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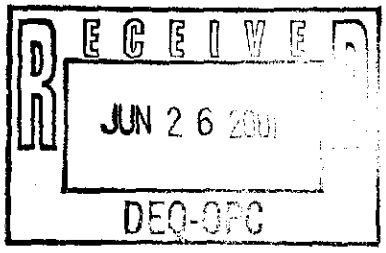

Ground Water Monitoring Plan

Former Gulf States Creosoting Site
Hattiesburg, Mississippi

FILE COPY

June 25, 2001

Project No. 21-04

MICHAEL PISANI & ASSOCIATES, INC.
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1.0 Introduction

This *Ground Water Monitoring Plan* establishes a ground water monitoring program for the Gulf States Creosoting site in Hattiesburg, Mississippi. The plan was prepared at the request of the Mississippi Department of Environmental Quality (MDEQ). This plan is organized in the following manner:

- Section 1 includes background information on the site and a summary of previous ground water investigations.
- Section 2 contains information on the current ground water monitoring well network and includes proposed locations for additional plume-defining wells.
- Section 3 presents procedures for the collection and handling of ground water samples.
- Section 4 provides information on the analytical program.
- Section 5 outlines the proposed monitoring frequency.
- Section 6 presents reporting requirements for the ground water monitoring program.

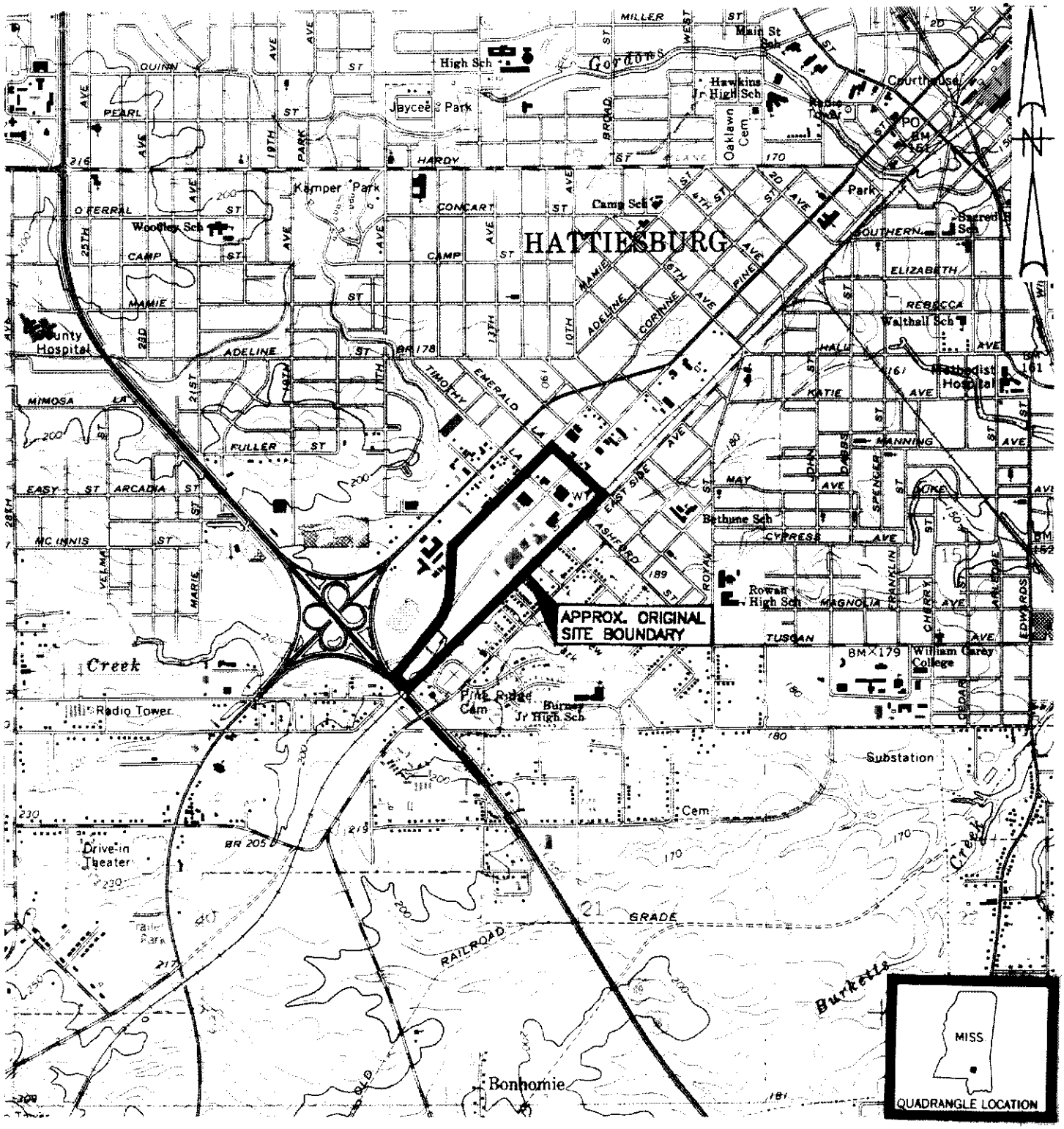
1.1 Site Description and Background

The former Gulf States Creosoting site is located in Hattiesburg, Mississippi near the intersection of U.S. Highways 49 and 11. The site is situated entirely within Section 16 of Township 4 North, Range 13 West, in Forrest County, Mississippi (Figure 1-1). Creosoting operations were conducted at the site between the early 1900s and approximately 1960. Wood treating operations were confined to a 2.5-acre area at the northeast corner of the site; this area is referred to as the former Process Area (see Figure 1-2).

The property was developed commercially beginning in approximately 1962. During the redevelopment of the site, fill materials containing creosote residuals were apparently placed in the southwestern portion of the site adjacent to Gordon's Creek; this area is referred to as the Fill Area. The original plant area is currently occupied by several automobile dealerships, auto parts retailers, a beverage dealership, and other commercial operations (Figure 1-2).

1.2 Summary of Previous Ground Water Investigations

Ground water beneath the Gulf States Creosoting site has been studied extensively beginning in 1994. In 1994, Environmental Protection Systems (EPS) conducted a limited investigation of the former Process Area only, which included the installation of four ground water monitoring wells. Since early 1997, Kerr-McGee Chemical, L.L.C. (KMC) has completed four major phases of site investigation, each including ground water



SOURCE: USGS MAP OF HATTIESBURG, MISSISSIPPI, 7.5' QUADRANGLE, 1964 PHOTOREVISED 1982

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New Orleans, Louisiana Houston, Texas

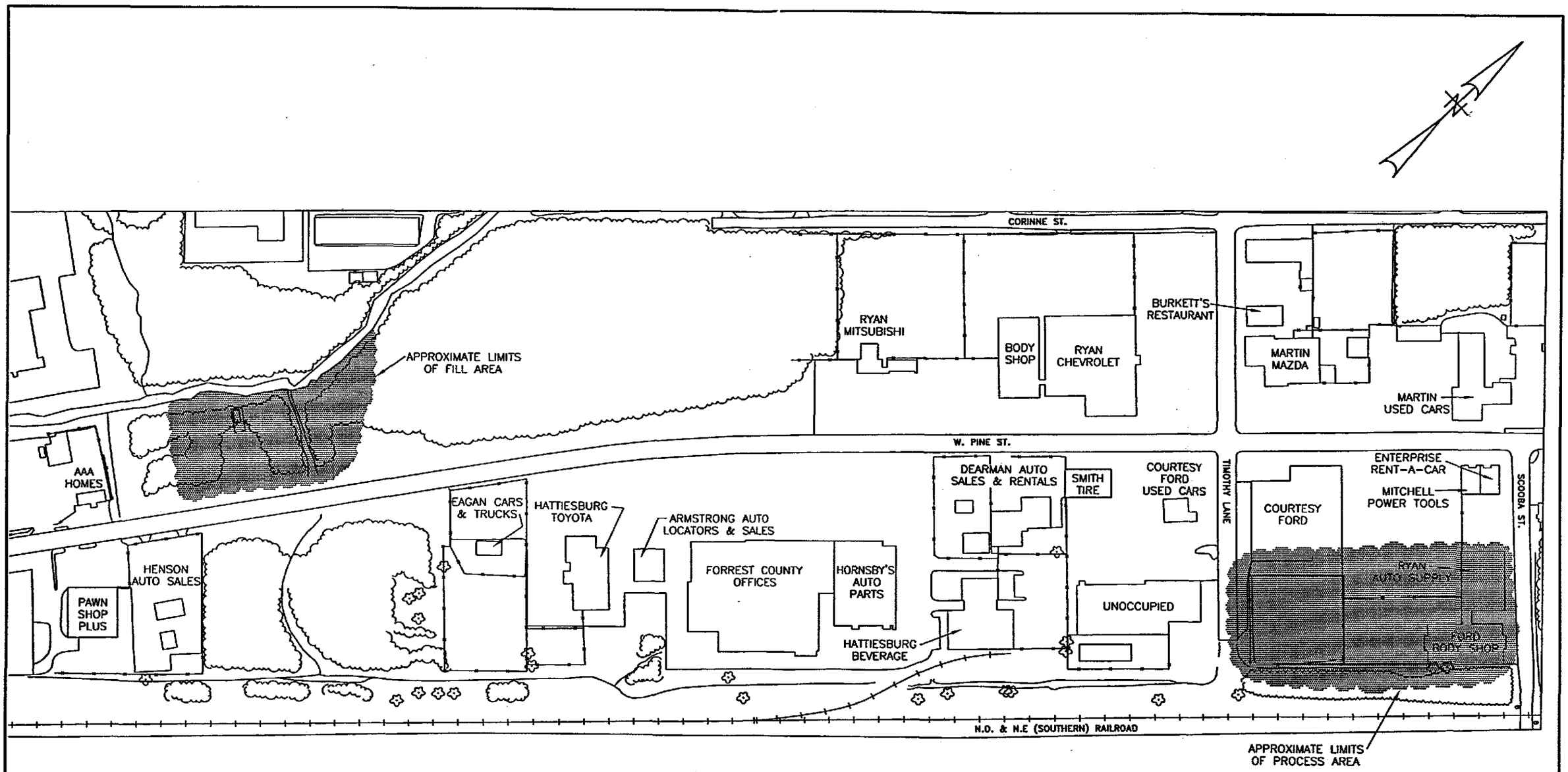
SCALE:

DWG. NO.: 21-01/07A

FIGURE 1-1
SITE LOCATION

FORMER GULF STATES CREOSOTING SITE

HATTIESBURG, MISSISSIPPI



BASE MAP FROM ATLANTIC TECHNOLOGIES, LTD., HUNTSVILLE, ALABAMA, APRIL 1, 1996

MICHAEL PISANI & ASSOCIATES
Environmental Management and Engineering Services
New Orleans, Louisiana — Houston, Texas

TITLE: FIGURE 1-2
CURRENT SITE FEATURES

PROJECT: FORMER GULF STATES CREOSOTING SITE

LOCATION: HATTIESBURG, MISSISSIPPI

SCALE: 1"=200' | DWG. NO.: 21-02/31B

assessment activities. A summary of activities completed and the results of the four phases of ground water investigation are presented in the following subsections.

1.2.1 Remedial Investigation

In February through April 1997, KMC conducted a Remedial Investigation (RI) at the site. The RI included detailed site-wide stratigraphic characterization, as well as the installation of four new monitoring wells. Water level data and ground water quality data were obtained from the four new wells and four existing wells.

Major conclusions from ground water investigations conducted during the RI were:

- The shallow geology of the former Process Area and the Fill Area are significantly different, and the shallow water bearing zones beneath the two areas are not hydraulically connected.
- Ground water flow within the sand channel beneath the former Process Area is eastward in the general direction of the Leaf River.
- Ground water beneath the former Process Area has been impacted by historical creosoting operations. However, affected ground water does not extend westward or southward from the former Process Area.

1.2.2 Phase II Remedial Investigation

In 1998, KMC conducted a Phase II Remedial Investigation (RI) at the site. The Phase II RI included additional stratigraphic characterization, the collection of ground water samples from 13 temporary ground water sampling points, the installation of eight new monitoring wells, and the collection of water level data and ground water quality data from the eight new wells and six existing wells.

Major conclusions from ground water investigations conducted during the Phase II RI were:

- Ground water flow from the former Process Area sand channel continues in an easterly direction into the adjacent residential area. Ground water within the Fill Area sands flows toward Gordon's Creek and downstream along the creek. This provides further evidence that the shallow water bearing zones beneath the two areas are not hydraulically connected.
- Creosote constituents have migrated offsite to the east of the former Process Area via the ground water pathway. However, only non-carcinogenic PAHs were reported in offsite ground water, and the number and concentrations of constituents decrease dramatically with distance from the former Process Area.
- Historically, a ditch that flows offsite to the east from the former Process Area conveyed process wastewater from wood treating operations. Ground water beneath and immediately adjacent to this ditch has been impacted by the vertical migration of constituents from the ditch itself.
- Affected ground water beneath the Fill Area is generally confined to portions of the site where historical filling with impacted materials occurred.

1.2.3 2000 Site Investigation Activities

In August and September 2000, KMC conducted additional site investigation activities at the site. The additional activities included the collection of ground water samples from 18 temporary ground water sampling points, the plugging and abandonment of three of the monitoring wells installed during the 1994 EPS investigation, the installation of two new monitoring wells, and the collection of water level data and ground water quality data from the two new wells and 13 existing wells.

Major conclusions from ground water investigations conducted during 2000 site investigation activities were:

- No DNAPLs are present in former Process Area monitoring wells. The previously documented presence of DNAPLs in two of the wells that were plugged and abandoned as part of additional site investigation activities was apparently the result of faulty well construction.
- The former Process Area plume extends to a maximum distance of 500 feet offsite.
- The extent of affected ground water beneath and immediately adjacent to the northeast drainage ditch has been fully delineated. Affected ground water is confined to a narrow band adjacent to the ditch. The plume originating from the former Process Area and the plume associated with the northeast drainage ditch do not appear to be interconnected.
- The area containing affected ground extends northward from the Fill Area in a thin band along the east bank of Gordon's Creek.

1.2.4 2001 Site Investigation Activities

In February and March 2001, KMC conducted additional site investigation activities at the site. The additional activities included the collection of ground water samples from two temporary ground water sampling points. Major conclusions from ground water investigations conducted during 2001 site investigation activities were:

- The plume originating from the former Process Area and the plume associated with the northeast drainage ditch are definitely not interconnected.
- The extent of affected ground water to the north of the Fill Area has now been fully delineated.

1.3 Plan Objectives

The primary purpose of this document is to establish standard methods for the collection and analysis of ground water samples from monitoring wells at the site. This plan also describes proposed locations for additional plume-defining wells and procedures for reporting of ground water monitoring results.

1.4 Technical Approach

Upon receipt of MDEQ's written approval of the proposed locations for additional plume-defining wells, KMC will complete the installation of the ground water monitoring system. Once the ground water monitoring system is in place, KMC will implement a ground water sampling and analysis program for the site. The ground water analytical program will consist of two major components:

- Analyses for specific constituents associated with creosote (i.e., polycyclic aromatic hydrocarbons, or PAHs) to monitor constituent concentrations over time; and
- Analyses for biogeochemical parameters necessary to evaluate the viability of monitored natural attenuation (MNA) as a ground water remedy.

It is important to stress that KMC is not proposing the use of MNA as a stand-alone ground water remedy. On the contrary, KMC has submitted a *Remedial Action Work Plan* (MP&A, February 14, 2000) that includes proposed source control measures to address existing sources that contribute to each of the three distinct ground water plumes. Thus, KMC does not view MNA to be a "no action" remedy, but rather one that augments source control measures in helping to achieve remedial objectives that are protective of human health and the environment.

2.0 Proposed Ground Water Monitoring System

This section of the plan contains information on the current ground water monitoring well network and includes proposed location for additional plume-defining wells.

2.1 Current Ground Water Monitoring Well Network

Ground water quality and conditions beneath the site have been assessed by a network of 15 monitoring wells. Existing monitoring well locations are depicted on Figure 2-1. Well completion information is summarized in Table 2-1.

The rationale for the locations of the 15 existing monitoring wells was as follows:

- Wells MW-1R, MW-2R, and MW-4 were installed to monitor ground water beneath the former Process Area;
- Wells MW-06, MW-07, MW-08, and MW-09 were installed to monitor ground water downgradient of the former Process Area and/or ground water beneath and adjacent to the northeast drainage ditch;
- Wells MW-10, MW-11, MW-12, and MW-13 were installed to monitor ground water within and adjacent to the Fill Area; and
- Wells MW-01, MW-03, MW-04, and MW-05 were installed to observe ground water conditions on a site-wide basis.

2.2 Proposed Additional Plume-Defining Wells

One of the primary goals of the additional site investigation activities completed in 2000 and 2001 was to fully define the extent of impacted ground water. This goal was achieved through the collection of ground water samples from 20 temporary well points. The approximate extent of impacted ground water in the former Process Area and in the vicinity of the northeast drainage ditch is shown on Figure 2-2; the approximate extent of impacted ground water in the Fill Area is shown on Figure 2-3.

MDEQ has requested that KMC install the additional wells necessary to define the perimeter of the three distinct plumes and to monitor these plumes for potential migration of creosote constituents. KMC proposes the installation of nine additional wells to achieve these goals. Wells will be installed in accordance with procedures that have previously been reviewed and approved by MDEQ.

The locations of proposed monitoring wells are shown on Figures 2-4 and 2-5. The primary function of each existing and proposed well is presented in Table 2-2. Additional information on the monitoring well network is provided in the following sections.

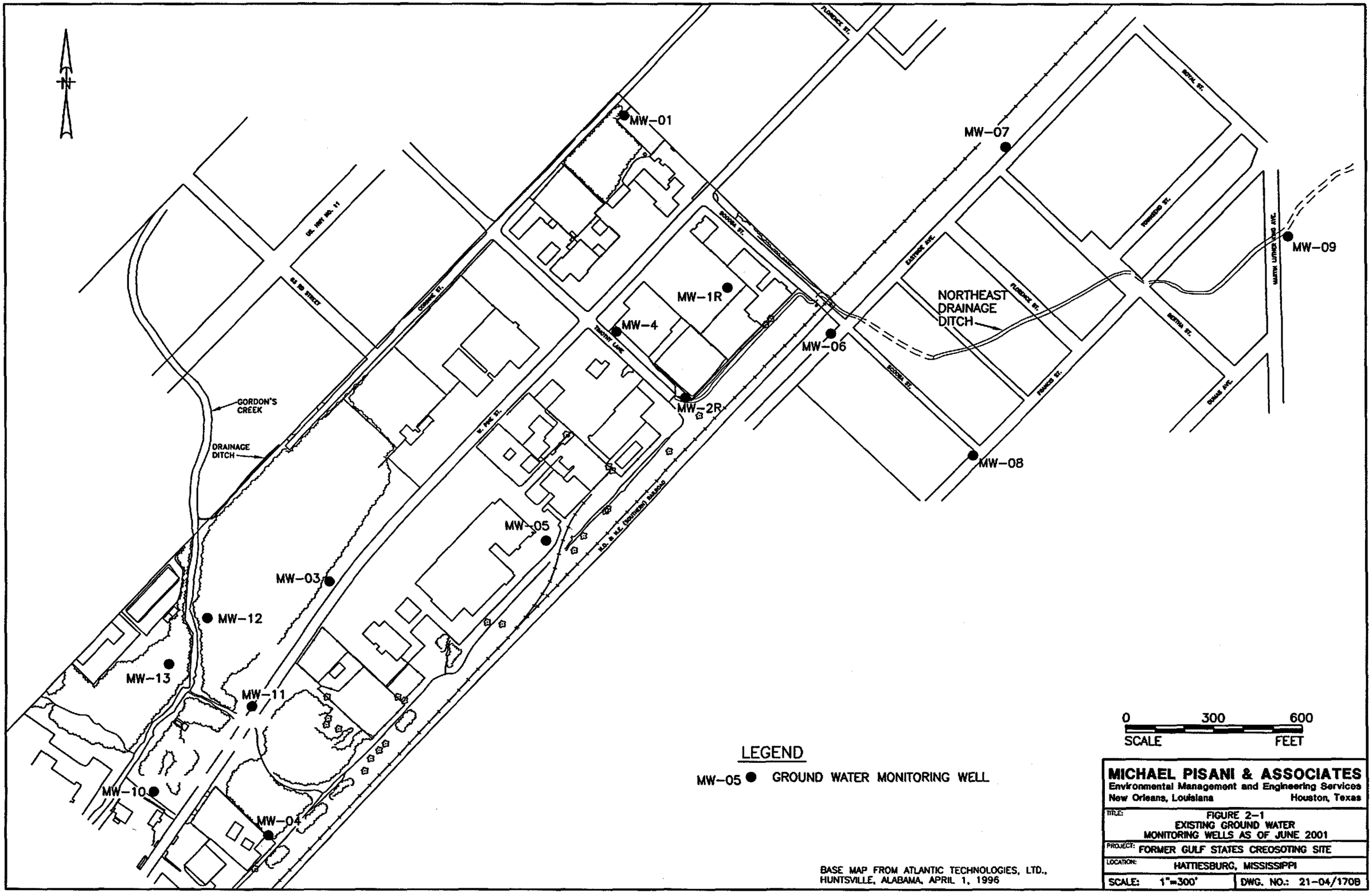
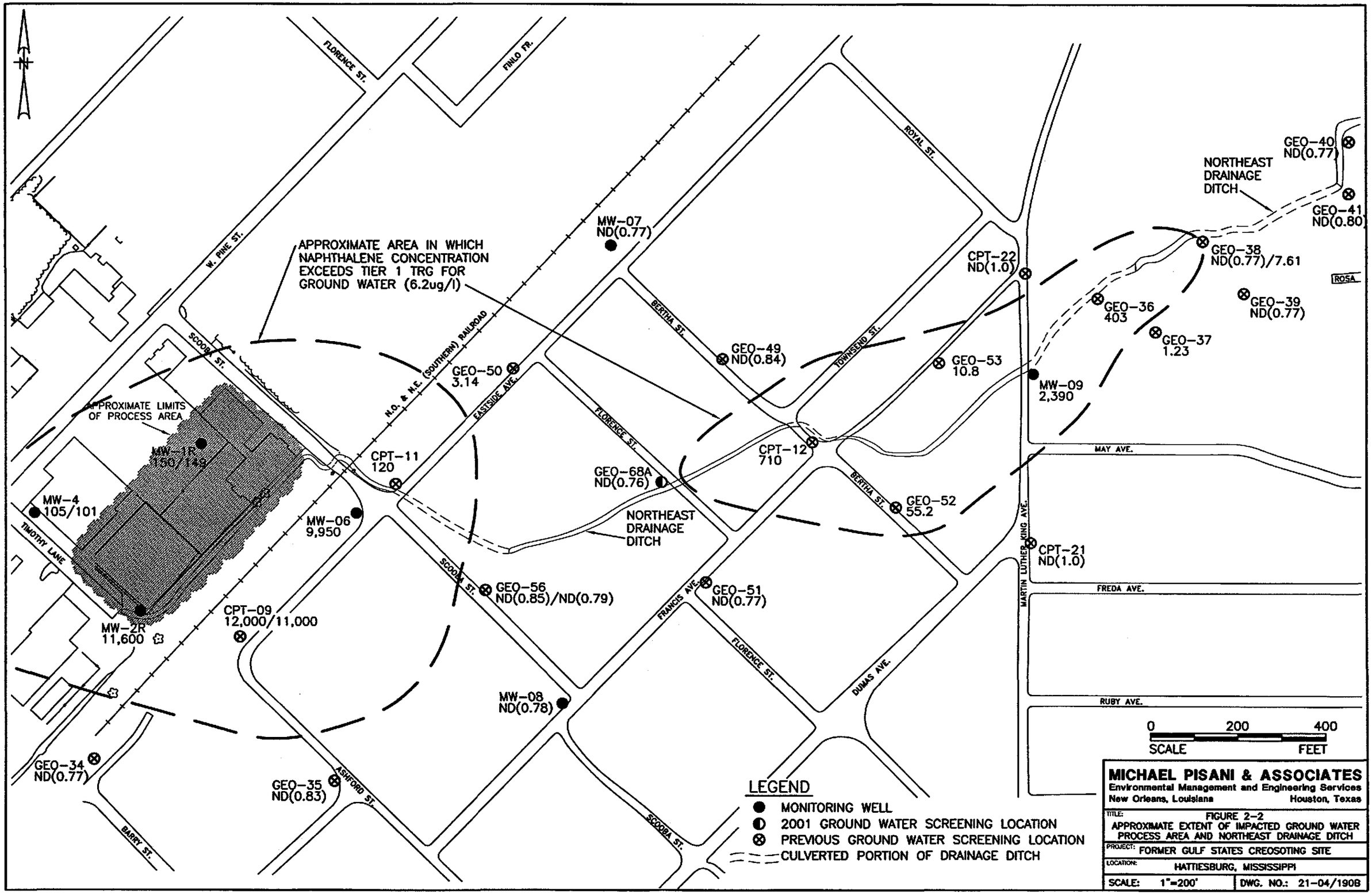

N
MW-01
MW-07
MW-09
MW-1R
MW-4
MW-06
MW-2R
MW-08
MW-05
MW-03
MW-12
MW-13
MW-11
MW-10
MW-04
NORTHEAST DRAINAGE DITCH
GORDON'S CREEK
DRAINAGE DITCH
FLORENCE ST.
ROYAL ST.
TERRYBERRY ST.
MARTIN LUTHER KING AVE.
EASTWOOD AVE.
SCHOOL ST.
COOPER ST.
W. PINE ST.
TIMOTHY LANE
FRANCIS ST.
BERTHA ST.
DUMAS AVE.
OLD 98 STREET
0
300
600
SCALE
FEET
LEGEND
MW-05 ● GROUND WATER MONITORING WELL
BASE MAP FROM ATLANTIC TECHNOLOGIES, LTD., HUNTSVILLE, ALABAMA, APRIL 1, 1996
MICHAEL PISANI & ASSOCIATES
Environmental Management and Engineering Services
New Orleans, Louisiana
Houston, Texas
TITLE: FIGURE 2-1
EXISTING GROUND WATER
MONITORING WELLS AS OF JUNE 2001
PROJECT: FORMER GULF STATES CREOSOTING SITE
LOCATION: HATTIESBURG, MISSISSIPPI
SCALE: 1"=300'
DWG. NO.: 21-04/1708

Table 2-1
Summary of Monitoring Well Completion Information

Former Gulf States Creosoting Site
Hattiesburg, Mississippi

Well	Date Installed	Borehole Diameter (inches)	Well Diameter (inches)	Construction Material	Well Depth (ft. bls)	Top of Casing Elevation (ft. msl)	Screened Interval (ft. bls)	Screened Interval Elevation (ft. msl)
MW-4	May 1994	10.25	4	PVC	34	191.42	24-34	157.42-167.42
MW-01	February 1997	8.25	2	PVC	35	186.14	17-32	154.14-169.14
MW-03	February 1997	8.25	2	PVC	37	189.24	29-34	155.24-160.24
MW-04	February 1997	8.25	2	PVC	40	191.28	27-37	154.28-164.28
MW-05	February 1997	8.25	2	PVC	42	191.59	19-39	152.59-172.59
MW-06	September 1998	8.25	2	PVC	38	185.44	18-38	147.44-167.44
MW-07	September 1998	8.25	2	PVC	38	186.45	18-38	148.45-168.45
MW-08	September 1998	8.25	2	PVC	40	188.73	20-40	148.73-168.73
MW-09	September 1998	8.25	2	PVC	28	174.99	13-28	146.99-161.99
MW-10	September 1998	8.25	2	PVC	13	186.73	8-13	173.73-178.73
MW-11	September 1998	8.25	2	PVC	14	187.76	9-14	173.76-178.76
MW-12	September 1998	8.25	2	PVC	22	183.84	17-22	161.84-166.84
MW-13	September 1998	8.25	2	PVC	19	183.98	9-19	164.98-174.98
MW-1R	August 2000	12/8.25	2	Stainless Steel	42	189.06	37-42	147.06-152.06
MW-2R	August 2000	12/8.25	2	Stainless Steel	44	190.45	39-44	146.45-151.45

Note:
All elevations are referenced to the North American Vertical Datum of 1988 (NAVD 88) and are reported with respect to mean sea level (msl).
bls - below land surface



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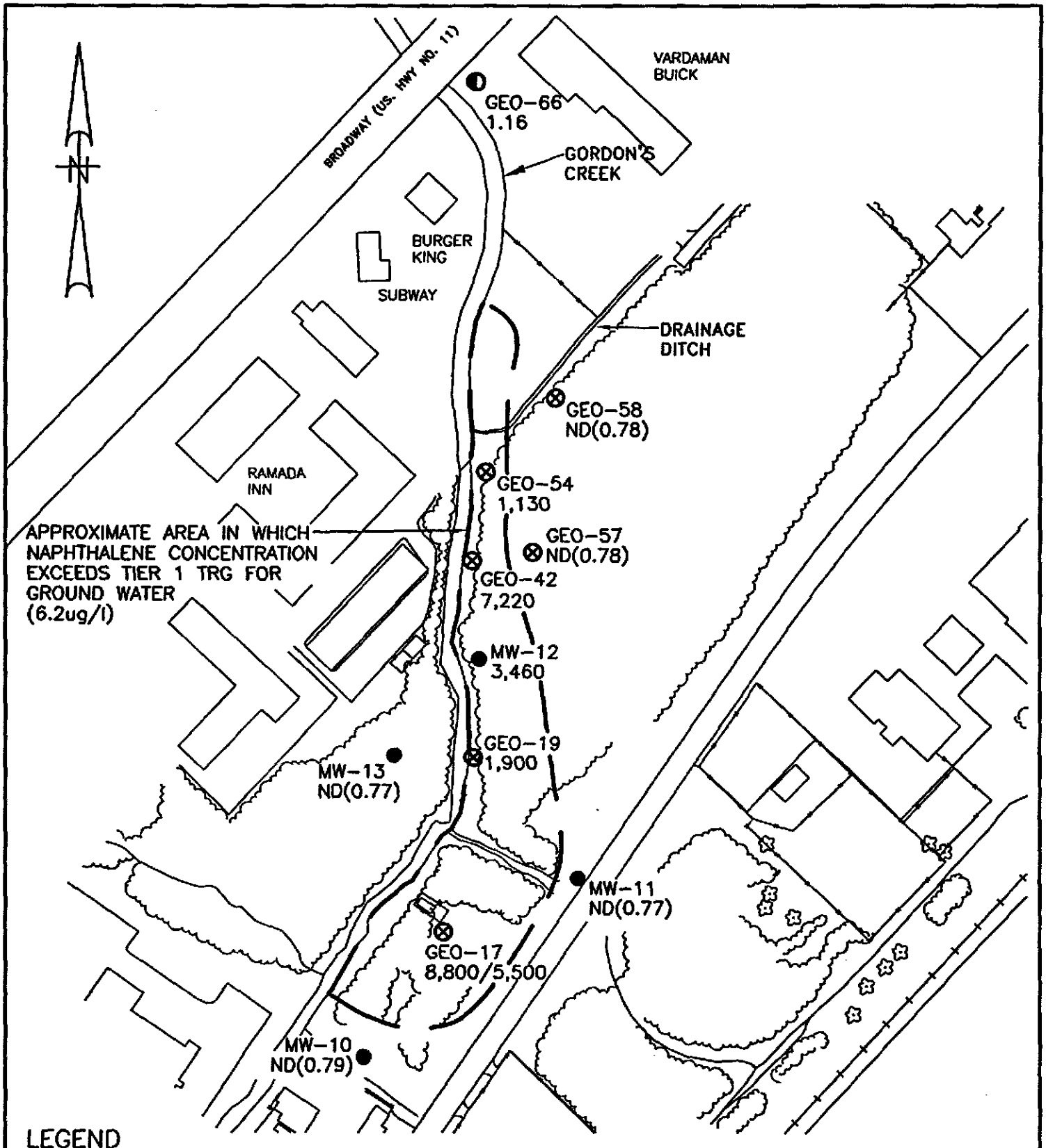
Environmental Management and Engineering Services
New Orleans, Louisiana Houston, Texas

TITLE: FIGURE 2-2
APPROXIMATE EXTENT OF IMPACTED GROUND WATER PROCESS AREA AND NORTHEAST DRAINAGE DITCH

PROJECT: FORMER GULF STATES CREOSOTING SITE

LOCATION: HATTIESBURG, MISSISSIPPI

SCALE: 1"=200' DWG. NO.: 21-04/1908



BASE MAP FROM ATLANTIC TECHNOLOGIES, LTD., HUNTSVILLE, ALABAMA, APRIL 1, 1996

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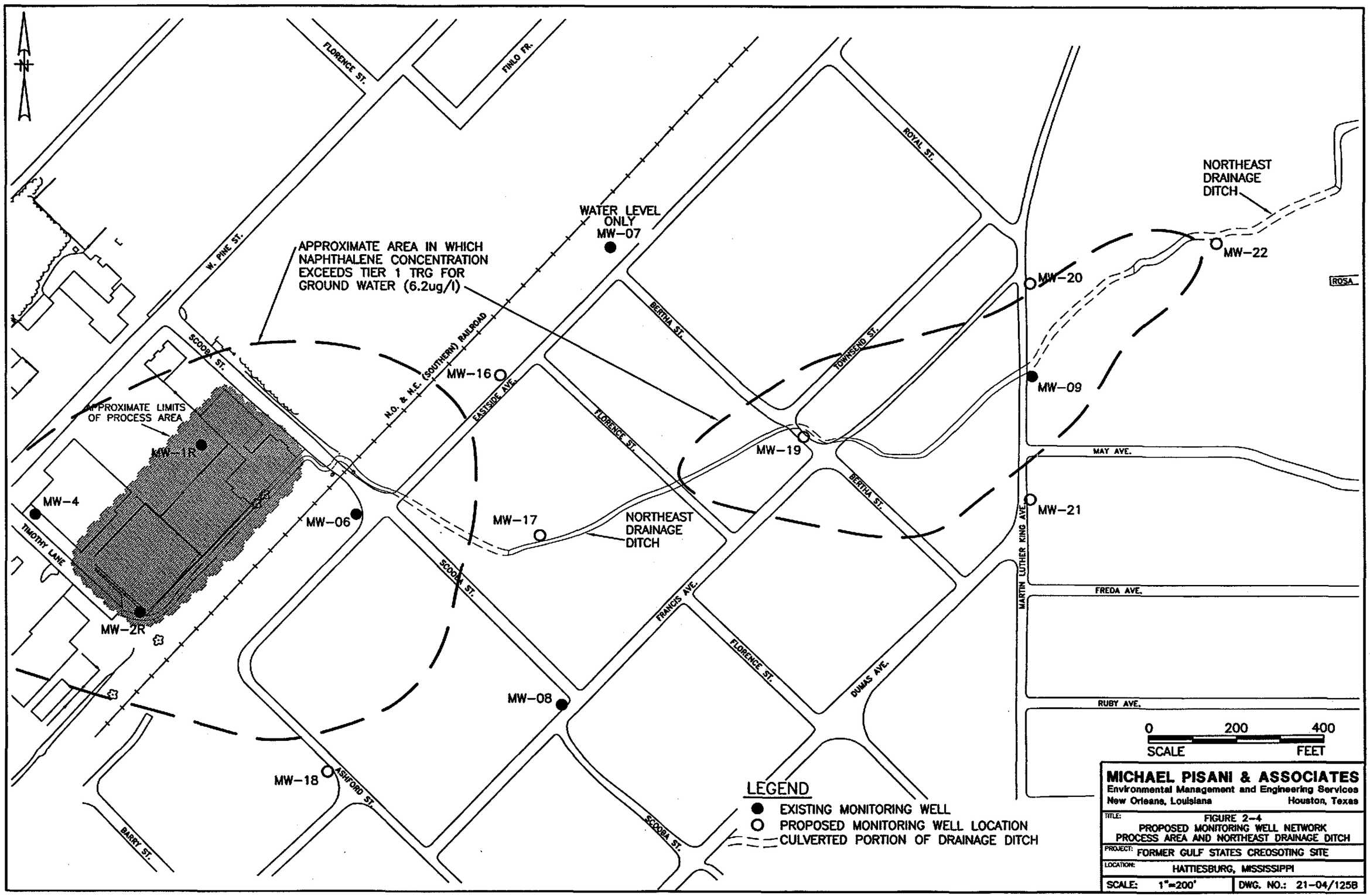
Environmental Management and Engineering Services
New Orleans, Louisiana Houston, Texas

SCALE: 1"=200' | DWG. NO.: 21-04/191A

FIGURE 2-3
PROPOSED MONITORING WELL NETWORK
FILL AREA

FORMER GULF STATES CREOSOTING SITE
HATTIESBURG, MISSISSIPPI



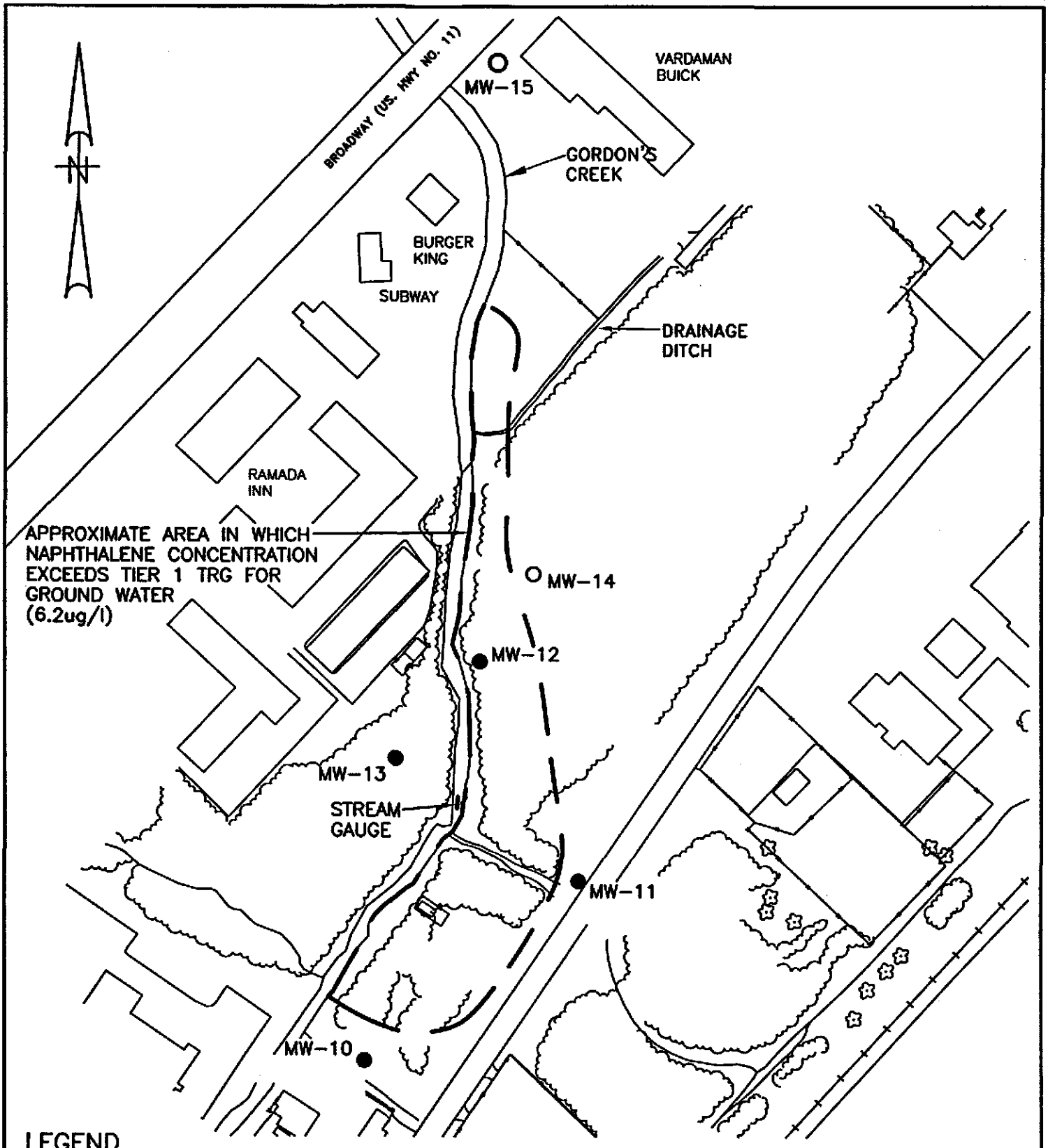
MICHAEL PISANI & ASSOCIATES
Environmental Management and Engineering Services
New Orleans, Louisiana Houston, Texas

TITLE: FIGURE 2-4
PROPOSED MONITORING WELL NETWORK
PROCESS AREA AND NORTHEAST DRAINAGE DITCH

PROJECT: FORMER GULF STATES CREOSOTING SITE

LOCATION: HATTIESBURG, MISSISSIPPI

SCALE: 1"=200' DWG. NO.: 21-04/125B



BASE MAP FROM ATLANTIC TECHNOLOGIES, LTD., HUNTSVILLE, ALABAMA, APRIL 1, 1996

MICHAEL PISANI & ASSOCIATES
Environmental Management and Engineering Services
New Orleans, Louisiana Houston, Texas

SCALE: 1"=200' | DWG. NO.: 21-04/169A

FIGURE 2-5
PROPOSED MONITORING WELL NETWORK
FILL AREA

FORMER GULF STATES CREOSOTING SITE
HATTIESBURG, MISSISSIPPI

Table 2-2
Wells Included in Proposed Ground Water Monitoring Program

Former Gulf States Creosoting Site
Hattiesburg, Mississippi

Well	Primary Function	Proposed Monitoring Frequency (first two years)
Wells Located within Plumes		
MW-1R	Monitor ground water within Process Area plume	Annual
MW-2R	Monitor ground water within Process Area plume	Annual
MW-4	Monitor ground water within Process Area plume	Annual
MW-06	Monitor ground water within Process Area plume	Annual
MW-09	Monitor ground water within Drainage Ditch plume	Annual
MW-19 (a)	Monitor ground water within Drainage Ditch plume	Annual
MW-12	Monitor ground water within Fill Area plume	Annual
Upgradient Wells		
MW-05	Monitor ground water upgradient of Process Area plume	Annual
MW-10	Monitor ground water upgradient of Fill Area plume	Annual
MW-11	Monitor ground water upgradient of Fill Area plume	Annual
Downgradient Wells		
MW-08	Monitor ground water downgradient of Process Area plume	Quarterly
MW-13	Monitor ground water beneath west bank of Gordon's Creek	Quarterly
MW-16 (a)	Monitor ground water downgradient of Process Area plume	Quarterly
MW-17 (a)	Monitor ground water upgradient of drainage ditch plume and downgradient of Process Area plume	Quarterly
MW-18 (a)	Monitor ground water downgradient of Process Area plume	Quarterly
MW-20 (a)	Monitor ground water downgradient of Drainage Ditch plume	Quarterly
MW-21 (a)	Monitor ground water downgradient of Drainage Ditch plume	Quarterly
MW-22 (a)	Monitor ground water downgradient of Drainage Ditch plume	Quarterly
MW-14 (a)	Monitor ground water downgradient of Fill Area plume	Quarterly
MW-15 (a)	Monitor ground water downgradient of Fill Area plume	Quarterly
Other Wells/Gauges		
MW-01	Monitor ground water level	None
MW-03	Monitor ground water level	None
MW-04	Monitor ground water level	None
MW-07	Monitor ground water level	None
Stream Gauge	Monitor surface water level in Gordon's Creek	None

(a) - Proposed well

2.2.1 Former Process Area and Northeast Drainage Ditch

Proposed locations for additional wells to monitor the former Process Area plume and the northeast drainage ditch plume are depicted on Figure 2-4. The rationale for the inclusion of new and additional wells in the monitoring program is as follows:

- Existing wells MW-1R, MW-2R, MW-4, and MW-06 will be sampled to monitor constituent concentrations within the former Process Area plume over time;
- Proposed wells MW-16, MW-17, and MW-18 and existing well MW-08 will be sampled to monitor for movement of the former Process Area plume (Note: Once MW-16 is installed, MW-07 will continue to be gauged for water levels, but will not be sampled);
- Proposed well MW-19 and existing well MW-09 will be sampled to monitor constituent concentrations within the northeast drainage ditch plume over time; and
- Proposed wells MW-20, MW-21, and MW-22 will be sampled to monitor for movement of the northeast drainage ditch plume.

2.2.2 Fill Area

Proposed locations for additional wells to monitor the Fill Area plume are depicted on Figure 2-5. Proposed wells MW-14 and MW-15 and existing wells MW-10, MW-11, and MW-12 will be sampled to monitor for movement of the Fill Area plume. Existing well MW-13 will be sampled to monitor ground water quality across Gordon's Creek from the Fill Area. Water levels at the stream gauge will be recorded to evaluate the relationship between Gordon's Creek and ground water adjacent to the creek.

2.2.3 Other Onsite Wells

Existing wells MW-01, MW-03, and MW-04 (see Figure 2-1) will continue to be gauged to monitor site-wide water levels. Ground water samples will not be collected from these wells.

3.0 Ground Water Sampling Procedures

This section of the plan presents procedures for the collection and handling of ground water samples.

3.1 Sample Containers and Preservatives

Prior to each sampling event, clean, dedicated sample containers will be provided by the contract laboratory(s). The laboratory(s) will add any necessary chemical preservatives to sample containers prior to shipping. The appropriate container type, preservative, and prescribed holding time for each analysis are summarized in Table 3-1.

3.2 Well Purging

Prior to sampling, wells will be purged to remove standing water. The removal of standing water will facilitate the collection of samples that are representative of ground water within the screened zones. Prior to purging, the water level in each well will be measured to the nearest 0.01 foot with an electronic water level indicator. In addition to calculating well volumes, water level data will be used in conjunction with surveyed top-of-casing data to determine ground water elevations and flow direction.

The wells will be purged with an adjustable-rate, low-flow submersible pump and disposable polyethylene tubing. If possible, the pumping rate will be adjusted so that the purge rate is equal to the recharge rate (i.e., there is little or no drawdown in the well). During purging, a multiprobe meter with a flow-through cell will be used to monitor field parameters (i.e., pH, Eh, specific conductance, temperature, and dissolved oxygen). The approximate volume of water removed will be measured and recorded during purging. Well purging will be considered complete when:

1. a minimum of three well volumes has been removed;
2. a well has been purged to dryness; or,
3. field indicator parameters have stabilized to within 10 percent of the mean for three consecutive readings.

3.3 Sample Collection

Within 24 hours after purging, ground water samples will be collected either with the low-flow pump and dedicated tubing or a dedicated, disposable bailer. Ground water will be discharged directly from the tubing or bailer into clean, laboratory-supplied sample containers. Samples for analyses of biogeochemical analysis will be collected first, followed by samples for PAH analysis. The proposed analytical program is presented in Section 4 of this report. Samples will be placed immediately on ice in insulated coolers. Strict chain-of-custody documentation will be maintained during sample collection, transport, and laboratory analysis.

Table 3-1
Analytical Methods, Container Types, Preservatives, and Holding Times

Former Gulf States Creosoting Site
Hattiesburg, Mississippi

Analysis	Method	Container Type	Preservative	Holding Time
Polycyclic aromatic hydrocarbons	SW-846 8270 or 8310	2 amber liters	none or sodium thiosulfate	extraction 7 days, analysis 40 days
Nitrate	EPA 300	2 40 ml glass vials	none	48 hours
Sulfate and chloride	EPA 300	1 250 ml plastic	none	28 days
Methane	SW-846 8015B modified	2 40 ml glass vials	HCl	14 days
Alkalinity	EPA 310.1	1 250 ml plastic	none	14 days
Iron (total and dissolved)	SW-846 6010B	2 500 ml plastic	HNO_3	6 months

3.4 Field Quality Assurance/Quality Control (QA/QC) Samples

Field QA/QC samples will be collected during each sampling event. QA/QC samples will be of the following types and frequency:

- Blind duplicate samples will be collected at the rate of 5 percent (1 per 20) of the total number of ground water samples collected. Duplicate samples will be collected by filling a second set of containers at random well locations. These samples, intended to verify the constituent concentrations at the sampling point, will be submitted blindly to the laboratory under a fictitious identifier. The actual identity of the blind duplicate will be documented in the field logbook.
- Equipment rinsate blanks will be prepared at the rate of one sample per event. Equipment rinsate blanks will consist of distilled water poured over decontaminated equipment used in sample collection. Equipment blanks are intended to identify sources of contamination from incomplete decontamination of equipment or from the decontamination solutions or procedures.

3.5 Sample Shipment

Samples will be packaged in a manner that minimizes the potential for leakage or breakage. Sample coolers will be delivered to the analytical laboratory(s) via overnight courier. The temperature of the samples will be recorded upon receipt at the laboratory(s).

3.6 Chain-of-Custody Control

Chain-of-custody forms will be utilized to document sample custody from collection through analysis. Custody forms will contain the following information:

- Sample identification number;
- Sampler's printed name and signature;
- Date and time of sample collection;
- Sample matrix;
- Analyses requested;
- Chemical preservatives; and
- Signatures of individuals in possession of the samples at any time.

The sampler will retain one copy of each chain-of-custody form. Two copies of each form will be shipped to the laboratory inside the sample cooler(s). Chain-of-custody seals will be placed on each cooler to prevent tampering with the samples. Samples must remain in the physical possession of the sample custodian, in direct view of the sample custodian, or stored in a secured area at all times.

4.0 Analytical Program

This section provides information on the proposed analytical suite for the ground water monitoring program.

4.1 Site-Related Constituents

Analytical results from previous ground water monitoring indicate that constituents of concern in ground water are limited to polycyclic aromatic hydrocarbons (PAHs). The single most prevalent constituent in ground water at the site is naphthalene. Naphthalene is also the only constituent present in offsite ground water at concentrations exceeding MDEQ Tier 1 target remediation goals (TRGs).

A list of PAHs to be analyzed is provided in Table 4-1. Samples will be analyzed by either SW-846 Method 8270 or 8310. Regardless of the method utilized, the laboratory will take measures to ensure that laboratory reporting limits do not exceed MDEQ Tier 1 TRGs for ground water.

4.2 Biogeochemical Parameters

Samples will be analyzed for biogeochemical parameters in order to evaluate the viability of monitored natural attenuation (MNA) as a ground water remedy. Data obtained from these analyses will be used to document intrinsic remediation of creosote constituents and may, in the future, be input into a solute fate and transport model. A list of biogeochemical parameters to be analyzed is provided in Table 4-1.

Table 4-1
Analytical Parameters

Former Gulf States Creosoting Site
Hattiesburg, Mississippi

Polycyclic Aromatic Hydrocarbons	Biogeochemical Parameters
Naphthalene	Nitrate
Acenaphthylene	Sulfate
Acenaphthene	Methane
Fluorene	Alkalinity
Phenanthrene	Chloride
Anthracene	Iron (total and dissolved)
Fluoranthene	
Pyrene	
Benzo(a)anthracene	Field Parameters
Chrysene	pH
Benzo(b)fluoranthene	Temperature
Benzo(k)fluoranthene	Specific conductance
Benzo(a)pyrene	Dissolved oxygen
Dibenzo(a,h)anthracene	Ferrous iron
Benzo(g,h,i)perylene	Oxidation-reduction potential (Eh)
Indeno(1,2,3-c,d)pyrene	

5.0 Monitoring Frequency

MDEQ personnel have stated that MDEQ has an unwritten policy requiring a minimum of two full years of quarterly ground water monitoring at a site. Once the first two years of data are collected and evaluated, an owner/operator or other responsible party may submit a request for decreased monitoring frequency (e.g., semiannual or annual ground water monitoring). During the first two years of monitoring at the Gulf States Creosoting site, samples will be collected from upgradient wells and wells within the plumes annually and from downgradient wells quarterly. The upgradient wells and wells within the plume will be sampled less frequently since constituent concentrations are not expected to vary significantly over short periods of time.

The proposed monitoring frequency for each well is shown on Table 2-2. KMC will conduct the sampling and analytical program outlined in Sections 2 through 4 for two calendar years 2001 and 2002 beginning upon receipt of MDEQ approval of this monitoring plan. Once the data from the first two years has been evaluated, KMC may submit a request for decreased monitoring frequency, including the rationale for any proposed decrease.

6.0 Reporting

This section presents reporting requirements for the ground water monitoring program.

6.1 Quarterly Laboratory Reports

It is anticipated that reports of laboratory analyses will be received within approximately 30 days of completion of each sampling event. During the first two years of monitoring, copies of laboratory reports will be submitted to MDEQ subsequent to each event.

6.2 Annual Ground Water Monitoring Reports

Subsequent to each calendar year of monitoring, the results from the previous year of monitoring will be submitted to MDEQ in an annual ground water monitoring report. Annual reports will include a description of ground water monitoring activities conducted during the previous year. Monitoring results will be tabulated in two formats: one table will be generated for each monitoring event, and a master table will be updated after each event to compile results on a well-by-well basis over time. In addition, water level data from each event will be tabulated, and potentiometric surface maps for each monitoring event will be generated. Ground water data will be evaluated to identify trends in concentrations of target constituents; graphical representations of concentrations over time will be provided where appropriate.

The results of biogeochemical analyses will be evaluated to assess the potential for intrinsic ground water remediation. Numerical models may be utilized to demonstrate the occurrence of intrinsic remediation. Annual reports will present conclusions from the previous year's monitoring and will provide recommendations for modifications to the ground water monitoring program, should any be necessary.