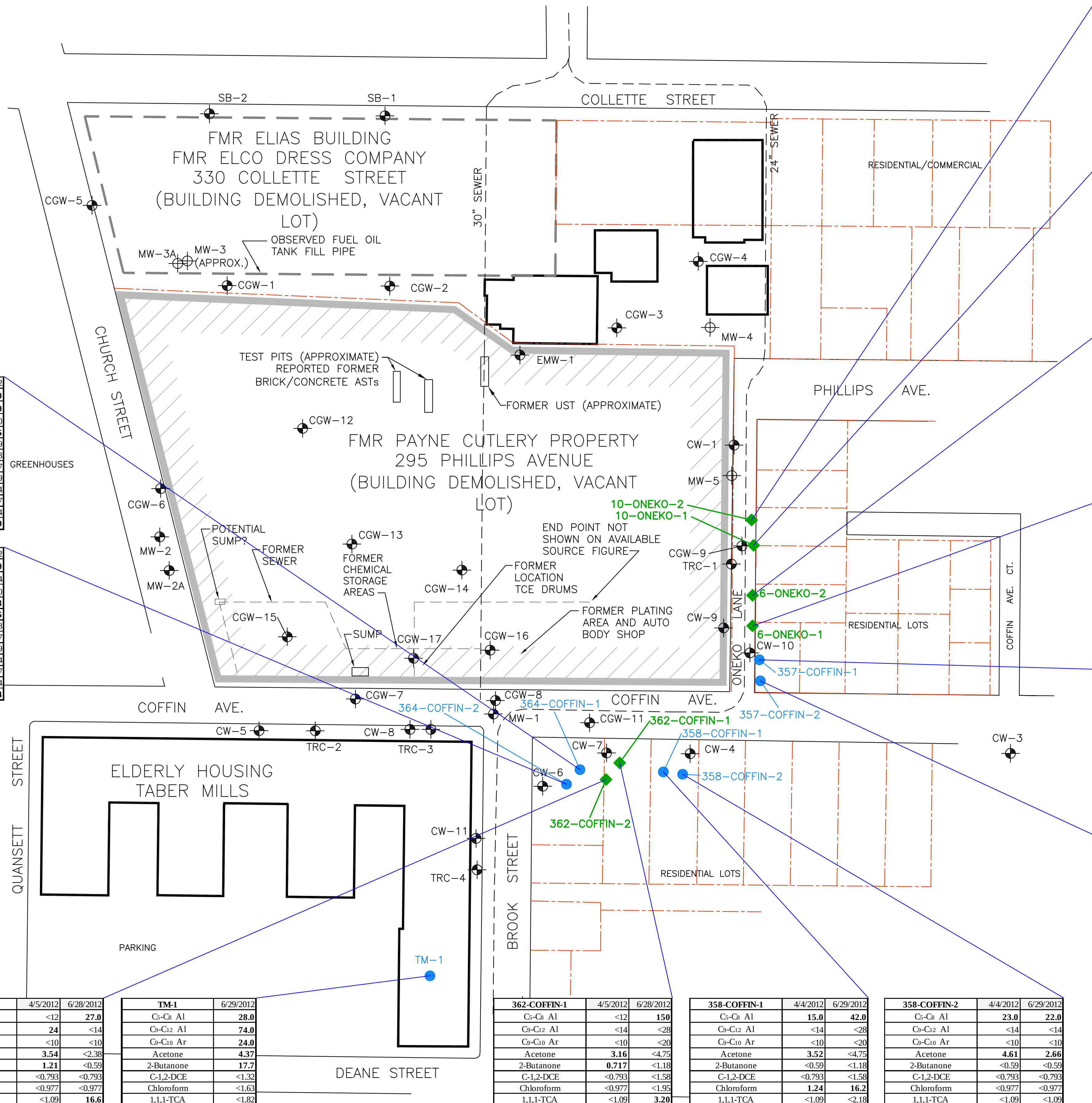
TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970–5600

FIGURE 2

DRAWN BY: HWB
CHECKED BY: ACL
DATE: NOV 2012

THIS DRAWING REFERENCES BUT IS NOT LINKED TO T:\E_CAD\172744\JULY 2012 GROUNDWATER RESULTS.xlsx

FILE: T:\E_CAD\172744\PAYNE GW RESULTS 11-12.dwg



10-ONEKO-2	4/5/2012
C_5-C_8 Al	<12
C_9-C_{12} Al	<14
C_9-C_{10} Ar	<10
Acetone	**4.23**
2-Butanone	**0.908**
C-1,2-DCE	<0.793
Chloroform	**1.64**
1,1,1-TCA	<1.09
Bromodichloromethane	<1.34
TCE	**2.06**
Toluene	<0.754
PCE	**2.56**

10-ONEKO-1	4/5/2012	6/29/2012
C_5-C_8 Al	<12	**61.0**
C_9-C_{12} Al	<14	**150**
C_9-C_{10} Ar	<10	<10
Acetone	**2.85**	**12.6**
2-Butanone	<0.59	**1.96**
C-1,2-DCE	<0.793	<0.793
Chloroform	<0.977	**1.21**
1,1,1-TCA	<1.09	<1.09
Bromodichloromethane	<1.34	<1.34
TCE	<1.07	<1.07
Toluene	**0.901**	<0.754
PCE	**1.65**	**3.18**

6-ONEKO-2	4/5/2012	6/28/2012
C_5-C_8 Al	<12	<24
C_9-C_{12} Al	<14	**37.0**
C_9-C_{10} Ar	<10	<20
Acetone	**2.68**	**7.08**
2-Butanone	<0.59	<1.18
C-1,2-DCE	<0.793	<1.58
Chloroform	<0.977	<1.95
1,1,1-TCA	<1.09	<2.18
Bromodichloromethane	<1.34	<2.68
TCE	<1.07	<2.15
Toluene	<0.754	<1.51
PCE	**6.24**	**19.2**

6-ONEKO-1	4/5/2012	6/28/2012
C_5-C_8 Al	<12	**81.0**
C_9-C_{12} Al	<14	<46
C_9-C_{10} Ar	<10	<33
Acetone	<2.38	<7.91
2-Butanone	<0.59	<1.97
C-1,2-DCE	<0.793	<2.64
Chloroform	<0.977	<3.26
1,1,1-TCA	**2.25**	**8.29**
Bromodichloromethane	<1.34	<4.47
TCE	**2.53**	**14.2**
Toluene	<0.754	<2.51
PCE	**55.5**	**203**

357-COFFIN-1	4/4/2012	6/28/2012
C_5-C_8 Al	**17.0**	**61.0**
C_9-C_{12} Al	**110**	**110**
C_9-C_{10} Ar	**18.0**	<10
Acetone	**10.6**	**2.61**
2-Butanone	**1.32**	<0.59
C-1,2-DCE	<0.793	<0.793
Chloroform	<0.977	**39.7**
1,1,1-TCA	<1.09	<1.09
Bromodichloromethane	<1.34	**1.45**
TCE	<1.07	<1.07
Toluene	**0.938**	<0.754
PCE	**2.23**	**3.49**

357-COFFIN-2	4/4/2012	6/28/2012
C_5-C_8 Al	<12	**50.0**
C_9-C_{12} Al	**43.0**	**47.0**
C_9-C_{10} Ar	<10	<33
Acetone	**2.38**	<7.91
2-Butanone	<0.59	<1.97
C-1,2-DCE	<0.793	<2.64
Chloroform	<0.977	<3.26
1,1,1-TCA	<1.09	<3.64
Bromodichloromethane	<1.34	<4.47
TCE	<1.07	<3.58
Toluene	<0.754	<2.51
PCE	**1.37**	<4.52

364-COFFIN-1	4/4/2012	6/28/2012
C_5-C_8 Al	<12	**37.0**
C_9-C_{12} Al	<14	**110**
C_9-C_{10} Ar	<10	<10
Acetone	**3.75**	**2.45**
2-Butanone	<0.59	<0.59
C-1,2-DCE	<0.793	<0.793
Chloroform	<0.977	<0.977
1,1,1-TCA	<1.09	<1.09
Bromodichloromethane	<1.34	<1.34
TCE	<1.07	<1.07
Toluene	<0.754	<0.754
PCE	**1.45**	**3.39**

364-COFFIN-2	4/4/2012	6/28/2012
C_5-C_8 Al	<12	**36.0**
C_9-C_{12} Al	<14	<14
C_9-C_{10} Ar	<10	<10
Acetone	**2.76**	**5.63**
2-Butanone	**3.33**	**1.75**
C-1,2-DCE	<0.793	<0.793
Chloroform	<0.977	<0.977
1,1,1-TCA	<1.09	<1.09
Bromodichloromethane	<1.34	<1.34
TCE	<1.07	<1.07
Toluene	<0.754	<0.754
PCE	**5.61**	**14.4**

362-COFFIN-2	4/5/2012	6/28/2012
C_5-C_8 Al	<12	**27.0**
C_9-C_{12} Al	**24**	<14
C_9-C_{10} Ar	<10	<10
Acetone	**3.54**	<2.38
2-Butanone	**1.21**	<0.59
C-1,2-DCE	<0.793	<0.793
Chloroform	<0.977	<0.977
1,1,1-TCA	<1.09	**16.6**
Bromodichloromethane	<1.34	<1.34
TCE	<1.07	<1.07
Toluene	<0.754	<0.754
PCE	<1.36	<1.36

TM-1	6/29/2012
C_5-C_8 Al	**28.0**
C_9-C_{12} Al	**74.0**
C_9-C_{10} Ar	**24.0**
Acetone	**4.37**
2-Butanone	**17.7**
C-1,2-DCE	<1.32
Chloroform	<1.63
1,1,1-TCA	<1.82
Bromodichloromethane	<2.23
TCE	**446**
Toluene	**4.79**
PCE	**12.7**

362-COFFIN-1	4/5/2012	6/28/2012
C_5-C_8 Al	<12	**150**
C_9-C_{12} Al	<14	<28
C_9-C_{10} Ar	<10	<20
Acetone	**3.16**	<4.75
2-Butanone	**0.717**	<1.18
C-1,2-DCE	<0.793	<1.58
Chloroform	<0.977	<1.95
1,1,1-TCA	<1.09	**3.20**
Bromodichloromethane	<1.34	<2.68
TCE	<1.07	<2.15
Toluene	<0.754	<1.51
PCE	<1.36	<2.71

358-COFFIN-1	4/4/2012	6/29/2012
C_5-C_8 Al	**15.0**	**42.0**
C_9-C_{12} Al	<14	<28
C_9-C_{10} Ar	<10	<20
Acetone	**3.52**	<4.75
2-Butanone	<0.59	<1.18
C-1,2-DCE	<0.793	<1.58
Chloroform	**1.24**	**16.2**
1,1,1-TCA	<1.09	<2.18
Bromodichloromethane	<1.34	<2.68
TCE	<1.07	<2.15
Toluene	<0.754	<1.51
PCE	**1.38**	**3.46**

358-COFFIN-2	4/4/2012	6/29/2012
C_5-C_8 Al	**23.0**	**22.0**
C_9-C_{12} Al	<14	<14
C_9-C_{10} Ar	<10	<10
Acetone	**4.61**	**2.66**
2-Butanone	<0.59	<0.59
C-1,2-DCE	<0.793	<0.793
Chloroform	<0.977	<0.977
1,1,1-TCA	<1.09	<1.09
Bromodichloromethane	<1.34	<1.34
TCE	<1.07	<1.07
Toluene	**1.29**	<0.754
PCE	<1.36	<1.36

LEGEND:

LABORATORY DATA SUMMARY

COMPOUND NAMES — WELL ID — SAMPLE DATE

Compound name	TM-1	6/29/2012
C5-C8 ALIPHATICS	C_5-C_8 Al	**28.0**
C9-C12 ALIPHATICS	C_9-C_{12} Al	**74.0**
C9-C10 AROMATICS	C_9-C_{10} Ar	**24.0**
	Acetone	**4.37**
	2-Butanone	**17.7**
CIS-1,2-DICHLOROETHENE	C-1,2-DCE	<1.32
	Chloroform	<1.63
1,1,1-TRICHLOROETHANE	1,1,1-TCA	<1.82
	Bromodichloromethane	<2.23
TRICHLOROETHENE	TCE	**446**
	Toluene	**4.79**
TETRACHLOROETHENE	PCE	**12.7**

BOLD = COMPOUND DETECTED

CONCENTRATION FOUND (ug/m^3)

COMPOUND ABBREVIATION

MASSDEP REGULATORY THRESHOLDS

COMPOUND NAMES — SCREENING VALUE (ug/m^3)

Compound name	Abbreviation	Screening value
C5-C8 ALIPHATICS	C_5-C_8 Al	4,100
C9-C12 ALIPHATICS	C_9-C_{12} Al	4,800
C9-C10 AROMATICS	C_9-C_{10} Ar	700
	Acetone	6,400
	2-Butanone	840
CIS-1,2-DICHLOROETHENE	C-1,2-DCE	56
	Chloroform	130
1,1,1-TRICHLOROETHANE	1,1,1-TCA	210
	Bromodichloromethane	10
TRICHLOROETHENE	TCE	56
	Toluene	3,800
TETRACHLOROETHENE	PCE	98

COMPOUND ABBREVIATION

(ug/m^3)– MICROGRAMS PER CUBIC METER

DELINEATES BOUNDARY OF FORMER PAYNE CUTLERY PROPERTY. HASH MARKS ARE ON INSIDE OF PROPERTY BOUNDARY.

EXISTING MONITORING WELL

OUTDOOR SOIL GAS SAMPLE

INDOOR SOIL GAS SAMPLE

LOT LINES

APPROX. LOCATION OF SEWER LINE

APPROX. LOCATION OF FORMER SEWER LINE

NOTES:
1. BASE MAP WAS DIGITIZED FROM A COPY OF AN UNDATED PLAN ENTITLED "SITE PLAN" PREPARED BY CYGNUS GROUP OF SOUTHBOROUGH MA. FIG 2 ORIGINAL SCALE 1"=50'.

APPROXIMATE GRAPHIC SCALE

0' 50' 100' 200'

SITE PLAN WITH SOIL GAS RESULTS

FORMER PAYNE CUTLERY
295 PHILLIPS AVE, NEW BEDFORD, MA

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

FIGURE 3

DRAWN BY: HWB
CHECKED BY: ACL
DATE: NOV 2012

THIS DRAWING REFERENCES BUT IS NOT LINKED TO T:\E_CAD\172744\SOIL GAS RESULTS JULY-2012.xlsx
FILE: T:\E_CAD\172744\PAYNE SOIL GAS RESULTS 11-12.dwg

362 Coffin Avenue	Basement 362C-1 3/27/2000	1st Floor 362C-2 3/27/2000	Basement 362B 3/28/2001	1st Floor 362L 3/28/2001
tol	**168**	**32.2**	**30.4**	**8.29**
C5-C8 Al	NT	NT	NT	NT
C9-C12 Al	NT	NT	NT	NT
C9-C10 Ar	NT	NT	NT	NT
Acetone	NT	NT	NT	NT
2-Butanone	NT	NT	NT	NT
1,2-DCA	NT	NT	NT	NT
1,1,1-TCA	**86.5**	**12.3**	**16.6**	2.18
benz	**39**	**44.1**	**6.77**	**5.46**
C. Tetrachloride	NT	NT	NT	NT
TCE	1.82	1.82	1.82	1.82
ethbenz	**32.8**	**2.9**	**4.64**	2.34
m,p-X	**150**	**8.76**	**25.2**	1.65
o-X	**55.9**	**3.94**	**6.85**	1.99
1,4-DCB	4.87	4.87	4.87	4.87
Napthalene	NT	NT	NT	NT

295 Phillips Ave	Courtyard 295P-1A 3/27/2000
tol	3.58
C5-C8 Al	NT
C9-C12 Al	NT
C9-C10 Ar	NT
Acetone	NT
2-Butanone	NT
1,2-DCA	NT
1,1,1-TCA	2.18
benz	2.88
C. Tetrachloride	NT
TCE	1.82
ethbenz	2.34
m,p-X	**3.55**
o-X	1.99
1,4-DCB	4.87
Napthalene	NT

12 Oneko Lane	Basement 12O-1 3/27/2000	1st Floor 12O-2 3/27/2000
tol	**5.69**	**19.5**
C5-C8 Al	NT	NT
C9-C12 Al	NT	NT
C9-C10 Ar	NT	NT
Acetone	NT	NT
2-Butanone	NT	NT
1,2-DCA	NT	NT
1,1,1-TCA	2.18	2.18
benz	2.88	**6.65**
C. Tetrachloride	NT	NT
TCE	1.82	1.82
ethbenz	2.34	**2.69**
m,p-X	**5.59**	**8.15**
o-X	**2.56**	1.99
1,4-DCB	4.87	4.87
Napthalene	NT	NT

8 Oneko Lane	Basement 8 Oneko B 3/28/2000	1st Floor 8 Onek 1st 3/28/2000
tol	**13.1**	**43.7**
C5-C8 Al	NT	NT
C9-C12 Al	NT	NT
C9-C10 Ar	NT	NT
Acetone	NT	NT
2-Butanone	NT	NT
1,2-DCA	NT	NT
1,1,1-TCA	**5.55**	**22.8**
benz	**3.8**	**12.8**
C. Tetrachloride	NT	NT
TCE	1.82	1.82
ethbenz	**2.38**	**8.63**
m,p-X	**9.15**	**26.6**
o-X	**6.03**	**7.98**
1,4-DCB	4.87	**65.5**
Napthalene	NT	NT

6 Oneko Lane	Basement 6O-1 3/27/2000	Basement 6O-3# 3/27/2000	1st Floor 6O-2 3/27/2000
tol	**6.86**	**7.04**	**35**
C5-C8 Al	NT	NT	NT
C9-C12 Al	NT	NT	NT
C9-C10 Ar	NT	NT	NT
Acetone	NT	NT	NT
2-Butanone	NT	NT	NT
1,2-DCA	NT	NT	NT
1,1,1-TCA	2.18	2.18	2.18
benz	**3.58**	2.88	**4.38**
C. Tetrachloride	NT	NT	NT
TCE	1.82	1.82	1.82
ethbenz	2.34	2.34	**2.6**
m,p-X	**4.42**	**4.68**	**8.06**
o-X	**2.04**	**2.12**	**3.81**
1,4-DCB	4.87	4.87	4.87
Napthalene	NT	NT	NT

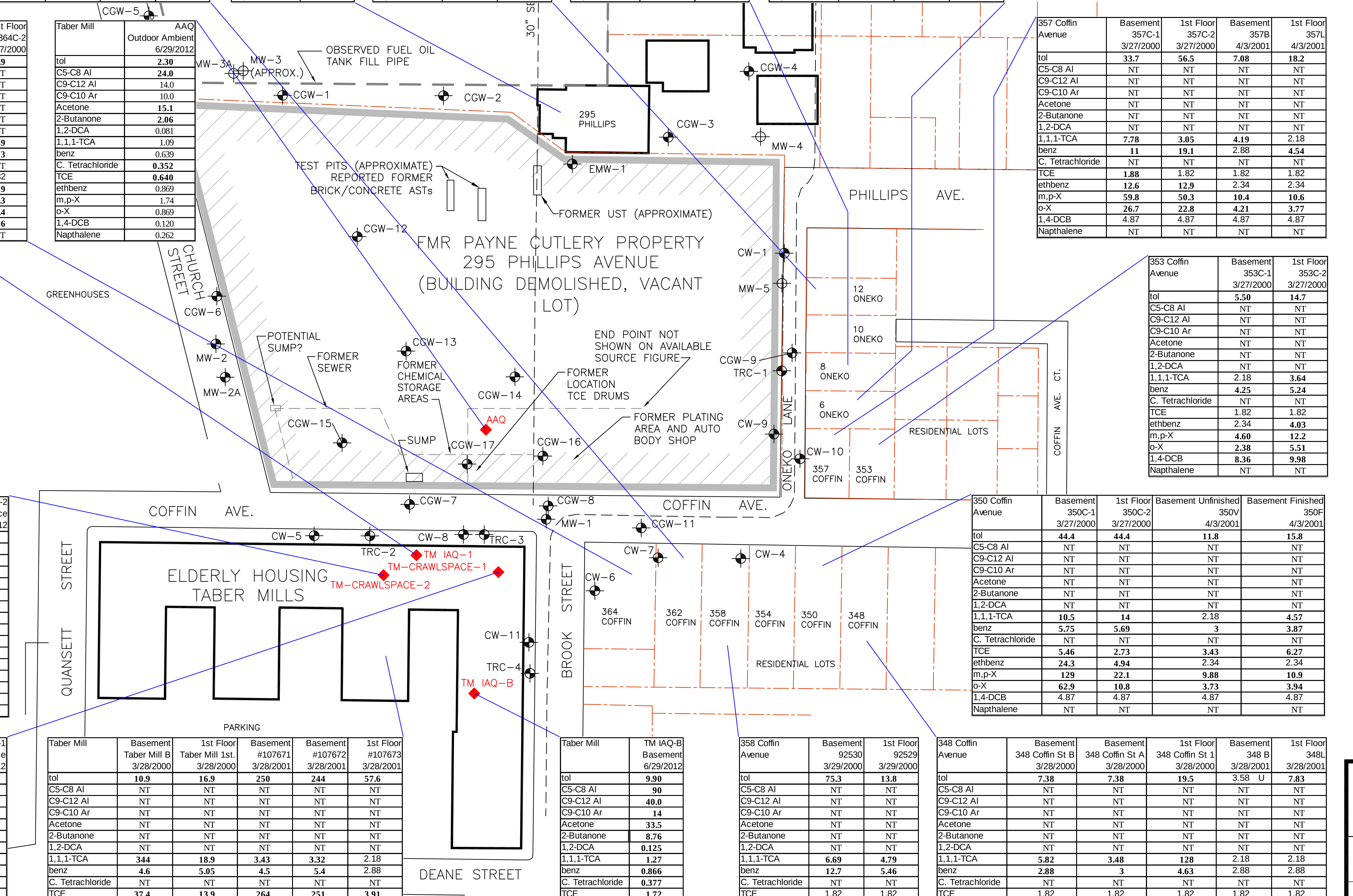
364 Coffin Avenue	Basement 364C-1 3/27/2000	1st Floor 364C-2 3/27/2000
tol	**62.5**	**42.9**
C5-C8 Al	NT	NT
C9-C12 Al	NT	NT
C9-C10 Ar	NT	NT
Acetone	NT	NT
2-Butanone	NT	NT
1,2-DCA	NT	NT
1,1,1-TCA	2.18	**5.49**
benz	**14.4**	**13**
C. Tetrachloride	NT	NT
TCE	1.82	1.82
ethbenz	**12.1**	**6.29**
m,p-X	**55.5**	**27.3**
o-X	**19.7**	**10.4**
1,4-DCB	4.87	**8.36**
Napthalene	NT	NT

Taber Mill	AAQ Outdoor Ambient 6/29/2012
tol	**2.30**
C5-C8 Al	**24.0**
C9-C12 Al	14.0
C9-C10 Ar	10.0
Acetone	**15.1**
2-Butanone	**2.06**
1,2-DCA	0.081
1,1,1-TCA	1.09
benz	0.639
C. Tetrachloride	**0.352**
TCE	**0.640**
ethbenz	0.869
m,p-X	1.74
o-X	0.869
1,4-DCB	0.120
Napthalene	0.262

Taber Mill	TM IAQ-1 First Floor 6/29/2012
tol	**3.30**
C5-C8 Al	**130**
C9-C12 Al	**68.0**
C9-C10 Ar	10.0
Acetone	**64.4**
2-Butanone	**3.18**
1,2-DCA	**0.134**
1,1,1-TCA	1.09
benz	**0.891**
C. Tetrachloride	**0.358**
TCE	**0.274**
ethbenz	0.869
m,p-X	1.74
o-X	0.869
1,4-DCB	0.120
Napthalene	**0.383 J**

357 Coffin Avenue	Basement 357C-1 3/27/2000	1st Floor 357C-2 3/27/2000	Basement 357B 4/3/2001	1st Floor 357L 4/3/2001
tol	**33.7**	**56.5**	**7.08**	**18.2**
C5-C8 Al	NT	NT	NT	NT
C9-C12 Al	NT	NT	NT	NT
C9-C10 Ar	NT	NT	NT	NT
Acetone	NT	NT	NT	NT
2-Butanone	NT	NT	NT	NT
1,2-DCA	NT	NT	NT	NT
1,1,1-TCA	**7.78**	**3.05**	**4.19**	2.18
benz	**11**	**19.1**	2.88	**4.54**
C. Tetrachloride	NT	NT	NT	NT
TCE	**1.88**	1.82	1.82	1.82
ethbenz	**12.6**	**12.9**	2.34	2.34
m,p-X	**59.8**	**50.3**	**10.4**	**10.6**
o-X	**26.7**	**22.8**	**4.21**	**3.77**
1,4-DCB	4.87	4.87	4.87	4.87
Napthalene	NT	NT	NT	NT

353 Coffin Avenue	Basement 353C-1 3/27/2000	1st Floor 353C-2 3/27/2000
tol	**5.50**	**14.7**
C5-C8 Al	NT	NT
C9-C12 Al	NT	NT
C9-C10 Ar	NT	NT
Acetone	NT	NT
2-Butanone	NT	NT
1,2-DCA	NT	NT
1,1,1-TCA	2.18	**3.64**
benz	**4.25**	**5.24**
C. Tetrachloride	NT	NT
TCE	1.82	1.82
ethbenz	2.34	**4.03**
m,p-X	**4.60**	**12.2**
o-X	**2.38**	**5.51**
1,4-DCB	**8.36**	**9.98**
Napthalene	NT	NT



350 Coffin Avenue	Basement 350C-1 3/27/2000	1st Floor 350C-2 3/27/2000	Basement Unfinished 350V 4/3/2001	Basement Finished 350F 4/3/2001
tol	**44.4**	**44.4**	**11.8**	**15.8**
C5-C8 Al	NT	NT	NT	NT
C9-C12 Al	NT	NT	NT	NT
C9-C10 Ar	NT	NT	NT	NT
Acetone	NT	NT	NT	NT
2-Butanone	NT	NT	NT	NT
1,2-DCA	NT	NT	NT	NT
1,1,1-TCA	**10.5**	**14**	2.18	**4.57**
benz	**5.75**	**5.69**	**3**	**3.87**
C. Tetrachloride	NT	NT	NT	NT
TCE	**5.46**	**2.73**	**3.43**	**6.27**
ethbenz	**24.3**	**4.94**	2.34	2.34
m,p-X	**129**	**22.1**	**9.88**	**10.9**
o-X	**62.9**	**10.8**	**3.73**	**3.94**
1,4-DCB	4.87	4.87	4.87	4.87
Napthalene	NT	NT	NT	NT

Taber Mill	TM-CRAWLSPACE-2 Crawlspace 6/29/2012
tol	**4.50**
C5-C8 Al	**55.0**
C9-C12 Al	**23.0**
C9-C10 Ar	10.0
Acetone	**25.2**
2-Butanone	**2.41**
1,2-DCA	**0.142**
1,1,1-TCA	1.09
benz	**0.939**
C. Tetrachloride	**0.352**
TCE	**0.677**
ethbenz	0.869
m,p-X	**2.67**
o-X	**1.00**
1,4-DCB	0.120
Napthalene	0.262

Taber Mill	TM-CRAWLSPACE-1 Crawlspace 6/29/2012
tol	**3.60**
C5-C8 Al	**48.0**
C9-C12 Al	**16.0**
C9-C10 Ar	10.0
Acetone	**26.8**
2-Butanone	**4.48**
1,2-DCA	**0.085**
1,1,1-TCA	1.09
benz	**0.789**
C. Tetrachloride	**0.352**
TCE	**0.338**
ethbenz	0.869
m,p-X	**2.48**
o-X	**0.899**
1,4-DCB	0.120
Napthalene	0.262

Taber Mill	Basement Taber Mill B 3/28/2000	1st Floor Taber Mill 1st. 3/28/2000	Basement #107671 3/28/2001	Basement #107672 3/28/2001	1st Floor #107673 3/28/2001
tol	**10.9**	**16.9**	**250**	**244**	**57.6**
C5-C8 Al	NT	NT	NT	NT	NT
C9-C12 Al	NT	NT	NT	NT	NT
C9-C10 Ar	NT	NT	NT	NT	NT
Acetone	NT	NT	NT	NT	NT
2-Butanone	NT	NT	NT	NT	NT
1,2-DCA	NT	NT	NT	NT	NT
1,1,1-TCA	**344**	**18.9**	**3.43**	**3.32**	2.18
benz	**4.6**	**5.05**	**4.5**	**5.4**	2.88
C. Tetrachloride	NT	NT	NT	NT	NT
TCE	**37.4**	**13.9**	**264**	**251**	**3.91**
ethbenz	2.34	**3.25**	**48.3**	**47.1**	2.34
m,p-X	**7.28**	**11.7**	**225**	**218**	**5.94**
o-X	**3.38**	**5.42**	**86**	**83.7**	**4.73**
1,4-DCB	**18.3**	**42**	4.87	4.87	4.87
Napthalene	NT	NT	NT	NT	NT

Taber Mill	TM IAQ-B Basement 6/29/2012
tol	**9.90**
C5-C8 Al	**90**
C9-C12 Al	**40.0**
C9-C10 Ar	**14**
Acetone	**33.5**
2-Butanone	**8.76**
1,2-DCA	**0.125**
1,1,1-TCA	**1.27**
benz	**0.866**
C. Tetrachloride	**0.377**
TCE	**1.72**
ethbenz	**1.20**
m,p-X	**4.20**
o-X	**1.48**
1,4-DCB	**0.126**
Napthalene	**0.734 J**

358 Coffin Avenue	Basement 92530 3/29/2000	1st Floor 92529 3/29/2000
tol	**75.3**	**13.8**
C5-C8 Al	NT	NT
C9-C12 Al	NT	NT
C9-C10 Ar	NT	NT
Acetone	NT	NT
2-Butanone	NT	NT
1,2-DCA	NT	NT
1,1,1-TCA	**6.69**	**4.79**
benz	**12.7**	**5.46**
C. Tetrachloride	NT	NT
TCE	1.82	1.82
ethbenz	**14.9**	2.34
m,p-X	**66.8**	**6.89**
o-X	**26.2**	**3.60**
1,4-DCB	4.87	4.87
Napthalene	NT	NT

348 Coffin Avenue	Basement 348 Coffin St B 3/28/2000	Basement 348 Coffin St A 3/28/2000	1st Floor 348 Coffin St 1 3/28/2000	Basement 348 B 3/28/2001	1st Floor 348L 3/28/2001
tol	**7.38**	**7.38**	**19.5**	3.58 U	**7.83**
C5-C8 Al	NT	NT	NT	NT	NT
C9-C12 Al	NT	NT	NT	NT	NT
C9-C10 Ar	NT	NT	NT	NT	NT
Acetone	NT	NT	NT	NT	NT
2-Butanone	NT	NT	NT	NT	NT
1,2-DCA	NT	NT	NT	NT	NT
1,1,1-TCA	**5.82**	**3.48**	**128**	2.18	2.18
benz	**2.88**	**3**	**4.63**	2.88	2.88
C. Tetrachloride	NT	NT	NT	NT	NT
TCE	1.82	1.82	1.82	1.82	1.82
ethbenz	2.34	2.34	2.34	2.34	2.34
m,p-X	**3.81**	**3.68**	**6.33**	1.65	1.65
o-X	**2.04**	1.99	**3.12**	1.99	1.99
1,4-DCB	**6.01**	4.87	**31**	4.87	4.87
Napthalene	NT	NT	NT	NT	NT

LEGEND:

LABORATORY DATA SUMMARY

Compound Name	Address 353 Coffin Avenue	Location/Sample ID/Date Basement 353C-1 3/27/2000	1st Floor 353C-2 3/27/2000
Toluene	tol	**5.50**	**14.7**
C5-C8 Aliphatics	C5-C8 Al	NT	NT
C9-C12 Aliphatics	C9-C12 Al	NT	NT
C9-C10 Aromatics	C9-C10 Ar	NT	NT
Acetone	Acetone	NT	NT
2-Butanone	2-Butanone	NT	NT
1,2-Dichloroethane	1,2-DCA	NT	NT
1,1,1-trichloroethane	1,1,1-TCA	2.18	**3.64**
benzene	benz	**4.25**	**5.24**
Carbon Tetrachloride	C. Tetrachloride	NT	NT
trichloroethene	TCE	1.82	1.82
ethylbenzene	ethbenz	2.34	**4.03**
m,p-Xylenes	m,p-X	**4.60**	**12.2**
o-Xylene	o-X	**2.38**	**5.51**
1,4-dichlorobenzene	1,4-DCB	**8.36**	**9.98**
Naphthalene	Napthalene	0.61	NT

COMPOUND ABBREVIATION

OTHER NOTATIONS/SYMBOLS

1.74	CONCENTRATION FOUND (ug/m^3)
0.274	COMPOUND DETECTED
NT	NOT TESTED
0.383 **J**	ESTIMATED

(ug/m^3) – MICROGRAMS PER CUBIC METER

MASSDEP REGULATORY THRESHOLDS

Compound Name	Abbreviation	Screening Value
Toluene	tol	54
C5-C8 Aliphatics	C5-C8 Al	58
C9-C12 Aliphatics	C9-C12 Al	68
C9-C10 Aromatics	C9-C10 Ar	10
Acetone	Acetone	91
2-Butanone	2-Butanone	12
1,2-Dichloroethane	1,2-DCA	0.09
1,1,1-trichloroethane	1,1,1-TCA	3
benzene	benz	2.3
Carbon Tetrachloride	C. Tetrachloride	0.54
trichloroethene	TCE	0.8
ethylbenzene	ethbenz	7.4
m,p-Xylenes	m,p-X	20
o-Xylene	o-X	20
1,4-dichlorobenzene	1,4-DCB	0.5
Naphthalene	Napthalene	0.61

DELINEATES BOUNDARY OF FORMER PAYNE CUTLERY PROPERTY. HASH MARKS ON INSIDE OF PROPERTY BOUNDARY.

EXISTING MONITORING WELL

INDOOR AIR SAMPLE LOCATION (TRC)

LOT LINES

APPROX. LOCATION OF SEWER LINE

APPROX. LOCATION OF FORMER SEWER LINE

NOTES:
1. BASE MAP WAS DIGITIZED FROM A COPY OF AN UNDATED PLAN ENTITLED "SITE PLAN" PREPARED BY CYGNUS GROUP OF SOUTHBOROUGH MA. FIG 2, ORIGINAL SCALE 1"=50'.

APPROXIMATE GRAPHIC SCALE

0' 50' 100' 200'

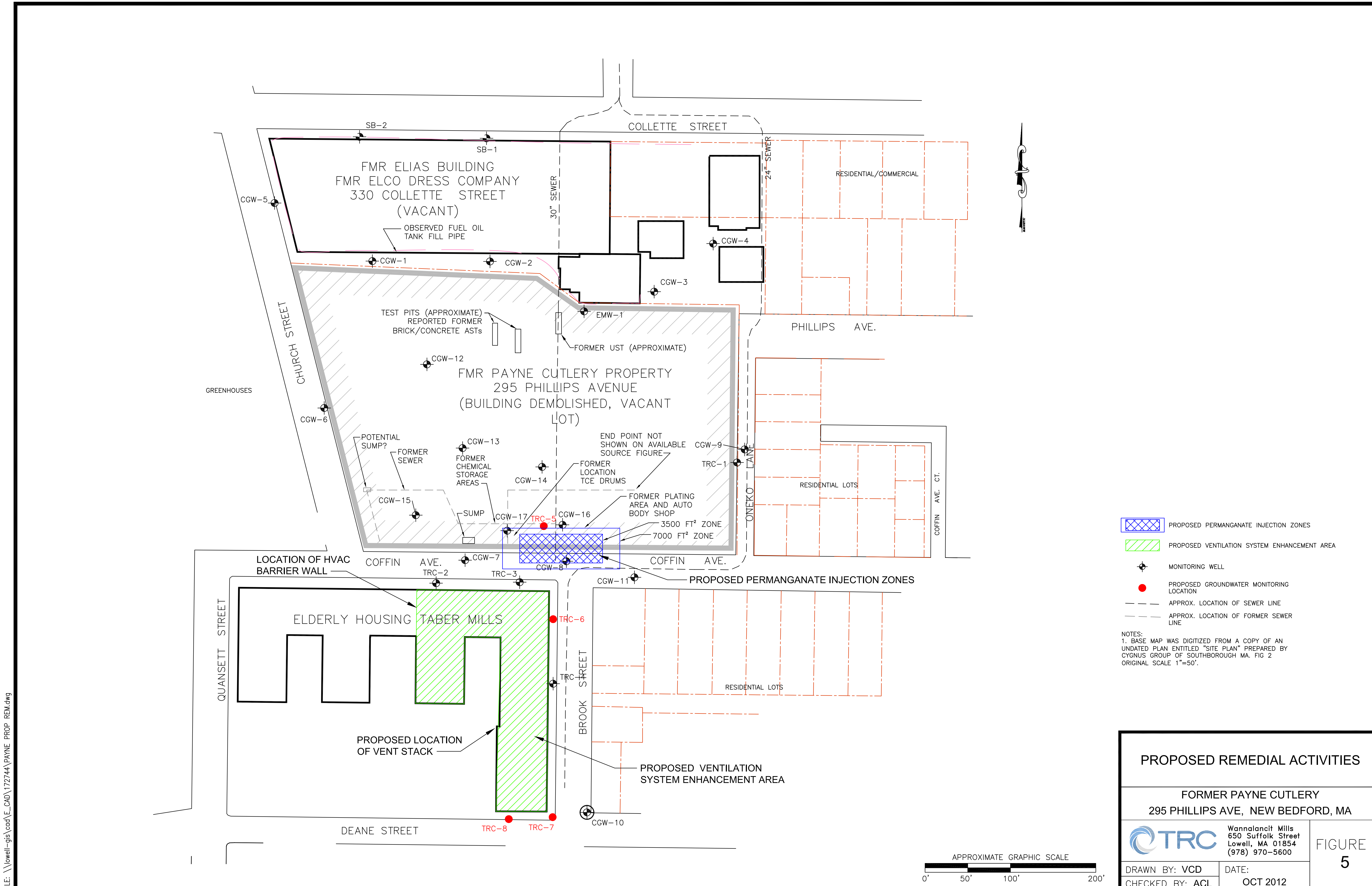
SITE PLAN WITH INDOOR AIR SAMPLING RESULTS

FORMER PAYNE CUTLERY
295 PHILLIPS AVE, NEW BEDFORD, MA

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

FIGURE 4

DRAWN BY: HWB
CHECKED BY: ACL
DATE: NOV 2012



COLLETTE STREET
SB-2
SB-1
FMR ELIAS BUILDING
FMR ELCO DRESS COMPANY
330 COLLETTE STREET
(VACANT)
OBSERVED FUEL OIL TANK FILL PIPE
30" SEWER
24" SEWER
RESIDENTIAL/COMMERCIAL
CGW-5
CGW-1
CGW-2
CGW-3
CGW-4
EMW-1
PHILLIPS AVE.
TEST PITS (APPROXIMATE) REPORTED FORMER BRICK/CONCRETE ASTs
FORMER UST (APPROXIMATE)
CHURCH STREET
CGW-12
FMR PAYNE CUTLERY PROPERTY
295 PHILLIPS AVENUE
(BUILDING DEMOLISHED, VACANT LOT)
GREENHOUSES
CGW-6
POTENTIAL SUMP?
FORMER SEWER
CGW-13
FORMER CHEMICAL STORAGE AREAS
CGW-14
END POINT NOT SHOWN ON AVAILABLE SOURCE FIGURE
FORMER LOCATION TCE DRUMS
CGW-9
TRC-1
ONEKO LANE
RESIDENTIAL LOTS
COFFIN AVE. CT.
CGW-15
SUMP
CGW-17
TRC-5
CGW-16
FORMER PLATING AREA AND AUTO BODY SHOP
3500 FT² ZONE
7000 FT² ZONE
CGW-7
CGW-8
COFFIN AVE.
COFFIN AVE.
LOCATION OF HVAC BARRIER WALL
TRC-2
TRC-3
CGW-11
PROPOSED PERMANGANATE INJECTION ZONES
ELDERLY HOUSING TABER MILLS
TRC-6
TRC-4
QUANSETT STREET
BROOK STREET
RESIDENTIAL LOTS
PROPOSED LOCATION OF VENT STACK
PROPOSED VENTILATION SYSTEM ENHANCEMENT AREA
TRC-8
TRC-7
CGW-10
DEANE STREET
PROPOSED PERMANGANATE INJECTION ZONES
PROPOSED VENTILATION SYSTEM ENHANCEMENT AREA
MONITORING WELL
PROPOSED GROUNDWATER MONITORING LOCATION
APPROX. LOCATION OF SEWER LINE
APPROX. LOCATION OF FORMER SEWER LINE
NOTES:
1. BASE MAP WAS DIGITIZED FROM A COPY OF AN UNDATED PLAN ENTITLED "SITE PLAN" PREPARED BY CYGNUS GROUP OF SOUTHBOROUGH MA. FIG 2 ORIGINAL SCALE 1"=50'.
APPROXIMATE GRAPHIC SCALE
0' 50' 100' 200'
PROPOSED REMEDIAL ACTIVITIES
FORMER PAYNE CUTLERY
295 PHILLIPS AVE, NEW BEDFORD, MA
TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600
FIGURE 5
DRAWN BY: VCD
CHECKED BY: ACL
DATE: OCT 2012
FILE: \\lowell-gis\cad\E_CAD\172744\PAYNE PROP REM.dwg