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MURPHY'S WASTE OIL SERVICE, INC.

Volume 1 of 3

Corrective Action Investigation Report

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, MA 01801

April 15, 1996

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CORRECTIVE ACTION INVESTIGATION REPORT

MURPHY'S WASTE OIL SERVICE, INC.
252 SALEM STREET
WOBURN, MASSACHUSETTS 01801

CHES Job No. EN-170

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INTRODUCTION

Clean Harbors Environmental Services, Inc. (CHES) has prepared this *Corrective Action Investigation Report (CARP)* for the property located at 252 Salem Street and 252 Rear Salem Street in Woburn, Massachusetts (the site). The site is owned by Old Oil Realty Trust and is leased by Murphy's Waste Oil Service, Inc. (Murphy's), a transfer, storage and disposal facility for waste oil and solvent-contaminated oil.

This *CARP* was prepared pursuant to the requirements of the RCRA Part B Permit issued by the Massachusetts Department of Environmental Protection (DEP) to Murphy's effective October 19, 1993. Section 10.e of the Part B Permit requires a Corrective Action Investigation of the site if DEP determines that there has been or there is the potential for a release from the facility or if previous subsurface investigations indicate that groundwater has been affected by the facility.

An initial *Hydrogeologic Characterization Report*, dated February 1, 1994, was prepared by CHES and submitted to DEP to document three subsurface investigations which were performed on the site by CHES between December 1987 and February 1989. The *Hydrogeologic Characterization Report* included results of the previous investigations, a summary of the geology and hydrogeology of the site area, and descriptions of pertinent site features. The report also included information on petroleum use, past spills and a Short-Term Remedial Measure which was performed on the site in March 1989 to remove 1,100 cubic yards of petroleum-contaminated soil during construction of the waste oil facility building and tank farm.

A *Scope of Work for Subsurface Investigation*, dated June 30, 1994, was subsequently prepared to address requirements of Section 10.b.1 of the RCRA Part B Permit. The *Scope of Work* incorporated information from the report, *Draft Remedial Investigation, Southwest Properties, Wells G&H Superfund Site, Woburn, Massachusetts* (Ref. 1), which was prepared by Remediation Technologies, Inc. (ReTec) for Beatrice Corporation in February 1994. The Murphy's site is located in the southwest corner of the area under investigation for the Central Area Remedial Investigation/Feasibility Study of the Wells G&H Superfund Site. An *Addendum I to*

Hydrogeologic Characterization Report (Addendum), dated January 31, 1995, was prepared by CHES and submitted to DEP to summarize findings of the ReTec investigation as they relate to the Murphy's site and to document additional investigation which was performed in accordance with the *Scope of Work*. DEP approved the *Hydrogeologic Characterization Report* and *Addendum* with modifications in a letter dated May 1, 1995 in accordance with Section 10.i of the Part B Permit. In its May 1 letter, the DEP determined that, based on results of the investigations documented in the *Hydrogeologic Characterization Report* and *Addendum*, soils, surface water, and groundwater at the facility have been impacted by releases from the site, and implementation of a Corrective Action Investigation was required.

In accordance with Section 10.e.2 of the RCRA Part B Permit, a *Corrective Action Investigation Plan (CIP)* was prepared and submitted to DEP on July 11, 1995 to describe proposed activities to be included in the Corrective Action Investigation. DEP approved the *CIP* with modifications in a letter dated September 1, 1995 in accordance with Section 10.i of the Part B Permit. A copy of the September 1, 1995 approval letter is presented in Appendix A.

SITE DESCRIPTION

The site is located at 252 Salem Street in the eastern portion of the City of Woburn, Massachusetts. Figure 1 is a Locus Map showing the site location. Properties surrounding the site are shown in Figure 2. The site is located approximately 1,000 feet west of and upgradient from the Aberjona River. The site consists of one parcel of land zoned as industrial and has a total area of approximately 3.4 acres. The City of Woburn Assessor's Office designates the site as Parcel 41, Block 005 on Map 16.

Throughout most of its history, the site has been used primarily as a waste oil and/or virgin oil temporary storage facility. In the 1920s, the Woburn Oil Company reportedly began operations by storing virgin oils on the northern portion of the site. Waste oils were additionally accepted onto the site in the mid-1950s. Murphy's Waste Oil Service, Inc. acquired the site facility on July 7, 1977. As many as 20 aboveground storage tanks installed by Murphy's Waste Oil Service, Inc. were located on the site in 1986. The current owner of the site land is Old Oil Realty Trust, to whom the land was deeded in 1980. In February 1989, Clean Harbors purchased the stock (i.e., the facility and assets) of Murphy's Waste Oil Service, Inc. and has continued to operate the facility under the latter name and leases the land from Old Oil Realty Trust.

The operating portion of the site is surrounded by a chain-link fence which restricts access to the site. Vehicular access to the site is via Salem Street. Figure 3 illustrates site details. The northern portion of the site is not paved and is referred to by previous site occupants and on site plans (dated in the 1920s) as the "Oil Yard." A gravel parking area is currently located in the northern portion of the site. A two-foot high concrete dike, which was constructed in September 1986, is also located in the northern portion of the site. The dike surrounded seven aboveground oil storage tanks, which were subsequently relocated to another area of the site in 1990.

The City of Woburn has a sanitary sewer easement which crosses the northern portion of the site in an east-west orientation. The sewer originates at the westerly abutting property, the former John J. Riley Company tannery, and discharges into a main line of the City of Woburn sanitary sewer system. The sewer manhole on the Riley property has apparently been vandalized and is currently filled with soil.

The central portion of the site is occupied by the waste oil facility which contains eleven aboveground storage tanks, an office, a laboratory and a rest room. The facility was constructed between March 1989 and January 1990. The tanks in the facility are located within a concrete containment area which is surrounded by a concrete dike and covered with a canopy. The area surrounding the facility is surfaced with crushed gravel, as is most of the central portion of the site. Underground utilities which service the oil storage facility include City water and sewer.

A garage is located in the southern portion of the site. The garage is constructed of steel siding over a four-foot concrete foundation. The floor is also constructed of concrete and does not contain any floor drains. From 1979 to the Summer of 1987, Murphy's Waste Oil Service, Inc. used the garage as an office and for company truck maintenance. The garage is heated by oil which is stored in a 1,000-gallon underground storage tank located off the southeast corner of the building. The areas west and south of the garage are vegetated with grass.

Topographically, the ground surface in the southern portion of the site slopes down gently to the north from Salem Street. The ground surface is relatively level within the fenced area of the central and northern portions of the site (50 feet National Geodetic Vertical Datum [NGVD]). Properties on Salem Street adjacent to the site are located on high ground, and a steep embankment approximately 30 feet high slopes down to the north outside of the fence. A low wetland area is

located outside of the fenced area in the eastern portions of the central and northern portions of the site.

In the 1950's, a depression was located in the area of the facility building (previously referred to as the "oil pit") for disposal of spent silica media which had been used to filter waste oil. Separate-phase oil was not disposed with the spent filter media because it had resale value. Much of this oily filter media was excavated and disposed during construction of the facility building. As described in the *Hydrogeologic Characterization Report*, a Short-Term Measure was performed in March and April 1989 to remove petroleum-impacted soil prior to construction of the building. Shallow unimpacted soils were stripped off and segregated, and approximately 1,100 cubic yards of the deeper oil-contaminated soils were excavated and disposed. The completed excavation extended to a depth below the groundwater table over the footprint area of the proposed facility building.

ADJACENT PROPERTIES

Properties surrounding the Murphy's site are shown in Figure 2. The Boston and Maine Railroad is adjacent to the west side of the site. Properties west of the railroad tracks include the former John J. Riley tannery and land owned by Connecticut Mutual Life Insurance Company (currently used as offices and warehouse space). The adjacent property north of the Murphy's site is undeveloped land owned by the Wildwood Conservation Trust. The land east of Murphy's is an industrial property occupied by Whitney Barrel Company. Three residential properties are located south of the site along Salem Street.

The John J. Riley Company began tannery operations in 1909. The property consisted of one developed parcel (228 Salem Street) with two buildings (a process plant and offices) and an additional undeveloped parcel east of the railroad tracks (referred to here as the Wildwood property). The two parcels of land were sold to Beatrice Foods, Inc. in 1978. In 1983, ownership of the undeveloped parcel was transferred to the Wildwood Conservation Trust.

The John J. Riley tannery was supplied process water from two private wells, one located 110 feet west of the Murphy's site (Production Well No. 1) and one on the Wildwood property 130 feet northeast of Murphy's (Production Well No. 2). The locations of both supply wells are shown in

Figure 2. Production Well No. 2 began operation in 1958. Both wells were shut down in 1989 after chlorinated VOCs were identified in groundwater samples from Well No. 2.

Previous site investigations performed at the John J. Riley tannery during the early 1980s identified two chromium and benzidine dye waste lagoons and piles of unprocessed hides north of the process building. Sludge material from process sedimentation tanks was buried next to the lagoons.

During the early 1980s, miscellaneous debris, piles of rusted 55-gallon drums and pesticide container caps were found on the Wildwood property. Between 200 and 500 five-gallon drums of arsenic trioxide were also found just north of the property. Based on these findings, the Wildwood property was added to the Wells G&H Superfund Site RI/FS.

Subsequent investigations of the Wildwood property identified surface accumulations of sludge (chemical and petroleum residues), mixed contaminant soils (including polynuclear aromatic hydrocarbon compounds [PAHs], polychlorinated biphenyl compounds [PCBs] and pesticides) and volatile organic compound (VOC) contaminated soils (including trans-1,2-dichloroethene [DCE], trichloroethene [TCE], tetrachloroethene [PCE], 1,1,1-trichloroethane [TCA] and chloroform). Most of the surface accumulations were located directly adjacent to a dirt road which enters the Wildwood property from Salem Street (through the Aberjona Auto Parts property). Chlorinated VOCs, primarily TCE, have been found to be widely distributed in groundwater on the Wildwood property, with the highest concentrations (92,000 micrograms per liter [ug/l]) observed in bedrock fractures (Ref. 2).

The Whitney Barrel Company, which began operations in 1949, reconditions drums, boilers, tanks and machinery, primarily from the food industry. Subsurface investigation of the Whitney Barrel property performed by GHR Engineering Associates in 1988 identified VOCs, semivolatile organic compounds (SVOCs), and PCBs in soil and groundwater. VOCs were detected in groundwater samples from well MW-4S at a maximum total concentration of 1,020 ug/l, and included the compounds 1,1-DCA, TCA, vinyl chloride, benzene, xylene and toluene (Ref. 1).

Murphy's Waste Oil Service, Inc., Whitney Barrel and Aberjona Auto Parts (known as the Southwest Properties of the Central Area) were added to the Wells G&H Superfund Site investigation in 1989 and are currently part of the RI/FS.

SUMMARY OF PREVIOUS RESULTS

Previous subsurface investigations performed by CHES between December 1987 and February 1989 identified oil-impacted soil in two areas of the Murphy's site. TPH was detected in shallow soils (2 - 4 feet below grade) at concentrations up to 16,000 mg/kg in the northern portion of the site where aboveground oil storage tanks were formerly located. TPH concentrations up to 21,000 mg/kg were also detected in soils in the central portion of the site in the area of the former oil pit prior to construction of the new facility building and implementation of the Short-Term Measure. In 1994, a subsurface investigation of a portion of the Murphy's site performed by ReTec as part of the Wells G&H RI/FS identified PAHs in soil adjacent to the Murphy's facility building at concentrations up to 9,087 ug/kg, indicating that some residual oil-impacted soils remained after implementation of the Short-Term Measure.

The ReTec investigation also identified impacted soils in the wetland between the Murphy's site and Whitney Barrel, which were found to contain PAHs (up to 6,162 ug/kg), pesticides (up to 2.89 mg/kg), arsenic (up to 17.0 mg/kg), cadmium (up to 4.8 mg/kg), chromium (up to 8,193 mg/kg), and cyanide (up to 4.7 mg/kg). Analytical results subsequently obtained by CHES verified the ReTec results, and detected TPH (up to 97,000 mg/kg), VOCs (up to 1,300 ug/kg), PCBs (up to 220 mg/kg), and lead (up to 35,100 mg/kg) in the wetland soils. Analytical results obtained by ReTec and CHES did not suggest an on-site source of contaminants in the wetland soils. Elevated concentrations of PCBs, pesticides, metals and cyanide were not detected elsewhere on the Murphy's site outside the wetland during either of the investigations. Of the contaminants identified in the wetland, only low concentrations of TPH (up to 470 mg/kg), and chromium (up to 4.9 mg/kg) were identified in adjacent borings MW-3, MW-4 and MW-5S.

During previous subsurface investigation documented in the *Addendum*, horizontal and vertical hydraulic gradients on the site were observed to be very low. Although shallow soils (less than 20 feet deep) were found to consist of relatively coarse sand and gravel, the low measured hydraulic gradients indicate that groundwater flow on the site is very slow.

Prior to 1989, groundwater flow on the site was likely influenced by the John J. Riley Company Production Wells No. 1 (depth unknown) and No. 2 (screened from 36 to 51 feet below grade). Only one other private water supply well is known to exist in the site area. A shallow well is located at Woburn Concrete Products approximately 1/4-mile south of the site (Figure 2). The

well, which was installed approximately 30 years ago, is screened at an estimated depth of 40 feet below grade and is currently used for mixing concrete only. It is not anticipated that this well influences groundwater flow on the Murphy's site.

Analytical data collected during previous investigation and documented in the *Addendum* indicated chlorinated VOCs in shallow groundwater in the northern portion of the site. Elevated concentrations of chlorinated VOCs, including trans-1,2-DCE, TCE, 1,1-DCA and 1,1,1-TCA were detected in well MW-3 in the northern portion of the site at a total concentration of 1,342 ug/l. Elevated concentrations of chlorinated VOCs were also detected in the northern portion during the previous subsurface investigation performed by CHES (*Hydrogeologic Characterization Report*). The source of chlorinated VOCs in shallow groundwater in the northern portion of the site has not been determined. Analytical data collected by ReTec and CHES have not detected chlorinated VOCs in soils above the groundwater table on the site at concentrations which would indicate a source area.

Chlorinated VOCs were also detected in shallow groundwater adjacent to the facility tank farm. Trans-1,2-DCE and vinyl chloride were detected in well MR-2SS adjacent to the tank farm at a total concentration of 255 ug/l. The origin of VOCs at well MR-2SS is unknown, however, analytical data from other shallow wells did not suggest widespread occurrence of chlorinated VOCs in groundwater between wells MR-2SS and MW-3.

Groundwater quality in the deep portion of the aquifer was evaluated in deep well MW-5D. The lower boundary of the aquifer was found to be the bedrock surface, which was encountered at a depth of 83 feet below grade. Well MW-5D was screened at the bedrock surface in a location which is structurally down-dip from the waste oil facility building and tank farm. Except for TPH (detected at 0.2 mg/l), groundwater analyses from well MW-5D did not indicate the presence of any contaminants which have been observed in shallow groundwater on the site.

CORRECTIVE ACTION INVESTIGATION PLAN

In order to satisfy the requirements of the RCRA Part B Permit for the Murphy's facility, a *Corrective Action Investigation Plan (CIP)* was submitted to DEP on July 11, 1995. The scope of work for the investigation was further discussed during a meeting between DEP and CHES representatives on August 24, 1995. DEP subsequently approved the *CIP* in a letter dated

September 1, 1995 with five modifications to the scope of work (Appendix A). The modifications were incorporated into the scope of work for the Corrective Action Investigation, which included the following tasks:

- collection of soil boring samples from the areas of the former aboveground storage tanks and the facility building for delineation of impacted soils;
- sampling and analysis of the wetland soils to determine the horizontal distribution of contaminants previously identified at the site;
- installation of additional groundwater monitoring wells at the facility and well points within the wetland to further delineate contaminants in the groundwater and characterize the aquifer properties;
- monitoring of groundwater and surface water elevations to further evaluate horizontal and vertical hydraulic gradients in the site area;
- sampling and analysis of groundwater and surface water on the site;
- further evaluation of aquifer characteristics using slug tests in the newly-installed wells, and
- evaluation of the sewer line on the site as a potential migratory pathway for separate-phase or dissolved-phase contaminants in groundwater.

SUBSURFACE INVESTIGATION METHODOLOGY

Applicable Permits

Prior to drilling the soil borings on the site, the locations of all known subsurface utilities were determined and DIGSAFE was notified. The scope of work was reviewed with the City of Woburn Conservation Commission to determine if a Notice of Intent was required to install the well points within the wetland. At a meeting on September 27, 1995, the Conservation

Commission determined that the Wetlands Ordinance was not applicable because the work was scientific in nature.

Access was requested to properties adjacent to the site for purposes of gauging groundwater levels in existing monitoring wells, surveying the well rim elevations, and sampling of wetland soils. These adjacent properties included Whitney Barrel, Wildwood Conservation Trust, Connecticut Mutual Life Insurance Company [referred to in previous reports as Butterworth-Heinemann], and the former John J. Riley tannery. Free access was granted to all of the properties except the former John J. Riley property, and DEP was verbally advised of the latter exception.

Soil Borings in Areas of Former Aboveground Tanks and Facility Building

Nineteen soil borings were performed on the site as part of the Corrective Action Investigation (borings B-1, B-2, and B-4 through B-20) in the areas of the former aboveground storage tanks and the facility building during the period of October 2 - 27, 1995. Six other borings were performed during the same period which were completed with installation of groundwater monitoring wells (discussed below). Locations of the borings (shown in Figure 4, Sampling Location Plan) were proposed in the *CIP* and some adjustments to the proposed locations were suggested by DEP in the meeting on August 24, 1995. Several additional boring locations were added during the investigation to better delineate the lateral extent of impacted soil in the two areas.

The soil borings were performed by Environmental Drilling, Inc. using 4¹/₄-inch hollow-stem auger. Soil samples were collected continuously to depths of 12 to 14 feet below grade using a two-inch diameter split-spoon sample tube advanced ahead of the auger using a 30-inch drop from a 140-pound hammer in accordance with ASTM D1586, "Penetration Test and Split Barrel Sampling of Soils." The hollow-stem augers were decontaminated by steam prior to each soil boring. Split-spoon sample tubes were washed with Liquinox detergent and then rinsed with methanol and deionized water. Drill cuttings were containerized for later characterization and proper disposal. The Uniform Hazardous Waste Manifest for disposal of soil cuttings generated during the investigation is presented in Appendix B.

All soil samples were characterized by noting grain size, apparent water saturation, and color. Soil boring logs containing sample descriptions and other pertinent information are presented in Appendix C. All soil samples were split vertically and prepared for field-screening and laboratory

analysis. Samples for field-screening were placed in clean 16-ounce glass jars and covered with aluminum foil prior to replacing the lid. Samples for laboratory analysis were transferred into clean glass jars with Teflon-lined lids and stored in a cooler.

Soil samples for field-screening were allowed to equilibrate for a minimum of 15 minutes for headspace development, and then were screened using a flame ionization detector (Foxboro Model 128 Organic Vapor Analyzer [OVA]). This instrument measures the total VOCs in vapor and reports in terms of parts per million (ppm) referenced to methane. Total VOC headspace measurements are presented in the soil boring logs and are summarized in Table 1.

Based on results of field-screening and/or evidence of possible soil staining, select samples from the borings were laboratory-analyzed for VOCs (by EPA Method 8240), PAHs (by EPA Method 8310, High Performance Liquid Chromatography), total petroleum hydrocarbons (TPH by GC/FID), 13 priority pollutant total metals and total cyanide. In general, soil samples were submitted for laboratory analysis representative of depths where elevated headspace measurements were observed and/or at the groundwater table. In borings which were performed for monitoring well installation (described below), one soil sample was composited over the screened interval for determination of grain size distribution by sieve analysis (by ASTM Method D422).

Soil Boring Results

Shallow soil types encountered during the Corrective Action Investigation were consistent with those previously described on the site, including approximately eight feet of fill material (fine to coarse sand with little silt and gravel) overlying native sand with varying amounts of gravel. As in previous investigations, the transition from fill to native materials was not readily apparent because the fill material was derived from local native deposits.

Using the new and existing soil boring data, three geologic cross-sections across the site were prepared. These cross-sections, designated B-B', C-C', and D-D', are shown in Figures 5 and 6. The locations of the cross-sections are shown in Figure 4 (Sampling Location Plan). These cross-sections show the sand and gravel fill layer overlying native sand and gravel deposits. The native sand and gravel deposits, which vary from 35 feet to 55 feet in thickness, overlie approximately 20 feet of fine sand which overlies bedrock. During the Corrective Action Investigation, two deep borings (MW-3D and MW-10) were advanced to the top of the fine sand layer. These wells are

shown graphically in Cross-Section B-B' (Figure 5). The other borings performed during the investigation extended to depths of 12 to 14 feet and were used primarily to evaluate the distribution of contaminants in the shallow sand and gravel fill layer.

Field-Screening Results

Field-screening measurements made during the Corrective Action Investigation and the previous investigation (documented in the *Hydrogeologic Investigation Report and Addendum*) were performed using a flame ionization detector. The field-screening results are considered a useful tool to generally describe the distribution of VOC-related contaminants in the soil samples. Field-screening headspace measurements are shown on the soil boring logs and are summarized in Table 1. Profiles of field-screening results (in ppm) with depth are shown in Figure 7 at each boring in which they were measured, indicating the vertical and horizontal distribution of VOCs in soils on the site.

In the area of the facility building, headspace measurements equal to or greater than 100 ppm were recorded in new borings MW-7, B-2, B-4 and previous boring MW-2. These elevated headspace measurements were generally associated with moderate to strong petroleum odors and staining in the soil samples. The area of the facility building was delineated by comparatively low field-screening measurements in borings B-19 and B-20 to the west; B-18, MW-9, B-1 and B-6 to the north; B-5, MW-5S and B-17 to the east; and MW-8 to the south.

Elevated headspace measurements were also recorded in the area of the former aboveground storage tanks in new borings B-7, B-8, B-9, B-11, B-13, B-14, MW-11 and existing boring MW-3. Petroleum odors and staining were observed in the soil samples yielding elevated headspace measurements in all of these borings except MW-3 and MW-11. The field-screening profiles indicate elevated headspace measurements in shallow unsaturated soils above the groundwater table in boring B-14; relatively low headspace measurements were observed in shallow soils in the other borings in the former tank area. The area of the former aboveground tanks is delineated by comparatively low field-screening results measured in borings B-12, B-15, B-16, MW-1 to the west; and B-18, MW-9 and B-1 to the south. The areas north and east of the former tank area were delineated by the P-series soil samples collected in the wetland (discussed below).

Soil Boring Analytical Results

Analytical results of the soil boring samples are presented in Appendix D and are summarized in Tables 2 through 4 with soil analytical data previously documented in the *Hydrogeologic Characterization Report*. Volatile organic compounds were detected in soil boring samples from the facility building area (B-4 and MW-7) and the area of the former aboveground tanks (B-13, B-14, B-16 and B-18). The VOCs identified in the samples included non-halogenated compounds (toluene and xylenes) and chlorinated compounds (PCE, 1,1-DCA, 1,1,1-TCA, TCE and trans-1,2-DCE). Toluene and xylenes were detected at relatively low concentrations in borings B-4 and B-14 (up to 380 ug/kg and 1,300 ug/kg, respectively). Higher levels of toluene and xylenes (12,000 ug/kg and 48,000 ug/kg, respectively) were detected in boring MW-7 in a soil sample collected at the groundwater table (sample depth of 6.5 to 8.5 feet below grade). Chlorinated VOCs were detected in soil samples from borings B-13 (total concentration up to 403 ug/kg), B-16 (68 ug/kg), and B-18 (up to 1,540 ug/kg). The highest concentrations of chlorinated VOCs were observed in the surface soil samples (sample depth of 0 to 2 feet) in borings B-13 and B-18. PQLs applicable to the VOC analyses were generally between 5 ug/kg and 50 ug/kg, depending on the compound. The PQLs were elevated for some of the sample analyses, specifically B-14/SS-2 & SS-5, B-17/SS-2, B-18/SS-1 & SS-3, B-19/SS-4 and MW-7/SS-4. These elevated PQLs were generally due to matrix interference due to sample consistency or the presence of other compounds, which may have required dilution of the sample.

TPH was identified in the soil boring samples at concentrations ranging from non-detectable levels (B-6, B-11, B-15, and MW-9) to a maximum of 7,700 mg/kg (B-4) (Table 3). Elevated concentrations of TPH were detected in soil samples from borings B-4 (up to 7,700 mg/kg), B-13 (up to 4,700 mg/kg), B-14 (up to 6,400 mg/kg) and MW-7 (up to 4,000 mg/kg). TPH concentrations in the other samples did not exceed 1,700 mg/kg and many of the analyses detected concentrations less than 500 mg/kg. Elevated TPH was detected in borings B-4 (10 to 12 feet), B-14 (8.5 to 10.5 feet) and MW-7 (6.5 to 8.5 feet) at depths which correlate approximately to the groundwater table. Elevated TPH was detected in shallow soils in borings B-13 (0 to 2 feet) and B-14 (2.5 to 4.5 feet).

PAHs were identified in the soil boring samples at total concentrations ranging from non-detectable levels (B-19 and MW-9) to a maximum total concentration of 73,700 ug/kg (B-17) (Table 3). The specific PAH compounds observed at levels which were considered to be elevated (based on soil

standards listed in the Massachusetts Contingency Plan) include benzo (a) anthracene (up to 4,900 ug/kg); chrysene (up to 7,100 ug/kg); benzo (b) fluoranthene (up to 4,100 ug/kg); benzo (a) pyrene (up to 5,900 ug/kg); and indeno (1,2,3-cd) pyrene (up to 6,500 ug/kg). The highest levels of these PAHs were observed in shallow soil samples (0 to 4 feet) in borings B-4, B-13, B-17 and B-18. PQLs applicable to the PAH analyses were generally between 1 ug/kg and 40 ug/kg, depending on the compound. Elevated PQLs were reported for some of the samples, including B-4/SS-1, B-13/SS-1, B-14/SS-2, B-17/SS-2, B-18/SS-1, B-19/SS4 and B-20/SS-4. PQLs for most of these samples were elevated due to matrix interference and/or sample dilution. PQLs were elevated for the latter two samples because of limited soil volume from the split-spoon.

Low concentrations of the 13 priority pollutant total metals were detected in the soil boring samples (Table 4). Chromium, copper, lead, nickel, and zinc were detected in most of the samples at levels which are considered typical of background conditions. Slightly elevated levels of lead were detected in surface soil samples (0 to 2 foot depth) from borings B-8 (1,900 mg/kg) and B-18 (560 mg/kg). Cyanide was not detected in any of the soil boring samples.

In summary, based on the soil boring analytical data collected during the Corrective Action Investigation and the previous subsurface investigation of the site performed in 1994, three areas of the site appear to have been impacted by petroleum and/or waste oil products:

- Elevated levels of non-halogenated and chlorinated VOCs, TPH and PAH were detected in shallow soils in the area of the former aboveground storage tanks near borings B-13, B-14 and B-18. TPH, PAHs and non-halogenated VOCs appear to extend down to the groundwater table at boring B-14.
- Elevated concentrations of non-halogenated VOCs, TPH and PAHs were detected in the area of the former oil pit at borings B-17 and MW-7 east of the facility building. These compounds were more prevalent in shallow soils at B-17 and were concentrated near the groundwater table at MW-7.
- TPH and PAHs were detected at elevated concentrations in the area of the former oil pit at boring B-4 west of the facility building. PAHs were more prevalent in the shallow soils at this location while the TPH concentration increased at depth near the groundwater table.

Monitoring Well Installation

In addition to the soil borings described above, eight other borings/groundwater monitoring wells were installed on the site during the period of October 5 - 27, 1995 as part of the Corrective Action Investigation. The locations of seven of the wells were proposed in the *CIP*, and one well (MW-7) was added during the field investigation. These wells were in addition to seven existing wells which were previously installed on the site (MW-1, MW-2, MW-3, MW-4, MW-5S, MW-5D, and MW-6).

Four wells (MW-7, MW-8, MW-9 and MW-11) were installed to a depth of 12 feet below grade to evaluate the shallow portion of the aquifer on the site. Well MW-7 was installed east of the facility building because apparent separate-phase oil was encountered in that location during the soil boring program described above. Wells MW-8 and MW-9 were installed to supplement the shallow monitoring well network around the facility building. Well MW-11 was installed adjacent to sewer manhole SMH #4 in the northern portion of the site to evaluate the depth of groundwater relative to the sewer line. The borings for the shallow wells were performed using hollow-stem augers as described above.

Two deep wells (MW-3D and MW-10) were installed to depths of 49 feet and 41 feet below grade, respectively, in areas where chlorinated VOCs have been detected in shallow groundwater. Well MW-3D was installed adjacent to well MW-3 in the northeast portion of the site; well MW-10 was installed adjacent to well MR-2SS at the northwest corner of the facility building. The borings for wells MW-3D and MW-10 were drilled using drive and wash methodology.

The monitoring wells were constructed of two-inch diameter Schedule 40 flush-joint threaded polyvinyl chloride (PVC) factory slotted (0.01-inch) well screen. The shallow wells were screened across the groundwater table; deep wells MW-3D and MW-10 were screened over a five-foot interval in the deep portion of the aquifer. The annular space around the well screen was packed with #2 silica sand to a depth of approximately one foot above the top of the well screen. A subsurface seal of at least one foot of bentonite was placed above the sand pack. The shallow wells were backfilled to grade with Portland cement; deep wells MW-3D and MW-10 were backfilled with powdered bentonite/cement grout conveyed through a tremie tube. Locking guard pipes were installed over all of the wells except MW-7, which was completed with a flush-mount road box because it is located within the traffic area. Protective bumper posts were installed adjacent to the guard pipes near traffic areas.

Two other shallow monitoring well points (MW-12 and MW-13) were manually-driven in the wetland to depths of approximately five feet below grade. Wells MW-12 and MW-13 were constructed of 1¹/₄-inch diameter stainless steel 36-inch long V-slot wire-wound 0.01-inch screen. A section of galvanized steel riser pipe was threaded onto the top of the screen and was fitted with a threaded cap. Completion reports for all monitoring wells and well points installed during the Corrective Action Investigation are presented in Appendix C.

Well Development and Stadia Survey

All of the newly-installed wells except MW-8 were developed on October 19, 1995 using a surface pump. Groundwater was purged from each well until clear. A slow pumping rate was used to avoid de-watering the screened interval. Well MW-8 was installed on October 27, 1995 and was subsequently developed by bailing and surging with a bailer. Purged groundwater was containerized for characterization and disposal. Based on analyses of the drummed water, the water was batched together with oily wastewater from the Murphy's facility and shipped off-site for treatment and disposal.

A stadia survey was performed on October 27, 1995 to determine locations and rim elevations of newly-installed wells on the site and existing wells on the Wildwood and Whitney Barrel properties. Access to an additional well on the Connecticut Mutual Life Insurance Company property was granted on December 1, 1995 and survey of the well was completed on March 1, 1996. In addition, invert elevations were surveyed in three sewer manholes on the site and adjacent properties to evaluate the depth of the sewer line relative to the groundwater table. Elevations were determined to the nearest one-hundredth of a foot relative to the National Geodetic Vertical Datum (NGVD) of 1929.

Wetland Soil Sampling

On November 16, 1995, soil samples were collected in 28 locations within the wetland on the site (samples P-1 through P-7, P-9 through P-15 and P-17 through P-30). The sample grid, shown in Figure 4 (Sampling Location Plan), was marked with flags in advance using a Brunton compass and taped survey. The samples were collected using a manually-advanced 1¹/₈-inch diameter

stainless steel soil probe equipped with plastic liners. The samples were composited over a depth range of 6 to 18 inches at each location.

All soil samples were characterized and the surface conditions were noted (Table 5). The composite samples were split and prepared for laboratory analysis and field-screening. Results of the field-screening, which was performed using a photoionization detector (HNU meter), are listed in Table 5. Samples from each location were laboratory-analyzed for TPH (by GC/FID), PCBs (by EPA Method 3540/8080), and total lead and chromium (by EPA Method 3005/6010).

Wetland Soil Results

The wetland soils on the site typically included four to six inches of decomposed vegetation overlying fine sand and silt which appeared equivalent to native shallow soils encountered in the soil borings. Standing water was present over most of the wetland during the sample event, and surface vegetation included, cattails, grasses, reeds, scrub and trees. Dry ground was encountered in the area of sample locations P-19 and P-22, and gravel fill was noted at location P-22. A concrete manway, possibly surplus from installation of the sewer line, is lying on the ground near location P-22. A partially-corroded steel tank is located near or over the Wildwood property line immediately adjacent to sample location P-24. The tank is 3.5 feet long and 3.5 feet in diameter, with an estimated capacity of 250 gallons. The top of the tank is convex and has a small round hatch; the bottom of the tank is concave. A portion of the eastern side of the wetland has been filled with construction-related debris (i.e. wood, concrete, and scrap metal) from the Whitney Barrel property. Table 5 lists soil and surface descriptions for sample locations P-1 through P-30.

Field-screening of soil samples collected from the wetland generally did not detect the presence of VOCs. However, headspace measurements of 8 ppm and 2 ppm were recorded at sample locations P-12 and P-15, respectively. The samples collected from these locations also had a strong petroleum odor.

Results of the wetland soil analyses are presented in Appendix E and are summarized in Tables 6 and 7. Based on the analyses, the horizontal distributions of TPH, PCB, lead and chromium within the wetland are shown in Figures 8 through 11, respectively. During this investigation, TPH was detected in the wetland soil samples at concentrations ranging from 22 mg/kg (P-28) to 82,000 mg/kg (P-12). Sample P-12 is located near sample location SW-2, at which a TPH

concentration of 97,000 mg/kg was detected in a surface soil sample collected in October 1994. Figure 8 shows this area to have elevated levels of TPH which are localized, as detected in samples P-15 (38,000 mg/kg), P-18 (24,000 mg/kg), P-14 (20,000 mg/kg) and P-23 (11,000 mg/kg). This area of elevated TPH concentrations appears limited to the west side of the wetland.

PCB compounds were identified in the wetland soil samples at concentrations ranging from non-detectable levels (P-28 and P-30) to a maximum of 69 mg/kg (P-5). These levels were substantially lower than the maximum concentration of 220 mg/kg which was detected at location SW-2 during the previous investigation performed in 1994. Similar to the previous investigation, both Aroclor 1254 and Aroclor 1260 compounds were detected, however, no trends in distribution of these PCB types were noted (Figure 9). With the possible exception of sample SW-2, the distribution of PCB compounds did not show any correlation to the TPH distribution. When sample SW-2 is excluded, the highest concentration of PCB compounds was observed in sample P-5, which was collected on the east side of the wetland adjacent to the Whitney Barrel property.

Total lead was detected in the wetland soils at concentrations ranging from 30 mg/kg (P-4) up to 24,900 mg/kg (P-12). This maximum concentration is comparable with previous analytical results at adjacent location SW-2, which indicated a maximum of 35,100 mg/kg of lead. Elevated concentrations of lead were also detected at locations P-14 (16,800 mg/kg) and P-18 (3,200 mg/kg). These data suggest a distribution of lead (Figure 10) which appears to correlate with the distribution of TPH.

Total chromium was detected in the northern portion of the wetland at concentrations ranging from 45 mg/kg (P-4) to 66,500 mg/kg (P-26). Sample P-26 was re-analyzed to determine the relative concentration of hexavalent chromium, which indicated a very low concentration (1.4 mg/kg). In addition to sample P-26, elevated total chromium concentrations were also detected at locations P-24 (62,500 mg/kg), P-23 (21,300 mg/kg), P-27 (14,000 mg/kg) and P-25 (12,400 mg/kg). Figure 11 shows a well-defined area of elevated chromium concentration which follows a linear path between locations P-24 and P-26. Two additional samples (P-31 and P-32) were collected on December 18, 1995 to evaluate sewer manhole SMH #4 and the aboveground storage tank area on the Murphy's site as possible sources of chromium. Chromium was detected at significantly lower levels in these two samples (1,500 mg/kg and 7,500 mg/kg, respectively) than at adjacent sample P-26, suggesting that the chromium may have originated from an off-site source located north of P-24. The corroded steel tank located near P-24 is considered to be a potential source of the elevated levels of chromium in the wetland soils.

Based on the analyses discussed above, additional soil samples were collected at locations P-12, P-24 and P-26 on December 18, 1995 to evaluate the possible presence of additional contaminants. Samples from these locations were analyzed for VOCs, PAHs, pesticides (by EPA Method 3540/8080), total arsenic and cadmium (by EPA Method 3050/6010), and total and amenable cyanide (by EPA Method 9010). Results of these analyses are presented in Appendix E and are summarized in Table 7. VOCs (specifically xylenes) were detected in sample P-12 at a concentration of 53,000 ug/kg. Xylenes were also detected at adjacent location SW-2 at a concentration of 1,300 ug/kg during the previous investigation in 1994. No other VOCs, PAHs, pesticides, or inorganic constituents were detected in the wetland soils during the Corrective Action Investigation. The PQLs for some of these analyses were elevated due to matrix interference and/or dilutions which were required.

In summary, based on the analytical results, the wetland appears to have been impacted by the following contaminants of concern:

- Elevated concentrations of TPH and lead were detected in soils in the west side of the wetland at locations SW-2, P-12, P-18, P-14 and P-15.
- PCB compounds were detected in the wetland soils with no apparent trend in distribution. Localized areas of elevated PCB concentrations were identified both on the east and west sides of the wetland.
- Elevated concentrations of total chromium were detected in the northern portion of the wetland in the area of locations P-23 through P-27. The mapped distribution of chromium in the wetland soils indicates a source unrelated to historical or present activities on the Murphy's site.

Hydrogeologic Evaluation

Previous investigations have indicated that the groundwater table on the site has a very low gradient (up to 0.18%). To verify these previous results, water levels were measured in 26 monitoring wells and three surface water monitoring stations on the site and adjacent properties. Water levels were measured nine times over a six-month period during the Corrective Action

Investigation using an interface probe or water level indicator. A summary of the water elevations measured during the investigation are listed in Table 8.

For this task, access to properties adjacent to Murphy's was requested for the purposes of locating existing groundwater monitoring wells within 200 feet of the site boundary. Access was granted to Whitney Barrel (wells MW-4S, MW-4M, MW-4D and BW-3), the Wildwood property (wells BW-2R, BSW-2 and BW-4), and the Connecticut Mutual property (well OW-2). Other wells indicated in the *CIP* on adjacent properties near the Murphy's site were either not found or were inaccessible.

The groundwater elevation data from eight wells (MW-1, MW-2, MW-3, MW-4, MW-5S, MW-6, MR-1SS and MR-2SS) were graphed to show the variation over the period of the investigation (Figure 12). The data show the water levels in the wells consistently rise from September to mid-November, decline thereafter into December, and then rise at the March 1996 event (there were no data collected in January and February). The range of fluctuation during this time period was a maximum of 3.45 feet (at MW-1).

The data for two monitoring events were used to characterize the groundwater table during periods of relatively low and high water table. Data collected from shallow monitoring wells on September 15, 1995 (low) and March 7, 1996 (high) were used to develop groundwater contour plans for the shallow portion of the aquifer, presented as Figures 13 and 14, respectively. Under low water table conditions, the groundwater flow direction was northeasterly toward the wetland. In March 1996, during a period of relatively high water level, the groundwater flow direction was also generally to the northeast. During both monitoring events, the observed horizontal hydraulic gradient was low, in the range of 0.1% to 0.3%.

An apparent trough in the groundwater table is shown in Figure 14 in the area of wells MW-11, MR-1SS and MW-9. The existence of a trough in the area of well MR-1SS was also suggested in a previous groundwater contour plan for data collected on November 9, 1994 (see Figure 6 in the *Addendum*). Cross-Section C-C' (Figure 5) shows the depth to the groundwater table relative to the sewer service connection which crosses this area of the site, indicating that the sewer line is below the groundwater table north of well MW-9. These data suggest that shallow groundwater may drain preferentially along the sewer service connection and along the City sewer which passes through the northern portion of the site.

To evaluate groundwater flow in the deep portion of the aquifer, water levels in the deep wells in the site area (wells MW-3D, MW-5D and MW-10 on the Murphy's site and MW-4D on the Whitney Barrel property) were mapped using data collected on March 7, 1996 (Figure 15). These data indicate groundwater flow to the northeast, east and southeast in a radial pattern centered at well MW-3D. The horizontal hydraulic gradient appeared higher for flow in the deep portion of the aquifer, in the range of 0.5% to 1.0%.

Vertical hydraulic gradients were calculated at shallow and deep well couplets on the site (MW-3/MW-3D, MW-5S/MW-5D and MW-10/MR-2SS) and in the wetland where surface water and groundwater elevation data were collected at a single point (MW-12/SW-A and MW-13/SW-B). A summary of the vertical gradient calculations is presented in Table 9. The vertical gradients at the well couplets were similar in magnitude to the horizontal gradient values presented above, however, the directions of the vertical gradients were inconsistent. The average vertical gradient at MW-3 was upward at +0.1%; the average vertical gradient at MW-5 was downward at -0.1%; the average vertical gradient at MW-10 was upward at +0.3%. The overall range of vertical gradients in all three well couplets ranged from -0.9% to +2.9%. The vertical gradient at MW-10 was consistently upward while the gradient direction fluctuated with no apparent trend at MW-3 and MW-5.

The vertical gradients in the wetland were generally an order of magnitude greater than those determined for the well couplets. Few surface water elevation data were collected at SW-A because the wetland was often dry at that location. The average vertical gradient at MW-13/SW-B was downward at -3.3%, with an overall range from -7.9% to +3.2%. The vertical gradient was downward at MW-13 during all monitoring events except November 17, 1995. On that date, an upward gradient was noted at MW-12 and MW-13 when the surface water and groundwater were at the highest recorded levels. Figure 16 shows the surface water and groundwater elevations at locations MW-12/SW-A and MW-13/SW-B recorded during the investigation. In general, the graphs illustrate a direct relationship between the surface water and groundwater levels, however, the range in elevation of the groundwater appears slightly greater than that of the surface water.

Separate-Phase Product Evaluation

No measurable layer of oil product has been detected on the groundwater at the site, however, evidence of separate-phase oil was observed in several wells. A sheen was observed on the probe

used to gauge water levels at wells MW-12 and MW-13 (in the wetland) during each gauging event. In addition, small oil droplets were observed on purged water from MW-7 on December 18, 1995 during a groundwater sampling event. No other evidence of separate-phase oil on the groundwater has been observed at the site.

Determination of Aquifer Characteristics

Hydraulic conductivity was measured in six new wells on the site (MW-8, MW-9, MW-10, MW-11, MW-12 and MW-13) on November 17 and December 4, 1995 using rising-head and falling-head slug tests. To conduct the rising-head tests (in wells MW-8, MW-9, MW-10 and MW-11), a weighted slug was lowered into the monitoring wells to displace water upward in the well. After equilibration of the water level, the slug was withdrawn and recovery of the water level was recorded using a pressure transducer and an In-Situ environmental data logger. Falling-head tests were performed in wells MW-12 and MW-13 in the wetland because the screens are fully below the water table and because they are too small to accommodate the weighted slugs. The falling-head tests were performed by rapidly filling the well casing with potable water and measuring the change in water level with the data logger. Vertically-averaged values of hydraulic conductivity over the screened interval in each well were calculated by the Hvorslev Method. Results of the aquifer testing are presented in Appendix F and are summarized in Table 10.

Aquifer Characteristics

Rising-head slug tests performed in the new monitoring wells yielded an average hydraulic conductivity value of 1.86×10^{-2} centimeter per second (cm/sec). This is a typical value for clean sand (Ref. 3) and is consistent with values previously measured for other existing wells on the site (average of 3.3×10^{-2} cm/sec), as documented in the *Addendum*. The falling-head tests in wells MW-12 and MW-13 in the wetland yielded values of 2.64×10^{-3} cm/sec and 2.00×10^{-3} cm/sec, respectively. These values are an order of magnitude lower than values calculated for the other monitoring wells and likely reflect the finer-grained soils present in the wetland.

Results of grain size analyses of composite soil samples obtained from the screened interval in each of the new borings are presented in Appendix G. These data were generally consistent with visual observations made during drilling. Based on the grain size analyses, soil samples from the

screened interval in the shallow borings are characterized as poorly-sorted sand with up to 50% fine gravel and less than 10% silt and clay. The highest percentages of coarse material were found at MW-8 and MW-10, where gravel was from 40% to 50% of the total sample weight (MW-8 had the highest hydraulic conductivity value calculated for the site). Samples from MW-9 and MW-11 yielded the lowest percentage of coarse (gravel) material in the shallow borings. Finer material was indicated in the sample from deep boring MW-3D, which contained 65% poorly-sorted sand and 35% silt and clay (with no gravel). These overall results are consistent with grain size data presented previously.

The average linear velocity of groundwater flow at each well was calculated using measured values of hydraulic conductivity and hydraulic gradient (average of 0.2%) and an assumed value of effective porosity of the soil matrix (25%). Using these values, the average horizontal linear velocity in the shallow aquifer is calculated to be 0.30 foot per day (ft/d). Based on the low vertical gradients measured at well clusters MW-3, MW-5 and MW-10 (average values from -0.1% to +0.3%), the vertical linear velocity is also expected to be less than one ft/d. Slightly higher vertical linear velocities may be expected in the wetland (up to 2.1 ft/d), where a downward gradient at well MW-13 indicates that surface water generally recharges groundwater.

Groundwater and Surface Water Sampling

The newly-installed wells and existing wells on the site were sampled on November 7 and December 18, 1995. The wells were purged by removal of at least three casing volumes of groundwater to assure that representative samples were obtained. Field measurements were then recorded in each of the wells for temperature, specific conductance and pH. Summaries of the field data are presented in Tables 11 and 12. Surface water samples were collected from the wetland on November 9, 1995. Surface water samples were not collected during the December sample event due to frozen conditions.

Water samples from each of the wells were obtained using disposable polyethylene bailers; surface water samples were obtained by direct filling of the sample containers. Each of the samples were laboratory-analyzed for VOCs (by EPA Method 624), SVOCs (by EPA Method 625), PCB compounds (by EPA Method 608), and dissolved lead. During the November sample event, groundwater samples from the newly-installed wells and surface water samples were additionally

analyzed for dissolved arsenic, cadmium and zinc, and amenable cyanide. Trip blanks and blind duplicates were prepared during both sample events for quality control.

Groundwater and Surface Water Analytical Results

Analytical results of the groundwater and surface water samples collected during this investigation are presented in Appendix H and are summarized with previous data in Tables 13 through 15. A total of nine VOCs were detected during the four sample events performed at the site (Table 13). Non-halogenated BTEX compounds, including benzene, toluene and xylenes were previously detected only in groundwater samples from well MR-2SS at total concentrations up to 345 micrograms per liter (ug/l). During the most recent sample events performed in 1995, only benzene was detected in well MR-2SS at a concentration of 5 ug/l (December sample event only).

Acetone, another non-halogenated VOC, was detected at low concentrations (up to 43 ug/l) in ten samples collected at the site on November 7, 1995. Nine of the ten detections were analyzed on the same day. The trip blank which accompanied the samples did not contain acetone, however, the blank was analyzed on a different day than the groundwater samples. Because acetone has not been detected previously in groundwater at the site and because the concentrations detected are similar in magnitude, it is considered likely that the acetone is due to laboratory contamination and is not representative of site conditions. With the exception of acetone, no VOCs were detected in surface water samples SW-A or SW-B.

Chlorinated VOCs, including trans-1,2-DCE, TCE, 1,1-DCA, vinyl chloride and 1,1,1-TCA, have been detected in several wells in the northern portion of the site (MW-3, MW-9, MW-11, MW-12, MR-1SS, and MW-2SS). The highest concentrations of chlorinated VOCs were detected in samples collected in December 1995 from shallow wells MW-3 (total concentration of 3,710 ug/l) and MW-11 (total concentration of 610 ug/l) with lower concentrations in the other wells. The most abundant of the chlorinated VOCs in well MW-3 was trans-1,2-DCE (up to 3,100 ug/l); this compound was not detected at well MW-11. With the exception of acetone (discussed above), VOCs were not detected in groundwater samples from any of the deep wells (MW-3D, MW-5D and MW-10).

SVOC analyses of the groundwater and surface water samples detected bis-2-ethylhexyl phthalate (a common laboratory contaminant) in one sample (MW-13) during the December sample event at a

very low concentration (23 ug/l). Other than that one detection, SVOCs were not detected in any of the groundwater or surface water samples during either sample event. Typical PQLs for the PAH subclass of SVOCs are summarized in Table 14. Elevated PQLs were reported in three samples during two sampling events in 1995. The November 1995 sampling event at MW-13 reported an elevated PQL, and the December 1995 sampling event reported elevated PQLs in the samples from MW-7, MW-13 and MR-2SS. The elevated PQLs were reportedly due to a hydrocarbon background in the sample matrix.

PCB compounds were detected only in the groundwater samples collected from MW-13 in the wetland (Table 14). PCBs were detected during both the November and December 1995 sample events at concentrations of 1.6 ug/l (Aroclor 1254) and 3.8 ug/l (Aroclor 1254), respectively. No PCB compounds were detected in surface water samples collected from locations SW-A or SW-B.

Results of groundwater and surface water analyses of inorganic constituents are summarized in Table 15. Dissolved arsenic has been detected at low concentrations (up to 0.006 mg/l) in five wells (MW-3, MW-5D, MW-11, MW-12, MW-13) and two surface water locations (SW-A and SW-B). It is noted that all of these locations are in or adjacent to the wetland. Cadmium was not detected above the PQL at any location during the 1995 sampling. Lead was detected at eight locations in 1995 (MW-3, MW-7, MW-9, MW-13, MR-2SS, SW-A and SW-B) at concentrations up to 0.013 mg/l. Zinc was detected at three locations in 1995 (MW-12, MW-13 and SW-A) at concentrations up to 2.0 mg/l. Cyanide was not detected above the PQL (0.02 mg/l) in any sample analyzed.

SUMMARY AND DISCUSSION

This *CARP* was prepared to satisfy requirements stipulated in the RCRA Part B Permit for the Murphy's Waste Oil Service, Inc. facility in Woburn, Massachusetts. The report presents results of recent subsurface investigation, including analysis of soils and groundwater at the facility. The data contained in this report supplement the *Hydrogeologic Characterization Report and Addendum*, which included summaries of previous investigations, regional geology and hydrogeology, and descriptions of the past use of petroleum and known releases on the site.

The analytical results presented in this report verified findings of previous investigations which identified oil-impacted soils in the former aboveground tank area and the former oil pit area (current

location of the facility building). VOC, TPH and PAH-impacted soils were detected at shallow depths in the area of the former aboveground storage tanks near borings B-13, B-14 and B-18 in the northern portion of the site. Analyses of shallow soils (sample depth of 0 to 4.5 feet) in this area also detected VOCs (primarily chlorinated) at total concentrations up to 1,540 ug/kg, TPH up to 6,400 mg/kg, and PAHs up to 37,450 ug/kg. The data indicate these contaminants are present in the soils down to the groundwater table in the area of boring B-14. This impacted area is delineated by comparatively unimpacted soil observed in borings B-15, B-16 and MW-1 to the west, B-12 and B-7 to the north, B-8, B-9 and MW-9 to the east, and B-19 to the south.

Elevated levels of petroleum-related compounds were also detected in shallow soils in the area of the facility building (near borings MW-7, B-4 and B-17). PAHs were detected at total concentrations up to 73,700 ug/kg. Low levels of TPH (up to 730 ug/kg) were also detected in the shallow soils in these borings. Elevated levels of non-halogenated VOCs (up to 60,000 ug/kg), TPH (up to 4,000 mg/kg) and PAHs (up to 18,470 ug/kg) were detected in soils at the groundwater table at MW-7. TPH and PAH-impacted soils extend to a depth of at least four feet below the groundwater table at boring B-4.

It is likely that PAHs, TPH and non-halogenated VOCs in soils in the facility building area are related to the former oil pit which was located in the central portion of the site. During the Short-Term Measure performed in 1989, a total of 1,100 cubic yards of petroleum-impacted soil were excavated from the footprint area of the facility building and disposed. The excavation extended to a depth of at least seven to eight feet below grade. Based on analytical results from boring B-4, it is possible that residual concentrations of PAHs, TPH and non-halogenated VOCs may exist beneath portions of the facility building at depths greater than eight feet below grade.

Soil sampling in the wetland on the site established the horizontal distributions of TPH, PCB compounds, lead and chromium. Elevated concentrations of TPH (up to 97,000 mg/kg) and lead (up to 35,100 mg/kg) were detected in shallow soils (sample depth of 6 to 18 inches) in the west side of the wetland at locations SW-2, P-12, P-14, P-15 and P-18. Based on this distribution, it is likely that the TPH and lead originated from the former tank area in the northern portion of the site. Since elevated concentrations of TPH and lead were not detected at depth in soil boring samples adjacent to the wetland, the contaminants probably did not migrate into the wetland via the groundwater.

PCB compounds were detected in the wetland soils with no apparent trend in distribution. Although the highest concentration (220 mg/kg) was detected on the west side of the wetland adjacent to Murphy's, localized areas of elevated PCB concentrations were also identified on the east side of the wetland adjacent to Whitney Barrel. During the previous investigations, PCBs were detected only at low concentrations (up to 0.6 mg/kg) in soil samples collected outside of the wetland on the Murphy's site. PCB compounds have been detected in soils on the Whitney Barrel and Wildwood properties at concentrations up to 0.5 mg/kg and 130 mg/kg, respectively (Ref. 1, 2).

Elevated concentrations of total chromium (up to 66,500 mg/kg) were detected in wetland soils in the area of locations P-23 through P-27 north of the former tank area. The sample yielding the highest concentration of total chromium contained only 1.4 mg/kg of hexavalent chromium. The wetland area impacted by chromium is well-defined, and follows a linear path oriented approximately north-south. Delineation sampling along the edge of the wetland adjacent to Murphy's did not indicate an on-site source for the chromium. Instead, the data suggest an off-site source located north of location P-24. A corroded steel tank located in the wetland adjacent to P-24, at or over the property line, is considered to be a potential source of the elevated levels of chromium.

Results of this investigation indicated very low vertical and horizontal hydraulic gradients on the site (0.1% to 0.3%). The prevailing groundwater flow direction in the shallow and deep portions of the aquifer appears to be to the northeast. The average horizontal linear velocity in the shallow aquifer was calculated to be 0.30 ft/d. The average vertical linear velocity is also expected to be less than 1.00 ft/d. Slightly higher vertical seepage velocities may be expected in the wetland (up to 2.1 ft/d), where a persistent downward gradient indicates that surface water generally recharges groundwater.

There were no measurable accumulations of separate-phase oil noted in the monitoring wells during the investigation, however, oil droplets and/or sheening on purged water were observed in three of the wells (MW-7, MW-12 and MW-13). Groundwater and surface water analyses performed during this investigation indicated low concentrations of non-halogenated VOCs (up to 345 ug/l), SVOCs (up to 23 ug/l) and dissolved metals (arsenic up to 0.006 mg/l; lead up to 1.4 mg/l; and zinc up to 2.0 mg/l). PCB compounds were detected only in well MW-13 in the wetland at very low concentrations (up to 3.8 ug/l).

This investigation verified previous data indicating the presence of chlorinated VOCs in shallow groundwater in the northern portion of the site. Chlorinated VOCs were observed at the highest levels in groundwater samples from wells MW-3 (total concentration up to 3,710 ug/l) and MW-11 (up to 610 ug/l), and at lower levels in samples from wells MW-9, MW-12, MW-8, MR-1SS and MR-2SS. Chlorinated VOCs were not detected in any of the deep wells on the site.

The most abundant of the chlorinated VOCs detected in the shallow groundwater was trans-1,2-DCE (up to 3,100 ug/l in well MW-3). Groundwater samples from well MW-11 contained primarily 1,1,1-TCA, but did not contain any trans-1,2-DCE. Trans-1,2-DCE is a product of chemical or biological degradation of TCE and 1,1,1-TCA (Ref. 4). These data suggest that the chlorinated VOCs in groundwater at well MW-3 have undergone more degradation than at MW-11, indicating a longer travel-time from the source. Since the highest concentrations were observed at well MW-3, the source area for the chlorinated VOCs is expected to be upgradient from that well in a southwesterly direction. The area of borings B-13, B-14 and B-18 is considered to be a possible source area, since chlorinated VOCs were detected in shallow soils in those borings, and this area is located upgradient of well MW-3. However, groundwater analytical data from MW-9 (located nearer to and downgradient from these borings) indicated only low levels of chlorinated VOCs. Chlorinated VOCs were not detected in shallow soils in any other areas of the site which would indicate a possible source area. Other possible source areas of chlorinated VOCs have been identified on the Wildwood property (Ref. 2). Based on the evidence above, the available data are inconclusive regarding a source of chlorinated VOCs in the site groundwater.

REFERENCES

1. Draft Remedial Investigation, Southwest Properties, Wells G&H Superfund Site, Woburn, Massachusetts, by Remediation Technologies, Inc., February 1994.
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3. Freeze, R.A. & J.A. Cherry, "Groundwater." Prentice-Hall, Inc. 1979.
4. Smith, L.R. and J. Dragan, 1984. "Degradation of Volatile Chlorinated Aliphatic Priority Pollutants in Groundwater," Environment Int'l Volume 10, p. 291-298.

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TABLE 1
FIELD-SCREENING RESULTS
Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Location	Sample	Depth (feet)	VOC Headspace (ppm)	Comments
B-1	SS-1	0.5-2.5	<1	Fill
	SS-2	2.5-4.5	4.0	"
	SS-3	4.5-6.5	7.0	"
	SS-4	6.5-8.5	<1	Sand and Gravel
	SS-5	8.5-10.5	2.0	"
	SS-6	10.5-12.5	4.0	"
B-2	SS-1	0.5-2.5	16	Fill
	SS-2	2.5-4.5	24	"
	SS-3	4.5-6.5	160	"
	SS-4	6.5-8.5	100	Sand and Gravel
	SS-5	8.5-10.5	100	"
	SS-6	10.5-12.5	150	"
B-4	SS-1	0-2	3.0	Fill
	SS-2	2-4	1.8	"
	SS-3	4-6	1.4	"
	SS-4	6-8	4.0	Sand and Gravel
	SS-5	8-10	—	"
	SS-6	10-12	>1,000	"
	SS-7	12-14	>1,000	"
B-5	SS-1	0-2	<1	Fill
	SS-2	2-4	<1	"
	SS-3	4-6	<1	"
	SS-4	6-8	<1	Sand & Gravel
	SS-5	8-10	<1	"
	SS-6	10-12	1.2	"
	SS-7	12-14	3.6	"
B-6	SS-1	0-2	1.2	Fill
	SS-2	2-4	19	"
	SS-3	4-6	<1	"
	SS-4	6-8	<1	Sand and Gavel
	SS-5	8-10	8.2	"
	SS-6	10-12	3.0	"
B-7	SS-1	0-2	<1	Fill
	SS-2	2-4	—	"
	SS-3	4-6	<1	"
	SS-4	6-8	48	Sand and Gavel
	SS-5	8-10	>1,000	"
	SS-6	10-12	600	"
B-8	SS-1	0-2	<1	Fill
	SS-2	2-4	<1	"
	SS-3	4-6	<1	"
	SS-4	6-8	>1,000	Sand with little Gravel
	SS-5	8-10	>1,000	"
	SS-6	10-12	280	"

TABLE 1 (continued)
FIELD-SCREENING RESULTS
Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Location	Sample	Depth (feet)	VOC Headspace (ppm)	Comments
B-9	SS-1	0-2	<1	Fill
	SS-2	2-4	<1	"
	SS-3	4-6	<1	"
	SS-4	6-8	28	Sand with little Gravel
	SS-5	8-10	850	"
	SS-6	10-12	180	"
B-10	SS-1	0-2	<1	Fill
	SS-2	2-4	<1	"
	SS-3	4-6	<1	"
	SS-4	6-8	1.8	Sand with little Gravel
	SS-5	8-10	2.0	"
	SS-6	10-12	30	"
B-11	SS-1	0-2	<1	Fill
	SS-2	2-4	<1	"
	SS-3	4-6	<1	"
	SS-4	6-8	12	Sand with little Gravel
	SS-5	8-10	32	"
	SS-6	10-12	325	"
B-12	SS-1	0-2	<1	Fill
	SS-2	2-4	<1	"
	SS-3	4-6	<1	"
	SS-4	6-8	2.6	Sand with little Gravel
	SS-5	8-10	4.2	"
	SS-6	10-12	1.6	"
B-13	SS-1	0-2	40	Fill
	SS-2	2-4	17	"
	SS-3	4-6	38	"
	SS-4	6-8	>1,000	Sand with little Gravel
	SS-5	8-10	>1,000	"
	SS-6	10-12	>1,000	"
B-14	SS-1	0.5-2.5	95	Fill
	SS-2	2.5-4.5	>1,000	"
	SS-3	4.5-6.5	>1,000	"
	SS-4	6.5-8.5	>1,000	Sand with little Gravel
	SS-5	8.5-10.5	>1,000	"
	SS-6	10.5-12.5	850	"
B-15	SS-1	0-2	<1	Fill
	SS-2	2-4	3.0	"
	SS-3	4-6	<1	"
	SS-4	6-8	<1	Sand with little Gravel
	SS-5	8-10	1.5	"
	SS-6	10-12	3.5	"
	SS-7	12-14	18	"

TABLE 1 (continued)
FIELD-SCREENING RESULTS
Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Location	Sample	Depth (feet)	VOC Headspace (ppm)	Comments
B-16	SS-1	0-2	<1	Fill
	SS-2	2-4	<1	"
	SS-3	4-6	<1	"
	SS-4	6-8	<1	Sand with little Gravel
	SS-5	8-10	<1	"
	SS-6	10-12	1.8	"
	SS-7	12-14	1.2	"
B-17	SS-1	0-2	8.2	Fill
	SS-2	2-4	70	"
	SS-3	4-6	14	"
	SS-4	6-8	1.5	Sand with little Gravel
	SS-5	8-10	3.8	"
	SS-6	10-12	1.4	"
B-18	SS-1	0-2	5.8	Fill
	SS-2	2-4	2.6	"
	SS-3	4-6	2.0	"
	SS-4	6-8	4.6	Sand with little Gravel
	SS-5	8-10	3.2	"
	SS-6	10-12	6.4	"
	SS-7	12-14	1.2	"
B-19	SS-1	0-2	<1	Fill
	SS-2	2-4	—	"
	SS-3	4-6	<1	Sand with little Gravel
	SS-4	6-8	7.6	"
	SS-5	8-10	<1	"
	SS-6	10-12	<1	"
B-20	SS-1	0-2	<1	Fill
	SS-2	2-4	—	"
	SS-3	4-6	<1	Sand with little Gravel
	SS-4	6-8	5.8	"
	SS-5	8-10	1.2	"
	SS-6	10-12	<1	"
MW-3D	SS-1	14-16	<1	Sand with little Gravel
	SS-2	19-21	<1	"
	SS-3	24-26	<1	"
	SS-4	29-31	<1	"
	SS-5	34-36	<1	"
	SS-6	39-41	1.2	"
	SS-7	44-46	<1	Gravel with trace Sand
	SS-8	49-51	<1	"

TABLE 1 (continued)
FIELD-SCREENING RESULTS
Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Location	Sample	Depth <i>(feet)</i>	VOC Headspace <i>(ppm)</i>	Comments
MW-7	SS-1	0.5-2.5	60	Fill
	SS-2	2.5-4.5	230	"
	SS-3	4.5-6.5	350	"
	SS-4	6.5-8.5	460	"
	SS-5	8.5-10.5	70	Sand
	SS-6	10.5-12.5	100	"
MW-8	SS-1	0-2	1.6	Fill
	SS-2	2-4	3.0	"
	SS-3	4-6	5.8	"
	SS-4	6-8	<1	"
	SS-5	8-10	<1	Sand with little Gravel
	SS-6	10-12	<1	"
MW-9	SS-1	0-2	<1	Fill
	SS-2	2-4	---	"
	SS-3	4-6	2.3	"
	SS-4	6-8	---	Sand with little Gravel
	SS-5	8-10	1.8	"
	SS-6	10-12	3.0	"
MW-10	SS-1	15-17	80	Sand and Gravel
	SS-2	17-19	68	"
	SS-3	24-26	2.7	"
	SS-4	29-31	5.0	"
	SS-5	34-36	2.8	"
	SS-6	39-41	4.0	"
	SS-7	41-46	1.7	"
MW-11	SS-1	0-2	<1	Sand and Loam
	SS-2	2-4	<1	"
	SS-3	4-6	4	Sand with little Gravel
	SS-4	6-8	18	"
	SS-5	8-10	740	"
	SS-6	10-12	58	"

Notes:

1. Headspace VOCs measured using Foxboro 128 GC Flame Ionization Detector.
2. --- = Sample not screened.

**TABLE 2
SOIL ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS**

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, MA

Location	Samples	Depth (feet)	Benzene (ug/kg)	Toluene (ug/kg)	Total Xylenes (ug/kg)	Acetone (ug/kg)	Chloro- ethane (ug/kg)	PCE (ug/kg)	1,1-DCA (ug/kg)	1,1,1-TCA (ug/kg)	TCE (ug/kg)	t-1,2-DCE (ug/kg)	Vinyl Chloride (ug/kg)	2-Butanone (ug/kg)
B-1	(SS-3)	4.5-6.5	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-1	(SS-5)	8.5-10.5	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-2	(SS-3)	4.5-6.5	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-4	(SS-1)	0-2	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-4	(SS-6)	10-12	ND(10)	ND(15)	290	ND(100)	ND(20)	ND(15)	ND(15)	ND(10)	ND(10)	ND(15)	ND(35)	ND(45)
B-6	(SS-5)	8-10	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-7	(SS-5)	8-10	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-8	(SS-1)	0-2	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-8	(SS-4)	6-8	ND(7.5)	ND(11)	ND(7.5)	ND(75)	ND(15)	ND(11)	ND(11)	ND(7.5)	ND(7.5)	ND(11)	ND(26)	ND(34)
B-9	(SS-5)	8-10	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-10	(SS-6)	10-12	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-11	(SS-4)	6-8	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-11	(SS-6)	10-12	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-12	(SS-5)	8-10	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-13	(SS-1)	0-2	ND(10)	ND(15)	ND(10)	ND(100)	ND(20)	29	46	32	86	210	ND(35)	ND(45)
B-13	(SS-5)	8-10	ND(10)	ND(15)	ND(10)	ND(100)	ND(20)	ND(15)	ND(15)	ND(10)	ND(10)	ND(15)	ND(35)	ND(45)
B-14	(SS-2)	2.5-4.5	ND(500)	ND(750)	1,300	ND(5000)	ND(1000)	ND(750)	ND(750)	ND(500)	ND(500)	ND(750)	ND(1800)	ND(2300)
B-14	(SS-5)	8.5-10.5	ND(200)	380	580	ND(2000)	ND(400)	ND(300)	ND(300)	ND(200)	ND(200)	ND(300)	ND(700)	ND(900)
B-15	(SS-5)	8-10	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-15	(SS-7)	12-14	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-16	(SS-6)	10-12	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	68	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
B-17	(SS-2)	2-4	ND(250)	ND(250)	ND(250)	ND(980)	ND(490)	ND(250)	ND(250)	ND(250)	ND(250)	ND(250)	ND(490)	ND(980)
B-18	(SS-1)	0-2	ND(230)	ND(230)	ND(230)	ND(910)	ND(450)	240	ND(230)	ND(230)	1,300	ND(230)	ND(450)	ND(910)
B-18	(SS-3)	4-6	ND(250)	ND(250)	ND(250)	ND(990)	ND(490)	300	ND(250)	ND(250)	680	ND(250)	ND(490)	ND(990)
B-19	(SS-4)	6-8	ND(990)	ND(990)	ND(990)	ND(4000)	ND(2000)	ND(990)	ND(990)	ND(990)	ND(990)	ND(990)	ND(2000)	ND(4000)
B-20	(SS-4)	6-8	ND(5)	ND(5)	ND(5)	ND(20)	ND(10)	ND(15)	ND(5)	ND(5)	ND(5)	ND(5)	ND(10)	ND(20)
MW-1	(SS-5)	8-10	ND(5)	ND(5)	ND(5)	ND(20)	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(10)	ND(20)
MW-2	(SS-2)	2-4	ND(5)	ND(5)	ND(5)	210	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(10)	50
MW-3	(SS-6)	10-12	ND(5)	ND(5)	ND(5)	ND(20)	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(10)	ND(20)
MW-3D	(SS-6)	39-41	ND(5)	ND(5)	ND(5)	ND(20)	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(10)	ND(20)
MW-4	(SS-6)	10-12	ND(5)	ND(5)	ND(5)	23	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(10)	ND(19)
MW-5S	(SS-6)	10-12	ND(5)	ND(5)	ND(5)	ND(18)	ND(9)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(9)	ND(18)
MW-6	(SS-1)	0-2	ND(5)	ND(5)	ND(5)	ND(20)	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(10)	ND(20)
MW-7	(SS-2)	2.5-4.5	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
MW-7	(SS-4)	6.5-8.5	ND(750)	12,000	48,000	ND(7500)	ND(1500)	ND(1100)	ND(1100)	ND(750)	ND(1100)	ND(1100)	ND(2600)	ND(3400)
MW-9	(SS-6)	10-12	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
MW-10	(SS-2)	17-19	ND(5)	ND(5)	ND(5)	ND(20)	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(10)	ND(20)
MW-10	(SS-4)	29-31	ND(5)	ND(5)	ND(5)	ND(20)	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(10)	ND(20)
MW-11	(SS-3)	4-6	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)
MW-11	(SS-5)	8-10	ND(5)	ND(7.5)	ND(5)	ND(50)	ND(10)	ND(7.5)	ND(7.5)	ND(5)	ND(5)	ND(7.5)	ND(18)	ND(23)

Notes:

- () = number in parentheses is laboratory Practical Quantitation Limit (PQL)
- ND = none detected above PQL
- ug/kg = micrograms per kilogram
- All analyses by EPA Method 8260
- Cis-1, 2-dichloroethene reported as trans-1, 2-dichloroethene
- Results for MW-1, MW-2, MW-3, MW-4, MW-5S and MW-6 from October 1994

**TABLE 3
SOIL ANALYTICAL RESULTS
TPH & POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS**

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, MA

Location	Sample	Depth (feet)	TPH mg/kg	Naphthalene (ug/kg)	Acenaphthylene (ug/kg)	Acenaphthene (ug/kg)	Fluorene (ug/kg)	Phenanthrene (ug/kg)	Anthracene (ug/kg)	Fluoranthene (ug/kg)	Pyrene (ug/kg)
B-1	(SS-3)	4.5-6.5	23	45	ND(41)	ND(41)	ND(8.4)	28	ND(21)	41	29
B-1	(SS-5)	8.5-10.5	16	ND(78)	ND(78)	ND(78)	ND(16)	65	ND(40)	100	100
B-2	(SS-3)	4.5-6.5	94	ND(290)	ND(290)	ND(290)	ND(59)	350	ND(150)	920	540
B-4	(SS-1)	0-2	660	ND(3200)	ND(3200)	3,200	730	5,600	1,600	7,000	7,600
B-4	(SS-6)	10-12	7,700	ND(750)	ND(750)	ND(750)	180	560	ND(390)	430	310
B-6	(SS-5)	8-10	ND(10)	ND(40)	ND(40)	220	ND(8.1)	28	ND(21)	56	46
B-7	(SS-5)	8-10	11	ND(40)	ND(40)	ND(40)	ND(8.0)	ND(20)	ND(20)	9.3	ND(8.0)
B-8	(SS-1)	0-2	1,600	400	150	410	18	100	ND(22)	240	220
B-8	(SS-4)	6-8	38	ND(540)	940	580	ND(110)	660	ND(280)	1,200	730
B-9	(SS-5)	8-10	13	ND(40)	ND(40)	ND(40)	ND(8.1)	ND(20)	ND(20)	ND(8.1)	ND(8.1)
B-10	(SS-6)	10-12	14	ND(40)	ND(40)	ND(40)	ND(8.1)	ND(21)	ND(21)	9.5	ND(8.1)
B-11	(SS-4)	6-8	ND(10)	ND(40)	ND(40)	ND(40)	ND(8.2)	ND(21)	ND(21)	28	22
B-11	(SS-6)	10-12	ND(10)	ND(39)	ND(39)	ND(39)	ND(8.0)	ND(20)	ND(20)	ND(8.0)	ND(8.0)
B-12	(SS-5)	8-10	150	ND(39)	ND(39)	ND(39)	ND(7.9)	ND(20)	ND(20)	ND(7.9)	ND(7.9)
B-13	(SS-1)	0-2	4,700	ND(1400)	ND(1400)	ND(1,400)	ND(290)	2,200	ND(730)	3,600	4,300
B-13	(SS-5)	8-10	1,200	ND(160)	ND(160)	ND(160)	65	320	88	200	190
B-14	(SS-2)	2.5-4.5	6,400	ND(1500)	ND(1500)	ND(1500)	300	890	ND(750)	820	410
B-14	(SS-5)	8.5-10.5	3,000	ND(400)	ND(400)	ND(400)	120	570	ND(210)	560	410
B-15	(SS-5)	8-10	11	ND(39)	ND(39)	70	ND(7.8)	ND(20)	ND(20)	ND(7.8)	ND(7.8)
B-15	(SS-7)	12-14	ND(10)	ND(38)	ND(38)	38	ND(7.8)	ND(20)	ND(20)	ND(7.8)	ND(7.8)
B-16	(SS-6)	10-12	240	ND(39)	52	ND(39)	ND(7.8)	59	ND(20)	41	11
B-17	(SS-2)	2-4	730	ND(2900)	3,200	5,100	700	9,000	2,600	11,000	13,000
B-18	(SS-1)	0-2	1,100	ND(1400)	4,100	4,200	ND(280)	5,000	ND(710)	5,900	5,300
B-18	(SS-3)	4-6	86	ND(240)	730	580	ND(50)	820	ND(130)	1,100	940
B-19	(SS-4)	6-8	1,700	ND(4700)	ND(4700)	ND(4700)	ND(4700)	ND(4700)	ND(4700)	ND(470)	ND(470)
B-20	(SS-4)	6-8	450	ND(4400)	ND(4400)	ND(4400)	ND(4400)	ND(4400)	ND(4400)	660	480
MW-1	(SS-1)	0-2	130	---	---	---	---	---	---	---	---
MW-1	(SS-5)	8-10	ND(10)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND(330)	ND(330)
MW-2	(SS-1)	0-2	130	---	---	---	---	---	---	---	---
MW-2	(SS-2)	2-4	130	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND(3,300)	ND(3,300)
MW-2	(SS-4A)	7.5-9.5	15	---	---	---	---	---	---	---	---
MW-3	(SS-1)	0-2	320	---	---	---	---	---	---	---	---
MW-3	(SS-4)	6-8	61	---	---	---	---	---	---	---	---
MW-3	(SS-6)	10-12	ND(10)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND(330)	ND(330)
MW-3D	(SS-6)	39-41	ND(10)	ND(42)	ND(42)	ND(42)	ND(8.5)	ND(21)	ND(21)	ND(8.5)	ND(8.5)

TABLE 3 (continued)
SOIL ANALYTICAL RESULTS
TPH & POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS

Murphy's Waste Oil Service, Inc.
 252 Salem Street
 Woburn, MA

Location	Sample	Depth (feet)	TPH mg/kg	Naphthalene (ug/kg)	Acenaphthylene (ug/kg)	Acenaphthene (ug/kg)	Fluorene (ug/kg)	Phenanthrene (ug/kg)	Anthracene (ug/kg)	Fluoranthene (ug/kg)	Pyrene (ug/kg)
MW-4	(SS-1)	0-2	470	---	---	---	---	---	---	---	---
MW-4	(SS-5)	8-10	12	---	---	---	---	---	---	---	---
MW-4	(SS-6)	10-12	ND(10)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND(330)	ND(330)
MW-5S	(SS-1)	0-2	140	---	---	---	---	---	---	---	---
MW-5S	(SS-6)	10-12	ND(10)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND (330)	ND(330)	ND(330)
MW-6	(SS-1)	0-2	180	ND(3,200)	ND(3,200)	ND(3,200)	ND(3,200)	ND(3,200)	ND(3,200)	ND(3,200)	ND(3,200)
MW-6	(SS-8)	18-20	ND(10)	---	---	---	---	---	---	---	---
MW-7	(SS-2)	2.5-4.5	230	740	ND(690)	ND(690)	ND(140)	380	ND(350)	740	230
MW-7	(SS-4)	6.5-8.5	4,000	ND(1500)	ND(1500)	ND(1500)	310	1,900	ND(750)	3,700	3,100
MW-9	(SS-6)	10-12	ND(10)	ND(41)	ND(41)	ND(41)	ND(8.3)	ND(21)	ND(21)	ND(8.3)	ND(8.3)
MW-10	(SS-2)	17-19	94	ND(190)	ND(190)	ND(190)	ND(39)	130	ND(98)	240	250
MW-10	(SS-4)	29-31	11	ND(37)	ND(37)	ND(37)	ND(7.5)	ND(19)	ND(19)	ND(7.5)	ND(7.5)
MW-11	(SS-3)	4-6	49	ND(230)	ND(230)	ND(230)	ND(47)	200	ND(120)	100	90
MW-11	(SS-5)	8-10	26	ND(40)	ND(40)	ND(40)	ND(8.2)	35	ND(21)	10	ND(8.2)

Notes:

1. () = number in parentheses is laboratory Practical Quantitation Limit (PQL)
2. ND = none detected above PQL
3. ug/kg = micrograms per kilogram
4. --- = not analyzed for that parameter
5. Results for MW-1, MW-2, MW-3, MW-4, MW-5S and MW-6 from October 1994

TABLE 3 (continued)
SOIL ANALYTICAL RESULTS
TPH & POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS

Murphy's Waste Oil Service, Inc.
 252 Salem Street
 Woburn, MA

Location	Samples	Depth (feet)	Benzo (a) anthracene (ug/kg)	Chrysene (ug/kg)	Benzo (b) fluoranthene (ug/kg)	Benzo (k) fluoranthene (ug/kg)	Benzo (a) pyrene (ug/kg)	Indeno (1,2,3-cd) pyrene (ug/kg)	Dibenzo (a,h) anthracene (ug/kg)	Benzo (g,h,i) perylene (ug/kg)
B-1	(SS-3)	4.5-6.5	16	23	18	8.8	18	7.0	1.6	16
B-1	(SS-5)	8.5-10.5	44	59	44	22	60	14	10	64
B-2	(SS-3)	4.5-6.5	440	420	380	200	540	77	44	370
B-4	(SS-1)	0-2	3,000	3,700	2,300	1,300	2,800	6,500	210	2,300
B-4	(SS-6)	10-12	170	500	150	51	220	61	ND(23)	150
B-6	(SS-5)	8-10	24	37	25	13	31	17	3.3	27
B-7	(SS-5)	8-10	3.1	ND(6.0)	4.2	2.0	3.4	2.5	ND(1.2)	3.5
B-8	(SS-1)	0-2	58	100	72	36	58	8.9	5.4	41
B-8	(SS-4)	6-8	370	350	580	280	390	300	46	500
B-9	(SS-5)	8-10	1.0	ND(6.0)	3.2	1.2	2.8	ND(2.0)	ND(1.2)	4.1
B-10	(SS-6)	10-12	3.7	ND(6.0)	4.0	2.1	4.5	3.6	ND(1.2)	4.6
B-11	(SS-4)	6-8	11	12	9.4	4.8	8.7	2.9	ND(1.2)	6.2
B-11	(SS-6)	10-12	3.3	ND(5.9)	3.4	1.8	3.0	ND(2.0)	ND(1.2)	3.3
B-12	(SS-5)	8-10	0.83	ND(5.9)	2.7	1.3	3.6	2.8	ND(1.2)	5.8
B-13	(SS-1)	0-2	1,000	1,900	1,800	820	1,600	510	110	1,400
B-13	(SS-5)	8-10	74	250	75	33	93	88	12	48
B-14	(SS-2)	2.5-4.5	240	380	300	140	240	ND(75)	ND(44)	80
B-14	(SS-5)	8.5-10.5	210	700	290	120	320	32	19	190
B-15	(SS-5)	8-10	ND(0.78)	ND(5.8)	ND(0.78)	ND(0.78)	ND(0.78)	ND(2.0)	ND(1.2)	ND(2.0)
B-15	(SS-7)	12-14	ND(0.78)	ND(5.8)	ND(0.78)	ND(0.78)	0.93	ND(2.0)	ND(1.2)	2.7
B-16	(SS-6)	10-12	9.5	14	20	6.8	9.7	ND(2.0)	ND(1.2)	22
B-17	(SS-2)	2-4	4,900	7,100	4,100	2,300	5,900	420	380	4,000
B-18	(SS-1)	0-2	990	3,100	1,800	1,000	2,200	2,000	160	1,700
B-18	(SS-3)	4-6	170	620	410	200	400	670	30	310
B-19	(SS-4)	6-8	ND(470)	ND(470)	ND(470)	ND(470)	ND(470)	ND(470)	ND(470)	ND(470)
B-20	(SS-4)	6-8	ND(440)	ND(440)	ND(440)	ND(440)	ND(440)	ND(440)	ND(440)	ND(440)
MW-1	(SS-1)	0-2	---	---	---	---	---	---	---	---
MW-1	(SS-5)	8-10	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)
MW-2	(SS-1)	0-2	---	---	---	---	---	---	---	---
MW-2	(SS-2)	2-4	ND(3,300)	ND(3,300)	ND(3,300)	ND(3,300)	ND(3,300)	ND(3,300)	ND(3,300)	ND(3,300)
MW-2	(SS-4A)	7.5-9.5	---	---	---	---	---	---	---	---
MW-3	(SS-1)	0-2	---	---	---	---	---	---	---	---
MW-3	(SS-4)	6-8	---	---	---	---	---	---	---	---
MW-3	(SS-6)	10-12	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)
MW-3D	(SS-6)	39-41	ND(0.85)	ND(6.3)	ND(0.85)	ND(0.85)	ND(0.85)	ND(2.1)	ND(1.3)	ND(2.1)

TABLE 3 (continued)
SOIL ANALYTICAL RESULTS
TPH & POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, MA

Location	Samples	Depth (feet)	Benzo (a) anthracene (ug/kg)	Chrysene (ug/kg)	Benzo (b) fluoranthene (ug/kg)	Benzo (k) fluoranthene (ug/kg)	Benzo (a) pyrene (ug/kg)	Indeno (1,2,3-cd) pyrene (ug/kg)	Dibenzo (a,h) anthracene (ug/kg)	Benzo (g,h,i) perylene (ug/kg)
MW-4	(SS-1)	0-2	---	---	---	---	---	---	---	---
MW-4	(SS-5)	8-10	---	---	---	---	---	---	---	---
MW-4	(SS-6)	10-12	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)
MW-5S	(SS-1)	0-2	---	---	---	---	---	---	---	---
MW-5S	(SS-6)	10-12	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)	ND(330)
MW-6	(SS-1)	0-2	ND(3,200)	ND(3,200)	ND(3,200)	ND(3,200)	ND(3,200)	ND(3,200)	ND(3,200)	ND(3,200)
MW-6	(SS-8)	18-20	---	---	---	---	---	---	---	---
MW-7	(SS-2)	2.5-4.5	300	220	320	170	400	140	34	350
MW-7	(SS-4)	6.5-8.5	1,500	1,600	1,600	890	2,000	450	220	1,200
MW-9	(SS-6)	10-12	ND(0.83)	ND(6.2)	ND(0.83)	ND(0.83)	ND(0.83)	ND(2.1)	ND(1.2)	ND(2.1)
MW-10	(SS-2)	17-19	100	130	120	62	160	23	20	160
MW-10	(SS-4)	29-31	ND(0.75)	ND(5.6)	ND(0.75)	ND(0.75)	ND(0.75)	ND(1.9)	ND(1.1)	ND(1.9)
MW-11	(SS-3)	4-6	34	41	37	16	37	15	ND(7.1)	53
MW-11	(SS-5)	8-10	4.1	7.1	4.3	2.1	5.1	ND(2.1)	ND(1.2)	4.5

Notes:

1. () = number in parentheses is laboratory Practical Quantitation Limit (PQL)
2. ND = none detected above PQL
3. ug/kg = micrograms per kilogram
4. --- not analyzed for that parameter
5. Results for MW-1, MW-2, MW-3, MW-4, MW-5S and MW-6 from October 1994

TABLE 4
SOIL ANALYTICAL RESULTS
INORGANIC CONSTITUENTS

Murphy's Waste Oil Service, Inc.
 252 Salem Street
 Woburn, MA

Location	Sample	Depth (feet)	Antimony (mg/kg)	Arsenic (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)	Cyanide (mg/kg)
B-1	(SS-3)	4.5-6.5	ND(4)	ND(8)	ND(0.038)	ND(0.38)	11	5.8	9	ND(0.0708)	ND(1.1)	ND(8)	ND(0.86)	ND(10)	15	ND(2.4)
B-1	(SS-5)	8.5-10.5	ND(4)	ND(7)	ND(0.036)	ND(0.36)	8.0	6.8	6	ND(0.0620)	ND(1.1)	ND(7)	ND(0.74)	ND(10)	17	ND(2.0)
B-2	(SS-3)	4.5-6.5	ND(3)	ND(8)	ND(0.039)	ND(0.39)	18	22	40	ND(0.0696)	ND(1.2)	ND(8)	ND(0.68)	ND(10)	49	ND(2.0)
B-4	(SS-1)	0-2	ND(3)	8	0.329	0.56	29	38	100	ND(0.0676)	13	ND(7)	ND(0.64)	ND(10)	84	ND(1.9)
B-4	(SS-6)	10-12	5	ND(8)	0.266	ND(0.38)	16	27	60	ND(0.0600)	11	ND(8)	ND(0.81)	ND(10)	36	ND(1.5)
B-6	(SS-5)	8-10	ND(4)	ND(7)	0.222	ND(0.37)	11	12	10	ND(0.0667)	5.9	ND(7)	ND(0.75)	ND(10)	24	ND(2.1)
B-7	(SS-5)	8-10	ND(4)	ND(7)	0.109	ND(0.36)	6.1	3.6	ND(4)	ND(0.0639)	3.2	ND(7)	ND(0.77)	ND(10)	9.7	ND(2.4)
B-8	(SS-1)	0-2	ND(4)	10	0.309	0.83	24	48	1,900	0.3167	17	ND(6)	ND(0.70)	ND(9)	70	ND(1.9)
B-8	(SS-4)	6-8	ND(3)	ND(8)	0.205	ND(0.41)	5.8	1.9	10	ND(0.0818)	ND(1.2)	ND(8)	ND(0.66)	ND(10)	6.6	ND(1.5)
B-9	(SS-5)	8-10	ND(3)	ND(8)	0.122	ND(0.41)	5.1	3.9	5	ND(0.0692)	ND(1.2)	ND(8)	ND(0.70)	ND(10)	7.7	ND(1.4)
B-10	(SS-6)	10-12	ND(4)	ND(7)	0.073	ND(0.36)	4.8	2.8	4	ND(0.0745)	3.3	ND(7)	ND(0.86)	ND(10)	7.9	ND(1.8)
B-11	(SS-4)	6-8	5	ND(7)	0.108	ND(0.36)	5.8	3.4	ND(4)	ND(0.0603)	ND(1.1)	ND(7)	ND(0.70)	ND(10)	6.9	ND(1.5)
B-11	(SS-6)	10-12	ND(4)	ND(5)	0.105	ND(0.26)	5.7	5.2	ND(3)	ND(0.0681)	ND(0.79)	ND(5)	ND(0.73)	ND(8)	7.1	ND(1.9)
B-12	(SS-5)	8-10	ND(3)	ND(6)	0.161	ND(0.32)	10	5.2	20	ND(0.0644)	5.2	ND(6)	ND(0.63)	ND(10)	24	ND(1.9)
B-13	(SS-1)	0-2	ND(2)	9	0.232	0.43	15	16	70	0.5339	8.9	ND(7)	ND(0.47)	ND(10)	57	ND(1.8)
B-13	(SS-5)	8-10	ND(3)	ND(7)	0.140	ND(0.35)	6.5	6.0	10	ND(0.0773)	1.1	ND(7)	ND(0.68)	ND(10)	15	ND(1.3)
B-14	(SS-2)	2.5-4.5	ND(4)	ND(7)	ND(0.035)	ND(0.35)	7.8	20	170	0.1521	2.5	ND(7)	ND(0.81)	ND(10)	48	ND(1.4)
B-14	(SS-5)	8.5-10.5	ND(4)	ND(6)	ND(0.032)	ND(0.32)	9.4	12	60	ND(0.0653)	1.3	ND(6)	ND(0.75)	ND(10)	25	ND(1.4)
B-15	(SS-5)	8-10	ND(4)	ND(8)	ND(0.038)	ND(0.38)	9.6	4.2	ND(4)	ND(0.0743)	2.6	ND(8)	ND(0.77)	ND(10)	9.8	ND(1.7)
B-15	(SS-7)	12-14	ND(4)	ND(8)	ND(0.039)	ND(0.39)	6.6	4.6	ND(4)	ND(0.0676)	2.2	ND(8)	ND(0.85)	ND(10)	11	ND(2.0)
B-16	(SS-6)	10-12	ND(3)	ND(7)	ND(0.034)	ND(0.34)	6.9	3.5	8	ND(0.0672)	ND(1.0)	ND(7)	ND(0.67)	ND(10)	10	ND(1.9)
B-17	(SS-2)	2-4	5	ND(7)	0.460	0.43	22	270	120	0.0004	13	ND(7)	ND(0.62)	ND(10)	120	ND(2.3)
B-18	(SS-1)	0-2	ND(3)	ND(5)	0.243	3.5	24	23	560	0.0508	13	ND(5)	ND(0.60)	10	68	ND(2.2)
B-18	(SS-3)	4-6	ND(3)	ND(5)	0.203	0.23	8.0	4.7	40	ND(0.0508)	ND(0.68)	ND(5)	ND(0.68)	ND(7)	14	ND(2.4)
B-19	(SS-4)	6-8	ND(3)	ND(7)	ND(0.036)	ND(0.36)	33	34	240	0.0565	2.4	ND(7)	ND(0.59)	ND(10)	97	ND(1.9)
B-20	(SS-4)	6-8	ND(3)	ND(6)	ND(0.031)	ND(0.31)	14	28	260	ND(0.0601)	5.6	ND(6)	ND(0.62)	ND(9)	55	ND(1.9)
MW-1	(SS-5)	8-10	ND(3)	ND(6)	ND(0.031)	0.37	18	21	7	ND(0.0636)	8.1	ND(6)	ND(0.65)	ND(9)	34	ND(1.1)
MW-2	(SS-2)	2-4	ND(3)	7	ND(0.035)	0.42	20	20	60	0.1579	9.0	ND(7)	ND(0.69)	ND(10)	56	ND(1.1)
MW-3	(SS-6)	10-12	ND(3)	ND(7)	0.067	ND(0.34)	3.9	1.8	ND(3)	ND(0.0718)	ND(1.0)	ND(7)	ND(0.50)	ND(10)	5.5	ND(1.1)
MW-3D	(SS-6)	39-41	ND(3)	6	0.260	ND(0.29)	9.1	8.0	4	ND(0.0855)	6.7	ND(6)	ND(0.55)	ND(9)	14	ND(1.1)
MW-4	(SS-6)	10-12	ND(4)	ND(6)	ND(0.029)	ND(0.29)	4.9	1.9	ND(3)	ND(0.0622)	ND(0.88)	ND(6)	ND(0.80)	ND(9)	8.0	ND(1.1)
MW-5S	(SS-6)	10-12	ND(3)	ND(5)	ND(0.025)	0.30	13	30	4	ND(0.0640)	8.0	ND(5)	ND(0.56)	ND(7)	27	ND(1.0)
MW-6	(SS-1)	0-2	5	ND(7)	ND(0.034)	0.55	20	28	130	0.1533	7.5	ND(7)	ND(0.71)	ND(10)	97	ND(1.0)
MW-7	(SS-2)	2.5-4.5	ND(4)	ND(8)	ND(0.038)	ND(0.38)	13	20	120	ND(0.0754)	ND(1.1)	ND(8)	ND(0.78)	ND(10)	61	ND(2.1)
MW-7	(SS-4)	6.5-8.5	ND(4)	ND(6)	ND(0.032)	ND(0.32)	32	19	240	0.0792	9.3	ND(6)	ND(0.82)	ND(9)	88	ND(1.9)
MW-9	(SS-6)	10-12	ND(4)	ND(8)	0.127	ND(0.42)	6.0	3.0	ND(4)	ND(0.0742)	ND(1.3)	ND(8)	ND(0.79)	ND(10)	7.8	ND(2.0)
MW-10	(SS-2)	17-19	ND(2)	ND(4)	0.260	0.24	17	23	10	ND(0.0595)	1.3	ND(4)	ND(0.41)	ND(7)	38	ND(2.1)
MW-10	(SS-4)	29-31	3	ND(4)	0.246	0.31	15	28	9	ND(0.0559)	14	ND(4)	ND(0.57)	ND(7)	37	ND(1.8)
MW-11	(SS-3)	4-6	6	ND(8)	ND(0.038)	ND(0.38)	400	13	20	ND(0.0585)	ND(1.1)	ND(8)	ND(0.76)	ND(10)	41	ND(1.5)
MW-11	(SS-5)	8-10	ND(4)	ND(7)	ND(0.033)	ND(0.33)	38	1.5	4	ND(0.0463)	ND(1.0)	ND(7)	ND(0.78)	ND(10)	11	ND(1.7)

Notes:

- () = number in parentheses is laboratory Practical Quantitation Limit (PQL).
- mg/kg - milligrams per kilogram
- ND = below PQL
- Results for MW-1, MW-2, MW-3, MW-4, MW-5S and MW-6 from October 1994

TABLE 5

WETLAND SAMPLING DATA SUMMARY

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Station ID	HNU (ppm)	Soil Description	Surrounding Area Description
P-1	<1	Dark brown fine SAND; and Silt; some organic matter.	Standing water, tree and scrub vegetation
P-2	<1	Dark brown fine SAND; and Silt; some organic matter. Strong organic odor.	Standing water, tree and scrub vegetation
P-3	<1	Dark to light brown fine SAND; and Silt.	Standing water, open area with cattails
P-4	<1	Dark brown to brownish-gray fine SAND; and Silt.	Standing water, reeds and scrub vegetation
P-5	<1	Dark brown fine SAND; and Silt; some organic matter.	Standing water, cattails and trees, plastic pail debris
P-6	<1	Dark to light brown fine SAND; and Silt.	Standing water, cattails and reeds
P-7	<1	Dark brown fine SAND; and Silt; some organic matter.	Standing water, open area
P-9	<1	Dark brown fine SAND; and Silt; some organic matter.	Standing water, cattails and reeds
P-10	<1	Dark brown to brownish-gray fine SAND; and Silt.	Standing water, open area with reeds
P-11	<1	Dark brown fine SAND; and Silt, some organic matter.	Standing water, tree and scrub vegetation
P-12	8	Dark brown fine SAND; and Silt, some organic matter. Heavily stained soil with strong petroleum odor.	Standing water, scrub vegetation
P-13	<1	Dark brown fine SAND; and Silt; some organic matter.	Standing water, tree and scrub vegetation
P-14	<1	Dark brown fine SAND; and Silt; some organic matter.	Standing water, tree and scrub vegetation
P-15	2	Dark brown fine SAND; and Silt; some organic matter. Heavily stained soil with strong petroleum odor.	Standing water, open area
P-17	<1	Dark brown fine SAND; and Silt; some organic matter.	Standing water, tree and scrub vegetation
P-18	<1	Dark brown fine SAND; and Silt; some organic matter. White ceramic (?) material in sample.	Standing water, tree and scrub vegetation
P-19	<1	Brown fine SAND; and Silt; some organic matter.	Dry ground, grass and scrub vegetation
P-20	<1	Dark brown fine SAND; and Silt; some organic matter.	Standing water, cattails and reeds
P-21	<1	Dark brown fine SAND; and Silt; some organic matter;	Standing water, tree and scrub vegetation
P-22	<1	Light brown medium to fine SAND; trace gravel; trace organic matter	Dry ground, gravel fill, tree vegetation
P-23	<1	Brown medium to fine SAND; and organic matter.	Standing water, reed and scrub vegetation, hydrogen sulfide odor
P-24	<1	Dark brown medium to fine SAND; and Silt; some organic matter	Standing water, reed and scrub vegetation,
P-25	<1	Dark brown medium to fine SAND; and Silt; some organic matter	Standing water, reed tree and scrub vegetation
P-26	<1	Dark brown medium to fine SAND; and Silt; some organic matter	Standing water, tree and scrub vegetation
P-27	<1	Dark brown fine SAND; and Silt; some organic matter.	Standing water, open area with cattail and reeds
P-28	<1	Dark brown fine SAND; and Silt; some organic matter.	Wet ground, reed and tree vegetation
P-29	<1	Dark to light brown fine SAND; and Silt; some organic matter	Standing water, open area with reed vegetation
P-30	<1	Dark brown fine SAND; and Silt; some organic matter.	Standing water, open area with cattail and reed vegetation

Notes:

1. Samples P-1 through P-30 collected on 11/16/95.
2. All samples collected at a depth of 6 inches to 18 inches below grade.

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**TABLE 6
SOIL ANALYTICAL RESULTS
INITIAL WETLAND SAMPLING**

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, MA

Location	TPH (mg/kg)	Total PCB (mg/kg)	Total Chromium (mg/kg)	Total Lead (mg/kg)
P-1	44	3.3	76	90
P-2	92	2.7	56	80
P-3	320	3.1	210	140
P-4	40	15	45.1	30
P-5	610	69	280	1,700
P-6	620	6.7	500	620
P-7	3,900	8.9	800	2,700
P-9	140	5.7	110	100
P-10	610	5.4	290	1,400
P-11	4,100	8.5	180	730
P-12	82,000	60	340	24,900
P-13	550	37	400	190
P-14	20,000	11 *	820	16,800
P-15	38,000	24 *	1,100	1,700
P-17	330	5.9	1,000	270
P-18	24,000	13 *	970	3,200
P-19	770	3.1 *	2,000	1,500
P-20	69	0.8 *	190	70
P-21	2,100	1.4 *	1,800	600
P-22	110	0.4 *	230	70
P-23	11,000	10	21,300	2,500
P-24	540	1.0 *	62,500	3,300
P-25	260	2.9	12,400	380
P-26	270	6.6 *	66,500	1,400
P-27	230	0.2 *	14,000	600
P-28	22	ND (1.3)	3,100	90
P-29	130	0.2 *	760	120
P-30	77	ND (0.2)	9,400	280
P-31	---	---	1,500	---
P-32	---	---	7,500	---
5 * SW-1	72	ND (0.1)	5,700	130
SW-2	97,000	220	1,100	35,100
SW-3	620	15	430	1,000
SW-4	74	0.8*	93	630

Notes:

- 1) Total Petroleum Hydrocarbons (TPH) by Gas Chromatogram/Flame Ionization Detector.
- 2) All samples collected at a depth of 0-2 feet below grade.
- 3) All PCBs detected are Aroclor 1254 except those marked with an asterisk(*), which are Aroclor 1260.
- 4) --- = Not analyzed.

5) SW-1 → SW-4 0-6"; 10/13-14/20

TABLE 7

SOIL ANALYTICAL RESULTS
ADDITIONAL WETLAND SAMPLING

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, MA

Location	Sample Date	Inorganics			VOCs	PAHs				Pesticides
		Arsenic (mg/kg)	Cadmium (mg/kg)	Amenable Cyanide (mg/kg)	Total Xylenes (ug/kg)	Benzo(a) Pyrene (ug/kg)	Benzo(b) Fluoranthene (ug/kg)	Fluoranthene (ug/kg)	Pyrene (ug/kg)	
P-12	12/18/95	ND (10)	ND (0.65)	ND (8.0)	53,000	ND (11,000)	ND (11,000)	ND (11,000)	ND (11,000)	ND(8)
P-24	12/18/95	ND (20)	ND (0.79)	ND (1.0)	ND (250)	ND (880)	ND (880)	ND (880)	ND (880)	ND(1)
P-26	12/18/95	ND (20)	ND (1.0)	ND (1.2)	ND (230)	ND (1,200)	ND (1,200)	ND (1,200)	ND (1,200)	ND(12)
SW-1	10/13/94	ND (10)	ND (0.55)	ND (0.5)	ND (5)	340	680	640	430	ND(0.5)
SW-2	10/14/94	ND (10)	11	ND (0.5)	1,300	ND (66,000)	ND (66,000)	ND (66,000)	---	ND(0.5)
SW-2	12/18/95	---	---	---	---	ND (9,800)	ND (9,800)	ND (9,800)	ND (9,800)	---
SW-3	10/14/94	ND (10)	2.9	ND (0.5)	ND (5)	ND (1,600)	ND (1,600)	ND (1,600)	ND (1,600)	ND(0.5)
SW-4	10/13/94	10	2.0	ND (0.5)	ND (5)	ND (1,600)	2,000	2,000	ND (1,600)	ND(0.5)

Notes:

- 1) --- = Not analyzed.
- 2) All samples collected at a depth of 0-2 feet below grade.
- 3) ND = None detected above method Practical Quantitation Limit (PQL).
- 4) Only those PAHs detected are shown.

TABLE 8
WATER LEVEL DATA

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Date	Location									
	MW-1	MW-2	MW-3	MW-3D	MW-4	MW-5S	MW-5D	MW-6	MW-7	MW-8
11/9/94	43.54	43.56	43.53	---	43.41	43.46	43.48	43.52	---	---
12/13/94	45.04	44.80	45.05	---	44.93	44.74	44.74	44.67	---	---
9/15/95	42.37	42.39	42.04	---	42.15	42.35	42.35	42.33	---	---
10/9/95	44.11	43.76	44.27	43.93	44.31	43.87	43.64	43.67	43.71	---
10/19/95	43.46	43.43	43.64	43.44	43.52	43.40	43.42	43.36	43.41	---
10/27/95	43.85	43.76	43.98	43.78	43.95	43.73	43.69	43.67	43.76	43.78
11/7/95	44.10	44.03	44.24	44.04	44.18	43.99	44.03	43.95	---	44.04
11/17/95	45.82	45.15	45.39	45.46	45.39	45.21	45.13	44.96	--	45.23
12/4/95	44.44	44.48	44.36	44.41	44.30	44.36	44.16	44.42	---	44.47
12/18/95	44.32	44.38	44.20	44.23	44.14	44.25	44.16	44.32	44.34	44.37
3/7/96	45.28	45.26	45.04	46.12	45.14	45.09	44.90	45.19	45.17	45.24
(Reference Elev.)	(53.29)	(53.85)	(52.86)	(52.41)	(52.29)	(53.88)	(54.06)	(55.71)	(50.44)	(54.32)

TABLE 8 (continued)

WATER LEVEL DATA

Murphy's Waste Oil Service, Inc.
 252 Salem Street
 Woburn, Massachusetts

Date	Location									
	MW-9	MW-10	MW-11	MW-12	MW-13	MR-1SS	MR-2SS	SW-A	SW-B	SW-C
11/9/94	---	---	---	---	---	43.20	43.55	---	---	---
12/13/95	---	---	---	---	---	44.93	---	---	---	---
9/15/95	---	---	---	---	---	42.05	42.33	---	---	---
10/9/95	44.18	---	44.01	44.82	44.49	---	43.86	44.76	44.69	---
10/19/95	43.44	43.48	43.19	43.47	43.87	43.28	43.37	---	44.17	---
10/27/95	43.88	43.82	43.69	43.96	44.19	43.81	43.75	---	44.40	---
11/7/95	44.11	44.08	43.87	44.38	44.51	44.01	43.99	---	44.58	---
11/17/95	45.48	45.56	45.35	45.38	45.29	45.65	45.48	45.12	45.17	---
12/4/95	44.27	44.47	44.03	44.35	44.44	44.03	44.38	---	44.60	---
12/18/95	44.16	44.36	43.86	43.99	44.22	43.97	44.26	---	---	44.66
3/7/96	45.06	45.28	44.86	44.96	44.94	44.93	45.16	44.98	45.01	44.89
(Reference Elev.)	(51.82)	(53.84)	(50.04)	(47.29)	(46.42)	(51.62)	(50.80)	(47.22)	(46.42)	(46.46)

TABLE 8 (continued)

WATER LEVEL DATA

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Date	Location								
	MW-4S Whitney Barrel	MW-4M Whitney Barrel	MW-4D Whitney Barrel	BW-2 Wildwood	BW-2R Wildwood	BSW-2 Wildwood	BW-3 Wildwood	BW-4 Wildwood	OW-2 Conn. Mutual
11/9/94	---	---	---	---	---	---	---	---	---
12/13/95	---	---	---	---	---	---	---	---	---
9/15/95	---	---	---	---	---	---	---	---	---
10/9/95	---	---	---	---	---	---	---	---	---
10/19/95	---	---	---	---	---	---	---	---	---
10/27/95	43.47	43.43	43.71	43.05	43.53	43.47	43.50	43.74	---
11/7/95	---	---	---	---	---	---	---	---	---
11/17/95	45.03	44.91	---	---	---	---	45.00	45.43	---
12/4/95	43.87	43.90	---	43.38	43.93	43.82	43.93	44.29	44.39
12/18/95	---	---	---	---	---	---	43.83	44.15	44.25
3/7/96	44.49	44.34	44.69	---	---	---	44.43	44.99	45.26
(Reference Elev.)	(46.53)	(46.91)	(47.59)	(46.82)	(47.78)	(48.04)	(47.38)	(46.46)	(76.19)

NOTES:

1. Reference elevations are PVC rim except MR-1SS, MW-12, MW-13, SW-A, SW-B, SW-C, BW-2, BSW-2, MW-4 and OW-2 (protective casing rim).
2. --- indicates well not installed, data point dry or otherwise not gauged.

TABLE 9

VERTICAL HYDRAULIC GRADIENT CALCULATIONS

Murphy's Waste Oil Service, Inc.
 252 Salem Stret
 Woburn, Massachusetts

Date	MW-3			MW-5			MW-10			MW-12			MW-13		
	ΔH <i>feet</i>	ΔY <i>feet</i>	<i>i</i> %												
11/9/94	---	37.5	---	0.02	69	0.0	---	28	---	---	3.8	---	---	3.8	---
12/13/94	---	37.5	---	0	69	0.0	---	28	---	---	3.8	---	---	3.8	---
9/15/95	---	37.5	---	0	69	0.0	---	28	---	---	3.8	---	---	3.8	---
10/9/95	-0.34	37.5	-0.9	-0.23	69	-0.3	---	28	---	0.06	3.8	1.6	-0.2	3.8	-5.3
10/19/95	-0.2	37.5	-0.5	0.02	69	0.0	0.11	28	0.4	---	3.8	---	-0.3	3.8	-7.9
10/27/95	-0.2	37.5	-0.5	-0.04	69	-0.1	0.07	28	0.3	---	3.8	---	-0.21	3.8	-5.5
11/7/95	-0.2	37.5	-0.5	0.04	69	0.1	0.09	28	0.3	---	3.8	---	-0.07	3.8	-1.8
11/17/95	0.07	37.5	0.2	-0.08	69	-0.1	0.08	28	0.3	0.26	3.8	6.8	0.12	3.8	3.2
12/4/95	0.05	37.5	0.1	-0.08	69	-0.1	0.09	28	0.3	---	3.8	---	-0.16	3.8	-4.2
12/18/95	0.03	37.5	0.1	-0.09	69	-0.1	0.1	28	0.4	---	3.8	---	---	3.8	---
3/7/96	1.08	37.5	2.9	-0.19	69	-0.3	0.12	28	0.4	-0.02	3.8	-0.5	-0.07	3.8	-1.8

Notes:

- Vertical gradients were calculated for well clusters MW-3/MW-3D; MW-5S/MW-5D; MR-2SS/MW-10; and groundwater relative to surface water at MW-12/SW-A and MW-13/SW-B.
- The parameters are defined as:
 ΔH = Change in head
 ΔY = Vertical difference between screened interval
 i = Vertical gradient in percent = $\Delta H/\Delta Y$

**TABLE 10
AQUIFER TESTING DATA SUMMARY**

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

WELL	L (ft)	L (cm)	r (cm)	R (cm)	To (sec)	K (cm/sec)	i (ftvert./fthor)	Vx (ft/day)
MW-8	2.80	85.3	2.6	10.2	3.0	2.85E-02	0.002	0.65
MW-9	5.40	164.6	2.6	10.2	5.0	1.16E-02	0.002	0.26
MW-10	5.00	152.4	2.6	10.2	5.2	1.18E-02	0.002	0.27
MW-11	5.99	182.6	2.6	10.2	2.4	2.25E-02	0.002	0.51
MW-12	3.00	91.4	1.7	2.0	19.2	3.14E-03	0.002	0.07
MW-13	3.00	91.4	1.7	2.0	25.5	2.37E-03	0.002	0.05

Hydraulic conductivity (K) was calculated using the Hvorslev method which is valid for unconfined conditions where the length of the well screen is greater than eight times the effective radius of the well screen. K was calculated by the formula:

$$K = \frac{r \ln(L/R)}{2LT_0}$$

Where:

- K is hydraulic conductivity
- r is the radius of the well casing
- R is the effective radius of the well screen (or soil boring)
- L is the average length of well screen through which water passes during the test
- To is the time it takes for the water level to rise 37 percent of the initial change

Average linear velocities were calculated using measured hydraulic conductivity, hydraulic gradients and an assumed value of effective porosity, using the equation:

$$V = \frac{Ki}{n_e}$$

Where:

- Vx is average linear velocity
- i is hydraulic gradient
- ne is effective porosity of sediments = 0.25

References:

Dunne, T. and Leopold, L.B., 1978. *Water in Environmental Planning*, W.H. Freeman and Company.
 Freeze, R.A. and J.A. Cherry, 1979. *Groundwater*, Prentice-Hall, Inc.
 Fetter, C.W., 1988. *Applied Hydrogeology*, Second Edition, Merrill Publishing Company.

TABLE 11

Field Data

November 7, 1995

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Location	Well Depth (feet)	Reference Elevation (feet)	Water Level (feet)	Water Elevation (feet)	Water Temp (Centigrade)	Specific Conductance (μ mhos/cm)	pH
MW-1	15.0	53.29	9.19	44.10	12.4	460	6.2
MW-2	15.0	53.85	9.82	44.03	12.6	626	6.1
MW-3	14.0	52.86	8.62	44.24	13.3	353	5.5
MW-3D	49.0	52.41	8.37	44.04	12.3	791	6.3
MW-4	15.0	52.29	8.11	44.18	14.3	302	6.1
MW-5S	15.0	53.88	9.89	43.99	14.6	530	6.2
MW-5D	83.5	54.06	10.03	44.03	14.7	1,150	7.3
MW-6	18.0	55.71	11.76	43.95	11.9	647	6.1
MW-7	12.0	50.44	—	—	—	—	—
MW-8	12.0	54.32	10.28	44.04	14.3	632	6.4
MW-9	12.0	51.83	7.71	44.11	14.8	486	5.7
MW-10	41.0	53.84	9.76	44.08	13.9	299	6.3
MW-11	12.0	50.04	6.17	43.87	13.6	8,600	6.1
MW-12	5.4	47.29	2.91	44.38	9.6	6,390	6.5
MW-13	5.3	46.42	1.91	44.51	7.1	1,200	6.3
MR-1SS	13.0	50.34	7.61	44.01	14.3	447	6.0
MR-2SS	15.0	50.80	6.81	43.99	14.5	996	6.3

NOTES:

1. Well reference elevations determined at top of PVC well rim, measured in feet relative to benchmark (pin in power pole = 51.38 feet NGVD).
2. Well depth in feet below standpipe/roadbox rim.
3. Water level measured from reference elevation down to water level.
4. Conductivity in micromhos per centimeter corrected to 25 degrees Centigrade.

TABLE 12

Field Data

December 18, 1995

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Location	Well Depth (feet)	Reference Elevation (feet)	Water Level (feet)	Water Elevation (feet)	Water Temp (Centigrade)	Specific Conductance (μ mhos/cm)	pH
MW-1	15.0	53.29	8.79	44.32	9.3	529	6.0
MW-2	15.0	53.85	9.47	44.38	8.8	570	5.9
MW-3	14.0	52.86	8.66	44.20	10.3	332	5.4
MW-3D	49.0	52.41	8.18	44.23	10.6	569	6.1
MW-4	15.0	52.29	8.15	44.14	8.9	340	5.8
MW-5S	15.0	53.88	9.63	44.25	11.0	10	6.1
MW-5D	83.5	54.06	9.90	44.16	9.0	5	6.3
MW-6	18.0	55.71	11.39	44.32	10.7	646	5.8
MW-7	12.0	50.44	6.10	44.34	11.7	1,656	6.3
MW-8	12.0	54.32	9.95	44.37	10.6	694	6.2
MW-9	12.0	51.83	7.66	44.16	9.7	316	5.8
MW-10	41.0	53.84	9.48	44.36	10.7	669	6.2
MW-11	12.0	50.04	6.18	43.86	10.0	815	5.6
MW-12	5.4	47.29	3.30	43.99	5.6	446	6.5
MW-13	5.3	46.42	2.20	44.22	4.9	352	6.3
MR-1SS	13.0	50.34	7.65	43.97	9.9	269	6.1
MR-2SS	15.0	50.80	6.54	44.26	11.5	901	6.0

NOTES:

1. Well reference elevations determined at top of PVC well rim, measured in feet relative to benchmark (pin in power pole = 51.38 feet NGVD).
2. Well depth in feet below standpipe/roadbox rim.
3. Water level measured from reference elevation down to water level.
4. Conductivity in micromhos per centimeter corrected to 25 degrees Centigrade.

TABLE 13
GROUNDWATER AND SURFACE WATER ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS

Murphy's Waste Oil Service, Inc.
 252 Salem Street
 Woburn, Massachusetts

Location	Date	Benzene (ug/l)	Toluene (ug/l)	Total Xylenes (ug/l)	Acetone (ug/l)	Chloro- ethane (ug/l)	PCE (ug/l)	1,1-DCA (ug/l)	1,1,1-TCA (ug/l)	TCE (ug/l)	t-1,2-DCE (ug/l)	Vinyl Chloride (ug/l)	2-Butanone (ug/l)
MW-1	11/9/94	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	11/7/95	ND (5)	ND (5)	ND (5)	25	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
MW-2	11/9/94	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	11/7/95	ND (5)	ND (5)	ND (5)	24	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
MW-3	11/9/94	ND (13)	ND (13)	ND (13)	ND (50)	ND (25)	ND (5)	98	44	100	1,100	ND (25)	ND (50)
	11/7/95	ND (130)	ND (130)	ND (130)	ND (500)	ND (250)	ND (130)	ND(130)	160	140	2,200	ND(250)	ND(500)
	12/18/95	ND (25)	ND (25)	ND (25)	ND (100)	ND (50)	ND (25)	170	220	220	3,100	ND (50)	ND (100)
(Blind Dup.)	12/18/95	ND (250)	ND (250)	ND (250)	ND (1,000)	ND (500)	ND (250)	250	360	400	5,300	ND (500)	ND (500)
MW-3D	11/7/95	ND (5)	ND (5)	ND (5)	25	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
MW-4	11/9/94	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	11/7/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
MW-5S	11/9/94	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	11/7/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
MW-5D	11/9/94	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	11/7/95	ND (5)	ND (5)	ND (5)	36	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
MW-6	11/9/94	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	11/7/95	ND (5)	ND (5)	ND (5)	32	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
MW-7	12/18/95	ND (25)	ND (25)	ND (25)	ND (100)	ND (50)	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (50)	ND (100)
MW-8	11/7/95	ND (5)	ND (5)	ND (5)	29	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	6	ND (10)	ND (20)

TABLE 13 (Cont.)

GROUNDWATER AND SURFACE WATER ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Location	Date	Benzene (ug/l)	Toluene (ug/l)	Total Xylenes (ug/l)	Acetone (ug/l)	Chloro- ethane (ug/l)	PCE (ug/l)	1,1-DCA (ug/l)	1,1,1-TCA (ug/l)	TCE (ug/l)	t-1,2-DCE (ug/l)	Vinyl Chloride (ug/l)	2-Butanone (ug/l)
MW-9	11/7/95	ND (5)	ND (5)	ND (5)	28	ND (10)	ND (5)	9	15	48	5	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	5	12	31	ND (5)	ND (10)	ND (20)
MW-10	11/7/95	ND (5)	ND (5)	ND (5)	24	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
MW-11 (Blind Dup.)	11/7/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	13	16	ND (5)	ND (5)	ND (10)	ND (20)
	11/7/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	14	16	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (25)	ND (25)	ND (25)	ND (100)	ND (50)	ND (25)	230	380	ND (25)	ND (25)	ND (50)	ND (100)
MW-12	11/7/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	10	ND (5)	ND (5)	96	ND (10)	ND (20)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (40)	ND (20)	ND (10)	15	ND (10)	ND (10)	150	ND (20)	ND (40)
MW-13	11/7/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
MR-1SS	8/31/93	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (3.4)	2.6	3.7	1.4	ND (2)	ND (2)	ND (3.4)
	11/9/94	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (20)	ND (5)	10	ND (5)	ND (5)	ND (10)	ND (20)
	11/7/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
MR-2SS	8/31/93	8.6	12.9	324	ND (10)	ND (10)	ND (17.4)	ND (10)	ND (10)	22.6	461	ND (10)	ND (17.4)
	11/9/94	9	9	9	ND (20)	ND (10)	ND (20)	ND (5)	ND (5)	ND (5)	240	15	ND (20)
	11/7/95	ND (5)	ND (5)	ND (5)	31	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	140	14	ND (20)
	12/18/95	5	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	140	12	ND (20)
SW-A	11/9/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
SW-B	11/9/95	ND (5)	ND (5)	ND (5)	43	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
SW-3	11/9/94	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
Trip Blank	11/9/94	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	11/7/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)
	12/18/95	ND (5)	ND (5)	ND (5)	ND (20)	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (10)	ND (20)

TABLE 13 (Cont.)

GROUNDWATER AND SURFACE WATER ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDSMurphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, MassachusettsNotes:

1. Laboratory analyses by EPA Method 624, data shown in micrograms per liter (ug/l).
2. Practical Quantitation Limit shown in parentheses where compounds not detected (ND) or trace (Tr).
3. Abbreviations are used for the following compounds:

1,1-DCA = 1,1-Dichloroethane	PCE = Tetrachloroethene
1,1,1-TCA = 1,1,1-Trichloroethane	TCE = Trichloroethene
t-1,2-DCE = Trans 1,2-Dichloroethene	

TABLE 14
GROUNDWATER AND SURFACE WATER ANALYTICAL RESULTS
PCB & POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS

Murphy's Waste Oil Service, Inc.
 252 Salem Street
 Woburn, MA

Location	Date	PCB <i>(ug/l)</i>	Bis(2-ethylhexyl)- phthalate <i>(ug/l)</i>	Naphthalene <i>(ug/l)</i>	Acenaphthylene <i>(ug/l)</i>	Acenaphthene <i>(ug/l)</i>	Fluorene <i>(ug/l)</i>	Phenanthrene <i>(ug/l)</i>	Anthracene <i>(ug/l)</i>	Fluoranthene <i>(ug/l)</i>	Pyrene <i>(ug/l)</i>
MW-1	11/9/94	ND (1.0)	ND (200)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-2	11/9/94	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-3	11/9/94	ND (1.0)	ND (200)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
(Blind Dup.)	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-3D	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-4	11/9/94	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-5S	11/9/94	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-5D	11/9/94	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-6	11/9/94	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-7	12/18/95	ND (1.0)	ND (190)	ND (94)	ND (94)	ND (94)	ND (94)	ND (94)	ND (94)	ND (94)	ND (94)
MW-8	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-9	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-10	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)

**TABLE 14 (cont.)
GROUNDWATER AND SURFACE WATER ANALYTICAL RESULTS
PCB & POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS**

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, MA

Location	Date	PCB <i>ug/l</i>	Bis(2-ethylhexyl)- phthalate <i>(ug/l)</i>	Naphthalene <i>(ug/l)</i>	Acenaphthylene <i>(ug/l)</i>	Acenaphthene <i>(ug/l)</i>	Fluorene <i>(ug/l)</i>	Phenanthrene <i>(ug/l)</i>	Anthracene <i>(ug/l)</i>	Fluoranthene <i>(ug/l)</i>	Pyrene <i>(ug/l)</i>
MW-11 (Blind Dup.)	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/8/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-12	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	23	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-13	11/7/95	1.6	ND (94)	ND (47)	ND (47)	ND (47)	ND (47)	ND (47)	ND (47)	ND (47)	ND (47)
	12/18/95	3.8	ND (38)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)
MR-1SS	11/9/94	ND (1.0)	ND (200)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MR-2SS	11/9/94	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (1.0)	ND (38)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)
SW-A	11/9/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
SW-B	11/9/95	ND (1.0)	ND (20)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
SW-3	11/9/94	ND (5.0)	ND (20)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)

Notes:

1. () = number in parentheses is laboratory Practical Quantitation Limit (PQL)
2. ND = none detected above PQL
3. ug/l = micrograms per liter

**TABLE 14 (Cont.)
GROUNDWATER AND SURFACE WATER ANALYTICAL RESULTS
PCB & POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS**

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Location	Date	Benzo (a) anthracene (ug/l)	Chrysene (ug/l)	Benzo (b) fluoranthene (ug/l)	Benzo (k) fluoranthene (ug/l)	Benzo (a) pyrene (ug/l)	Indeno (1,2,3-cd) pyrene (ug/l)	Dibenzo (a,h) anthracene (ug/l)	Benzo (g,h,i) perylene (ug/l)
MW-1	11/9/94	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-2	11/9/94	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-3	11/9/94	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
(Blind Dup.)	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-3D	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-4	11/9/94	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-5S	11/9/94	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-5D	11/9/94	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-6	11/9/94	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-7	12/18/95	ND (94)	ND (94)	ND (94)	ND (94)	ND (94)	ND (94)	ND (94)	ND (94)
MW-8	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-9	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)

**TABLE 14 (Cont.)
GROUNDWATER AND SURFACE WATER ANALYTICAL RESULTS
PCB & POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS**

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Location	Date	Benzo (a) anthracene (ug/l)	Chrysene (ug/l)	Benzo (b) fluoranthene (ug/l)	Benzo (k) fluoranthene (ug/l)	Benzo (a) pyrene (ug/l)	Indeno (1,2,3-cd) pyrene (ug/l)	Dibenzo (a,h) anthracene (ug/l)	Benzo (g,h,i) perylene (ug/l)
MW-10	11/7/95	ND (100)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-11 (Blind Dup.)	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/8/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-12	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MW-13	11/7/95	ND (47)	ND (47)	ND (47)	ND (47)	ND (47)	ND (47)	ND (47)	ND (47)
	12/18/95	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)
MR-1SS	8/31/93	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/9/94	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
MR-2SS	8/31/93	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/9/94	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	11/7/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
	12/18/95	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)	ND (19)
SW-A	11/9/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
SW-B	11/9/95	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
SW-3	11/9/94	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)

Notes:

1. () = number in parentheses is laboratory Practical Quantitation Limit (PQL)
2. ND = none detected above PQL
3. ug/l = micrograms per liter

TABLE 15
GROUNDWATER AND SURFACE WATER ANALYTICAL RESULTS
DISSOLVED INORGANIC ANALYSES

Murphy's Waste Oil Service, Inc.
 252 Salem Street
 Woburn, Massachusetts

Location	Date	Arsenic (mg/l)	Cadmium (mg/l)	Lead (mg/l)	Zinc (mg/l)	Total Cyanide (mg/l)
MW-1	11/9/94	ND (0.002)	ND (0.002)	ND (0.002)	ND (0.04)	ND (0.04)
	11/7/95	---	---	ND (0.002)	---	---
	12/18/95	---	---	ND (0.005)	---	---
MW-2	11/9/94	ND (0.002)	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.04)
	11/7/95	---	---	ND (0.002)	---	---
	12/18/95	---	---	ND (0.005)	---	---
MW-3	11/9/94	0.003	ND (0.001)	0.002	0.04	ND (0.04)
	11/7/95	---	---	ND (0.002)	---	---
	12/18/95	ND (0.002)	---	ND (0.005)	---	---
(Blind Dup.)	12/18/95	---	---	0.013	---	---
MW-3D	11/7/95	ND (0.002)	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.02)
	12/18/95	---	---	ND (0.005)	---	---
MW-4	11/9/94	ND (0.002)	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.02)
	11/7/95	---	---	ND (0.002)	---	---
	12/18/95	---	---	ND (0.005)	---	---
MW-5S	11/9/94	ND (0.002)	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.02)
	11/7/95	---	---	ND (0.002)	---	---
	12/18/95	---	---	ND (0.005)	---	---
MW-5D	11/9/94	0.003	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.02)
	11/7/95	---	---	ND (0.002)	---	---
	12/18/95	ND (0.002)	---	ND (0.005)	---	---
MW-6	11/9/94	ND (0.002)	0.002	0.006	ND (0.04)	ND (0.02)
	11/7/95	---	---	ND (0.002)	---	---
	12/18/95	---	---	ND (0.005)	ND (0.04)	---
MW-7	12/18/95	---	---	0.006	---	---
MW-8	11/7/95	ND (0.002)	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.02)
	12/18/95	---	---	ND (0.005)	---	---

TABLE 15 (cont.)

GROUNDWATER AND SURFACE WATER ANALYTICAL RESULTS
DISSOLVED INORGANIC ANALYSES

Murphy's Waste Oil Service, Inc.
252 Salem Street
Woburn, Massachusetts

Location	Date	Arsenic (mg/l)	Cadmium (mg/l)	Lead (mg/l)	Zinc (mg/l)	Total Cyanide (mg/l)
MW-9	11/7/95	ND (0.002)	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.02)
	12/18/95	---	---	0.006	---	---
MW-10	11/7/95	ND (0.002)	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.02)
	12/18/95	---	---	ND (0.001)	---	---
MW-11 (Blind Dup.)	11/7/95	ND (0.002)	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.02)
	11/7/95	0.003	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.02)
	12/18/95	ND (0.002)	---	ND (0.001)	---	---
MW-12	11/7/95	0.004	ND (0.001)	ND (0.02)	1.4	ND (0.02)
	12/18/95	ND (0.002)	---	ND (0.001)	2.0	---
MW-13 ---	11/7/95	0.004	ND (0.001)	0.004	0.56	ND (0.02)
	12/18/95	---	---	ND (0.001)	---	---
MR-1SS	8/31/93	ND (0.004)	ND (0.005)	ND (0.001)	ND (0.005)	ND (0.002)
	11/9/94	ND (0.002)	ND (0.001)	ND (0.002)	ND (0.04)	ND (0.04)
	11/7/95	---	---	ND (0.002)	---	---
	12/18/95	---	---	ND (0.001)	---	---
MR-2SS	8/31/93	ND (0.002)	ND (0.005)	0.029	0.025	ND (0.023)
	11/9/94	ND (0.002)	ND (0.001)	0.020	ND (0.04)	ND (0.02)
	11/7/95	---	---	0.006	---	---
	12/18/95	---	---	0.009	---	---
SW-A	11/9/95	0.006	ND (0.001)	0.010	0.11	ND (0.02)
SW-B	11/9/95	0.003	ND (0.001)	0.005	ND (0.04)	ND (0.02)
SW-3	11/9/94	ND (0.002)	ND (0.001)	0.028	ND (0.04)	ND (0.04)

Notes:

1. Practical Quantitation Limit shown in parentheses where compounds not detected (ND).
2. mg/l = Milligrams per liter
3. --- = Parameter not analyzed.

F1GUR38

NOTES:

- PROPERTY LINE AND FEATURES TAKEN FROM "PLAN OF LAND IN WOBURN, MASSACHUSETTS" BY NORTHEAST SURVEY, INC. 730 BOSTON POST ROAD, SUDBURY, MASSACHUSETTS 01776. SHEET 1 OF 1. JOB NO. 30688, DATED APRIL 1, 1988. WETLAND DELINEATED ON MURPHY'S PROPERTY BY SANFORD ECOLOGICAL SERVICES.
- 3,000 GALLON SELF CONTAINED ABOVEGROUND TANK USED FOR STORING VIRGIN DIESEL FUEL OIL.

LEGEND

- RR-3 ⊕ EXISTING & FORMERLY EXISTING MONITORING WELL INSTALLED BY OTHERS ON ADJUTING PROPERTIES (LOCATION APPROXIMATE)
- MR-2SS ⊕ EXISTING MONITORING WELL
- — — — — PROPERTY LINE
- S — — — — — SEWER LINE
- W — — — — — WATER LINE
- — — — — GUARD RAIL
- — — — — WOOD RAIL FENCE
- ⊕ UTILITY POLE
- UTILITY BOX
- E.P. — — — — — EDGE OF PAVEMENT
- ⊕ HYDRANT
- ⊕ SEWER MANHOLE
- ⊕ APPROXIMATE LOCATION OF EXISTING SEPTIC SYSTEM & WATER SERVICE

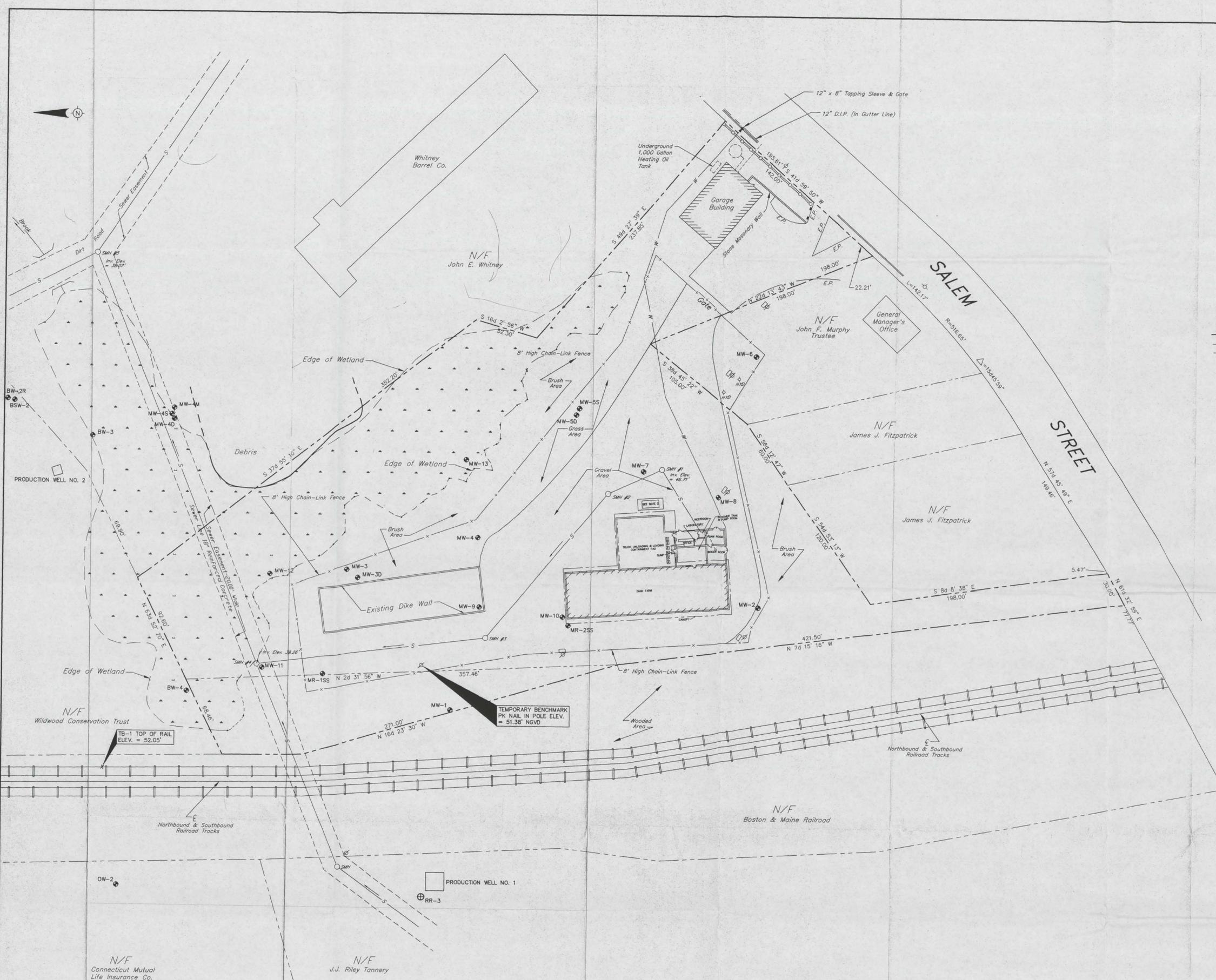
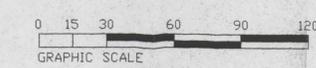


FIGURE 3

A PRELIMINARY		M.A.C. C.S.M. C.S.M.	
ISSUE	DESCRIPTION	ORGN.	CHD.
 ENVIRONMENTAL SERVICES, INC. REMEDIAL TECHNOLOGIES DIVISION 12 Mercer Road Natick, Massachusetts 01760 Telephone (508) 650-6910		APPR.	DATE
TITLE MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS 01801			
PROJECT NO. EN-170		DRAWING NO. 170-C-03	
SCALE 1"=30'			



NOTES:

1. PROPERTY LINE AND FEATURES TAKEN FROM "PLAN OF LAND IN WOBURN, MASSACHUSETTS" BY NORTHEAST SURVEY, INC. 730 BOSTON POST ROAD, SUDBURY, MASSACHUSETTS 01776. SHEET 1 OF 1. JOB NO. 30688, DATED APRIL 1, 1988. WETLAND DELINEATED ON MURPHY'S PROPERTY BY SANFORD ECOLOGICAL SERVICES.
2. 3,000 GALLON SELF CONTAINED ABOVEGROUND TANK USED FOR STORING VIRGIN DIESEL FUEL OIL.

LEGEND

- SW-1 Δ WETLAND SOIL MONITORING LOCATION
- RR-3 \oplus EXISTING & FORMERLY EXISTING MONITORING WELL INSTALLED BY OTHERS ON ADJACENT PROPERTIES (LOCATION APPROXIMATE)
- MR-255 \bullet EXISTING MONITORING WELL
- B-1 \bullet SOIL BORING
- P-1 \bullet WETLAND SOIL SAMPLE LOCATION
- PROPERTY LINE
- S- SEWER LINE
- W- WATER LINE
- GUARD RAIL
- WOOD RAIL FENCE
- UTILITY POLE
- UTILITY BOX
- E.P.- EDGE OF PAVEMENT
- HYDRANT
- SEWER MANHOLE
- APPROXIMATE LOCATION OF EXISTING SEPTIC SYSTEM & WATER SERVICE
- A---A' CROSS SECTION LINE LOCATION

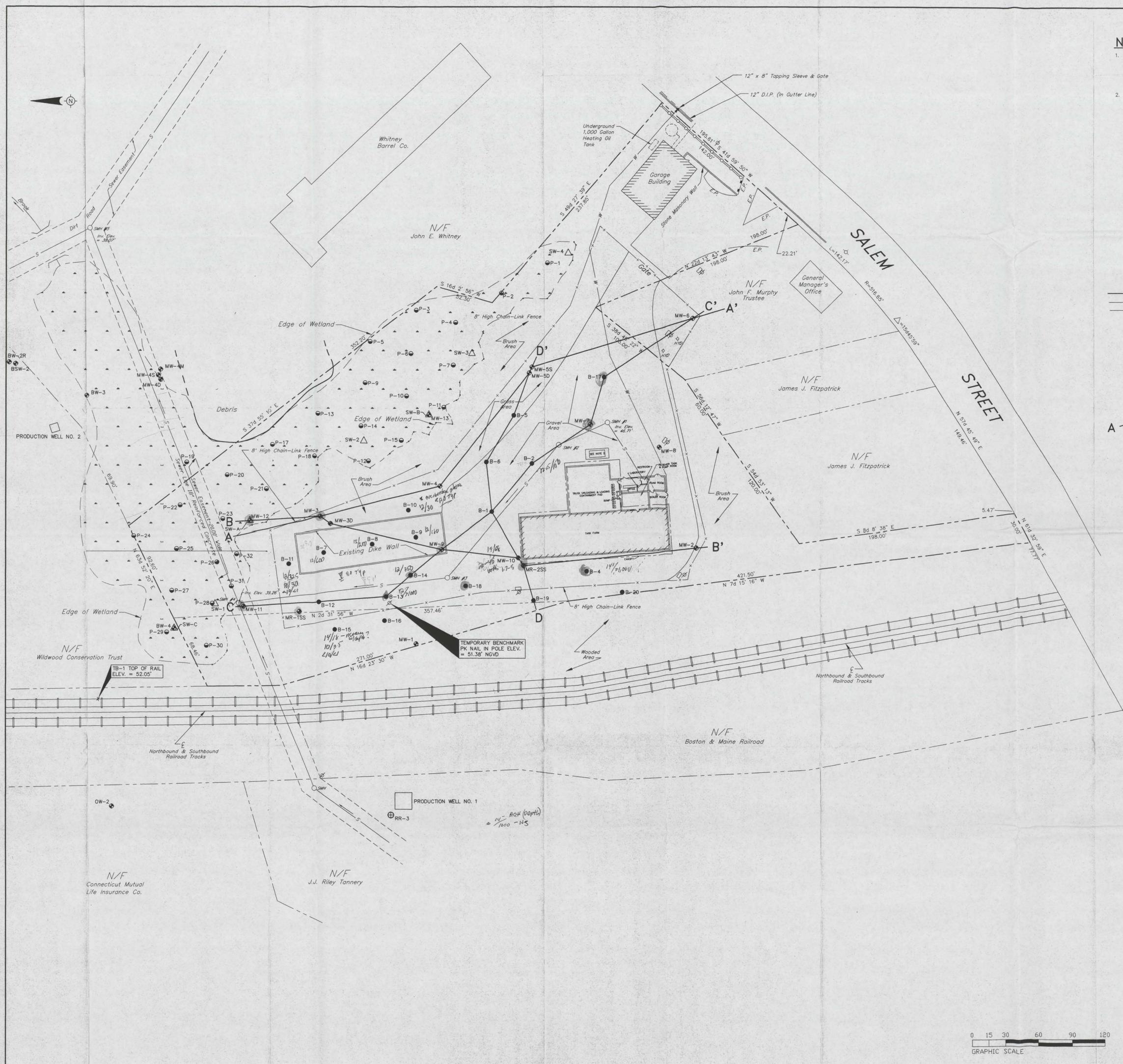


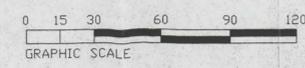
FIGURE 4

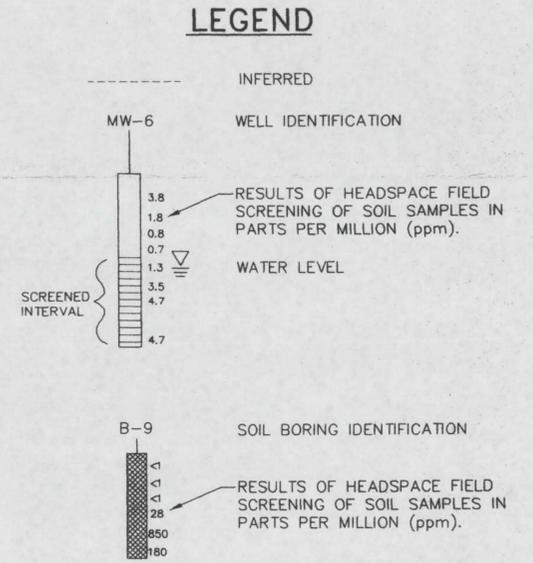
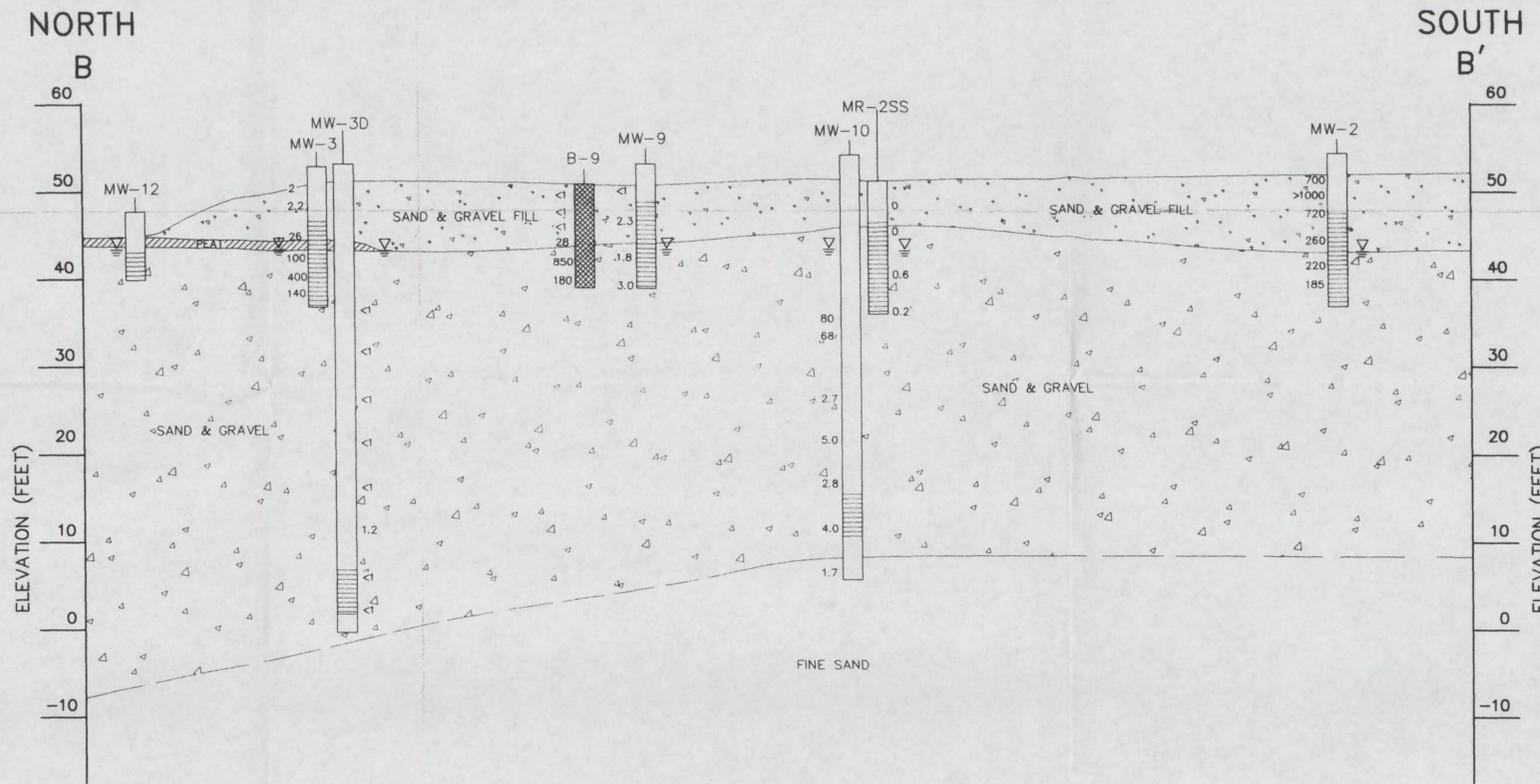
ISSUE	DESCRIPTION	DATE	DRN.	CHKD.	APPR.	DATE
A	PRELIMINARY					

CleanHarbors
 ENVIRONMENTAL SERVICES, INC.
 REMEDIAL TECHNOLOGIES DIVISION
 12 Mercer Road
 Natick, Massachusetts 01760
 Telephone (508) 650-6910

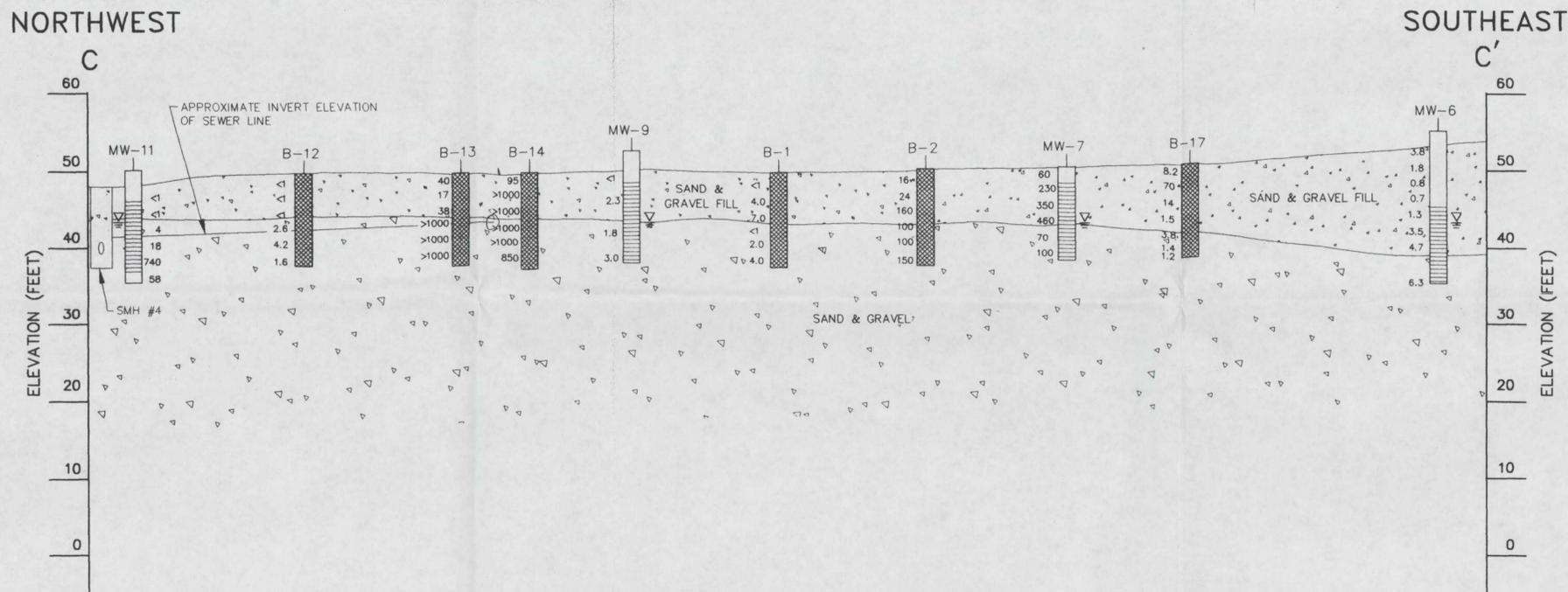
TITLE MURPHY'S WASTE OIL SERVICE, INC.
 252 SALEM STREET
 WOBURN, MASSACHUSETTS 01801
SAMPLING LOCATION PLAN

PROJECT NO. EN-170 DRAWING NO. 170-C-04
 SCALE 1"=30'





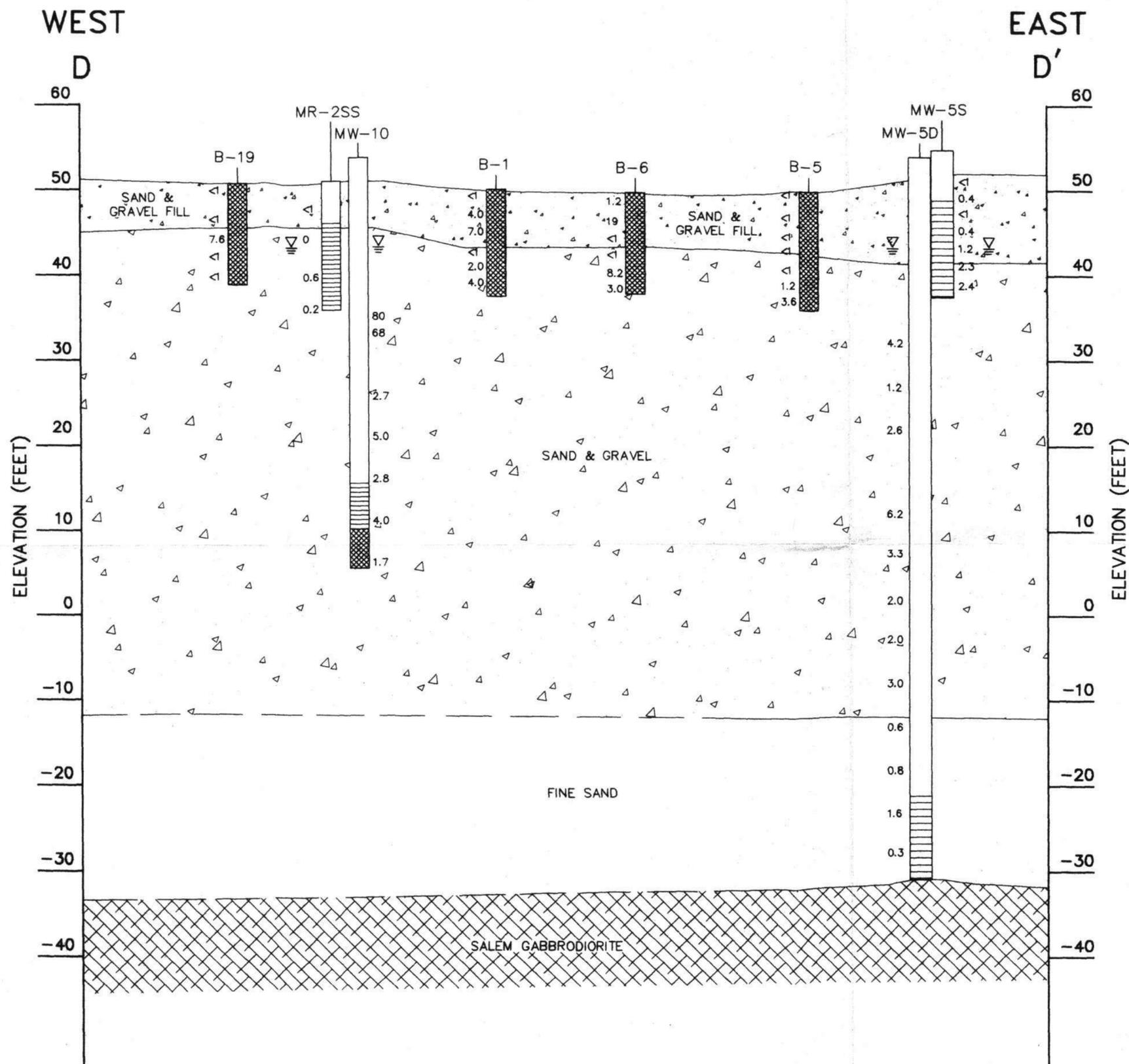
- NOTES:**
- ELEVATION IN FEET (NGVD).
 - GROUNDWATER ELEVATIONS MEASURED BY CHES ON OCTOBER 19, 1995.



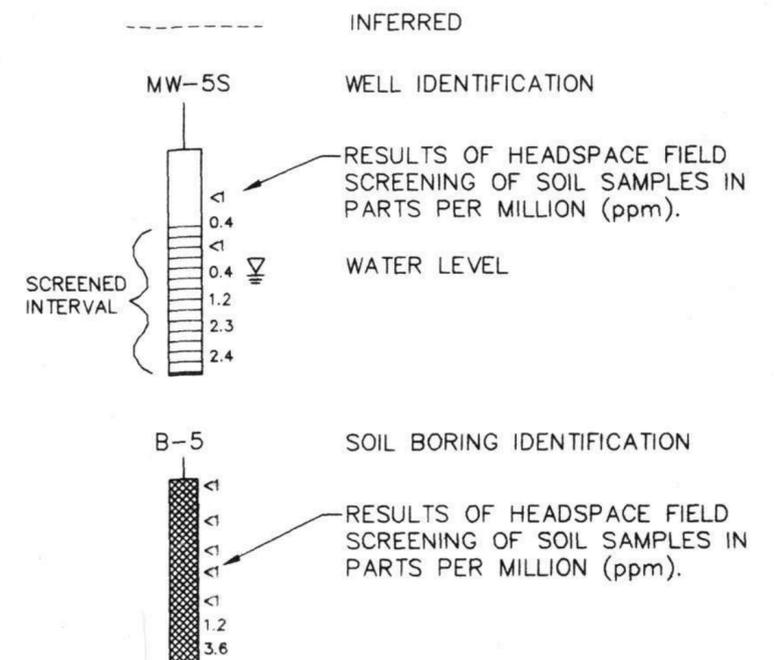
SCALE:
 HORIZONTAL = 1"=30'
 VERTICAL = 1"=10'
 VERTICAL EXAGGERATION = 3X

FIGURE 5

A	PRELIMINARY	W.G.	CJM	CJM	4/1/95
ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
CleanHarbors ENVIRONMENTAL SERVICES, INC. REMEDIAL TECHNOLOGIES DIVISION 12 Mercer Road Natick, Massachusetts 01760 Telephone (508) 650-6910					
TITLE: MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS					
CROSS SECTIONS B-B' & C-C'					
PROJECT NO.	EN-170	DRAWING NO.	1656-C-24		
SCALE	AS NOTED				



LEGEND



NOTES:

1. ELEVATION IN FEET (NGVD).
2. GROUNDWATER ELEVATIONS MEASURED BY CHES ON OCTOBER 19, 1995.

FIGURE 6

A	PRELIMINARY	Yom Co	CSM	CSM	4/1/96
ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
<p>CleanHarbors ENVIRONMENTAL SERVICES, INC. REMEDIAL TECHNOLOGIES DIVISION 12 Mercer Road Natick, Massachusetts 01760 Telephone (508) 650-6910</p>					
<p>TITLE MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS</p>					
<p>CROSS SECTION D-D'</p>					
PROJECT NO. EN-170		DRAWING NO. 1656-C-25			
SCALE AS NOTED					

SCALE:
 HORIZONTAL = 1"=30'
 VERTICAL = 1"=10'
 VERTICAL EXAGGERATION = 3X

NOTES:

- PROPERTY LINE AND FEATURES TAKEN FROM "PLAN OF LAND IN WOBURN, MASSACHUSETTS" BY NORTHEAST SURVEY, INC. 730 BOSTON POST ROAD, SUDBURY, MASSACHUSETTS 01776, SHEET 1 OF 1, JOB NO. 30688, DATED APRIL 1, 1988. WETLAND DELINEATED ON MURPHY'S PROPERTY BY SANFORD ECOLOGICAL SERVICES.
- 3,000 GALLON SELF CONTAINED ABOVEGROUND TANK USED FOR STORING VIRGIN DIESEL FUEL OIL.
- GRAPHS DEPICT PROFILES OF FIELD SCREENING RESULTS AT EACH SOIL BORING LOCATION USING A FLAME IONIZATION DETECTOR (OVA). Y-AXIS IS SAMPLE DEPTH IN FEET, X-AXIS IS HEADSPACE MEASUREMENT IN PARTS PER MILLION (ppm) PLOTTED ON A LOG SCALE.

LEGEND
SUMMARY SOIL ANALYTICAL DATA

- VOC VOLATILE ORGANIC COMPOUNDS (TOTAL CONCENTRATION IN ug/kg)
- TPH TOTAL PETROLEUM HYDROCARBON COMPOUNDS (TOTAL CONCENTRATION IN mg/kg)
- PAH POLYNUCLEAR AROMATIC HYDROCARBON COMPOUNDS (TOTAL CONCENTRATION IN ug/kg)
- ND NOT DETECTED
- [] SOIL SAMPLE DEPTH INTERVAL

Debris

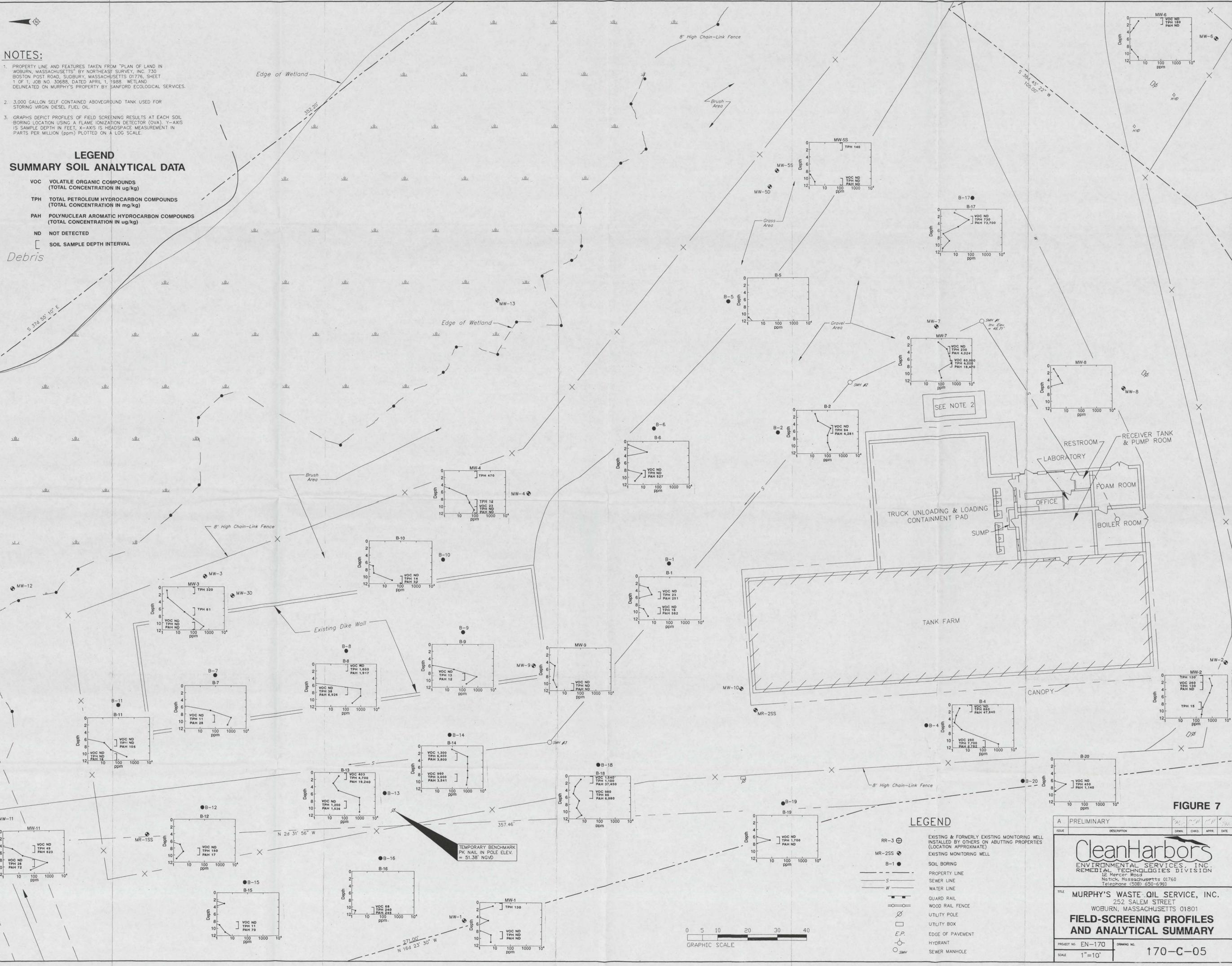
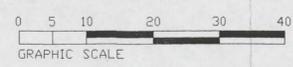


FIGURE 7

LEGEND

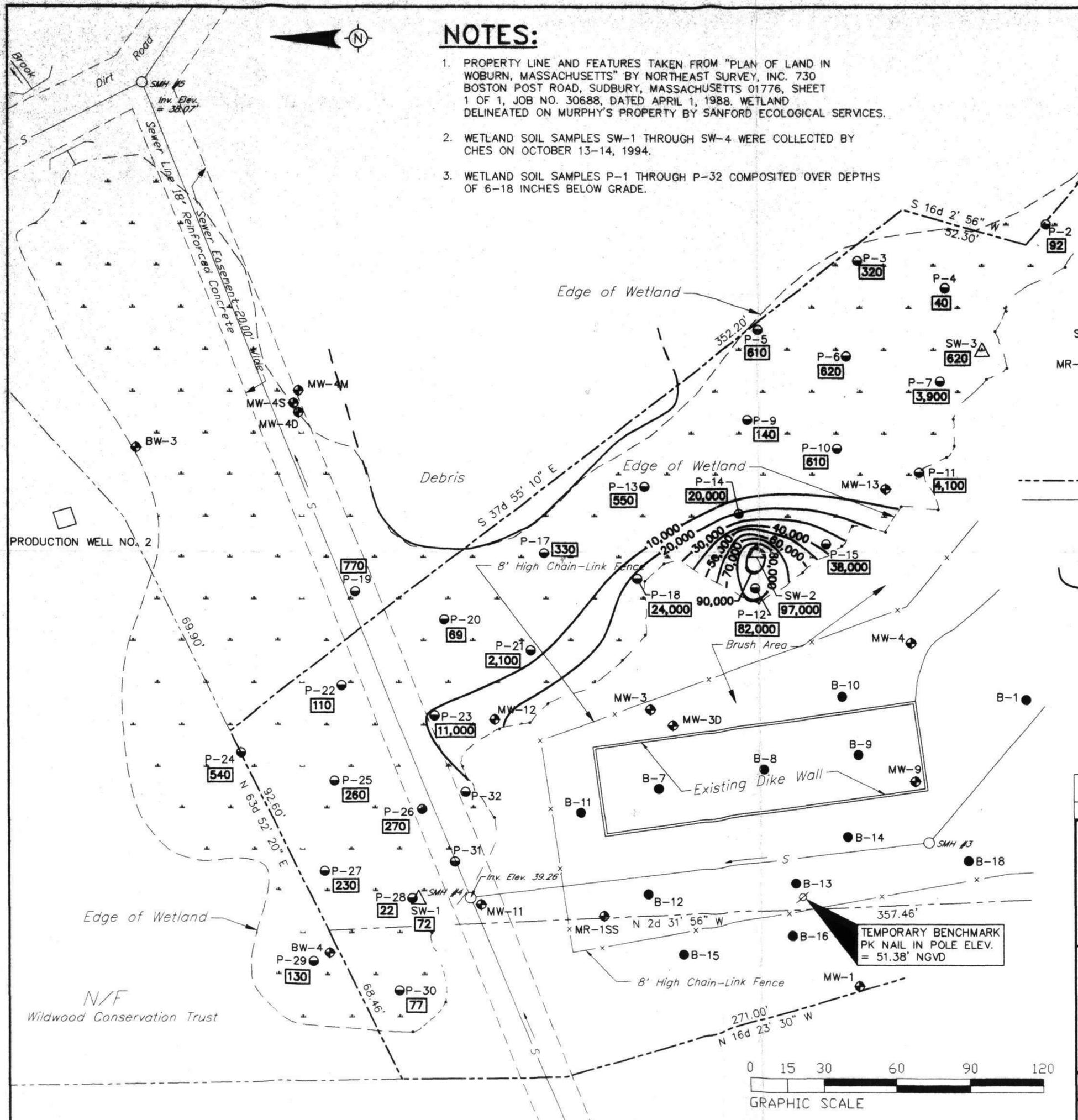
- RR-3 ⊕ EXISTING & FORMERLY EXISTING MONITORING WELL INSTALLED BY OTHERS ON ADJUTING PROPERTIES (LOCATION APPROXIMATE)
- MR-2SS ⊕ EXISTING MONITORING WELL
- B-1 ● SOIL BORING
- PROPERTY LINE
- - - SEWER LINE
- - - WATER LINE
- GUARD RAIL
- WOOD RAIL FENCE
- UTILITY POLE
- UTILITY BOX
- - - E.P. EDGE OF PAVEMENT
- HYDRANT
- SMW SEWER MANHOLE



A PRELIMINARY		DATE	ISSUE
DESCRIPTION	DATE	CHG.	APPR.
 Clean Harbors ENVIRONMENTAL SERVICES, INC. REMEDIATION TECHNOLOGIES DIVISION 12 Mercer Road Norwick, Massachusetts 01760 Telephone (508) 650-6910			
TITLE MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS 01801			
FIELD-SCREENING PROFILES AND ANALYTICAL SUMMARY			
PROJECT NO. EN-170	DRAWING NO.	170-C-05	
SCALE 1"=10'			

NOTES:

1. PROPERTY LINE AND FEATURES TAKEN FROM "PLAN OF LAND IN WOBURN, MASSACHUSETTS" BY NORTHEAST SURVEY, INC. 730 BOSTON POST ROAD, SUDBURY, MASSACHUSETTS 01776, SHEET 1 OF 1, JOB NO. 30688, DATED APRIL 1, 1988. WETLAND DELINEATED ON MURPHY'S PROPERTY BY SANFORD ECOLOGICAL SERVICES.
2. WETLAND SOIL SAMPLES SW-1 THROUGH SW-4 WERE COLLECTED BY CHES ON OCTOBER 13-14, 1994.
3. WETLAND SOIL SAMPLES P-1 THROUGH P-32 COMPOSITED OVER DEPTHS OF 6-18 INCHES BELOW GRADE.

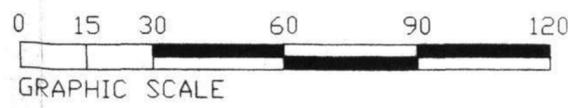


LEGEND

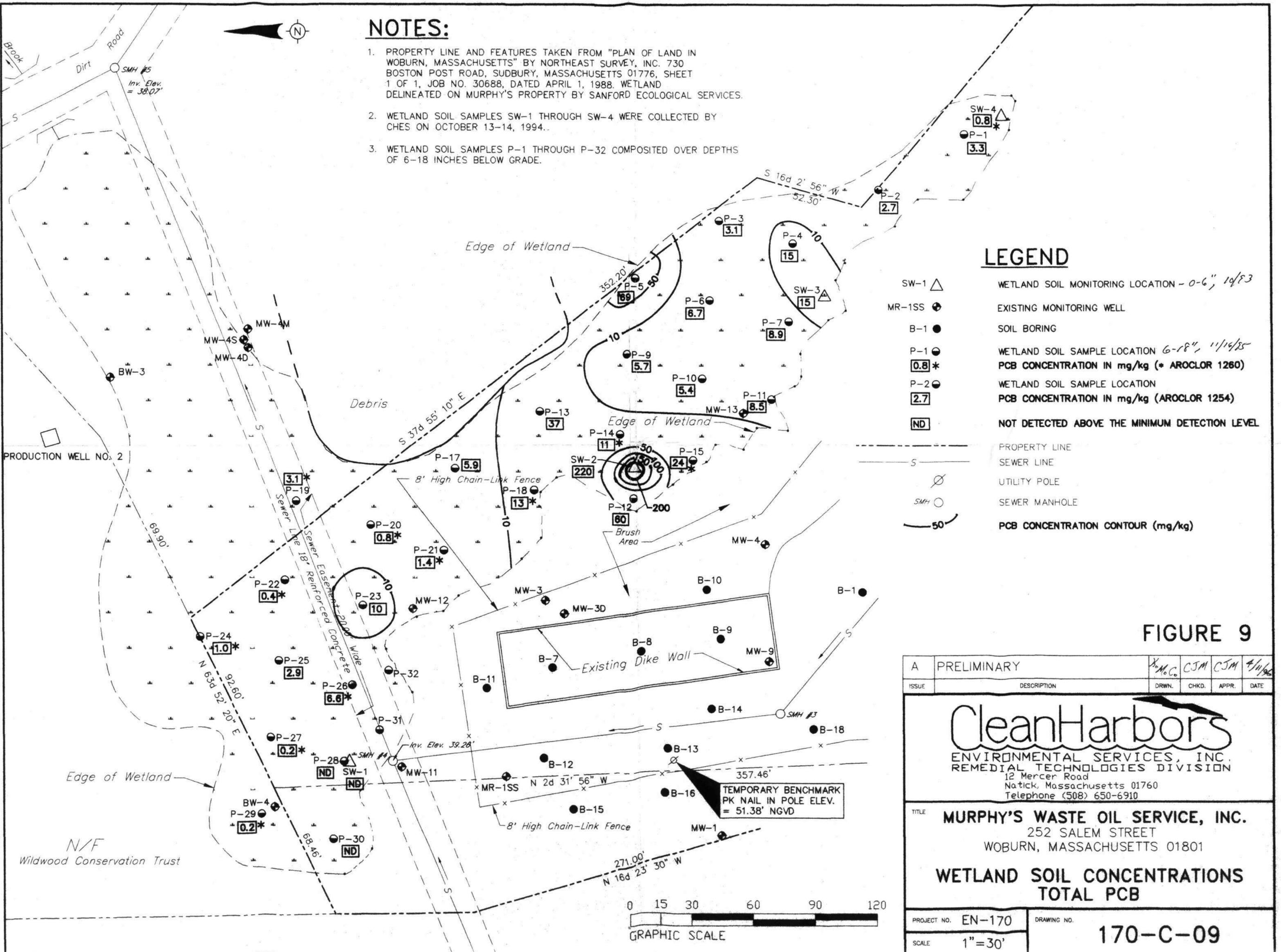
- SW-1 Δ WETLAND SOIL MONITORING LOCATION
- MR-1SS \oplus EXISTING MONITORING WELL
- B-1 \bullet SOIL BORING
- P-1 \bullet WETLAND SOIL SAMPLE LOCATION
- 44 \square TPH CONCENTRATION IN mg/kg
- TPH TOTAL PETROLEUM HYDROCARBONS
- PROPERTY LINE
- S SEWER LINE
- \circ UTILITY POLE
- SMH \circ SEWER MANHOLE
- 10,000 \curvearrowright TPH CONCENTRATION CONTOUR (mg/kg)

FIGURE 8

A	PRELIMINARY	X.M.C.	CJM	CJM	4/1/95
ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
<p>CleanHarbors ENVIRONMENTAL SERVICES, INC. REMEDIAL TECHNOLOGIES DIVISION 12 Mercer Road Natick, Massachusetts 01760 Telephone (508) 650-6910</p>					
<p>TITLE: MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS 01801</p>					
<p>WETLAND SOIL CONCENTRATIONS TOTAL PETROLEUM HYDROCARBONS</p>					
PROJECT NO.	EN-170	DRAWING NO.	170-C-12		
SCALE	1" = 30'				



N/F
Wildwood Conservation Trust



NOTES:

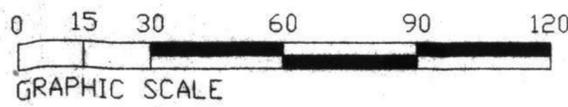
1. PROPERTY LINE AND FEATURES TAKEN FROM "PLAN OF LAND IN WOBURN, MASSACHUSETTS" BY NORTHEAST SURVEY, INC. 730 BOSTON POST ROAD, SUDBURY, MASSACHUSETTS 01776, SHEET 1 OF 1, JOB NO. 30688, DATED APRIL 1, 1988. WETLAND DELINEATED ON MURPHY'S PROPERTY BY SANFORD ECOLOGICAL SERVICES.
2. WETLAND SOIL SAMPLES SW-1 THROUGH SW-4 WERE COLLECTED BY CHES ON OCTOBER 13-14, 1994.
3. WETLAND SOIL SAMPLES P-1 THROUGH P-32 COMPOSITED OVER DEPTHS OF 6-18 INCHES BELOW GRADE.

LEGEND

- SW-1 Δ WETLAND SOIL MONITORING LOCATION - 0-6", 10/83
- MR-1SS \oplus EXISTING MONITORING WELL
- B-1 \bullet SOIL BORING
- P-1 \bullet WETLAND SOIL SAMPLE LOCATION 6-18", 11/14/85
- $\boxed{0.8}$ * PCB CONCENTRATION IN mg/kg (* AROCLOR 1260)
- $\boxed{2.7}$ WETLAND SOIL SAMPLE LOCATION
- $\boxed{2.7}$ PCB CONCENTRATION IN mg/kg (AROCOR 1254)
- \boxed{ND} NOT DETECTED ABOVE THE MINIMUM DETECTION LEVEL
- - - - - PROPERTY LINE
- - - - - SEWER LINE
- \circ UTILITY POLE
- SMH \circ SEWER MANHOLE
- \curvearrowright 50 PCB CONCENTRATION CONTOUR (mg/kg)

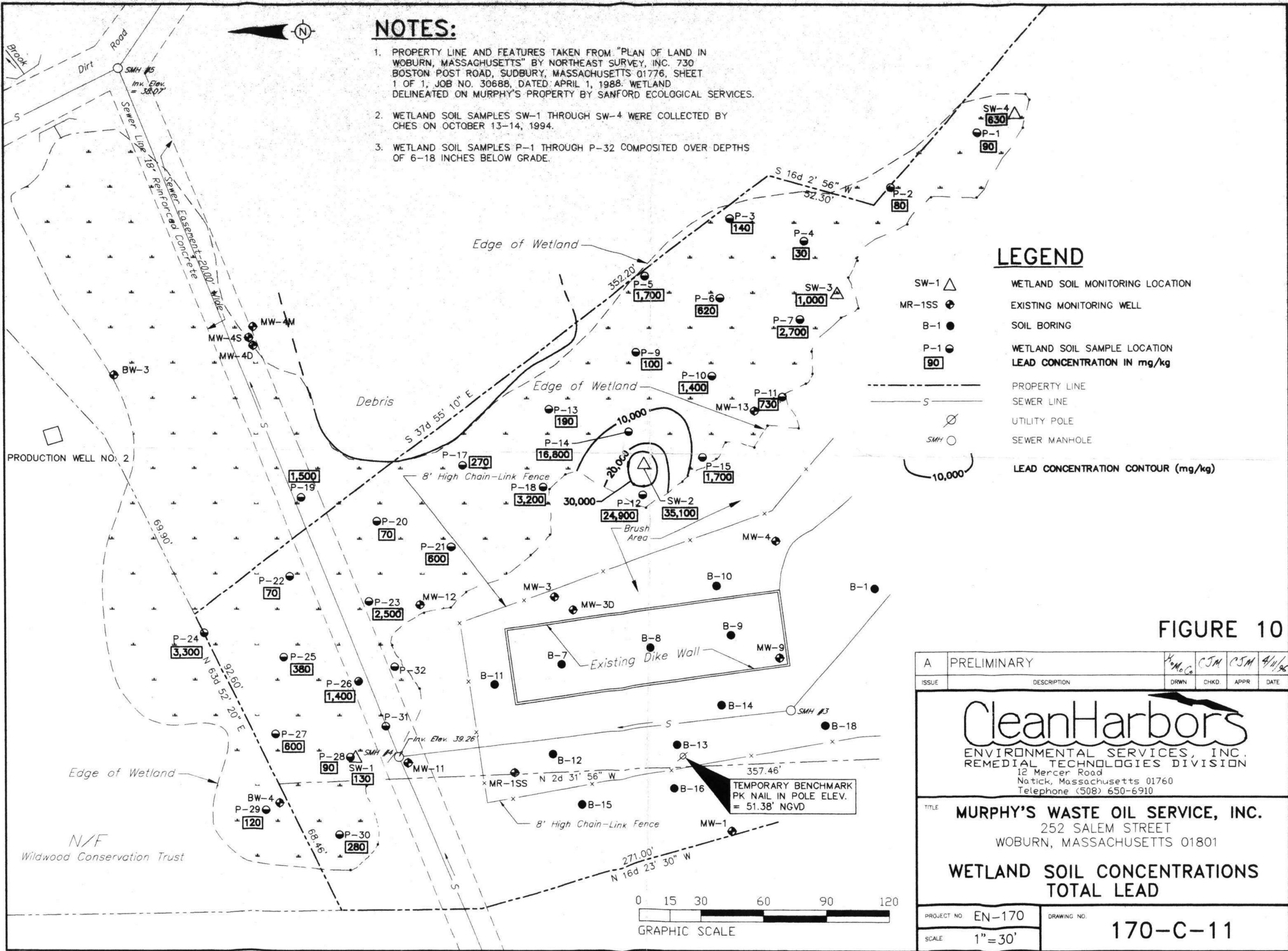
FIGURE 9

A	PRELIMINARY	X	M.G.	CJM	CJM	4/1/96
ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE	
<p>Clean Harbors ENVIRONMENTAL SERVICES, INC. REMEDIAL TECHNOLOGIES DIVISION 12 Mercer Road Natick, Massachusetts 01760 Telephone (508) 650-6910</p>						
<p>TITLE MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS 01801</p>						
<p>WETLAND SOIL CONCENTRATIONS TOTAL PCB</p>						
PROJECT NO.	EN-170	DRAWING NO.		170-C-09		
SCALE	1" = 30'					



NOTES:

1. PROPERTY LINE AND FEATURES TAKEN FROM "PLAN OF LAND IN WOBURN, MASSACHUSETTS" BY NORTHEAST SURVEY, INC. 730 BOSTON POST ROAD, SUDBURY, MASSACHUSETTS 01776, SHEET 1 OF 1, JOB NO. 30688, DATED APRIL 1, 1988. WETLAND DELINEATED ON MURPHY'S PROPERTY BY SANFORD ECOLOGICAL SERVICES.
2. WETLAND SOIL SAMPLES SW-1 THROUGH SW-4 WERE COLLECTED BY CHES ON OCTOBER 13-14, 1994.
3. WETLAND SOIL SAMPLES P-1 THROUGH P-32 COMPOSITED OVER DEPTHS OF 6-18 INCHES BELOW GRADE.



LEGEND

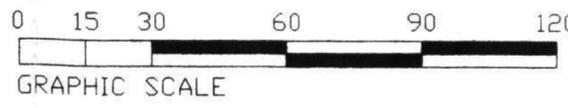
- SW-1 Δ WETLAND SOIL MONITORING LOCATION
- MR-1SS \oplus EXISTING MONITORING WELL
- B-1 \bullet SOIL BORING
- P-1 \bullet WETLAND SOIL SAMPLE LOCATION
- 90 \square LEAD CONCENTRATION IN mg/kg
- PROPERTY LINE
- S --- SEWER LINE
- \otimes UTILITY POLE
- SMH \circ SEWER MANHOLE
- 10,000 \curvearrowright LEAD CONCENTRATION CONTOUR (mg/kg)

FIGURE 10

A	PRELIMINARY	K.M.C.	CJM	CJM	4/1/96
ISSUE	DESCRIPTION	DRWN	CHKD.	APPR	DATE

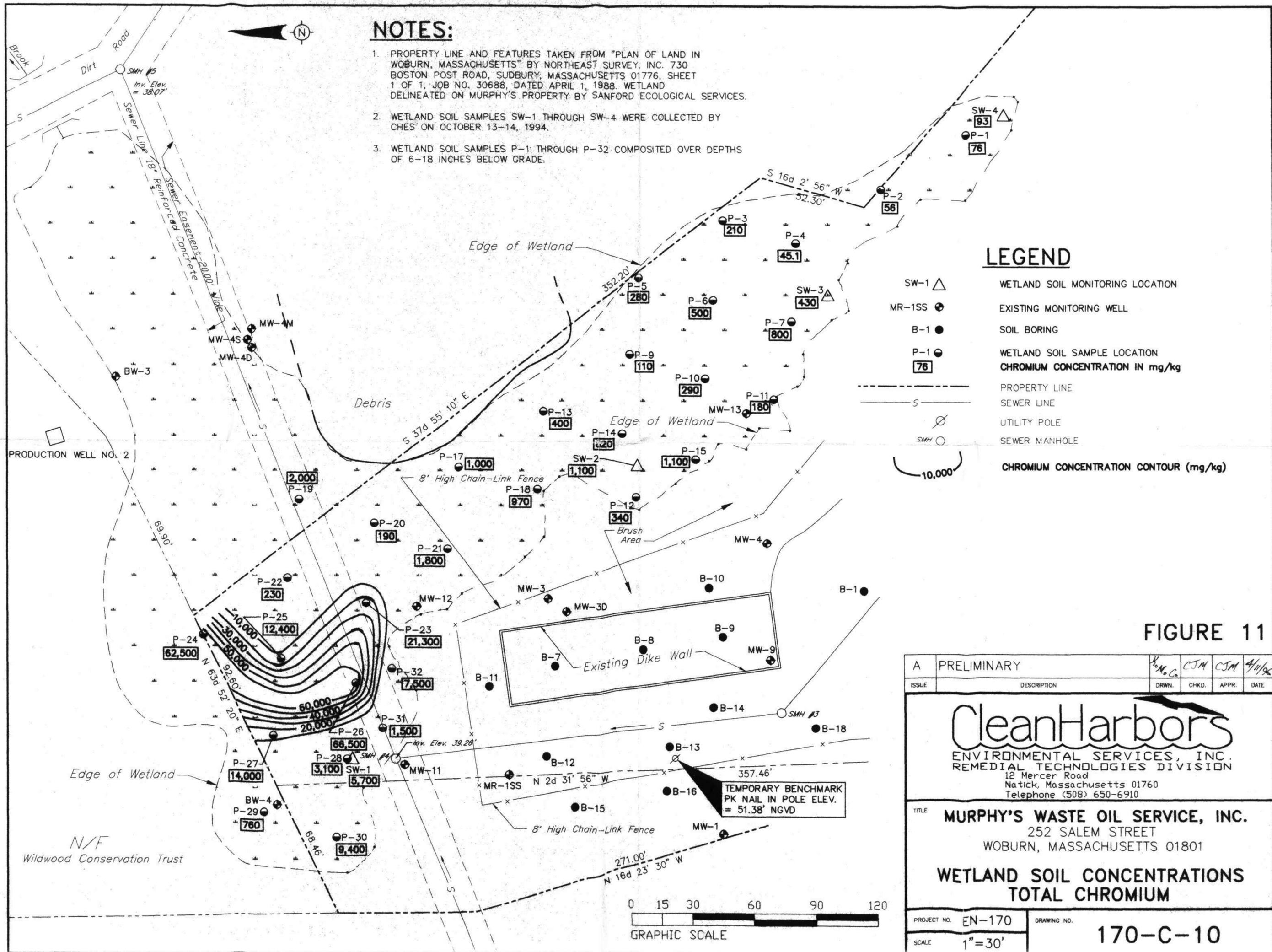
CleanHarbors
 ENVIRONMENTAL SERVICES, INC.
 REMEDIAL TECHNOLOGIES DIVISION
 12 Mercer Road
 Natick, Massachusetts 01760
 Telephone (508) 650-6910

TITLE	MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS 01801	
	WETLAND SOIL CONCENTRATIONS TOTAL LEAD	
PROJECT NO.	EN-170	DRAWING NO.
SCALE	1"=30'	170-C-11



NOTES:

1. PROPERTY LINE AND FEATURES TAKEN FROM "PLAN OF LAND IN WOBURN, MASSACHUSETTS" BY NORTHEAST SURVEY, INC. 730 BOSTON POST ROAD, SUDBURY, MASSACHUSETTS 01776, SHEET 1 OF 1, JOB NO. 30688, DATED APRIL 1, 1988. WETLAND DELINEATED ON MURPHY'S PROPERTY BY SANFORD ECOLOGICAL SERVICES.
2. WETLAND SOIL SAMPLES SW-1 THROUGH SW-4 WERE COLLECTED BY CHES ON OCTOBER 13-14, 1994.
3. WETLAND SOIL SAMPLES P-1 THROUGH P-32 COMPOSITED OVER DEPTHS OF 6-18 INCHES BELOW GRADE.

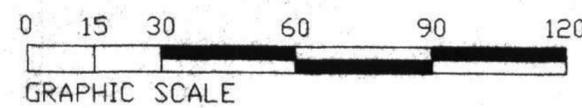


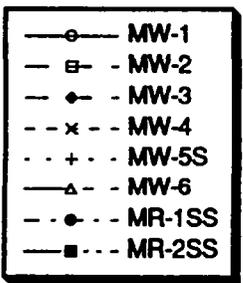
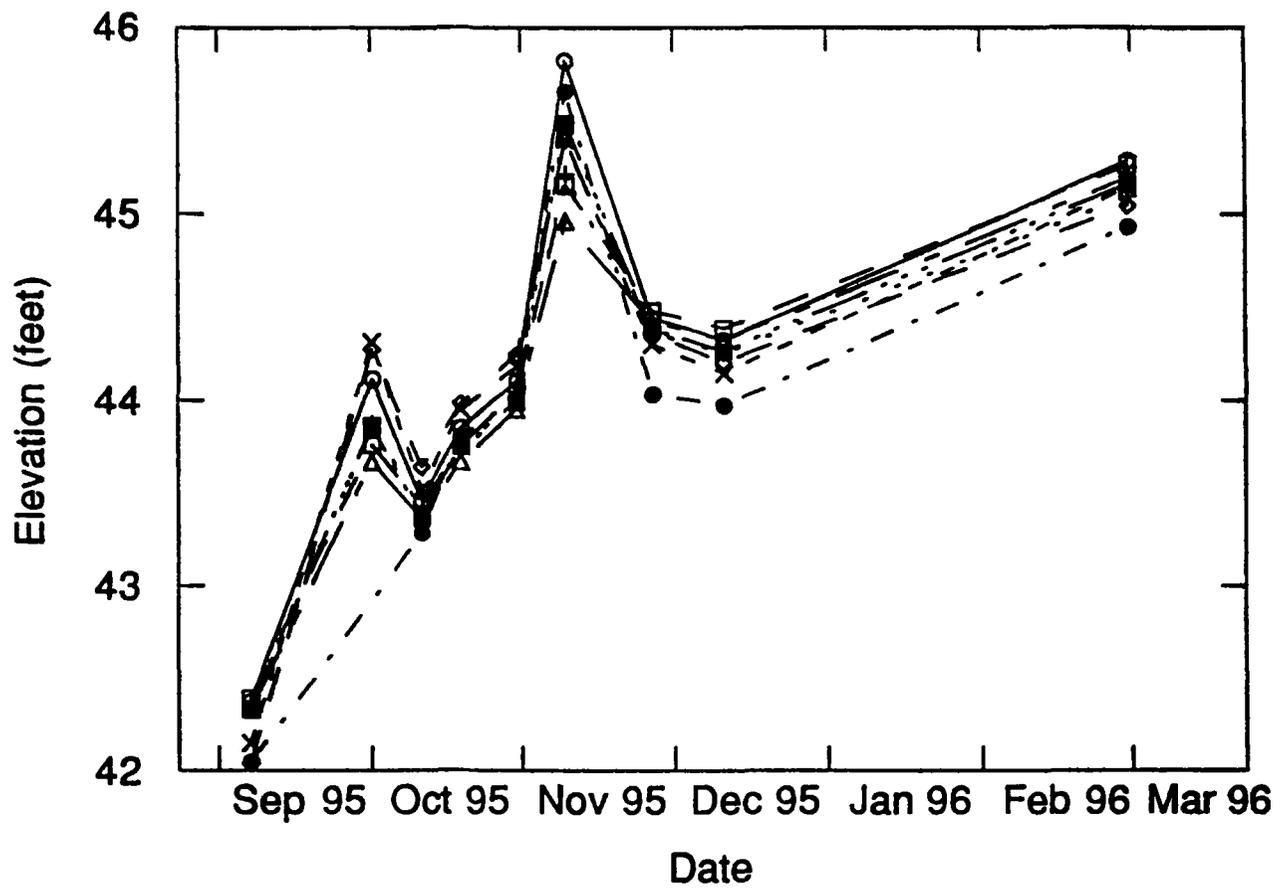
LEGEND

- SW-1 Δ WETLAND SOIL MONITORING LOCATION
- MR-1SS \oplus EXISTING MONITORING WELL
- B-1 \bullet SOIL BORING
- P-1 \ominus WETLAND SOIL SAMPLE LOCATION
- 76 CHROMIUM CONCENTRATION IN mg/kg
- PROPERTY LINE
- S- SEWER LINE
- \otimes UTILITY POLE
- SMH \circ SEWER MANHOLE
- 10,000 CHROMIUM CONCENTRATION CONTOUR (mg/kg)

FIGURE 11

A	PRELIMINARY	YonCo	CJM	CJM	4/1/96
ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
<p>CleanHarbors ENVIRONMENTAL SERVICES, INC. REMEDIAL TECHNOLOGIES DIVISION 12 Mercer Road Natick, Massachusetts 01760 Telephone (508) 650-6910</p>					
<p>TITLE MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS 01801</p>					
<p>WETLAND SOIL CONCENTRATIONS TOTAL CHROMIUM</p>					
PROJECT NO.	EN-170	DRAWING NO.			
SCALE	1"=30'	170-C-10			





Note:

1. Groundwater elevations in feet NGVD measured in select wells during Corrective Action Investigation.

A	PRELIMINARY				
ISSUE	DESCRIPTION	DRWN	CHKD	APPR	DATE

CleanHarbors
 Environmental Services, Inc.
 Remedial Technologies Division
 12 MERCER ROAD
 NATICK, MASSACHUSETTS 01760
 (508) 650-6910

MURPHY'S WASTE OIL SERVICE, INC.
 252 SALEM STREET
 WOBURN, MASSACHUSETTS

GROUNDWATER ELEVATION PLOT

PROJECT NO. EN-170	DWG. NO. FIGURE 12
SCALE: NA	

NOTES:

1. PROPERTY LINE AND FEATURES TAKEN FROM "PLAN OF LAND IN WOBURN, MASSACHUSETTS" BY NORTHEAST SURVEY, INC. 730 BOSTON POST ROAD, SUDBURY, MASSACHUSETTS 01776, SHEET 1 OF 1, JOB NO. 30688, DATED APRIL 1, 1988. WETLAND DELINEATED ON MURPHY'S PROPERTY BY SANFORD ECOLOGICAL SERVICES.
2. 3,000 GALLON SELF CONTAINED ABOVEGROUND TANK USED FOR STORING VIRGIN DIESEL FUEL OIL.
3. GROUNDWATER ELEVATIONS MEASURED BY CHES ON SEPTEMBER 15, 1995. ELEVATIONS RELATIVE TO TEMPORARY BENCHMARK PK NAIL IN POLE ELEV. = 51.38' NGVD.

LEGEND

- RR-3 ⊕ EXISTING & FORMERLY EXISTING MONITORING WELL (LOCATION APPROXIMATE)
- MR-2SS ⊕ EXISTING MONITORING WELL
- 50.80 REFERENCE ELEVATION (TOP OF PVC) (FEET)
- 42.33 GROUNDWATER ELEVATION (FEET)
- PROPERTY LINE
- S SEWER LINE
- W WATER LINE
- ▬ GUARD RAIL
- ▬ WOOD RAIL FENCE
- UTILITY POLE
- UTILITY BOX
- E.P. EDGE OF PAVEMENT
- HYDRANT
- SEWER MANHOLE
- APPROXIMATE LOCATION OF EXISTING SEPTIC SYSTEM & WATER SERVICE
- 42.2 GROUNDWATER CONTOUR

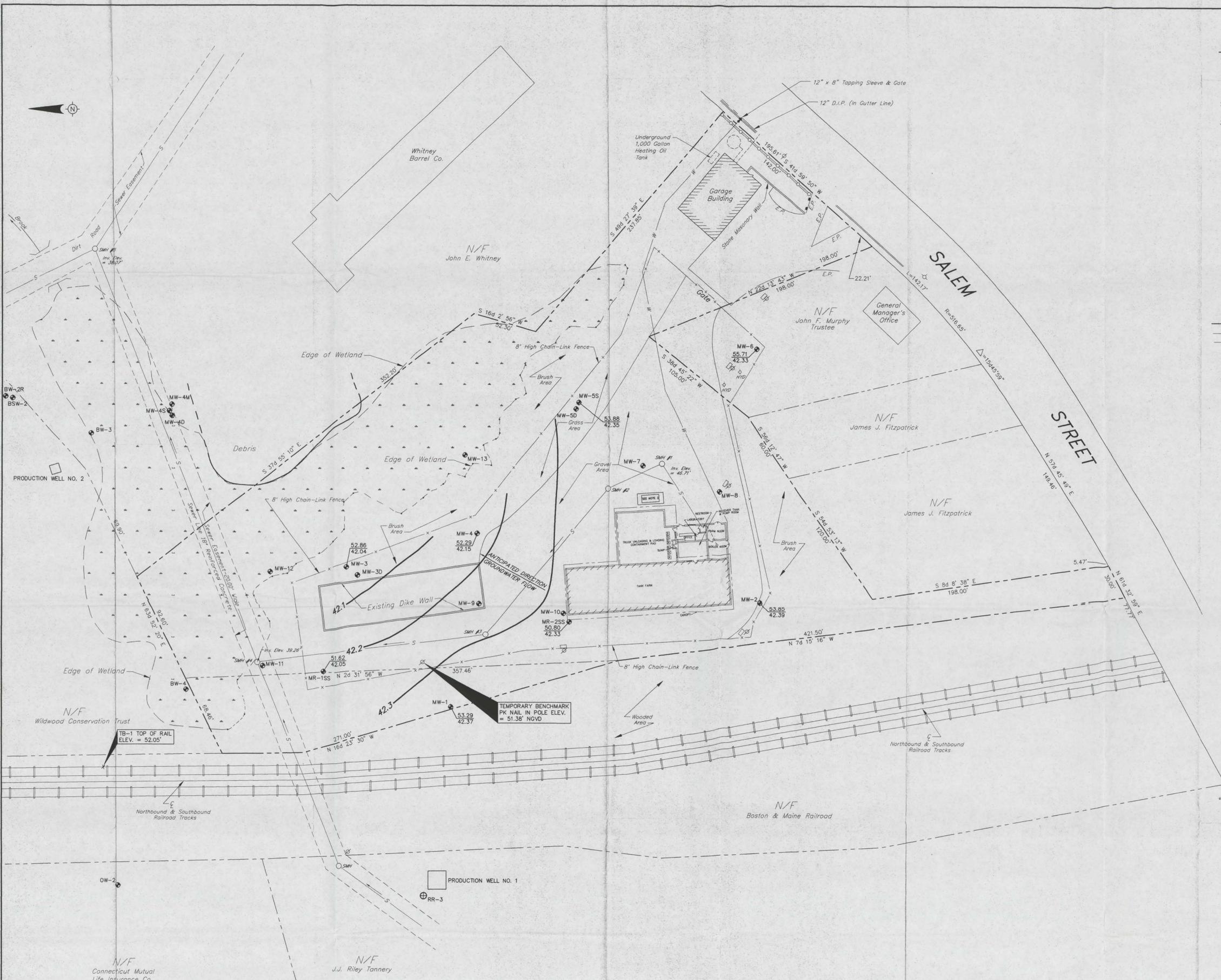
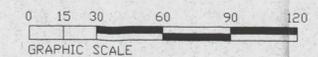


FIGURE 13

A	PRELIMINARY	CSM	CSM	CSM	CSM
ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
<p>CleanHarbors ENVIRONMENTAL SERVICES, INC. REMEDIAL TECHNOLOGIES DIVISION 12 Mercer Road Natick, Massachusetts 01760 Telephone (508) 650-6910</p>					
<p>TITLE MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS 01801</p>					
<p>GROUNDWATER CONTOUR PLAN SHALLOW AQUIFER SEPTEMBER 15, 1995</p>					
PROJECT NO.	EN-170	DRAWING NO.	170-C-07		
SCALE	1" = 30'				



NOTES:

1. PROPERTY LINE AND FEATURES TAKEN FROM "PLAN OF LAND IN WOBURN, MASSACHUSETTS" BY NORTHEAST SURVEY, INC. 730 BOSTON POST ROAD, SUDBURY, MASSACHUSETTS 01776, SHEET 1 OF 1, JOB NO. 30688, DATED APRIL 1, 1988. WETLAND DELINEATED ON MURPHY'S PROPERTY BY SANFORD ECOLOGICAL SERVICES.
2. 3,000 GALLON SELF CONTAINED ABOVEGROUND TANK USED FOR STORING VIRGIN DIESEL FUEL OIL.
3. GROUNDWATER ELEVATIONS MEASURED BY CHES ON MARCH 7, 1996. ELEVATIONS RELATIVE TO TEMPORARY BENCHMARK PK NAIL IN POLE ELEV. = 51.38' NGVD.

LEGEND

- RR-3 ⊕ EXISTING & FORMERLY EXISTING MONITORING WELL INSTALLED BY OTHERS ON ABUTTING PROPERTIES (LOCATION APPROXIMATE)
- MR-2SS ⊕ EXISTING MONITORING WELL
- 50.80
45.16 REFERENCE ELEVATION (TOP OF PVC) (FEET)
GROUNDWATER ELEVATION (FEET)
- PROPERTY LINE
- S- SEWER LINE
- W- WATER LINE
- ▬ GUARD RAIL
- ▬ WOOD RAIL FENCE
- UTILITY POLE
- UTILITY BOX
- E.P. EDGE OF PAVEMENT
- HYDRANT
- SEWER MANHOLE
- APPROXIMATE LOCATION OF EXISTING SEPTIC SYSTEM & WATER SERVICE
- - - 45.2 GROUNDWATER CONTOUR (DASHED WHERE INFERRED)

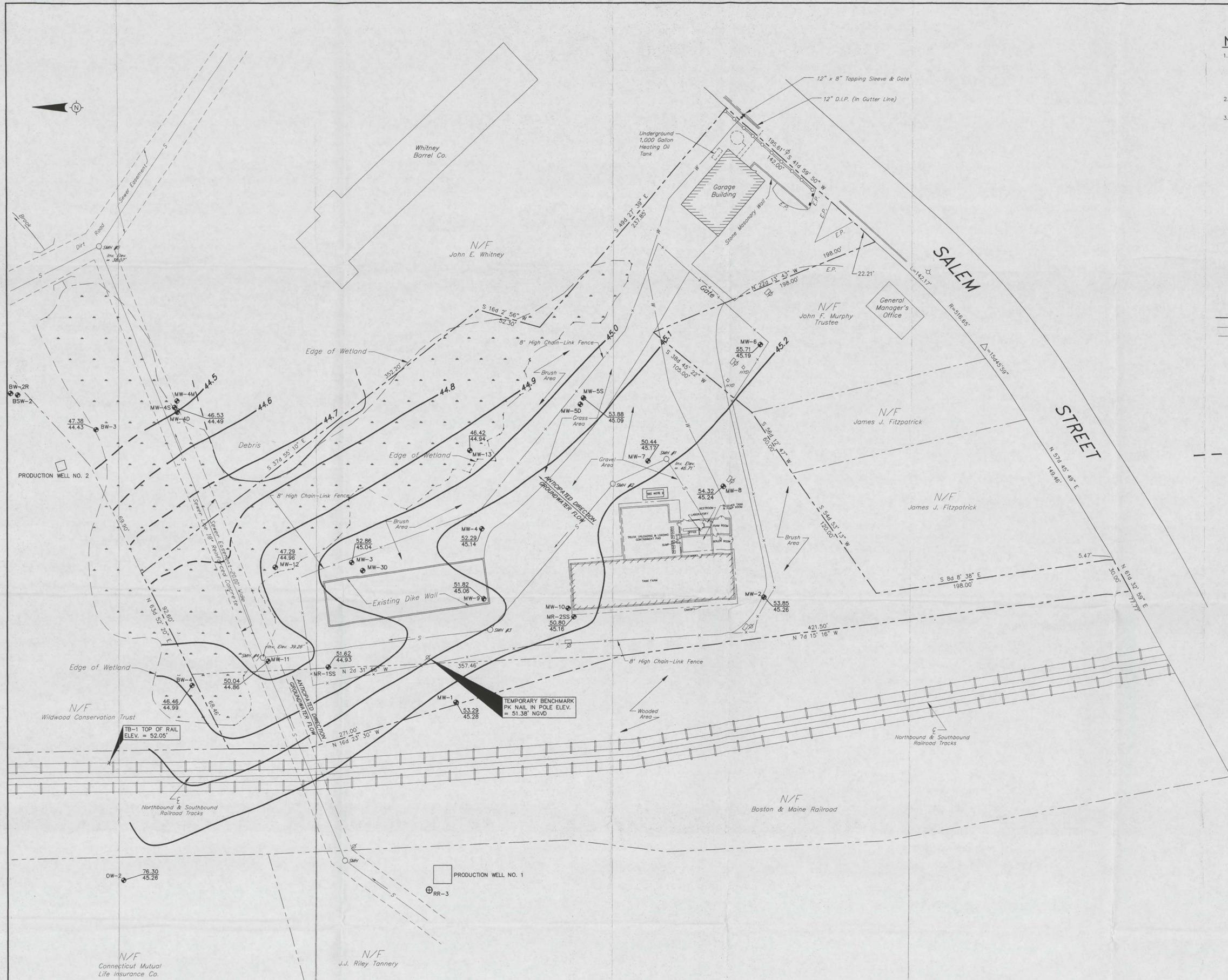
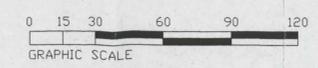


FIGURE 14

A	PRELIMINARY	4/1/96	CSM	CSM	4/1/96
ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
Clean Harbors ENVIRONMENTAL SERVICES, INC. REMEDIAL TECHNOLOGIES DIVISION 12 Mercer Road Norwick, Massachusetts 01760 Telephone (508) 650-6910					
TITLE MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS 01801					
GROUNDWATER CONTOUR PLAN SHALLOW AQUIFER MARCH 7, 1996					
PROJECT NO.	EN-170	DRAWING NO.	170-C-06		
SCALE	1" = 30'				



NOTES:

1. PROPERTY LINE AND FEATURES TAKEN FROM "PLAN OF LAND IN WOBURN, MASSACHUSETTS" BY NORTHEAST SURVEY, INC. 730 BOSTON POST ROAD, SUDBURY, MASSACHUSETTS 01776, SHEET 1 OF 1, JOB NO. 30668, DATED APRIL 1, 1988. WETLAND DELINEATED ON MURPHY'S PROPERTY BY SANFORD ECOLOGICAL SERVICES.
2. 3,000 GALLON SELF CONTAINED ABOVEGROUND TANK USED FOR STORING VIRGIN DIESEL FUEL OIL.
3. GROUNDWATER ELEVATIONS MEASURED BY CHES ON MARCH 7, 1996. ELEVATIONS RELATIVE TO TEMPORARY BENCHMARK PK NAIL IN POLE ELEV. = 51.38' NGVD.

LEGEND

- RR-3 ⊕ EXISTING & FORMERLY EXISTING MONITORING WELL INSTALLED BY OTHERS ON ABUTTING PROPERTIES (LOCATION APPROXIMATE)
- MW-50 ⊕ EXISTING MONITORING WELL
- 54.06
44.90 REFERENCE ELEVATION (TOP OF PVC) (FEET)
GROUNDWATER ELEVATION (FEET)
- PROPERTY LINE
- S- SEWER LINE
- W- WATER LINE
- ▬ GUARD RAIL
- ▬ WOOD RAIL FENCE
- ⊕ UTILITY POLE
- UTILITY BOX
- E.P. EDGE OF PAVEMENT
- HYDRANT
- SEWER MANHOLE
- APPROXIMATE LOCATION OF EXISTING SEPTIC SYSTEM & WATER SERVICE
- 45.2 GROUNDWATER CONTOUR

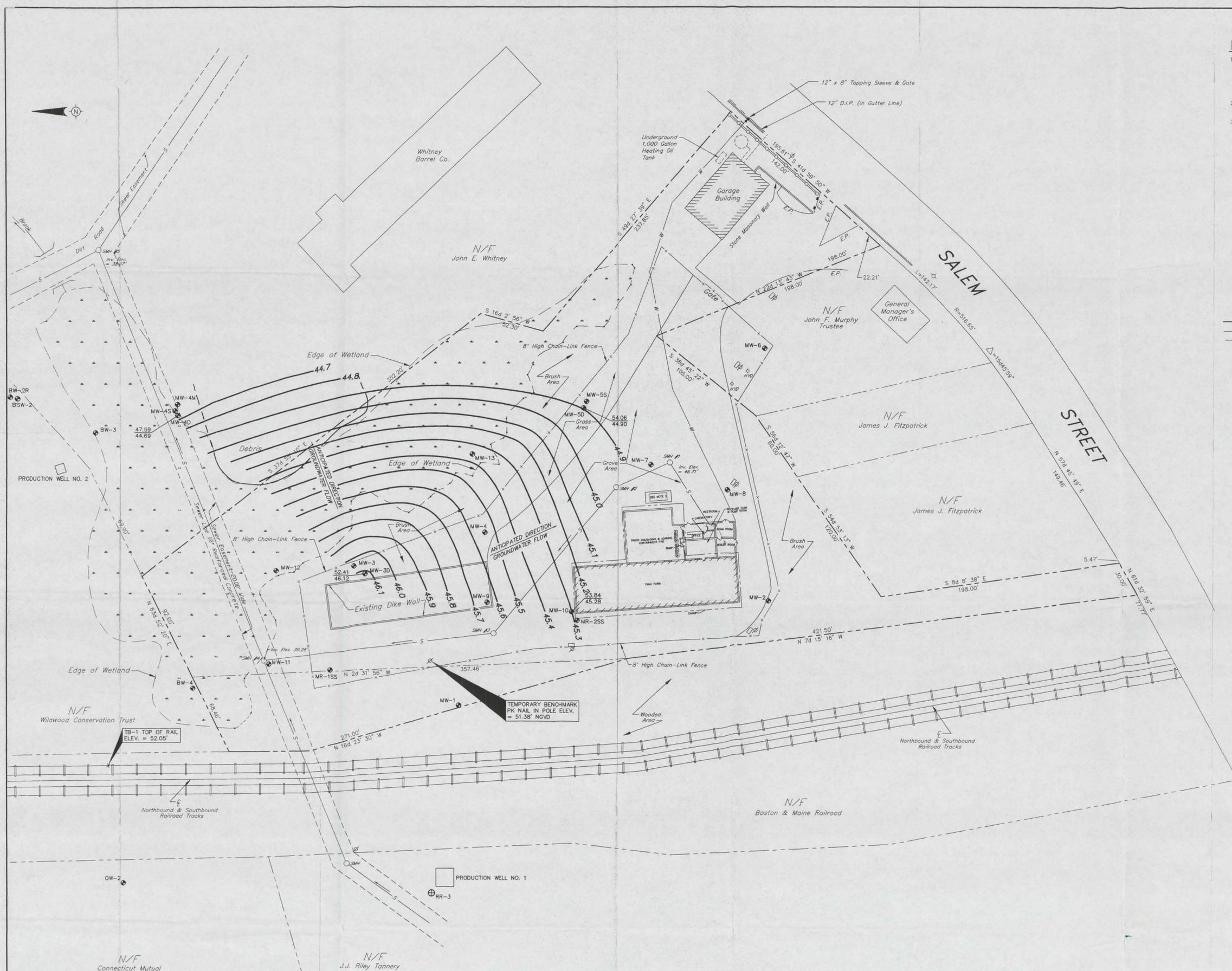
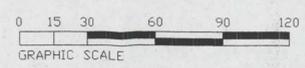
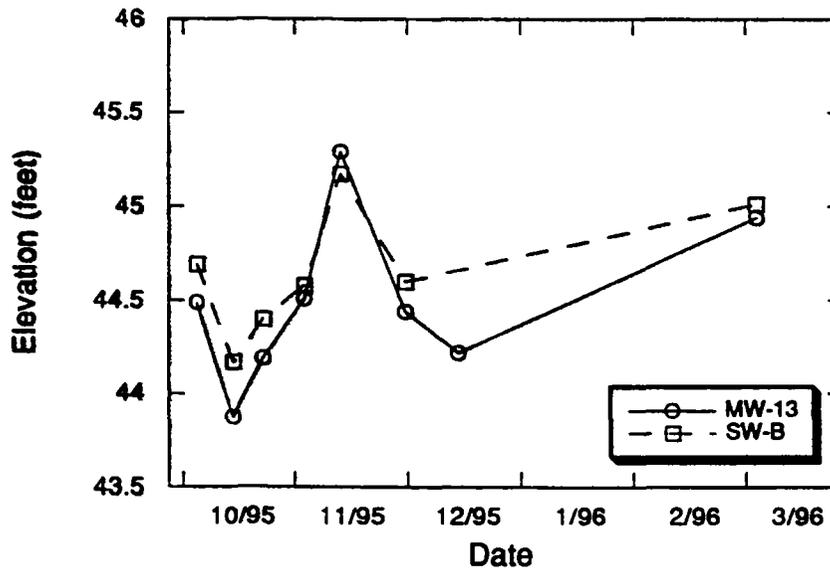
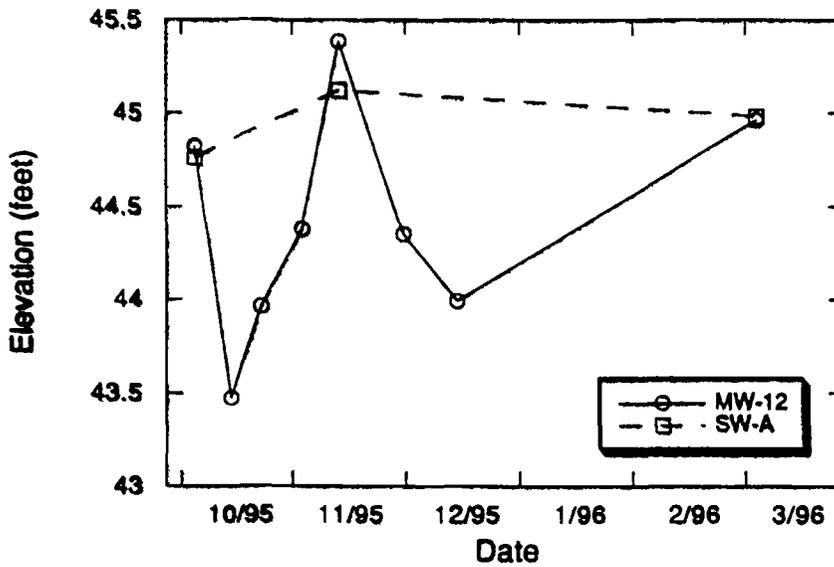


FIGURE 15

A	PRELIMINARY	CSM	CSM	CSM
ISSUE	DESCRIPTION	DRAWN	CHECKD.	APPR. DATE
<p>Clean Harbors ENVIRONMENTAL SERVICES, INC. REMEDIAL TECHNOLOGIES DIVISION 12 Mercer Road Natick, Massachusetts 01760 Telephone (508) 690-6910</p>				
<p>TITLE MURPHY'S WASTE OIL SERVICE, INC. 252 SALEM STREET WOBURN, MASSACHUSETTS 01801</p>				
<p>GROUNDWATER CONTOUR PLAN DEEP AQUIFER MARCH 7, 1996</p>				
PROJECT NO.	EN-170	DRAWING NO.	170-C-08	
SCALE	1"=30'			





NOTES:

WATER LEVELS WERE GAUGED FROM WELLS IN WETLANDS (MW-12 AND MW-13) AND FROM SURFACE WATER AT THE WELLS (SW-A AND SW-B, RESPECTIVELY).



**Environmental Services, Inc.
Remedial Technologies Division**

12 MERCER ROAD
NATICK, MASSACHUSETTS 01760
(508) 650-6910

A	PRELIMINARY				
ISSUE	DESCRIPTION	DRWN	CHKD	APPR	DATE

MURPHY'S WASTE OIL SERVICE, INC.
232 SALEM STREET
WOBURN, MASSACHUSETTS

WETLAND WATER ELEVATIONS PLOT

PROJECT NO.: EN-170	DWG. NO. FIGURE 16
SCALE: NA	

APP. #



Commonwealth of Massachusetts
Executive Office of Environmental Affairs

Department of Environmental Protection

William F. Weld
Governor
Argeo Paul Cellucci
11 Governor

Trudy Coxe
Secretary
David B. Struh
Commissioner

September 1, 1995

Certified Mail No. Z 127 741 052

Jules B. Selden, Esq.
Clean Harbors Environmental Services, Inc.
Law Department
325 Wood Road
P.O. Box 327
Braintree, MA 02184-2402

Re: Corrective Action Investigation Plan - **Approval**
w/modifications.

Dear Mr. Selden:

The Massachusetts Department of Environmental Protection, Bureau of Waste Prevention, Division of Hazardous Materials (Department) has reviewed the Corrective Action Investigation Plan (Plan) for Murphy's Waste Oil Service, Inc. (Facility) 252 Salem Street, Woburn, Massachusetts. The Plan was submitted to the Department on behalf of the Facility by Clean Harbors Environmental Services, Inc. of Braintree, Massachusetts in fulfillment of Condition 10(e)(2) of the Facility's Hazardous Waste License (License). The Plan, titled "Corrective Action Investigation Plan, Murphy's Waste Oil Service, Inc., 252 Salem Street, Woburn, MA 01801" was received by the Department on July 13, 1995.

The Department **APPROVES** the Plan in accordance with License Condition 10(i) with the following modifications:

1. Evaluation of Sewer Line:

The approximate invert elevation of the sewer lines at the Facility (including the MWRA interceptor sewer) shall be determined using either survey data or as built plans, if available.

US EPA ARCHIVE DOCUMENT

CITEMPH.ADV

September 1, 1995

2. Wetland Evaluation:

a. The Plan calls for analyzing thirty (30) wetland soil samples for the previously identified major contaminants of concern: TPH, PCBs, lead, and chromium. The results of this initial sampling shall be used to select a reduced number of sampling locations for analysis of other incidental contaminants identified in the previous wetland sampling: PAHs, VOCs, arsenic, cadmium, cyanide, and pesticides. In order to allow sufficient time for this additional sampling the Plan's schedule for completing field activities is extended forty-five (45) days.

b. Soil descriptions shall be prepared for all wetland samples and included in the investigation report either in a tabular format or as an appendix.

3. Areas of Former Above Ground Tanks and Facility Building:

a. The additional soil boring data shall be used to depict the horizontal and vertical distribution of the soil contamination.

b. TPH, PAHs, VOCs, and inorganic compounds have been previously identified as contaminants in the soil and ground water at the Facility. The suite of analytes for the soil borings shall be expanded beyond TPH to include these additional contaminants.

c. As discussed at our August 24, 1995 meeting, a limited number of soil borings shall be added or relocated in order to define the lateral extent of the soil contamination in the areas of the above ground storage tanks formerly located in the northwest portion of the facility and the current operating building.

d. The Plan proposes collecting one or two soil samples per boring based on visual observation and headspace screening for VOCs. Sufficient soil samples shall be collected and analyzed from each boring to define the vertical distribution of contaminants.

CIPMRPH.LPV

September 1, 1995

4. Monitoring Well Installation:

The proposed deep monitoring wells MW-F and MW-G shall be advanced to the base of the sand and gravel unit shown on the Figure 4, Geologic Cross Section A-A', in the January 1995, Addendum to the Hydrogeologic Report.

5. Groundwater and Surface Water Sampling:

a. All surface water and ground water samples shall be analyzed for the parameters of concern at the Facility: SVOCs, VOCs, PCBs, and lead. In addition, all newly installed monitoring wells shall be sampled for arsenic, cadmium, amenable cyanide and zinc. TPH may be eliminated from the suite of ground water and surface water analytical parameters at the Facility's discretion.

b. The surface water samples shall be collected from the wetland adjacent to the proposed piezometers MW-A and MW-B. If surface water is not present at these locations surface water samples shall be collected from previous sampling locations SW-1, SW-3, and SW-4. In addition, the elevation of the water in the wetland shall be determined when the water levels in the monitoring wells are measured.

c. In selecting analytical methods the Facility should utilize methods that provide the appropriate detection limits. In the event of elevated detection limits the Report should discuss the significance of the elevated detection limits.

d. Any off-site monitoring wells sampled or used for purposes of water levels shall be resurveyed to the Facility datum.

6. General:

a. All activities shall be conducted in a manner consistent with the following:

DEP Policy #WAC-310-91 Standard References for Monitoring Wells - April 1991;

CIPMRPH.APV
September 1, 1995

DEP Policy #WAC-401-91 Policy for the Investigation, Assessment, and Remediation of Petroleum Releases - Interim Site Investigation Protocol Document - April 1991; and

The requirements of 310 CMR 40.0113 RCRA Authorized State Hazardous Waste Program (M.G.L.c. 21C and 310 CMR 30.000).

License Condition 10(i)(a) allows the Department to approve the Plan with modifications with the Facility's concurrence. If the Facility does not concur (accept) the modifications than the Plan shall be considered **Disapproved** by the Department pursuant to License Condition 10(i)(b) and the Facility shall submitted a new or modified Plan in compliance with License Condition 10(i)(c).

Should you have any questions regarding this matter please contact Mr. John A. Carrigan at (617) 292 - 5584.

Sincerely,



Mr. Al Nardone, EEVI
Hazardous Waste Branch

AN/JAC/RF/rf

cc: Health Agent
City Hall
Woburn, MA

John Fitzgerald
DEP/BWSC
NERO
Woburn, MA

Ed Pawlowski
DEP/BWP-DHM
NERO
Woburn, MA

Ana Stern
DEP/BWP-DHM
Boston, MA

Anna Mayor
DEP/BWSC
Boston, MA

APP. 3



DEPARTMENT OF ENVIRONMENTAL PROTECTION
 DIVISION OF HAZARDOUS MATERIALS
 One Winter Street Boston, Massachusetts 02108

137018
 110

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

National Response Center (800) 424-8802

In case of emergency or spill, immediately call

UNIFORM HAZARDOUS WASTE MANIFEST MALLEY		1. Generator's US EPA ID No. MAH004588005	Manifest Document No.		2. Page 1 of 1	Information in the shaded areas is not required by Federal law.	
3. Generator's Name and Mailing Address MORPHY WASTE INC 296 WILSON ST					A. State Manifest Document Number MA J 295193		
4. Generator's Phone (617) 952-9166					B. State Gen ID		
5. Transporter 1 Company Name CERRIL HARBORS ENV. SERVICES		6. US EPA ID Number MAH0034922250		C. State Trans. ID			
7. Transporter 2 Company Name		8. US EPA ID Number		D. Transporter's Phone (617) 549-1800			
9. Designated Facility Name and Site Address CERRIL HARBORS ENV. SERVICES 333 BULLOCK AVE BOSTON, MA 02134					E. State Trans. ID		
10. US EPA ID Number MAH0034922250					F. Transporter's Phone ()		
11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)					12. Containers		13. Total Quantity
a. HAZARDOUS WASTE SOLIDS, N.O.S. UNIDENTIFIED HAZARDOUS WASTE SOLIDS, N.O.S.					NO.	Type	14. Unit Wt/Vol
							Waste No.
					2	DM	800 lbs
							0007, 0008
J. Additional Descriptions for Materials Listed Above (include physical state and hazard code.)					K. Handling Codes for Wastes Listed Above		
a.					a.		
b.					b.		
c.					c.		
d.					d.		
15. Special Handling Instructions and Additional Information							
16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations. If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.							
Printed/Typed Name THOMAS A SCALON					Signature <i>[Signature]</i>		Date Month Day Year 02/19/76
17. Transporter 1 Acknowledgement of Receipt of Materials					Signature <i>[Signature]</i>		Date Month Day Year 02/19/76
Printed/Typed Name Robert Swalley Jr					Signature <i>[Signature]</i>		Date Month Day Year 02/19/76
18. Transporter 2 Acknowledgement of Receipt of Materials					Signature		Date
Printed/Typed Name					Signature		Date
19. Discrepancy Indication Space							
20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.							
Printed/Typed Name					Signature		Date Month Day Year

Form Approved OMB No. 2050-0039. Expires 9-30-96
 EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

COPY>8: GENERATOR RETAINS

ATP. C



Clean Harbors
Environmental Services, Inc.
Remedial Technologies Division

12 MERCER ROAD
 NATICK, MASSACHUSETTS 01760
 (508) 650-6910

Boring No: B-1

Page: 1 of 1

Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: Environmental Drilling Inc. **Driller:** J. Grasser
Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"
Start Date: 10/2/95 **Ground Elevation:** NA
Finish Date: 10/2/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (Inches)	Blow Count (per 6 inches)					
0	SS-1	5-2.5	24/16	26-48-54-23	<1.0 ppm		Very dark grayish brown medium to fine SAND with some Gravel. Sample dry.		
2	SS-2	2.5-4.5	24/7	11-6-4-6	4.0 ppm		Very dark grayish brown medium to fine SAND with some Gravel and rock fragments. Sample dry with slight petroleum odor and staining.		
4	SS-3	4.5-6.5	24/17	8-6-4-5	7.0 ppm	SAND	Very dark grayish brown medium to fine SAND with some Silt to light medium to fine SAND. Sample dry with slight petroleum odor and staining.		
6	SS-4	6.5-8.5	24/20	9-8-9-7	<1.0 ppm		Light olive brown medium to fine SAND with little Gravel. Sample moist.		
8	SS-5	8.5-10.5	20/15	34-34-27-120	2.0 ppm	▼ 9.0'	Light olive brown medium to fine SAND with some Gravel and Silt. Sample wet.		
10	SS-6	10.5-12.5	24/18	42-67-72-32	4.0 ppm		Olive brown medium to fine SAND with little Silt and Gravel. Sample wet.		
12							End of boring at 12.5 feet Boring sealed off with grout - No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT	NOTES: (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million)
SS - split spoon	and = 35-50%	
ST - shelby tube	some = 20-35%	
AF - auger flight	little = 10-20%	
RC - rock core	trace = 1-10%	
GRANULAR SOILS	COHESIVE SOILS	
Blow Cts Density	Blow Cts Density	
< 4 very loose	< 2 very soft	
5 - 10 loose	2 - 4 soft	
11 - 30 medium	4 - 8 medium stiff	
31 - 50 dense	8 - 15 stiff	
> 50 very dense	15 - 30 very stiff	

Disk Name:

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12 MERCER ROAD
NATICK, MASSACHUSETTS 01760
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Boring No: B-2

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Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: Environmental Drilling Inc. **Driller:** J. Grasser
Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"
Start Date: 10/2/95 **Ground Elevation:** NA
Finish Date: 10/2/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (Inches)	Blow Count (per 6 inches)					
0	SS-1	5-2.5	24/13	23-12-11-13	16 ppm		Very dark grayish brown medium to fine SAND with some Gravel and rock fragments. Sample dry.		
2	SS-2	2.5-4.5	10/7	9-120	24 ppm		Very dark grayish brown medium to fine SAND with some Gravel. Sample dry.		
4	SS-3	4.5-6.5	24/17	3-3-3-2	160 ppm	SAND	Very dark grayish brown medium to fine SAND with some Gravel and Silt. Sample moist with moderate petroleum odor and staining.		
6	SS-4	6.5-8.5	24/15	10-117-73-20	100 ppm		Very dark grayish brown fine SAND with some Gravel and little Silt. Sample moist with moderate petroleum odor and staining.		
8	SS-5	8.5-10.5	24/15	8-18-16-15	100 ppm	▼ 9.0'	Very dark brown fine to medium SAND with little Silt and Gravel. Sample wet with moderate petroleum odor and staining.		
10	SS-6	10.5-12.5	24/15	8-12-15-16	150 ppm		Very dark brown fine to medium SAND with some coarse Sand. Sample wet with slight petroleum odor.		
12							End of boring at 12.5 feet Boring sealed off with grout - No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon	and = 35-50%
ST - Shelby tube	some = 20-35%
AF - auger flight	little = 10-20%
RC - rock core	trace = 1-10%
GRANULAR SOILS	COHESIVE SOILS
Blow Cts Density	Blow Cts Density
< 4 very loose	< 2 very soft
5 - 10 loose	2 - 4 soft
11 - 30 medium	4 - 8 medium stiff
31 - 50 dense	8 - 15 stiff
> 50 very dense	15 - 30 very stiff

NOTES:

(1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million)

Disk Name:



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 Natick, MA 01760
 (508) 650-6910

Boring No: B-4

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Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170

Inspector: P. Nicewonger

Contractor: Environmental Drilling Inc.

Driller: J. Grasser

Drilling Method: Hollow Stem Auger

Casing/Auger Size: 4 1/4"

Start Date: 10/4/95

Ground Elevation: NA

Finish Date: 10/5/95

Well Elevation: NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/10	20-23-28-18	3.0 ppm	SAND	Grayish brown medium to coarse SAND and Gravel and Rock fragments. Sample dry with slight petroleum odor and staining.		
2	SS-2	2-4	24/7	2-11-9-8	1.8 ppm		Grayish brown medium to coarse SAND and Gravel with some light medium to fine Sand. Sample dry with slight odor.		
4	SS-3	4-6	24/12	17-28-39-9	1.4 ppm		Very dark brown medium to coarse SAND with Gravel and Rock fragments (fill material). Sample moist with slight petroleum odor and stain.		
6	SS-4	6-8	24/5	14-10-11-7	4.0 ppm		Same as SS-3.		
8	SS-5	8-10	24/0	12-15-12-22			No recovery in split-spoon.		
10	SS-6	10-12	24/14	23-12-12-10	>1,000 ppm		Very dark brown medium to fine SAND with little Silt and Gravel at top 5", medium to coarse Sand with some Gravel at bottom 9". Sample wet with strong petroleum odor and staining.		
12	SS-7	12-14	24/11	5-3-8-8	>1,000 ppm		Dark olive gray medium to coarse SAND with some Gravel, trace of fine Sand. Sample wet with strong petroleum odor and staining.		
						9.0'			
						14'	Bottom of boring		2

SAMPLE TYPES		PERCENTAGE BY WEIGHT	
SS - split spoon		and = 35-50%	
ST - shelby tube		some = 20-35%	
AF - auger flight		little = 10-20%	
RC - rock core		trace = 1-10%	
GRANULAR SOILS		COHESIVE SOILS	
Blow Cts	Density	Blow Cts	Density
< 4	very loose	< 2	very soft
5 - 10	loose	2 - 4	soft
11 - 30	medium	4 - 8	medium stiff
31 - 50	dense	8 - 15	stiff
> 50	very dense	15 - 30	very stiff

NOTES:

- (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).
- (2) Boring sealed with grout.

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Boring No: B-5

Page: 1 of 1

Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170 **Inspector:** P. Nicewonger

Contractor: Environmental Drilling Inc. **Driller:** J. Grasser

Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"

Start Date: 10/27/95 **Ground Elevation:** NA

Finish Date: 10/27/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening 1	Strata Change	FIELD CLASSIFICATION	Notes	Well Screen	
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)						
0	SS-1	0-2	24/14	7-10-23-28	<1.0 ppm	SAND and GRAVEL	Dark gray medium to fine SAND with Gravel (fill material), some organic material. Sample dry.			
2	SS-2	2-4	24/6	27-28-16-21	<1.0 ppm		Dark brown medium to fine SAND with some Gravel. Sample dry.			
4	SS-3	4-6	24/5	19-12-7-15	<1.0 ppm		Dark brown medium to fine SAND with some Gravel gradually changing to yellowish brown medium to fine Sand. Sample dry.			
6	SS-4	6-8	3/2	120	<1.0 ppm		Yellowish brown medium to fine Sand with some Gravel. Sample dry.			
8	SS-5	8-10	10/3	46-120	<1.0 ppm		Grayish brown coarse GRAVEL with some medium to fine Sand. Sample moist.			
10	SS-6	10-12	24/18	2-10-24-32	1.2 ppm		10'	Olive gray GRAVEL with medium to coarse Sand and some trace fine Sand. Sample wet.		
12	SS-7	12-14	24/24	31-50-52-36	3.6 ppm			Olive gray medium to coarse SAND with some Gravel and trace fine Sand. Sample wet.		
						14'	Bottom of Boring		2	

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon	and = 35-50%
ST - shelby tube	some = 20-35%
AF - auger flight	little = 10-20%
RC - rock core	trace = 1-10%
GRANULAR SOILS	COHESIVE SOILS
Blow Cts Density	Blow Cts Density
< 4 very loose	< 2 very soft
5 - 10 loose	2 - 4 soft
11 - 30 medium	4 - 8 medium stiff
31 - 50 dense	8 - 15 stiff
> 50 very dense	15 - 30 very stiff

NOTES:

- (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).
- (2) Boring sealed with grout.



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12 MERCER ROAD
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Boring No: B-6

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Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: Environmental Drilling Inc. **Driller:** J. Grasser
Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"
Start Date: 10/5/95 **Ground Elevation:** NA
Finish Date: 10/5/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen	
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)						
0	SS-1	0-2	24/19	14-29-60-47	1.2 ppm	SAND	Very dark brown coarse SAND and Gravel and Rock fragments (fill material). Sample dry.			
2	SS-2	2-4	4/2	120	19 ppm		Gray medium to fine SAND and Gravel and Rock fragments. Sample dry.			
4	SS-3	4-6	24/8	10-21-28-10	<1.0 ppm		Dark yellowish brown medium to fine SAND with some Gravel and Rock fragments. Dark band of organic material present. Sample dry.			
6	SS-4	6-8	24/16	5-4-11-16	<1.0 ppm		Dark yellowish brown medium to fine SAND with trace Gravel and organic material. Sample moist.			
8	SS-5	8-10	24/10	18-17-26-24	8.2 ppm		▼ 9.0'	Dark yellowish brown medium SAND with some Gravel and light fine Sand, 1" band of petroleum staining observed in the sample. Sample wet with slight petroleum odor.		
10	SS-6	10-12	24/17	15-18-26-35	3 ppm		Light yellowish brown medium to fine SAND. Sample wet with possible slight petroleum odor.			
12							End of boring at 12 feet. Boring backfilled with cuttings and grouted to surface - No well installed.			

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon	and = 35-50%
ST - shelby tube	some = 20-35%
AF - auger flight	little = 10-20%
RC - rock core	trace = 1-10%
GRANULAR SOILS	COHESIVE SOILS
Blow Cts Density	Blow Cts Density
< 4 very loose	< 2 very soft
5 - 10 loose	2 - 4 soft
11 - 30 medium	4 - 8 medium stiff
31 - 50 dense	8 - 15 stiff
> 50 very dense	15 - 30 very stiff

NOTES:
 (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).

Disk Name:



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Environmental Services, Inc.
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 NATICK, MASSACHUSETTS 01760
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Boring No: B-7

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Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: Environmental Drilling Inc. **Driller:** J. Grasser
Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"
Start Date: 10/4/95 **Ground Elevation:** NA
Finish Date: 10/4/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/5	9-14-14-7	<1.0 ppm		Very dark grayish brown medium to fine SAND with some Gravel and rock fragments, trace organic material. Sample dry.		
2	SS-2	2-4	24/0	12-9-9-10			No recovery in split-spoon.		
4	SS-3	4-6	24/2	10-9-8-4	<1.0 ppm		Grayish brown medium to fine SAND with little Gravel. Sample dry.		
6	SS-4	6-8	24/12	4-8-12-13	48 ppm		Dark yellow brown medium to fine SAND with little Gravel. Bottom of sample moist with slight petroleum odor.		
8	SS-5	8-10	24/19	5-7-10-11	>1,000 ppm	▼ 8.5'	Light olive gray medium to fine SAND. Sample wet with heavy petroleum odor.		
10	SS-6	10-12	24/17	12-9-7-10	600 ppm		Dark olive gray medium to fine SAND with trace Gravel. Sample wet with moderate petroleum odor.		
12							End of boring at 12.0 feet Boring sealed up with grout - No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT	NOTES: (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).
SS - split spoon ST - shelby tube AF - auger flight RC - rock core	and = 35-50% some = 20-35% little = 10-20% trace = 1-10%	
GRANULAR SOILS Blow Cts Density	COHESIVE SOILS Blow Cts Density	
< 4 very loose 5 - 10 loose 11 - 30 medium 31 - 50 dense > 50 very dense	< 2 very soft 2 - 4 soft 4 - 8 medium stiff 8 - 15 stiff 15 - 30 very stiff	

Disk Name:

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12 MERCER ROAD
 NATICK, MASSACHUSETTS 01760
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Boring No: B-8

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Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170

Inspector: P. Nicewonger

Contractor: Environmental Drilling Inc.

Driller: J. Grasser

Drilling Method: Hollow Stem Auger

Casing/Auger Size: 4 1/4"

Start Date: 10/4/95

Ground Elevation: NA

Finish Date: 10/4/95

Well Elevation: NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen	
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)						
0	SS-1	0-2	24/8	22-22-19-14	<1.0 ppm	SAND	Olive brown medium to coarse SAND with some Gravel and organic material. Sample dry.			
2	SS-2	2-4	24/11	11-6-9-4	<1.0 ppm		Olive brown medium to coarse SAND with some fine Sand and little Gravel. Sample dry.			
4	SS-3	4-6	24/1	46-8-5-2	<1.0 ppm		Same as SS-2.			
6	SS-4	6-8	24/11	3-3-5-11	>1,000 ppm		Olive brown medium to fine SAND from 6' to 6'.8", light fine Sand with little Gravel from 6' 8" to 6' 11". Sample moist with heavy petroleum odor.			
8	SS-5	8-10	24/17	5-9-10-13	>1,000 ppm		▽ 9.0'	Light olive brown medium to fine SAND with trace Gravel. Sample wet with slight petroleum staining and strong odor.		
10	SS-6	10-12	24/24	5-9-16-16	280 ppm		Olive brown medium to fine SAND with trace Gravel. Sample wet with no staining and moderate petroleum odor.			
12							End of boring at 12.0 feet Boring sealed up with grout - No well installed.			

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon	and = 35-50%
ST - Shelby tube	some = 20-35%
AF - auger flight	little = 10-20%
RC - rock core	trace = 1-10%
GRANULAR SOILS	COHESIVE SOILS
Blow Cts Density	Blow Cts Density
< 4 very loose	< 2 very soft
5 - 10 loose	2 - 4 soft
11 - 30 medium	4 - 8 medium stiff
31 - 50 dense	8 - 15 stiff
> 50 very dense	15 - 30 very stiff

NOTES:

(1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).

Disk Name:

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Remedial Technologies Division

12 MERCER ROAD
 NATICK, MASSACHUSETTS 01760
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Boring No: B-9

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Project Name: Murphy's Waste Oil Service, Inc.
 Project Location: 252 Salem Street, Woburn, MA
 CHES Job #: EN-170 Inspector: P. Nicewonger
 Contractor: Environmental Drilling Inc. Driller: J. Grasser
 Drilling Method: Hollow Stem Auger Casing/Auger Size: 4 1/4"
 Start Date: 10/4/95 Ground Elevation: NA
 Finish Date: 10/4/95 Well Elevation: NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/10	18-10-12-7	<1.0 ppm	SAND	Grayish brown medium to coarse SAND and Gravel (fill material). Sample dry.		
2	SS-2	2-4	24/13	4-4-5-6	<1.0 ppm		Same as SS-1.		
4	SS-3	4-6	24/6	5-8-7-8	<1.0 ppm		Olive brown medium to fine SAND and Gravel with rock fragments. Sample dry.		
6	SS-4	6-8	24/17	2-4-12-18	28 ppm		Dark brown medium to fine SAND with little Gravel. Sample moist with slight petroleum staining and odor.		
8	SS-5	8-10	24/13	6-10-7-14	850 ppm		▼ 9.0' Dark brown medium to coarse SAND at top 5", medium to fine Sand at bottom 8". Sample wet with slight petroleum staining and strong petroleum odor.		
10	SS-6	10-12	24/17	8-7-10-13	180 ppm		Olive brown fine SAND with little Gravel. Sample wet with moderate petroleum odor.		
12							End of boring at 12.0 feet Boring sealed off with grout - No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon ST - Shelby tube AF - auger flight RC - rock core	and = 35-50% some = 20-35% little = 10-20% trace = 1-10%
GRANULAR SOILS Blow Cts Density	COHESIVE SOILS Blow Cts Density
< 4 very loose 5 - 10 loose 11 - 30 medium 31 - 50 dense > 50 very dense	< 2 very soft 2 - 4 soft 4 - 8 medium stiff 8 - 15 stiff 15 - 30 very stiff

NOTES:
 (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).

Disk Name:

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Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: Environmental Drilling Inc. **Driller:** J. Grasser
Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"
Start Date: 10/5/95 **Ground Elevation:** NA
Finish Date: 10/5/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen	
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)						
0	SS-1	0-2	24/10	8-10-9-8	<1.0 ppm	SAND	Dark brown medium to fine SAND, trace Gravel with some organic material. Sample dry.			
2	SS-2	2-4	24/6	9-10-12-14	<1.0 ppm		Yellowish brown medium to fine SAND with some Gravel and Rock fragments. Sample dry.			
4	SS-3	4-6	24/12	17-10-9-12	<1.0 ppm		Yellowish brown medium to fine SAND with some light medium to fine Sand, trace Gravel and wood fragments. Sample dry.			
6	SS-4	6-8	24/14	41-12-8-15	1.8 ppm		Very dark brown medium to coarse SAND with some Gravel and Rock fragments. Sample moist.			
8	SS-5	8-10	24/1	22-30-30-28	2.0 ppm		▼ 8.0'	Yellowish brown medium to fine SAND with little Gravel. Sample wet.		
10	SS-6	10-12	24/19	3-5-4-4	30 ppm			Yellowish brown medium to fine SAND with trace coarse Sand. Sample wet with slight petroleum odor.		
12							End of boring at 12 feet. Boring backfilled with cuttings - No well installed.			

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon	and = 35-50%
ST - shelby tube	some = 20-35%
AF - auger flight	little = 10-20%
RC - rock core	trace = 1-10%
GRANULAR SOILS	COHESIVE SOILS
Blow Cts Density	Blow Cts Density
< 4 very loose	< 2 very soft
5 - 10 loose	2 - 4 soft
11 - 30 medium	4 - 8 medium stiff
31 - 50 dense	8 - 15 stiff
> 50 very dense	15 - 30 very stiff

NOTES:

(1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).

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Boring No: B-11

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Project Name: Murphy's Waste Oil Service, Inc.
 Project Location: 252 Salem Street, Woburn, MA
 CHES Job #: EN-170 Inspector: P. Nicewonger
 Contractor: Environmental Drilling Inc. Driller: J. Grasser
 Drilling Method: Hollow Stem Auger Casing/Auger Size: 4 1/4"
 Start Date: 10/4/95 Ground Elevation: NA
 Finish Date: 10/4/95 Well Elevation: NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/11	8-7-14-9	<1.0 ppm		Grayish brown medium to fine SAND with some Gravel. Top 1" loam material. Sample dry.		
2	SS-2	2-4	24/6	11-9-14-17	<1.0 ppm		Light olive brown medium to fine SAND with trace Gravel. Sample dry.		
4	SS-3	4-6	24/2	10-7-4-4	<1.0ppm	SAND	Grayish brown medium to fine SAND with some Gravel. Sample dry.		
6	SS-4	6-8	24/11	3-9-8-8	12 ppm		Grayish brown medium to fine SAND with trace Gravel. Sample moist with possible slight staining.		
8	SS-5	8-10	24/14	5-4-7-7	32 ppm	▼ 9.0'	Grayish brown medium to fine SAND with some light fine Sand and Gravel. Sample wet.		
10	SS-6	10-12	24/24	9-9-10-13	325 ppm		Light brownish gray medium to fine SAND with some Gravel. Sample wet with slight to moderate petroleum odor.		
12							End of boring at 12.0 feet Boring backfilled with cuttings and grouted to surface - No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon	and = 35-50%
ST - shelby tube	some = 20-35%
AF - auger flight	little = 10-20%
RC - rock core	trace = 1-10%
GRANULAR SOILS	COHESIVE SOILS
Blow Cts Density	Blow Cts Density
< 4 very loose	< 2 very soft
5 - 10 loose	2 - 4 soft
11 - 30 medium	4 - 8 medium stiff
31 - 50 dense	8 - 15 stiff
> 50 very dense	15 - 30 very stiff

NOTES:
 (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).

Disk Name:

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Boring No: B-12

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Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: Environmental Drilling Inc. **Driller:** J. Grasser
Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"
Start Date: 10/4/95 **Ground Elevation:** NA
Finish Date: 10/4/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/11	22-20-12-12	<1.0 ppm		Grayish brown medium SAND with some Gravel (top 2") to light medium to coarse SAND with Gravel. Sample dry.		
2	SS-2	2-4	24/6	13-7-10-12	<1.0 ppm		Light olive brown medium to fine SAND with some Gravel and rock fragments. Sample dry.		
4	SS-3	4-6	24/1	6-7-2-1	<1.0ppm	SAND	Olive brown medium to fine SAND with some Gravel and rock fragments. Sample dry.		
6	SS-4	6-8	24/15	2-6-17-20	2.6 ppm		Grayish brown medium to fine SAND with trace Gravel. Top 4-5" stained with slight petroleum odor. Sample moist.		
8	SS-5	8-10	24/20	10-12-18-20	4.2 ppm	▼ 9.0'	Grayish brown medium to fine SAND with trace coarse Sand. Sample wet.		
10	SS-6	10-12	24/22	8-7-10-20	1.6 ppm		Olive gray fine SAND with trace Silt and trace Gravel. Sample wet.		
12							End of boring at 12.0 feet Boring backfilled with cuttings and grouted to surface - No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT	NOTES: (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).
SS - split spoon ST - shelby tube AF - auger flight RC - rock core	and = 35-50% some = 20-35% little = 10-20% trace = 1-10%	
GRANULAR SOILS Blow Cts Density	COHESIVE SOILS Blow Cts Density	
< 4 very loose 5 - 10 loose 11 - 30 medium 31 - 50 dense > 50 very dense	< 2 very soft 2 - 4 soft 4 - 8 medium stiff 8 - 15 stiff 15 - 30 very stiff	

Disk Name:

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Clean Harbors
Environmental Services, Inc.
Remedial Technologies Division

12 MERCER ROAD
 NATICK, MASSACHUSETTS 01760
 (508) 650-6910

Boring No: B-13

Page: 1 of 1

Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170 **Inspector:** P. Nicewonger

Contractor: Environmental Drilling Inc. **Driller:** J. Grasser

Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"

Start Date: 10/4/95 **Ground Elevation:** NA

Finish Date: 10/4/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (Inches)	Blow Count (per 6 inches)					
2	SS-1	0-2	24/10	12-12-19-19	40 ppm		Very dark brown medium to fine SAND with some Gravel and rock fragments. Sample dry with heavy petroleum staining and odor.		
4	SS-2	2-4	24/12	16-13-15-17	17 ppm		Very dark brown medium to fine SAND with some Gravel. Sample dry with petroleum staining and moderate odor.		
6	SS-3	4-6	24/10	8-6-4-3	38 ppm	SAND	Very dark brown medium to fine SAND with little Gravel. Sample dry with heavy petroleum staining and odor.		
8	SS-4	6-8	24/8	6-8-5-6	>1,000 ppm		Very dark grayish brown medium to fine SAND with little Gravel. Sample dry with heavy petroleum staining and odor.		
10	SS-5	8-10	24/20	3-7-10-17	>1,000 ppm	▼ 9.0'	Very dark grayish brown medium to fine SAND from 8' - 9', fine Sand from 9' - 10', Sample wet with strong petroleum odor and heavy petroleum staining.		
12	SS-6	10-12	24/14	5-10-16-14	>1,000 ppm		Dark grayish brown medium to fine SAND with trace Gravel and coarse Sand. Sample wet with heavy petroleum odor.		
							End of boring at 12.0 feet Boring sealed up with grout - No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT	NOTES: (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).
SS - split spoon	and = 35-50%	
ST - shelly tube	some = 20-35%	
AF - auger flight	little = 10-20%	
RC - rock core	trace = 1-10%	
GRANULAR SOILS	COHESIVE SOILS	
Blow Cts Density	Blow Cts Density	
< 4 very loose	< 2 very soft	
5 - 10 loose	2 - 4 soft	
11 - 30 medium	4 - 8 medium stiff	
31 - 50 dense	8 - 15 stiff	
> 50 very dense	15 - 30 very stiff	

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Boring No: B-14

Page: 1 of 1

Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170 **Inspector:** P. Nicewonger

Contractor: Environmental Drilling Inc. **Driller:** J. Grasser

Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"

Start Date: 10/2/95 **Ground Elevation:** NA

Finish Date: 10/2/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0									
	SS-1	5-2.5	24/16	23-13-12-12	95 ppm		Very dark grayish brown medium to fine SAND with little Gravel and rock fragments. Sample dry with moderate petroleum staining and odor.		
2									
	SS-2	2.5-4.5	24/13	33-30-47-23	>1000 ppm		Very dark grayish brown medium to fine SAND with some Gravel; some wood fragments noted in sample. Sample dry with strong petroleum odor and staining.		
4									
	SS-3	4.5-6.5	24/12	11-11-13-7	>1000 ppm	SAND	Very dark grayish brown medium to fine SAND with little Gravel, organic material including wood fragments noted in sample. Sample dry with strong petroleum odor and staining.		
6									
	SS-4	6.5-8.5	24/10	6-3-5-6	>1000 ppm		Very dark gray medium to fine SAND with some Gravel. Sample moist with free product at approximately 8 feet.		
8									
	SS-5	8.5-10.5	24/22	9-4-7-9	>1000 ppm		Very dark gray medium to fine SAND with some Gravel from 8.5-9.5, medium to fine Sand with little Silt from 9.5-10.5. Sample wet with strong petroleum odors and staining.		
10						▼ 10.0'			
	SS-6	10.5-12.5	24/24	9-13-18-20	850 ppm		Olive brown medium to fine SAND with little Silt, some thin bands of petroleum staining with strong petroleum odor. Sample wet.		
12									
							End of boring at 12.5 feet Boring sealed off with grout - No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon ST - Shelby tube AF - auger flight RC - rock core	and = 35-50% some = 20-35% little = 10-20% trace = 1-10%
GRANULAR SOILS Blow Cts Density	COHESIVE SOILS Blow Cts Density
< 4 very loose 5 - 10 loose 11 - 30 medium 31 - 50 dense > 50 very dense	< 2 very soft 2 - 4 soft 4 - 8 medium stiff 8 - 15 stiff 15 - 30 very stiff

NOTES:

(1) Foxboro 128 GC OVA used for field-screening(ppm = parts per million).

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Boring No: B-15

Page: 1 of 1

Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170 **Inspector:** P. Nicewonger

Contractor: Environmental Drilling Inc. **Driller:** J. Grasser

Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"

Start Date: 10/3/95 **Ground Elevation:** NA

Finish Date: 10/3/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/10	2-2-11-6	<1.0 ppm		Dark brown organic material (foam), light medium to fine SAND with some Gravel. Sample dry.		
2	SS-2	2-4	24/5	6-7-7-7	3.0 ppm		Grayish brown medium to coarse SAND with trace Gravel. Sample dry.		
4	SS-3	4-6	24/6	3-2-7-7	<1.0 ppm	SAND	Olive brown medium to coarse SAND with trace Gravel. Sample dry.		
6	SS-4	6-8	24/6	15-7-5-9	<1.0 ppm		Light brownish gray medium to fine SAND with trace Gravel. Sample dry.		
8	SS-5	8-10	24/15	6-12-13-17	1.5 ppm	▼ 9.0'	Light brownish gray medium to fine SAND with some Gravel. Sample wet with possible slight petroleum odor.		
10	SS-6	10-12	24/17	8-9-14-17	3.5 ppm		Dark grayish brown medium to coarse SAND with trace Gravel. Sample wet.		
12	SS-7	12-14	24/24	16-19-23-20	18 ppm		Dark grayish brown medium to coarse SAND with trace fine Sand and Gravel. 2" band of dark Gravel at 13' 8" - 13' 10". Sample wet.		
						14'	Bottom of Boring		2

SAMPLE TYPES	PERCENTAGE BY WEIGHT	NOTES: (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million). (2) Boring sealed with grout.
SS - split spoon ST - shelby tube AF - auger flight RC - rock core	and = 35-50% some = 20-35% little = 10-20% trace = 1-10%	
GRANULAR SOILS Blow Cts Density	COHESIVE SOILS Blow Cts Density	
< 4 very loose 5 - 10 loose 11 - 30 medium 31 - 50 dense > 50 very dense	< 2 very soft 2 - 4 soft 4 - 8 medium stiff 8 - 15 stiff 15 - 30 very stiff	

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Boring No: B-16

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Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170 **Inspector:** P. Nicewonger

Contractor: Environmental Drilling Inc. **Driller:** J. Grasser

Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"

Start Date: 10/3/95 **Ground Elevation:** NA

Finish Date: 10/3/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/14	3-12-15-10	<1.0 ppm		Brown organic material with medium to fine SAND with some Gravel. Sample dry.		
2	SS-2	2-4	24/5	10-8-7-11	>1.0 ppm		Brown medium to fine SAND with trace Gravel. Sample dry.		
4	SS-3	4-6	24/6	28-9-6-5	>1.0 ppm		Very dark grayish brown medium to fine SAND with some Gravel, trace organic material. Sample dry.		
6	SS-4	6-8	24/8	3-4-5-5	>1.0 ppm	SAND	Dark brown medium to fine SAND (top 3" of sample), light medium to coarse sand (bottom 5" of sample). Sample dry.		
8	SS-5	8-10	24/10	6-6-5-6	>1.0 ppm		Very dark grayish brown medium to fine SAND with some Gravel. Sample moist.		
10	SS-6	10-12	24/19	2-2-9-11	1.8 ppm		Very dark grayish brown medium to fine SAND with some Gravel and trace Silt. Sample moist with 2" band of staining at 11.0', slight petroleum odor present.		
12	SS-7	12-14	24/14	2-3-6-7	1.2 ppm	13'	Olive brown medium to coarse SAND with some light fine Sand and trace Gravel.		
						14'	Bottom of Boring		2

SAMPLE TYPES		PERCENTAGE BY WEIGHT	
SS - split spoon		and = 35-50%	
ST - shelby tube		some = 20-35%	
AF - auger flight		little = 10-20%	
RC - rock core		trace = 1-10%	
GRANULAR SOILS		COHESIVE SOILS	
Blow Cts	Density	Blow Cts	Density
< 4	very loose	< 2	very soft
5 - 10	loose	2 - 4	soft
11 - 30	medium	4 - 8	medium stiff
31 - 50	dense	8 - 15	stiff
> 50	very dense	15 - 30	very stiff

NOTES:

- (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).
- (2) Boring sealed with grout.



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Boring No: B-17

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Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: Environmental Drilling Inc. **Driller:** A. Caron
Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"
Start Date: 10/9/95 **Ground Elevation:** NA
Finish Date: 10/9/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/15	18-25-28-33	8.2 ppm		Very dark grayish brown coarse SAND and Gravel (fill material). Sample dry with slight petroleum odor and staining.		
2	SS-2	2-4	24/10	32-27-18-18	70 ppm		Very dark grayish brown medium to fine SAND with some Gravel. Sample dry with slight petroleum odor and staining.		
4	SS-3	4-6	24/14	8-13-14-19	14 ppm		Light olive brown fine to coarse SAND with some Gravel. Sample dry with slight petroleum odor.		
6	SS-4	6-8	24/10	11-17-24-18	1.5 ppm		Light olive brown medium to coarse SAND with some fine Sand and Gravel. Sample moist.		
8	SS-5	8-10	24/7	17-16-18-17	3.8 ppm	▼ 8.0'	Dark olive gray medium to coarse SAND with some fine Sand and Gravel. Sample wet with slight petroleum odor.		
10	SS-6	10-12	24/6	12-12-14-16	1.4 ppm		Dark olive gray medium to coarse SAND with some Gravel and trace fine Sand. Sample wet.		
12							End of boring at 12 feet. Boring sealed off with grout - No well installed.		

SAMPLE TYPES		PERCENTAGE BY WEIGHT	
SS - split spoon		and = 35-50%	
ST - shelby tube		some = 20-35%	
AF - auger flight		little = 10-20%	
RC - rock core		trace = 1-10%	
GRANULAR SOILS		COHESIVE SOILS	
Blow Cts	Density	Blow Cts	Density
< 4	very loose	< 2	very soft
5 - 10	loose	2 - 4	soft
11 - 30	medium	4 - 8	medium stiff
31 - 50	dense	8 - 15	stiff
> 50	very dense	15 - 30	very stiff

NOTES:

(1) Foxboro 128 GC OVA used for field-screening {ppm = parts per million}.

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Boring No: B-18

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Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: Environmental Drilling Inc. **Driller:** A. Caron
Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"
Start Date: 10/9/95 **Ground Elevation:** NA
Finish Date: 10/9/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/11	26-18-31-15	5.8 ppm		Dark brown medium to fine SAND and Gravel (fill material). Sample dry with slight petroleum odor. No sheen.		
2	SS-2	2-4	24/4	12-18-25-4	2.6 ppm		Dark brown medium SAND with some Gravel, slight orange color to soil. No odor. Sample dry.		
4	SS-3	4-6	24/22	4-5-7-25	2.0 ppm		Dark brown medium to fine SAND with some Gravel, 2-3" band of orange stained Sand. Sample moist.		
6	SS-4	6-8	12/11	70-120	4.6 ppm	▼ 7.0'	Dark brown medium to fine SAND with trace Gravel. Sample wet with no petroleum staining and possible slight petroleum odor.		
8	SS-5	8-10	18/13	109-87-120	3.2 ppm		Grayish brown medium to fine SAND with some Gravel and trace coarse SAND, slight orange color to Sand. Sample wet with slight petroleum odor.		
10	SS-6	10-12	24/16	52-86-32-24	6.4 ppm		Dark olive gray medium to fine SAND with some Gravel and trace coarse Sand. Sample wet with no petroleum stain or odor.		
12							End of boring at 12 feet. Boring sealed off with grout - No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon	and = 35-50%
ST - shelby tube	some = 20-35%
AF - auger flight	little = 10-20%
RC - rock core	trace = 1-10%
GRANULAR SOILS	COHESIVE SOILS
Blow Cts Density	Blow Cts Density
< 4 very loose	< 2 very soft
5 - 10 loose	2 - 4 soft
11 - 30 medium	4 - 8 medium stiff
31 - 50 dense	8 - 15 stiff
> 50 very dense	15 - 30 very stiff

NOTES:

(1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).

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Remedial Technologies Division**

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Boring No: B-19

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Project Name:	Murphy's Waste Oil Service, Inc.
Project Location:	252 Salem Street, Woburn, MA
CHES Job #:	EN-170
Inspector:	P. Nicewonger
Contractor:	Environmental Drilling Inc.
Driller:	J. Grasser
Drilling Method:	Hollow Stem Auger
Casing/Auger Size:	4 1/4"
Start Date:	10/27/95
Ground Elevation:	NA
Finish Date:	10/27/95
Well Elevation:	NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/6	5-12-7-6	<1.0 ppm		Dark grayish brown medium to fine SAND with some Gravel. Sample dry.		
2	SS-2	2-4	24/0	10-9-6-12			No Recovery.		
4	SS-3	4-6	24/7	8-7-10-7	<1.0 ppm	SAND and GRAVEL	Dark grayish brown medium to fine SAND with some coarse Sand and Gravel. Sample dry.		
6	SS-4	6-8	24/12	7-10-21-13	7.6 ppm		Dark grayish brown medium to fine SAND with some Gravel, wood fragments and staining at bottom of sample. Sample moist with slight petroleum odor.		
8	SS-5	8-10	24/13	6-7-9-7	<1.0 ppm	9.0'	Dark grayish brown medium to fine SAND with some coarse Sand and trace Gravel. Sample wet with slight petroleum odor and staining.		
10	SS-6	10-12	24/24	5-7-9-12	<1.0 ppm		Olive brown medium to fine SAND with some coarse Sand and trace Gravel. Sample wet with slight petroleum odor.		
12							End of Boring at 12 feet. Boring sealed off with grout. No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon	and = 35-50%
ST - shelby tube	some = 20-35%
AF - auger flight	little = 10-20%
RC - rock core	trace = 1-10%
GRANULAR SOILS	COHESIVE SOILS
Blow Cts Density	Blow Cts Density
< 4 very loose	< 2 very soft
5 - 10 loose	2 - 4 soft
11 - 30 medium	4 - 8 medium stiff
31 - 50 dense	8 - 15 stiff
> 50 very dense	15 - 30 very stiff

NOTES:

(1) Foxboro 128 GC OVA used for field-screening {ppm = parts per million}.

Disk Name:

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Boring No: B-20

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Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170 **Inspector:** P. Nicewonger

Contractor: Environmental Drilling Inc. **Driller:** J. Grasser

Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"

Start Date: 10/27/95 **Ground Elevation:** NA

Finish Date: 10/27/95 **Well Elevation:** NA

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/8	5-7-12-10	<1.0 ppm		Dark grayish brown medium to fine SAND with some Gravel and wood fragments (fill material). Sample dry.		
2	SS-2	2-4	24/0	7-5-3-3			No Recovery.		
4	SS-3	4-6	24/14	5-6-10-9	<1.0 ppm	SAND and GRAVEL	Dark grayish brown medium to fine SAND with trace Gravel. Sample dry with slight petroleum odor and staining.		
6	SS-4	6-8	24/10	10-13-23-28	5.8 ppm		Dark grayish brown medium to fine SAND with some Gravel, wood fragments and staining at bottom of sample. Sample moist with slight petroleum odor.		
8	SS-5	8-10	24/12	7-7-9-13	1.2 ppm	8.0'	Olive brown medium to coarse SAND with some Gravel. Sample wet.		
10	SS-6	10-12	24/24	16-13-11-13	<1.0 ppm		Very dark brown medium to fine SAND, gradually changing to medium to coarse Sand with some Gravel. Sample wet with slight petroleum odor.		
12							End of Boring at 12 feet. Boring sealed off with grout. No well installed.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT	NOTES: (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).
SS - split spoon ST - Shelby tube AF - auger flight RC - rock core	and = 35-50% some = 20-35% little = 10-20% trace = 1-10%	
GRANULAR SOILS Blow Cts Density	COHESIVE SOILS Blow Cts Density	
< 4 very loose 5 - 10 loose 11 - 30 medium 31 - 50 dense > 50 very dense	< 2 very soft 2 - 4 soft 4 - 8 medium stiff 8 - 15 stiff 15 - 30 very stiff	

Disk Name:

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Boring No: MW-3D Page: 1 of 2

Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: Environmental Drilling Inc. **Driller:** J. Grasser
Drilling Method: HSA/Casing **Casing/Auger Size:** 4 1/4"
Start Date: 10/5/95 **Ground Elevation:** 50.81
Finish Date: 10/6/95 **Well Elevation:** 52.81

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0							Surface material characterized in boring MW-3.		
5									
10									
15	SS-1	14-16	24/10	8-3-8-9	<1.0 ppm		Dark grayish brown medium to fine SAND with trace Gravel. Sample wet.	2	
20	SS-2	19-21	24/12	6-4-4-4	<1.0 ppm	SAND and Gravel	Grayish brown medium to fine SAND with defined Gravel layer at top of sample. Sample wet.		
25	SS-3	24-26	24/11	4-4-5-6	<1.0 ppm		Grayish brown medium to fine SAND with trace Gravel, a band of coarse Gravel noted within sample. Sample wet.		
30	SS-4	29/31	24-10	7-6-8-11	<1.0 ppm		Grayish brown medium to fine SAND with trace coarse Sand and little Gravel. Sample wet.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon	and = 35-50%
ST - shelby tube	some = 20-35%
AF - auger flight	little = 10-20%
RC - rock core	trace = 1-10%
GRANULAR SOILS	COHESIVE SOILS
Blow Cts Density	Blow Cts Density
< 4 very loose	< 2 very soft
5 - 10 loose	2 - 4 soft
11 - 30 medium	4 - 8 medium stiff
31 - 50 dense	8 - 15 stiff
> 50 very dense	15 - 30 very stiff

NOTES:
 (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).
 (2) Switch to driven casing.

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Boring No: MW-3D Page: 2 of 2

Project Name: Murphy's Waste Oil Service, Inc.
 Project Location: 252 Salem Street, Woburn, MA
 CHES Job #: EN-170 Inspector: P. Nicewonger
 Contractor: Environmental Drilling Inc. Driller: J. Grasser
 Drilling Method: HSA/Casing Casing/Auger Size: 4 1/4"
 Start Date: 10/5/95 Ground Elevation: 50.81
 Finish Date: 10/6/95 Well Elevation: 52.36

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION	Notes	Well Screen	
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)						
30										
	SS-5	34-36	24/13	4-6-7-11	<1.0 ppm	SAND and GRAVEL	Same as SS-4 with a 2" band of yellowish brown staining with slight metallic odor. Sample wet.			
35										
	SS-6	39-41	24/14	19-14-22-20	1.2 ppm			Yellowish brown stained fine SAND with trace Gravel. Sample wet with moderate metallic odor.		
40										
	SS-7	44-46	24/2	17-14-14-11	<1.0 ppm		Dark olive gray medium to coarse GRAVEL with traces of coarse to fine Sand. Sample wet.			
45										
	SS-8	49-51	24/3	26-27-27-20	<1.0 ppm	17.	Olive gray medium to coarse GRAVEL with traces of coarse to fine Sand. Sample wet.			
50										
							End of boring at 51 feet. Well installed at 49 feet.	3		
55										

SAMPLE TYPES		PERCENTAGE BY WEIGHT	
SS - split spoon		and = 35-50%	
ST - shelby tube		some = 20-35%	
AF - auger flight		little = 10-20%	
RC - rock core		trace = 1-10%	
GRANULAR SOILS		COHESIVE SOILS	
Blow Cts	Density	Blow Cts	Density
< 4	very loose	< 2	very soft
5 - 10	loose	2 - 4	soft
11 - 30	medium	4 - 8	medium stiff
31 - 50	dense	8 - 15	stiff
> 50	very dense	15 - 30	very stiff

NOTES:
 (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).
 (2) Switch to driven casing.
 (3) See well completion report for details.

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Environmental Services, Inc.
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12 MERCER ROAD
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Boring No: MW-7

Page: 1 of 1

Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170 **Inspector:** J. McCreery

Contractor: Environmental Drilling Inc. **Driller:** J. Grasser

Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"

Start Date: 10/2/95 **Ground Elevation:** 50.71

Finish Date: 10/2/95 **Well Elevation:** 50.35

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0.5-2.5	24/13	27-30-40-13	60 ppm		Very dark grayish brown fine to medium SAND and Silt with some rock fragments. Sample dry.		
2	SS-2	2.5-4.5	24/14	9-10-23-10	230 ppm		Very dark grayish brown fine SAND and Silt with some rock fragments and wood inclusions. Moist.		
4	SS-3	4.5-6.5	24/10	23-12-12-10	350 ppm	SAND	Very dark grayish brown fine SAND and Silt with some coarse Sand and rock fragments. Moist.		
6	SS-4	6.5-8.5	24/9	20-9-4-7	460 ppm	▼ 7.0'	Same as SS-3 over 2" wet, oil-stained SAND and Silt with some wood fiber and roots, strong petroleum odor.		
8	SS-5	8.5-10.5	24/4	5-7-6-6	70 ppm		Black fine to coarse SAND with some silt. Sample oily, free oil on split-spoon. Strong petroleum odor. Sample wet.		
10	SS-6	10.5-12.5	24/8	6-6-8-21	100 ppm		Black very coarse SAND. Strong petroleum odor. Sample wet.		
12							End of boring at 12 feet. Well installed at 12 feet.	2	

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon	and = 35-50%
ST - shelly tube	some = 20-35%
AF - auger flight	little = 10-20%
RC - rock core	trace = 1-10%
GRANULAR SOILS	COHESIVE SOILS
Blow Cts Density	Blow Cts Density
< 4 very loose	< 2 very soft
5 - 10 loose	2 - 4 soft
11 - 30 medium	4 - 8 medium stiff
31 - 50 dense	8 - 15 stiff
> 50 very dense	15 - 30 very stiff

NOTES:

- (1) Foxboro 128 GC OVA used for field screening (ppm = parts per million).
- (2) See well completion report for details.

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Boring No: MW-8

Page: 1 of 1

Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170 **Inspector:** P. Nicewonger

Contractor: Environmental Drilling Inc. **Driller:** J. Grasser

Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"

Start Date: 10/27/95 **Ground Elevation:** 51.93

Finish Date: 10/27/95 **Well Elevation:** 54.32

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/14	8-15-10-11	1.6 ppm		Top 6" fill material, dark brown medium to fine SAND with brick and concrete fragments. Sample dry with slight petroleum odor and staining.		
2	SS-2	2-4	16/5	15-14-120	3.0 ppm		Brown medium to fine SAND with some Gravel. Sample dry with slight petroleum odor and dark petroleum staining.		
4	SS-3	4-6	24/4	9-3-5-7	5.8 ppm	SAND and GRAVEL	Brown medium to fine SAND and Gravel with trace coarse Sand. Sample dry with slight petroleum odor.		
6	SS-4	6-8	24/5	10-12-9-4	<1.0 ppm		Olive brown medium to fine SAND with some Gravel and trace coarse Sand, bottom of sample moist.		
8	SS-5	8-10	24/14	11-7-8-11	<1.0 ppm	8.0'	Olive brown medium to coarse SAND with trace fine Sand and Gravel. Sample wet.		
10	SS-6	10-12	24/16	15-17-17-22	<1.0 ppm		Olive brown medium to coarse SAND with some Gravel and trace fine Sand. Sample wet.		
12							End of Boring at 12 feet. Well installed at 12 feet.		

SAMPLE TYPES

- SS - split spoon
- ST - shelby tube
- AF - auger flight
- RC - rock core

PERCENTAGE BY WEIGHT

- and = 35-50%
- some = 20-35%
- little = 10-20%
- trace = 1-10%

GRANULAR SOILS
Blow Cts Density

- < 4 very loose
- 5 - 10 loose
- 11 - 30 medium
- 31 - 50 dense
- > 50 very dense

COHESIVE SOILS
Blow Cts Density

- < 2 very soft
- 2 - 4 soft
- 4 - 8 medium stiff
- 8 - 15 stiff
- 15 - 30 very stiff

NOTES:

- (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million)
- (2) The Burmister System is used for field classification of soils.

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Boring No: MW-9		Page: 1 of 1	
Project Name: Murphy's Waste Oil Service, Inc.			
Project Location: 252 Salem Street, Woburn, MA			
CHES Job #: EN-170	Inspector: P. Nicewonger		
Contractor: Environmental Drilling Inc.		Driller: J. Grasser	
Drilling Method: Hollow Stem Auger	Casing/Auger Size: 4 1/4"		
Start Date: 10/5/95	Ground Elevation: 50.31		
Finish Date: 10/5/95	Well Elevation: 51.77		

Depth (feet)	SAMPLE				Field Screening 1	Strata Change	FIELD CLASSIFICATION	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/8	2-8-10-10	<1.0 ppm		Very dark brown medium to fine SAND with some Gravel and Rock fragments and organic material. Sample dry.		
2							No recovery in split-spoon.		
	SS-2	2-4	24/0	22-26-90-55					
4					2.3 ppm	SAND	Dark brown medium to coarse SAND with some Gravel and Rock fragments. Sample dry.		
	SS-3	4-6	24/7	23-24-16-11					
6							No recovery in split-spoon.		
	SS-4	6-8	24/0	11-4-2-10					
8					1.8 ppm		Yellowish brown medium to fine SAND with slight petroleum staining on top 3". Sample wet with slight petroleum odor.		
	SS-5	8-10	24/17	10-9-17-19		▼ 9.0'			
10					3.0 ppm		Yellowish brown medium to fine SAND. Sample wet with slight petroleum staining and odors.		
	SS-6	10-12	24/24	5-15-19-20					
12							End of boring at 12 feet. Well installed at 12 feet.	2	

SAMPLE TYPES	PERCENTAGE BY WEIGHT	NOTES: (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million). (2) See well completion report for details.
SS - split spoon ST - Shelby tube AF - auger flight RC - rock core	and = 35-50% some = 20-35% little = 10-20% trace = 1-10%	
GRANULAR SOILS Blow Cts Density	COHESIVE SOILS Blow Cts Density	
< 4 very loose 5 - 10 loose 11 - 30 medium 31 - 50 dense > 50 very dense	< 2 very soft 2 - 4 soft 4 - 8 medium stiff 8 - 15 stiff 15 - 30 very stiff	

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Boring No: MW-10 Page: 1 of 2

Project Name: Murphy's Waste Oil Service, Inc.
 Project Location: 252 Salem Street, Woburn, MA
 CHES Job #: EN-170 Inspector: P. Nicewonger
 Contractor: Environmental Drilling Inc. Driller: J. Grasser
 Drilling Method: Hollow Stem Casing Casing/Auger Size: 4" / 4 1/4"
 Start Date: 10/09/95 Ground Elevation: 51.33'
 Finish Date: 10/10/95 Well Elevation: 53.77'

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION ²	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
0							Surface material characterized in Boring MR-2SS.		
5									
10									
15	SS-1	15-17	24/4	20-13-9-9	80 ppm	SAND and GRAVEL	Very dark gray medium to coarse SAND, with some Gravel. Sample wet with heavy petroleum staining and strong petroleum odors.	2	
	SS-2	17-19	24/20	19-21-27-24	68 ppm		Very dark gray medium to coarse SAND with some Gravel and trace fine Sand. Sample wet with slight petroleum odors and staining.		
20									
25	SS-3	24-26	24/2	11-22-22-27	2.7 ppm		Olive gray GRAVEL with some medium to coarse Sand. Sample wet.		
30	SS-4	29-31	24/10	20-22-17-14	5.0 ppm		Dark olive gray medium to coarse SAND with some Gravel. Sample wet.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT
SS - split spoon ST - shelby tube AF - auger flight RC - rock core	and = 35-50% some = 20-35% little = 10-20% trace = 1-10%
GRANULAR SOILS Blow Cts Density	COHESIVE SOILS Blow Cts Density
< 4 very loose 5 - 10 loose 11 - 30 medium 31 - 50 dense > 50 very dense	< 2 very soft 2 - 4 soft 4 - 8 medium stiff 8 - 15 stiff 15 - 30 very stiff

NOTES:
 (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million)
 (2) Switch to driven casing.

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Boring No: MW-10 Page: 2 of 2

Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: Environmental Drilling Inc. **Driller:** J. Grasser
Drilling Method: Hollow Stem Casing **Casing/Auger Size:** 4" / 4 1/4"
Start Date: 10/09/95 **Ground Elevation:** 51.33'
Finish Date: 10/10/95 **Well Elevation:** 53.77'

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (inches)	Blow Count (per 6 inches)					
35	SS-5	34-36	24/18	15-18-20-24	2.8 ppm		Olive gray medium to fine SAND with some coarse Sand and Gravel. Sample wet.		
40	SS-6	39-41	24/18	14-10-17-15	4.0 ppm	SAND and GRAVEL	Olive gray medium to coarse SAND with some Gravel. Sample wet.		
45	SS-7	44-46	24/12	7-9-10-12	1.7 ppm		Light brown fine SAND with a gradual color change to gray. Sample wet		
50							End of boring at 46 feet. Well installed at 41 feet.		

SAMPLE TYPES	PERCENTAGE BY WEIGHT	NOTES: (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million). (2) Switch to driven casing.
SS - split spoon ST - shelby tube AF - auger flight RC - rock core	and = 35-50% some = 20-35% little = 10-20% trace = 1-10%	
GRANULAR SOILS Blow Cts Density	COHESIVE SOILS Blow Cts Density	
< 4 very loose 5 - 10 loose 11 - 30 medium 31 - 50 dense > 50 very dense	< 2 very soft 2 - 4 soft 4 - 8 medium stiff 8 - 15 stiff 15 - 30 very stiff	

Disk Name:

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Boring No: MW-11 Page: 1 of 1

Project Name: Murphy's Waste Oil Service, Inc.

Project Location: 252 Salem Street, Woburn, MA

CHES Job #: EN-170 **Inspector:** P. Nicewonger

Contractor: Environmental Drilling Inc. **Driller:** J. Grasser

Drilling Method: Hollow Stem Auger **Casing/Auger Size:** 4 1/4"

Start Date: 10/3/95 **Ground Elevation:** 49.95

Finish Date: 10/3/95 **Well Elevation:** 48.10

Depth (feet)	SAMPLE				Field Screening ¹	Strata Change	FIELD CLASSIFICATION	Notes	Well Screen
	Type & No.	Sample Interval (feet)	pen rec (Inches)	Blow Count (per 6 inches)					
0	SS-1	0-2	24/11	2-2-2-2	<1.0 ppm		Dark brown medium to fine SAND and organic material (loam). Sample dry.		
2	SS-2	2-4	24/12	2-1-2-2	<1.0 ppm		Same as SS-1.		
4	SS-3	4-6	24/10	11-3-5-9	4.0 ppm	SAND	Dark brown medium to fine SAND with some Gravel. Bottom of sample moist.		
6	SS-4	6-8	24/7	6-4-2-2	18 ppm		Very dark brown medium to fine SAND with some Gravel. Sample wet.		
8	SS-5	8-10	24/20	2-5-7-11	740 ppm		very dark brown medium to fine SAND from 8' to 8' 2", light medium to fine Sand. Sample wet, possible slight odor.		
10	SS-6	10-12	24/20	1-3-5-8	58 ppm		Dark yellowish brown medium to fine SAND with trace coarse Sand and Gravel. Sample wet.		
12							End of boring at 12.0 feet Well installed at 12 feet.	2	

SAMPLE TYPES

SS - split spoon
 ST - Shelby tube
 AF - auger flight
 RC - rock core

PERCENTAGE BY WEIGHT

and = 35-50%
 some = 20-35%
 little = 10-20%
 trace = 1-10%

GRANULAR SOILS
 Blow Cts Density

< 4 very loose
 5 - 10 loose
 11 - 30 medium
 31 - 50 dense
 > 50 very dense

COHESIVE SOILS
 Blow Cts Density

< 2 very soft
 2 - 4 soft
 4 - 8 medium stiff
 8 - 15 stiff
 15 - 30 very stiff

NOTES:

- (1) Foxboro 128 GC OVA used for field-screening (ppm = parts per million).
- (2) See well completion report for details.

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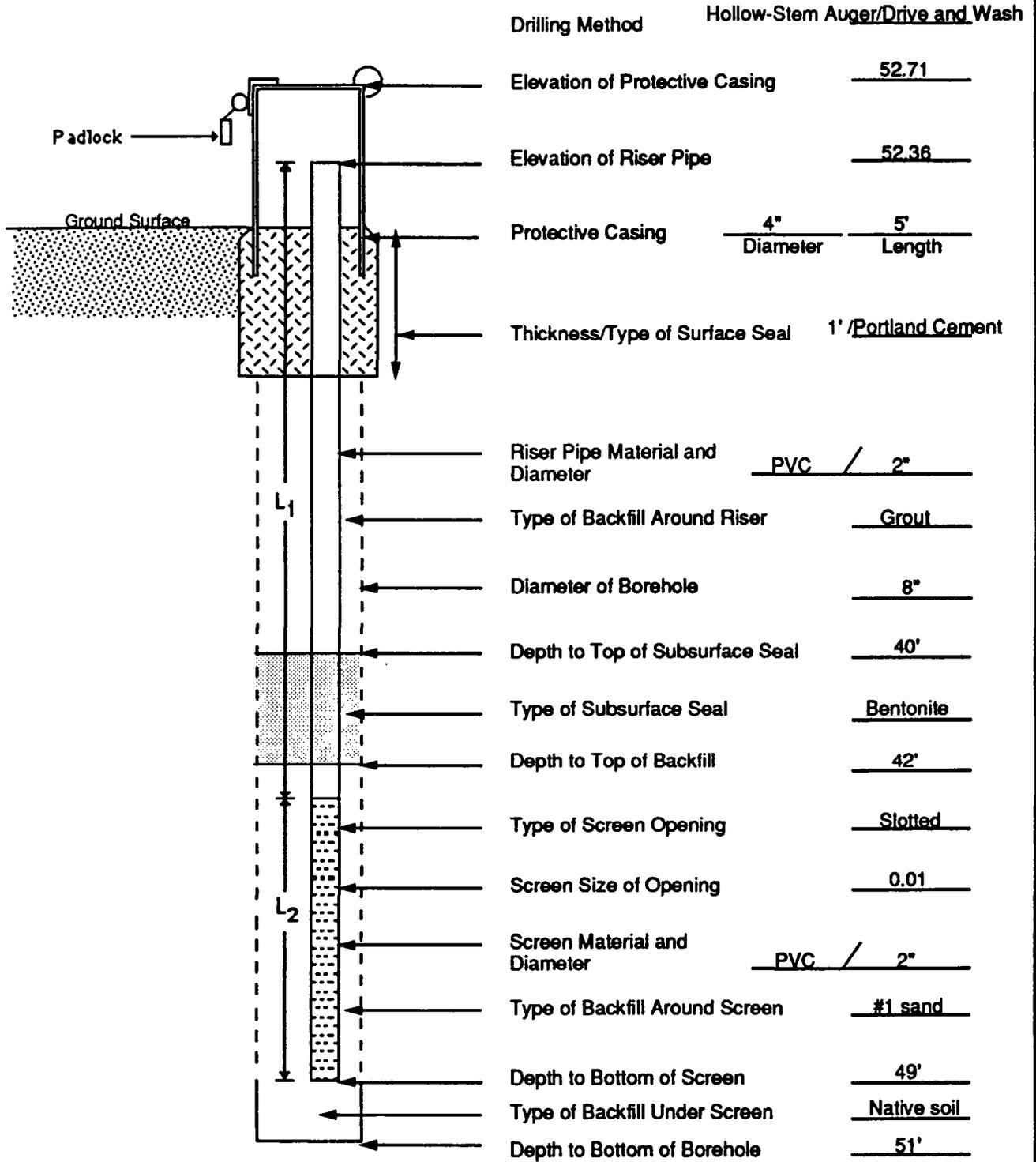


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Well Completion Report

Well No: MW-3D

Project Name:	Murphy's Waste Oil Service, Inc.		
Project Location:	252 Salem Street, Woburn, MA		
CHES Job #:	EN-170	Inspector:	P. Nicewonger
Contractor:	Environmental Drilling Inc.		
Driller:	J. Grasser	Installation Date:	10/6/95



Elevation Datum: NGVD

(L₁) Length of Riser (ft) 45' (L₂) Length of Screen (ft) 5' Ground Elevation 50.81

Disk Name:

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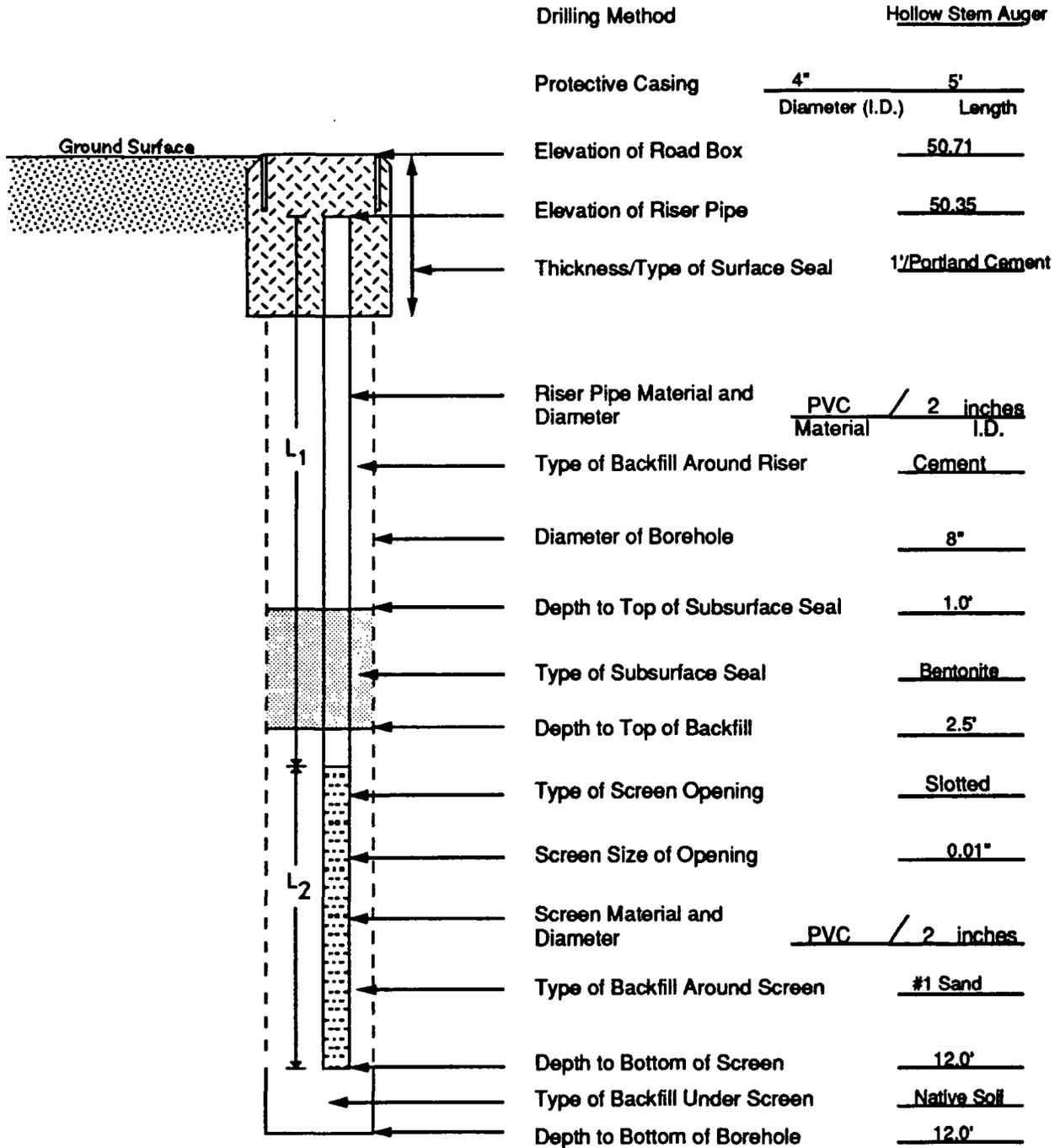


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Well Completion Report

Well No: MW-7

Project Name: Murphy's Waste Oil Service, Inc.
 Project Location: 252 Salem Street, Woburn, MA
 CHES Job #: EN-170 Inspector: J. McCreery
 Contractor: Environmental Drilling, Inc.
 Driller: J. Grasser Installation Date: 10/2/95



Elevation Datum: NGVD

(L₁) Length of Riser (ft) 2.6

(L₂) Length of Screen (ft) 9.0

Ground Elevation 50.35

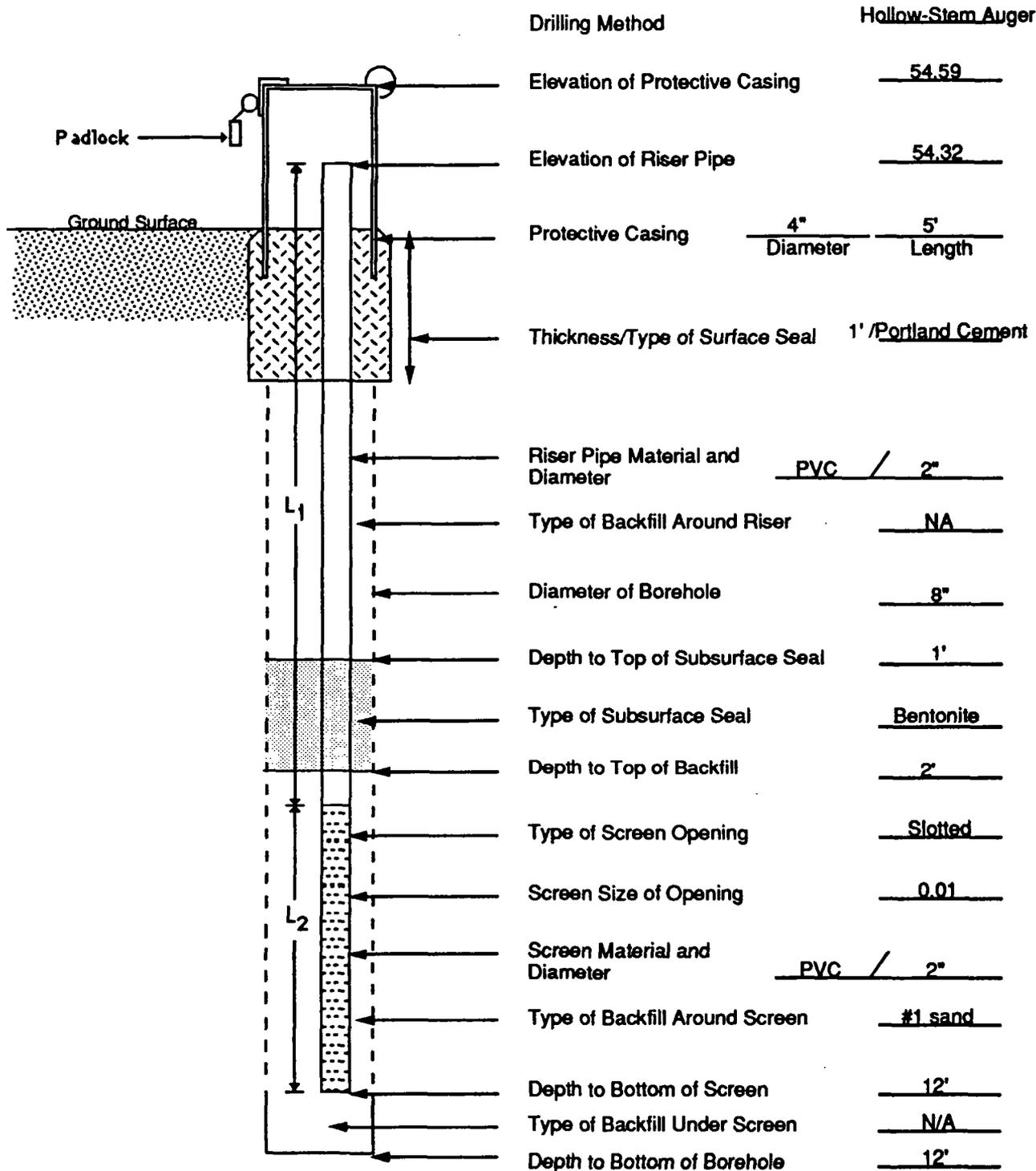


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Well Completion Report

Well No: MW-8

Project Name: Murphy's Waste Oil Service, Inc.
 Project Location: 252 Salem Street, Woburn, MA
 CHES Job #: EN-170 Inspector: P. Nicewonger
 Contractor: Environmental Drilling Inc.
 Driller: J. Grasser Installation Date: 10/27/95



Elevation Datum: NGVD

(L₁) Length of Riser (ft) 4

(L₂) Length of Screen (ft) 9

Ground Elevation 51.93

Disk Name:

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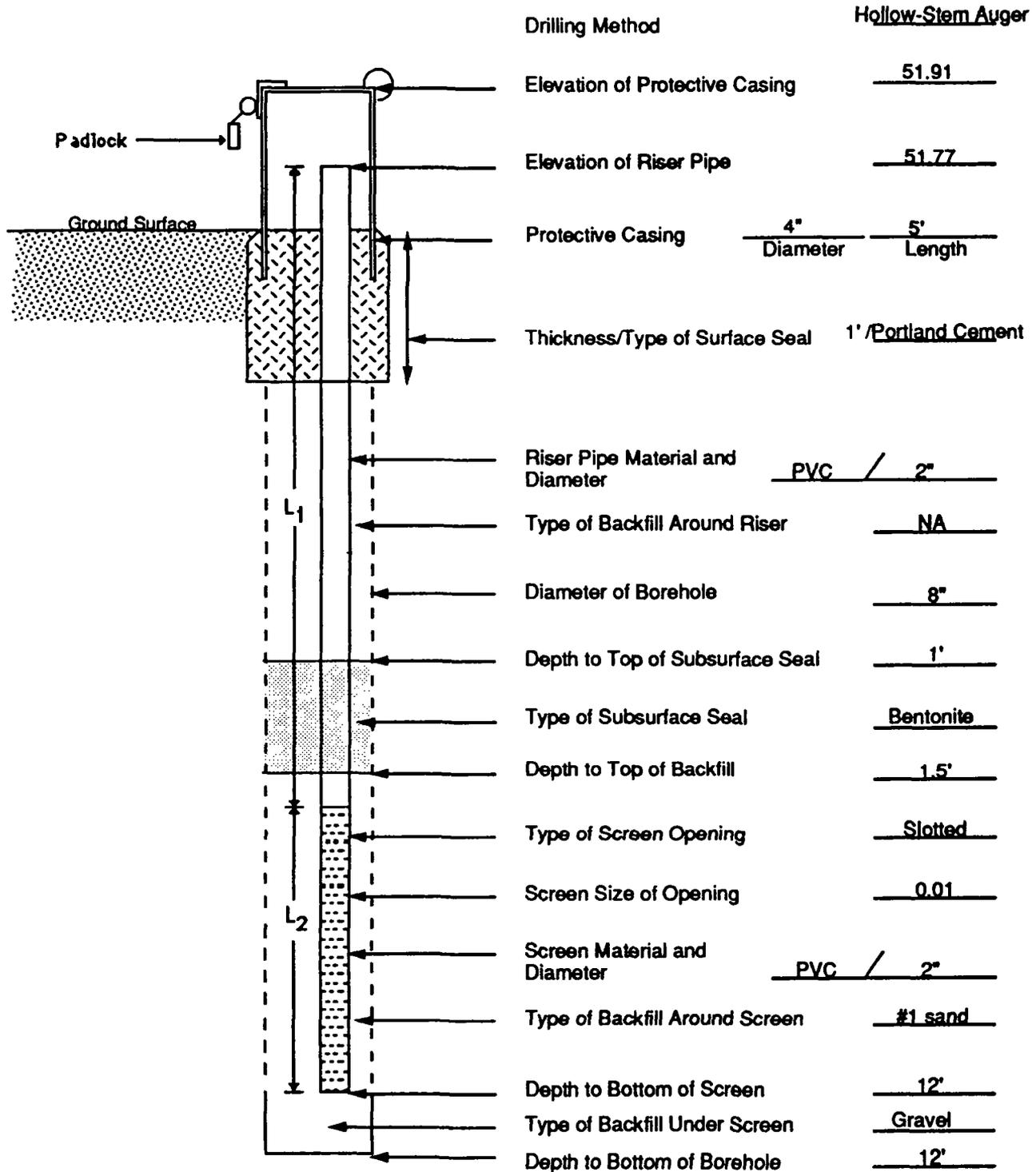


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Well Completion Report

Well No: MW-9

Project Name: Murphy's Waste Oil Service, Inc.
 Project Location: 252 Salem Street, Woburn, MA
 CHES Job #: EN-170 Inspector: P. Nicewonger
 Contractor: Environmental Drilling Inc.
 Driller: J. Grasser Installation Date: 10/5/95



Elevation Datum: NGVD

(L₁) Length of Riser (ft) 4'

(L₂) Length of Screen (ft) 12'

Ground Elevation 50.31

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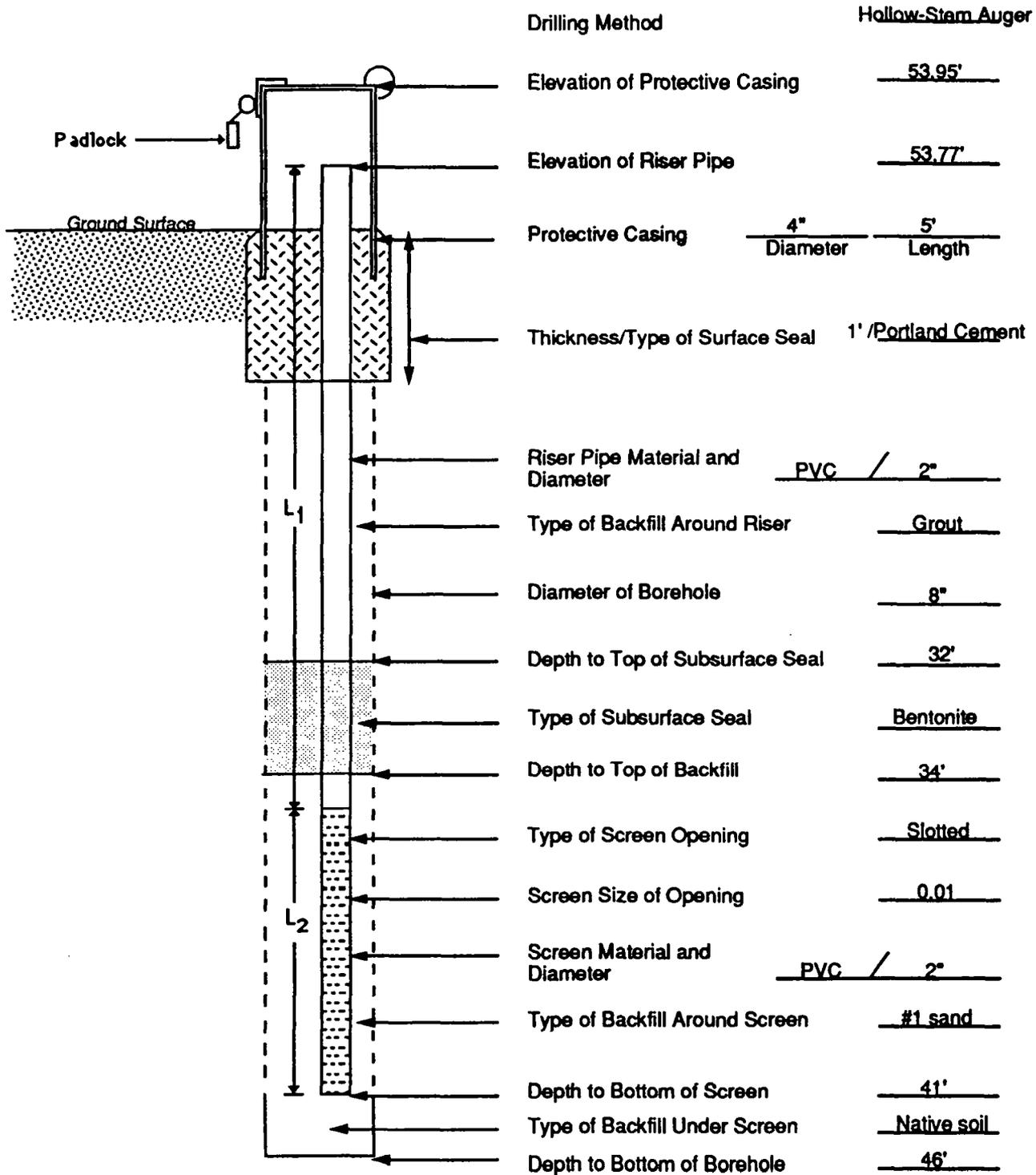


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Well Completion Report

Well No: MW-10

Project Name: Murphy's Waste Oil Service, Inc.
 Project Location: 252 Salem Street, Woburn, MA
 CHES Job #: EN-170 Inspector: P. Nicewonger
 Contractor: Environmental Drilling Inc.
 Driller: J. Grasser Installation Date: 10/10/95



Elevation Datum: NGVD

(L₁) Length of Riser (ft) 35

(L₂) Length of Screen (ft) 5

Ground Elevation 51.33'

Disk Name:

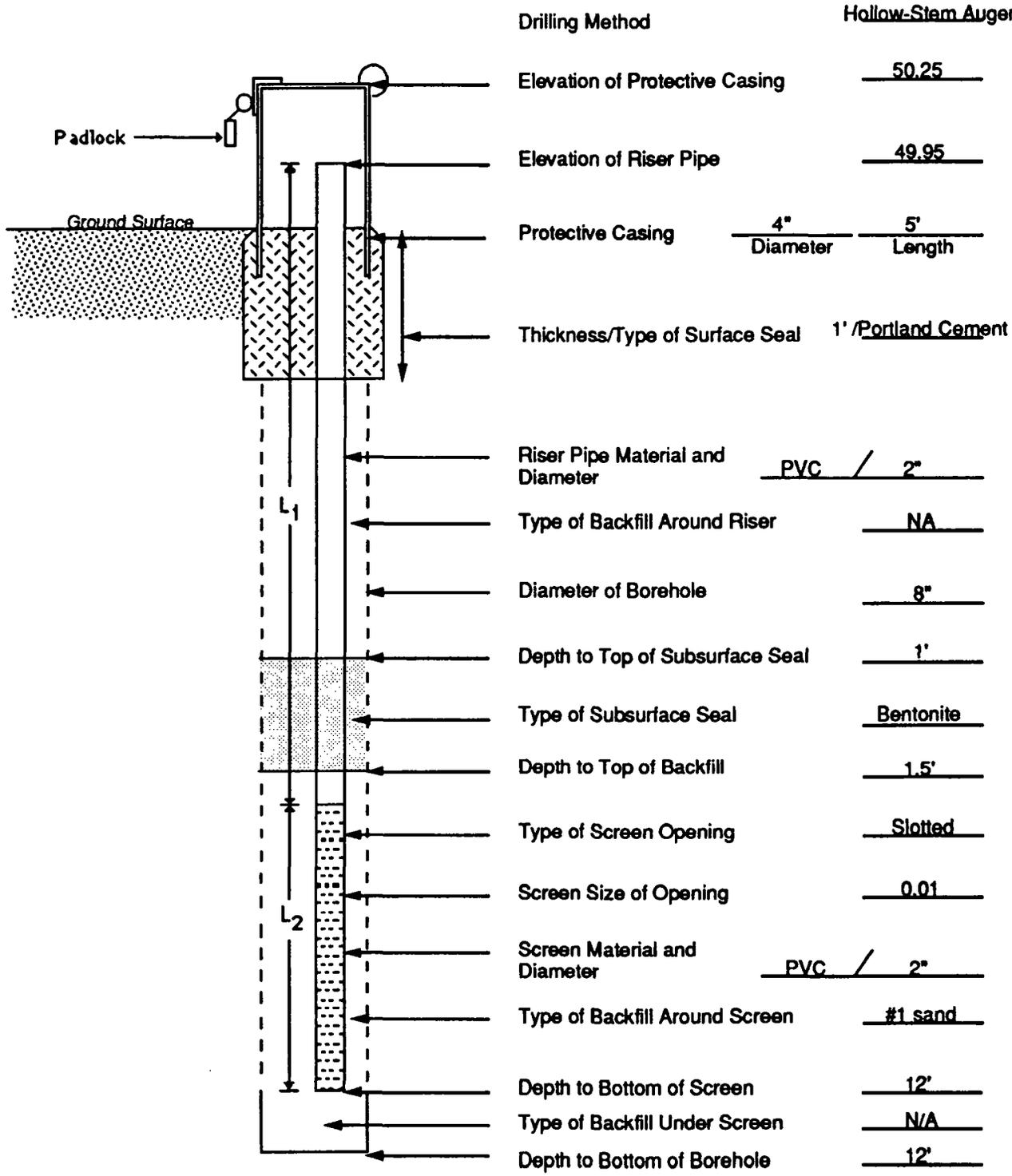


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Well Completion Report

Well No: MW-11

Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicawonger
Contractor: Environmental Drilling Inc.
Driller: J. Grasser **Installation Date:** 10/3/95



Drilling Method	Hollow-Stem Auger	
Elevation of Protective Casing	50.25	
Elevation of Riser Pipe	49.95	
Protective Casing	4" Diameter	5' Length
Thickness/Type of Surface Seal	1' / Portland Cement	
Riser Pipe Material and Diameter	PVC / 2"	
Type of Backfill Around Riser	NA	
Diameter of Borehole	8"	
Depth to Top of Subsurface Seal	1'	
Type of Subsurface Seal	Bentonite	
Depth to Top of Backfill	1.5'	
Type of Screen Opening	Slotted	
Screen Size of Opening	0.01	
Screen Material and Diameter	PVC / 2"	
Type of Backfill Around Screen	#1 sand	
Depth to Bottom of Screen	12'	
Type of Backfill Under Screen	N/A	
Depth to Bottom of Borehole	12'	

Elevation Datum: NGVD

(L₁) Length of Riser (ft) 4' (L₂) Length of Screen (ft) 10' Ground Elevation 48.10

Disk Name:

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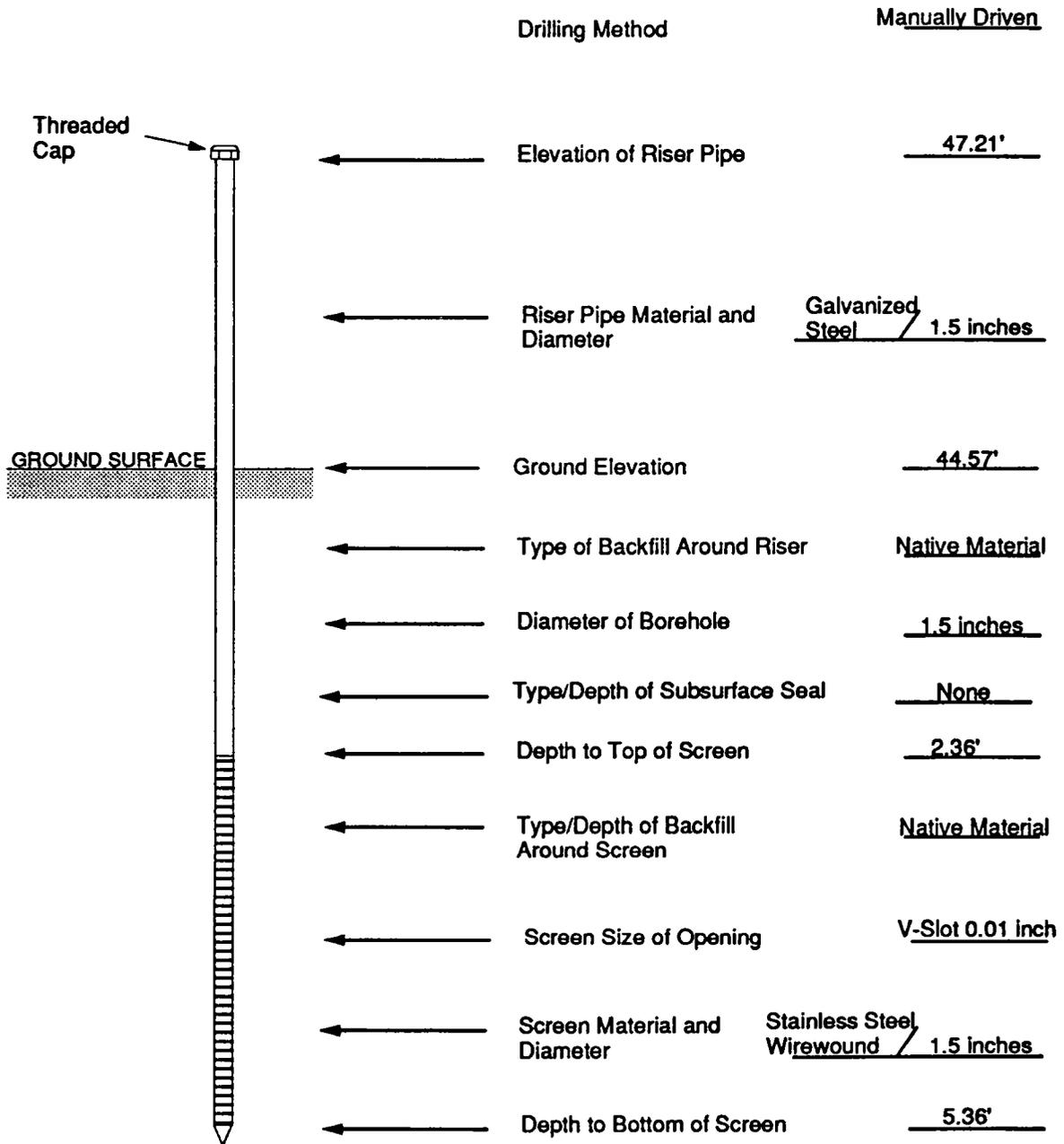


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Well Completion Report

Well No: MW-12

Project Name: Murphy's Waste Oil Service, Inc.	
Project Location: 252 Salem Street, Woburn, MA	
CHES Job #: EN-170	Inspector: P. Nicewonger
Contractor: None	
Driller: P. Nicewonger	Installation Date: 10/3/95



Drilling Method Manually Driven

Elevation of Riser Pipe 47.21'

Riser Pipe Material and Diameter Galvanized Steel / 1.5 inches

GROUND SURFACE Ground Elevation 44.57'

Type of Backfill Around Riser Native Material

Diameter of Borehole 1.5 inches

Type/Depth of Subsurface Seal None

Depth to Top of Screen 2.36'

Type/Depth of Backfill Around Screen Native Material

Screen Size of Opening V-Slot 0.01 inch

Screen Material and Diameter Stainless Steel Wirewound / 1.5 inches

Depth to Bottom of Screen 5.36'

Disk Name:

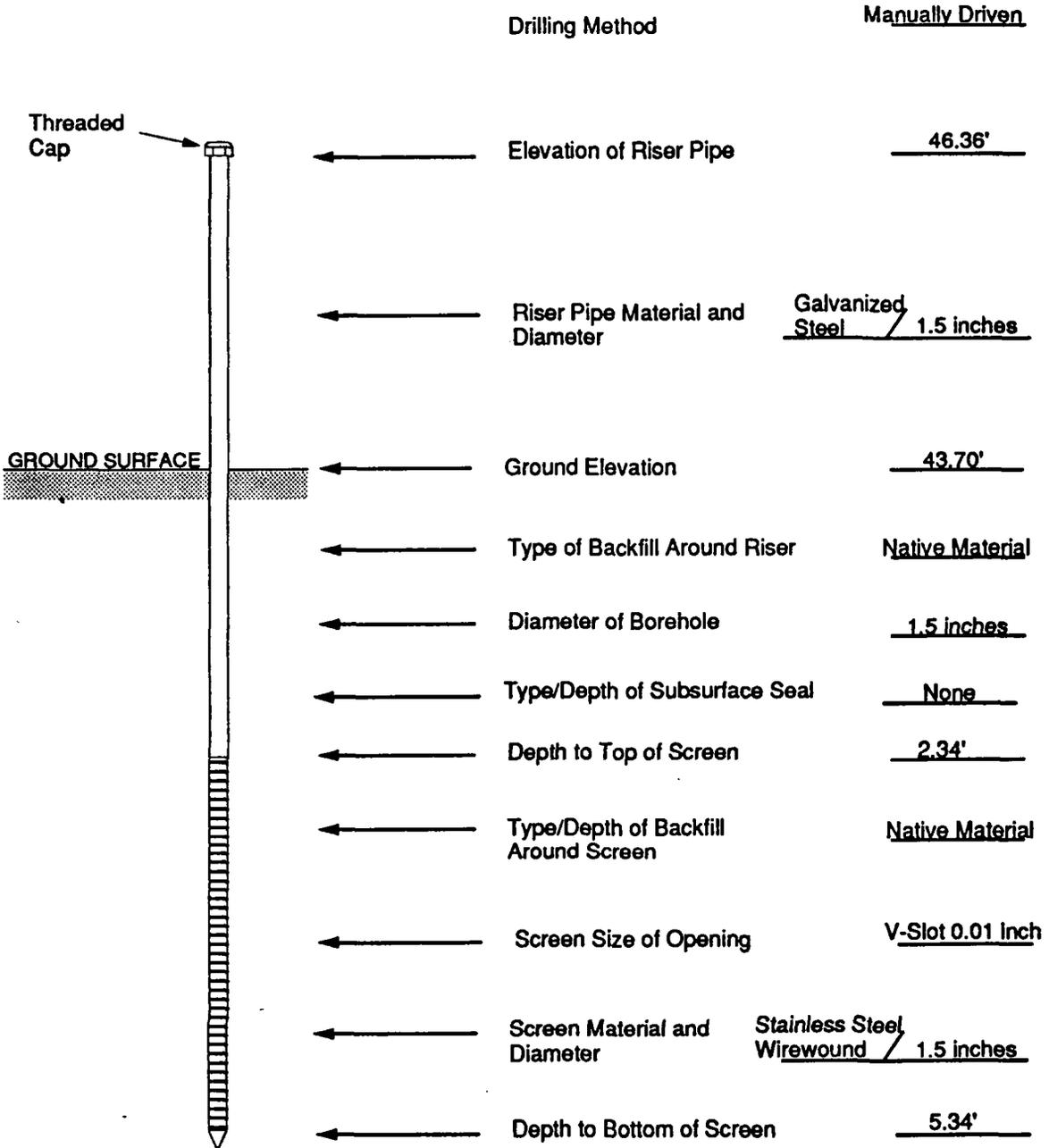


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Well Completion Report

Well No: MW-13

Project Name: Murphy's Waste Oil Service, Inc.
Project Location: 252 Salem Street, Woburn, MA
CHES Job #: EN-170 **Inspector:** P. Nicewonger
Contractor: None
Driller: P. Nicewonger **Installation Date:** 10/3/95



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Disk Name: