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PHASE II & PHASE III ENVIRONMENTAL SITE ASSESSMENT AND REMEDIAL ACTIONS AT PROPERTIES AT 1 & 7 MAIN STREET

East Haddam, Connecticut

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Prepared for:

Town of East Haddam
East Haddam, Connecticut

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I. SUMMARY

Our Phase II & Phase III Site Assessment and Remedial Actions at 1 & 7 Main Street in East Haddam included the removal of three underground tanks, the excavation and removal of approximately 367 tons of contaminated soils, the drilling of 39 soil borings, the installation of six ground water monitor wells (supplementing three monitor wells installed by others), the measurement of volatile organic compounds [VOCs] in soil gas under the garage building, and the laboratory testing of numerous soil and ground water samples.

An inactive heating oil tank and an inactive gasoline tank, located outside the eastern wall of the garage building, were removed in 2002, along with approximately 121 tons of petroleum-contaminated soils. Post excavation soil samples revealed the presence of remnant arsenic soil contamination in the gasoline tank cleanup area and in the summer of 2004 approximately 180 tons of additional soils were removed. The soil removal effort was halted in part because of the presence of an underground sanitary sewer line. We estimate that an additional 100 tons of arsenic-contaminated soils may remain in the area between a depth interval of approximately 3 and 6 feet below the ground surface. Our tests suggest that the arsenic-contaminated soils do not pose a significant risk of ground water contamination. The excavation and removal of the arsenic-contaminated soils does not appear to be necessary at this time. Future plans for the redevelopment of the site should consider whether the contaminated soils will be covered by a new building or whether the soils should be excavated and removed during construction work.

A blue residue of unknown origin was observed on the ground surface behind the town hall. Approximately 65 tons of soils containing elevated concentrations of metals were excavated and removed from the area to address the residue.

We did not identify other areas where soil removal was necessary to meet remediation criteria. An apparent minor spill of a petroleum product was detected under the floor of the garage and a petroleum odor was noted in a soil sample collected from a gasoline tank grave adjacent to the southwestern corner of the garage, but laboratory tests of several soil samples from these two areas did not reveal exceedances of remediation criteria.

We did not directly evaluate an underground diesel fuel tank located on a portion of the site subject to a perpetual easement granted to the State of Connecticut.

Although local ground water is classified "GB" (degraded), our tests indicate that site ground water exhibits generally good quality. We did not detect VOCs or Extractable Total Petroleum Hydrocarbons [ETPH] in several overburden ground water samples, suggesting that the use of fuels and petroleum products on the site has not significantly degraded ground water. Chloroform was detected at trace concentrations (0.6 and 1.0 ug/L) in two bedrock ground water samples. The source of the chloroform is not known, but this compound can be introduced into water samples during sample collection or laboratory analysis. The absence of chloroform in overburden monitor wells suggests that chloroform has not been spilled on site. Unfiltered ground water samples contained elevated concentrations of metals, likely due to the presence of silt in the samples and probably not associated with ground water contamination. Low flow sampling should be performed to further evaluate the metal detections in the unfiltered samples.

The site appears to be an "establishment" under the Connecticut Transfer Act.

A long-term ground water monitoring may be necessary if the site is transferred under the Connecticut Transfer Act. However, we do not believe that the initiation of a full monitoring program prior to a transfer is warranted. At this time, we recommend that one round of ground water samples be collected from the monitor well network for laboratory testing. After future plans for the site have been finalized, then a more complete ground water testing program may be necessary.

II. BACKGROUND INFORMATION

A. Purpose

This Phase II & Phase III Environmental Site Assessment and Remedial Actions report evaluates the risk of subsurface contamination involving hazardous wastes and hazardous substances at 1 & 7 Main Street in East Haddam. The site was the subject of a March 2002 Phase I Environmental Site Assessment report prepared by Shanahan Consulting.

B. Scope of Work

The following tasks were performed for this investigation:

1. The completion of a magnetometer survey to explore for underground tanks.
2. The excavation and removal of three underground tanks (by a tank removal contractor).
3. The excavation and removal of petroleum-contaminated soils detected at two underground tanks, metal-contaminated soils in an area where a blue residue was observed on the ground surface behind town hall, and arsenic-contaminated soils located east of the garage.
4. The completion of a soil gas survey under the floor of the garage building.
5. The drilling of 39 soil borings.
6. The collection of soil samples from the borings, from the blue residue disposal area, and from a drainage ditch in the southwestern part of the site.
7. The test screening of soil samples with a photoionization detector [PID].
8. The collection of ground water samples from six monitor wells and from a supply well.
9. The preparation of an overburden ground water contour map.
10. Laboratory analyses of ground water samples and selected soil samples.

C. Site Description

The approximately 2.75-acre site consists of the following two adjoining properties: (1) 1 Main Street - a 1.56-acre property designated Lot 14 on Map 17 by the East Haddam assessor's office and (2) 7 Main Street - a 1.19-acre property designated as Lot 15 on Map 17.

Figure 1 shows the location of the site. A site plan is shown on Figure 2. Figures 3 and 4 present more detailed views of site features and the locations of explorations performed for this assessment. Figure 5 presents explorations performed under the garage building. Figure 6 presents an overburden ground water contour map. Figure 7 depicts the area of an underground tank removal west of the garage, while Figure 8 shows tank removals performed east of the garage. Figure 9 presents the extent of soil remediation performed to address a blue residue on the ground surface in the eastern part of the site.

The site includes the following four buildings: (1) the former garage of the Town of East Haddam Department of Public Works [DPW] now largely vacant, (2) the "River House" office building (including offices of the Town of East Haddam), (3) the Connecticut Department of Transportation [DOT] generator house used in connection with their maintenance of a nearby off-site drawbridge over the Connecticut River, and (4) the East Haddam town hall.

The one-story garage building was constructed in stages from circa 1911 to circa 1950 and was initially used by the DOT for maintenance operations for the nearby drawbridge. Sanborn Fire Insurance Maps document various operations in the DOT bridge maintenance facility including: a blacksmith shop, a paint shop, and a machine shop. Beginning in 1973, the garage was used by the Town of East Haddam DPW for their maintenance and storage operations. The DPW vacated the building in 2000. In late 2002, the northern portion of the garage building and an adjoining shed were torn down.

The two-story River House was erected in circa 1911 as a residence. Since 1973, the building has been occupied by offices.

The DOT generator house is located on a 0.098-acre perpetual easement ceded by the town to the State of Connecticut. The generator house was erected in the mid 1980s and replaced a previous power house located adjacent to and west of the current building.

The town hall building was erected as a residence prior to 1874 and the property was used for residential purposes until circa 1936. From circa 1936 to 1938, a bank apparently occupied the former residence. From circa 1939 to 1957, a lumber company operated an office in the town hall building and used a rear building and adjoining shed for storage. Town offices began to occupy a portion of the former residence beginning in 1939 and have fully occupied the building since1957.

A storage building and shed north of the town hall were torn down in late 2002.

The site appears to be an "establishment" under the Transfer Act (CGS 22a-134 through 134e). A variety of wastes were removed from the site in January 2000 by the Town of East Haddam including approximately 1297 kilograms of RCRA-regulated hazardous wastes (unused toluene, paint-related wastes, unused 2,4-D salt, waste flammable solvents, waste corrosive liquid) and approximately 197 gallons of non-hazardous wastes (waste motor oil, unused No. 6 heating oil, and detergent). The wastes, which had reportedly accumulated over a period of at least 12 years, were removed from both the garage at 1 Main Street and from the storage building at 7 Main Street. In our March 2002 Phase I report, we had concluded that the property at 1 Main Street was an establishment, but that property at 7 Main Street might not be an establishment because we believed that hazardous wastes were not generated at 7 Main Street. However, additional information provided since the Phase I report was completed indicates that the January 2000 waste shipment included wastes generated at both 1 and 7 Main Street and that the quantities of wastes generated at each location are somewhat uncertain. We have therefore concluded that the entire site (both properties) may be regulated under the Transfer Act.

Local ground water is classified "GB" (known or presumed to be degraded). In spite of the "GB" classification, the site uses a bedrock supply well located west of the garage building. Reportedly, site occupants use bottled water and do not consume the well water.

Public water is not available in the site area and off-site properties generally use individual supply wells. We did not identify public drinking water supply wells within one mile of the site. The site is not shown in Aquifer Protection Areas mapped by the Connecticut Department of Environmental Protection [DEP].

D. Previous Explorations and Testing

As part of a Phase II Environmental Site Assessment that was never completed (we were provided with an unfinished draft report dated 12 December 2000), Land-Tech Consultants, Inc. [Land-Tech] installed bedrock monitor wells MW1 and MW2 and overburden well MW3 on the site. MW1 is located south of the River House in an area where possible contamination was reported during excavation work performed by the town. MW2 was installed near the grave of a former underground gasoline tank outside the southwestern corner of the garage building. MW3 is situated adjacent to the grave of a former underground gasoline tank behind town hall. Appendix A presents driller's logs and well construction diagrams for MW1, MW2, and MW3.

Land-Tech tested soil samples collected from a depth of 5-7 feet at both MW2 and MW3 for Total Petroleum Hydrocarbons [TPH] by EPA Method 418.1, for volatile organic compounds [VOCs] by Method 8260, and for eight RCRA metals by mass analysis and TCLP methods. Appendix B presents the results of the MW2 and MW3 soil tests. VOCs and TCLP metals were not detected in the soil samples. TPH was detected at 200 mg/kg in the MW2 soil sample and at 54 mg/kg in the MW3 soil sample. Relatively low concentrations of several metals (by mass analysis methods) were reported in the soil samples. The concentrations of TPH and metals did not exceed applicable remediation criteria established by the Connecticut DEP (as set forth in the Remediation Standard Regulations [RSRs]).

Land-Tech collected ground water samples from MW1, MW2, and MW3 on 9 August 2000 for analysis for TPH, eight RCRA metals (analysis of unfiltered samples for total metals), and VOCs by EPA Method 8260. In addition, on 15 November 2000, Land-Tech sampled ground water from the three monitor wells for analysis for pesticides. The results of the Land-Tech ground water tests are presented in Appendix B and are discussed later in this report.

E. Potential Areas of Concern

Our March 2002 Phase I Site Assessment and subsequent observations of the site identified the following potential areas of concern with regards to subsurface contamination:

1. A vent pipe for a possible former underground heating oil tank attached to the southwestern corner of the storage building behind the town hall. The fate of the possible underground tank was not reported. The tank location was further evaluated, as is discussed later in this report.

2. A former 1000-gallon underground gasoline tank located outside the southern end of a former shed behind town hall at 7 Main Street. The tank was reportedly removed by the town in January 2000. No soil samples were collected from the tank grave for laboratory testing.

3. A blue residue observed on the ground surface outside the northern wall of the former storage building behind the town hall.

4. An inactive 1000-gallon underground gasoline tank and adjacent pump pad located outside the eastern wall of the garage building at 1 Main Street.

5. A former 275-gallon aboveground heating oil tank located outside the eastern wall of the garage, just north of the inactive underground gasoline tank (Item No 5). The aboveground tank was replaced by an indoor tank.

6. An inactive 1000-gallon underground heating oil tank outside the eastern wall of the garage.

7. A "pump" shown on a 1932 highway right of way map in the southeastern corner of the property. The purpose of the pump is unknown. The 1932 map does label another pump outside the garage as a "gas pump" suggesting that the unknown southeastern pump was not used to dispense gasoline.

8. An inactive septic system located in front of the River House at 7 Main Street and formerly used by the River House and the garage building. The septic system may have received floor drainage discharges from the garage. Land-Tech reported that town workers performing excavation work in the general area of the septic system had reported possible subsurface contamination. The septic system was installed in 1971. Prior to 1971, sanitary wastes from the property were apparently discharged directly to the Connecticut River.

9. An inactive 500-gallon underground gasoline tank and a former 550-gallon aboveground gasoline tank, located in the same general area west of the garage building on the edge of the paved parking lot and driveway. An underground gasoline tank was shown at this location on a 1925 Sanborn Fire Insurance Map. The aboveground tank was reportedly placed in the area in 1989 and was removed in the mid 1990s. We observed no surface evidence of spills associated with the former aboveground tank.

10. An approximately 10 foot by 10 foot pavement patch adjacent to the southwestern corner of the garage building that was the reported former location of a former underground gasoline tank and adjacent pump. The tank was apparently either 1000 gallons or 2000 gallons in capacity and was removed by the town sometime after 1991. No soil samples were reportedly collected at the time of the tank removal. An underground gasoline tank and/or pump had been shown at this location as early as 1935 (on a Sanborn Fire Insurance Map).

11. A 300-gallon underground diesel fuel tank installed in 2001 by the DOT to fuel an emergency generator. A DOT employee reported that the tank is of double containment design, includes two vapor monitoring wells adjacent to the two ends of the tank and a gauge inside the building, and was installed on top of a shallow bedrock ledge.

12. Floor drainage systems in the garage building. The floor drains were reportedly cleaned and sealed in August 2000. In our Phase I Site Assessment report, we observed evidence of three floor drains in the building as follows: one drain in the central part of the building and two drains in the southern part. In their previous site evaluation, Land-Tech verbally reported a fourth drain in the northern part of the garage building. Since the Phase I work, we have been able to view the garage floor more closely (carpeting and stored items have been removed) and we now believe that the following drains are located in the garage: two drains in the southern part and two drains in the central part (not one as was previously reported). We observed no evidence of a drain in the floor of the recently-demolished northern end of the building (the floor slab was not removed during the demolition work).

    The southern drains apparently discharged to a buried dry well outside the eastern wall of the garage (the dry well was uncovered during recent underground tank removals that are discussed later in this report). Land-Tech reported that the central garage drainage system flowed to catch basins west of the garage which then discharged to the Connecticut River via an open paved ditch in the southwestern part of the site. Land-Tech also reported that the northern drain (which we did not find) flowed to the west and may have discharged to the Connecticut River or to the septic system.

    Since the data on the central and northern floor drainage systems are uncertain, we have assumed that one or more of these drains may have discharged: (1) via an underground pipe directly to the Connecticut River, (2) to the Connecticut River via the storm drainage system and the open ditch, or (3) to the now-inactive septic system.

13. Areas under the garage floor. Our research indicates that the garage was built in stages as follows: (1) northern part erected in circa 1930, (2) western half (approximately)of central part erected in circa 1911, (3) eastern half (approximately) of central part erected in circa 1950, and (4) southern part erected in circa 1911. The area now covered by the eastern half of the central garage area (built in circa 1950) was formerly occupied by a small storehouse and a blacksmith shop. During our Phase I Site Assessment, we observed two 275-gallon aboveground heating oil tanks in the northern part of the garage (one tank was in use while the other tank was inactive and apparently empty). We observed no signs of leakage from the indoor tanks. Two 55-gallon drums of unknown contents were observed in the central part of the garage during our Phase I Site Assessment. The sealed drums were in excellent condition and no leakage was evident. We observed an inactive oil feed line in the floor in the western end of the northern garage area. A few scattered stains noted on the floor the building did not appear to represent significant contamination risks.

    Soil under the garage floor could be contaminated by: leakage at floor drains, leakage from the oil line under the northern floor, interior spills that penetrated the floor, or by the dumping of wastes onto the former ground surface now covered by the eastern half of the central garage area.

14. An aboveground waste oil tank with a reported built-in containment area formerly located near the western edge of the site. The tank was reportedly used by the East Haddam DPW. During our Phase I Site Assessment, we did not observe evidence of surface spills in the reported area of the tank. Given the absence of apparent spills and the reported containment design of the tank, we did not believe that further evaluation of the tank location was warranted.

15. An inactive septic system that served the town hall office building prior to its connection to the public sanitary sewer system in 1999. Given the reported use of the town hall building by offices, we did not expect that the former septic system received petroleum product or chemical waste discharges. We therefore concluded that further evaluation of the septic system was not warranted.

16 A 275-gallon aboveground heating oil tank observed outside the southwestern corner of the former storage building behind the town hall at 7 Main Street. During our Phase I Site Assessment, we did not observe evidence of spills from the tank and we concluded that further evaluation of the tank was not warranted. The tank was removed when the rear storage building was demolished.

III. UNDERGROUND TANK REMOVALS AND INITIAL SOIL REMEDIATION

A. Explorations for Underground Tanks

On 13 June 2002, Long Thai of Hygenix, Inc. of Stamford, Connecticut (working as a subcontractor to Shanahan Consulting) performed a magnetometer survey around the River House, the garage building, and the storage building behind town hall (since demolished) to search for possible underground tanks. Possible magnetic detections were noted in the following four areas: (1) MD1- on the edge of the paved area west of the garage building, (2) MD2 - in the lawn south of the River House, (3) MD3 - several responses in the gravel parking area north of the storage building, and (4) MD4 - a weak response outside the southwest corner of the storage building ay 1 Main Street.

A suspected filler pipe (filled with soil) for an inactive underground fuel tank was observed in the area of MD1. A 1925 Sanborn Fire Insurance Map had shown an underground gasoline tank in the area of the filler. A metal probe was driven into the filler pipe to a depth of approximately 3 feet. When withdrawn, the probe appeared to exhibit a petroleum odor. MD1 was later confirmed to be an inactive gasoline tank located on the edge of the paved area west of the garage building (the tank was subsequently removed as is discussed later in this report).

Excavation with a hand shovel in the area of MD2 revealed the cover of an inactive septic tank at a depth of approximately 1½ feet. The lid of the tank included a metal re-bar that apparently triggered the magnetic response.

Magnetic responses recorded in the rear gravel parking lot were attributed to the presence of several small metal parts observed on the ground and no further investigation of these detections was warranted. However, we did evaluate a magnetic detection just outside the northeast corner of the storage building (labeled MD3 on Figure 4), because this location appeared to represent a possible underground tank position. A probe bar was driven into the ground at the suspect tank location to a depth of 3 feet and no evidence of a tank was encountered (e.g. no probe refusal on top of tank, no petroleum odor on withdrawn probe). In addition, no vent or fill pipes were seen in the area.

The weak magnetic response observed outside the southwest corner of the storage building (MD4) was considered suspicious due to the presence of an apparent underground tank vent pipe of unknown purpose on this corner of the building. We suspected that the vent pipe served a former or current underground heating oil tank because an inactive oil-fired furnace was located in the southwestern part of the building. The magnetometer response in the area was quite weak, suggesting that if an underground tank were present, it would be too deep to reach with a metal probe. To further evaluate the possible buried tank, on 27 June 2002, Underground Systems of Simsbury, Connecticut [an underground tank removal contractor] excavated with a backhoe in the area of the magnetic response. A buried warning tape for an underlying sanitary sewer line (later reported to be serving an off-site home north of the site) was encountered by the backhoe. The warning tape apparently triggered the low magnetometer reading. On 28 June 2002, Underground Systems excavated with a hand shovel to expose the buried portion of the vent pipe beside the storage building. The pipe was cut at depth and a measuring tape was extended into the line to determine its point of origin. The tape measurement indicated that the pipe extended horizontally at depth to a position approximately 20 feet to the southwest (near the western boundary of the site). Excavation with a backhoe at the termination point of the buried vent line revealed only the open end of the vent line and no evidence of an underground tank. We concluded that an underground heating oil tank may have been present in the area, but had been removed at some unknown date. No release of petroleum product was noted in the test pit dug where the line ended.

B. Removal of Underground Tanks

Our Phase I Site Assessment research and the magnetometer survey identified three inactive underground tanks remaining in the ground, as follow: (1) 500-gallon underground gasoline tank located west of garage building (referred to as MD1 above), (2) 1000-gallon underground gasoline tank outside eastern wall of garage, and (3) 1000-gallon underground heating oil tank outside eastern wall of garage.

On 27 & 28 June 2002, Underground Systems of Simsbury, Connecticut [a tank removal contractor] used an excavator to remove the three underground tanks. The tank removals were observed by Ned Shanahan of Shanahan Consulting. United Industrial Services emptied the three tanks of remnant liquid prior to their removals. Sand that had been placed in the gasoline tank east of the garage was also pumped out for off-site disposal. The empty tanks were removed by Underground Systems for off-site disposal.

Figure 7 shows the western tank grave and Figure 8 shows the two eastern tank graves and the locations of soil samples collected in connection with the tank removals and subsequent soil cleanups.

1. 500-Gallon Underground Gasoline Tank West of Garage

We observed no evidence of a release during the removal of the 500-gallon gasoline tank west of the garage, which appeared to be quite old (it was shown on a 1925 Sanborn Map). The tank contained remnant gasoline. The grave measured approximately 9½ feet long by 5 feet wide by 5½ feet deep (the depth was measured in reference to the ground surface on the north, south, and east sides of the grave; a one-foot-high retaining wall on the west side of the grave increased the relative depth to 6½ feet from this side of the grave). No ground water was observed in the tank grave.

Two metal pipes were observed to be exiting the grave to the south. One of the pipes was of short length and was removed by the excavator. The second pipe (of unknown purpose) could not be removed without endangering the retaining wall on the southern edge of the tank grave. We elected to explore in the area of the second pipe during our upcoming test boring program.

Ned Shanahan collected five samples of soil from the four sides (samples T1S1, T1S2, T1S3, T1S5) and the bottom of the tank grave (T1S4). The samples were kept chilled during transport to Connecticut Testing Laboratories, Inc. of Meriden for analysis for aromatic volatile organic compounds [VOCs] and MTBE by EPA Method 8021B and for lead (by mass analysis and by SPLP leaching method). The samples submitted for VOC analysis were preserved via Method 5035.

The laboratory test results are presented in Appendix C and are summarized in the table below.

WESTERN GASOLINE TANK GRAVE - SOIL TEST DATA
Concentrations as shown

SAMPLE DEPTH	T1-S1 5½'	T1-S2 5½'	T1-S3 5½'	T1-S4 6'	T1-S5 5½'	Pollutant Mobility Criteria	Direct Exposure Criteria	
							Residential	Commercial
AVOCs (mg/kg)	ND	ND	ND	ND	ND	Varies	Varies	Varies
Lead (mg/kg)	15.0	19.1	12.6	33.1	36.8	NA	500	1000
SPLP Lead (mg/l)	ND	0.006	ND	0.008	0.007	0.015	NA	NA

Notes for table:

1. ND means not detected. NA means remediation criteria not applicable to this analysis. AVOCs are aromatic volatile organic compounds and MTBE.
2. Pollutant Mobility Criteria and Direct Exposure Criteria are taken from the DEP Remediation Standard Regulations [C.G.S. Section 22a-133k]. Pollutant Mobility Criteria shown are applicable to a "GA" area. Although the site is classified "GB", overburden ground water is not expected in the area of the tank and "GA" criteria therefore apply.

The soil test data did not exceed applicable remediation criteria. The absence of aromatic VOCs in the samples appeared to confirm our field observations that the tank had not leaked.

2. 1000-Gallon Underground Gasoline Tank East of Garage

The 1000-gallon eastern gasoline tank included an adjacent concrete pad west of the tank that had apparently been used to support a former fuel pump. Surface soils around the pump pad, which was approximately 4 feet by 4 feet in size, were stained and odorous.

The tank grave measured approximately 9½ feet long by 4 feet wide by 5½ feet deep. No ground water was observed in the grave. Soils at depth near the southern end of the grave appeared to exhibit petroleum odors. Surface soils in the area (particularly near the pump pad) exhibited petroleum odors (apparently due to spills at the pump or during the re-fueling of the tank).

Ned Shanahan collected five samples of soil from the four sides (samples T2S1, T2S2, T2S3, T2S4) and the bottom (T2S5) of the tank grave. In addition, sample T2S6 was collected at a shallow depth (1-1½ feet) south of the pump pad. The five samples from the tank grave were tested at Connecticut Testing Laboratories, Inc. for aromatic VOCs and MTBE by EPA Method 8021B and for lead (by mass analysis and by SPLP leaching method). The surficial sample collected near the pump pad [T2-S6] was tested for aromatic and halogenated VOCs by EPA Method 8260, for Extractable Total Petroleum Hydrocarbons [ETPH], for eight RCRA metals [arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver] by both mass analysis and SPLP leaching methods, for PCBs, and for polynuclear aromatic hydrocarbons [PAHs] by EPA Method 8270. The more comprehensive testing of sample T2-S6 was performed to evaluate whether waste oils had been dumped on the ground near a rear pedestrian door to the garage.

The laboratory test results are presented in Appendix C and are summarized in the table below.

EASTERN GASOLINE TANK AREA - SOIL TEST DATA Concentrations as shown									
SAMPLE DEPTH	T2-S1 5½'	T2-S2 5½'	T2-S3 5½'	T2-S4 5½'	T2-S5 6'	T2-S6 1-1½'	Pollutant Mobility Criteria	Direct Exposure Criteria Residential	 Commercial
Ethyl benzene (mg/kg)	ND	ND	0.350	ND	ND	ND	10.1	500	1000
Xylenes (mg/kg)	ND	ND	4.902	ND	ND	ND	19.5	500	1000
ETPH (mg/kg)	---	---	---	---	---	12,343	2500	500	2500
PCBs (mg/kg)	---	---	---	---	---	ND	NA	1	10
PAHs	---	---	---	---	---	ND	Varies	Varies	Varies
Lead (mg/kg)	404	9.0	742	25.5	8.5	1140	NA	500	1000
SPLP Lead (mg/l)	ND	ND	0.083	ND	ND	0.15	0.15	NA	NA
Arsenic (mg/kg)	---	---	---	---	---	11.6	NA	10	10
SPLP Arsenic (mg/l)	---	---	---	---	---	ND	0.5	NA	NA
Barium (mg/kg)	---	---	---	---	---	68	NA	4700	140,000
SPLP Barium (mg/l)	---	---	---	---	---	ND	10	NA	NA
Cadmium (mg/kg)	---	---	---	---	---	2.7	NA	34	1000
SPLP Cadmium (mg/l)	---	---	---	---	---	ND	0.05	NA	NA
Chromium (mg/kg)	---	---	---	---	---	39.0	NA	3900	51,000
SPLP Chromium (mg/l)	---	---	---	---	---	ND	0.5	NA	NA
Mercury (mg/kg)	---	---	---	---	---	0.16	NA	20	610
SPLP Mercury (mg/l)	---	---	---	---	---	ND	0.02	NA	NA
Selenium (mg/kg)	---	---	---	---	---	ND	NA	340	10,000
SPLP Selenium (mg/l)	---	---	---	---	---	ND	0.5	NA	NA
Silver (mg/kg)	---	---	---	---	---	ND	NA	340	10,000
SPLP Silver (mg/l)	---	---	---	---	---	ND	0.36	NA	NA

Notes: 1. ND means not detected. — means sample not tested for this parameter. NA means remediation criteria not applicable to this analysis. AVOCs are aromatic volatile organic compounds.
2. Pollutant Mobility Criteria and Direct Exposure Criteria are taken from the DEP Remediation Standard Regulations [C.G.S. Section 22a-133k].
3. Test results exceeding remediation criteria have been highlighted with thick lines.

The soil test data revealed exceedances of soil remediation criteria in samples T2-S3 (from the southern end of the tank grave) and T2-S6 (shallow sample collected near the pump pad). The T2-S3 sample contained lead at 742 mg/kg which exceeds the 500 mg/kg residential Direct Exposure Criteria [DEC]. T2-S3 also contained gasoline VOCs (ethyl benzene and xylenes) at concentrations below applicable criteria. The surficial sample (T2-S6) contained the following contaminants in excess of remediation criteria: ETPH at 12,343 mg/kg (residential DEC at 500 mg/kg), lead at 1140 mg/kg (residential DEC at 500 mg/kg), and arsenic at 11.6 mg/kg (residential and commercial DEC at 10 mg/kg).

The grave was re-filled with the soil originally removed from the area, while arrangements were made to perform a soil remediation effort.

3. 1000-Gallon Underground Heating Oil Tank East of Garage

The 1000-gallon underground heating oil tank was located approximately 35 feet south of the eastern gasoline tank. The grave of the tank measured 12 feet long by 5 feet wide by 7 feet deep. Ground water was not observed in the grave. Soil at depth at the northern end of the grave appeared to exhibit petroleum odors and staining. In addition, surface soils around the fill pipe were stained and odorous.

During the removal of the tank, an apparent dry well serving floor drains in the southern end of the adjacent garage was encountered south of the tank grave. The dry well, which was removed from the ground, consisted of a short length of corrugated metal pipe (roughly 3 feet in diameter) buried to a depth of approximately 4 feet. An approximately 3-inch-diameter discharge pipe was observed to enter the dry well from the adjacent garage wall. No petroleum odors or staining were noted in the discharge pipe. A soil sample (DW1) was collected at the former location of the dry well at a depth of approximately 5 feet (approximately 1 foot below the base of the dry well).

Ned Shanahan collected seven samples of soil from the area as follows: (1) sample DW1 from below the dry well; (2) samples T3S1, T3S2, T3S3, and T3S4 from the sides of tank grave; (3) T3S5 from the bottom of the tank grave; and (4) T3S6 from the area of surface staining near the fill pipe. Each of the seven soil samples was tested for ETPH at the laboratory. Sample T3-S1, from the northern end of the grave where petroleum odors and staining were noted, was also tested for aromatic VOCs by Method 8021B and for PAHs by Method 8270. T3-S6 (consisting of odorous surface soils) and DW1 (collected below the dry well) were also tested for aromatic and halogenated VOCs by EPA Method 8260, for eight RCRA metals [arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver] by both mass analysis and SPLP leaching methods, for PCBs, and for polynuclear aromatic hydrocarbons [PAHs] by EPA Method 8270 to evaluate the possible presence of waste oil.

The laboratory test results are presented in Appendix C and are summarized in the table below.

HEATING OIL TANK AND DRY WELL - SOIL TEST DATA

Concentrations as shown

SAMPLE DEPTH	T3-S1 7'	T3-S2 7'	T3-S3 7'	T3-S4 7'	T3-S5 7½'	T3-S6 Surf.	DW1 5'	Pollutant Mobility Criteria	Direct Exposure Criteria	
									Resid.	Com.
Ethyl benzene (mg/kg)	3.252	---	---	---	---	ND	ND	10.1	500	1,000
Toluene (mg/kg)	2.389	---	---	---	---	ND	ND	67	500	1,000
Xylenes (mg/kg)	23.191	---	---	---	---	ND	ND	19.5	500	1,000
ETPH (mg/kg)	6105	ND	ND	ND	ND	4383	ND	2500	500	2500
PCBs (mg/kg)	---	---	---	---	---	ND	ND	NA	1	10
Naphthalene (mg/kg)	23.121	---	---	---	---	ND	ND	56	1000	2500
Acenaphthylene (mg/kg)	0.895	---	---	---	---	ND	ND	84	1000	2500
Acenaphthene (mg/kg)	3.992	---	---	---	---	ND	ND	84	1000	2500
Flourene (mg/kg)	8.792	---	---	---	---	ND	ND	56	1000	2500
Phenanthrene (mg/kg)	28.003	---	---	---	---	ND	ND	40	1000	2500
Anthracene (mg/kg)	5.093	---	---	---	---	ND	ND	400	1000	2500
Fluoranthene (mg/kg)	1.450	---	---	---	---	ND	ND	56	1000	2500
Pyrene (mg/kg)	4.064	---	---	---	---	ND	ND	40	1000	2500
Benzo(a)anthracene (mg/kg)	0.131	---	---	---	---	ND	ND	1	1	7.8
Chrysene (mg/kg)	0.360	---	---	---	---	ND	ND	1	84	780
Dibenzocarbazole (mg/kg)	0.884	---	---	---	---	ND	ND	None	None	None
Lead (mg/kg)	---	---	---	---	---	415	24.6	NA	500	1000
SPLP Lead (mg/l)	---	---	---	---	---	0.07	ND	0.15	NA	NA
Arsenic (mg/kg)	---	---	---	---	---	7.6	7.7	NA	10	10
SPLP Arsenic (mg/l)	---	---	---	---	---	ND	ND	0.5	NA	NA
Barium (mg/kg)	---	---	---	---	---	64	31	NA	4700	140,000

DEPTH SAMPLE	T3-S1 7′	T3-S2 7′	T3-S3 7′	T3-S4 7′	T3-S5 7½′	T3-S6 Surf.	DW1 5'	Pollutant Mobility Criteria	Direct Exposure Criteria	
									Resid.	Com.
SPLP Barium (mg/l)	---	---	---	---	---	ND	ND	10	NA	NA
Cadmium (mg/kg)	---	---	---	---	---	1.1	ND	NA	34	1000
SPLP Cadmium (mg/l)	---	---	---	---	---	ND	ND	0.05	NA	NA
Chromium (mg/kg)	---	---	---	---	---	33.8	21.7	NA	3900	51,000
SPLP Chromium (mg/l)	---	---	---	---	---	ND	ND	0.5	NA	NA
Mercury (mg/kg)	---	---	---	---	---	0.05	ND	NA	20	610
SPLP Mercury (mg/l)	---	---	---	---	---	ND	ND	0.02	NA	NA
Selenium (mg/kg)	---	---	---	---	---	ND	ND	NA	340	10,000
SPLP Selenium (mg/l)	---	---	---	---	---	ND	ND	0.5	NA	NA
Silver (mg/kg)	---	---	---	---	---	ND	ND	NA	340	10,000
SPLP Silver (mg/l)	---	---	---	---	---	ND	ND	0.36	NA	NA

Notes: 1. ND means not detected. — means sample not testedor this parameter. NA means remediation criteria not applicable to this analysis. AVOCs are aromatic volatile organic compounds.
2. Pollutant Mobility Criteria and Direct Exposure Criteria are taken from the DEP Remediation Standard Regulations [C.G.S. Section 22a-133k].
3. Test results exceeding remediation criteria have been highlighted with thick lines.

The soil tests did not reveal evidence of a release at the floor drainage dry well (which confirmed our field observations).

Contamination in excess of remediation criteria was detected in sample T3-S1 (collected on the north end of the grave of the heating oil tank) and at T3-S6 (the surface sample near the fill pipe). T3-S1 contained ETPH at 6105 mg/kg (residential DEC is 500 mg/kg) and xylenes at 23.191 mg/kg (Pollutant Mobility Criteria [PMC] is 19.5 mg/kg). T3-S6 contained ETPH at 4383 mg/kg (DEC is 500 mg/kg).

The grave was re-filled with the soil originally removed from the area, while arrangements were made to perform a soil remediation effort.

C. Soil Remediation by Underground Systems

In an attempt to address the soil contamination found at the eastern gasoline and heating oil tanks, Underground Systems returned to the site on 12 & 13 August 2002 to excavate contaminated soils under the observation of Ned Shanahan. Figure 8 depicts the soil removal areas and post-excavation soil sampling at the tanks.

Six truckloads of contaminated soils from the August 2002 cleanup efforts (totaling 121.06 tons) were taken directly to Phoenix Soil LLC for treatment and disposal. Appendix D presents manifests for the removal of the waste soils.

1. Soil Remediation at Underground Heating Oil Tank

A mixture of contaminated and uncontaminated soils had been placed in the tank grave after its removal in June 2002. Underground Systems removed the soil mixture for off-site disposal. Soil tests performed in June 2002 demonstrated that contaminated soils were present on the ground surface adjacent to the wall of the building (apparently due to fuel overfills) and in the northern end of the tank grave at depth. After removing the soil mixture in the grave, soil was removed from the northern end of the grave and in areas of surface staining. In addition, a small surface stain observed near the southern edge of the tank grave was scraped to a depth of 1½ feet. The soil removal effort was guided by petroleum odors and staining.

The final dimensions of the excavation measured approximately 22 feet long by 9 feet wide and up to 9 feet deep. No ground water was observed in the cleanup excavation, but hand excavation in the base of hole to a depth of 9½ feet revealed wet soils.

After the removal of the contaminated soil, Ned Shanahan collected five post-excavation soil samples (PE1-PE5) on the edges of the removal area. PE1 and PE2 were collected in the northern end of the grave (bottom and north wall respectively) after removing odorous soils at depth. PE3 and PE4 were collected after removing odorous soils in the apparent overfill area adjacent to the building wall. PE5 sample was collected in the area where the small surface stain had been removed south of the tank grave. The soil samples were placed in a chilled cooler and were transported to Connecticut Testing Laboratories for analysis for ETPH and aromatic VOCs by EPA Method 8021B. The two contaminants sought in the post-excavation samples had been detected above remediation criteria in soil tests performed at the time of tank removal.

The results of the laboratory analysis of the post-excavation soils are presented in Appendix C and are summarized in the table below.

POST-EXCAVATION SOIL TESTS - HEATING OIL TANK
Concentrations as shown

SAMPLE LOCATION DEPTH	PE1 Bottom 9'	PE2 N. Side 7'	PE3 W. Side 2'	PE4 W. Side 2'	PE5 Bottom 1½'	Pollutant Mobility Criteria	Direct Exposure Criteria	
							Resid.	Comm.
AVOCs (mg/kg)	ND	ND	ND	ND	ND	Varies	Varies	Varies
ETPH (mg/kg)	ND	ND	ND	ND	ND	2500	500	2500

Notes: 1. ND means not detected. NA means remediation criteria not applicable to this analysis. AVOCs are aromatic volatile organic compounds and MTBE.
2. Pollutant Mobility Criteria and Direct Exposure Criteria are taken from the DEP Remediation Standard Regulations [C.G.S. Section 22a-133k].

ETPH and aromatic VOCs were not detected in the five post-excavation soil samples. The soil test data indicated that the soil removal effort had successfully removed contaminated soils and that further removal was not necessary.

2. Soil Remediation at Eastern Underground Gasoline Tank

A mixture of contaminated and uncontaminated soils that had been placed in the hole after the removal of the tank in June 2002 was excavated by Underground Systems for off-site disposal. The hole was then extended to the west, east, and south and was deepened to depths up to approximately 8½ feet. The soil removal was guided by petroleum odors and staining. The most odorous soils appeared to be associated with surface spills near the former pump pad. No ground water was observed in the cleanup excavation, but soil at the deepest parts of the hole appeared to be moist. The final dimensions of the removal area measured up to approximately 22 feet long, 11 feet wide, and 8½ feet deep.

After the removal of the contaminated soil, Ned Shanahan collected seven post-excavation soil samples (PE6-PE12) on the edges of the removal area. The soil samples were placed in a chilled cooler and were transported to Connecticut Testing Laboratories for analysis for ETPH, aromatic VOCs by EPA Method 8021B, and for arsenic and lead by mass analysis methods. The parameters selected for the soil tests had been detected above remediation criteria in soil samples collected at the time of tank removal.

The results of the laboratory analysis of the post-excavation soils are presented in Appendix C and are summarized in the table below.

POST-EXCAVATION SOIL TESTS - EASTERN GASOLINE TANK
Concentrations as shown

SAMPLE LOCATION DEPTH	PE6 N. Side 6½'	PE7 Bottom 3½'	PE8 E. Side 4½'	PE9 Bottom 8½'	PE10 W. Side 7½'	PE11 S. Side 8'	PE12 E. Side 8'	Pollutant Mobility Criteria	Direct Exposure Criteria	
									Resid.	Comm.
AVOCs (mg/kg)	ND	ND	ND	ND	ND	ND	ND	Varies	Varies	Varies
ETPH (mg/kg)	ND	ND	ND	ND	ND	ND	ND	2500	500	2500
Arsenic (mg/kg)	14.4	10.7	6.6	4.8	5.0	6.0	5.7	NA	10	10
Lead (mg/kg)	5.0	150	4.0	3.0	ND	3.0	5.0	NA	500	1000

Notes: 1. ND means not detected. NA means remediation criteria not applicable to this analysis. AVOCs are aromatic volatile organic compounds.
2. Pollutant Mobility Criteria and Direct Exposure Criteria are taken from the DEP Remediation Standard Regulations [C.G.S. Section 22a-133k].
3. Test results exceeding remediation criteria have been highlighted with thick lines.

The post-excavation test data indicated that the remediation effort had successfully removed soils containing fuel constituents (ETPH, lead, aromatic VOCs). However, two samples (PE6, PE7) contained arsenic at concentrations (14.1 and 10.7 mg/kg, respectively) which exceeded the 10 mg/kg remediation criteria. PE7 was collected at a depth of 3½ feet in the area of the former pump pad, while PE7 was collected at a depth of 6½ feet east of the pad on the northern edge of the tank grave. We elected to fill the cleanup excavation pending further investigation of the lingering arsenic detections.

IV. SOIL GAS SURVEY

A. Description of Survey

On 13 & 14 June 2002, Hygenix, Inc. [Hygenix] collected soil gas samples from 19 locations under the floor slab of the garage building. Hygenix performed the work as a subcontractor to Shanahan Consulting and Ned Shanahan was present on site to assist in the survey. The survey was performed as a screening tool to explore for possible spills of petroleum products under the garage.

The concrete slab floor ranged in thickness from approximately 6 to 8 inches and was in good condition. Appendix E describes the exploratory work performed by Hygenix and Figure 5 shows the approximate locations of the sampling points (as well as subsequent soil borings drilled through the garage floor to collect soil samples [borings discussed later in this report]).

The soil gas sampling locations are described below:

SOIL GAS SAMPLING LOCATIONS	
LOCATION	DESCRIPTION
SG1, SG8, SG9, SG10	In southern part of garage where two floor drains were observed.
SG2, SG3	In southern part of building where a former machine shop (for bridge repair work) was reported.
SG4, SG5	In northern part of the building to explore for possible releases from a fuel oil line observed in the floor.
SG6, SG7	In garage area in northern part of building.
SG11, SG12, SG13, SG14, SG15	In eastern section of the central part of garage (this section was erected in circa 1950). SG11 was also located near two 55-gallon drums stored in building. The eastern section included a single floor drain.
SG16, SG17, SG18, SG19	In a garage area in the western section of the central part of the building (section erected in circa 1911). A single floor drain was observed in the western section.

Hygenix measured total concentrations of volatile organic compounds [VOCs] using both a 10.2 eV and an 11.7 eV HNU photoionization detector [PID] at each of nineteen soil gas sample locations.

B. Survey Results

The results of the soil gas survey are summarized in the table below and are presented in the Hygenix report in Appendix E.

SOIL GAS CONCENTRATIONS UNDER FLOOR OF GARAGE BUILDING Concentrations in ppm					
LOCATION	10.2 eV PID	11.7 eV PID	LOCATION	10.2 eV PID	11.7 eV PID
SG1	ND	ND	SG11	ND	ND
SG2	ND	ND	SG12	Trace	ND
SG3	ND	ND	SG13	ND	ND
SG4	ND	ND	SG14	Trace	ND
SG5	ND	ND	SG15	Trace	ND
SG6	ND	ND	SG16	1	ND
SG7	ND	ND	SG17	Trace	ND
SG8	ND	ND	SG18	1	ND
SG9	ND	ND	SG19	15	5
SG10	ND	ND			

Note: ND means not detected.

The PID measurements may reflect the presence of various volatile contaminants (e.g. petroleum products, solvents) or naturally-occurring organic compounds. Positive soil gas readings could be triggered by contaminants in either shallow ground water or soils near the sampling point.

No VOCs were detected in the southern and northern parts of the garage. The southern area where no PID responses were noted included the former machine shop area (SG2 and SG3). In the central section of the building, seven locations (SG12, SG14-SG19) exhibited positive PID readings using either the 10.2 eV or 11.7 eV instrument. The VOC concentrations at location SG19 were significantly higher than any other reading. The soil gas detections guided our subsequent drilling program under the garage floor, as is discussed later in this report.

V. GROUND WATER FLOW EVALUATION

Our evaluation of overburden ground water flow in the site area involved the use of water table elevations at five overburden monitor wells (W1-W4 and MW3). Overburden wells W5 and W6 were installed after the ground water flow evaluation. We also surveyed the elevation of two existing bedrock monitor wells (MW1, MW2).

Elevation data for the five overburden and two bedrock monitor wells are tabulated below. The well elevations were surveyed relative to an arbitrary datum by Robert R. Weaver, L.S. of East Haddam, Connecticut.

WELL CONSTRUCTION ELEVATION DATA (Feet)				
WELL	Type of Well	Elevation of Top of Metal Cover	Elevation of Top of PVC Casing	Total Depth of Well Below Top of PVC
MW1	Bedrock	38.58	38.14	47
MW2	Bedrock	33.88	33.50	29
MW3	Overburden	36.11	35.93	20
W1	Overburden	36.90	36.62	17
W2	Overburden	34.24	33.96	14
W3	Overburden	31.80	31.43	14
W4	Overburden	35.68	35.4	17.5

Note: Elevations refer to an assumed elevation of 35.00 feet at a nail near the southwest corner of the town garage building at 1 Main Street.

Ground water elevation data measured at the monitor wells on 2 January 2004 are tabulated below.

GROUND WATER ELEVATION DATA (Feet)			
WELL	Elevation of Top of PVC	Depth Below PVC	Elevation of Water Table
MW1	38.14	12.76	25.38
MW2	33.50	6.70	26.80
MW3	35.93	9.29	26.64
W1	36.62	5.62	31.00
W2	33.96	6.33	27.63
W3	31.43	5.58	25.85
W4	35.40	6.14	29.26

Note: Water levels measured by Ned Shanahan using a Waterra WS-100 water level sensor.

As shown on Figure 6, we constructed an overburden ground water contour map using the data from the five overburden wells. The elevation data indicate that overburden ground water in the area of the garage generally flows to the south and overburden ground water behind the town hall (near well MW3) appears to flow toward the southeast.

During our exploration work, we did not encounter ground water in the overburden deposits in the western part of the site (see cross-hatched area on Figure 6). The ground surface slopes steeply to the west (toward the Connecticut River) on the western edge of the site, suggesting that bedrock ground water in this area may have a westward flow direction.

The lower elevation of the water table in bedrock well MW2 (26.80 feet) when compared with the adjacent overburden well W2 (27.63 feet) suggests that ground water flows downward (from the overburden into the bedrock) at this well pair.

VI. DRILLING PROGRAM

A. Test Borings and Monitor Wells

On 8 & 9 October 2003 and 12 & 13 November 2003, Associated Borings Co., Inc. of Naugatuck, Connecticut drilled 30 soil borings (TG1-TG27 and TH1-TH3) and four monitor wells (W1-W4) on site. In addition, on 20 July 2004, Associated Borings installed monitor wells W5 and W6. Ned Shanahan of Shanahan Consulting observed the drilling of the borings. The approximate locations of the borings and wells are shown on Figures 3 and 4. Boring logs and well construction diagrams are presented in Appendix F.

Site features that hindered the drilling program included:

1. Drilling inside the garage building was hampered by low ceilings. The derrick of the rig could not be raised in the central part of the garage, preventing the collection of spilt spoon samples (soil samples were collected either by hand from the side of the hole or directly from the drilling augers). The ceiling in the southern part of the garage was too low to permit drilling with the auger. Based on the available data [including the absence of contamination at the floor drainage dry well for the southern garage drains and the absence of soil gas detections], we did not believe that significant contamination was present in the southern part of the garage.

2. Low-hung utility lines near the southwestern corner of the garage building limited the drilling locations in the former gasoline tank/pump adjacent to this corner of the garage. We elected not to raise the drilling derrick and collected soil samples directly from the drilling augers in explorations performed in the area.

3. A reported underground water line and sanitary sewer line located outside the eastern wall of the garage hampered our drilling effort.

The rationale for the boring and well locations are described in the table below:

RATIONALE FOR BORING AND WELL LOCATIONS	
EXPLORATION(S)	DESCRIPTION
W1	Overburden monitor well installed west of the garage.
W2	Overburden monitor well installed in pavement patch of former underground gasoline tank and pump outside southwestern corner of garage. The well provides overburden ground water data and supplements an existing adjacent bedrock well [MW2]. W2 was drilled into borehole of TG7.
W3	Overburden monitor well downgradient of (south of) garage.
W4	Overburden monitor well east of garage and downgradient of the former leaking underground heating oil tank.
W5	Overburden monitor well installed east of the garage and downgradient of the former leaking underground gasoline tank.
W6	Overburden monitor well installed downgradient of the area where blue residue was observed on the ground surface behind the town hall.
TH1, TH2	Drilled to water table in the reported former location of an underground gasoline behind the town hall.

RATIONALE FOR BORING AND WELL LOCATIONS	
EXPLORATION(S)	DESCRIPTION
TG1	Drilled to bottom of gasoline tank soil removal area to supplement post-excavation soil samples collected after August 2002 soil removal effort. In reviewing our prior post-excavation testing, we concluded that an additional bottom sample would be beneficial in the area of TG1.
TG2, TG3	Drilled to water table to evaluate extent of arsenic found in post-excavation soil samples from previous soil remediation effort. TG3 was also located near a former aboveground heating oil tank.
TH3, TG4	Drilled to water table near the site boundary to evaluate area where an apparent tank vent pipe was found to terminate underground.
TG5	Drilled to water table in area where an unknown pump was shown on a 1932 map.
TG6, TG7, TG8	Drilled to water table in pavement patch of former underground gasoline tank and pump outside southwestern corner of garage.
TG9	Drilled to refusal (no ground water observed) at location south of underground gasoline tank removed in June 2002 to evaluate unknown buried pipe seen exiting tank grave.
TG10-TG12, TG18-TG21	Drilled to refusal (no ground water observed) in area south of River House where inactive septic system was located and where town workers had reported possible subsurface contamination during prior excavation work.
TG13-TG17, TG22-TG23	Drilled to water table through floor of central part of garage to evaluate PID responses in soil gas survey, the likelihood of remnant contamination under 1950 addition, and floor drains. TG22 and TG23 were drilled near one floor drain after ETPH was detected in a previous boring (TG14) at the drain.
TG24-TG27	Drilled to water table to evaluate elevated PID response in soil sample collected from W1. Later laboratory testing later reported no VOCs in the W1 soil sample.

In planning the drilling program, we considered site geologic conditions. In areas where overburden ground water was present, large spills of petroleum products would be expected to move through soils and float on the water table. In areas where shallow bedrock was observed above the water table, significant releases of contaminants would likely accumulate on the bedrock surface. Based on these perceived contaminant transport mechanisms, we drilled in each area of concern until we encountered either the water table interface or the top of the apparent bedrock surface.

The borings ranged in depth from 1½ to 17½ feet below ground surface. Refusal was encountered on the apparent bedrock surface at depths of between 1½ and 10 feet in the western part of the site (where a surficial bedrock knob is visible).

After their installation, monitor wells W1-W6 were developed to remove sediment from the well casings by hand bailing.

Overburden sediments generally consisted of a surface layer of mixed sand, gravel, and silt (possibly soil fill in some locations), underlain by sand and silt.

Petroleum odors or staining were observed in only one of the 72 soil samples collected during drilling. TG8S1, the sample which exhibited a petroleum odor, was collected at a depth of 8 feet in the pavement patch of the former underground gasoline tank and pump outside southwestern corner of garage

building. No petroleum odor was noted for TG8S2, collected at a depth of 10 feet in the same boring.

B. Soil Sampling

Soil samples were collected during the drilling program at selected depth intervals by one of the following three methods: (1) by hand directly from the side of the hole using a clean sample jar or a clean plastic spoon, (2) directly from the auger flights, or (3) by using a standard split spoon sampler (the most common sampling method). The approximate depths of the soil samples are shown in the table in Appendix G. Between samples, the split-spoon sampler was washed in a detergent/water solution and rinsed in water.

On 8 October 2003, Ned Shanahan collected a sample of blue-colored residue (sample SS1) on the ground surface near the former rear storage building using a clean plastic spoon. The blue residue was observed over an area estimated at up to 30 feet long and up to 13 feet wide.

On 20 July 2004, Ned Shanahan collected a shallow soil sample (sample DO1) in a drainage ditch in the southwestern part of the site near the location where a storm drainage pipe discharged into the ditch. The sample was collected using a split spoon sampler driven into the ditch by Associated Borings. The ditch was paved with asphalt and the sample was collected below a thin asphalt layer at a depth interval of approximately 0.1 to 1.0 feet. The spilt spoon encountered refusal at 1 foot, presumably on the bedrock surface given nearby bedrock outcrops. The bottom 1-inch of the sample was dark in appearance, but no petroleum odor was noted.

With the exception of sample DO1, duplicate soil samples were collected for each sample location. One of the duplicate samples was placed in a glass jar and kept chilled for possible future analyses at a laboratory. The second sample was placed in a plastic "ziploc" bag and was test-screened in the field using a photoionization detector [PID]. Sample DO1 was sent directly to the laboratory without PID screening.

C. Ground Water Sampling

Monitor wells MW1, MW2 , W1, W2, W3, and W4 were sampled by Ned Shanahan on 2 January 2004 using a manual Waterra inertial pumping system (consisting of dedicated plastic tubing and a footvalve).

Prior to sample collection, the water level in each well was measured and Ned Shanahan then generally removed three times the volume of standing water in the well. However, at MW1, the well was purged dry after the removal of 11 gallons (approximately 2 well volumes) before it was sampled. The ground water samples were kept chilled pending delivery to the laboratory. Both filtered and unfiltered samples were collected for metals analysis. Filtering was performed by using a 0.45 micron filter attached directly to the Waterra well tubing.

On 2 January 2004, Ned Shanahan also collected a sample of water from the bedrock supply well located on the property. The well was sampled from a spigot near the wellhead in the underground well house after running water in the nearby River House for several minutes.

Petroleum odors or sheens were not observed in the ground water samples. The filtered samples collected for metals testing at each well were clear. The unfiltered water samples contained silt.

We inspected two tank "sniffer" wells located adjacent to the underground diesel fuel tank at the DOT building with the intention of collecting a ground water sample. However, we discovered that the wells were only five feet deep (approximately) and did not contain ground water.

VII. CHEMICAL TESTING DATA

A. Test Screening of Soils

A photoionization detector [PID] was used to test screen the 79 soil samples collected during the drilling program for the presence of volatile organic compounds [VOCs]. The instrument used for the screening was an HNU PI 101 with an 11.7 eV lamp. Test screening was performed in the field by testing the headspace above the soil samples in plastic "ziploc" bags.

The results of the test screening are presented in Appendix G.

The PID responses ranged from 0.0 to 10.2 ppm total VOCs. The highest VOC readings were encountered in the following samples: W1S1 (located outside western wall of garage) - 10.2 ppm, TG8S1 (located in grave of gasoline tank outside southwest corner of garage)- 4.8 ppm, and TG7S1 - 0.6 ppm. W1 was located outside the western wall of the garage, while TG7 and TG8 were both located in the grave of the former gasoline tank outside the southwestern corner of the garage. The remaining 76 soil samples exhibited PID readings of 0.5 ppm of less.

The PID responds to VOCs found in fuels, solvents, and other petroleum products. In addition, the instrument may detect the presence of naturally-occurring organic compounds.

B. Description of Laboratory Tests of Soil and Ground Water Samples

Laboratory tests of soil and ground water samples were performed at Connecticut Testing Laboratories, Inc. in Meriden, Connecticut.

1. Soil Tests

We tested 47 soil samples at the laboratory for a variety of contaminants, as is tabulated below.

LABORATORY TESTS OF SOIL SAMPLES		
SAMPLE (S)	LABORATORY TESTS PERFORMED	TESTING RATIONALE
DO1	ETPH, PCBs, VOCs	Evaluate soil in drainage ditch for possible petroleum contamination.
TH1S2, TH1S3, TH2S2	Aromatic VOCs and lead by mass analysis	Evaluate possible gasoline contamination in former underground tank grave behind town hall.
SS1	Ten metals (arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, mercury, nickel, silver, zinc) by mass analysis; eight metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc) by SPLP method, and eight RCRA metals by TCLP method	Evaluate blue residue on ground surface for possible metal contamination.

LABORATORY TESTS OF SOIL SAMPLES		
SAMPLE (S)	LABORATORY TESTS PERFORMED	TESTING RATIONALE
TH3S3, TG4S3	ETPH	Wet soil samples tested to evaluate whether heating oil spilled near end of tank vent pipe.
TG1S1	Aromatic VOCs, ETPH arsenic, lead, SPLP Lead	Intended as a supplemental post-excavation bottom sample for cleanup area at underground gasoline tank.
TG2S1, TG2S2, TG2S3, TG3S1, TG3S2, TG3S3	Arsenic	Evaluated extent of remnant arsenic contamination in tank removal area.
TG5S3	ETPH; aromatic VOCs, lead, SPLP lead	Wet soil sample collected near unknown pump on 1932 map tested for possible fuel spills.
TG6S1, TG6S2, TG7S1, TG7S2, TG8S1, TG8S2	Aromatic VOCS, lead, SPLP lead	Searched for possible gasoline contamination in pavement patch marking former underground gasoline tank and pump outside southwest corner of garage.
TG9S2	Aromatic VOCS, lead, SPLP lead	Evaluated possible gasoline contamination at a depth of 5 feet in area where buried pipe was seen exiting grave of removed gasoline tank west of garage.
TG10S1, TG11S2, TG12S1, TG18S2, TG19S3, TG20S2, TG21S1	ETPH for all samples. Tested TG11S2 and TG19S3 for VOCs.	Tested soils at apparent bedrock surface in area of septic system. Tested two deeper samples from area (TG11S2, TG19S3) for VOCs when no significant PID responses were observed.
TG13S1, TG14S1, TG14S3, TG15S1, TG15S2, TG15S3, TG16S1, TG16S3, TG17S1, TG17S3, TG22S1, TG22S3, TG23S1, TG23S3	ETPH for all samples. Tested TG15 samples and TG17S1for VOCs. Tested TG13S1 and TG14S1 for nine metals by mass analysis methods. Tested for selected SPLP metals in samples based on mass analysis results. Tested TG22S1 for PCBs, VOCs, and nine metals by mass analysis and TG23S1 for PCBs. Tested for selected SPLP metals based on mass analysis results.	Evaluated possible contamination under central part of garage. Tested surficial samples (considered most likely to be impacted) and wet samples (to evaluate water table conditions). Tested TG15 samples for VOCs due to detection of VOCs in soil gas from this area [sample SG19]. Performed additional lab tests in floor drain area (TG14, TG22, TG23) when ETPH detected in soil here. TG13 and TG14 located under 1950 addition where historical surface spills could have occurred.
W1S1, W1S2, TG24S1, TG27S1	VOCs	Tested several samples outside western wall of garage to evaluate elevated PID response for sample W1S1.

Based on our knowledge of site usage, we considered ETPH to be the primary indicator of contamination on the site. We tested selected samples for VOCs guided by field test screening. In the areas of former gasoline tanks, aromatic VOCs and lead were considered indicators of contamination. We tested selected samples for nine metals (arsenic, cadmium, copper, chromium, lead, nickel, silver, zinc) considered to be useful indicators of site activities. The samples submitted for metals testing were chosen after reviewing ETPH and other earlier test data. After the results of the mass analysis tests for metal had been received, in general, we tested the samples for a subset of leachable metals (by SPLP Method) for those metals that could theoretically exceed DEP Pollutant Mobility Criteria (mass analysis concentrations do not exceed 20 times SPLP concentrations based on dilutions used in the leaching test).

Soils were tested for aromatic VOCs by EPA Method 8021B and for aromatic and halogenated VOCs (referred to as simply "VOCs" in the table above) using EPA Method 8260. The samples submitted for VOC testing were preserved via Method 5035.

The soil samples were kept chilled during delivery to the laboratory.

2. Ground Water Tests

The six monitor well ground water samples [MW1, MW2, W1, W2, W3, W4] were tested for: (1) aromatic and halogenated VOCs by EPA Method 502.2, (2) ETPH, and (3) total [unfiltered] and dissolved [filtered] concentrations of arsenic, chromium, and lead. The metals selected for testing had been detected above regulatory criteria in one or more unfiltered ground water samples collected by Land-Tech in 2000.

The Supply Well sample from the bedrock supply well was tested for VOCs by EPA Method 502.2

The water samples were kept chilled during delivery to the laboratory on the day of their collection.

C. Results of Laboratory Analyses of Soil

The results of the laboratory soil tests are presented in Appendix H and are summarized in the tables that follow. Appendix H also contains the chain-of-custody records for the samples.

SOIL TEST DATA - BLUE RESIDUE SAMPLE SS1

Concentrations as shown

	SS1 Surface	PMC	RCRA Hazardous Waste Limit	DEC	
				Resid.	Comm.
Arsenic (mg/kg)	7.6	NA	NA	10	10
Cadmium (mg/kg)	1.4	NA	NA	34	1000
Total Chromium (mg/kg)	191	NA	NA	3900	51,000
Hexavalent Chromium (mg/kg)	ND	NA	NA	100	100
Lead (mg/kg)	854	NA	NA	500	1000
Copper (mg/kg)	562	NA	NA	2500	76,000
Mercury (mg/kg)	57	NA	NA	20	610
Nickel (mg/kg)	10.6	NA	NA	1400	7500
Silver (mg/kg)	ND	NA	NA	340	10,000
Zinc (mg/kg)	505	NA	NA	20,000	610,000
SPLP Arsenic (mg/l)	ND	0.5	NA	NA	NA
SPLP Cadmium (mg/l)	ND	0.05	NA	NA	NA
SPLP Chromium (mg/l)	0.07	0.5	NA	NA	NA
SPLP Copper (mg/l)	0.08	13	NA	NA	NA
SPLP Lead (mg/l)	0.128	0.15	NA	NA	NA
SPLP Mercury (mg/l)	0.004	0.02	NA	NA	NA
SPLP Nickel (mg/l)	ND	1.0	NA	NA	NA
SPLP Zinc (mg/l)	ND	50	NA	NA	NA
TCLP Arsenic (mg/l)	ND	NA	5	NA	NA
TCLP Barium (mg/l)	5.3	NA	100	NA	NA
TCLP Cadmium (mg/l)	0.02	NA	1	NA	NA
TCLP Chromium (mg/l)	ND	NA	5	NA	NA
TCLP Lead (mg/l)	0.251	NA	5	NA	NA
TCLP Mercury (mg/l)	ND	NA	0.2	NA	NA
TCLP Selenium (mg/l)	ND	NA	1	NA	NA
TCLP Silver (mg/l)	ND	NA	5	NA	NA

SOIL TEST DATA - SOIL BORING SAMPLES & DRAINAGE DITCH SAMPLE DO1

Concentrations as shown

SAMPLE DEPTH	TH1S2 5-7'	TH1S3 10-12'	TH2S2 5-7'	TH3S3 10-12'	PMC	DEC	
						Resid.	Comm.
ETPH (mg/kg)	---	---	---	ND	2500	500	2500
AVOCs (mg/kg)	ND	ND	ND	---	Varies	Varies	Varies
Lead (mg/kg)	28.4	4.8	5.2	---	NA	500	1000

	TG1S2 8-10'	TG2S1 0-2'	TG2S2 5-7'	TG2S3 10-12'	TG3S1 0-2'	TG3S2 5-7'	TG3S3 10-12'	PMC	DEC	
									Res.	Com.
ETPH (mg/kg)	ND	---	---	---	---	---	---	2500	500	2500
AVOCs (ug/kg)	ND	---	---	---	---	---	---	Varies	Varies	Varies
Arsenic (mg/kg)	2.6	4.3	8.6	4.2	1.8	4.9	5.3	NA	10	10
Lead (mg/kg)	4.1	---	---	---	---	---	---	NA	500	1000
SPLP Lead (mg/l)	ND	---	---	---	---	---	---	0.15	NA	NA

	TG4S3 10-12'	TG5S3 10-12'	TG6S1 6'	TG6S2 10'	TG7S1 8'	TG7S2 10'	TG8S1 8'	TG8S2 10'	PMC	DEC	
										Res.	Com.
ETPH (mg/kg)	ND	ND	---	---	---	---	---	---	2500	500	2500
AVOCs (ug/kg)	---	ND	ND	ND	ND	ND	ND	ND	Varies	Varies	Varies
Lead (mg/kg)	---	6.9	58	14.6	45.7	7.2	14.3	5.4	NA	500	1000
SPLP Lead (mg/l)	---	ND	0.009	ND	0.008	ND	ND	ND	0.15	NA	NA

	TG9S2 5'	TG10S1 5'	TG11S2 7-7½'	TG12S1 3½'	TG18S2 5-5½'	TG19S3 7-9'	TG20S2 5-5½'	TG21S1 0-1½'	PMC	DEC	
										Res.	Comm.
ETPH (mg/kg)	---	ND	ND	ND	ND	ND	ND	ND	500	500	2500
VOCs (ug/kg)	---	---	ND	---	---	ND	---	---	Varies	Varies	Varies
AVOCs (ug/kg)	ND	---	---	---	---	---	---	---	Varies	Varies	Varies
Lead (mg/kg)	12.9	---	---	---	---	---	---	---	NA	500	1000
SPLP Lead (mg/kg)	ND	---	---	---	---	---	---	---	0.015	Varies	Varies

	TG14S3 10'	TG15S1 ½-1'	TG15S2 5'	TG15S3 10'	TG16S1 ½-1'	TG16S3 10'	TG17S1 ½-1'	TG17S3 10'	PMC	DEC	
										Res.	Com.
ETPH (mg/kg)	ND	ND	ND	ND	ND	ND	ND	ND	2500	500	2500
VOCs (ug/kg)	---	ND	ND	ND	---	---	ND	---	Varies	Varies	Varies

	TG22S3 10'	TG23S1 ½-1'	TG23S3 10'	TG24S1 1-3'	TG27S1 1-3'	W1S1 1-3'	W1S2 5-7'	PMC	DEC	
									Res.	Com.
ETPH (mg/kg)	ND	ND	ND	---	---	---	---	2500	500	2500
VOCs (ug/kg)	---	---	---	ND	ND	ND	ND	Varies	Varies	Varies
PCBs (mg/kg)	---	ND	---	---	---	---	---	NA	1	10

	TG13S1 ½-1'	TG14S1 ½-1'	TG22S1 ½-1'	PMC	DEC	
					Res.	Comm.
ETPH (mg/kg)	ND	59	495	2500	500	2500
VOCs (ug/kg)	ND	ND	ND	Varies	Varies	Varies
PCBS (mg/kg)	---	---	ND	NA	1	10
Arsenic (mg/kg)	3.0	9.1	2.0	NA	10	10
Cadmium (mg/kg)	ND	ND	ND	NA	34	1000
Total Chromium (mg/kg)	19.1	36.3	15.4	NA	3900	51,000
Copper (mg/kg)	12.2	20.4	21.9	NA	2500	76,000
Lead (mg/kg)	91.1	52.2	53.7	NA	500	1000
Mercury (mg/kg)	0.03	0.04	ND	NA	20	610
Nickel (mg/kg)	14.7	25.4	11.4	NA	1400	7500
Silver (mg/kg)	ND	ND	ND	NA	340	10000
Zinc (mg/kg)	71.3	40.9	50.8	NA	20,000	610,000
SPLP Chromium (mg/l)	ND	ND	ND	0.5	NA	NA
SPLP Lead (mg/l)	ND	ND	0.013	0.15	NA	NA
SPLP Nickel (mg/l)	---	ND	---	1	NA	NA

	DO1 0.1-1'	PMC	DEC	
			Res.	Comm.
ETPH (mg/kg)	ND	500	500	2500
VOCs (ug/kg)	ND	Varies	Varies	Varies
PCBS (mg/kg)	ND	NA	1	10

Notes for soils tables:

1. ND means not detected. --- means parameter not tested in this sample. None means no criteria established. NA means remediation criteria not applicable to this analysis. VOCs are aromatic and halogenated volatile organic compounds. AVOCs are aromatic volatile organic compounds. ETPH is Extractable Total Petroleum Hydrocarbons.
2. In general, soil samples were tested for those SPLP metals that could theoretically exceed remediation criteria based on total metals testing by mass analysis methods.
3. PMC [Pollutant Mobility Criteria] and DEC [Direct Exposure Criteria] are taken from the DEP Remediation Standard Regulations [RSRs] (C.G.S. Section 22a-133k). Since the site is classified "GB", we generally applied PMC for "GB" classification areas. However, in accordance with the RSRs, we applied stricter "GA" PMC for the following soil samples: TG9, TG10, TG11, TG12, TG18, TG19, TG20, TG21, and DO1because no ground water was encountered in overburden deposits at these site locations.
4. Test results exceeding remediation criteria have been highlighted with thick lines.

The lone exceedances of applicable soil remediation criteria (as established in the Remediation Standard Regulations) detected in the exploration program involved the sample of blue residue (SS1)

collected on the ground behind town hall. SS1 contained lead and mercury at concentrations greater than residential Direct Exposure Criteria. Our TCLP tests indicated that the residue was not a characteristic hazardous waste under RCRA based on metals content.

The soil tests revealed an apparent minor surface spill under the central part of the garage building near a floor drain. Samples TG14S1 and TG22S1, both collected near the drain, contained ETPH at concentrations below the strictest 500 ppm regulatory criteria (TG14S1 at 59 mg/kg and TG22S1 at 495 mg/kg) . In drilling a total of three borings around the floor drain (TG14, TG22, TG23), we tested four additional soil samples for ETPH with no detections reported. Significantly, wet soil samples TG14S3, TG22S3, and TG23S3 did not contain ETPH, suggesting that the water table had not been affected. To further characterize the apparent petroleum spill, we tested the sample with the highest concentration of ETPH (sample TG22S1) for PCBs, for nine metals (by mass analysis), for selected metals by the SPLP leaching method, and for VOCs by EPA Method 8260. We also tested TG23S1 for PCBs and we tested TG14S1 for nine total metals and selected leachable metals. We did not detect PCBs or VOCs or significant concentrations of metals in the various soil tests. The data indicate that the spill at the floor drain involves ETPH, is of limited extent, and did not reach the water table.

In the pavement patch for the former underground gasoline tank and pump outside the southwest corner of the garage, we encountered one soil sample with a petroleum odor (TG8S1). However, laboratory tests of TG8S1 and of five other soil samples from the area did not reveal the presence of aromatic VOCs, lead, or SPLP lead.

The elevated PID response for sample W1S1 was apparently due to a natural organic material since no regulated VOCs were detected in the sample at the laboratory.

In reviewing our post-excavation testing at the underground gasoline tank outside the garage, we concluded that an additional bottom sample from the soil removal area was appropriate. Analysis of TG1S2 (collected as a additional bottom sample) did not detect aromatic VOCs, ETPH, SPLP lead or significant concentrations of arsenic or lead.

We encountered no evidence of contamination at the following areas: (1) in the septic system area south of the River House, (2) near the buried pipe south of the former gasoline tank grave (TG9), (3) at the unknown pump adjacent to Main Street (TG5), (4) in the drainage ditch in the southwestern part of the site (DO1), (5) at the former gasoline tank behind town hall (TH1, TH2), or (6) at a suspected former underground heating oil tank north of town hall (TH3, TG4).

In our prior remediation work at the former underground gasoline tank and pump east of the garage building, we detected arsenic (by mass analysis method) above remediation criteria in two post-excavation soil samples. Supplemental soil removal and explorations to evaluate the arsenic detection are discussed in the next section of this report.

D. Results of Laboratory Analyses of Ground Water

1. Monitor Wells

The table below summarizes the results of laboratory analyses of ground water samples collected at seven monitor wells (MW1, MW2, MW3, W1, W2, W3, W4) on 2 January 2004 by Shanahan Consulting and at three monitor wells (MW1, MW2, MW3) on two occasions in 2000 by Land-Tech. Appendix I presents our recent ground water laboratory test data and the chain of custody records for the water samples.

GROUND WATER TEST DATA - BEDROCK MONITOR WELLS
Concentrations in ppb

CONTAMINANT	MW1			GROUND WATER PROTECTION CRITERIA	SURFACE WATER PROTECTION CRITERIA	VOLATILIZATION CRITERIA	
	8-9-00	11-15-00	1-2-04			Residential	Commercial
TPH	1800	---	---	500	NE	NA	NA
ETPH	---	---	ND	100	NE	NA	NA
Toluene	5.5	---	ND	1000	4,000,000	7100	41,000
Chloroform	2.0	---	ND	6	14,100	26	62
Other VOCs	ND	---	ND	Varies	Varies	Varies	Varies
Pesticides	---	ND	---	Varies	Varies	NA	NA
Total Arsenic	16	---	5	50	NA	NA	NA
Dissolved Arsenic	---	---	ND	50	4	NA	NA
Total Barium	180	---	---	1000	NE	NA	NA
Total Cadmium	ND	---	---	5	NA	NA	NA
Total Chromium	200	---	ND	50	NA	NA	NA
Dissolved Chromium	---	---	ND	50	1200	NA	NA
Total Lead	ND	---	22	15	NA	NA	NA
Dissolved Lead	---	---	ND	15	13	NA	NA
Total Mercury	ND	---	---	2	NA	NA	NA
Total Selenium	ND	---	---	50	NA	NA	NA
Total Silver	ND	---	---	36	NA	NA	NA

GROUND WATER TEST DATA - BEDROCK MONITOR WELLS
Concentrations in ppb

CONTAMINANT	MW2			GROUND WATER PROTECTION CRITERIA	SURFACE WATER PROTECTION CRITERIA	VOLATILIZATION CRITERIA	
	8-9-00	11-15-00	1-2-04			Residential	Commercial
TPH	1400	---	---	500	NE	NA	NA
ETPH	---	---	ND	100	NE	NA	NA
Chloroform	1.9	---	0.6	6	14,100	26	62
Other VOCs	ND	---	ND	Varies	Varies	Varies	Varies
Pesticides	---	ND	---	Varies	Varies	NA	NA
Total Arsenic	47	---	8	50	NA	NA	NA
Dissolved Arsenic	---	---	ND	50	4	NA	NA
Total Barium	380	---	---	1000	NE	NA	NA
Total Cadmium	ND	---	---	5	NA	NA	NA
Total Chromium	250	---	ND	50	NA	NA	NA
Dissolved Chromium	---	---	ND	50	1200	NA	NA
Total Lead	570	---	62	15	NA	NA	NA
Dissolved Lead	---	---	6	15	13	NA	NA
Total Mercury	ND	---	---	2	NA	NA	NA
Total Selenium	ND	---	---	50	NA	NA	NA
Total Silver	ND	---	---	36	NA	NA	NA

GROUND WATER TEST DATA - OVERBURDEN MONITOR WELL MW3
Concentrations in ppb

CONTAMINANT	SAMPLE DATES			GROUND WATER PROTECTION CRITERIA	SURFACE WATER PROTECTION CRITERIA	VOLATILIZATION CRITERIA	
	8-9-00	11-15-00	1-2-04			Residential	Commercial
TPH	ND	---	---	500	NE	NA	NA
ETPH	---	---	ND	100	NE	NA	NA
VOCs	ND	---	ND	Varies	Varies	Varies	Varies
Pesticides	---	ND	---	Varies	Varies	NA	NA
Total Arsenic	ND	---	---	50	NA	NA	710
Total Barium	30	---	---	1000	NE	NA	NA
Total Cadmium	ND	---	---	5	NA	NA	NA
Total Chromium	ND	---	---	50	NA	NA	NA
Total Lead	ND	---	---	15	NA	NA	NA
Total Mercury	ND	---	---	2	NA	NA	NA
Total Selenium	ND	---	---	50	NA	NA	NA
Total Silver	ND	---	---	36	NA	NA	NA

GROUND WATER TEST DATA - OVERBURDEN MONITOR WELLS W1-W4
Concentrations in ppb

CONTAMINANT	W1	W2	W3	W4	GROUND WATER PROTECTION CRITERIA	SURFACE WATER PROTECTION CRITERIA	VOLATILIZATION CRITERIA	
							Resid.	Comm.
ETPH	ND	ND	ND	ND	100	NE	NA	NA
VOCs	ND	ND	ND	ND	Varies	Varies	Varies	Varies
Total Arsenic	10	5	7	22	50	NA	NA	NA
Dissolved Arsenic	ND	ND	ND	ND	50	4	NA	NA
Total Chromium	ND	ND	ND	ND	50	NA	NA	NA
Dissolved Chromium	ND	ND	ND	ND	50	1200	NA	NA
Total Lead	13	25	17	35	15	NA	NA	NA
Dissolved Lead	ND	ND	ND	ND	15	13	NA	NA

Notes for tables:

1. ND means not detected. —means sample not tested for this parameter. ETPH is Extractable Total Petroleum Hydrocarbons. VOCs is volatile organic compounds. NA means criteria not applicable to this parameter. NE means no criteria established.
2. Remediation Criteria are generally taken from the Connecticut DEP Remediation Standard Regulations [C.G.S. Section 22a-133k]. Volatilization Criteria are taken from a March 2003 list of proposed criteria issued by the DEP. As reflected in table comparisons, DEP Water Quality Standards indicate that Surface Water Protection Criteria for detected metals are based on dissolved not total metals concentrations. Ground Water Protection Criteria are shown in table despite "GB" classification of site due to local use of ground water in supply wells.
3. Test results exceeding remediation criteria have been highlighted with thick lines.

ETPH was not detected in the seven monitor well ground water samples collected for our investigation. The previous Land-Tech detections of TPH at MW1 and MW2 may have be caused by natural organic materials.

Tests of ground water collected from MW3 by Land-Tech and by Shanahan Consulting did not detect evidence of petroleum products (i.e. no VOCs or ETPH/TPH were detected). Although the well is adjacent to the grave of the former gasoline tank, our ground water flow calculations indicate that the well is not directly downgradient of the grave, thereby limiting the usefulness of the well. However, two wet soil samples collected below the water table at borings drilled in the grave (TH1 and TH2) did not reveal VOC contamination.

Chloroform (a VOC) was detected at 0.6 ug/L in bedrock monitor well MW2. With the exception of this trace chloroform detection, VOCs were not detected in the 2004 monitor well samples. The concentration of chloroform at MW2 is less than applicable remediation criteria. Land-Tech reported the presence of chloroform in both MW1 (at 2.0 ug/L) and MW2 (at 1.9 ug/L) in their August 2000 samples. Chloroform is a common commercial solvent that is also found in chlorinated public water supplies as a disinfection byproduct. Chloroform can be introduced into samples during sample collection (e.g. on field equipment) or during laboratory testing. In their August 2000 sampling effort, Land-Tech also reported the presence of toluene at 5.5 ug/L in ground water from bedrock well MW1, but our tests of MW1 in 2004 did not detect VOCs.

Dissolved lead was detected at 6 ug/L in our MW2 ground water sample. The remaining dissolved metals sought in our tests were not detected in the well samples. The MW2 lead concentration is below the Surface Water Protection Criterion (13 ug/L) and the Ground Water Protection Criterion (15 ug/L).

The unfiltered ground water samples collected for this investigation contained total lead at concentrations ranging up to 62 ug/L and total arsenic at concentrations up to 22 ug/L. Total chromium was not detected in the six unfiltered samples. In their previous study, Land-Tech also detected metals in unfiltered ground water samples from wells MW1, MW2, and MW3. We suspect that the total metal detections are due to the presence of suspended sediment in the samples and are not representative of ground water contamination. The detection limits used by the laboratory in the 2000 metals tests are in some cases higher than remediation criteria, a fact that reduces the usefulness of these data (see laboratory test report in Appendix B for detection limits).

2. Supply Well

The table below summarizes the results of laboratory analyses of ground water samples collected from the bedrock supply well on 2 January 2004 by Shanahan Consulting and in August 2000 by Land-Tech.

GROUND WATER TEST DATA - SUPPLY WELL Concentrations in ppb						
CONTAMINANT	SAMPLING DATES		GROUND WATER PROTECTION CRITERIA	SURFACE WATER PROTECTION CRITERIA	VOLATILIZATION CRITERIA	
	8-30-00	1-2-04			Residential	Commercial
TPH	ND	---	500	NE	NA	NA
Chloroform	---	1	6	14,100	26	62
Other VOCs	---	ND	Varies	Varies	Varies	Varies
Total Arsenic	ND	---	50	NA	NA	NA
Total Barium	ND	---	1000	NE	NA	NA
Total Cadmium	ND	---	5	NA	NA	NA
Total Chromium	ND	---	50	NA	NA	NA
Total Lead	1	---	15	NA	NA	NA
Total Mercury	ND	---	2	NA	NA	NA
Total Selenium	ND	---	50	NA	NA	NA
Total Silver	ND	---	36	NA	NA	NA

Notes: 1. ND means not detected. —means sample not tested for this parameter. TPH is Total Petroleum Hydrocarbons. NA means criteria not applicable to this parameter. NE means no criteria established.
2. Remediation Criteria are generally taken from the Connecticut DEP Remediation Standard Regulations [C.G.S. Section 22a-133k]. Volatilization Criteria are taken from a March 2003 list of proposed criteria issued by the DEP.

Our recent supply well test detected chloroform at 1 ug/L. No other VOCs were detected. The concentration of chloroform in the water sample does not exceed DEP remediation criteria and is less than the Maximum Contaminant Level of 100 ug/L (for total trihalomethanes) established for public drinking water supplies by the U.S. Environmental Protection Agency [EPA]. Chloroform can be introduced into water samples during collection or laboratory testing. The compound may also be found in supply wells after the chlorination of the well for sanitation purposes.

Our test of the supply well and a previous water test performed by Land-Tech did not detect the sought parameters at concentrations exceeding drinking water limits.

The detection of low concentrations of chloroform in the supply well sample and in monitor well sample MW2 does not appear to represent an on-site release. We did not detect chloroform in several shallow overburden wells, as would be expected if chloroform had been spilled on the property.

VIII. SUPPLEMENTAL SOIL REMEDIATION

A. Soil Removal in Area of Blue Residue

On 9 July 2004, the area of blue residue observed north of the town hall at 1 Main Street was excavated by workers for the Town of East Haddam using a backhoe. The excavation of the soils was observed by Ned Shanahan of Shanahan Consulting.

The cleanup was guided by the blue coloration of the soils. The excavation proceeded to a depth ranging from approximately 1 to 2½ feet below ground surface. Figure 9 presents the approximate limits of the soil removal area, which was of irregular shape.

After the removal of the contaminated soil, Ned Shanahan collected 11 post-excavation soil samples (BR1-BR11) on the edges and bottom of the removal area. The soil samples were placed in a chilled cooler and were transported to Connecticut Testing Laboratories for analysis for lead and mercury (by mass analysis methods) and for leachable chromium, lead, and mercury by the SPLP method. Lead and mercury were selected as the primary parameters for testing because they had exceeded remediation criteria in previous tests of the blue residue. The SPLP chromium tests were erroneously requested, due to a mistaken belief that overburden deposits in the area of the residue did not contain ground water (a condition that would have resulted in the applicability of "GA" soil remediation criteria even though the site is in a "GB" ground water zone). After the soil removal effort, we installed an overburden monitor well adjacent to the removal area (well W6) that demonstrated the presence of overburden ground water.

The results of the laboratory analysis of the post-excavation soils are presented in Appendix C and are summarized in the table below.

POST-EXCAVATION SOIL TESTS - BLUE RESIDUE REMEDIATION
Concentrations as shown

SAMPLE	BR1	BR2	BR3	BR4	BR5	BR6	BR7	PMC	DEC	
DEPTH	0-0.3'	0-0.3'	0-0.3'	0-0.3'	0-0.3'	0-0.3'	0-0.3'		Resid.	Comm.
Lead (mg/kg)	28.6	271	79.3	59.3	75.4	137	79.2	NA	500	1000
Mercury (mg/kg)	0.07	1.77	0.38	0.23	0.25	0.47	0.23	NA	20	610
SPLP Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.5	NA	NA
SPLP Lead (mg/L)	0.006	0.013	0.005	0.006	0.013	0.011	ND	0.15	NA	NA
SPLP Mercury (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02	NA	NA

POST-EXCAVATION SOIL TESTS - BLUE RESIDUE REMEDIATION Concentrations as shown							
SAMPLE	BR8	BR9	BR10	BR11	PMC	DEC	
DEPTH	1½'	2'	2'	2½'		Resid.	Comm.
Lead (mg/kg)	48.5	3.4	5.8	5.5	NA	500	1000
Mercury (mg/kg)	0.13	ND	0.06	0.09	NA	20	610
SPLP Chromium (mg/L)	ND	ND	ND	ND	0.5	NA	NA
SPLP Lead (mg/L)	0.006	ND	ND	ND	0.15	NA	NA
SPLP Mercury (mg/L)	ND	ND	ND	ND	0.02	NA	NA

Notes: 1. ND means not detected. NA means remediation criteria not applicable to this analysis.
2. Pollutant Mobility Criteria [PMC] and Direct Exposure Criteria [DEC] are taken from the DEP Remediation Standard Regulations [C.G.S. Section 22a-133k].

The post-excavation test data indicate that the remediation effort successfully removed soils containing the sought metals over applicable remediation criteria. Further soil removal in the area of the blue residue was not necessary.

The blue residue cleanup generated an estimated 65 tons of contaminated soils which were stockpiled on plastic and covered with plastic pending disposal arrangements.

B. Supplemental Removal of Arsenic-Containing Soils East of Garage

As was discussed previously, the soil remediation performed in August 2002 by Underground Systems at the former underground gasoline tank east of the garage appeared to have successfully removed petroleum contamination associated with the tank, but two samples of soil left in place (samples PE6 and PE7) contained arsenic at concentrations above the residential and commercial Direct Exposure Criterion of 10 mg/kg.

To address the arsenic soil contamination, on 9 July, 29 July, and 31 August 2004, soils were excavated and removed to deepen and extend the initial gasoline tank cleanup area. The supplemental remediation was performed by workers for the Town of East Haddam using a backhoe and was observed by Ned Shanahan of Shanahan Consulting.

The results of the laboratory analysis of the post-excavation soils for each of the three supplemental removal efforts east of the garage are presented in Appendix C and are summarized in the tables below. The approximate locations of the samples and the removal area are shown on Figure 8. We labeled post excavation soil samples using an additional "P" for each separate removal event (i.e. the second supplemental event used sample labels of PPE1-PPE6, the third event used sample labels of PPPE1-PPPE7, and the fourth event used labels 4PE1-4PE4). Soil excavated from the area east of the garage in the summer of 2004 was placed on plastic and covered with plastic pending arrangements for off-site disposal.

POST-EXCAVATION SOIL TESTS - 7-9-04 SOIL REMOVAL EVENT EAST OF GARAGE Concentrations as shown									
SAMPLE LOCATION DEPTH	PPE1 Bottom 8'	PPE2 Side 5'	PPE3 Bottom 8'	PPE4 Bottom 8'	PPE5 Side 6'	PE6 Side 5'	Pollutant Mobility Criteria	Direct Exposure Criteria	
								Resid.	Comm.
AVOCs (mg/kg)	ND	ND	ND	ND	ND	ND	Varies	Varies	Varies
ETPH (mg/kg)	ND	ND	ND	ND	ND	ND	2500	500	2500
Arsenic (mg/kg)	5.4	10.7	4.5	6.1	10.1	11.6	NA	10	10
Lead (mg/kg)	1.3	3.1	1.4	1.8	2.8	2.7	NA	500	1000

Notes: 1. ND means not detected. NA means remediation criteria not applicable to this analysis. AVOCs are aromatic volatile organic compounds. VOCs are volatile organic compounds.
2. Pollutant Mobility Criteria and Direct Exposure Criteria are taken from the DEP Remediation Standard Regulations [C.G.S. Section 22a-133k].
3. Test results exceeding remediation criteria have been highlighted with thick lines.

The 9 July 2004 removal effort at the gasoline tank involved the deepening of the area of sample PE7 from 3 feet to approximately 8 feet and extending the northern wall of the original excavation by approximately 4 feet. Soil was left in place under a stoop for a rear pedestrian door due to concerns that the stoop might collapse into the hole. Post excavation samples PPE2 (collected under the stoop), PPE5 (on the north wall), and PPE6 (on the east wall) exceeded the arsenic remediation criteria of 10 mg/kg and further soil removal was therefore warranted.

POST-EXCAVATION SOIL TESTS - 7-29-04 SOIL REMOVAL EVENT EAST OF GARAGE Concentrations as shown										
SAMPLE LOCATION DEPTH	PPPE1 Side 5'	PPPE2 Side 5'	PPPE3 Bottom 8'	PPPE4 Side 3'	PPPE5 Bottom 5'	PPPE6 Bottom 3½'	PPPE7 Side 3'	Pollutant Mobility Criteria	Direct Exposure Criteria	
									Resid.	Comm.
VOCs (mg/kg)	---	---	---	ND	ND	ND	ND	Varies	Varies	Varies
ETPH (mg/kg)	---	---	---	ND	ND	ND	ND	2500	500	2500
PCBs (mg/kg)	---	---	---	ND	ND	ND	ND	NA	1	10
Arsenic (mg/kg)	13.9	11.0	4.3	8.0	10.4	8.4	17.0	NA	10	10
Lead (mg/kg)	---	---	---	244	3.0	12	5.0	NA	500	1000
SPLP Lead (mg/L)	---	---	---	ND	ND	ND	ND	0.15	NA	NA

Notes: 1. ND means not detected. — means sample not tested for thisparameter. NA means remediation criteria not applicable to this analysis. AVOCs are aromatic volatile organic compounds. VOCs are volatile organic compounds.
2. Pollutant Mobility Criteria and Direct Exposure Criteria are taken from the DEP Remediation Standard Regulations [C.G.S. Section 22a-133k].
3. Test results exceeding remediation criteria have been highlighted with thick lines.

During the second supplemental soil cleanup event on 29 July 2004, the excavation was extended to the north and east to depths ranging from approximately 3½ to 5 feet. In addition, soil was removed from under the door stoop (the stoop was found to be connected to the building and did not fall into the hole).

During the work, a concrete pad for a reported former aboveground tank (reportedly a heating oil tank) was observed against the eastern wall of the garage. A limited quantity of oily soils were seen in the area of the pad, apparently due to surface spills. The oily soils were removed and post excavation soil samples from the general area of the pad (samples PPPE4-PPPE7) were tested for arsenic, ETPH, VOCs, PCBs, lead, and SPLP lead due to concerns that a fuel or waste oil spill might have occurred. The remaining post excavation soil samples (PPPE1-PPPE3) were tested for arsenic. Each of the post excavation soil samples collected at a depth of 5 feet (including sidewall samples PPPE1, PPPE2, and PPPE7 and bottom sample PPPE5 contained arsenic above the 10 mg/kg remediation goal, necessitating further soil removal.

POST-EXCAVATION SOIL TESTS - 8-31-04 SOIL REMOVAL EVENT EAST OF GARAGE
Concentrations as shown

SAMPLE LOCATION DEPTH	4PE1 Side 6'	4PE2 Side 5'	4PE3 Bottom 6½'	4PE4 Side 5'	Pollutant Mobility Criteria	Direct Exposure Criteria	
						Resid.	Comm.
Arsenic (mg/kg)	4.9	9.5	4.8	24.2	NA	10	10
SPLP Arsenic (mg/L)	---	---	---	ND	0.5	NA	NA

Notes: 1. ND means not detected. — means sample not testedor this parameter. NA means remediation criteria not applicable to this analysis. AVOCs are aromatic volatile organic compounds. VOCs are volatile organic compounds.
2. Pollutant Mobility Criteria and Direct Exposure Criteria are taken from the DEP Remediation Standard Regulations [C.G.S. Section 22a-133k].
3. Test results exceeding remediation criteria have been highlighted with thick lines.

The final soil removal event was performed on 31 August 2004 and involved extending the hole to the north and east and deepening the hole. During our excavation work, we noted that soils in the area exhibited three distinct layers, as follows: (1) an upper layer of silty subsoil between the ground surface and a depth of approximately 3 to 3½ feet, (2) a middle layer of sand and gravel between the base of the silty subsoil and a depth ranging from approximately 6 to 8½ feet, and (3) a base layer of blonde sand starting at a depth of approximately 6 to 8½ feet. Our tests of bottom samples had consistently shown that the blonde sand layer met arsenic remediation criteria. The blonde sand layer had been observed at a depth of 8 to 8 ½ feet in the southern part of the cleanup area where soil removal had begun in August 2002, but was observed at a considerably shallower depth of 6 or 6½ feet on the northern end of the hole where soil removal had occurred more recently.

After the 31 August removal effort, four post excavation soil samples were collected for analysis for arsenic. Sample 4PE4 (on the eastern side wall) contained arsenic at 24.2 mg/kg, the highest arsenic concentration detected in the area to that time. The remaining three post excavation samples met the 10 mg/kg remediation criterion. Sample 4PE4 was analyzed for SPLP arsenic to evaluate whether the soil posed a significant threat of ground water contamination. SPLP arsenic was not detected in the 4PE4 sample. The eastern wall of the hole was located a few feet west of a reported underground sanitary sewer line and further digging in the area of 4PE4 would have threatened the integrity of the line. We elected to halt the soil removal effort and to evaluate the extent of the arsenic contamination by collecting soil samples from borings (as is discussed below).

In summary, contaminated soils were removed from the former gasoline tank area east of the garage in four separate events between August 2002 and August 2004. Post excavation soil samples marking the final limits of the hole (samples 4PE1-4PE4, PPPE2, PPPE3, PPE1, PPE3, PPP4, PE8-PE12 on Figure 8) met remediation criteria with the exception of sample 4PE4 which contained arsenic at 24.2 mg/kg. Waste

soils generated during the three removal events in the summer of 2004 (estimated at roughly 180 tons) were stockpiled on plastic and covered with plastic.

C. Disposal of Waste Soils Generated During Supplemental Soil Removal Effort

On 29 July 2004, Ned Shanahan collected a composite of the waste soil generated during the excavation of the blue residue waste pile (soil sample W1) and a separate composite sample of waste soil excavated in the first two supplemental soil removal events in the area east of the garage (sample W2). The two soil samples were tested for VOCs, 8 RCRA metals by mass analysis and TCLP methods, PCBs, semivolatile organic compounds by EPA Method 8270, ETPH, and reactive cyanide and sulfide. The results of the waste soil laboratory analyses are presented in Appendix C. The soils were found to be non-hazardous under RCRA regulations and were found to be acceptable for disposal at the Cottage Street landfill in Springfield, Massachusetts operated by Waste Management, Inc.

From 22 November through 7 December 2004, the waste soils generated during the blue residue cleanup and the three supplemental cleanup events at the gasoline tank area east of the garage (totaling 245.96 tons) were transported to the Cottage Street landfill for disposal. Material Shipping Record & Logs, weigh tickets, and invoices from the November/December disposal are included in Appendix D. One of the weigh tickets (No. 19868, 21.73 tons, dated 11/23/04) incorrectly shows the source of one truckload of soil as Adrieans Landing (an unrelated remediation effort in Hartford, Connecticut) due to a clerical error at Waste Management. However, the Material Shipping Record & Log and the invoice both demonstrate that the 21.73-ton shipment was part of the East Haddam cleanup. Our attempts to obtain a corrected Ticket No. 19868 from Waste Management were not unsuccessful.

D. Additional Explorations and Testing to Evaluate Remnant Arsenic Contamination

On 5 April 2005, nine borings (AS1-AS9) were drilled by Associated Borings, Co., Inc. using a hollow-stem auger rig to evaluate the remnant arsenic contamination on the eastern wall of the soil cleanup area east of the garage. The drilling was observed by Ned Shanahan of Shanahan Consulting. The approximate locations of the borings are shown on Figure 4. Driller's logs for the borings are presented in Appendix F.

The arsenic contamination was marked by sidewall sample 4PE4 collected at a depth of 5 feet below ground surface. Sample 4PE4 contained 24.2 mg/kg of arsenic, but SPLP arsenic was not detected in the sample.

The following table summarizes the soil samples collected from the nine borings.

SOIL SAMPLES FROM BORINGS AS1-AS9					
SAMPLE	DEPTH (FT.)	DESCRIPTION	SAMPLE	DEPTH (FT.)	DESCRIPTION
AS1S1	1-3	silty soil	AS6S1	1-3	silty soil
AS1S2	3-5	sand & gravel	AS6S2	3-5	sand & gravel
AS1S3	5-6	sand & gravel, blonde sand at 6'	AS6S3	5-6	sand & gravel, blonde sand at 6'
AS2S1	1-3	silty soil	AS7S1	1-2½	silty soil
AS2S2	3-5	sand & gravel	AS7S2	3-5	sand & gravel
AS2S3	5-6	sand & gravel, sand at 6'	AS7S3	5-6	sand & gravel, blonde sand at 6'
AS3S1	1-3	silty soil	AS8S1	1-3	silty soil
AS3S2	3-5	sand & gravel	AS8S2	3-5	sand & gravel
AS3S3	5-6½	sand & gravel, blonde sand at 6½'±	AS8S3	5-6	sand & gravel, blonde sand at 6'
AS4S1	1-3	silty soil	AS9S1	1-3	silty soil
AS4S2	3-5	sand & gravel	AS9S2	3-5	no recovery, no sand & gravel evident
AS4S3	5-6½	sand & gravel, blonde sand at 6½'±	AS9S3	5-7	blonde sand
AS5S1	1-3	silty soil, cinders			
AS5S2	3-5	sand & gravel			
AS5S3	5-6½	sand & gravel, blonde sand at 6½'±			

Nineteen soil samples from the borings were submitted to the laboratory for analysis for arsenic. The results of the laboratory tests are presented in Appendix H and are summarized in the tables below.

SOIL TEST DATA - ARSENIC EVALUATION
Concentrations as shown

SAMPLE	AS1S1	AS1S2	AS1S3	AS2S1	AS2S3	AS3S1	AS3S2	AS3S3	PMC	DEC	
DEPTH	1-3'	3-5'	5-6'	1-3'	5-6'	1-3'	3-5'	5-6½'		Res.	Com.
Arsenic (mg/kg)	8.3	17.9	24.6	5.8	14.1	2.3	8.2	8.1	NA	10	10

SAMPLE	AS4S1	AS4S3	A5S1	AS5S3	AS6S1	AS6S3	AS7S1	AS7S3	PMC	DEC	
DEPTH	1-3'	5-6½'	1-3'	5-6½'	1-3'	5-6'	1-2½'	5-6'		Res.	Com.
Arsenic (mg/kg)	2.6	8.2	ND	8.5	8.6	5.5	6.9	8.1	NA	10	10

SAMPLE	AS8S1	AS8S3	AS9S1	PMC	DEC	
DEPTH	1-3'	5-6'	1-3'		Res.	Com.
Arsenic (mg/kg)	8.5	6.3	6.6	NA	10	10

Notes: 1. ND means not detected. —means sample not tested for this parameter. NA means remediation criteria not applicable to this analysis.
2. Pollutant Mobility Criteria and Direct Exposure Criteria are taken from the DEP Remediation Standard Regulations [C.G.S. Section 22a-133k].
3. Test results exceeding remediation criteria have been highlighted with thick lines.

The data collected during the arsenic evaluation revealed that the arsenic soil contamination was limited to two borings near the eastern edge of the cleanup excavation (AS1, AS2). With the exception of soil samples collected from AS1 and AS2, arsenic concentrations met remediation criteria. At AS1 and AS2, elevated concentrations of arsenic were found in the middle sand and gravel layer, observed at a depth interval of approximately 3 to 6 feet below ground surface. Tests of the upper silty soil layer did not detect arsenic exceedances and several previous tests of the lower blonde sand layer (during our prior cleanup efforts) had not detected arsenic over the remediation criterion. The source of the contamination is not known, but it does not appear to be of natural origin given its localized distribution.

On Figure 8, we have shown an approximate area where remnant arsenic contamination is suspected. The contamination zone covers an area of approximately 500 square feet over a depth interval of 3 to 6 feet (the quantity of remnant contaminated soils is estimated at approximately 100 tons).

The highest concentration of arsenic detected in the boring program was 24.6 mg/kg in sample AS1S3, collected adjacent to the eastern edge of the soil removal area. A sidewall sample collected in the vicinity of AS1 after the soil cleanup (sample 4PE4) contained arsenic at 24.2 mg/kg, showing good agreement with the data from the boring program. SPLP arsenic was not detected in sample 4PE4 suggesting that the arsenic in the soils does not pose a significant ground water contamination threat. Given that the arsenic-containing soils are below a depth of 3 feet, direct exposure with the soils is unlikely. An underground sanitary sewer line is located within the area of remnant contamination, which would complicate efforts to remove the contaminated soils.

IX. CONCLUSIONS AND RECOMMENDATIONS

A. Likelihood of Subsurface Contamination on Site

The site consists of adjoining properties at 1 Main Street and 7 Main Street in the center of East haddam. The property at 7 Main Street is currently occupied by the East Haddam town hall and was formerly occupied by a bank, a lumber company, and a residence. The 1 Main Street property includes the River House (town offices), a generator building used by the Connecticut Department of Transportation in connection with their operation of a nearby drawbridge over the Connecticut River, and a largely vacant garage last used by the Town of East Haddam department of public works. The generator building is located on a perpetual easement granted to the state by the town. Historically, the property at 1 Main Street was used for residential purposes and as a bridge maintenance operation by the State of Connecticut. The site appears to be an "establishment" under the Connecticut Transfer Act (CGS 22a-134 through 134e).

Work performed on site for this assessment and remediation effort included: (1) the removal of three underground tanks, including the excavation and disposal of approximately 121 tons of petroleum-contaminated soils associated with two of the tanks; (2) the drilling of 39 soil borings; (3) the installation of six overburden monitor wells (supplementing two existing bedrock monitor wells and one existing overburden monitor well); (4) the collection and test screening of 79 soil samples; (5) the measurement of VOCs in soil gas at 19 locations under the garage floor; (6) the laboratory testing of 66 soil samples from the exploration program and eight ground water samples; and (7) the removal of approximately 245 additional tons of arsenic-contaminated soils east of the garage and metal-contaminated soils behind town hall in a supplemental remediation effort.

1. Soil Quality

We observed shallow soils containing a blue residue with elevated levels of mercury and lead in an area behind the town hall at 7 Main Street. The contaminated soils were successfully excavated and removed for off-site disposal and samples of soil remaining in place after the soil removal met applicable remediation criteria established by the Connecticut Department of Environmental protection [DEP] in the Remediation Standard Regulations [RSRs].

An underground heating oil tank and an underground gasoline tank were removed from an area adjacent to the eastern wall of the garage building.

Contaminated soils associated with the heating oil tank were removed and taken off site for disposal. Samples of soil remaining in place in the heating oil tank remediation area met applicable remediation criteria in the RSRs.

Several iterations of soil removal were performed in the area of the gasoline tank, beginning in August 2002 and ending in August 2004. The soil cleanup at the gasoline tank successfully removed soils containing petroleum contaminants, but arsenic remained on the eastern wall of the soil cleanup area after the final removal event. Borings were drilled to further evaluate the remnant arsenic contamination and our tests indicated that an area covering roughly 500 square feet over a depth interval of approximately 3 to 6 feet below the ground surface may contain arsenic over the 10 mg/kg remediation criterion. The remnant arsenic does not appear to pose a significant risk of ground water contamination given the absence of leachable arsenic in our analysis of one of the most polluted samples. An underground sanitary sewer line is located within the zone of suspected contamination, complicating any attempt to remove the soil at present.

We did not detect exceedances of soil remediation criteria at other areas of concern evaluated on the property. At two of these locations, we detected evidence of minor spills, as is discussed below:

1. We detected an apparent minor spill of petroleum product under the garage floor near a floor drain, but the highest concentration of ETPH detected in soils from the area was 495 mg/kg, which is below the strictest remediation criterion of 500 mg/kg. At the floor drain, we drilled three borings (TG14, TG22, TG23) and tested a total of six soil samples. Only one additional soil sample contained ETPH (at 59 mg/kg). Significantly, moist or wet soil samples collected at the water table at the three borings did not contain ETPH, suggesting ground water had not been impacted. We did not detect PCBs, VOCs, or significant concentrations of metals in soils from the area. We do not believe that further evaluation of soils in the apparent spill area is warranted.

2. We noted a petroleum odor in a soil sample collected in a pavement patch marking the location of a former underground gasoline tank and pump outside the southwestern corner of the garage. However, laboratory analysis of the odorous sample and of five other soil samples from the area did not reveal the presence of aromatic VOCs. Lead and SPLP lead concentrations in the six soil samples did not exceed remediation criteria. Further evaluation of soils in the former southwestern tank area does not appear to be warranted.

2. Ground Water Quality

Ground water sampling points on site consist of six overburden monitor wells installed during our assessment (W1-W6), one overburden monitor well (MW3) and two bedrock monitor wells (MW1, MW2) installed by a previous investigator, and the bedrock supply well. In January 2004, we sampled the supply well and monitor wells MW1-MW3 and W1-W4. Monitor wells W5and W6 were installed after the January 2004 sampling event and have not been tested.

Ground water on site is classified "GB" (degraded), but our tests indicate that site ground water exhibits generally good quality.

In particular, we did not detect VOCs or ETPH in ground water samples collected at the five sampled overburden wells, suggesting that ground water has not been impacted by petroleum products used on site. We did not detect ETPH in the two bedrock wells, suggesting that the detection of TPH in these wells in August 2000 may have been due to natural organic materials.

Chloroform (a VOC) was detected at low concentrations in bedrock monitor well MW2 (at 0.6 ug/L) and in the supply well sample (at 1.0 ug/L). The source(s) of the chloroform are not known. Chloroform is a commercial solvent and a byproduct of the chlorination of public water supplies and may be introduced into water samples during sample collection or laboratory analysis. The absence of chloroform in the overburden well samples suggests that chloroform has not been spilled on site.

Elevated levels of the metals arsenic, chromium, and lead were detected in unfiltered samples of ground water collected from the two bedrock monitor wells (MW1, MW2) in August 2000. Our recent tests of unfiltered samples from the bedrock monitor wells and from four newly-installed overburden wells (W1-W4) for these three metals detected lead above Ground Water Protection Criteria [GWPC] in five of the six wells. Arsenic was detected at concentrations below GWPC and chromium was not detected in the recently-collected unfiltered well samples. We also tested filtered samples from the six monitor wells for dissolved arsenic, chromium, and lead and detected no exceedances of remediation criteria. Given the silty character of the unfiltered samples, we suspect that the total metal detections are due to the presence of sediment in the samples and are not associated with ground water contamination. Low flow sampling (which reduces the sediment content of samples) may be appropriate to further evaluate whether the metal detections are due to silt in unfiltered samples.

Water samples collected from the supply well in August 2000 and January 2004 met drinking water limits for the parameters tested.

3. Evaluation of Areas of Concern

The table below summarizes our assessment of potential areas of concern identified on the site.

AREAS OF CONCERN 1 & 7 Main Street, East Haddam	
CONCERN	EVALUATION
Blue Residue on Ground Surface Behind Town Hall	Analysis of soil containing the blue residue revealed elevated concentrations of mercury and lead. A soil remediation effort was completed in July 2004 and samples of soil left in place after cleanup met soil remediation criteria.
Former Underground Gasoline Tank Behind Town Hall	The tank was reportedly removed in January 2000. Tests of soil samples from the reported area of the tank did not reveal evidence of a release. A ground water sample collected from monitor well MW3 in the area of the tank did not contain ETPH or VOCs.
Former Underground Gasoline Tank and Pump Outside Eastern Wall of Garage	The former tank and petroleum-contaminated soils were removed in 2002. A supplemental soil remediation effort was performed on three separate dates in the summer of 2004 in an unsuccessful attempt to remove the arsenic soil contamination. Post-cleanup explorations indicate that arsenic contamination remains in an area estimated at 500 square feet over a depth interval of approximately 3 to 6 feet below the ground surface.
Former Underground Heating Oil Tank Outside Eastern Wall of Garage	The former tank and associated contaminated soils were removed in 2002. Post-excavation soil samples met remediation criteria. A ground water sample collected from monitor well W4 on the edge of the cleanup area did not contain ETPH or VOCs.
Unknown Pump on 1932 Map in Southeastern Corner of Site	Contamination was not detected in soil samples collected in boring TG5 drilled to the water table in the area of the pump.
Possible Former Underground Heating Oil Tank Between Garage and Former Storage Building Behind Town Hall	ETPH was not detected in soil samples collected at the water table in two borings drilled in the area where a vent pipe terminated under ground.
Inactive Septic System and Well MW1 Area	Six borings drilled to the apparent bedrock surface did not encounter evidence of contamination. Laboratory tests of seven soil samples for ETPH and two soil samples for VOCs did not detect contaminants. Ground water from MW1 did not contain ETPH or VOCs.
Former Underground Gasoline Tank and Former Aboveground Gasoline Tank West of Garage	The underground gasoline tank was removed in 2002. The aboveground gasoline tank was reportedly removed in mid 1990s. Tests of soil samples collected from the underground tank grave did not detect evidence of a spill.
Former Aboveground Heating Oil Tank Outside Eastern Wall of Garage	During soil remediation of a nearby underground gasoline tank, soil in the area of the former aboveground tank was excavated and removed, including a limited area of oily soils apparently associated with the former aboveground tank. Post excavation soil samples in the area did not contain ETPH, VOCs, PCBs, or significant concentrations of lead.
Pavement Patch for Former Underground Gasoline Tank and Pump Outside Southwestern Corner of Garage	Although a petroleum odor was noted in one soil sample collected from area, the testing of six soil samples (including the odorous sample) did not detect aromatic VOCs or concentrations of lead over remediation criteria. The testing of ground water from an overburden monitor well [W2] and a bedrock monitor well [MW2] in or adjacent to the pavement patch did not detect VOCs or ETPH.
Underground Diesel Fuel Tank at DOT Generator Building	The underground tank is located on a land easement granted to the State of Connecticut and we did not directly evaluate the tank for leakage.

AREAS OF CONCERN 1 & 7 Main Street, East Haddam	
CONCERN	EVALUATION
Underground Diesel Fuel Tank at DOT Generator Building	The underground tank is located on a land easement granted to the State of Connecticut and we did not directly evaluate the tank for leakage.
Floor Drainage Systems in Garage	Observations and soil testing at an apparent floor drainage dry well outside the eastern wall of the garage revealed no evidence of contamination from the southern floor drains. We found no evidence of contamination at the inactive septic system, a possible subsurface discharge location for other floor drains in the garage. No contamination was detected in a soil sample collected in a paved drainage ditch that may have received floor drainage discharges. A minor petroleum spill was detected under the garage floor near one of the central floor drains, but no contaminants were detected in soils above remediation criteria.
Areas Under Garage Floor	The area under the garage floor was evaluated using a soil gas survey and the drilling of seven borings through the floor slab. Soil samples collected under the floor did not contain contaminants above remediation criteria. An apparent minor petroleum spill was detected under the floor near one floor drain (see above discussion of floor drainage systems).

B. Ground Water Classification and Use

Our measurements of water table elevations indicate that overburden ground water on site generally flows toward the south or southeast.

Although local ground water is classified "GB" (degraded), the site and nearby properties use individual wells for supply purposes. We did not identify public drinking water supply wells within one mile of the site. The site is not included in Aquifer Protection Areas mapped by the DEP.

C. Future Actions

Possible future actions that may be performed to address lingering environmental issues are discussed below along with rough estimates of the costs of these actions. The cost estimates should be used with caution and should be revised as additional data are collected.

1. Address remnant arsenic-contaminated soils east of garage.

Estimated cost: **$10,000 to $15,000 to excavate and remove estimated 100 tons of soil (including post excavation soil testing and consulting fees).**

No cost to cover soils with a new building if feasible.

The arsenic-contaminated soils appear to be at least 3 feet below the ground surface and therefore appear to pose no immediate threat of direct exposure. Our laboratory tests suggest that the contaminated soils do not pose a significant risk of ground water contamination. Given these data, the excavation and removal of the buried soils does not appear to be necessary at this time, especially given that an underground sanitary sewer line is located in the contaminated area.

However, future plans for the redevelopment of the site should consider whether the contaminated soils will be covered by a new building (thereby rendering them inaccessible and environmentally isolated) or whether the soils should be excavated and removed during construction work.

2. Monitor ground water.

Estimated costs:

One round of tests in near future - $5000

Possible later testing program:

One year of compliance monitoring - $15,000 to $20,000
Post remediation monitoring (possibly for 1-3 years) - $5000 per year

The future transfer of the site under the Connecticut Transfer Act would likely necessitate the monitoring of site ground water for several years. Transfer Act ground water monitoring would likely include the collection of quarterly samples for one year (compliance monitoring), following the collection of semiannual samples for a period that might range from one to three years (post remediation monitoring).

However, we do not believe that the initiation of a full monitoring program prior to a transfer is appropriate. For instance, if the monitoring were started now, then the any future excavation and removal of the remnant arsenic-contaminated soils would likely trigger the need to re-start the monitoring program thereby increasing costs.

At this time, we recommend that one round of ground water samples be collected from the monitor well network for laboratory testing to provide more data concerning ground water conditions. Wells W5 and W6, which have not yet been sampled, should be included in the round of tests. The sampling event should include low flow sampling to evaluate previous detections of metals in ground water. All wells should be surveyed to update the ground water flow map.

After future plans for the site have been finalized and the remnant arsenic-contaminated soils have been addressed, then a more complete ground water testing program may be necessary.

3. Evaluation of Underground Diesel Fuel Tank on State Easement

We do not believe that it is appropriate for the Town of East Haddam to undertake evaluations of the integrity of the tank used the State of Connecticut. If the condition of the tank needs to be determined at the time of a future site transfer, then the state should be requested to provide the necessary data. If a leak from the tank is detected, then the state should be requested to perform remedial actions.

X. LIMITATIONS

The conclusions provided in this report are based on the scope of work conducted and the sources of information used in the course of this investigation. If additional pertinent information becomes available, it should be provided to Shanahan Consulting so that we may alter this report as necessary.

The report was prepared to be used exclusively in the assessment of subsurface contamination on site in the areas where explorations were performed and should not be used for any other purpose.

We cannot guarantee that the scope of work undertaken for this assessment will satisfy the Connecticut Department of Environmental Protection.

The work was undertaken in accordance with generally accepted environmental consulting practices. No other warranty, express or implied, is made.

SOURCES OF INFORMATION

Connecticut Department of Environmental Protection, "Connecticut Aquifer Protection Areas", September 2000.

Connecticut Department of Environmental Protection, "Community Water Systems in Connecticut, A 1984 Inventory", 1986.

Connecticut Department of Environmental Protection, "Remediation Standard Regulations", Section 22a-133k, 30 January 1996.

Connecticut Department of Environmental Protection, "Water Quality Standards", 1996.

Land-Tech Consultants, Inc., Draft Version of "Environmental Site Assessment of 1 & 7 Main Street, East Haddam, Connecticut", date 12-12-00, report provided by Mike Bartos of Land-Tech Consultants.

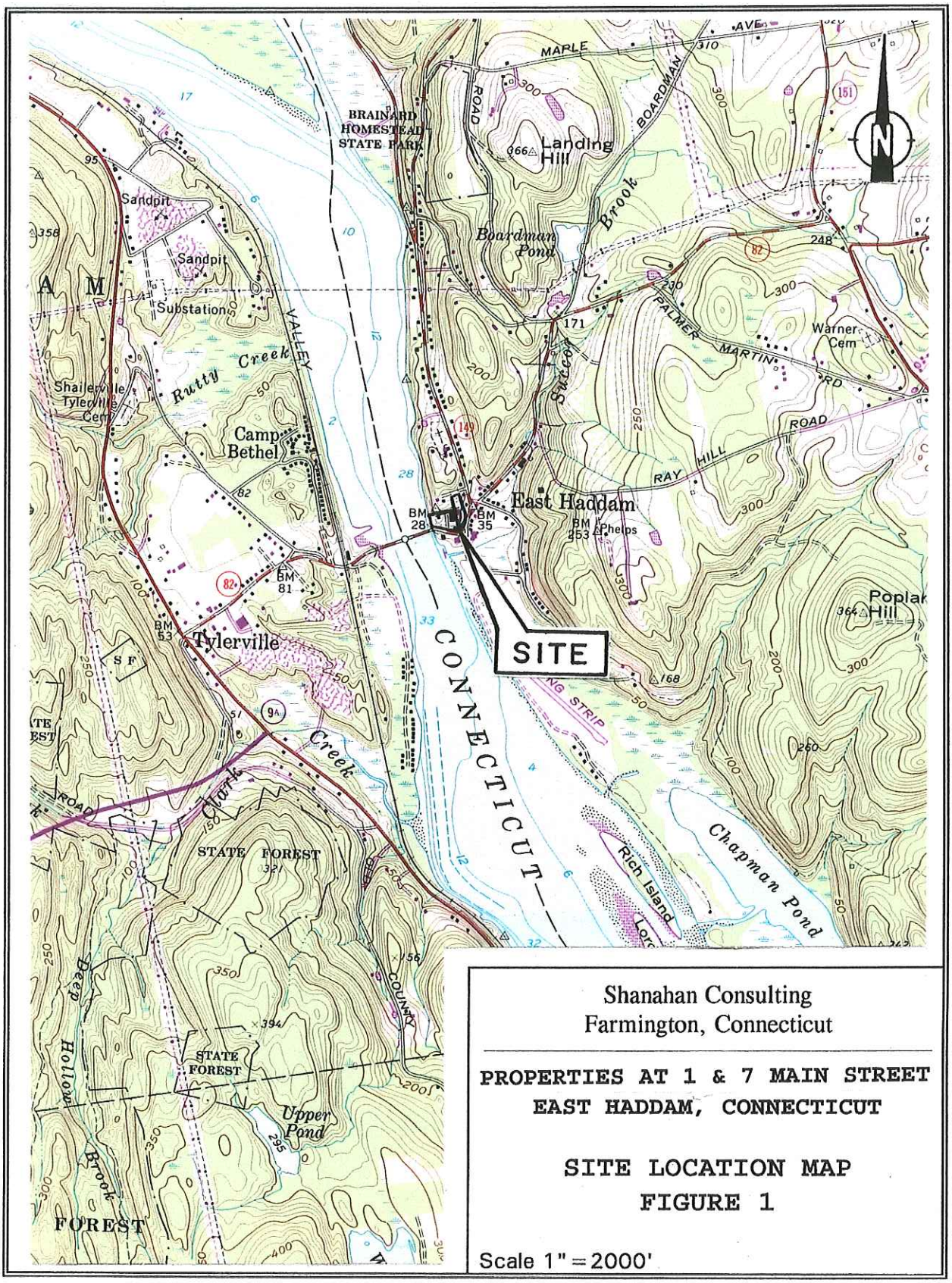
"Property Survey for Town of East Haddam in East Haddam, Connecticut", site plan prepared by Richard Ziobron, dated 3-14-88, East Haddam Town Clerk Map No. 3174.

"Topographic Map. Land Surrounding East Haddam Town Hall, East Haddam, Connecticut", prepared by URS Greiner Woodward Clyde, dated January 2000, provided by Town of East Haddam.

Shanahan Consulting, "Phase I Environmental Site Assessment of 1 & 7 Main Street, East Haddam, Connecticut", March 2002.

FIGURES

FIGURES



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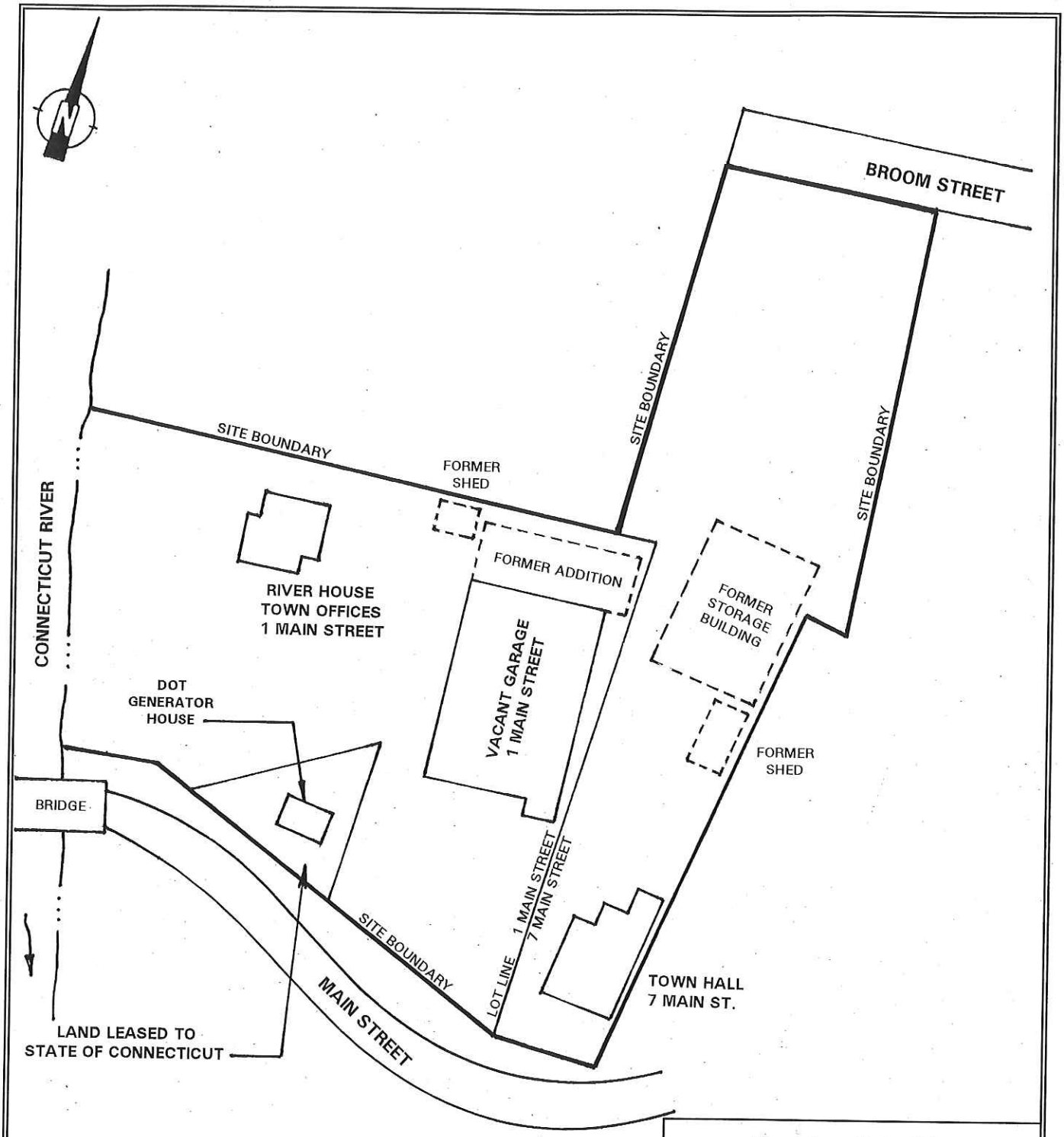
PROPERTIES AT 1 & 7 MAIN STREET
EAST HADDAM, CONNECTICUT

SITE LOCATION MAP
FIGURE 1

Scale 1" = 2000'



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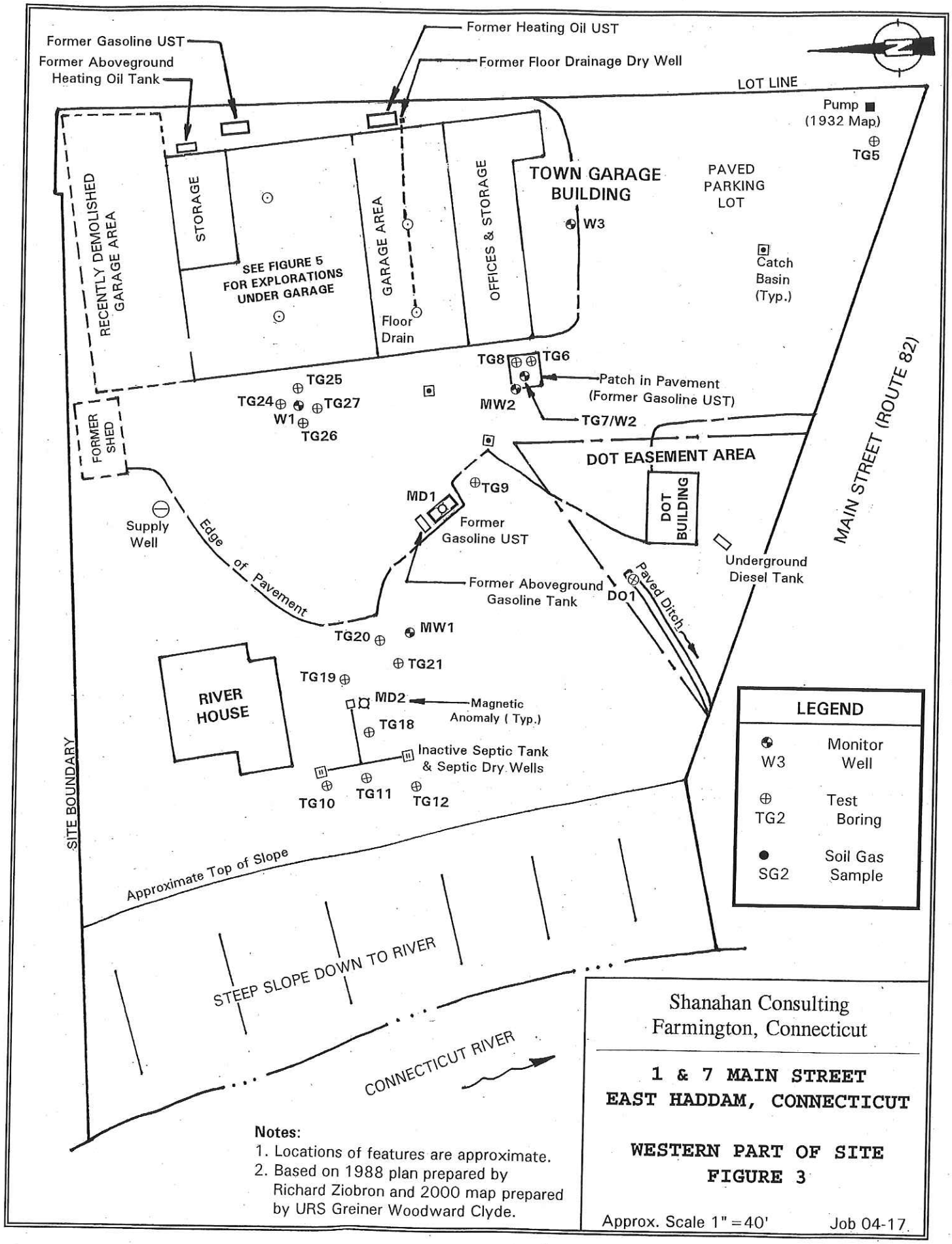
1 & 7 MAIN STREET
EAST HADDAM, CONNECTICUT

SITE PLAN
FIGURE 2

Approx. Scale 1" = 80' Job 04-17

Notes: 1. Locations of features are approximate.
2. Based on 1988 plan by Richard Ziobron and 2000 map By URS Greiner Woodward Clyde.



Notes:

1. Locations of features are approximate.
2. Based on 1988 plan prepared by Richard Ziobron and 2000 map prepared by URS Greiner Woodward Clyde.

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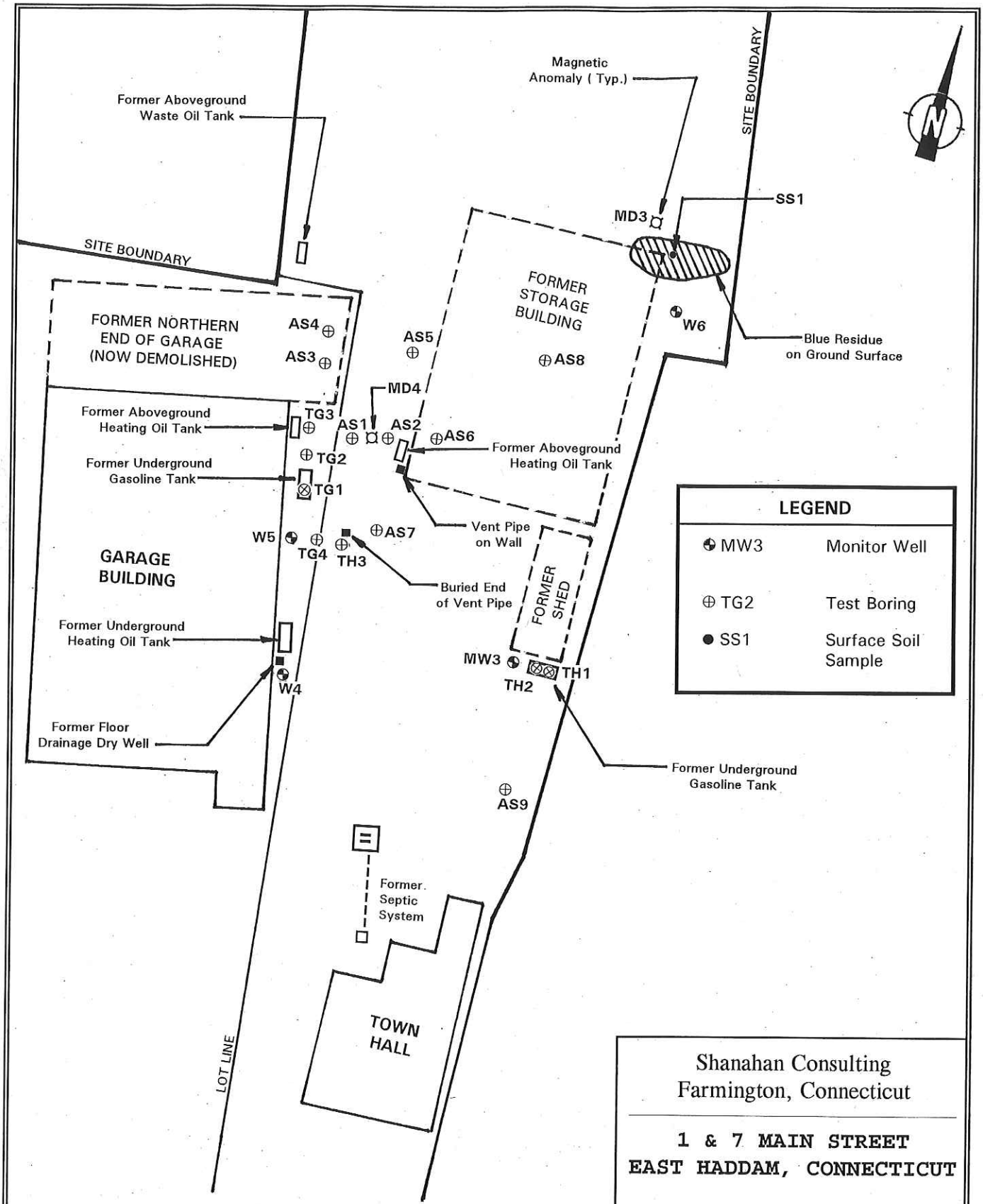
1 & 7 MAIN STREET
EAST HADDAM, CONNECTICUT

WESTERN PART OF SITE
FIGURE 3

Approx. Scale 1" = 40' Job 04-17



Notes: 1. Locations of features are approximate.
2. Based on 1988 plan by Richard Ziobron and 2000 map By URS Greiner Woodward Clyde.

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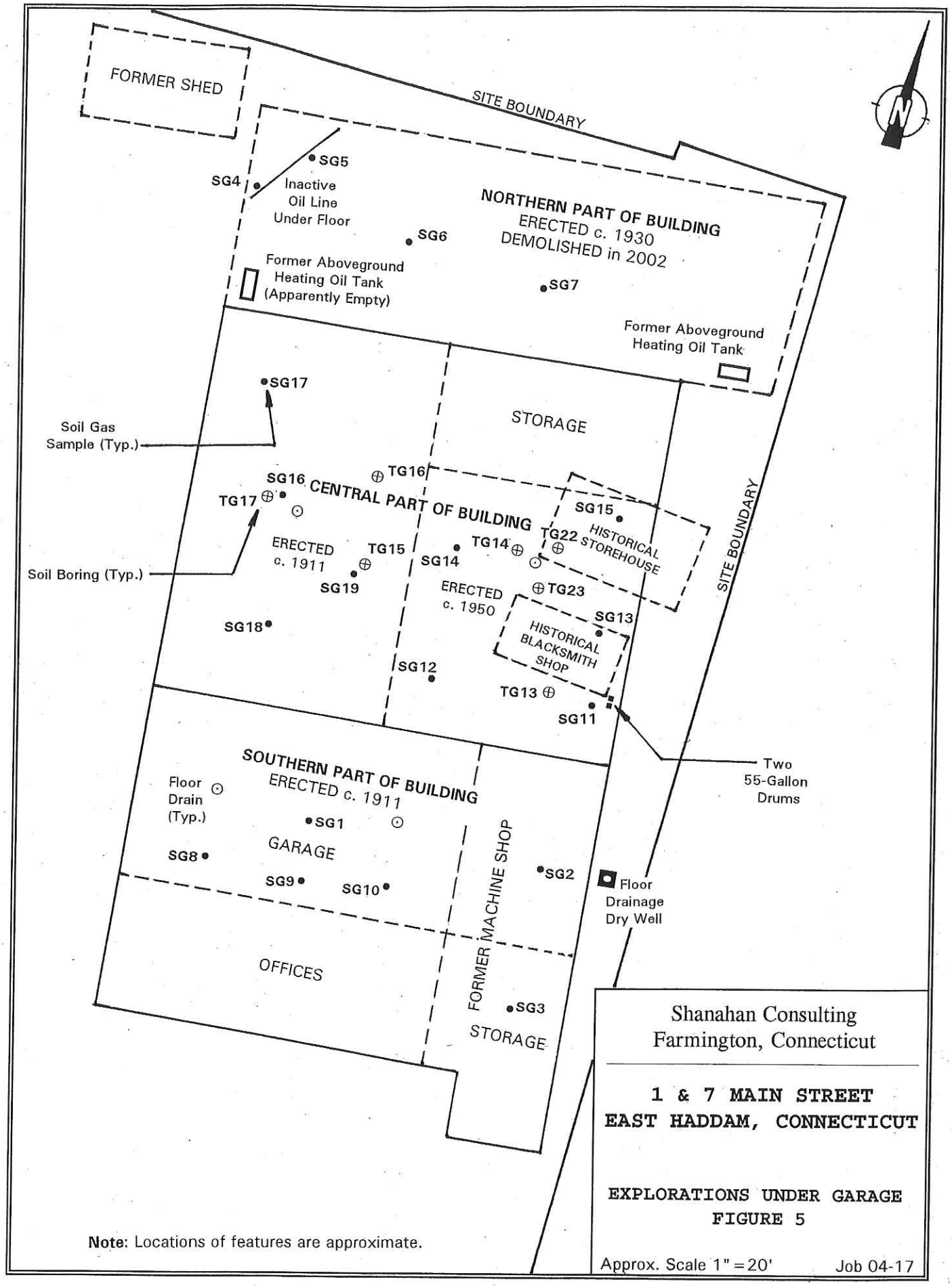
1 & 7 MAIN STREET
EAST HADDAM, CONNECTICUT

EASTERN PART OF SITE
FIGURE 4

Approx. Scale 1" = 40' Job 04-17



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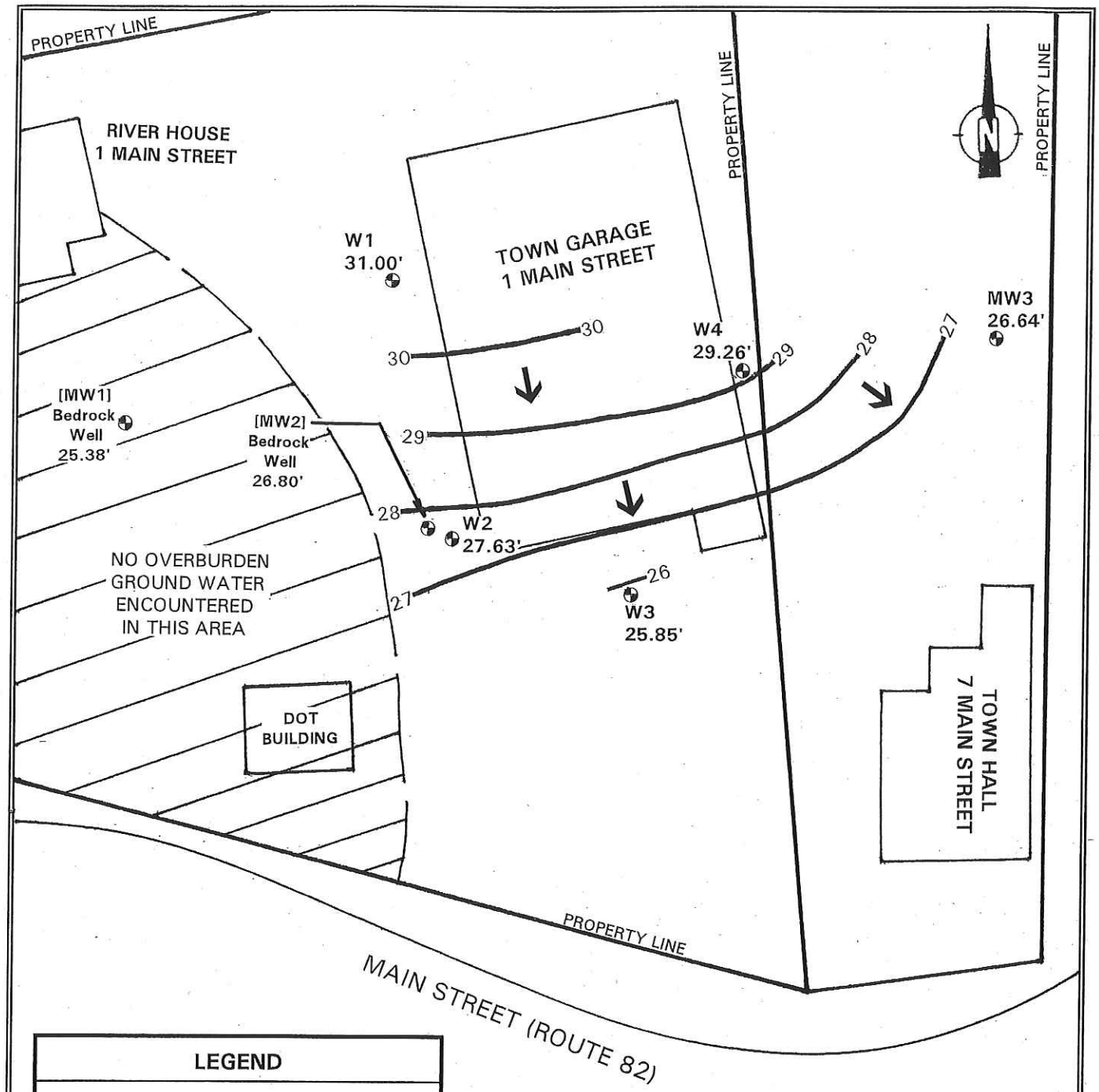
1 & 7 MAIN STREET
EAST HADDAM, CONNECTICUT

EXPLORATIONS UNDER GARAGE
FIGURE 5

Approx. Scale 1" = 20' Job 04-17

Note: Locations of features are approximate.



LEGEND

W1 ⊕ 31.00'	Monitor Well with ground water elevation in feet
↖	Approximate overburden ground water flow direction

Notes:
1. Locations of features are approximate.
2. Ground water elevations measured on 1-2-04. Elevations refer to arbitrary datum

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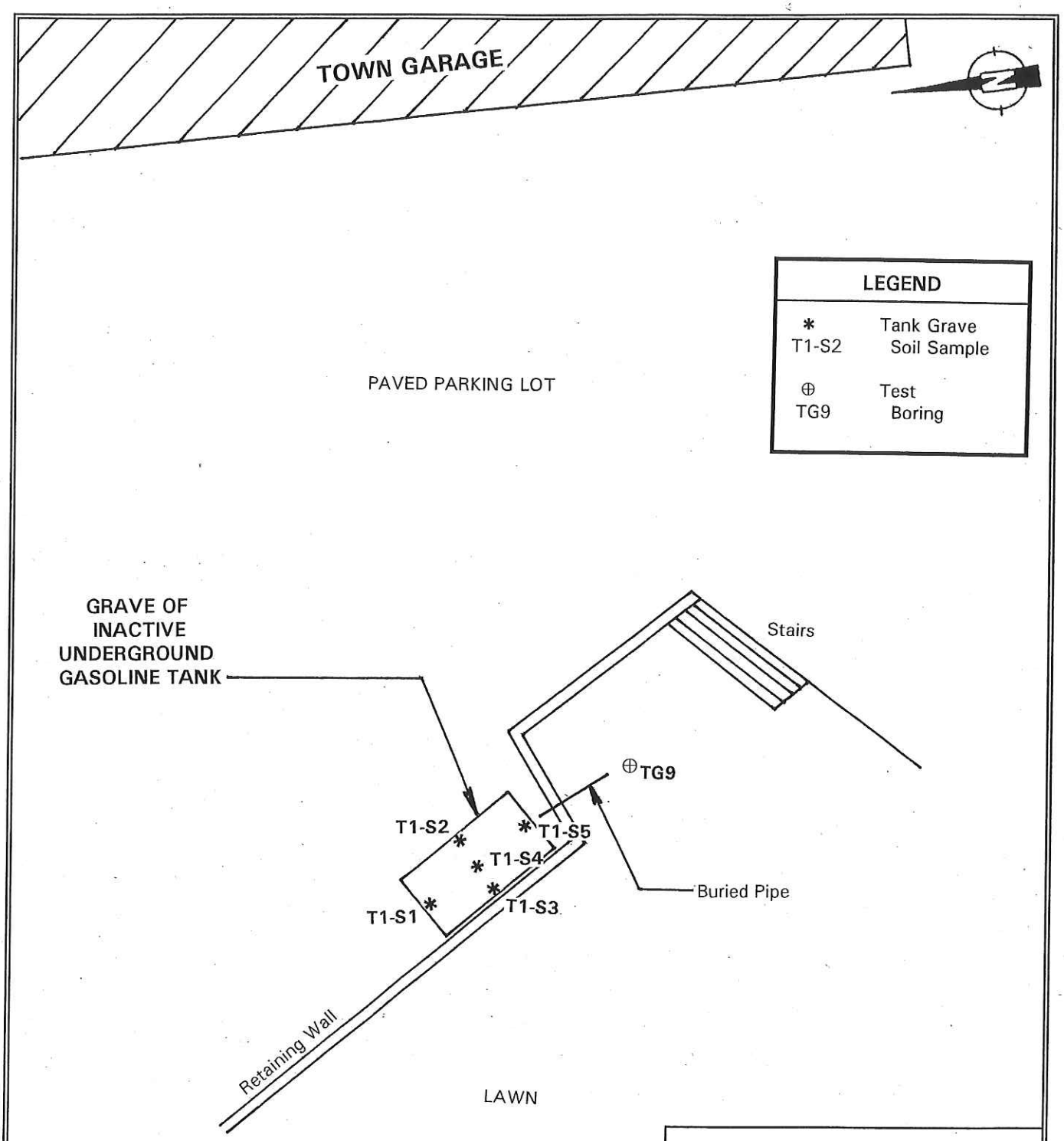
1 & 7 MAIN STREET
EAST HADDAM, CONNECTICUT

OVERBURDEN GROUND WATER FLOW
FIGURE 6

Approx. Scale 1" = 40' Job 04-17



Note: Locations of features are approximate.

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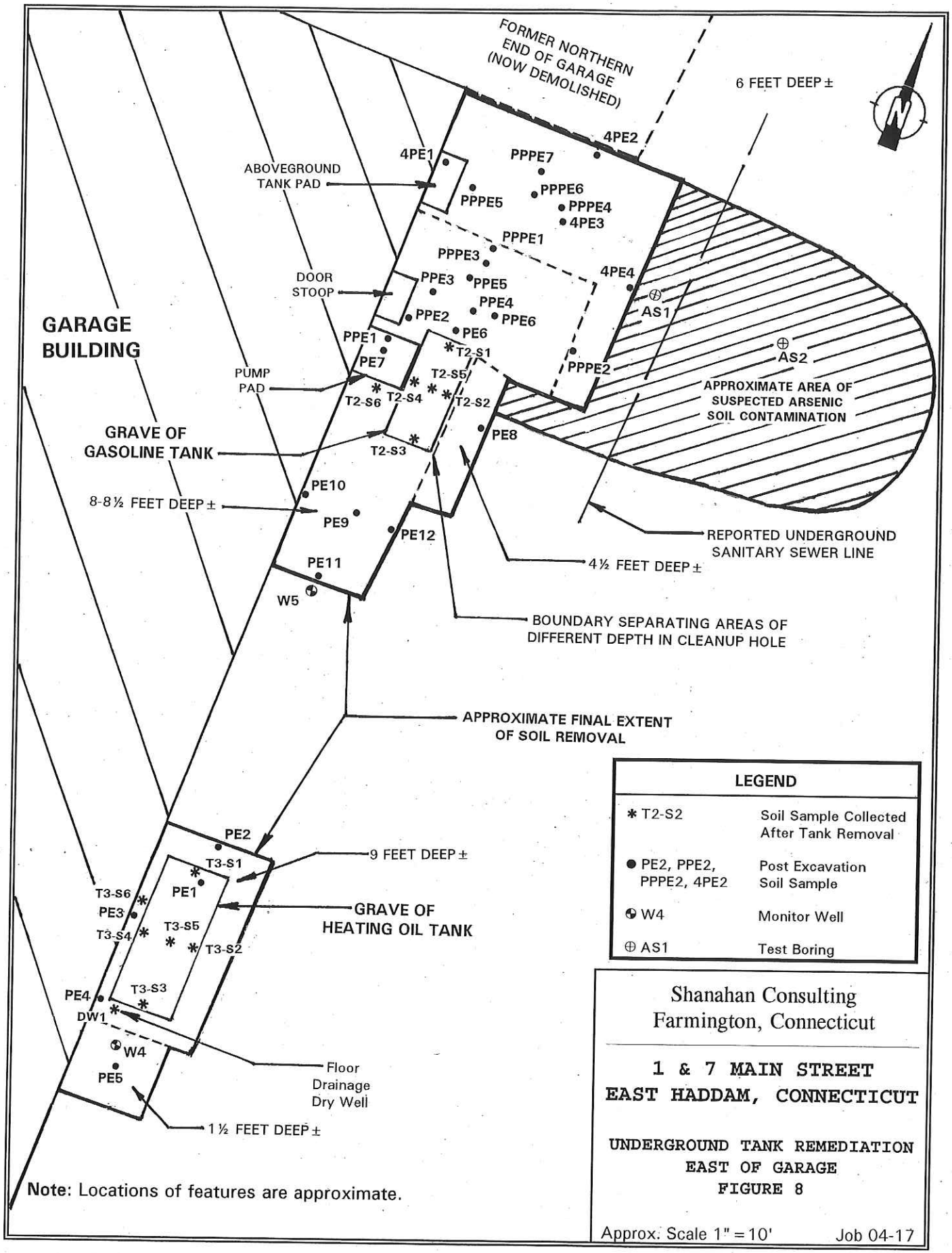
1 & 7 MAIN STREET
EAST HADDAM, CONNECTICUT

UNDERGROUND TANK REMOVAL
WEST OF GARAGE
FIGURE 7

Approx. Scale 1" = 10' Job 04-17



Note: Locations of features are approximate.

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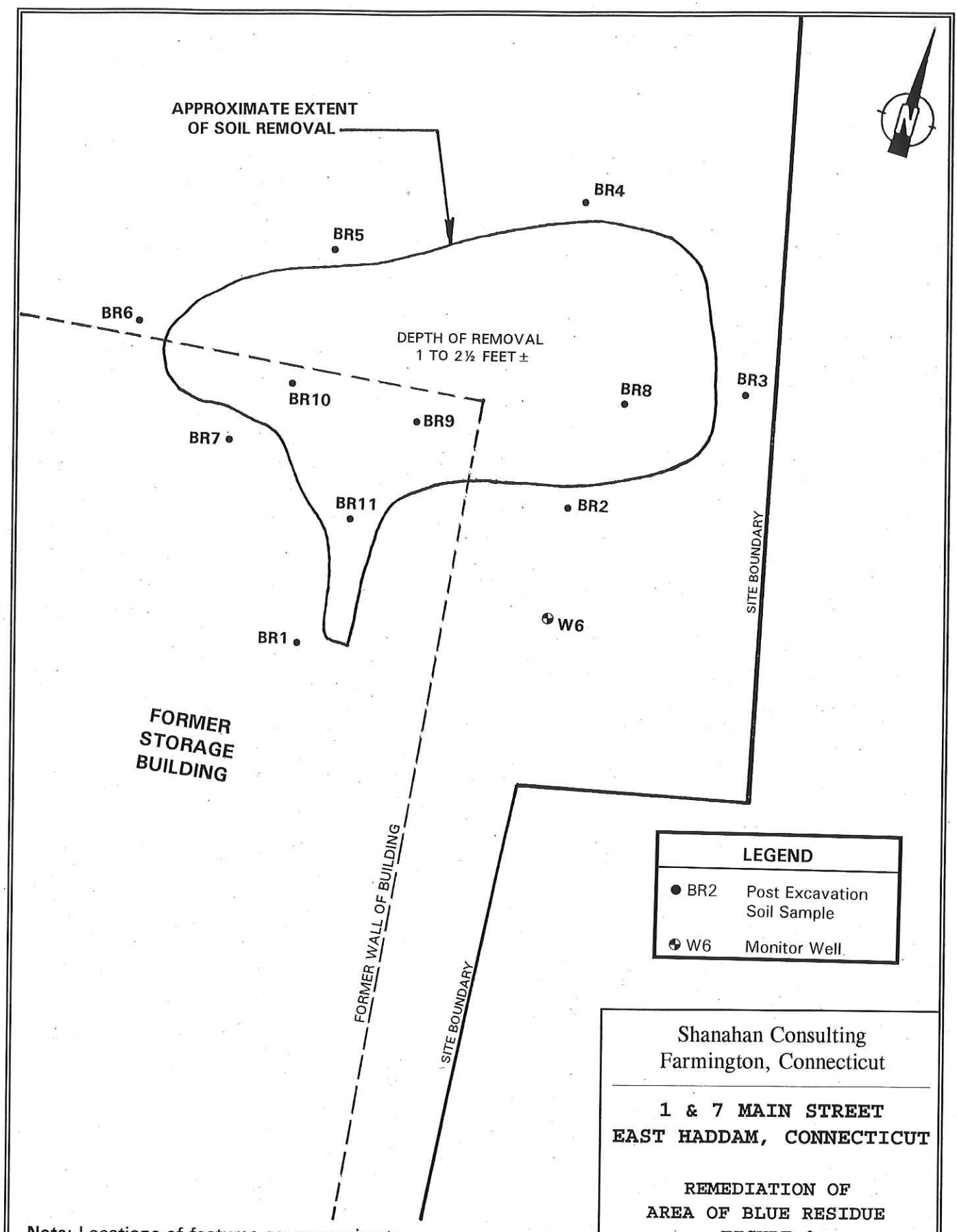
1 & 7 MAIN STREET
EAST HADDAM, CONNECTICUT

UNDERGROUND TANK REMEDIATION
EAST OF GARAGE
FIGURE 8

Approx. Scale 1" = 10' Job 04-17



Note: Locations of features are approximate.

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1 & 7 MAIN STREET
EAST HADDAM, CONNECTICUT

REMEDIATION OF
AREA OF BLUE RESIDUE
FIGURE 9

Approx. Scale 1" = 10' Job 04-17