MARTIN MARIETTA CORPORATION

WORK PLAN DOCUMENT I

DESCRIPTION OF INTERIM REMEDIAL MEASURE
FOR AREA OF CONCERN # 16

MARTIN MARIETTA CORPORATION
FARRELL ROAD PLANT
GEDDES, NEW YORK

May 18, 1994

ERM-NORTHEAST, INC.
5788 Widewaters Parkway
Dewitt, New York 13214

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1.0 INTRODUCTION

Martin Marietta Corporation (MMC), is a corporation doing business in the State of New York which previously owned a property known as Farrell Road Plant 2 (FRP-2) and leased an adjacent property known as Farrell Road Plant 1 (FRP-1), on Farrell Road in the Town of Geddes, New York. These properties comprise the "GE Farrell Road Site" and are referred to as "FRP" or the "site". The site is located northeast of Routes 690 and 90, south of the Seneca River and approximately one mile to the west of Onondaga Lake. The site (FRP-1 and FRP-2) consists of approximately 156 acres of which approximately 81 acres have been classified as a Class One wetland by the New York State Department of Environmental Conservation (NYSDEC).

Previous environmental investigations conducted at the site have determined that soil and ground water have been affected by past activities at FRP. As a result, the FRP site was listed by NYSDEC on the Registry of Inactive Hazardous Waste Disposal Sites (Site No. 734055).

In April 1993, MMC purchased the FRP-2 portion of the site from General Electric Company (GE). In December 1993, MMC transferred title for that portion of the site to Syroco, Inc., an unrelated corporation. MMC has entered into an Order on Consent (the "Order") with NYSDEC (Index #A7-0308-93-10), dated 21 March 1994, to conduct Interim Remedial Measures (IRMs) at FRP-2, on its own behalf as prior owner and as successor in interest to GE.

MMC has also entered into an Order on Consent with NYSDEC (Index #A7-0307-93-10), dated 15 December 1993, for the performance of a Remedial Investigation and Feasibility Study (RI/FS) at the site.

The goal of the IRM Order is to develop and implement three IRMs at FRP-2 in three Areas of Concern (AOCs). This IRM Work Plan will describe the remedial objectives of the IRM program for AOC #16 (as identified in Attachment C to the Order), and the methods and procedures to be implemented to achieve the remedial objectives.

1.1 PURPOSE AND ORGANIZATION OF THE IRM WORK PLAN

Martin Marietta's consultant, ERM-Northeast, Inc. (ERM), has prepared this IRM Work Plan (Work Plan) in accordance with the details outlined in Section II of the IRM Order. This Work Plan focuses on the methods and procedures to be implemented in performing the IRM, including background information related to the AOC (Document I - Section 2.0), a description of IRM activities (Document I - Section 3.0), a detailed Engineering Contingency Plan (Document I - Section 4.0), a Sampling and Analysis Plan (Document II), and a Health and Safety Plan (Document III).

This Work Plan consists of three sections as follows:

1) **Description of Interim Remedial Measure** - This section is designated Work Plan Document I and introduces the Work Plan, summarizes all background information related to the AOC, provides a description of IRM activities, identifies the selected treatment technology, defines remediation goals, details an AOC specific field implementation program, outlines the schedule of IRM activities, and provides a detailed engineering contingency plan.

2) **Sampling and Analysis Plan (SAP)** - This section is designated Work Plan Document II and describes the sampling and analysis to be performed during the IRM including data quality objectives and

a Quality Assurance Project Plan (QAPP). The QAPP describes the procedures to be followed to provide quality assurance and maintain quality control while conducting activities described in the IRM field sampling plan.

3) **Health and Safety Plan (HASP)** - This section is designated Work Plan Document III and describes the health and safety procedures to which all persons involved in implementation of the IRM shall adhere.

The purpose of this IRM Work Plan is to achieve the following objectives:

- provide a means for evaluating the performance of the individual components of the remedial system to gauge whether they are operating in accordance with the design intent of the combined ground water recovery and treatment, and soil vapor extraction system;

- provide a means for evaluating the effectiveness of the operating combined ground water recovery and treatment, and soil vapor extraction system in achieving the remedial objectives established in Section 3.2.3;

- define monitoring requirements, methods of data analysis and decision making processes to effect operational changes or design modifications to the combined ground water recovery and treatment, and soil vapor extraction system to meet recovery and treatment requirements or substantially improve the ability of the remediation system to achieve the remedial goals; and

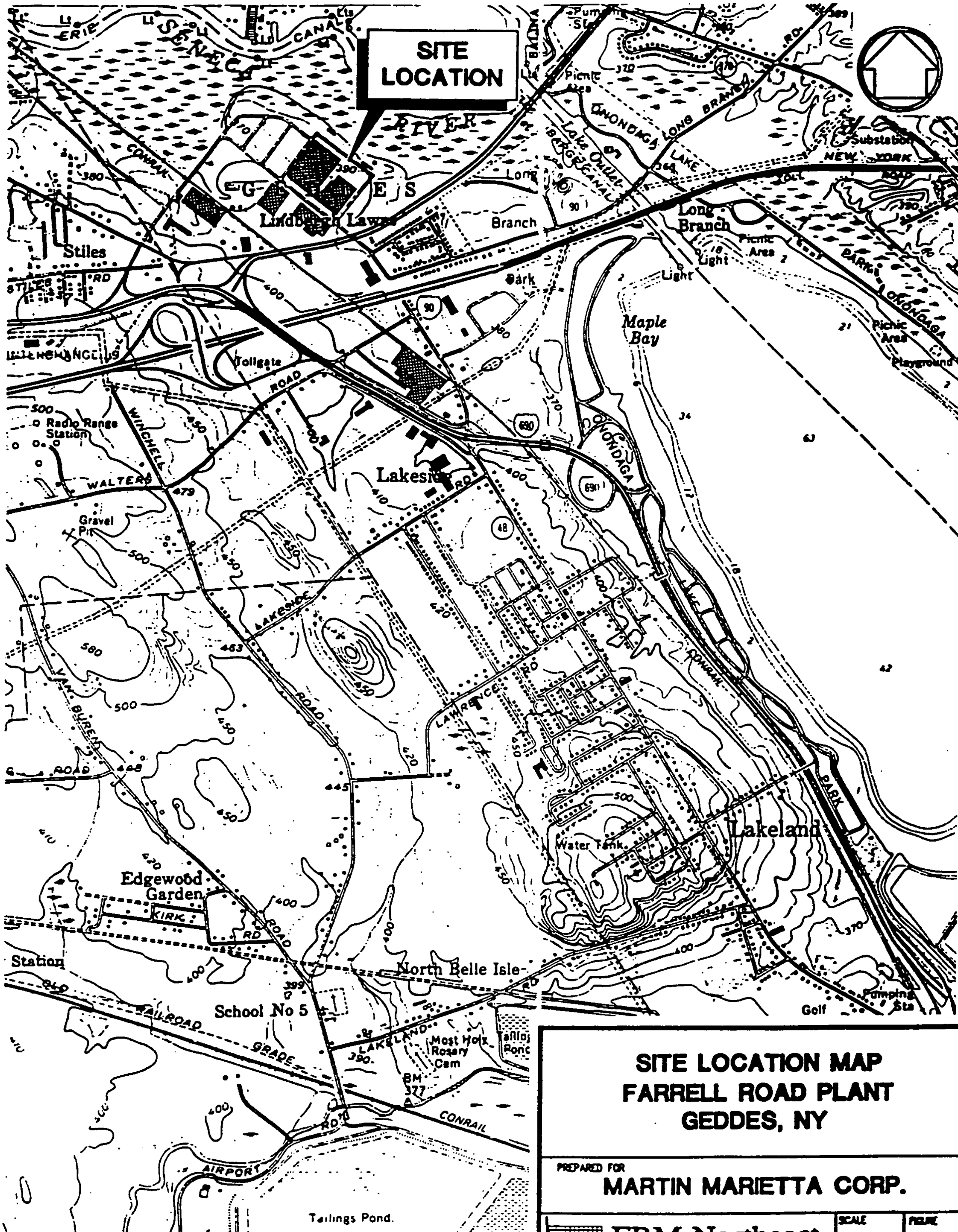
- establish a mechanism to implement post-IRM sampling (soil and ground water) and long-term monitoring of the combined ground water recovery and treatment, and soil vapor extraction system.

1.2 SITE BACKGROUND

The site is located northeast of the intersections of Routes 690 and 90, south of the Seneca River and approximately one mile to the west of Onondaga Lake as indicated on Figure 1-1. The property was developed in the early 1960s by General Electric Aerospace (GEA) as a manufacturing center, and was used as a design, manufacturing and assembly center for radar and sonar equipment. By December 1992, GEA had moved all operations from FRP to other locations. GEA sold FRP-2 to MMC in April 1993. Ownership of FRP-2 was transferred by MMC to Syroco, Inc. in December 1993. In February 1994, MMC assigned its lease for the FRP-1 property to Syroco, Inc.

The 156-acre site includes four buildings: Building No. 1 was used as a design center; Building No. 2 was used as a manufacturing and assembly plant; the Test Building was used to test radar products; and the Maintenance Garage was used to service and house plant vehicles.

Building No. 1 contains approximately 175,000 square feet of floor space and Building No. 2 contains approximately 300,000 square feet of floor space; the buildings are connected by a ground level walkway. The Maintenance Garage contains approximately 6,500 square feet of floor space and is located at the northwest corner of the site. The Test Building contains approximately 9,000 square feet of floor space and is located at the northeast corner of the site. The location of these buildings is depicted on the Site Map included as Figure 1-2.



SOURCE: USGS 7.5 MINUTE QUADRANGLES CAMILLUS AND SYRACUSE WEST, NY

SITE LOCATION MAP
FARRELL ROAD PLANT
GEDDES, NY

PREPARED FOR
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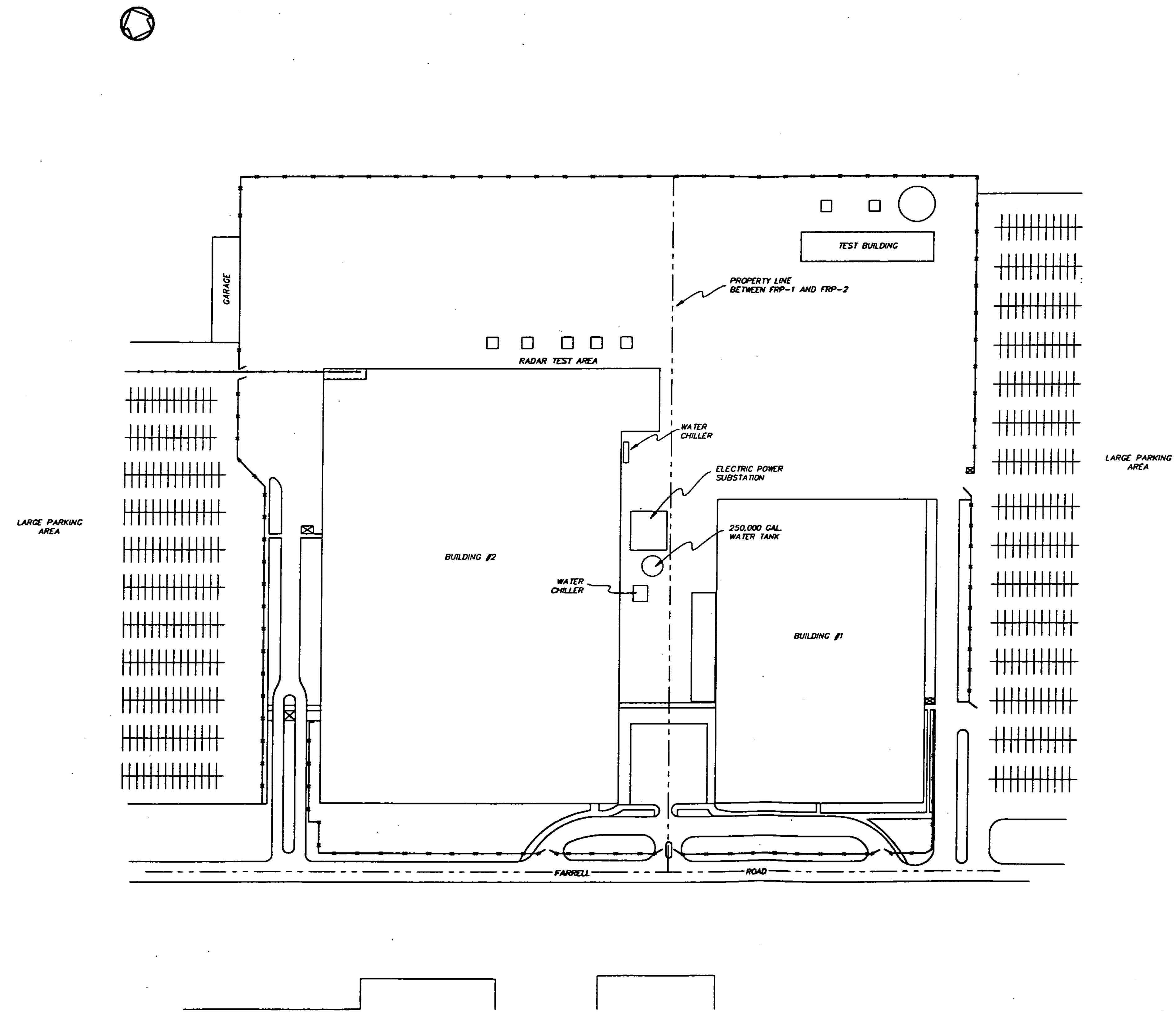
SCALE	FIGURE
1"=2000'	1-1
DATE 9/93	



SITE MAP

FARRELL ROAD PLANT
GEDDES, NY

MARTIN MARIETTA CORP.

ERM-Northeast
Environmental Resources Management
ERM

FIGURE 1-2

The four buildings are enclosed by a perimeter fence which is bordered by large paved parking areas on the east and west. The site is bordered on the south by Farrell Road, on the north and west by the Seneca River and on the east by John Glenn Boulevard.

The site is located within the Ontario Lowland geological province of New York State. The lowlands are characterized by large areas of low relief interrupted by streamlined hills called drumlins. Surficial geology at the site is composed of modern and glacial-aged lake sediments (Muller and Cadwell, 1986) underlain by Silurian (greater than 400 million years old) shales and evaporates (Rickard and Fisher, 1970).

A shallow unconfined aquifer was mapped in the area by Kantrowitz (1970) and Winkley (1989). The shallow aquifer is composed of glacial sand and gravels and has been reported to produce usable quantities of water. Shallow ground water is between two feet and seven feet beneath the ground surface, and flows to the north. Bedrock beneath the site is likely to produce low-yielding wells with salty water (Kantrowitz, 1970).

1.3 PREVIOUS INVESTIGATIONS/REPORTS

ERM conducted a preliminary hydrogeologic investigation in June 1991. The investigation was designed to determine site-wide ground water flow direction, to estimate the extent of petroleum residuals near an underground storage tank (UST) T-51 east of Building No. 2, and to determine the potential effects of a septic leach field near the Maintenance Garage. Results indicated that ground water generally flows in a north/northwest direction across the site; and ground water adjacent to UST T-51 has been affected by petroleum residuals and volatile organic compounds (VOCs).

As a follow-up investigation, ERM conducted a Phase II Hydrogeologic Investigation in November 1991. The purpose of the investigation was to estimate the extent of petroleum residuals and VOCs in the soil and ground water near UST T-51. The investigation determined that petroleum residuals were limited to the area proximal to UST T-51, and anomalous VOCs (predominantly freon) were present in ground water east of Building No. 2. ERM recommended further ground water investigation.

Concurrent with the ground water investigations at the site, ERM conducted a Phase I Environmental Site Assessment of FRP. The site assessment included a review of all available site records with environmental implications, examination of site manufacturing processes, storage and disposal procedures and interviews with current and past employees.

Based on the Phase I reports, ERM identified 16 areas of FRP that needed further investigations. Three of the areas requiring investigation are AOCs addressed in the IRM Order including:

- AOC #5 - removed USTs and drywell on the west side of Building No. 2;

- AOC #7 - removed UST T-51 on the east side of Building No. 2; and

- AOC #16 - removed gasoline UST T-68 near the Maintenance Garage.

Results of previous investigations are presented in the following documents prepared by ERM unless otherwise noted:

10) *Debris Pile Excavation, GE Farrell Road Plant Two; Addendum to the 1992 Environmental Investigation.* 29 July 1992;

11) *A Letter Report Regarding: Soil Remediation at Farrell Road Plant Two.* 15 September 1992;

12) *Garage Area Investigation, GE Farrell Road Plant Two, Addendum to the 1992 Environmental Investigation.* (issued in draft form 17 September 1992; reissued 14 October 1992);

13) *A Letter Report Regarding: Ground Water Sampling North of the Farrell Road Plant.* 23 October 1992;

14) *A Letter Report Regarding: Farrell Road Plant; Storm and Sanitary Sewer Survey* . 15 June 1993;

15) *Soil Vapor Extraction Pilot Test Results.* August 1993;

16) *A Letter Report Regarding: MMC Farrell Road Site; 10 Soil Borings at Proposed Loading Dock.* 2 September 1993;

17) *Soil Remediation Design Report; Soil Vapor Extraction Pilot Study - Former Solvent Storage Tank Area (Area 5).* October 1993.

18) *Remedial Investigation/Feasibility Study Work Plan; Farrell Road Plant.* January 1994;

19) *Accelerated RI/FS Tasks; Farrell Road Plant Field Summary Data Report.* March 1994.

1) *Preliminary Hydrogeologic Investigation of the GE Aerospace Farrell Road Plant*. 27 June 1991;

2) *A Letter Report Regarding: Investigation of Trichloromethane Sources Farrell Road Plant*. 23 September 1991;

3) *Phase II Hydrogeologic Investigation of GE Aerospace, Farrell Road Plant*. 15 November 1991;

4) *A Letter Report Regarding: Summary of Gasoline Underground Storage Tank and Soil Removal*. 18 June 1992; prepared by Blasland & Bouck Engineers, P.C.;

5) *Phase I Environmental Assessment of GE Farrell Road Plant Two (FRP-2), Syracuse, New York*. 31 December 1992 (Amended 2 July 1992);

6) *Phase I Environmental Assessment of GE Farrell Road Plant One (FRP-1), Town of Geddes, New York*. 31 December 1991 (Amended 10 July 1992);

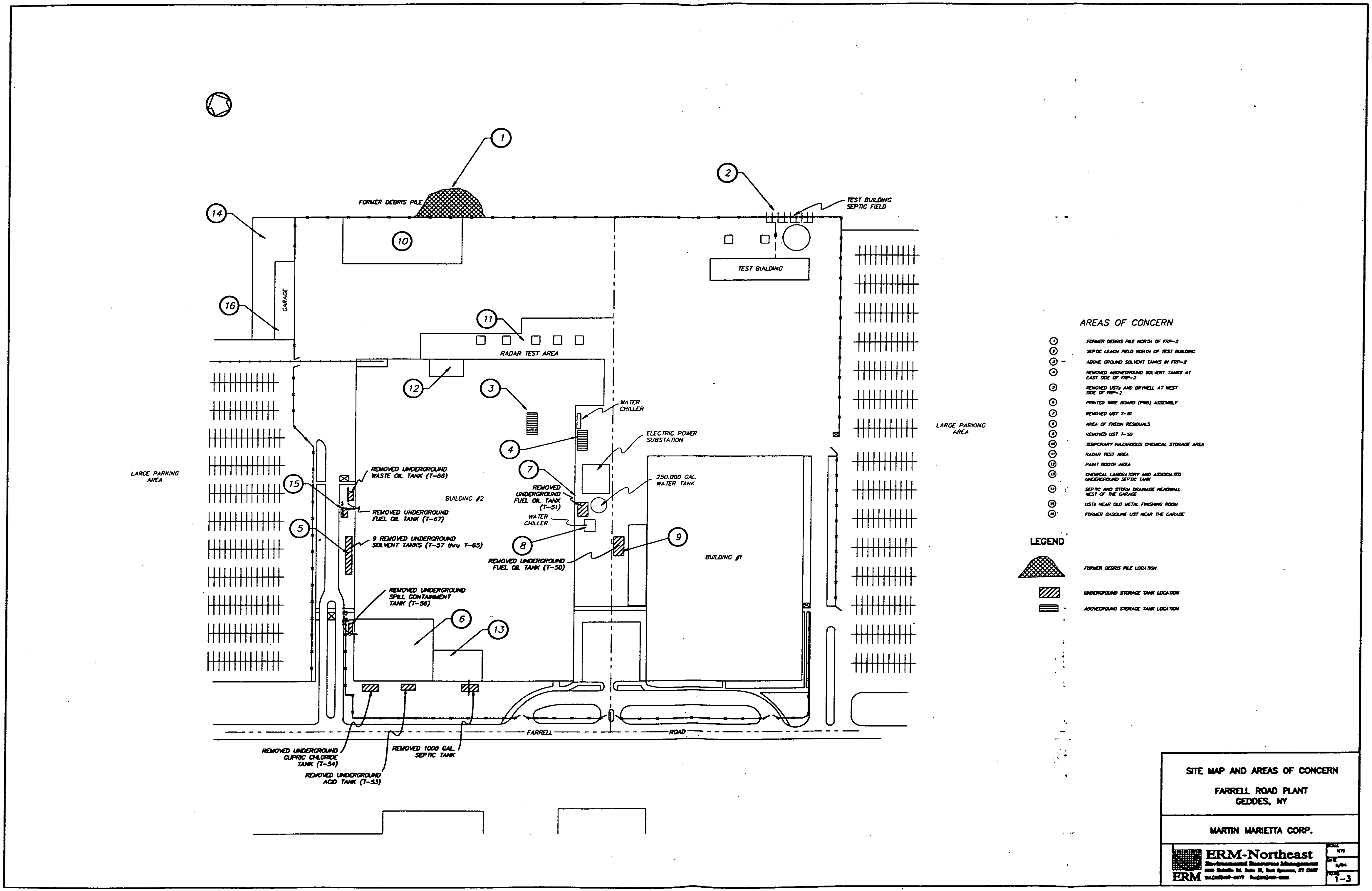
7) *1992 Environmental Investigation, GE Farrell Road Plant Two (FRP-2), Syracuse, New York*. 10 July 1992;

8) *1992 Environmental Investigation, GE Farrell Road Plant One (FRP-1), Syracuse, New York*. 16 July 1992;

9) *A Letter Report Regarding: PCB Sampling at Farrell Road Plant Two*. 15 September 1992;

1.4 *IDENTIFY AOC*

This IRM Work Plan will describe the IRM program for the soil and ground water remediation in the area of the removed gasoline UST near the Maintenance Garage (referred to as the "Garage"). This area has been designated as AOC #16 and its location is indicated on the Site Map and Areas of Concern included as Figure 1-3.


FORMER DEBRIS PILE
TEST BUILDING SEPTIC FIELD
TEST BUILDING
GARAGE
RADAR TEST AREA
WATER CHILLER
ELECTRIC POWER SUBSTATION
LARGE PARKING AREA
REMOVED UNDERGROUND WASTE OIL TANK (T-66)
REMOVED UNDERGROUND FUEL OIL TANK (T-67)
9 REMOVED UNDERGROUND SOLVENT TANKS (T-57 thru T-65)
BUILDING #2
REMOVED UNDERGROUND FUEL OIL TANK (T-51)
250,000 GAL. WATER TANK
WATER CHILLER
REMOVED UNDERGROUND FUEL OIL TANK (T-50)
BUILDING #1
REMOVED UNDERGROUND SPILL CONTAINMENT TANK (T-58)
FARRELL ROAD
REMOVED UNDERGROUND CUPRIC CHLORIDE TANK (T-54)
REMOVED UNDERGROUND ACID TANK (T-53)
REMOVED 1000 GAL. SEPTIC TANK
AREAS OF CONCERN
1 FORMER DEBRIS PILE NORTH OF FRP-2
2 SEPTIC LEACH FIELD NORTH OF TEST BUILDING
3 ABOVE GROUND SOLVENT TANKS IN FRP-2
4 REMOVED ABOVEGROUND SOLVENT TANKS AT EAST SIDE OF FRP-2
5 REMOVED USTs AND DRYWELL AT WEST SIDE OF FRP-2
6 PRINTED WIRE BOARD (PWB) ASSEMBLY
7 REMOVED UST T-51
8 AREA OF FREON RESIDUALS
9 REMOVED UST T-50
10 TEMPORARY HAZARDOUS CHEMICAL STORAGE AREA
11 RADAR TEST AREA
12 PAINT BOOTH AREA
13 CHEMICAL LABORATORY AND ASSOCIATED UNDERGROUND SEPTIC TANK
14 SEPTIC AND STORM DRAINAGE HEADWALL WEST OF THE GARAGE
15 USTs NEAR OLD METAL FINISHING ROOM
16 FORMER GASOLINE UST NEAR THE GARAGE
LEGEND
FORMER DEBRIS PILE LOCATION
UNDERGROUND STORAGE TANK LOCATION
ABOVEGROUND STORAGE TANK LOCATION
SITE MAP AND AREAS OF CONCERN
FARRELL ROAD PLANT
GEDDES, NY
MARTIN MARIETTA CORP.
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ERM
1-3

Section 2

2.0 BACKGROUND OF AOC #16

This section of the Work Plan discusses the history, geology, previous remedial investigations, and contaminant characterization specific to AOC #16.

2.1 DESCRIPTION

AOC #16 is located near the Maintenance Garage within the FRP-2 portion of the site and consists of approximately 725 cubic yards (cy) of affected soil. Approximately 525 cy of soil are located beneath the Garage and 200 cy are located beneath grass/asphalt areas to the south and west of the Garage. In addition, ground water in the vicinity of the Garage and removed UST is affected.

2.2 HISTORY

A gasoline UST (referred to as UST T-68) was located along the south wall of the Maintenance Garage. In June of 1992, UST T-68 and an unknown quantity of affected soil were removed. The tank was constructed of double-wall fiberglass and, upon removal, did not reveal any structural weaknesses. However, it was reportedly installed in 1986 to replace two USTs of unknown integrity.

ERM conducted a soil boring program to estimate environmental impact from the two tanks removed in 1986. Soil samples and ground water grab samples were analyzed for VOCs. Analytical results indicated that the soil and ground water adjacent to the tanks had been affected by various components of gasoline.

ERM installed five monitoring wells. Monitoring well MW-20 is located upgradient; MW-21 and MW-22 are located immediately downgradient of the removed tank. Monitoring well MW-23 is located in the area of highest known affected soil and ground water. Monitoring well MW-25 is located within the Garage, downgradient of the former tank area. Existing monitoring well MW-9 is located farther downgradient of the former tank area. Ground water has been affected by the gasoline release. The lateral extent of the dissolved components is limited to the area around the Garage.

2.3 *GEOLOGY*

AOC #16 is located at the northwest corner of the site adjacent to the wetland associated with the Seneca River. The soil at AOC #16 is composed of poorly sorted brown silt and fine sand interbedded with well sorted layers of silt (silt partings). Borings on the northern side of the area encountered a dark brown layer at approximately four feet below grade, which probably is associated with a former soil horizon of the wetland. The dark brown layer is absent from the south side of the Garage.

The brown silt and sand continues to a depth of at least 18 feet in the subsurface south of the Garage and to approximately 33 feet at the north end of the Garage. The near surface silt and sand overlies a red glacial "clay-till". The clay has an undetermined thickness in the area of the garage but is greater than 100 feet thick adjacent to Farrell Road and at least 65 feet thick approximately 100 feet north of the Garage.

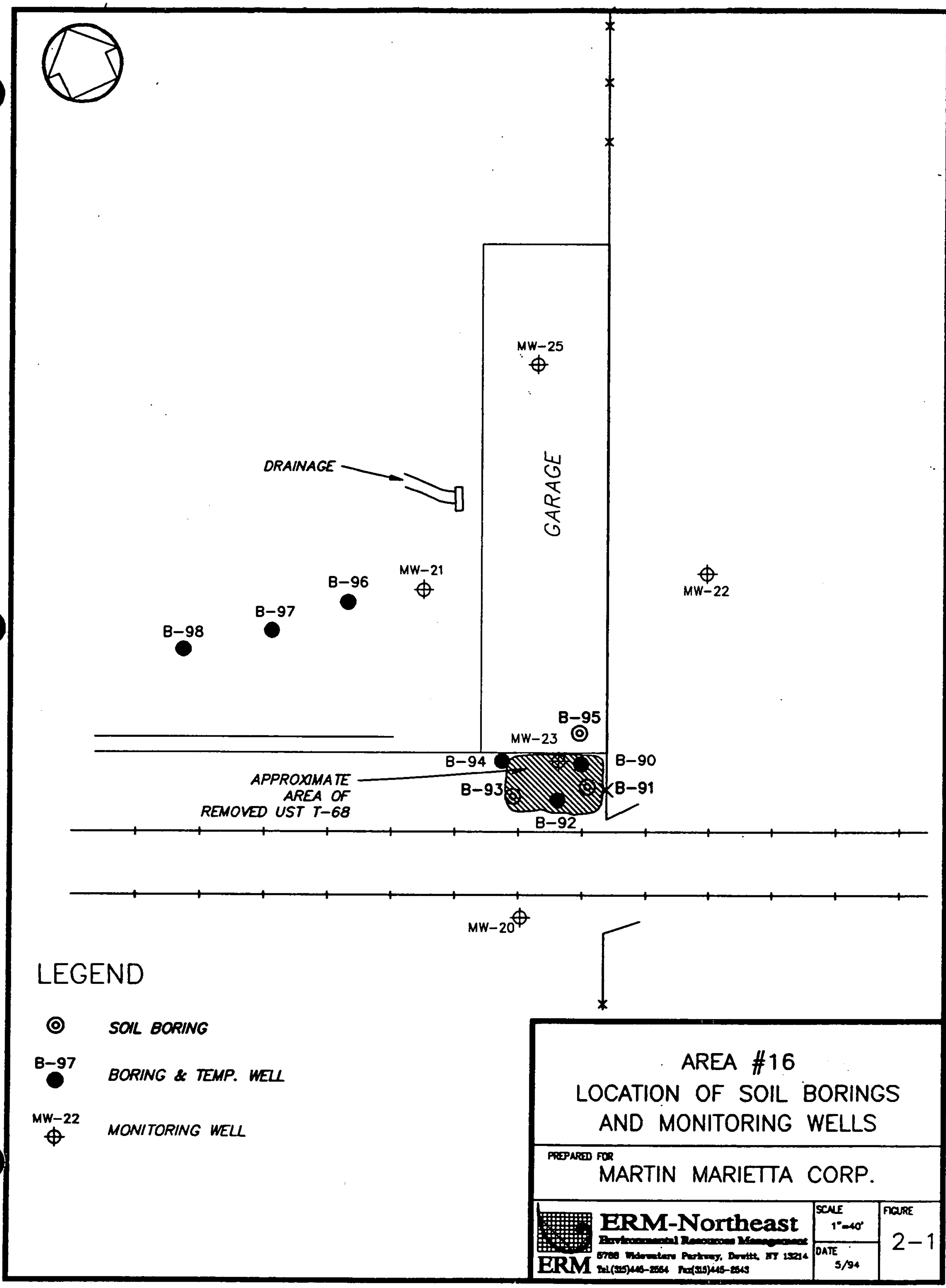
Ground water is located between 9 to 12 feet below grade and flows to the north/northwest. Saturated thickness increases from 8 feet south of the Garage to approximately 24 feet at the north end of the Garage. An in-situ conductivity test conducted in MW-23 estimated permeability to be

4.19×10^{-2} to 3.59×10^{-2} cm/sec. In-situ hydraulic conductivity tests conducted in MW-3 (located approximately 250 feet east of the Garage) estimated permeability to be 6.43×10^{-3} cm/sec. Monitoring well MW-3 is completed in the same near surface unit as the monitoring wells at the Garage.

2.4 *PREVIOUS REMEDIAL INVESTIGATIONS*

The approximate extent of VOCs in unsaturated soil near the former gasoline storage tank location has been delineated in a previous report entitled *Garage Area Investigation; GE-Farrell Road Plant Two; Addendum to the 1992 Environmental Investigation,* dated 14 October 1992. This report is included as Appendix A. The locations of the soil borings and monitoring wells used to delineate the area are shown on Figure 2-1. VOCs in unsaturated soil were found in three borings (B-90, B-93 and B-95). The highest concentration of VOCs was found in B-90, where the concentration of total VOCs was 1,375,400 ppb. Affected soil was found in soil borings taken at depths of approximately six to ten feet below grade down to ground water, which is approximately eight to twelve feet below grade. The analytical data for soil samples obtained during these investigations is included in Table 2-1.

In addition, a ground water monitoring program was conducted to assess the extent of ground water affected by the gasoline release. Significant concentrations of VOCs were detected in ground water samples from monitoring wells MW-21, MW-22, MW-23, MW-25 and in ground water grab samples from borings B-90, B-94, B-96 and B-97. The analytical data for ground water samples obtained during these investigations is included in Table 2-2.


DRAINAGE
GARAGE
MW-25
MW-21
MW-22
B-96
B-97
B-98
B-95
MW-23
B-94
B-90
B-93
B-91
B-92
APPROXIMATE AREA OF REMOVED UST T-68
MW-20
LEGEND
SOIL BORING
B-97
BORING & TEMP. WELL
MW-22
MONITORING WELL
AREA #16
LOCATION OF SOIL BORINGS
AND MONITORING WELLS
PREPARED FOR
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Environmental Resources Management
ERM
SCALE
1"=40'
DATE
5/94
FIGURE
2-1

TABLE 2-1
MARTIN MARIETTA CORPORATION
FARRELL ROAD PLANT
IRM WORK PLAN FOR AOC #16
ANALYTICAL DATA FOR SOIL FROM PREVIOUS INVESTIGATIONS

	B-90 (8'-10')	B-91 (8'-10')	B-93 (6'-8')	B-95 (9')
Benzene	5,400	---	6	1,800
Toluene	210,000	---	94	41,000
Ethylbenzene	160,000	---	15	16,000
Xylenes	1,000,000	---	110	25,000
TOTAL	1,375,400	---	225	83,800

NOTES:

All values are in ppb (parts per billion).
--- Not detected in this sample but detected in another.

557-045\2-1irm16.tbl

TABLE 2-2
MARTIN MARIETTA CORPORATION
FARRELL ROAD PLANT
IRM WORK PLAN FOR AOC #16
ANALYTICAL DATA FOR GROUND WATER FROM PREVIOUS INVESTIGATION

TEMPORARY WELL	B-90 (GW)	B-92 (GW)	B-94 (GW)	B-96 (GW)	B-97 (GW)	B-98 (GW)
Benzene	20,000	---	---	1,800	13	---
Toluene	31,000	---	19,000	3,600	21	---
Ethylbenzene	4,100	---	7,000	1,000	69	---
Xylenes	17,000	---	28,000	1,500	310	---
1,1,1-TCA	---	---	---	---	---	70
TOTAL	72,100	---	54,000	7,900	413	70

MONITORING WELL:	MW-20 6/12/92	MW-20 7/30/92	MW-21 6/12/92	MW-21 7/30/92	MW-21 11/30/92	MW-22 6/12/92	MW-22 7/30/92	MW-22 8/19/92	MW-23 7/30/92	MW-25 7/30/92	MW-25 8/19/92
Benzene	---	---	8,300	6	---	120	410	270	5,800	14,000	2,300
Toluene	---	---	17,000	---	---	19	1,200	1,200	6,200	8,000	570
Ethylbenzene	---	---	1,300	---	---	---	390	130	670	770	---
Xylenes	---	---	7,000	68	---	1,700	4,400	3,900	3,500	3,400	360
TOTAL	---	---	33,600	74	---	1,839	6,400	5,500	16,170	26,170	3,230

NOTES:

All values are in ppb (parts per billion).
— Not detected in this sample but detected in another.

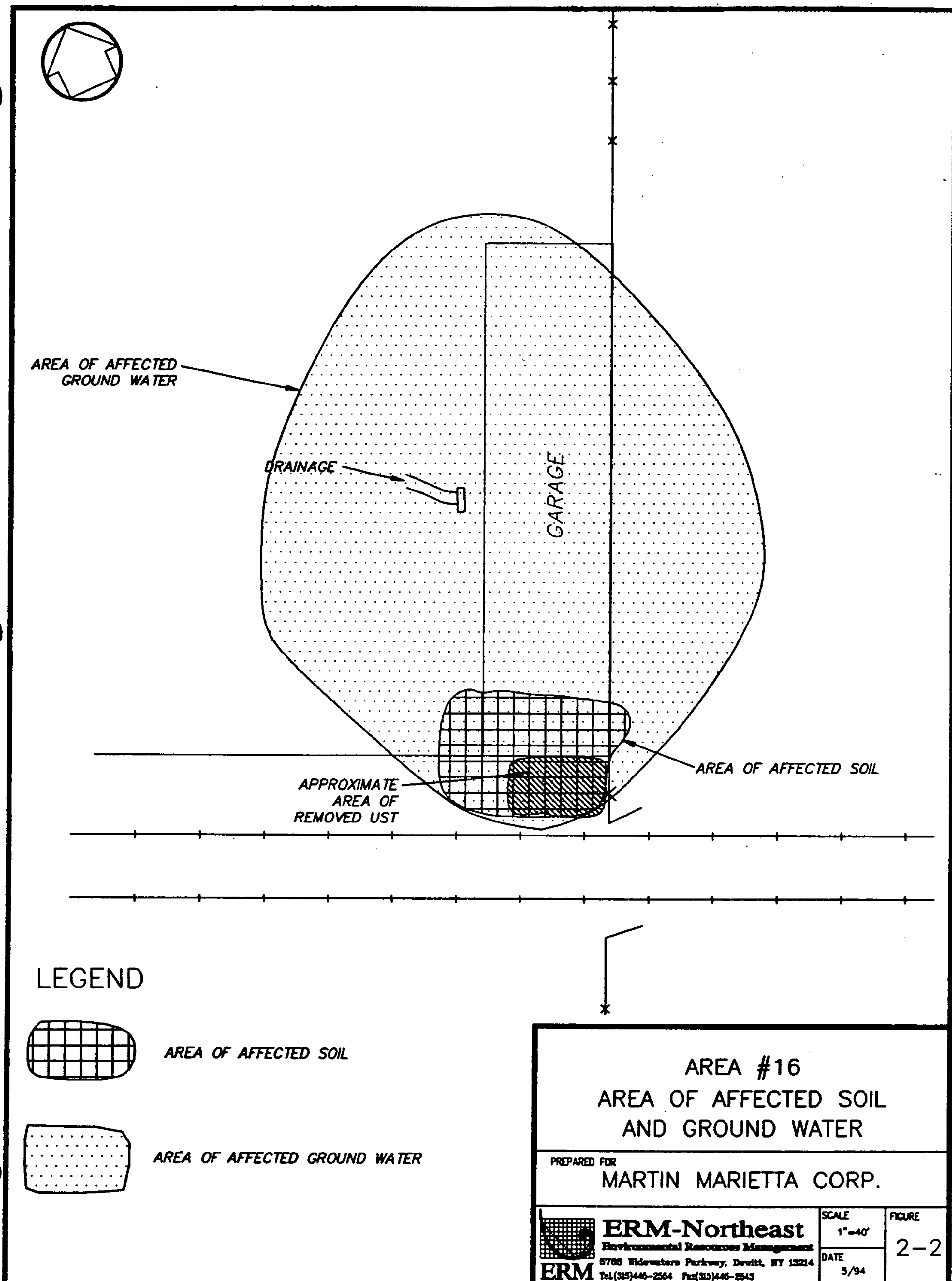
557-045\2-2irm16.tbl

The area of affected soil and ground water based on data obtained from previous remedial investigations is shown on Figure 2-2.

2.5 *CONTAMINANT CHARACTERIZATION*

The compounds found in the soil and ground water at AOC #16 include: benzene, toluene, ethylbenzene and xylene. In addition, one ground water sample from B-98 found 1,1,1-trichloroethane (TCA).

Although the 1992 Environmental Investigation and additional investigations adequately characterized the concentrations of VOCs in and around AOC #16, the presence or absence of other constituents in the soils will be investigated in accordance with the Remedial Investigation/Feasibility Study (RI/FS) Work Plan dated January 1994. Two soil borings will be drilled to the red clay layer and sampled at two depths as described in the RI/FS Work Plan. The soil borings (designated as B-104 and B-105) will be completed in the approximate location as shown on Figure 2-3. The two samples collected for laboratory analysis will be analyzed for target compound list (TCL) analytes, semi-VOCs and lead. The borings will be backfilled with auger cuttings upon completion.


AREA OF AFFECTED GROUND WATER
DRAINAGE
GARAGE
AREA OF AFFECTED SOIL
APPROXIMATE AREA OF REMOVED UST
LEGEND
AREA OF AFFECTED SOIL
AREA OF AFFECTED GROUND WATER
AREA #16
AREA OF AFFECTED SOIL
AND GROUND WATER
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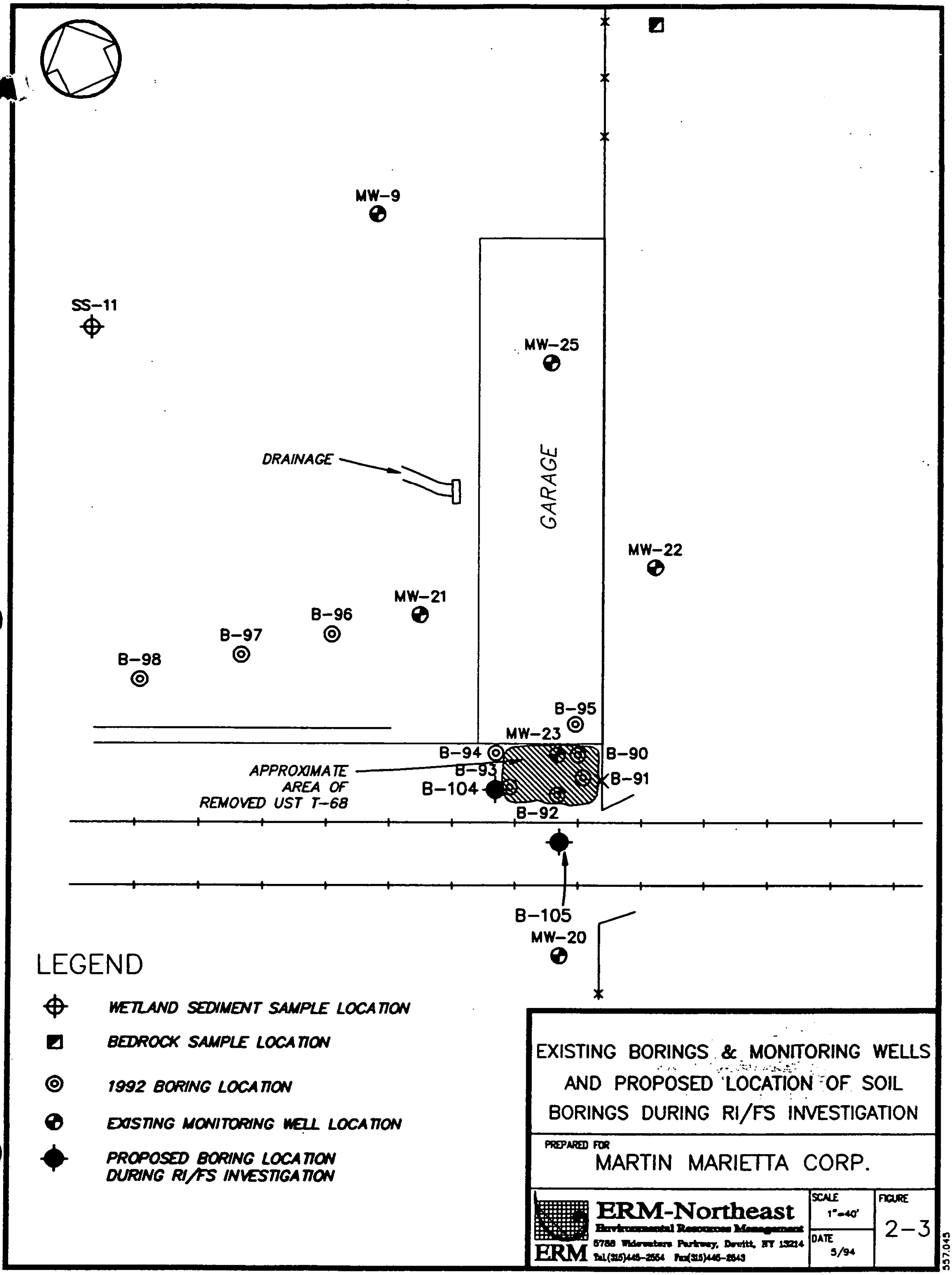
ERM
SCALE
1"=40'
DATE
5/94
FIGURE
2-2



MW-9
SS-11
MW-25
DRAINAGE
GARAGE
MW-22
MW-21
B-96
B-97
B-98
B-95
MW-23
B-94
B-90
APPROXIMATE
AREA OF
REMOVED UST T-68
B-93
B-104
B-91
B-92
B-105
MW-20
LEGEND
WETLAND SEDIMENT SAMPLE LOCATION
BEDROCK SAMPLE LOCATION
1992 BORING LOCATION
EXISTING MONITORING WELL LOCATION
PROPOSED BORING LOCATION
DURING RI/FS INVESTIGATION
EXISTING BORINGS & MONITORING WELLS
AND PROPOSED LOCATION OF SOIL
BORINGS DURING RI/FS INVESTIGATION
PREPARED FOR
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ERM
SCALE
1"=40'
DATE
5/94
FIGURE
2-3

Section 3

Section 3

3.0 DESCRIPTION OF IRM ACTIVITIES

This section of the Work Plan provides a description of the IRM activities including: AOC site preparation, identification of the selected treatment technology, construction documents and design considerations, excavation activities, waste handling procedures (characterization, storage, transport and disposal), field implementation components, AOC specific sampling and monitoring program, and AOC site restoration. In addition, a schedule for the implementation of IRM activities and details related to submission of IRM progress reports is presented.

3.1 AOC SITE PREPARATION

During site preparation activities, heavy equipment and construction materials will be kept out of the wetland. The following site preparation activities will be performed to prepare for implementation of the IRM in AOC #16:

- install a surface seal (asphalt pavement) over grassed areas on the west side of the Garage to eliminate remediation system short-circuiting;
- coordinate with FRP-2 owner regarding access to utilities, including electric and water;
- locate all underground utilities;
- coordinate with FRP-2 owner regarding the location of the staging area for stockpiled waste soils and drum staging for decontamination water; and
- obtain necessary state and local permits and/or develop documentation to demonstrate substantive compliance with technical requirements.

- obtain necessary state and local permits and/or develop documentation to demonstrate substantive compliance with technical requirements.

3.2 *IDENTIFY TREATMENT TECHNOLOGY*

This section of the Work Plan summarizes the selected remediation and vapor treatment technologies, and states the remediation objectives.

3.2.1 *Remediation Technology*

Based on the results of the hydrogeologic investigations and remediation technology modeling, a combined soil and ground water remediation system has been selected for AOC #16.

A soil remediation system consisting of in-situ soil vapor extraction (SVE) has been selected to remediate affected soil for AOC #16. This remediation process will incorporate in-situ soil treatment to most effectively remediate affected soil at AOC #16.

SVE has proven to be effective in removing VOCs from subsurface soils. By applying a vacuum to the vadose zone, a negative pressure field is generated. Depending on specific compound properties, certain compounds, such as VOCs, are mobilized and subsequently removed from the subsurface. Use of SVE will not only remove vapors from the vadose zone, but can provide the added benefit of improving ground water quality by increasing transport of VOCs from the saturated zone to the vadose zone.

The SVE system will consist of the following major components:

- vapor extraction and air injection wells;

- vacuum blower and associated piping to recover VOC contaminated soil vapors from the affected soils;

- a thermal oxidizer, if necessary, to destroy vapor phase VOCs recovered by the SVE system; and

- associated treatment system control panel, alarm package and instrument controls.

A ground water remediation system consisting of ground water recovery and treatment by a low profile air stripper has been selected to remediate affected ground water for AOC #16. In addition, naturally occurring iron and manganese in ground water at the site will require addition of a polyphosphate sequestering agent upstream of the air stripper unit. This agent will keep the naturally occurring iron and manganese in solution as it passes through the air stripper.

The ground water remediation system will consist of the following major components:

- recovery wells which will recover the most significantly affected ground water near the former UST location, and lower the ground water table to facilitate soil vapor extraction;

- associated pumps and underground piping to convey the recovered ground water to an air stripper, which will transfer the VOC from the water to the vapor phase;

- discharge treated water a significant distance from recovery wells (near existing outfall 003) to maximize hydraulic control of the area; and

- associated treatment system control panel, alarm package, autodialer and instrument controls.

3.2.2 *Vapor Treatment Technology*

The vapor treatment technology to be selected will be determined based on the initial startup pilot testing to be conducted following field installation activities.

The vapor treatment system to treat extracted soil vapors from the SVE system may consist of a model VAC 25 CL thermal oxidizer manufactured by ThermTech®, Inc. of Kingwood, Texas. Based on anticipated soil vapor concentrations the thermal oxidizer may be required to meet NYSDEC air discharge requirements.

The off-gas created from the ground water air stripping treatment process will be discharged through a 35-foot high stack. Based on anticipated influent ground water concentrations and data modeling, treatment of the off-gas air stream is not required to satisfy NYSDEC air requirements.

The IRM described herein is being performed pursuant to a NYSDEC Order on Consent. A formal NYSDEC permit will not be required to discharge treated gases. However, appropriate calculations will be prepared to demonstrate substantive compliance with technical requirements for the vapor treatment technology. This includes an evaluation of the applicability of NYSDECs regulations set forth at 6NYCRR Part 212, New York State Air Guide-1 and New York State Air Guide-29.

In addition, if the SVE system monitoring indicates that VOC concentrations have significantly decreased, it may be cost effective to shut down the thermal oxidizer (if installed) and install carbon canisters for vapor treatment or reroute the SVE off-gases to the 35-foot high exhaust stack utilized for the off-gas created by the ground water treatment system. An evaluation of this alternative treatment approach will be conducted once VOC concentrations drop to a level that indicates that either carbon would be a more appropriate treatment or no treatment would be required.

3.2.3 *Remediation Objectives*

3.2.3.1 *Soil Remediation System*

The soil remediation objectives for AOC #16 are based on NYSDEC Technical and Administrative Guidance Memorandum (TAGM) No. 4046, Determination of Soil Cleanup Objectives and Cleanup Levels. However, these objectives are goals which may or may not be obtainable given the selected technology and site conditions. MMC reserves the right to discuss cleanup objectives with NYSDEC based on the results of IRM sampling and analysis, the results of the site Risk Assessment, and other information which may become available.

Although NYSDEC TAGM No. 4046 objectives may or may not be obtainable, up to 90 percent reduction in soil VOC concentrations is expected. Information on remediation objectives is contained in the United State Environmental Protection Agency's (USEPA) Superfund Innovative Technology Evaluation (SITE) program technology profiles. The SITE technology profiles discuss technology descriptions, waste applicability, status of demonstration projects and demonstration results.

The demonstration results for an in-situ vacuum extraction project profile determined the following:

- VOC concentrations in soil vapors may be reduced by up to 95 to 99 percent; and

- VOC concentrations in soil may be reduced by up to 90 percent.

Based on this information and experience with similar projects, the quantitative remediation objectives for AOC #16 includes the following:

- SVE system operation and monitoring until a 95 to 99 percent reduction in soil vapor concentrations for total VOCs, in blower influent and individual vapor extraction wells, is obtained; and

- reduction of total VOC concentrations in soil by 90 percent or greater to the concentrations as shown in Table 3-1.

The main qualitative objectives of the selected soil remediation system for AOC #16 are to:

- provide source control action by treating soil to prevent the contamination of ground water by additional leaching of chemicals out of the soil mass; and

- treat the affected soil in-situ using established SVE techniques by operating SVE system until the extracted vapors have been reduced by 95 to 99 percent or reach asymptotic levels (point of diminishing returns), to reduce soil contamination and minimize movement of VOCs into ground water.

3.2.3.2 *Ground Water Remediation System*

Based on experience with similar projects, the ground water remediation objectives for AOC #16 are:

- create a capture zone to prevent movement of contaminated ground water off-site;

- lower the water table in the VOC source area to the greatest extent practical in order to expose the affected soil to the flow of air induced by the SVE system;

TABLE 3-1
MARTIN MARIETTA CORPORATION
FARRELL ROAD PLANT
IRM WORK PLAN FOR AOC #16
PROPOSED SOIL AND GROUND WATER CLEANUP GOALS

Contaminant	Maximum Concentration Found in Soil (ppm)	Cleanup Goal Anticipated Soil Concentration at 90% Removal (ppm)	Maximum Concentrations Found in Ground Water (ppm)	Cleanup Goal for Ground Water (ppm)
1,1,1-TCA	N/A	N/A	0.07	.005
Benzene	5.4	0.54	20	.0007
Toluene	210	21	31	.005
Ethylbenzene	160	16	7	.005
Xylene (Isomers)	1,000	100	28	.005

NOTES:

ppm Parts per million.
N/A Contaminant not analyzed.

- recover ground water until VOC concentrations remaining in the aquifer decline to asymptotic low levels (point of diminishing return), or to cleanup goals presented in Table 3-1, or to a level that can be demonstrated to be protective of human health and environment; and

- treat ground water such that, to the extent technically feasible, the concentration of contaminants in the discharge water is reduced to within promulgated standards.

In order to meet these objectives, it is assumed that the SVE and ground water remediation system will operate for a period of eight to twelve months following system installation and startup. Periodic system sampling and analysis will be performed to monitor and optimize system performance. MMC will notify NYSDEC if it is determined that the results of system performance monitoring warrant a change in system operations.

3.3 CONSTRUCTION DOCUMENTS

The construction documents for the combined SVE and ground water remediation systems to be installed and operated at AOC #16 are included as Appendix B. During the construction phase, heavy equipment and construction materials will be kept out of the wetland. The construction documents consist of an equipment list and design drawings. The design drawings include the following sheets:

Sheet 1	:Title Sheet;
Sheet C-1	:Site Plan and Miscellaneous Details;
Sheet C-2	:Well Details and General Miscellaneous Details;
Sheet PID-1	:Soil Vapor Flow Schematic;
Sheet PID-2	:Ground Water Recovery Flow Diagram;
Sheet EA-1	:Equipment Arrangement;

Sheet S-1	:Treatment Building and Civil Details; and
Sheet S-2	:Vapor Discharge Stack (10" dia. tapered) Base & Concrete Foundation Details.

3.3.1 *Soil Remediation System*

The SVE system includes a 5.0 HP blower which can deliver up to 180 cubic feet per minute (cfm) at a vacuum of 50 inches of water column, but can also pump less by turning down a throttling valve on the blower inlet piping. In addition, the system consists of a moisture separator, in-line filter, interconnecting piping for soil gas and dilution air, control panel and various instruments and controls.

The blower housing, impeller and cover are constructed of spark-proof die-cast aluminum. The blower package includes inlet and outlet internal muffling (keeping the noise level within OSHA standards), and a direct drive 5.0 HP explosion-proof motor.

The moisture separator is designed to remove condensate from the soil gas. It is inherently safe, and includes a drain valve, sight glass, vacuum relief valve, an explosion-proof level switch designed to cause a blower shutdown and an alarm to sound at high liquid levels in the moisture separator. A small manually operated peristaltic pump can be used to remove liquid from the moisture separator without interrupting the vacuum extraction process.

The in-line filter removes particulates from the air stream to protect the blower. The filter element is easily replaced, if necessary. A differential pressure gauge is provided on the inlet and outlet of the filter to indicate if it needs to be replaced.

The control panel includes the following: motor starter, transformer, alarm shutdown relays, alarm (audio and indicator light), alarm silence and reset, main disconnect, start/stop push buttons, and remote start/stop push buttons.

The system is equipped with alarm/shutdowns to indicate: high liquid level in moisture separator, low air flow (due to blower failure or a blockage), high differential pressure across blower, high discharge air temperature, and motor overload. The control switches are explosion-proof and are configured to protect the blower from permanent damage.

Various instruments will be installed to monitor operating conditions. These instruments include several vacuum, pressure and temperature gauges. A change in readings alerts the operator to a potential problem. Sample ports are provided to allow for easy air sampling from vapor extraction wells, blower influent (before mixing with dilution air), or downstream of vapor treatment.

Vacuum monitor points between vapor extraction wells are available, if needed, to enhance vacuum system efficiency monitoring. Three passive air vents and existing ground water monitoring well (MW-23) can be temporarily capped during system O&M and utilized as between vapor extraction well vacuum monitor points.

Throttling valves are provided on the soil vapor inlet piping and the dilution valve inlet piping. These allow control of the total air flow by increasing the back pressure on the blower, and/or by varying the ratio of soil vapor to dilution (atmospheric) air. Flow measurement ports are provided in the piping on the soil vapor inlet, dilution air inlet, and downstream of vapor treatment. Flow rates will be determined using an air velocity meter.

The blower discharge may be connected to a thermal oxidizer or other treatment unit as needed to treat the extracted gases prior to release to the atmosphere. The outlet of the thermal oxidizer would be discharged to the atmosphere through a stack, and the discharge piping would include sample ports for discharge air monitoring.

3.3.2 *Ground Water Remediation System*

The ground water remediation system consists of a low-profile shallow tray Model 2331 air stripper, or approved equal. The air stripper contains the following components: inlet screen and damper, stainless steel demister, air pressure gauge, spray nozzle, site tube, stainless steel latches, aeration tray cleanout ports, 300 cfm blower with inlet particulate filter, 15 gpm discharge pump, sampling ports, and control panel with pump level controls, alarm interlocks, motor starter, panel light, low air pressure alarm switch, high water level alarm switch, and discharge pump level switch.

An iron/manganese sequestering agent feed system consisting of a storage container, feed pump and in-line static mixer has been designed to greatly reduce fouling of the air stripper which may lead to ineffective operation of the system. The sequestering agent (polyphosphate solution) will be stored in a 55-gallon high density polyethylene (HDPE) aboveground tank. The sequestering agent will be fed by a 5-gpd (maximum) variable-speed diaphragm pump to an in-line static mixer located in the force main between the ground water recovery system and the air stripper. The concentration of the sequestering agent in the stripper influent is controlled by the flow rate setting of the feed pump.

3.3.3 *Design Considerations*

In designing the combined SVE and ground water recovery and treatment system to remediate gasoline affected soil and ground water in AOC #16, several factors were evaluated including: results of pilot testing conducted for AOC #5 and potential existence of 1,1,1-TCA in the area.

A pilot study was conducted for an area of VOC-affected soil on-site (AOC #5) in July 1993. Since the geology in AOC #5 and AOC #16 are similar, the information and data gathered during this pilot study was evaluated to determine a basis of design for the SVE system at AOC #16.

The information evaluated to complete the design for AOC #16 included: 1) the effective "radius of influence" in order to determine appropriate well spacing and the number of wells needed for full-scale operation; 2) the soil vapor extraction rate; and 3) the required vacuum to be applied to the extraction well. In order to determine the air quality of the extracted soil vapor to select the appropriate vapor treatment alternative, calculations were completed to approximate soil vapor concentrations from actual soil sample data.

Due to the potential existence of 1,1,1-TCA in the area, certain design considerations have been included in the design including:

- appropriate sizing of the air stripper and capability to add more trays, if necessary; and

- piping connection capability to allow for the installation of an air scrubber downstream of the thermal oxidizer; if required after review of treatment alternatives following the startup pilot test.

3.4 *EXCAVATION*

Excavation activities required in order to implement the IRM for AOC #16 include surface excavation for the installation of: a) asphalt pavement, b) vapor extraction wells, air injection wells, ground water recovery wells and monitoring well, c) trenches for air and water transport piping, and d) foundation for the equipment storage building. It is expected that these excavation activities (except for vapor extraction, air injection, ground water recovery and monitoring well installation) will not interfere with affected soil in the area, although characterization of the excavated soil will be conducted as specified in Section 3.5 (Waste Handling) of this document.

It is not anticipated that there will be any need to alter the wetland hydrology as a result of IRM construction activities. Site preparation and construction phase activities will be performed in a manner to minimize the potential for wetland hydrology alteration.

3.5 *WASTE HANDLING*

This section of the Work Plan describes the waste handling procedures regarding characterization, storage, transport and disposal for carbon, personal protective equipment (PPE), drill cuttings and excavation spoils, decontamination water, moisture separator water and well development water.

All sampling and analysis for waste characterization will be performed in accordance with NYSDOH standard quality assurance and quality control protocols. The following analytical methods will be conducted based on constituents which have been identified at the site:

- Polychlorinated Biphenyls (PCBs) - EPA Method 8080;
- VOCs - EPA Method 624;
- VOCs - EPA Method 8240;
- Semi-VOCs - EPA Method 8270; and
- Resource Conservation and Recovery Act (RCRA) metals - Toxicity Characteristic Leaching Procedure (TCLP).

In addition to the waste handling procedures outlined below, alternative waste management procedures may be incorporated in accordance with NYSDEC Technical and Administrative Guidance Memorandum (TAGM), HWR-89-4032 related to disposal of drill cuttings; draft TAGM (no number assigned) related to well development water disposal; and USEPA Office of Solid Waste and Emergency Response (OSWER) Guide to Management of Investigation-Derived Wastes.

3.5.1 Characterization

3.5.1.1 Carbon

Carbon utilized for liquid phase polishing or vapor phase treatment control will be characterized by obtaining one (1) grab sample from each canister of waste carbon. The sample will be analyzed for PCBs, VOCs, semi-VOCs and RCRA metals. The analytical results will be evaluated and appropriate storage, transport and disposal completed.

3.5.1.2 Personal Protective Equipment

PPE including Tyvek® suits, disposable gloves, respirator cartridges and miscellaneous materials used in the installation, startup and operation and maintenance (O&M) activities will be segregated by area of activity. The PPE will be labeled, staged in a secured area and properly disposed upon completion of field work.

3.5.1.3 Drill Cuttings/Excavation Spoils

Drill cuttings and excavation spoils created as part of the IRM construction activities will be separated into two categories based on headspace concentrations detected by a Photo Ionization Detector (PID). This procedure is standard protocol in determining preliminary characterization requirements. In each category the soil will be characterized by obtaining one (1) sample per area or one (1) sample for every twenty cubic yards of soil generated (whichever is less). Samples from the same homogeneous area may be composited, as appropriate. The soil will be analyzed for PCBs, VOCs, semi-VOCs, and RCRA metals by TCLP. The analytical results will be evaluated and appropriate storage, transport and disposal completed.

3.5.1.4 *Decontamination Water*

Water created through equipment and personnel decontamination procedures will be drummed and characterized by obtaining one (1) sample for each 55-gallon drum of water generated. The sample will be analyzed for PCBs, VOCs, semi-VOCs, and RCRA metals. The analytical results will be evaluated and appropriate storage, transport and disposal completed.

3.5.1.5 *Moisture Separator Water*

Water collected by the moisture separator upstream of the SVE system blower will be drummed and characterized by obtaining one (1) sample for every 55-gallon drum of water generated. The water sample will be analyzed for PCBs, VOCs, semi-VOCs, and RCRA metals. The analytical results will be evaluated and appropriate storage, transport and disposal completed.

3.5.1.6 *Well Development Water*

Water collected as part of well development activities will be characterized by obtaining one (1) sample for every 55-gallon drum of water generated. The water sample will be analyzed for PCBs, VOCs, semi-VOCs, and RCRA metals. The analytical results will be evaluated and appropriate storage, transport and disposal completed.

3.5.2 *Storage, Transport and Disposal*

3.5.2.1 *Carbon*

Once the liquid phase or vapor phase carbon canisters have been fully utilized and removed from service, action will be taken to:

- move carbon canisters to a dedicated holding area located on site;
- define the quantity of material;
- conduct material sampling and analysis;
- provide appropriate container labeling;
- determine appropriate treatment based on analytical results;
- obtain and complete appropriate manifest forms; and
- transport and dispose of the material.

The two disposal methods commonly used for carbon include incineration and regeneration.

3.5.2.2 *Personal Protective Equipment*

Upon completion of work tasks involving homogeneous areas of soil, PPE will be double bagged and placed in a 55-gallon drum or a one cubic yard waste wrangler box. These drums or boxes will be labelled accordingly, stored in a dedicated area on-site and transported and disposed of at a landfill consistent with soil disposal requirements.

3.5.2.3 *Drill Cuttings/Excavation Spoils*

Drill cuttings and excavation spoils will be separated into two categories based on headspace concentrations obtained with a PID. This procedure is standard protocol in determining the preliminary storage, transport and disposal requirements. If headspace concentrations are significant, action will be taken to:

- store soil in 55-gallon drums subsequently moved to a dedicated holding area on-site, or stockpile soil in a properly designed and constructed staging area;
- define the quantity of material;
- conduct material sampling and analysis;
- provide appropriate container labeling;
- determine appropriate treatment, if required, based on analytical results;
- transport and dispose of the material; and
- obtain and complete appropriate manifest forms.

If headspace concentrations are not significant, action will be taken to:

- stockpile soil on-site at a designated location;
- place soil on and cover with a double layer of 6 mil. polyethylene and construct secondary containment around the pile;

- define the quantity of material;
- conduct material sampling and analysis;
- provide appropriate container labeling;
- determine appropriate treatment, if required, based on analytical results;
- transport and dispose of material; and
- obtain and complete appropriate manifest forms.

The disposal methods to be evaluated for soil disposal, depending on analytical data, will include: incineration, stabilization and landfilling. In some instances treatment or disposal restrictions may not apply.

3.5.2.4 Decontamination Water

Decontamination water will be managed and action taken to:

- store water in a 55-gallon drum subsequently moved to a dedicated holding area on-site;
- define the quantity of material;
- conduct sampling and analysis;
- provide appropriate container labeling;
- determine treatment requirements based on analytical results;

- treat water on-site by adding to the air stripper water treatment system if the addition of this water will not upset or exceed discharge limitations;

- transport and dispose of material, if necessary; and

- obtain and complete appropriate manifest forms, if necessary.

3.5.2.5 *Moisture Separator Water*

The water collected in the moisture separator will be collected and action taken to:

- store water in a 55-gallon drum subsequently moved to a dedicated holding area on-site;

- define the quantity of material;

- conduct sampling and analysis;

- provide appropriate container labeling;

- determine treatment requirements based on analytical results;

- treat water on-site by adding to the air stripper water treatment system if the addition of this water will not upset or exceed discharge limitations;

- transport and dispose of material, if necessary; and

- obtain and complete appropriate manifest forms, if necessary.

3.5.2.6 Well Development Water

Well development water will be managed and action taken to:

- store water in a 55-gallon drum subsequently moved to a dedicated holding area on-site;
- define the quantity of material;
- conduct sampling and analysis;
- provide appropriate container labeling;
- determine treatment requirements based on analytical results;
- treat water on-site by adding to the air stripper water treatment system if the addition of this water will not upset or exceed discharge limitations;
- transport and dispose of materials, if necessary; and
- obtain and complete appropriate manifest forms, if necessary.

3.6 FIELD IMPLEMENTATION

Field implementation for this IRM includes: field mobilization, well installation, field construction, system startup testing, system O&M, post-IRM sampling and long-term monitoring.

3.6.1 *Field Mobilization*

Prior to field mobilization, all necessary state and local permits will be obtained and/or documentation to demonstrate substantive compliance with technical requirements will be developed. The treatment system equipment at the site will be located within the area shown on the design drawings included as Appendix B. The location of all underground utilities will be checked and marked out prior to the installation of wells and piping trenches.

3.6.2 *Well Installation*

A total of 7 vapor extraction wells and 3 passive air injection wells will be installed as part of the SVE system. The vapor extraction wells will be four inches in diameter and the passive air injection wells will be two inches in diameter. A total of three ground water recovery wells and one new monitoring well will be installed as part of the ground water remediation system. The recovery wells will be six inches in diameter and the monitoring well will be two inches in diameter. The wells will be installed using a hollow stem auger drilling technique. All wells will be drilled to a depth of 15 feet, or until the top of the clay layer is encountered. Well construction details are provided in the design drawings.

3.6.3 *Field Construction*

All field installation activities including well installation, trenching and piping, electrical connections and equipment installation will be performed by a qualified contractor. All activities involving contact with hazardous materials will be performed by 40-hour health and safety trained personnel, in accordance with the site-specific HASP included in Document III of this

Work Plan.

3.6.4 *System Startup Testing*

System startup testing will be conducted following completion of field installation activities and will consist of a two phased approach. The first phase will include a two day pilot test to verify the need for air controls related to the SVE system. This pilot test will be conducted by utilizing carbon as the off-gas treatment. The second phase will include a two week system startup period to be conducted following evaluation of the information/data gathered in the initial startup phase. During system startup, monitoring of the system will be conducted on a daily basis to verify off-gas treatment efficiency, optimize SVE flow rates and pressures, optimize ground water recovery flow rates, and to ensure that all mechanical equipment are functioning properly. During this period, all system components will be started and evaluated to ensure proper operation. An O&M log sheet to be used during startup testing and O&M activities will be developed to document the:

- vacuum applied to each vapor extraction well;
- soil vapor flow rates from each vapor extraction well;
- pressure and temperature readings;
- soil vapor concentration readings at various points to stabilize and optimize the system;
- flow rates from ground water recovery wells;
- general system appearance and operation;

- status of system monitoring and control equipment;
- air stripper inlet pressure;
- air and water (influent and effluent) temperature;
- status of electrical equipment for unusual heat, noise, odors, etc.; and
- concentration of sequestering agent used.

The soil vapor concentrations at various locations within the system will be screened with either a portable field gas chromatograph (GC) or PID during the two week startup testing period.

A series of air and ground water samples will be collected during the two week startup period and analyzed to determine remediation system performance. A total of six air sampling events will be conducted during the two week startup period. Two sets of samples will be collected on the first day, followed by one sample set per day for the next two days. Subsequently, one sampling event will be conducted at the end of the first week and again at the end of the second week. Each sampling event will consist of obtaining samples of the SVE system influent, SVE system effluent, and the thermal oxidizer (if present) effluent. A total of up to 18 air samples will be collected during the two week startup period. Analytical turn-around time is approximately three weeks.

Ground water samples will be collected from air stripper influent and effluent to ensure appropriate operation of the air stripper and to document discharge water quality.

3.6.5 System O&M

Following completion of the startup period, normal system O&M will be initiated. Schedules will be developed for inspection and maintenance of all equipment in accordance with manufacturer specifications. System O&M will include, but not limited to, the following activities to:

- monitor vacuum, pressure, temperature and soil vapor concentration readings;

- inspect all pumps, motors, and blower; document and address any abnormal conditions (vibration, noise, heat, etc.);

- check all heat tracing circuits for operation (winter months); direct repairs/replacements as needed;

- inspect and lubricate rotating equipment bearings, and perform other periodic and preventive maintenance in accordance with manufacturer's specifications;

- recalibrate flow meters, pressure gauges and switches, and other pertinent meters and gauges in accordance with manufacturer's specifications;

- inspect ground water recovery and injection systems including wells, pumps, piping, etc. Conduct well and pump rehabilitation activities as needed;

- inspect air stripping system including trays, pumps, filters and sequestering agent equipment. Arrange for cleaning of the trays as needed; and

- check all heat tracing circuits for operation (winter months). Direct repairs/replacements as needed.

In addition to the above mentioned routine O&M requirements, any additional servicing, adjustment, testing, etc. required by the manufacturer, or as necessary to keep the SVE system functioning properly, would be integrated into the maintenance schedule as required.

Normal operation will involve semi-weekly or monthly monitoring of the same operating parameters as presented in the startup program. Soil vapors from vapor extraction wells, blower influent and blower effluent will be monitored using a PID. Based on this monitoring, air flow rates for vapor extraction wells may be modified. In addition, some vapor extraction wells may be operated in "pulse mode" to optimize SVE system removal efficiency. Pulse mode is defined as *"shut down of one or more vapor extraction wells for a period of time in order to allow an area of influence to re-equilibrate, and restart in an attempt to open new pathways for VOC removal."*

A rough estimate will be made of the quantity of VOCs extracted, by multiplying the semi-weekly or monthly air flow rates by the VOC soil vapor concentrations detected. This estimate can then be compared to the estimated total mass of VOCs removed, to gauge the effectiveness of the system.

It is assumed that operation of the SVE remediation system will be continued under this schedule for approximately eight to twelve months, or until a 95 to 99 percent reduction of the initial VOC soil vapor concentration is measured in the influent to the blower. The initial concentration will be defined as the average concentration measured during the first two weeks of operation. In addition to monitoring the influent to the blower, each individual vapor extraction well will be monitored for 95 to 99 percent reduction of VOC soil vapor concentration. This will ensure that vapor extraction wells located within "hot spots" are not being misrepresented by dilution of air flow from vapor extraction wells within "clean areas".

An alternate method of determining the completion of treatment is if the soil vapor concentrations (at blower influent and individual vapor extraction wells) reach asymptotic levels for a sustained period of time. An asymptotic level is defined as *"a level obtained in which no more than a ten percent fluctuation in soil vapor concentration is obtained over a three month period."*

In addition, the ground water treatment system influent and effluent will be sampled. Results will be evaluated to determine effectiveness of the system.

At some point during the operation of the SVE system, it may be cost effective to shut down the vapor treatment unit (i.e., thermal oxidizer) and install carbon canisters for vapor treatment.

3.6.6 Post-IRM Sampling

This section of the Work Plan outlines the activities to be completed to verify that remediation objectives have been obtained by identifying post-IRM soil and ground water sampling. Depending on the effectiveness of the remediation systems these post-IRM sampling activities may or may not occur at the same time.

3.6.6.1 Soil

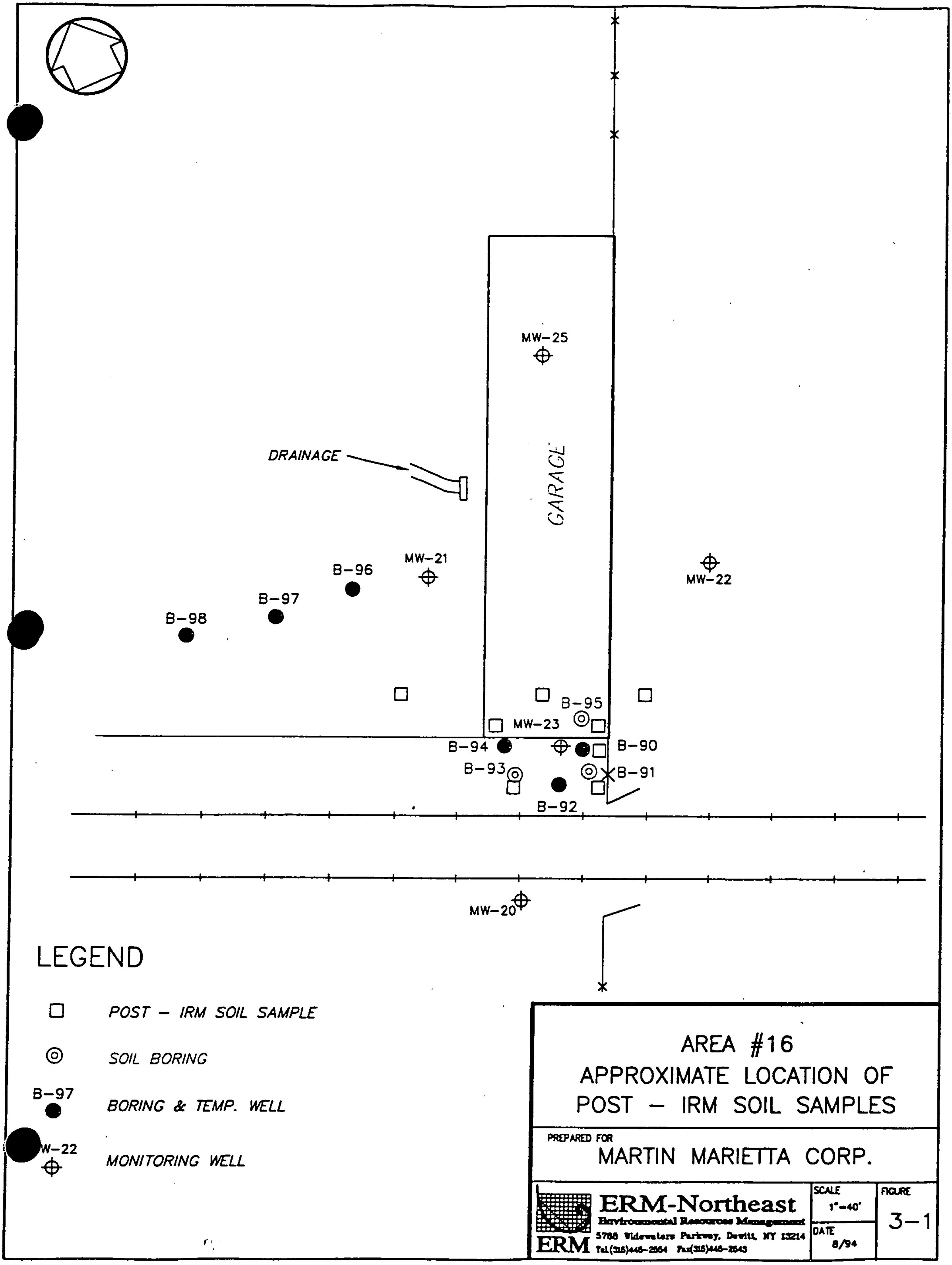
When periodic air sampling indicates that significant reduction (at least 95 to 99 percent) of total VOCs in the soil vapors (at influent to blower and at each individual vapor extraction well) have occurred, or soil vapor concentrations reach an asymptotic level for a sustained period of time, a post-IRM soil sampling program will be conducted.

It is anticipated that this sampling program will consist of obtaining approximately eight to ten soil samples in the area to determine remediation system performance. The sample depth will correspond to the depth at which the most affected pre-remedial samples were collected. The soil samples will be analyzed for the contaminants identified in Section 2.5 by EPA Method 8240 in accordance with the Sampling and Analysis Plan (Work Plan Document II). The approximate locations of the post-IRM soil samples are indicated on Figure 3-1.

If residual contaminant levels satisfy the cleanup goals as defined in Section 3.2.3, SVE system shut down will be recommended. The NYSDEC will be involved in and have final approval of the decision to shut down the SVE system. If the soils still contain VOC concentrations in excess of the cleanup goals, the soils data and the system monitoring data will be reviewed to assess the ability to further reduce the VOC concentrations in the soils. If the system is deemed capable of removing additional VOCs, the system will be run for a determined period of time and confirmatory sampling will again be conducted at the end of this period.

3.6.6.2 Ground Water

When periodic monitoring of the ground water treatment system influent indicates significant reduction (at least 95 to 99 percent) of VOCs in ground water has occurred, or concentrations reach an asymptotic level for three consecutive months, as previously defined, recommendation for ground water treatment system shut down will be made to NYSDEC. Once the ground water system is shut down, a post-IRM ground water sampling program will be initiated.


MW-25
GARAGE
DRAINAGE
MW-21
MW-22
B-96
B-97
B-98
B-95
MW-23
B-94
B-90
B-93
B-91
B-92
MW-20
LEGEND
POST - IRM SOIL SAMPLE
SOIL BORING
B-97
BORING & TEMP. WELL
W-22
MONITORING WELL
AREA #16
APPROXIMATE LOCATION OF
POST - IRM SOIL SAMPLES
PREPARED FOR
MARTIN MARIETTA CORP.
ERM-Northeast
Environmental Resources Management
5788 Widewaters Parkway, Dewitt, NY 13214
Tel.(315)445-2554 Fax(315)445-2543
ERM
SCALE
1"=40'
DATE
8/94
FIGURE
3-1

It is anticipated that this ground water sampling program will consist of ground water sampling and analysis from five monitoring wells to evaluate the effect of the ground water recovery and treatment system on ground water quality. The following monitoring wells will be sampled and ground water analyzed by EPA Method 624 in accordance with the Sampling and Analysis Plan (Work Plan Document II).

- MW-20 (upgradient);
- MW-23 (in "hot spot" of plume); and
- MW-21, MW-22 and MW-25 (downgradient).

If the residual VOC concentrations satisfy the ground water cleanup goals as defined in Section 3.2.3, ground water treatment system shut down will be recommended. The NYSDEC will be involved in and have final approval of the decision to shut down the ground water treatment system. If the ground water concentrations attain asymptotic levels and still contain VOC concentrations in excess of the cleanup goals, the ground water data and the system monitoring data will be reviewed to assess the ability to further reduce the ground water VOC concentrations. If the system is deemed capable of removing additional VOCs, the system will be pulsed for a determined time period and confirmatory sampling again conducted at the end of this period.

3.6.7 Long-Term Monitoring

Subsequent to system shutdown, a long-term monitoring program will be conducted to ensure that operation of the ground water remediation system had a long-term effect on the ground water quality. Accordingly, the following activities will be performed:

- water level monitoring from all wells (recovery, vapor extraction, air injection, monitoring) and the creation of a ground water elevation map to evaluate site hydrogeology;

- ground water sampling and analysis from five monitoring wells to evaluate the effect of the ground water recovery and treatment system on ground water quality in AOC #16. These wells will include:

  - MW-20 (upgradient);
  - MW-23 (in "hot spot" of plume); and

- MW-21, MW-22 and MW-25 (downgradient).

It is anticipated that this monitoring program will be conducted every three months for up to one year following ground water remediation system shutdown.

3.7 AOC SITE RESTORATION

Upon satisfactorily completing the remedial objectives outlined in this Work Plan restoration activities will be performed to:

- decommission the vapor extraction and air injection wells;
- remove the chain link fence utilized for enclosing remediation equipment;
- dismantle and clean the remediation equipment; and
- disconnect and remove all piping, equipment, controls and accessories from the site.

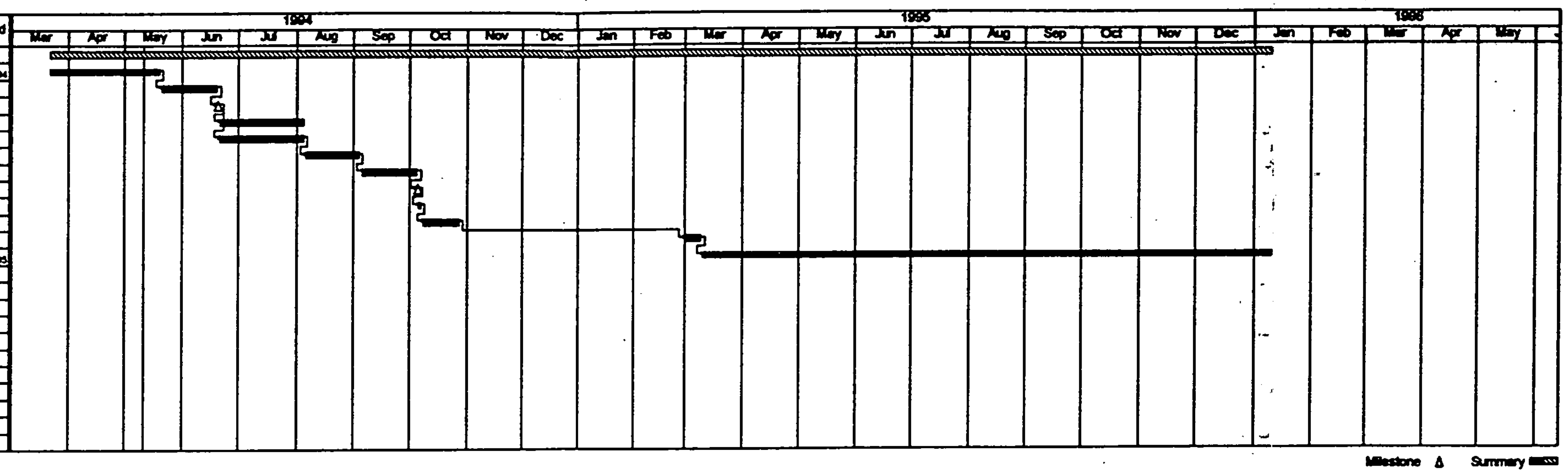
3.8 SCHEDULE OF IRM ACTIVITIES

The proposed schedule of IRM activities for AOC #16 is presented in Figure 3-2.

Due to the anticipated date of completion of equipment installation (October 1994) in this area and the need for collection and evaluation of startup pilot test data, the schedule identifies a two phase startup period.

AOC #16 IRM SCHEDULE
MARTIN MARIETTA CORPORATION
FARRELL ROAD PLANT

Ro #	Task Name	Duration	Fixed Start	Fixed End
1	AOC #16 IRM (GARAGE AREA)	643.00 d		
2	WORK PLAN PREPARATION	60.00 d	Mar/22/94	May/20/94
3	WORK PLAN REVIEW BY NYSDEC	30.00 d		
4	WORK PLAN APPROVAL BY NYSDEC	0.00 d		
5	PERMIT PREPARATION AND APPROVAL	45.00 d		
6	CONTRACTOR PROCUREMENT	45.00 d		
7	EQUIPMENT PURCHASE AND MOBILIZATION	30.00 d		
8	INSTALLATION	30.00 d		
9	INSTALLATION COMPLETE	0.00 d		
10	PHASE I - STARTUP (2 DAY PILOT TEST)	2.00 d		
11	EVALUATION OF PILOT TEST DATA	20.00 d		
12	PHASE II STARTUP	10.00 d	Mar/01/95	
13	OPERATION AND MAINTENANCE	299.00 d	Mar/01/95	Dec/31/95



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Page 1
*Times allotted for NYSDEC response is estimated.

SCHEDULE OF IRM ACTIVITIES
AOC #16
FARRELL ROAD PLANT

PREPARED FOR
MARTIN MARIETTA CORPORATION

ERM-Northeast
Environmental Resources Management
ERM

SCALE NTS
DATE 5/94
FIGURE 3-2

The Phase I pilot test will be conducted immediately following field installation activities, while Phase II will begin in March 1995. Startup of the remediation system following the winter weather season will allow for maximizing system performance for approximately eight to ten months of continuous operation prior to incurring seasonal weather conditions.

3.9 *IRM PROGRESS REPORTS*

IRM progress will be reported and submitted to NYSDEC on a monthly basis. The IRM progress report will be included with the monthly RI/FS Consent Order progress report and include information as detailed in IRM Consent Order Section IV.

Section 4

Section 4

4.0 *ENGINEERING CONTINGENCY PLAN*

The Engineering Contingency Plan associated with this IRM has been developed in the event that any element of the IRM program fails to operate in accordance with the remedial objectives outlined in this Work Plan. Contingency plans have been prepared for design, field installation, O&M monitoring and post-IRM situations.

4.1 *DESIGN CONTINGENCY*

Engineering contingency elements which have been incorporated into the construction documents as part of the design include:

- provisions to expand the SVE system by having spare ports for additional vapor extraction wells and size the blower for increased air flow or vacuum pressure;

- provisions to expand the ground water treatment system by having spare ports for additional recovery wells and allow for additional air stripper trays;

- piping connection capability for the SVE system to allow for the installation of vapor phase carbon canisters downstream of the thermal oxidizer;

- piping connection capability for the ground water treatment system to allow for the installation of vapor phase carbon canisters downstream of the air stripper;

- piping connection capability for the SVE system to allow for rerouting vapor off gases to 35-foot exhaust stack utilized for ground water treatment system off-gas;

- piping connection capability to allow for the installation of an air scrubber downstream of the thermal oxidizer to remove hydrochloric acid and reduce air temperature;

- piping connection capability to allow for the installation of vapor phase carbon canisters to replace the thermal oxidizer; and

- piping connection capability to add water from decontamination activities, SVE moisture separator and well development activities to the air stripper for treatment;

- provisions to temporarily shut down the ground water recovery and treatment system in the event of flooding in the area of treated effluent discharge.

4.2 FIELD INSTALLATION CONTINGENCY

Engineering contingency elements which have been incorporated into the field installation phase of the IRM include:

- if unknown physical constraints exist, placement of vapor extraction air injection wells, recovery wells or monitoring wells may be modified;

- to select the depth of well screen for vapor extraction wells based on field screening and depth to ground water at time of well installation;

- to select alternative air treatment controls for the SVE system based on the results of the two day pilot test conducted as part of the system startup testing; and

- to modify startup operating conditions if free-product is encountered at one or more of the soil vapor extraction or ground water recovery wells during well installation.

4.3 O&M MONITORING CONTINGENCY

Engineering contingency elements which have been incorporated into the O&M monitoring phase of the IRM include:

- to develop O&M manual for the remediation system which will identify troubleshooting procedures for filter change-outs, high water levels in moisture separator upstream of blower, condensate in vacuum pipelines, freezing in pipelines, inconsistent vacuum readings and thermal oxidizer monitoring;

- if monitoring indicates that VOC concentrations have decreased after several weeks of operation, the system operation may be modified by increasing or decreasing flow rates in one or more of the soil vapor extraction wells;

- if monitoring indicates that VOC concentrations have significantly decreased it may be cost effective to shut down the thermal oxidizer and install carbon canisters for vapor treatment, or determine if no air controls are required;

- provisions to adjust system operating parameters to meet air discharge requirements and delete the need for air controls; and

- provisions to shut down the remediation equipment in the event of inclement weather conditions which may effect system operations.

4.4 *POST-IRM CONTINGENCY*

Engineering contingency elements which have been incorporated into the post-IRM phase of the IRM include provisions for action to be taken:

- if after a sustained period of operation (regular and/or "pulse mode" as identified in Section 3.6.5), air monitoring analytical results in conjunction with PID screening data indicate that significant reduction in soil vapor concentration in blower influent and individual vapor extraction wells has been obtained, (95 to 99 percent), the post-IRM soil sampling program outlined in Section 3.6.6 will be conducted;

- if soil sampling analysis results do not meet cleanup objectives outlined in Section 3.2.3 the entire SVE system may be temporarily shut down and restarted and operated in a "modified pulse mode procedure" based on remaining areas of affected soil as determined by post-IRM soil sampling results;

- after operating in a "modified pulse mode procedure", for a period of time as defined by Martin Marietta and NYSDEC, a second round of post-IRM soil samples will be obtained in locations in which cleanup goals were not achieved during the first round of soil sampling;

- if air monitoring results and soil sample analytical data are not significantly affected by the "modified pulse mode procedure", alternative cleanup goals will be presented;

- if necessary, alternate technologies could be evaluated to obtain further remediation including: excavation, hot air sparging, or bioremediation;

- if after a sustained period of operation the analytical results from the air stripper influent indicate that significant reduction of VOC concentrations has been obtained (95 to 99 percent), or when asymptotic ground water concentrations of VOCs are reached, recommendation for ground water treatment system shut down will be made, and subsequent to shut down, the post-IRM ground water sampling program outlined in Section 3.6.6 will be conducted;

- if after operating the ground water recovery system for twelve months and ground water sampling analysis results do not meet cleanup objectives outlined in Section 3.2.3, a risk analysis may be conducted to demonstrate the levels of VOC concentrations which would maintain protection of human health and the environment; and

- to shut down a segment of the remediation equipment in the event that remediation goals are satisfied for soil before ground water or vice versa.

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