IRA Completion Statement & Phase IV Excerpts

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1.0 INTRODUCTION

1.1 Statement of Purpose

LSPCO was retained by ACME to provide environmental services at their facility. This report was prepared by LSPCO, on behalf of ACME, to satisfy the Massachusetts Contingency Plan (MCP) requirements for an IRA Completion Report, Phase IV Remedy Implementation Plan (Phase IV), and Phase IV Final Inspection Report and Completion Statement. In addition, a Phase V Remedy Operation Status (ROS) Report is included for continued operation of the remediation system to achieve a Permanent Solution, as outlined in MCP, 310 CMR 40.0893. ACME has performed response actions under the MCP for a release of petroleum from an underground storage tank (UST) located at the facility. Response actions included operation and maintenance of a product recovery and an in-situ aquifer bioremediation system as an IRA, and completion of Phases I, II, and III of the MCP.

The objective at the site is to obtain a Class A-3 Response Action Outcome (RAO) Statement where remedial actions have achieved a level of No Significant Risk, as defined in the MCP, the concentration of contaminants has not been reduced to background, and an Activity and Use Limitation (AUL) is required. This report constitutes the design and implementation of the Phase III selected Remedial Response Action (RAA), which is operation and maintenance of an aquifer bioremediation system and implementation of an AUL, intended to achieve the goals and objectives previously stated. LSPCO determined that it is not feasible to achieve background concentrations at all locations at the Disposal Site because a portion of the release is located beneath the ACME facility.

1.2 Background

A Site Location Map is included as Figure 1. The ACME facility and land where the facility is located is hereafter referred to as the "Property." The portion of land where the petroleum release is present is hereafter referred to as the "Disposal Site." The Property is currently operated as a heat treating facility. Heat treating is a process that hardens and strengthens metal products for their intended use. A current floor plan of the facility is included as Figure 2. In reference to this figure, the facility contains several areas with varying types of heat treating furnaces and associated tempering units. An area at the rear of the facility is used for shot blasting and tumbling to debar metal products.

Based on findings reported by the local Department of Public Health & Code Enforcement (DPH), on October 1, 1998, the MADEP advised ACME of a release of oil to the underground Brook Culvert. The release was temporarily abated by the DPH at the time of their inspection. LSPCO determined that a 2-hour reporting condition [310 CMR 40.0311(8)] was present at the Disposal Site where oil had released, or could potentially release, to a storm drain. This condition also met the criteria for a condition of Substantial Release Migration [310 CMR 40.0413(2)(a)]. The MCP requires IRAs in both cases. This condition was verbally reported by LSPCO to DEP on March 19, 1999. Assessment-only IRA activities were verbally approved at the time of reporting.

It was determined that the likely source of the oil was from a 3,000-gallon No. 2 fuel oil UST. A Site Map is included as Figure 3. The UST was closed in-place in 1991 in accordance with 527 CMR 9.22 and at the approval of the local Fire Department. According to ACME, UST closure included emptying and cleaning the tank, inspecting, and filling the tank with concrete slurry.

On May 18, 1999, an IRA Plan was submitted to the MADEP and a Modified IRA Plan was subsequently submitted to the MADEP in November 2000. A summary of IRA activities is provided in Section 2.2 of this report.

A Phase I Report and Tier Classification was submitted to the MADEP in March 2000. This report classified the Disposal Site as Tier II under the MCP. In May 2002, a Phase II Comprehensive Site Assessment Report was submitted. This report concluded that the release was characterized as No. 2 fuel oil, originating from the 3,000-gallon UST located beneath the eastern end of the facility. This release resulted in hydrocarbon impact to soil and groundwater downgradient of the former UST and extending to the underground Brook culvert. In July 2002, a Phase III Evaluation and Selection of Remedial Action Alternatives and Remedial Action Plan were submitted to the MADEP. Evaluation during the preparation of the Phase III Report resulted in the selection of land use restriction as the appropriate remedial option for the Disposal Site.

1.3 Area Receptor Information

The Disposal Site is located in an area of mixed land use with a population of greater than 4,400 people per square mile. Commercial and industrial companies are located along West Street. Residential homes and apartment buildings are located east of the Disposal Site along South Street.

The Disposal Site and surrounding area are serviced by municipal water and there is no record of any private well within 500 feet of the Disposal Site. According to the FirstSearch™ Report and MAGIS Map (both included in the Phase II Report), there are no Areas of Critical Environmental Concern within ¼ mile, or public water supplies within ½ mile of the Disposal Site. The Brook Culvert is a twin-box (i.e. west and east) culvert located underground having a combined dimension of 24 feet wide by seven feet high. Water in the culvert, although underground, is considered surface

water located on-site because the culvert discharges water from Big Lake directly to Two Small Pond. Two Small Pond is a Class B surface water body designated by MADEP as suitable for fish habitat and other aquatic life, wildlife, primary and secondary contact recreation, and as a public water supply source with treatment. The WDPH reports that contact recreation, fishing and boating is not allowed at the pond and is indicated to the public by posted signs. The pond does reportedly support fish.

1.4 Hydrogeology and Subsurface Stratigraphy

Groundwater at the Disposal Site is encountered at a depth of approximately eight to nine feet below grade. Water table elevation data indicates that the approximate direction of groundwater flow across the eastern portion of the Disposal Site is to the east, towards the underground Brook culvert.

Subsurface soils consist of medium to fine sand with varying amounts of soil and gravel with localized traces of brick and fill material. Bedrock was not encountered less than 20-feet below the ground surface during any drilling activities on Disposal Site.

1.5 Soil and Groundwater Impact

The petroleum release resulted in impact to soil located around the former UST, and impact to groundwater and soil in the capillary zone downgradient of the former UST, extending from the UST to the underground Brook culvert. Liquid-phase hydrocarbon (LPH) has been recorded immediately downgradient of the former UST at well MW-4 and along the west wall to the underground culvert. LPH had discharged to surface water in the underground culvert prior to sealing the weep holes in the culvert. Visual inspection of weep holes located in the underground culvert wall, which is approximately 25 feet downstream (south) of the Disposal Site, did not identify petroleum migrating in the culvert at these locations. The hydrocarbon plume has not migrated beyond the underground culvert and, based on dissolved hydrocarbon concentrations in

monitoring well MW-2 located along the west side of the underground culvert wall, significant migration of the dissolved plume in this direction has not occurred.

Based on historical data, Method 1 soil and groundwater standards have been exceeded for Extractable Petroleum Hydrocarbons (EPH), chlorinated hydrocarbons and lead on the eastern portion of the Disposal Site. Volatile Petroleum Hydrocarbons (VPH) Method 1 standards were also exceeded in groundwater on the eastern portion of the Disposal Site. The release of chlorinated hydrocarbons and lead were determined not to be attributable to the UST and are currently being addressed under a separate RTN.

All historical analytical data obtained during the IRA activities are included in the tables included as Appendix B. In reference to Appendix B, included are soil analytical results (Table 3 – Soil Laboratory Results, PPM), groundwater analytical results (Table 3 – Summary of Groundwater Analytical Data and Table 4 – Summary of Groundwater Analytical Data - Nutients), surface water analytical results (Table 4) and bioremediation system analytical results (Table 5 – Summary of Groundwater Analytical Data – System Influent and Table 6 – Summary of Groundwater Analytical Data – System Effluent). In addition, groundwater gauging data tables summarizing data from April 1999 through November 2002 are included in Appendix C.

2.0 IRA COMPLETION REPORT

2.1 IRA Plan Objective

The goal of the IRA was to mitigate IRA conditions present at the Disposal Site, which included 1) a release of fuel oil to surface water in the underground Brook Culvert; 2) a release of fuel oil that resulted in the appearance of a visible sheen on surface water in the underground Brook Culvert; and, 3) the presence of floating liquid-phase fuel oil on groundwater located next to the underground culvert's exterior wall and at monitoring well MW-4. Mitigation would be accomplished by recovery of liquid-phase fuel oil and the reduction of dissolved-phase hydrocarbon concentrations in groundwater. The objective of the Modified IRA Plan was to operate, maintain and monitor an in-situ bioremediation system at the Disposal Site. A copy of the Modified IRA Plan is included in Appendix D.

2.2 Summary of IRA Activities

The May 1999 IRA Plan proposed 1) removal of LPH from the underground culvert; and, 2) groundwater and LPH monitoring. In accordance with the IRA Plan, in September 1999, approximately 150 gallons of LPH and water was collected from the culvert via the weep hole and groundwater and LPH monitoring was implemented. The November 2000 Modified IRA Plan proposed the construction and operation of an in-situ bioremediation system in order to prevent further migration of LPH to the underground culvert. The bioremediation system included a groundwater recovery trench with a recovery well, a groundwater recharge trench and nutrient treatment. The bioremediation system was installed in April and May 2001. Construction, operation and maintenance of the bioremediation system are performed by "the Sub" a subcontractor to LSPCO. Continuous operation of the system began on May 23, 2001. Weekly to bi-weekly operation and maintenance of the system has been conducted by the Sub to manually remove LPH from oil/water separator drums, maintain nutrient and microbe levels and check and maintain system hydraulic equipment as necessary.

Environmental monitoring under the IRA included quarterly groundwater monitoring for depth to water, LPH thickness, dissolved-phase petroleum hydrocarbon concentrations (via both EPH and VPH analyses) and nutrient analyses. Nutrient analyses included nitrogen-ammonia, nitrogen-nitrate, total phosphorus, dissolved oxygen and carbon dioxide. Water in the underground culvert was monitored quarterly for nutrients and visually inspected for a hydrocarbon sheen. System operational and hydrocarbon concentration data have been reported in semi-annual IRA Status Reports, the most recent of which was submitted in January 2003.

As reported in the January 2003 IRA Status Report, a total of approximately 110 gallons of fuel oil has been recovered since system startup and a total of 252,382 gallons of groundwater has been treated through January 3, 2003. As discussed in the January 2003 IRA Status Report, dissolved-phase hydrocarbon concentrations and nutrient levels in groundwater indicate effective treatment by the bioremediation system. Stable nutrient concentrations in surface water in the underground culvert indicate that groundwater from the Disposal Site is not entering the culvert. Dissolved-phase petroleum concentrations at monitoring well MW-2 remained below Method 1 GW-2 and GW-3 Standards, which continues to show that no significant fuel oil has migrated along the underground Brook Culvert wall.

There has been no known deleterious impact to identified environmental receptors or natural resource areas, nor are there any such deleterious impacts anticipated as a result of the installation, operation and/or maintenance of the remedial system.

2.3 IRA Remediation Waste

Waste generated during IRA activities included soil generated during installation of the recovery system, LPH bailed from the monitor wells and recovered by the bioremediation system, and hydrocarbon-impacted water generated during groundwater sampling activities. All remediation waste, as described in previous IRA Status Reports, is stored on-site in 55-gallon drums, labeled as "Hazardous Waste" and disposed of off-site in accordance with 310 CMR 40.0030 of the MCP and

Massachusetts Hazardous Waste Management regulations 310 CMR 30.000. The drum is a designated RCRA satellite accumulation container and is pumped along with other waste oil streams for bulk transport from the facility. Copies of Uniform Hazardous Waste Manifests generated during IRA activities are included in Appendix E.

2.4 IRA Completion Statement

The bioremediation system was constructed and operated as an IRA. The system continued to operate and provide remedial benefit at the Disposal Site during comprehensive response actions. Because the Phase III Remedial Action Plan also selected the bioremediation system for the comprehensive remedial action measure, the system's operation as an IRA is considered complete. The Phase IV Remedy Implementation Plan (RIP) was developed and implemented to operate the remedial system under Phase V ROS activities. Since ROS activities will be initiated upon submittal of this report, no further IRA activities are required at the Disposal Site and LSPCO has concluded that the objectives of the IRA Plan have been successfully met. Specifically, the IRA has:

- Defined the nature and extent of petroleum which resulted in a release to the underground Brook culvert and LPH on groundwater;
- Mitigated further releases of petroleum to water in the underground Brook culvert where no petroleum sheen has been observed on water in the underground culvert since the IRA was implemented;
- Contained and recovered LPH on groundwater; and,
- All investigation-derived waste and remediation waste associated with the IRA has been properly contained and transported off-site. Remediation waste from the bioremediation system continues to be collected; however, but now under Phase V of the MCP.

No additional permits, other than those outlined in the November 2000 Modified IRA Plan, were required for completion of this IRA and, pursuant to 310 CMR 40.1403, no public involvement notifications are required to complete this IRA.

3.0 PHASE IV FINAL INSPECTION REPORT

3.1 Phase IV Remedy Implementation Plan

As documented in the Phase III Report and Remedial Action Plan, the selected alternative included continued operation and maintenance of the bioremediation system to treat soil and groundwater down gradient of the leaking UST, and implementation of an AUL or land use restriction for petroleum-impacted soil adjacent to the UST. The in-situ bioremediation system was installed in accordance with the November 2000 Modified IRA Plan.

Bioremediation is the reduction of contaminant mass via biological consumption and degradation of contaminant compounds. This method uses groundwater collected at the Disposal Site and amends it with microbes and nutrients at the ground surface to produce an active microbial population in the water. The amended water is returned to the subsurface via a shallow recharge trench. The microbial destruction of contaminants occurs in the soil where the microbe and nutrient plume contact the hydrocarbons and use it as a food source. Re-circulation of the microbe and nutrient plume flushes residual petroleum adhered to soil into groundwater and enhances biodegradation of contaminants. Monitoring will be conducted within and outside the active treatment area to evaluate the progress of remediation.

The implementation of this alternative will likely approach conditions consistent with a Permanent Solution and a Level of No Significant Risk. If groundwater quality monitoring data indicate that this solution is inadequate to address the impacted area, additional technologies may be proposed and implemented.

The AUL will be implemented after bioremediation is complete.

3.2 Construction Plans, Engineering Design and Specifications

On March 31, 1999, six monitoring wells were installed to a depth of eight (MW-6 only) to 15 feet below grade. Each of the wells were constructed of 2-inch-diameter polyvinyl chloride (PVC) and screened from five to 15 feet (except MW-6 which was screened from two to eight feet). Copies of the well construction details are provided in Appendix F. Placement of the monitoring wells was based on areas of concentrated, subsurface hydrocarbon impact.

To treat hydrocarbon-impacted soil and groundwater at the Disposal Site, on April 23 and 24, 2001, groundwater recovery and groundwater recharge trenches were installed. The locations of both trenches are shown on Figure 4. The 75 feet long by 3 feet wide groundwater recovery trench was installed adjacent to the underground Brook culvert to a depth of 11 feet in order to collect petroleum mobilized in the aquifer and to prevent migration of an uncontained groundwater plume. The bottom third of the recovery trench was backfilled with crushed stone and the top two thirds was backfilled with natural materials. A 10-inch-diameter PVC recovery well, screened from approximately five feet to 11 feet, was installed in the recovery trench to a depth of 11 feet. The recovery well is equipped with one submersible pump with a high-level relay alarm. This pump meets ½-horsepower requirements and operates in single phase at 120 Volts. The system is designed to pump 10 gallons per minute (gpm). The 30 feet long by 3 feet wide groundwater recharge trench was installed upgradient, adjacent to the closed in-place USTs to a depth of 3 feet. A perforated pipe was installed for the length of the trench at a depth of 2 feet below grade to aid in groundwater recharge to the area.

Piping from the recovery well to the recharge trench is constructed of 1.25-inch-diameter schedule 40 PVC. Wiring is installed within ¾-inch galvanized PVC conduits. Piping and wiring is installed at a depth of approximately three feet below grade.

Treatment equipment for the bioremediation system is housed within an 8 feet by 8 feet wooden structure located east of the facility (see Figure 4 for equipment location). The shed is heated to prevent freezing. Groundwater is pumped from the recovery well to the treatment shed where LPH is removed and nutrients (phosphate and nitrate) and microbes are added. 55-gallon high-density polyethylene (HDPE) drums are used to manage groundwater for equalization and for mixing in nutrients and microbes. A ½-horsepower, 10 gpm, transfer pump, equipped with high- and low-level control sensors and alarms, then pumps nutrient-amended groundwater to the recharge trench. A groundwater flow schematic is shown in Figure 5.

3.3 Phase IV Implementation

The components described above in Section 3.2 were installed as prescribed in the Phase IV RIP (Section 3.1). There have been no significant modifications to the system installation that would require disclosure in this Final Inspection Report.

3.4 Phase IV Final Inspection

In accordance with 310 CMR 40.0878, the LSP-Of-Record for this Disposal Site conducted a final inspection of the Comprehensive Remedial Action on July 23, 2002. The inspection was conducted with the LSP who constructed the system, and revealed that the Comprehensive Remedial Action was built in accordance with the proposed construction plans outlined above in the RIP, and that system performance is meeting and/or is expected to achieve all design objectives. In accordance with 310 CMR 40.0875(1), an As-Built Construction Report for this Disposal Site is not required.

4.0 PROPOSED PHASE V REMEDY OPERATION STATUS REPORT

Up to the date of this IRA Completion Report, Disposal Site assessment, well sampling, and treatment system monitoring and sampling data have been summarized in IRA Status Reports. The most recent Status Report was submitted to the MADEP on January 23, 2003. Now that the IRA is complete, data collected since January 1, 2003 will be summarized in ROS Reports every six months as required in Phase V under the MCP. The first ROS Report will be submitted to the MADEP by July 19, 2003.

4.1 Gauging and Groundwater Sampling

Groundwater gauging and sample collection will continue to be collected from the monitoring wells on a quarterly basis, in January, April, July and October. Each of the monitoring wells will be sampled for VPH and EPH. In addition, nitrogen-ammonia, nitrogen-nitrate, total phosphorus, dissolved oxygen and carbon dioxide are measured in groundwater from each of the monitoring wells in order to assess biological parameters. Due to snow and ice cover, sampling locations at the Disposal Site could not be accessed to perform the January 2003 groundwater sampling event. The April sampling event will be performed as scheduled.

Water in the underground Brook culvert will continue to be monitored quarterly for nitrogen-ammonia, nitrogen-nitrate and total phosphorus. In addition, the underground culvert will continue to be visually inspected for a hydrocarbon sheen.

4.2 Bioremediation System Operation, Maintenance and Monitoring Plan

Operation of the bioremediation system began on May 23, 2001. Weekly to bi-weekly operation and maintenance of the system will continue to be conducted by the Sub. The following data is obtained during system operation and maintenance visits: 1) LPH recovery rates; 2) volume of

groundwater treated by the bioremediation system; and, 3) quarterly influent and effluent groundwater sampling for VPH and EPH. A summary of system performance and removal data will continue to be provided in semi-annual ROS Reports.

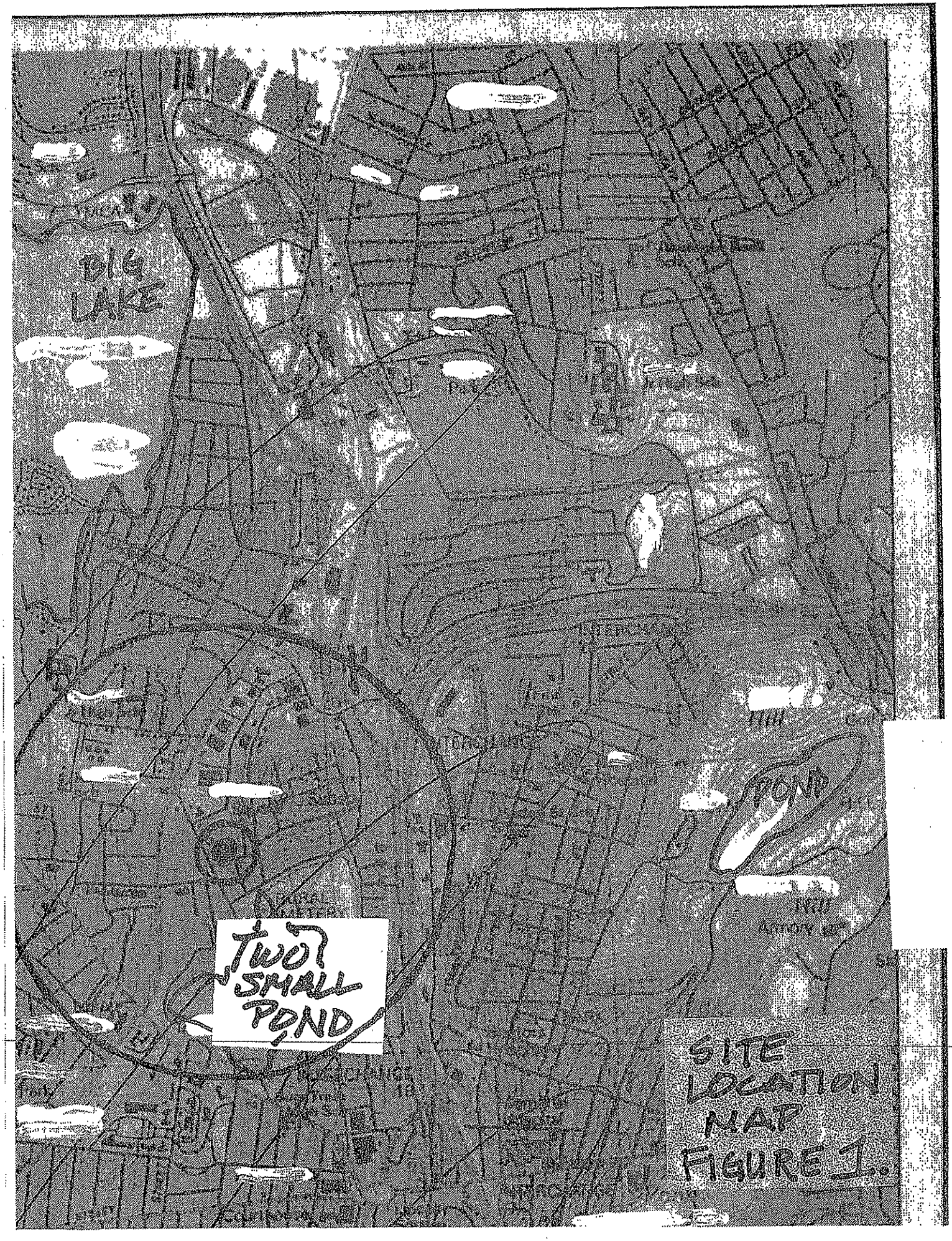
4.3 Remediation Waste Management

Waste generated during Phase V ROS activities will include LPH bailed from the monitor wells, LPH recovered by the bioremediation system, and hydrocarbon-impacted water generated during groundwater sampling activities. All remediation waste will continue to be stored on-site in 55-gallon drums, labeled as "Hazardous Waste" and disposed of off-site in accordance with 310 CMR 40.0030 of the MCP and 310 CMR 30.000 of the Massachusetts Hazardous Waste Management regulations.

4.4 Licensed Site Professional Opinion

It is the opinion of LSPCO and the LSP that Phase V ROS activities continue in accordance with the procedures prescribed in this Phase V Report. Recovery system operational data will be collected as prescribed in the Operation, Maintenance and Monitoring Plan (Section 4.2) and evaluated in order to ensure optimal performance.

FIGURES


Big Lake
TWO SMALL POND
POND
SITE LOCATION MAP
FIGURE 1.

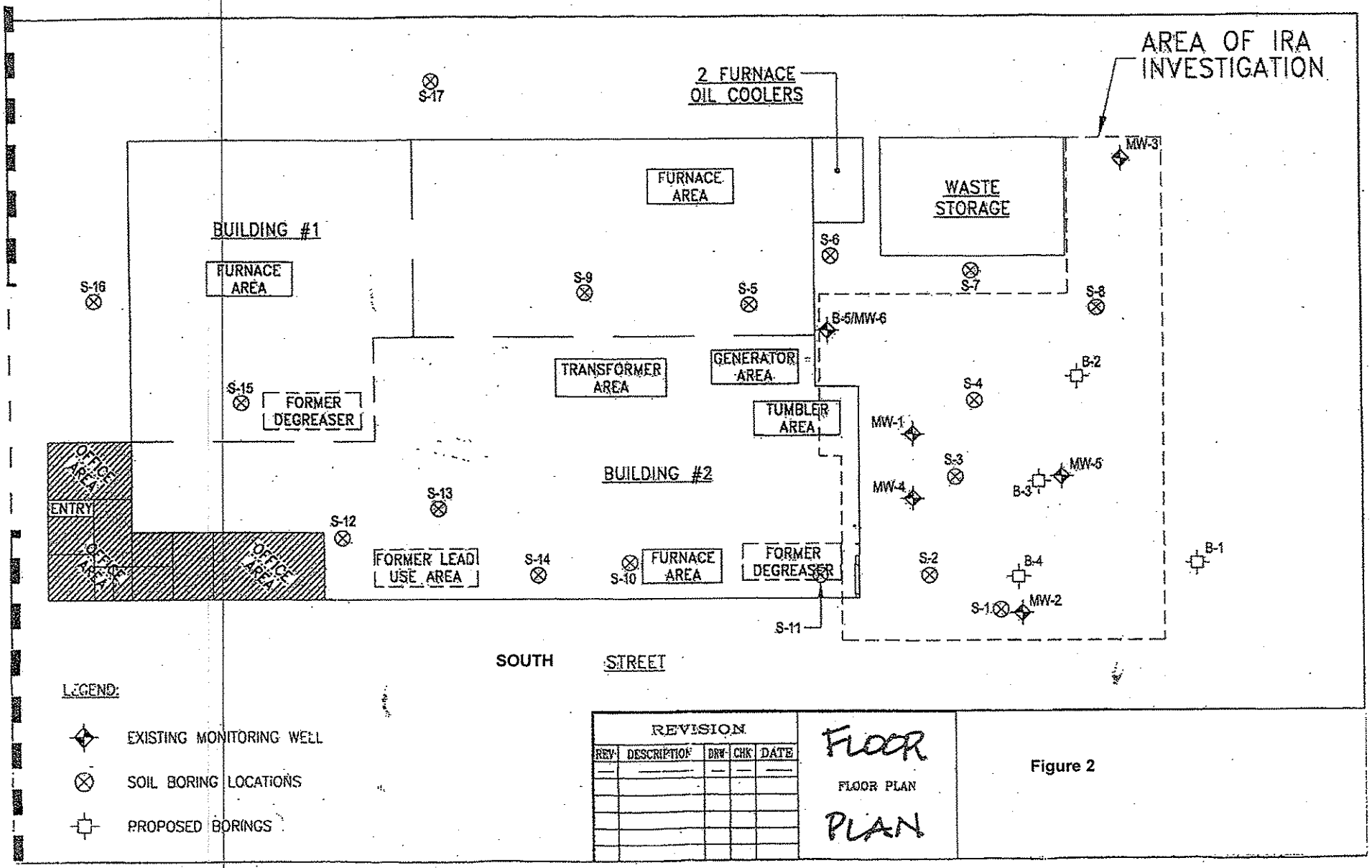
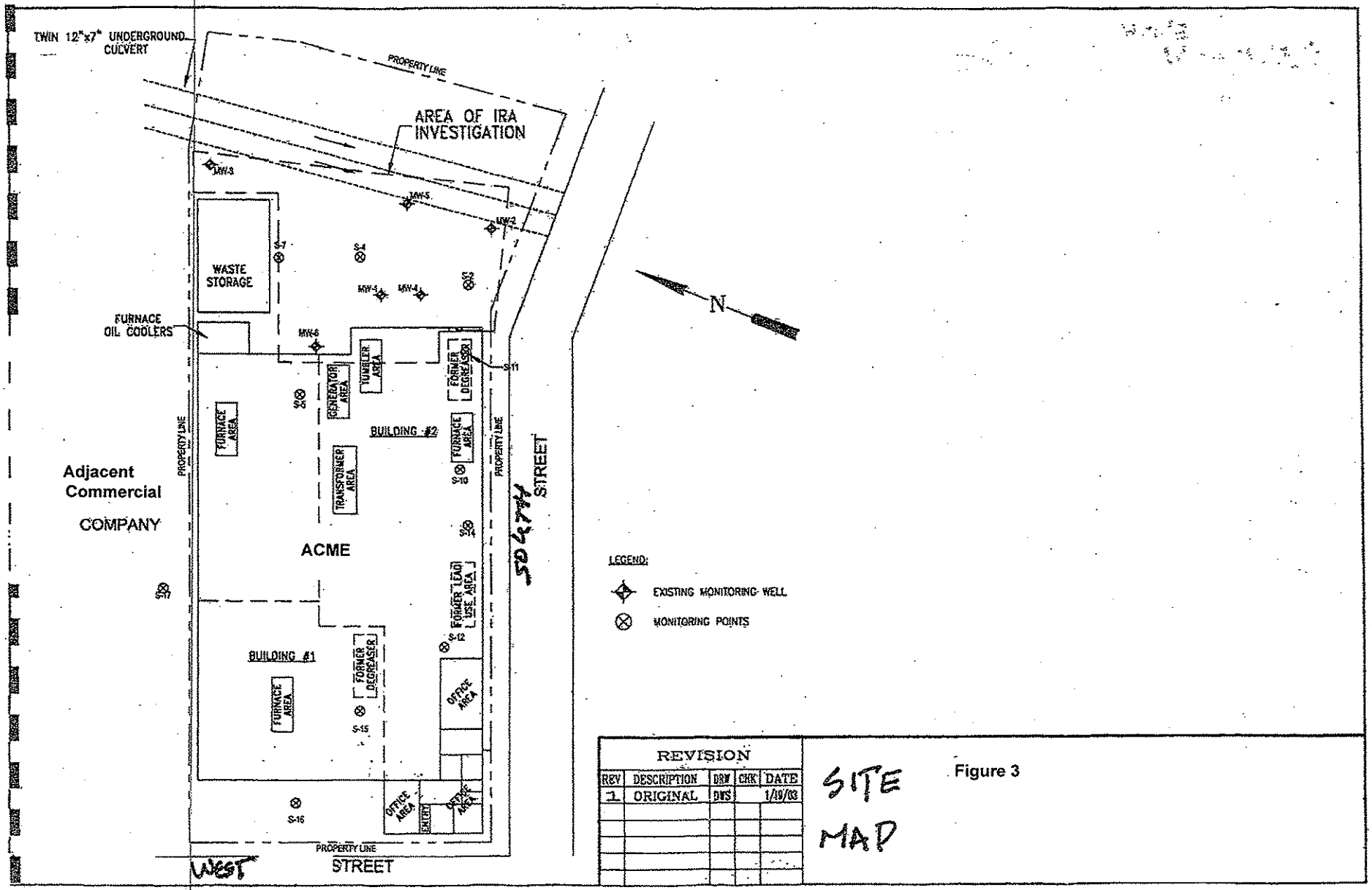

AREA OF IRA INVESTIGATION
2 FURNACE OIL COOLERS
S-17
FURNACE AREA
WASTE STORAGE
MW-3
BUILDING #1
FURNACE AREA
S-6
S-7
S-16
S-9
S-5
S-8
B-5/MW-6
TRANSFORMER AREA
GENERATOR AREA
B-2
S-15
FORMER DEGREASER
S-4
TUMBLER AREA
MW-1
OFFICE AREA
ENTRY
BUILDING #2
S-3
MW-5
MW-4
B-3
S-13
S-12
FORMER LEAD USE AREA
S-14
S-10
FURNACE AREA
FORMER DEGREASER
S-2
B-4
B-1
S-1
MW-2
S-11
SOUTH STREET
LEGEND:
EXISTING MONITORING WELL
SOIL BORING LOCATIONS
PROPOSED BORINGS
REVISION
REV
DESCRIPTION
DRW
CHK
DATE
FLOOR PLAN
FLOOR PLAN

Figure 2



REVISION				
REV	DESCRIPTION	DRW	CHK	DATE
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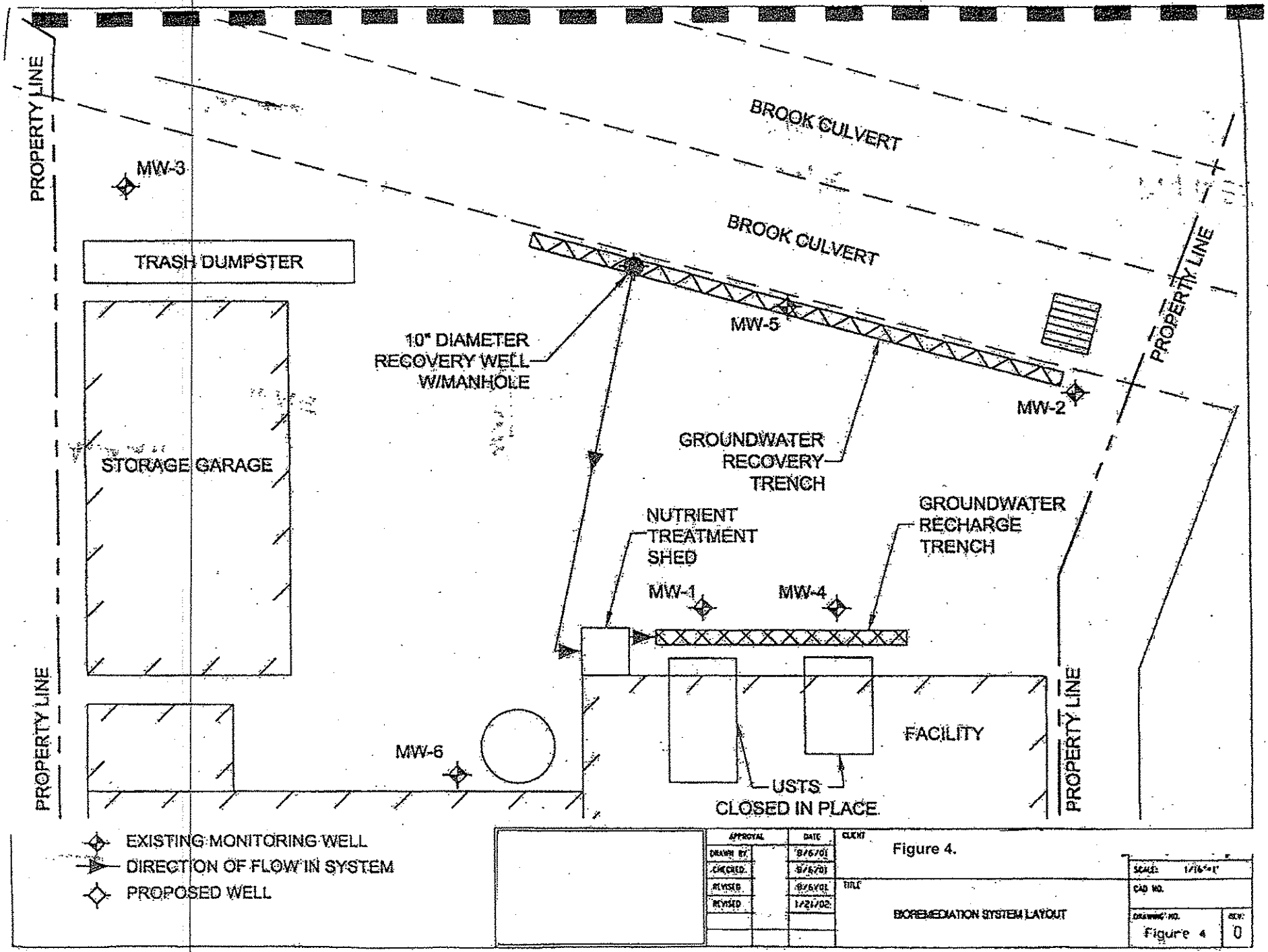
SITE MAP

Figure 3


PROPERTY LINE
MW-3
BROOK CULVERT
BROOK CULVERT
TRASH DUMPSTER
10" DIAMETER
RECOVERY WELL
W/MANHOLE
MW-5
MW-2
PROPERTY LINE
STORAGE GARAGE
GROUNDWATER
RECOVERY
TRENCH
NUTRIENT
TREATMENT
SHED
GROUNDWATER
RECHARGE
TRENCH
MW-1
MW-4
MW-6
FACILITY
USTS
CLOSED IN PLACE
PROPERTY LINE
PROPERTY LINE
EXISTING MONITORING WELL
DIRECTION OF FLOW IN SYSTEM
PROPOSED WELL
APPROVAL
DATE
DRAWN BY
CHECKED
REVISED
REVISED
8/6/01
8/6/01
8/6/01
1/21/02
CLIENT
Figure 4.
TITLE
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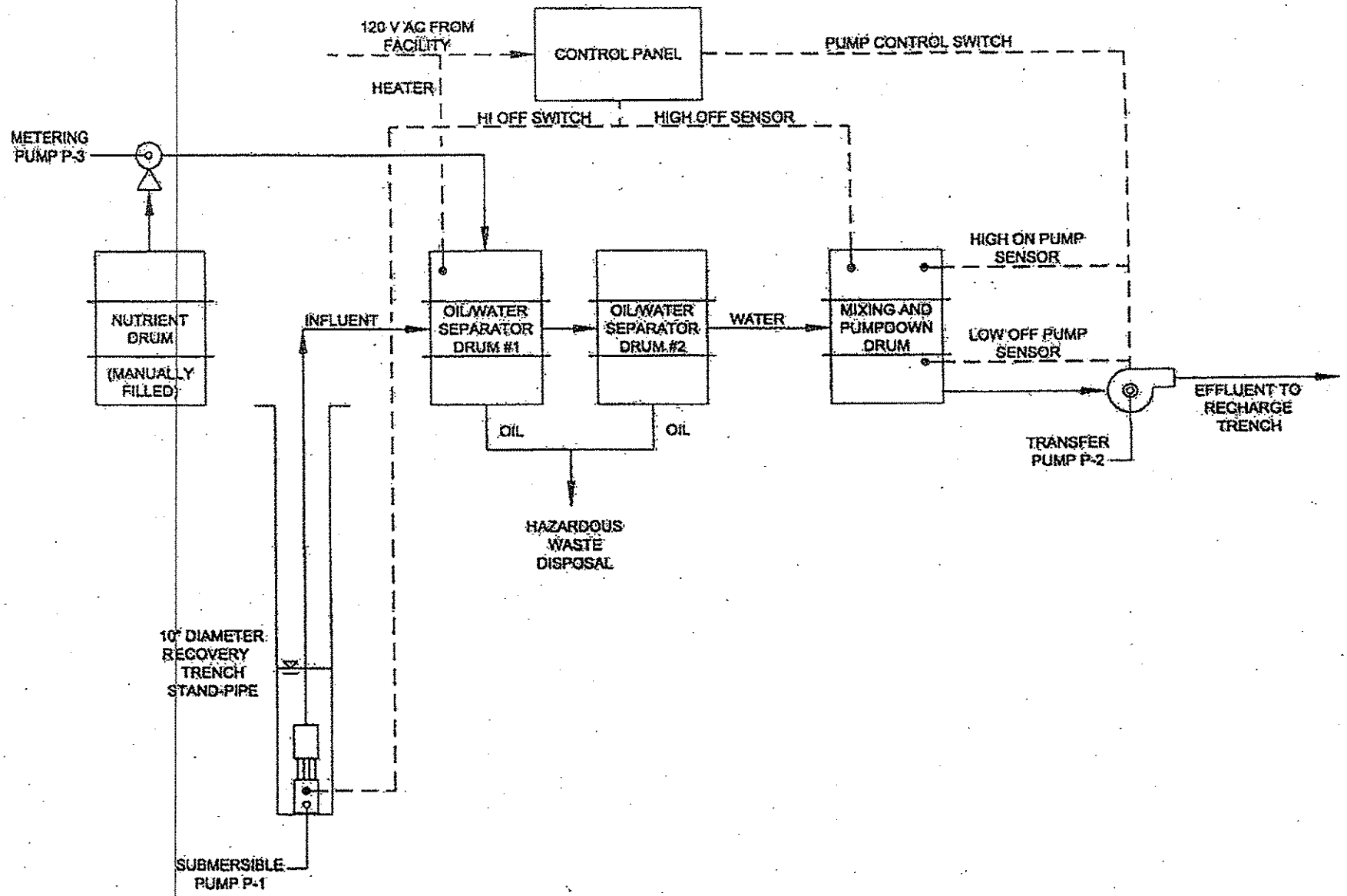

APPROVAL	DATE
DRAWN BY	10/26/00
CHECKED	10/26/00
REVISED	02/16/01

CLIENT

Figure 5.

TITLE

GROUNDWATER FLOW SCHEMATIC

PROJECT NO. 98-021H

SCALE: NTS

CAD NO.

DRAWING NO. Figure 5

REV. 0