Attachment A

Management of Remediation Waste Under RCRA

United States

Environmental Protection Agency

Solid Waste and
Emergency Response
(5305W)

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Management of Remediation Waste Under RCRA

October 14, 1998

MEMORANDUM

SUBJECT: Management of Remediation Waste Under RCRA

TO: RCRA/CERCLA Senior Policy Managers
Regional Counsels

FROM: Timothy Fields, Jr., Acting Assistant Administrator for
Solid Waste and Emergency Response ***/signed/***

Steven A. Herman, Assistant Administrator for
Enforcement and Compliance Assurance ***/signed/***

Rapid clean up of RCRA corrective action facilities and Superfund sites is one of the Agency's highest priorities. In this context, we often receive questions about management of remediation waste under the Resource Conservation and Recovery Act (RCRA). To assist you in successfully implementing RCRA requirements for remediation waste, this memorandum consolidates existing guidance on the RCRA regulations and policies that most often affect remediation waste management. We encourage you to work with the regulations, policies and approaches outlined in this memorandum to achieve our cleanup goals as quickly and efficiently as possible.

Note that not all remediation wastes are subject to RCRA Subtitle C hazardous waste requirements. As with any other solid waste, remediation wastes are subject to RCRA Subtitle C only if they are listed or identified hazardous waste. Environmental media are subject to RCRA Subtitle C only if they contain listed hazardous waste, or exhibit a characteristic of hazardous waste. These distinctions are discussed more completely below.

The information in this memo is divided into three categories: information on regulations and policies that apply to all remediation waste; information on regulations and policies that apply only to contaminated media; and, information on regulations and policies that apply only to contaminated debris. Most of the references cited in this memo are available over the Internet. The Federal Register notices published after 1994 are available at www.access.gpo.gov/nara; the guidance memos and other EPA documents are available at www.epa.gov/correctiveaction. Federal Register notices and other documents are also available through the RCRA/CERCLA hotline: in Washington D.C., call (703) 412-9810; outside Washington D.C., call (800) 424-9346; and hearing impaired call (800) 553-7672. The hotline's hours are Monday - Friday, excluding Federal holidays, 8:00 - 5:00, eastern standard time. Many EPA guidance memos and other documents may also be obtained through the RCRA/CERCLA hotline fax-back system. To obtain a list of documents available over the fax-back system, and fax-back system code numbers, call the RCRA/CERCLA hotline at the numbers listed above.

I hope this information will assist you as you continue to make protective, inclusive, and efficient cleanup decisions. If you have additional questions or require more information, please contact

Robert Hall or Greg Madden, of our staffs, on (703) 308-8484 or (202) 564-4229 respectively.

Regulations and Policies that Apply to All Remediation Wastes

Area of Contamination Policy. In what is typically referred to as the area of contamination (AOC) policy, EPA interprets RCRA to allow certain discrete areas of generally dispersed contamination to be considered RCRA units (usually landfills). Because an AOC is equated to a RCRA land-based unit, consolidation and *in situ* treatment of hazardous waste within the AOC do not create a new point of hazardous waste generation for purposes of RCRA. This interpretation allows wastes to be consolidated or treated *in situ* within an AOC without triggering land disposal restrictions or minimum technology requirements. The AOC interpretation may be applied to any hazardous remediation waste (including non-media wastes) that is in or on the land. Note that the AOC policy only covers consolidation and other in situ waste management techniques carried out within an AOC. For *ex situ* waste management or transfer of wastes from one area of contamination to another, see discussion of corrective action management units, below.

The AOC policy was first articulated in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). See 53 FR 51444 for detailed discussion in proposed NCP preamble; 55 FR 8758-8760, March 8, 1990 for final NCP preamble discussion. See also, most recent EPA guidance, March 13, 1996 EPA memo, "Use of the Area of Contamination Concept During RCRA Cleanups."

Corrective Action Management Units (CAMUs). The corrective action management unit rule created a new type of RCRA unit - a Corrective Action Management Unit or CAMU -- specifically intended for treatment, storage and disposal of hazardous remediation waste. Under the CAMU rule, EPA and authorized states may develop and impose site-specific design, operating, closure and post-closure requirements for CAMUs in lieu of MTRs for land-based units. Although there is a strong preference for use of CAMUs to facilitate treatment, remediation waste placed in approved CAMUs does not have to meet LDR treatment standards.

The main differences between CAMUs and the AOC policy (discussed above) are that, when a CAMU is used, waste may be treated *ex situ* and then placed in a CAMU, CAMUs may be located in uncontaminated areas at a facility, and wastes may be consolidated into CAMUs from areas that are not contiguously contaminated. None of these activities are allowed under the AOC policy, which, as discussed above, covers only consolidation and *in situ* management techniques carried out within an AOC.

CAMUs must be approved by EPA or an authorized state and designated in a permit or corrective action order. In certain circumstances, EPA and states (including states that are not authorized for the CAMU regulations) may use other mechanisms to approve CAMUs. See, 58 FR 8677, February 16, 1993; appropriate use of RCRA Section 7003 orders and comparable state orders is discussed below and in an EPA guidance memo from J. Winston Porter to EPA Regional Administrators, "RCRA Permit Requirements for State Superfund Actions," November 16, 1987, OSWER Directive 9522.00-2. In addition, as appropriate, CAMUs may be approved by EPA as an applicable or relevant and appropriate requirement during a CERCLA cleanup using a record of decision or by an authorized state during a state cleanup using a CERCLA-like authority and a similar state document. See, e.g., 58 FR 8679, February 16, 1993. An opportunity for the public to review and comment on tentative CAMU approvals is required by the regulations when CAMUs are approved using permitting procedures and as a matter of EPA policy when CAMUs are approved using orders. EPA recommends that, whenever possible, remediation project managers combine this public participation with other public involvement activities that are typically part of remediation. For example, public notice of tentative approval of a CAMU could be combined with public notice of a proposed plan under CERCLA.

The CAMU rule is currently subject to litigation; however, the suit has been stayed pending promulgation of the final HWIR-Media regulations. Although EPA proposed to withdraw CAMUs as part of the HWIR-Media proposal, the Agency now intends to retain the CAMU rule. The Agency encourages approval of CAMUs when they are appropriate given the site-specific conditions.

The CAMU regulations are at 40 CFR 264.552, promulgated February 16, 1993 (58 FR 8658). The differences between CAMUs and AOCs are discussed in more detail in the March 13, 1996 EPA guidance memo, "Use of the Area of Contamination Concept During RCRA Cleanups."

Corrective Action Temporary Units (TUs). Temporary units, like corrective action management units, are RCRA units established specifically for management of hazardous remediation waste. The regulations for temporary units (TUs) were promulgated at the same time as the regulations for corrective action management units. The CAMU regulations established land-based units for treatment, storage and disposal of remediation waste; the TU regulations established non-land based units for treatment and storage of hazardous remediation waste. Under the TU regulations, EPA and authorized states may modify existing MTR design, operating and closure standards for temporary tank and container units used to treat and store hazardous remediation waste. Temporary units may operate for one year, with an opportunity for a one year extension.

Like CAMUs, temporary units must be approved by EPA or an authorized state and designated in a permit or corrective action order. In certain circumstances, EPA and states (including states that are not authorized for the TU regulations) may use other mechanisms to approve TUs. See, 58 FR 8677, February 16, 1993; appropriate use of RCRA Section 7003 orders and comparable state orders is discussed below and in an EPA guidance memo from J. Winston Porter to EPA Regional Administrators, "RCRA Permit Requirements for State Superfund Actions," November 16, 1987, OSWER Directive 9522.00-2. In addition, as appropriate, TUs may be approved by EPA as an applicable or relevant and appropriate requirement during a CERCLA cleanup using a record of decision or by an authorized state during a state cleanup using a CERCLA-like authority and a similar state document. Placement of waste in tanks or containers, including temporary units, is not considered land disposal. Therefore, waste does not have to be treated to meet LDR treatment standards prior to being placed in a TU. Of course, LDRs must be met if hazardous remediation wastes are eventually land disposed, for example, after they are removed from the TU; however, if treatment in a TU results in constituent concentrations that comply with applicable land disposal restriction treatment standards, no further treatment prior to land disposal is required as a condition of the LDRs.

An opportunity for the public to review and comment on tentative TU approvals is required by the regulations when TUs are approved using permitting procedures and as a matter of EPA policy when TUs are approved using orders. As with CAMUs, EPA recommends that whenever possible, remediation project managers combine this public participation with other public involvement activities that are typically part of remediation. For example, public notice of tentative approval of a temporary unit could be combined with public notice of a proposed plan under CERCLA.

The TU regulations are at 40 CFR 264.553, promulgated February 16, 1993 (58 FR 8658).

Determination Of When Contamination is Caused by Listed Hazardous Waste. Where a facility owner/operator makes a good faith effort to determine if a material is a listed hazardous waste but cannot make such a determination because documentation regarding a source of contamination, contaminant, or waste is unavailable or inconclusive, EPA has stated that one may assume the source, contaminant or waste is not listed hazardous waste and, therefore, provided the material in question does not exhibit a characteristic of hazardous waste, RCRA requirements do not apply. This approach was first articulated in the Proposed NCP preamble which notes that it is often necessary to know the source of a waste (or contaminant) to determine whether a waste is a listed hazardous waste under RCRA Listing determinations are often particularly difficult in the remedial context because the listings are generally identified by the sources of the hazardous wastes rather than the concentrations of various hazardous constituents; therefore, analytical testing alone, without information on a waste's source, will not generally produce information that will conclusively indicate whether a given waste is a listed hazardous waste. and also notes that, "at many CERCLA sites no information exists on the source of the wastes." The proposed NCP preamble goes on to recommend that the lead agency use available site information such as manifests, storage records and vouchers in an effort to ascertain the sources of wastes or contaminants, but that when this documentation is not available or inconclusive the lead agency may assume that the wastes (or contaminants) are not listed RCRA hazardous wastes. This approach was confirmed in the final NCP preamble. See, 53 FR 51444, December 21, 1988 for proposed NCP preamble discussion; 55 FR 8758, March 13, 1990 for final NCP preamble discussion.

This approach was also discussed in the HWIR-Media proposal preamble, 61 FR 18805, April 29, 1996, where it was expanded to also cover dates of waste disposal - i.e., if, after a good faith effort to determine dates of disposal a facility owner/operator is unable to make such a determination because documentation of dates of disposal is unavailable or inconclusive, one may assume disposal occurred prior to the effective date of applicable land disposal restrictions. This is important because, if hazardous waste was originally disposed of before the effective dates of applicable land disposal restrictions and media contaminated by the waste are determined not to contain hazardous waste when first generated (i.e., removed from the land, or area of contamination), the media are not subject to RCRA requirements, including LDRs. See the discussion of the contained-in policy, below.

Site Specific LDR Treatment Variances. The regulations for site-specific LDR treatment variances allow EPA and authorized states to establish a site-specific LDR treatment standard on a case-by-case basis when a nationally applicable treatment standard is unachieveable or inappropriate. Public notice and a reasonable opportunity for public comment must be provided before granting or denying a site-specific LDR treatment variance. EPA recommends that remediation project managers combine this public involvement with other public involvement activities that are typically part of remediation. Regulations governing site-specific LDR treatment variances are at 40 CFR 268.44(h), promulgated August 17, 1988 (53 FR 31199) and clarified December 5, 1997 (62 FR 64504). The most recent EPA guidance on site-specific LDR treatment variances, which includes information on establishing alternative LDR treatment standards, is in the January 8, 1997 guidance memo, "Use of Site-Specific Land Disposal Restriction Treatability Variances Under 40 CFR 268.44(h) During Cleanups."

In 1996, EPA revised its policy on state authorization for site-specific LDR treatment variances and began encouraging states to become authorized to approve variances. See, HWIR-Media proposal, 61 FR 18828 (April 29, 1996).

On May 26, 1998, EPA promulgated additional site-specific land disposal restriction treatment variance opportunities specific to hazardous contaminated soil. These opportunities are discussed below.

Treatability Studies Exemption. The term "treatability study"as defined at 40 CFR 260.10 refers to a study in which a hazardous waste is subjected to a treatment process to determine: (1) whether the waste is amenable to the treatment process; (2) what pretreatment (if any) is required; (3) the optimal process conditions needed to achieve the desired treatment; (4) the efficiency of a treatment process for a specific waste or wastes; or, (5) the characteristics and volumes of residuals from a particular treatment process. Under regulations at 40 CFR 261.4(e) and (f), hazardous wastes managed during a treatability study are exempt from many RCRA Subtitle C requirements. The regulations limit the amount of waste that may be managed under an exempt treatability study to, generally, 1000 kg of hazardous waste or 1 kg of acutely hazardous waste per study. For contaminated environmental media, the volume limit is, generally, 10,000 kilograms of media that contain non-acutely hazardous waste and 2,500 kilograms of media that contain acutely hazardous waste per study. There are also limits on the types and lengths of studies that may be conducted under the exemption and record keeping and reporting requirements. Regulations governing treatability studies are at 40 CFR 261.4(e) and (f), associated preamble discussions at 52 FR 27290 (July 19, 1988) and 59 FR 8362 (February 18, 1994).

Exemption for Ninety Day Accumulation. Management of hazardous waste in tanks, containers, drip pads and containment buildings does not constitute land disposal. In addition, EPA has provided an exemption for generators of hazardous waste which allows them to accumulate (i.e., treat or store) hazardous waste at the site of generation in tanks, containers, drip pads or containment buildings for up to ninety days without RCRA interim status or a RCRA permit. Accumulation units must meet applicable design, operating, closure and post-closure standards. Because putting hazardous waste in a tank, container, drip pad or containment building is not considered land disposal, LDR treatment standards do not have to be met before putting waste in such units. LDRs must be met if hazardous wastes are eventually land disposed, for example, after they are removed from the accumulation unit; however, if treatment in an accumulation unit results in constituent concentrations that comply with applicable land disposal restriction treatment standards, no further treatment prior to land disposal is required as a condition of the LDRs. The exemption for ninety-day accumulation is found in regulations at 40 CFR 262.34; associated preamble discussion is at 51 FR at 10168 (March 24, 1986).

Permit Waivers. Under CERCLA Section 121(e), no Federal, state or local permit is required for on-site CERCLA response actions. EPA has interpreted CERCLA Section 121(e) to waive the requirement to obtain a permit and associated administrative and procedural requirements of permits, but not the substantive requirements that would be applied through permits. Note that, under *certain circumstances, substantive requirements may be waived using CERCLA. See the ARAR waiver provisions at 40 CFR 300.430(f)(1)(ii)(C).*

In addition, on a case-by-case basis, where there may be an imminent and substantial endangerment to human health or the environment, EPA has broad authority to require corrective action and other appropriate activities under RCRA Section 7003. Under RCRA Section 7003, EPA has the ability to waive both the requirement to obtain a permit and the substantive requirements that would be imposed through permits. When EPA uses RCRA Section 7003, however, the Agency seldom uses RCRA Section 7003 to waive substantive requirements. In rare situations where substantive requirements are waived, the Agency would impose alternative requirements (e.g, waste treatment or storage requirements) as necessary to ensure protection of human health and the environment. EPA may issue RCRA Section 7003 orders at, among other sites, facilities that have been issued RCRA permits and facilities that are authorized to operate under RCRA interim status. In discussing the use of 7003 orders, where other permit authorities are available to abate potential endangerments, EPA generally encourages use of those other permit authorities (e.g., 3005(c)(3) omnibus permitting authority) rather than RCRA Section 7003. Similarly, if RCRA Section 3008(h) or RCRA Section 3013 authority is available, EPA generally encourages use of these authorities rather than RCRA

Section 7003. If permit authorities or non-RCRA Section 7003 enforcement authorities are inadequate, cannot be used to address the potential endangerment in a timely manner, or are otherwise inappropriate for the potential endangerment at issue, use of RCRA Section 7003 should be considered. See, "Guidance on the Use of Section 7003 of RCRA," U.S. EPA, Office of Enforcement and Compliance Assurance, October 1997.

In 1987, EPA issued guidance indicating that RCRA-authorized states with state waiver authorities comparable to CERCLA 121(e) or RCRA Section 7003 could use those state waiver authorities to waive RCRA requirements as long as the state did so in a manner no less stringent than that allowed under the corresponding Federal authorities. These waivers are most often used, as are the Federal waivers, to obviate the need to obtain a RCRA permit, rather than to eliminate substantive requirements. See, EPA guidance memo from J. Winston Porter to EPA Regional Administrators, "RCRA Permit Requirements for State Superfund Actions," November 16, 1987, OSWER Directive 9522.00-2.

Exemption from 40 CFR Part 264 Requirements for People Engaged in the Immediate Phase of a Spill Response. Regulations at 40 CFR 264.1(g)(8) provide that people engaged in treatment or containment activities are not subject to the requirements of 40 CFR part 264 if the activities are carried out during immediate response to: (1) a discharge of hazardous waste; (2) an imminent and substantial threat of a discharge of hazardous waste; (3) a discharge of a materials which, when discharged, becomes a hazardous waste; or, (4) an immediate threat to human health, public safety, property or the environment from the known or suspected presence of military munitions, other explosive material, or an explosive device. This means that, during the immediate phase of a spill response, hazardous waste management activities do not require hazardous waste permits (or interim status) and hazardous waste management units used during immediate response actions are not subject to RCRA design, operating, closure or post-closure requirements.

Of course, if hazardous waste treatment activities or other hazardous waste management activities continue after the immediate phase of a spill response is over, all applicable hazardous waste management and permitting requirements would apply. In addition, if spills occur at a facility that is already regulated under 40 CFR part 264, the facility owner/operator must continue to comply with all applicable requirements of 40 CFR Part 264 Subparts C (preparedness and prevention) and D (contingency plan and emergency procedures). See regulations at 40 CFR 260.1(g) and associated preamble discussion at 45 FR 76626 (November 19, 1980). See also, Sept. 29, 1986 memo from J. Winston Porter (EPA Assistant Administrator) to Fred Hansen interpreting the 40 CFR 264.1(g) regulations.

Changes During Interim Status to Comply with Corrective Action Requirements. Under regulations at 40 CFR 270.72(a)(5), an owner or operator of an interim status facility may make changes to provide for treatment, storage and disposal of remediation wastes in accordance with an interim status corrective action order issued by EPA under RCRA Section 3008(h) or other Federal authority, by an authorized state under comparable state authority, or by a court in a judicial action brought by EPA or an authorized state. These changes are limited to treatment, storage and disposal of remediation waste managed as a result of corrective action for releases at the facility in question; however, they are exempt from the reconstruction ban under 40 CFR 270.72(b). Under this provision, for example, EPA could approve a corrective action management unit for treatment of remediation waste using a 3008(h) order (or an authorized state could approve a CAMU using a similar state authority), even if that unit would otherwise amount to "reconstruction." Of course, units added at interim status facilities in accordance with this provision must meet all applicable unit requirements; for example, in the case of a CAMU, the CAMU requirements apply. See, regulations at 40 CFR 270.72(a)(5) promulgated March 7, 1989 and associated preamble discussion at 54 FR 9599.

Emergency Permits. In the event of an imminent and substantial endangerment to human health or the environment, EPA, or an authorized state, may issue a temporary emergency permit for treatment, storage or disposal of hazardous waste. Emergency permits may allow treatment, storage or disposal of hazardous waste at a non-permitted facility or at a permitted facility for waste not covered by the permit. Emergency permits may be oral or written. (If oral, they must be followed within five days by a written emergency permit.) Emergency permits must specify the hazardous wastes to be received and managed and the manner and location of their treatment, storage and disposal. Emergency permits may apply for up to ninety days, but may be terminated at any point if EPA, or an authorized state, determines that termination is appropriate to protect human health or the environment. Emergency permits must be accompanied by a public notice that meets the requirements of 40 CFR 124.10(b), including the name and address of the office approving the emergency permit, the name and location of the hazardous waste treatment, storage or disposal facility, a brief description of the wastes involved, the actions authorized and the reason for the authorization, and the duration of the emergency permit.

Emergency permits are exempt from all other requirements of 40 CFR part 270 and part 124; however, to the extent possible and not inconsistent with the emergency situation, they must incorporate all otherwise applicable requirements of 40 CFR part 270 and parts 264 and 266.

See, regulations at 40 CFR 270.61, originally promulgated as 40 CFR 122.27 on May 19, 1987 (45 FR 33326). EPA has also written a number of letters interpreting the emergency permit regulations, see, for example, November 3, 1992 letter to Mark Hansen, Environmental Products and Services Inc., from Sylvia Lowrance, Director Office of Solid Waste (available in the RCRA Permit Policy Compendium).

Temporary Authorizations at Permitted Facilities. Under regulations at 40 CFR 270.42(e), EPA, or an authorized state, may temporarily authorize a permittee for an activity that would be the subject of a class two or three permit modification in order to, among other things, facilitate timely implementation of closure or corrective action activities. Activities approved using a temporary authorization must comply with applicable requirements of 40 CFR part 264. Temporary authorizations are limited to 180 days, with an opportunity for an extension of 180 additional days. To obtain an extension of a temporary authorization, a permittee must have requested a class two or three permit modification for the activity covered in the temporary authorization. Public notification of temporary authorizations is accomplished by the permittee sending a notice about the temporary authorization to all persons on the facility mailing list and to appropriate state and local governments. See regulations at 40 CFR 270.42, promulgated on September 28, 1988, and associated preamble at 53 FR 37919.

Regulations and Policies that Apply to Contaminated Environmental Media Only

Contained-in policy. Contaminated environmental media, of itself, is not hazardous waste and, generally, is not subject to regulation under RCRA. Contaminated environmental media can become subject to regulation under RCRA if they "contain" hazardous waste. As discussed more fully below, EPA generally considers contaminated environmental media to contain hazardous waste: (1) when they exhibit a characteristic of hazardous waste; or, (2) when they are contaminated with concentrations of hazardous constituents from listed hazardous waste that are above health-based levels.

If contaminated environmental media contain hazardous waste, they are subject to all applicable RCRA requirements until they no longer contain hazardous waste. EPA considers contaminated environmental media to no longer contain hazardous waste: (1) when they no longer exhibit a characteristic of hazardous waste; and (2) when concentrations of hazardous constituents from listed hazardous wastes are below health-based levels. Generally, contaminated environmental media that do not (or no longer) contain hazardous waste are not subject to any RCRA requirements; however, as discussed below, in some circumstances, contaminated environmental media that contained hazardous waste when first generated (i.e., first removed from the land, or area of contamination) remain subject to LDR treatment requirements even after they "no longer contain" hazardous waste.

The determination that any given volume of contaminated media does not contain hazardous waste is called a "contained-in determination." In the case of media that exhibit a characteristic of hazardous waste, the media are considered to "contain" hazardous waste for as long as they exhibit a characteristic. Once the characteristic is eliminated (e.g., through treatment), the media are no longer considered to "contain" hazardous waste. Since this determination can be made through relatively straightforward analytical testing, no formal "contained-in" determination by EPA or an authorized state is required. Just like determinations about whether waste has been adequately decharacterized, generators of contaminated media may make independent determinations as to whether the media exhibit a characteristic of hazardous waste. In the case of media that are contaminated by listed hazardous waste, current EPA guidance recommends that contained-in determinations be made based on direct exposure using a reasonable maximum exposure scenario and that conservative, health-based, standards be used to develop the site-specific health-based levels of hazardous constituents below which contaminated environmental media would be considered to no longer contain hazardous waste. Since this determination involves development of site-specific health-based levels, the approval of EPA or an authorized state is required.

In certain circumstances the, RCRA land disposal restrictions will continue to apply to contaminated media that has been determined not to contain hazardous waste. This is the case when contaminated media contain hazardous waste when they are first generated (i.e., removed from the land, or area of contamination) and are subsequently determined to no longer contain hazardous waste (e.g., after treatment), but still contain hazardous constituents at concentrations above land disposal restriction treatment standards. It is also the case when media are contaminated as a result of disposal of untreated (or insufficiently treated) listed hazardous waste after the effective date of an applicable LDR treatment requirement. Of course, if no land disposal will occur (e.g., the media will be legitimately recycled) the LDR treatment standards do not apply. In addition, contaminated environmental media determined not to contain any waste (i.e., it is just media, it does not contain solid or hazardous waste) would not be subject to any RCRA Subtitle C requirements, including the LDRs, regardless of the time of the "contained-in" determination.

The contained-in policy was first articulated in a November 13, 1986 EPA memorandum, "RCRA Regulatory Status of Contaminated Groundwater." It has been updated many times in Federal Register preambles, EPA memos and correspondence, see, e.g., 53 FR 31138, 31142, 31148 (Aug. 17, 1988), 57 FR 21450, 21453 (May 20, 1992), and detailed discussion in HWIR-Media proposal preamble, 61 FR 18795 (April 29, 1996). A detailed discussion of the continuing requirement that some soils which have been determined to no longer contain hazardous waste (but still contain solid waste) comply with land disposal treatment standards can be found in the HWIR-Media proposal preamble, 61 FR 18804; the September 15, 1996 letter from Michael Shapiro (EPA OSW Director) to Peter C. Wright (Monsanto Company); and the preamble to the LDR Phase IV rule, 63 FR 28617 (May 26, 1998).

Note that the contained-in policy applies only to environmental media (soil, ground water, surface water and sediments) and debris. The contained-in policy for environmental media has not been codified. As discussed below, the contained-in policy for hazardous debris was codified in 1992.

RCRA Section 3020(b) Exemption for Reinjection of Contaminated Ground Water. Under RCRA Section 3020(a), disposal of hazardous waste into or above a formation that contains an underground source of drinking water is generally prohibited. RCRA Section 3020(b) provides an exception for underground injection carried out in connection with certain remediation activities. Under RCRA Section 3020(b), injection of contaminated ground water back into the aquifer from which it was withdrawn is allowed if: (1) such injection is conducted as part of a response action under Section 104 or 106 of CERCLA or a RCRA corrective action intended to clean up such contamination; (2) the contaminated ground water is treated to substantially reduce hazardous constituents prior to reinjection; and, (3) the response action or corrective action will, on completion, be sufficient to protect human health and the environment. Approval of reinjection under RCRA Section 3020(b) can be included in approval of other cleanup activities, for example, as part of approval of a RCRA Statement of Basis or CERCLA Record of Decision. See, RCRA Section 3020(b), established as part of the 1984 HSWA amendments. See also, OSWER Directive 9234.1-06, "Applicable of Land Disposal Restrictions to RCRA and CERCLA Ground Water Treatment Reinjection Superfund Management Review: Recommendation No. 26," November 27, 1989.

LDR Treatment Standards for Contaminated Soils. On May 26, 1998, EPA promulgated land disposal restriction treatment standards specific to contaminated soils. This rule, which also addresses a number of non-soil issues, has been challenged by a number of parties. To date, the parties have filed non-binding statements of issues only; however, based on those statements, it appears that, with the exception of the requirement that PCBs be included as an underlying hazardous constituent which has been challenged for both soil and non-soil wastes, the soil treatment standards are not included in the challenges. These treatment standards require that contaminated soils which will be land disposed be treated to reduce concentrations of hazardous constituents by 90 percent or meet hazardous constituent concentrations that are ten times the universal treatment standards (UTS), whichever is greater. (This is typically referred to as 90% capped by 10xUTS.) For contaminated soil that exhibits a characteristic of ignitable, reactive or corrosive hazardous waste, treatment must also eliminate the hazardous characteristic.

The soil treatment standards apply to all underlying hazardous constituents Except fluoride, selenium, sulfides, vanadium and zinc. reasonably expected to be present in any given volume of contaminated soil when such constituents are found at initial concentrations greater than ten times the UTS. For soil that exhibits a characteristic of toxic, ignitable, reactive or corrosive hazardous waste, treatment is also required for: (1) in the case of the toxicity characteristic, the characteristic constituent; and, (2) in the case of ignitability, reactivity or corrosivity, the characteristic property. Although treatment is required for each underlying hazardous constituent, it is not necessary to monitor soil for the entire list of underlying hazardous constituents. Generators of contaminated soil can reasonably apply knowledge of the likely contaminants present and use that knowledge to select appropriate underlying hazardous constituents, or classes of constituents, for monitoring. As with the LDR treatment standards for hazardous debris (discussed below), generators of contaminated soil may use either the applicable universal treatment standards for the contaminating hazardous waste or the soil treatment standards.

See, soil treatment standard regulations at 40 CFR 268.49, promulgated May 26, 1998 and associated preamble discussion at 63 FR 28602-28622.

Note that the soil treatment standards supersede the historic presumption that an LDR treatment variance is appropriate for contaminated soil. LDR treatment variances are still available for contaminated soil, provided the generator can show that an otherwise applicable treatment standard (i.e., the soil treatment standard) is unachieveable or inappropriate, as discussed above, or can show that a site-specific, risk-based treatment variance is proper, as discussed below.

Site-Specific, Risk-Based LDR Treatment Variance for Contaminated Soils. On May 26, 1998, EPA promulgated a new land disposal restriction treatment variance specific to contaminated soil. Under 40 CFR 268.44(h)(3), variances from otherwise applicable LDR treatment standards may be approved if it is determined that compliance with the treatment *standards would result in treatment beyond the point at which short- and long-term threats to* human health and the environment are minimized. This allows a site-specific, risk-based determination to supersede the technology-based LDR treatment standards under certain circumstances.

Alternative land disposal restriction treatment standards established through site specific, risk-based minimize threat variances should be within the range of values the Agency generally finds acceptable for risk-based cleanup levels. That is, for carcinogens, alternative treatment standards should ensure constituent concentrations that result in the total excess risk to an individual exposed over a lifetime generally falling within a range from 10^{-4} to 10^{-6}, using 10^{-6} as a point of departure and with a preference for achieving the more protective end of the risk range. For non-carcinogenic effects, alternative treatment standards should ensure constituent concentrations that an individual could be exposed to on a daily basis without appreciable risk of deleterious effect during a lifetime; in general, the hazard index should not exceed one (1). Constituent concentrations that achieve these levels should be calculated based on a reasonable maximum exposure scenario -- that is, based on an analysis of both the current and reasonable expected future land uses, with exposure parameters chosen based on a reasonable assessment of the maximum exposure that might occur; however, alternative LDR treatment standards may not be based on consideration of post-land disposal controls such as caps or other barriers.

See, regulations at 40 CFR 268.44(h)(4), promulgated May 26, 1998 and associated preamble discussion at 63 FR 28606-28608.

Regulations and Policies that Apply Only to Debris

LDR Treatment Standards for Contaminated Debris. In 1992, EPA established land disposal restriction treatment standards specific to hazardous contaminated debris. The debris-specific treatment standards established by these regulations are based on application of common extraction, destruction, and containment debris treatment technologies and are expressed as specific technologies rather than numeric criteria. As with the contaminated soil treatment standards discussed earlier, generators of hazardous contaminated debris may choose *between meeting either the debris treatment standards or the numerical treatment standard* promulgated for the contaminating hazardous waste. See, regulations at 40 CFR 268.45, promulgated August 18, 1992, and associated preamble discussion at 57 FR 37194 and 27221.

Interpretation that Debris Treated to the LDR Debris Treatment Standards Using Extraction or Destruction Technologies no Longer Contain Hazardous Waste. With the land disposal restriction treatment standards for hazardous contaminated debris, in 1992, EPA determined that hazardous debris treated to comply with the debris treatment standards using one of the identified extraction or destruction technologies would be considered no longer to contain hazardous waste and would, therefore, no longer be subject to regulation under RCRA, provided the debris do not exhibit any of the hazardous waste characteristics. This "contained-in determination" is automatic; no agency action is needed. Note that this automatic contained-in determination does not apply to debris treated to the debris treatment standards using one of the identified immobilization technologies. See, regulations at 40 CFR 261.3(f) and treatment standards at Table 1 of 40 CFR 268.45, promulgated August 18, 1992, and associated preamble discussion at 51 FR 37225.

cc: Barbara Simcoe, Association of State and Territorial Solid Waste Management Officials

Attachment B

OSWER Directive No. 9441.01 (84)

McCOY No. 147

United States Environmental Protection Agency

Office of Solid Waste and Emergency Response

EPA

147

DIRECTIVE NUMBER: 9441.01(84)

TITLE: Determining if the Soils from Missouri Dioxin Sites are Hazardous

APPROVAL DATE: 1-6-84

EFFECTIVE DATE: 1-6-84

ORIGINATING OFFICE: OSW

☐ **FINAL**

☐ **DRAFT**

LEVEL OF DRAFT

☐ A — Signed by AA or DAA
☐ B — Signed by Office Director
☐ C — Review & Comment

REFERENCE (other documents):

Contaminated soil \ listing decision

OSWER OSWER OSWER
DIRECTIVE DIRECTIVE DI

Key Words: Contaminated Soil, Dioxin

Regulations:

Subject: Determining if the Soils from Missouri Dioxin Sites are Hazardous

Addressee: David Wagoner, Director, Air and Waste Management Division, Region VII

Originator: John H. Skinner, Director, Office of Solid Waste

Source Doc: #9441.01(84)

Date: 1-6-84

Summary:

To determine if a soil, in which toxic compounds are present, is a RCRA hazardous waste, the origin of the toxicants must be known. If the exact origin of the toxicants is unknown, the soil is not considered RCRA hazardous unless it exhibits one or more of the characteristics of RCRA hazardous waste.

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MEMORANDUM

SUBJECT: Soils from Missouri Dioxin Sites

FROM: John H. Skinner, Director
Office of Solid Waste

TO: David Wagoner, Director
Air and Waste Management Division, Region VII

We have reviewed the results of the analytical program for soils from Missouri dioxin sites, in response to your request for an interpretation as to whether or not these soils are RCRA hazardous wastes.

The analyses indicate the presence of a number of toxic compounds in many of the soil samples taken from various sites. However, the presence of these toxicants in the soil does not automatically make the soil a RCRA hazardous waste. The origin of the toxicants must be known in order to determine that they are derived from a listed hazardous waste(s). If the exact origin of the toxicants is not known, the soils cannot be considered RCRA hazardous wastes unless they exhibit one or more of the characteristics of hazardous waste (i.e., ignitability, corrosivity, reactivity, or extraction procedure toxicity).

If there are any questions, please contact Matt Straus in the Waste Identification Branch (FTS 382-4770).

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Attachment C

Excerpt from the Preamble to the Proposed HWIR – Media Rule

EXCERPT FROM THE PREAMBLE TO THE PROPOSED RULE REQUIREMENTS FOR MANAGEMENT OF HAZARDOUS CONTAMINATED MEDIA (HWIR-MEDIA)
4/29/96 61 FR 18804

replaced by the provisions of this Part. In addition, when treating media subject to LDRs according to the treatment standards in §269.30, the following provisions of Part 268 would continue to apply` §§268.2-268.7 (definitions, dilution prohibition, surface impoundment treatment variance, case-by-case extensions, no migration petitions, and waste analysis and recordkeeping), §268.44 (treatment variances), and §268.50 (prohibition on storage). Again, the Agency does not intend to recreate all of the Subtitle C requirements, but in this case only replace certain requirements themselves as they relate to hazardous contaminated media.

2. Intentional Contamination of Media Prohibited—§269.11

EPA recognizes that promulgation of standards for hazardous contaminated media that are less onerous than the requirements for hazardous waste may create incentives for mixing waste with soil or other media to render the waste subject to these provisions. The Agency expressly proposes to prohibit this behavior (§269.11).

EPA recognizes, however, that sometimes it is necessary to have some mixing of contaminated media for technical purposes to facilitate cleanup. That mixing is not the prohibited mixing referred to here. This prohibition specifically includes the intent to avoid regulation. If the intent of the mixing is to better comply with the regulations that would apply to the wastes prior to mixing, then it would not be prohibited under this clause. The Agency requests comments on whether further safeguards, in addition to this proposed provision and the civil and criminal enforcement authorities of RCRA, are needed to ensure that no attempts are made to mix wastes with media to take advantage of the reduced requirements of the proposed HWIR-media rule.

3. Interstate Movement of Contaminated Media—§269.12

EPA recognizes that media that would be exempted under today's rule, but that previously would have been managed as hazardous wastes, would be transported to and through States that were not the overseeing agency for the remedial action that generated those media. Therefore, the Agency designed the interstate movement requirements of proposed §269.12 to ensure that receiving (consignment) States—or States through which media would travel—could approve the designation that the media is not hazardous before they accepted the media for transport or disposal.

The default in these requirements is that the media must be managed as Subtitle C waste in the receiving or transporting State if the receiving or transporting State has not been notified of the designation as non-hazardous, or if the receiving or transporting State does not agree with the determination. Receiving and transporting States would also have to be authorized for this Part in order to approve these decisions in their States. If a receiving or transporting State agrees to the redesignation, then the media may be managed as non-hazardous.

EPA requests comments on these interstate movement requirements, specifically on any implementation concerns with this approach, and any suggestions to ease implementation. Several people have expressed concern about notifying the States through which the media would be transported, but not ultimately disposed. The Agency believes that it may be appropriate to limit notification requirements to the States ultimately receiving the media. EPA also feels that it would be necessary to limit the designation of media as non-hazardous only to States that are authorized for this Part. The Agency believes that this would be necessary because the authority to make these contained-in decisions is an integral element for authorization for this Part. EPA believes

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that it may be appropriate to allow States not authorized for this Part to simply approve another authorized States' decision that the media are not hazardous. The Agency requests comments on these issues.

C. Treatment Requirements

1. Overview of the Land Disposal Restrictions

The Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), enacted on November 8, 1984, largely prohibit land disposal of hazardous wastes.15 Once a hazardous waste is prohibited from land disposal, the statute provides only two options: comply with a specified treatment standard prior to land disposal, or dispose of the waste in a unit that has been found to satisfy the statutory no migration test (referred to as a "no migration" unit) (RCRA section 3004(m)). Storage of waste prohibited from land disposal is also prohibited, unless the storage is solely for the purpose of accumulating the quantities of hazardous waste that are necessary to facilitate proper recovery, treatment, or disposal (RCRA section 3004(j)). For purposes of the land disposal restrictions, land disposal includes any placement of hazardous waste into a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave (hereafter referred to as "placement") (RCRA section 3004(k)).

Not all management of hazardous waste constitutes placement for purposes of the LDRs. EPA has interpreted "placement" to include putting hazardous waste into a land-based, moving hazardous waste from one land-based unit to another, and removing hazardous waste from the land, managing it in a separate unit, and re-placing it in the same (or a different) land-based. Placement does not occur when waste is consolidated within a land-based unit, when it is treated *in situ*, or when it is left in place (e.g., capped). (See 55 FR 8666, 8758-8760, (March 8, 1990) and "Determining When Land Disposal Restrictions (LDRs) Are Applicable to CERCLA Response Actions," EPA, OSWER Directive 9347.3-O5FS, (July 1989)).

Congress directed EPA to establish treatment standards for all hazardous wastes restricted from land disposal at the same time as the land disposal prohibitions take effect. According to the statute, treatment standards established by EPA must substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste so that short- and long-term threats to human health and the environment are minimized (RCRA section 3004(m)(1)). In *Hazardous Waste Treatment Council* v. *EPA*, 886 F.2d 355 (D.C. Dir. 1989), Cert. Denied 111 S.Ct 139 (1990), the court held that section 3004(m) allows both technology- and risk-based treatment standards, provided that technology-based standards are not established "beyond the point at which there is not a `threat' to human health or the environment." *id.* at 362 (i.e., beyond the point at which threats to human health and the environment are minimized) (59 FR 47980, 47986, September 19, 1994). Hazardous wastes that have been treated to meet the applicable treatment standard may be land disposed in land disposal facilities that meet the requirements of RCRA Subtitle C (RCRA section 3004(m)(2)).

Congress established a schedule for promulgation of land disposal restrictions and treatment standards for all hazardous wastes listed and identified as of November 8, 1984 (the effective date of the HSWA amendments) so that treatment standards would be in effect, and land disposal of all hazardous waste that did not comply with the standards would be prohibited, by May 8, 1990 (RCRA section 3004(g)). For some classes of hazardous wastes, Congress established separate schedules: for certain hazardous wastes identified by the State of California ("California List"), Congress directed EPA to establish treatment standards and prohibit land disposal by July 8, 1987; for hazardous wastes containing solvents and dioxins, Congress directed the Agency to establish treatment standards and prohibit land disposal by November 8, 1986. (RCRA sections 3004(d) and (e)). For wastes listed or identified as hazardous after the HSWA amendments (referred to as "newly identified wastes"), EPA must establish treatment standards and land disposal prohibitions within six months of the effective date of the listing or identification (RCRA section 3004(g)(4)). Under current regulations, environmental media containing hazardous waste are prohibited from land disposal unless they are treated to meet the treatment standards promulgated for the original hazardous waste in question (i.e., the same treatment standard the contaminating hazardous waste would have to meet if it were newly generated). (See 58 FR 48092, 48123, (September 14, 1993)).

The land disposal restrictions generally attach to hazardous wastes, or environmental media containing hazardous wastes, when they are first generated. Once these restrictions attach, the standards promulgated pursuant to section 3004(m) must be met before the wastes (or environmental media containing the wastes) can be placed into any land disposal unit other than a no migration unit. In cases involving characteristic wastes, the D.C. Circuit held that even elimination of the property that caused EPA to identify wastes as hazardous in the first instance (e.g., treating characteristic wastes so they no longer exhibit a hazardous characteristic) does not automatically eliminate the duty to achieve compliance with the land disposal treatment standards. (*Chemical Waste Management* v. *U.S. EPA*, 976 F.2d 2,22 (D.C. Dir. 1992), *cert. denied*, 113 S.Ct 1961 (1993).) The Agency has examined the logic of the *Chemical Waste* decision and concluded that the same logic could arguably be applied in the remediation context; i.e., a determination that environmental media once subject to LDR standards no longer contain hazardous wastes may not automatically eliminate LDR requirements. While the *Chemical Waste* court did not specifically address the remediation context, the Agency believes it may be prudent to follow the logic the court applied to characteristic wastes, and has developed today's proposal accordingly.

It is important to note that the land disposal restrictions apply only to hazardous (or, in some cases, formerly hazardous) wastes and only to placement of hazardous wastes after the effective date of the applicable land disposal prohibition—generally May 8, 1990 for wastes listed or identified at the time of the 1984 amendments, or six months after the effective date of the listing or identification for newly identified wastes.16 In other words, the duty to comply with LDRs has already attached to hazardous wastes land disposed ("placed") after the applicable effective dates, but not to hazardous wastes disposed prior to the applicable effective dates. Accordingly, hazardous

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wastes disposed prior to the effective date of the applicable prohibition only become subject to the LDRs if they are removed from the land and placed into a land disposal unit after the effective date of the applicable prohibition. (See 53 FR 31138, 31148, (August 17, 1988) and *Chemical Waste Management* v. *US EPA*, 86 9 F.2d 1526, 1536 (D.C. Cir. 1989)), "treatment or disposal of [hazardous waste] will be subject to the [LDR] regulation only if that treatment or disposal occurs after the promulgation of applicable treatment standards.") Similarly, environmental media contaminated by hazardous wastes placed before the effective dates of the applicable land disposal restrictions does not become subject to the LDRs unless they are removed from the land and placed into a land disposal unit after the effective dates of the applicable restrictions.

The land disposal restrictions do not attach to environmental media contaminated by hazardous wastes when the wastes were placed before the effective dates of the applicable land disposal prohibitions. If these media are determined not to contain hazardous wastes before they are removed from the land, then they can be managed as non-hazardous contaminated media and they're not subject to land disposal restrictions. For example, soil contaminated by acetone land disposed ("placed") in 1986 (prior to the effective date of the land disposal prohibition for acetone) and, while still in the land, determined not to contain hazardous waste, is not subject to the land disposal restrictions.17 This is consistent with the Agency's approach in the HWIR-waste rule, where it indicates that LDRs do not attach to wastes that are not hazardous at the time they are first generated (60 FR 66344, December 21, 1995).

Since application of the land disposal restrictions is limited, in order to determine if a given environmental medium must comply with LDRs one must know the origin of the material contaminating the medium (i.e., hazardous waste or not hazardous waste), the date(s) the material was placed (i.e., before or after the effective date of the applicable land disposal prohibition), and whether or not the medium still contains hazardous waste (i.e., contained-in decision or not).

Facility owner/operators should make a good faith effort to determine whether media were contaminated by hazardous wastes and ascertain the dates of placement. The Agency believes that by using available site- and waste-specific information such as manifests, vouchers, bills of lading, sales and inventory records, storage records, sampling and analysis reports, accident reports, site investigation reports, spill reports, inspection reports and logs, and enforcement orders and permits, facility owner/operators would typically be able to make these determinations. However, as discussed earlier in the preamble of today's proposal, if information is not available or inconclusive, facility owner/operators may generally assume that the material contaminating the media were not hazardous wastes. Similarly, if environmental media were determined to be contaminated by hazardous waste, but if information on the dates of placement is unavailable or inconclusive, facility owner/operators may, in most cases assume the wastes were placed before the effective date.

The Agency believes that, in general, it is reasonable to assume that environmental media do not contain hazardous wastes placed after the effective dates of the applicable land disposal prohibitions when information on the dates of placement is unavailable or inconclusive, in part, because current regulations, in effect since the early 1980's, require generators of hazardous waste to keep detailed records of the amounts of hazardous waste they generate. These records document whether the waste meets land disposal treatment standards and list the dates and locations of the waste's ultimate disposition. With these records, the Agency should be able to determine if environmental media were contaminated by hazardous wastes and if they would be subject to the land disposal restrictions.

In addition, EPA believes that the majority of environmental media contaminated by hazardous wastes were contaminated prior to the effective dates of the applicable land disposal restrictions. Generally, the contamination of environmental media by hazardous waste after the effective date of the applicable land disposal restriction would involve a violation of the LDRs, subject to substantial fines and penalties, including criminal sanctions. The common exception would be one-time spills of hazardous waste or hazardous materials. In these cases, the Agency believes that, typically, independent reporting and record keeping requirements (e.g., CERCLA sections 102 and 103 reporting requirements or state spill reporting requirements) coupled with ordinary "good housekeeping" procedures, result in records that will allow the Agency to determine the nature of the spilled material, and the date (or a close approximation of the date) of the spill. The Agency requests comments on this approach and on any other assumptions, records, or standards of evaluation that would ensure that facility owner/operators would identify any contaminated media subject to land disposal restrictions properly and completely.

Information on contained-in decisions should be immediately available since, generally, these determinations are made by a regulatory agency on a site-specific basis and careful records are kept.

2. Treatment Requirements—§269.30

a. Approach to treatment requirements and recommendations of the FACA Committee. RCRA section 3004(m) requires that treatment standards for wastes restricted from land disposal, "* * * specify those levels or methods of treatment, if any, which substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste so that short-term and long-term threats to human health and the environment are minimized." A recurring debate through EPA's development of the land disposal restriction program has been whether treatment standards should be technology-based (i.e., based on performance of a treatment technology) or risk-based (i.e., based on assessment of risks to human health and the environment that are posed by the wastes). The Agency believes that both approaches are allowed. It has long been recognized that Congress did not directly address the questions of how to set treatment standards in the language of section 3004(m).18 In addition, Congress did not specifically address whether the LDR treatment standards for newly generated wastes and remediation wastes must be identical; the structure of RCRA's LDR provisions suggests that Congress believed that remediation waste may merit special consideration. (See, RCRA sections 3004(d)(3) and 3004(e)(3), which

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provided a separate schedule for establishing LDR prohibitions and treatment standards for most remediation wastes).

EPA's preference would be to establish generic nationwide risk-based treatment standards that represent minimized threats to human health and the environment in the short- and long-term. However, the difficulties involved in establishing risk-based standards for contaminated media on a generic nationwide basis are formidable19, due, in large part, to the wide variety of site-specific physical and chemical compositions encountered during cleanups in the field. In the absence of the information necessary to develop generic, risk-based standards for contaminated media, the Agency is proposing generic standards using a technology-based approach and, for lower-risk media subject to the LDRs, provisions for site-specific, risk-based minimize threat determinations. (See discussion of Media Treatment Variances, below).

Technology-based standards achieve the objective of minimizing threats by eliminating as much of the uncertainty associated with disposal of hazardous waste as possible. For this reason, technology-based standards were upheld as legally permissible so long as they are not established "beyond the point at which there is not a "threat" to human health or the environment." (See, *Hazardous Waste Treatment Council* v. *EPA*, 886 F.2d 355, 361-64 (D.C. Cir. 1989),*cert. denied* 111 S.Ct. 139 (1990), page 362; see also (55 FR 6640, 6642, February 26, 1990)).

Today's proposed regulations would modify the land disposal restriction treatment standards for contaminated media so that they reflect appropriate treatment technologies and strategies for environmental media, and the site-specific nature of cleanup activities more accurately. When non-hazardous contaminated media is still subject to LDRs (e.g., because hazardous wastes contaminating the media were land disposed ("placed") after the effective date of the applicable LDR prohibition, or because the media were determined to still contain hazardous wastes when removed from the land), today's proposal would establish, as a policy matter, a presumption for site-specific LDR treatment variances. This approach is consistent with the recommendations of the FACA Committee, which agreed that the land disposal treatment standards for "as-generated" wastes are not generally appropriate for contaminated environmental media, and that higher-risk media should be subject to generic national standards while requirements for lower-risk media should be determined on a site-specific basis in the context of agency-overseen cleanups.

b. Proposed treatment standards for contaminated media (1) Applicability. Hazardous contaminated media are environmental media that contain hazardous waste or that exhibit a hazardous characteristic and have not been determined, pursuant to §269.4, to no longer contain hazardous wastes. Non-hazardous contaminated media are environmental media that have been determined, pursuant to §269.4, not to contain hazardous wastes. Media contaminated by hazardous wastes placed after the effective date of the applicable land disposal prohibition must be treated to meet LDR treatment standards before it is placed into a land disposal unit. In this case, the land disposal restrictions attach because hazardous waste was originally land disposed—placed—after the effective date of the applicable land disposal prohibition and the standards of section 3004(m) were never met. Likewise, hazardous contaminated media removed from the land after the effective date of the applicable land disposal restriction and placed into a land disposal unit, must be treated to meet LDR treatment standards. The land disposal restrictions attach in this case because, although the hazardous waste was not restricted from land disposal when first disposed, it has subsequently been prohibited from land disposal and, therefore, if removed from the land after the effective date of the applicable prohibition, cannot be placed into a land disposal unit until it meets the standards of RCRA section 3004(m). As discussed earlier in today's preamble, once the land disposal restrictions attach, the standards of section 3004(m) must be met before the wastes (or environmental media) may be placed into any land disposal unit other than a no migration unit, elimination of the property that cause the waste to be hazardous (e.g., deciding, pursuant to §269.4, that a given environmental medium no longer contains hazardous waste) does not automatically mean the wastes have complied with RCRA section 3004(m). 20

(2) Today's proposal. In today's proposed rule, EPA would, (1) establish generic, technology-based treatment standards for higher-risk contaminated media subject to the LDRs (i.e., hazardous contaminated media) and, (2) for lower-risk contaminated media subject to the LDRs (i.e., non-hazardous contaminated media), establish, as a policy matter, a presumption for site-specific LDR treatment variances. The treatment standards proposed today would only apply when media subject to the LDRs are managed under a RMP. For hazardous contaminated media other than soils (e.g., groundwater and sediments), the proposed rule would require treatment to meet the LDR treatment standards applicable to the hazardous wastes contained in the media. (See §269.30(f)). For example, ground water contaminated with a commercial chemical product such as acetone (hazardous waste number U002) would have to be treated to the standards specified in Part 268 for acetone.

Attachment D

Excerpt from the Preamble to the Final Rule: Land Disposal Restrictions Phase IV

EXCERPT FROM PREAMBLE TO FINAL RULE, LAND DISPOSAL RESTRICTIONS PHASE IV: FINAL RULE PROMULGATING TREATMENT STANDARDS FOR METAL WASTES AND MINERAL PROCESSING WASTES 5/26/98 63 FR 28556

E. The Contained-In Policy

The contained-in principle is the basis for EPA's longstanding interpretation regarding application of RCRA Subtitle C requirements to mixtures of contaminated media and hazardous wastes. Under the "contained-in" policy, EPA requires that soil (and other environmental media), although not wastes themselves, be managed as if they were hazardous waste if they contain hazardous waste or exhibit a characteristic of hazardous waste. See, for example, 53 FR 31138, 31148 (August 17, 1988) and 57 FR 21450, 21453 (May 20, 1992) (inadvertently citing 40 CFR 261(c)(2) instead of 40 CFR 261.3(d)(2)); see also Chemical Waste Management v. EPA, 869 F.2d 1526, 1539-40 (D.C. Cir. 1989) (upholding the contained-in principle as a reasonable interpretation of EPA regulations). In practice, EPA has applied the contained-in principle to refer to a process where a site-specific determination is made that concentrations of hazardous constituents in any given volume of environmental media are low enough to determine that the media does not "contain" hazardous waste. Typically, these so called "contained-in" determinations do not mean that no hazardous constituents are present in environmental media but simply that the concentrations of hazardous constituents present do not warrant management of the media as hazardous waste.[46] (1) For contaminated soil, the result of "contained-in determinations" is that soil no longer "contains" a

63 FR 28622

hazardous waste; however, as discussed above, the result is not automatically that soil no longer must comply with LDRs.

In order to preserve flexibility and because EPA believes legislative action is needed, the Agency has chosen, at this time, not to go forward with the portions of the September 14, 1993 or April 29, 1996 proposals that would have codified the contained-in policy for contaminated soils. The Agency continues to believe that legislation is needed to address application of certain RCRA subtitle C requirements to hazardous remediation waste, including contaminated soil. If legislation is not forthcoming, the Agency may, in the future, re-examine its position on the relationship of the contained-in policy to site-specific minimize threat determinations based on implementation experience and/or may choose to codify the contained-in policy for contaminated soil in a manner similar to that used to codify the contained-in policy for contaminated debris.

1. Current Guidance on Implementation of the Contained-in Policy

EPA has not, to date, issued definitive guidance to establish the concentrations at which contained-in determinations may be made. As noted above, decisions that media do not or no longer contain hazardous waste are typically made on a case-by-case basis considering the risks posed by the contaminated media. The Agency has advised that contained-in determinations be made using conservative, health-based levels derived assuming direct exposure pathways. 61 FR at 18795 (April 29, 1996) and other sources cited therein. A compilation of many of the Agency's statements on the contained-in policy has been placed in the docket for today's rulemaking.

The land disposal restriction treatment standards for contaminated soil promulgated today do not affect implementation of the contained-in policy. They are not considered, and should not be used, as de facto "contained-out" concentrations although, in some cases, it may be appropriate to determine that soil treated to the soil treatment standards no longer contains hazardous waste. Remediation project managers should continue to make contained-in decisions based on site-specific conditions and by considering the risks posed by any given contaminated media.

2. Relationship of the Contained-In Policy to Site-Specific, Risk-Based Minimize Threat Determinations

As discussed above, the D.C. Circuit held in the Chemical Waste opinion that the RCRA Section 3004(m) obligation to minimize threats can continue even after a waste would no longer be identified as "hazardous." Chemical Waste Management v. EPA, 976 F.2d at 13-16. The Agency believes that it is prudent to apply the logic of the Chemical Waste opinion to contaminated soil. Therefore, when the contained-in policy is applied to soil that is already subject to a land disposal prohibition, the Agency is compelled to decide if a determination that soil does not or no longer "contains" hazardous waste is sufficient to determine that threats posed by subsequent land disposal of those soils have been minimized. As discussed earlier in today's preamble, EPA is not, at this time, able to make a generic finding that all contained-in determinations will automatically satisfy this standard. This is largely because, for reasons of needed administrative flexibility and because we believe legislation is needed, EPA has not codified standards for approving contained-in determinations and has not codified procedures for making such determinations. Absent such standards and procedures, the Agency cannot, at this time, make a generic finding that all contained-in determinations will result in constituent concentrations that also minimize threats within the meaning of RCRA Section 3004(m). These decisions, of course, could be made on a site-specific basis, by applying the standards and procedures for site-specific, risk-based minimize threat variances, promulgated today.

The regulations governing site-specific, risk-based minimize threat determinations promulgated today are, essentially, the same as the Agency's guidance for making contained-in determinations. See, for example, 61 FR 18795 (April 29, 1996) and other sources cited therein. That is, decisions should be made by considering the inherent risks posed by any given soil, assuming direct exposure (i.e., no post-land disposal controls) and applying conservative information to calculate risk. Therefore, the Agency expects that, in most cases, a determination that soils do not (or no longer) contain hazardous waste will equate with minimize threat levels and, therefore, encourages program implementors to combine contained-in determinations, as appropriate, with site-specific, risk-based minimize threat variances.

F. Relationship of Soil Treatment Standards to the Final HWIR-Media Rule

In the April 29, 1996 HWIR-Media proposal, EPA proposed to establish a comprehensive alternative management regime for hazardous contaminated media, of which the treatment standards for contaminated soil would have been a small part. The HWIR-Media proposal discussed a number of options for comprehensive management standards for hazardous contaminated media.

Today's action resolves and finalizes the portion of the HWIR-Media proposal that addressed land disposal restriction treatment standards for contaminated soil. See 61 FR 18805-18814, April 29, 1996. Other portions of the proposal are not resolved by this action and will be addressed by EPA in future actions. EPA continues to emphasize that, whilethe soil-specific LDR treatment standards will improve contaminated soil management and expedite cleanups, the Agency also recognizes that additional reform is needed, especially for management of non-media remediation wastes like remedial sludges. The Agency will continue to participate in discussions on potential legislation to promote this additional needed reform.

VIII. Improvements and Corrections to LDR Regulations

Summary: The regulated community has pointed out several examples of the LDR regulations that were unclear or had typographical errors. These sections are clarified and corrected below.

A. Typographical Error in Section 261.1(c)(10)

A typographical error was found in the cross reference in the note in §261.1(c)(10). The first Phase IV final rule ("Minirule," 62 FR 25998) said "They are covered under the exclusion from the definition of solid waste for shredded circuit boards being recycled (261.4(a)(13))." The correct cross reference is to "(261.4(a)(14)." This typographical error is corrected in this final rule.

B. Typographical Error in Section 268.4(a)(2)(ii) and (a)(2)(iii)

These paragraphs have referred to §268.8 for some time. Section 268.8 was where the so called "soft hammer" provisions were once found in the regulations. These provisions expired in 1990, and the provisions have been removed from the regulations; thus there is no need to continue to include references to §268.8.

63 FR 28623

C. Clarifying Language Added to Section 268.7

The first item in the paperwork tables requires that the EPA Hazardous Waste and Manifest numbers be placed on the notification forms. Today's changes clarify that the manifest number required to be placed on the notification form is that of the first shipment of waste to the treatment or disposal facility.

The tables of paperwork requirements found at §268.7(a)(4) and (b)(3) have entries that describe what waste constituents have to be identified on the one-time LDR notification (see item 3 in the generator table at §268.7(a)(4), and item 2 in the treatment and storage facility table at §268.7(b)(3)). The language of these items has been changed to avoid confusion about whether wastes managed at facilities subject to the Clean Water Act (CWA), CWA-equivalent facilities, or wastes injected into deepwells subject to the Safe Drinking Water Act (SDWA) are subject to a paperwork requirement (and if so, what requirements). Wastes managed in these facilities are subject to a one-time notification requirement. This notification must be placed in the facility's on site files and must contain the information described in the paperwork tables. Therefore, the parenthetical language that appeared to exclude such facilities from the paperwork requirements has been removed from item 2 in the "Generator" table, and item 3 in the "Treatment Facility" table.

In addition, these items have been further clarified by adding the language "in characteristic wastes" after the clause "and underlying hazardous constituents," to indicate exactly what type of wastes must be considered when determining whether underlying hazardous constituents are present. The title of the paperwork table at §268.7(b)(3) has been changed to clarify that the requirements apply to storage facilities as well as treatment facilities. A number of certifications were inadvertantly removed from §268.7(b) through Office of Federal Register drafting errors. Those certifications are reinstated because it was never the intention of the Agency that they were removed.

D. Correction to Section 26

Endnotes

1 (Popup)

46 Of course, as noted earlier, EPA or an authorized state could determine, at any time, that any given volume of environmental media did not contain (or no longer contained) any solid or hazardous waste (i.e., it's just media). These types of determinations might be made, for example, if concentrations of hazardous constituents fall below background levels, or are at non-detectable levels. Such a determination would terminate all RCRA Subtitle C requirements, including LDRs. See, September 15, 1995 letter from Michael Shapiro (EPA) to Peter Wright (Monsanto Company), making this finding, and 61 FR 18806 (April 29, 1996).

Remedial Action Work Plan

Former Gulf States Creosoting Site
Hattiesburg, Mississippi

February 14, 2000

February 14, 2000

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MP&A21-04/05R

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1.0 Project Background and Summary

1.1 Site 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, and is roughly bounded by the Southern Railroad to the southeast, Scooba Street to the northeast, Corinne Street and Gordon's Creek to the northwest, and U.S. Highway 49 to the southwest.

The wood treating facility operated between the early 1900s and approximately 1960. Operations at the facility were of a relatively small scale, consisting of the use of creosote only in a single pressure treating cylinder. The site was redeveloped for commercial and light industrial use beginning in approximately 1962. There are no residential or institutional uses of the site.

1.2 Work Plan Objectives

This work plan defines, evaluates, and specifies activities required to address impacted media at the site. The objectives of these response activities are to:

- reduce site risks posed by potential exposure to impacted surface soils;
- mitigate intermittent releases of wood treating constituents to Gordon's Creek;
- identify and address potential source materials (i.e., pooled creosote) in the former process area; and
- eliminate the potential for exposure to impacted sediments in an offsite drainage ditch.

1.3 General Plan

The general plan for remedial action at the site has two primary components. The first component is the targeted cleanup of impacted media in the fill area, the former process area, and the northeast drainage ditch. The second component is the use of institutional controls to ensure that: a) future use of the impacted areas of the former site is consistent with their current use (i.e., commercial and/or industrial); and b) current and future site owners and/or lessees of the impacted areas are advised of the presence of creosote-impacted media and restrictions on land use.

1.4 Site Risk and Conceptual Site Model

Creosoting constituents of potential health concern at the site include polycyclic aromatic hydrocarbons, of which benzo(a)pyrene is the predominant contributor to potential risks. Much of the former process area is currently covered with asphalt or large building structures that preclude direct contact with impacted materials. Potential future exposure scenarios considered in the assessment of risks included a construction worker, a maintenance worker, and a site visitor and assumed bare soils were available for direct contact.

Hazards posed by chemical constituents in soil for health effects other than an increased risk of cancer were well below a threshold of possible concern. Calculated increases in cancer risks, due largely to the presence of benzo(a)pyrene equivalents, slightly exceeded U.S. EPA's *de minimis* acceptable target risk level of 1×10^{-6} (i.e., a one in one million increase). However, no cancer risk for any of the scenarios considered approached the upper end of U.S. EPA's acceptable target risk range (i.e., 1×10^{-4}, or one in 10,000).

The added lifetime cancer risk conservatively estimated for a maintenance worker was 2×10^{-5} (i.e., an upper bound risk of two incidences of cancer out of a population of 100,000 persons so exposed). The potential risk for a site visitor was estimated to be 1×10^{-5}, and the estimated potential risk for a construction worker was 3×10^{-6}, which is only slightly greater than the *de minimis* acceptable target risk level.

1.5 Evaluation of Remedial Alternatives

In the document *Guidance for Remediation of Uncontrolled Hazardous Substance Sites in Mississippi* (September 1990), the Mississippi Department of Environmental Quality (MDEQ) establishes guidance for the development of feasibility studies and remedial action plans. The feasibility study (FS) "serves as a mechanism for the development, screening, and detailed evaluation of alternative remedial actions." The FS is comprised of two phases: 1) development and screening of alternatives; and 2) detailed analysis of alternatives. The MDEQ guidance mirrors the U.S. EPA guidance for conducting feasibility studies under CERCLA.

Section 4.0 of this document is an FS conducted in accordance with the MDEQ guidance. The site remedy presented in Section 5.0 of this work plan was selected based on the results of the FS.

1.6 Scope of Remedial Action

The scope of work for each of the three areas to be addressed via remedial action is summarized below.

1.6.1 Fill Area

The scope of remedial action for addressing the fill area consists of the following steps:

1. Drive sheet pilings to cut off intermittent seeps of separate phase creosote to Gordon's Creek
2. Install a recovery system behind the sheet pilings to collect separate phase creosote
3. Utilize biological augmentation (e.g., phytoremediation, in situ biotreatment, injection of nutrients) to promote and accelerate further degradation of creosote constituents.

1.6.2 Former Process Area

The scope of remedial action for addressing the former process area consists of the following steps:

1. Conduct additional investigations to determine presence and "recoverability" of non-aqueous phase liquids (NAPLs)
2. Remove NAPLs (i.e., pooled creosote) from beneath the Courtesy Ford parking area
3. Conduct in situ treatment of creosote-impacted soils in the unpaved area between Courtesy Ford and Southern railroad tracks
4. If necessary to further reduce risks associated with direct contact, cap treated soils with concrete
5. Conduct ground water monitoring to demonstrate natural attenuation of creosote constituents

1.6.3 Northeast Drainage Ditch

The scope of remedial action for addressing the northeast drainage ditch consists of the following steps:

1. Excavate creosote-impacted ditch sediments and adjacent soils for treatment and/or disposal at an approved offsite facility
2. Install a storm water collection and conveyance pipe to replace approximately 1,000 feet of the ditch and provide for drainage
3. Backfill around culvert with clean soil and plant native grass.

2.0 Summary of Remedial Investigation Findings

Detailed results of Remedial Investigation (RI) activities conducted in 1997 and 1998 were presented in three separate reports. These reports were:

- *Remedial Investigation Report*, June 30, 1997
- *Interim Report - Phase II Remedial Investigation*, August 14, 1998
- *Phase II Remedial Investigation Report*, December 30, 1998

A summary of the RI findings is provided in the following sections. Information on the site environmental setting is summarized in Section 2.1, while information regarding the nature and extent of impacted media is summarized in Section 2.2.

2.1 Site Environmental Setting

The following subsections contain information on the site topography and drainage, geology, and ground water occurrence and conditions.

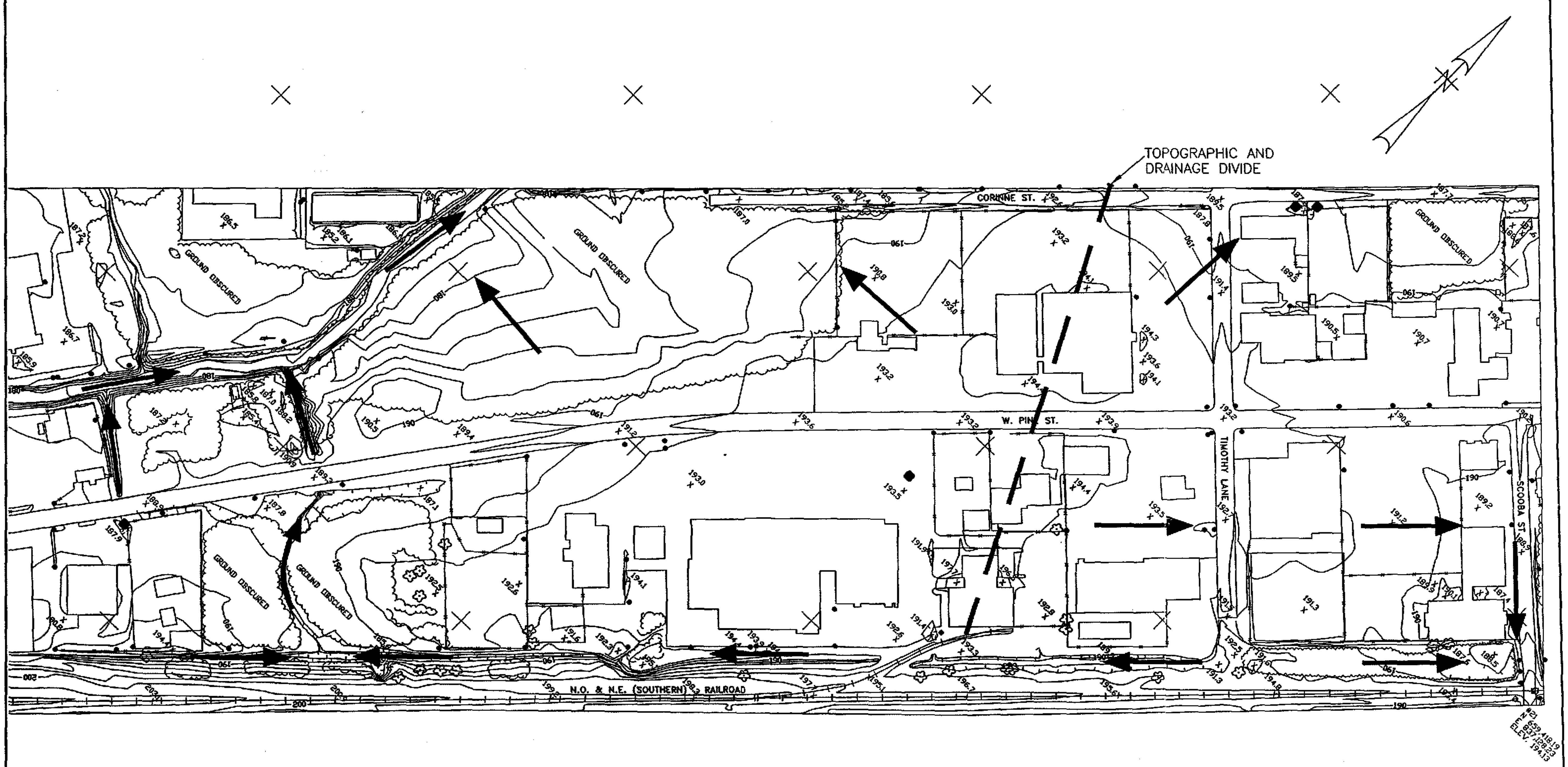
2.1.1 Topography and Surface Drainage

Figure 2-1 is a topographic map of the site prepared from a 1996 aerial survey by Atlantic Technologies of Huntsville, Alabama. The map indicates that present site elevations range from approximately 196 feet above mean sea level (msl) along a topographic ridge or divide in the north central portion of the site to 176 feet msl within the Gordon's Creek channel at the western edge of the site. The topographic divide for the site is located approximately 300 to 400 feet southwest of Timothy Lane and runs roughly north-south. The ground surface west of this topographic divide slopes gradually from east to west, toward Gordon's Creek. East of the divide, the ground surface slopes northeastward toward Scooba Street.

Due to the presence of this topographic divide, surface drainage from the site flows to two separate and distinct drainage basins. The first is a drainage basin created by a system of ditches and culverts, including the Southern railroad ditch immediately adjacent to Courtesy Ford, which flow eastward toward the Leaf River. The second is a drainage basin created by Gordon's Creek that flows northward from the site and eventually turns east toward the Leaf River. Surface runoff from the portion of the site east of the topographic divide drains eastward toward the Leaf River via the ditch and culvert system; the remainder of the site drains westward toward Gordon's Creek. Current site drainage is depicted on Figure 2-1.

2.1.2 Site Geology

Results of remedial investigation activities show the shallow geology of the former process area and fill area to be significantly different, with the exception of an underlying hard clay aquitard common to both areas. The top of this hard clay aquitard was encountered in all borings at elevations ranging from 145 to 165 feet msl. Published reports and geologic logs from wells in the Hattiesburg area indicate that this is roughly equivalent in elevation



0 100 200 300 400

SCALE FEET

LEGEND

GENERAL DIRECTION OF SURFACE DRAINAGE

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 SITE DRAINAGE	
PROJECT: FORMER GULF STATES CREOSOTING SITE	
LOCATION: HATTIESBURG, MISSISSIPPI	
SCALE: 1"=200'	DWG. NO.: 21-04/70B

to the top of the massive Hattiesburg clay. No borings advanced during the RI fully penetrated the clay layer, which is reportedly between 120 and 200 feet thick in the Hattiesburg area.

The former process area geology is characterized by the presence of an upper clay unit, a sand channel, and the underlying Hattiesburg clay aquitard. The thickness of the upper clay unit ranges from 20 to 25 feet beneath the former process area, while the maximum thickness of the sand channel is 21 feet. The sand channel, which is the uppermost water-bearing zone beneath the former process area, pinches out to the west and does not extend westward to Gordon's Creek or beneath the fill area.

The fill area geology is characterized by shallow interbedded sands and clays underlain by the Hattiesburg clay aquitard. The interbedded sand deposits, which comprise the uppermost water-bearing zone beneath the fill area, do not extend eastward to the former process area. The shallow water-bearing zones beneath the former process area and fill area are not interconnected.

The locations of cross-sections depicting the geology of the former process area and fill area are shown on Figure 2-2. Cross-sections through the former process area and the fill area are displayed on Figures 2-3 and 2-4, respectively.

2.1.3 Ground Water Occurrence and Conditions

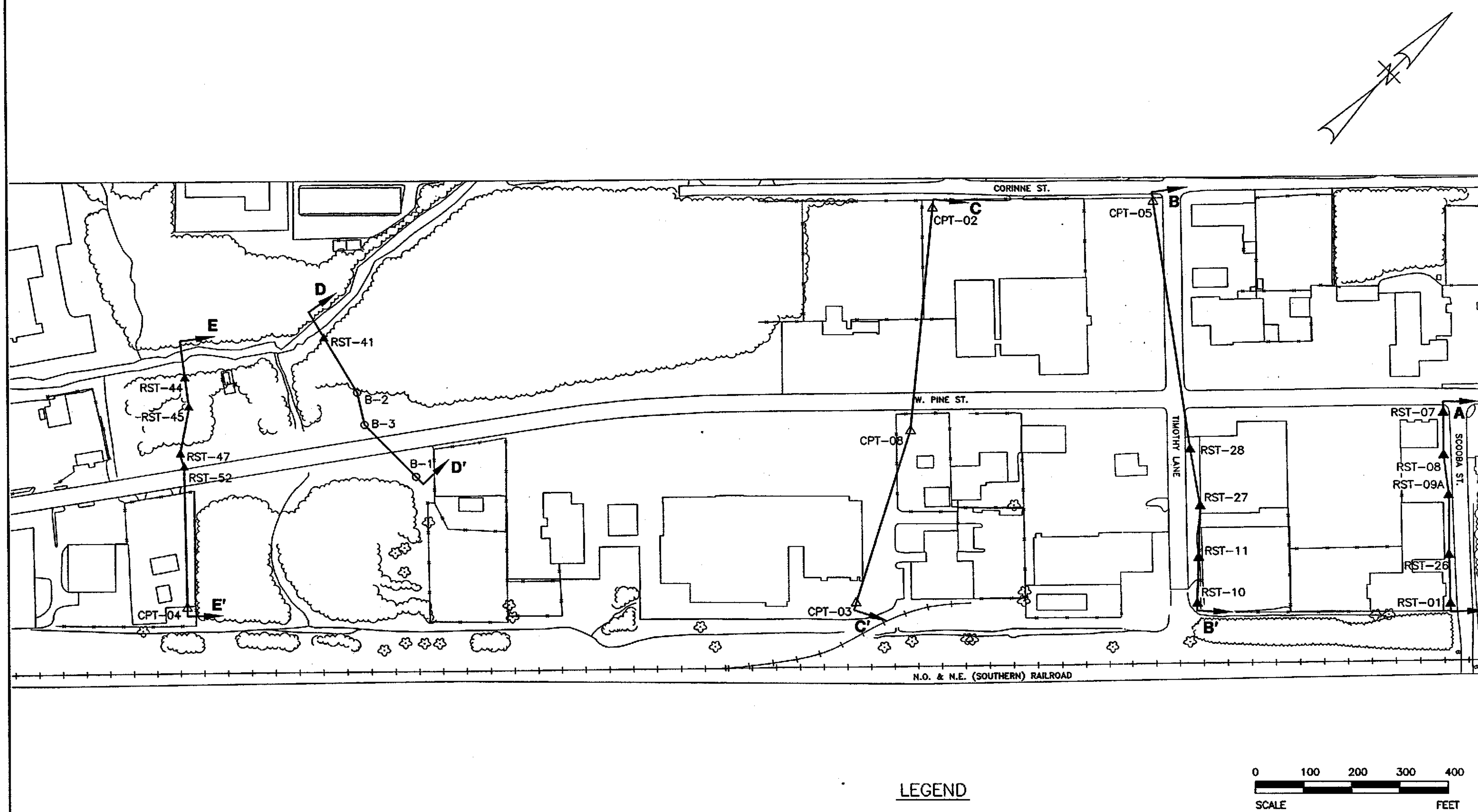
Just as the shallow geology of the former process area and fill area are significantly different, the shallow aquifer systems beneath the two areas are separate and distinct. As stated above, the uppermost water-bearing zone beneath the former process area does not extend westward to the fill area, and the uppermost water-bearing zones beneath the fill area do not extend eastward to the former process area. Furthermore, ground water within the two zones flows in completely opposite directions. Ground water within the former process area sand channel flows eastward toward the Leaf River (see Figure 2-5). Ground water within the fill area sands flows westward toward Gordon's Creek and downstream along the creek (see Figure 2-6).

2.2 Nature and Extent of Impacted Media

The discussion regarding nature and extent of impacted media at the site is broken down into the following sections of this report:

- 2.2.1 Fill Area (soil, ground water, NAPL)
- 2.2.2 Former Process Area (soil, ground water, NAPL)
- 2.2.3 Northeast Drainage Ditch (sediment)

During the Phase I RI, a Rapid Optical Screening Tool (ROST) was used to determine the nature and extent of creosote-impacted soil within the former process area and the fill area. The ROST system combines cone penetrometer testing (CPT) and laser-induced fluorescence (LIF) to provide a continuous stratigraphic profile, as well as rapid sampling and real-time, semi-quantitative analysis of the chemical characteristics (primarily aromatic



LEGEND

△ CPT PUSH

▲ ROST PUSH

O SOIL BORING

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

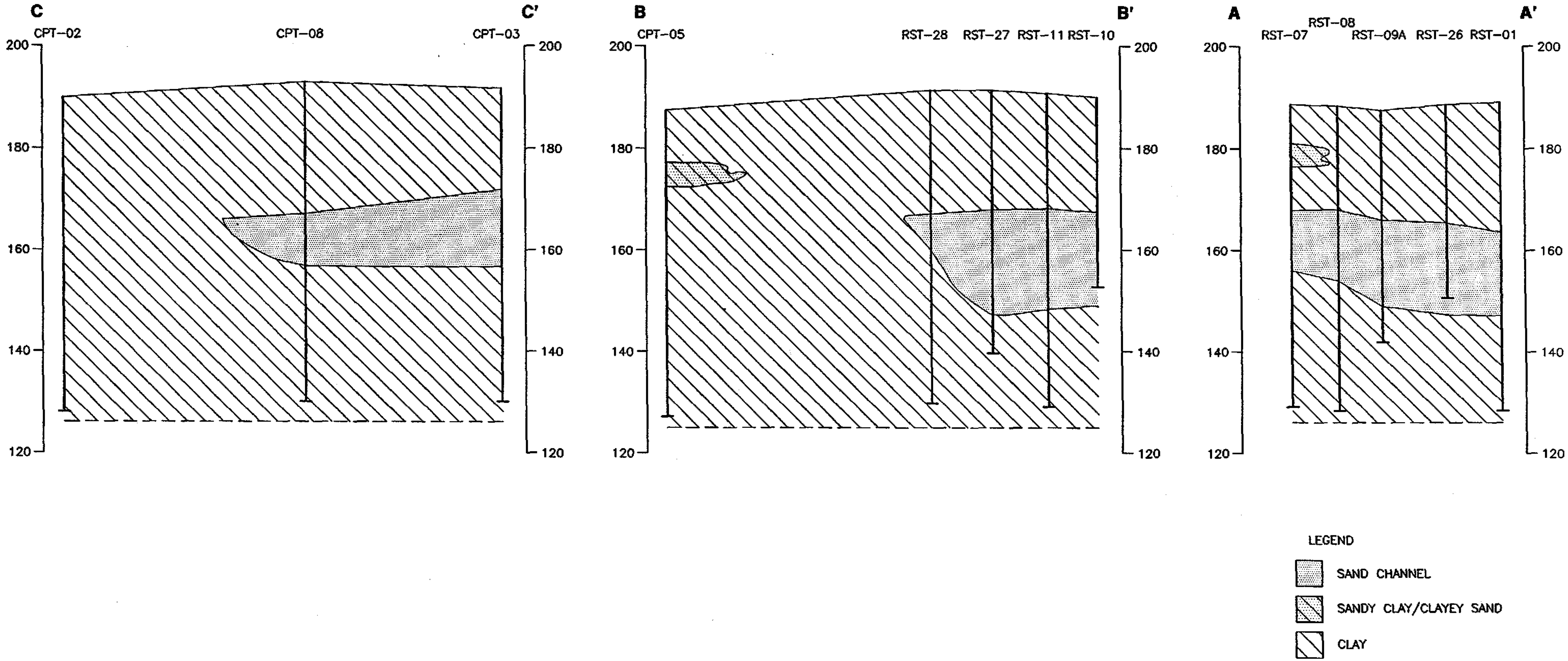
MICHAEL PISANI & ASSOCIATES
Environmental Management and Engineering Services
New Orleans, Louisiana — Houston, Texas

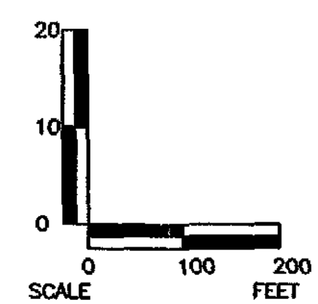
TITLE: FIGURE 2-2
CROSS-SECTION LOCATION MAP

PROJECT: FORMER GULF STATES CREOSOTING SITE

LOCATION: HATTIESBURG, MISSISSIPPI

SCALE: 1"=200' | DWG. NO.: 21-04/71B





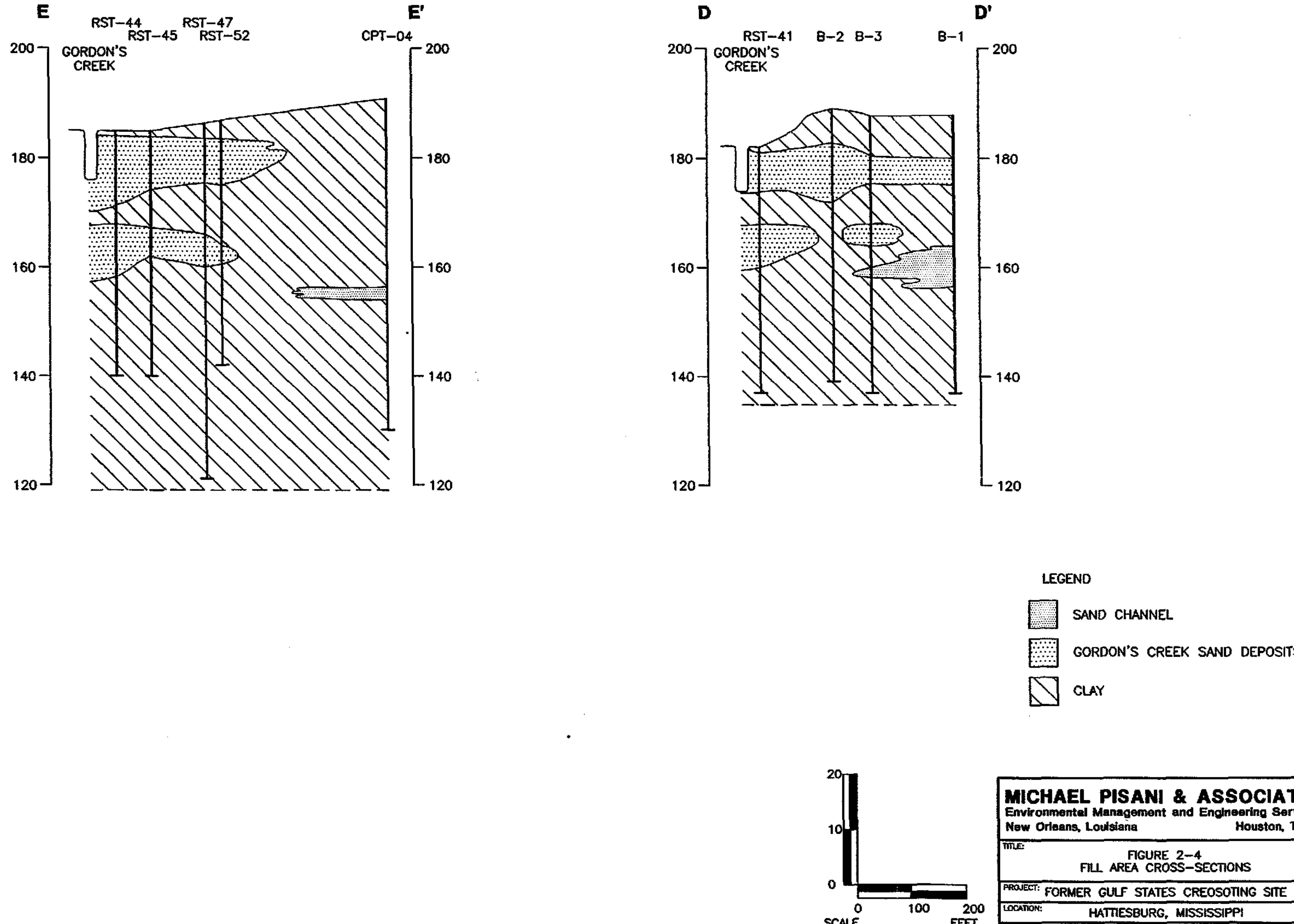
MICHAEL PISANI & ASSOCIATES
Environmental Management and Engineering Services
New Orleans, Louisiana **Houston, Texas**

TITLE: FIGURE 2-3
FORMER PROCESS AREA CROSS-SECTIONS

PROJECT: FORMER GULF STATES CREOSOTING SITE

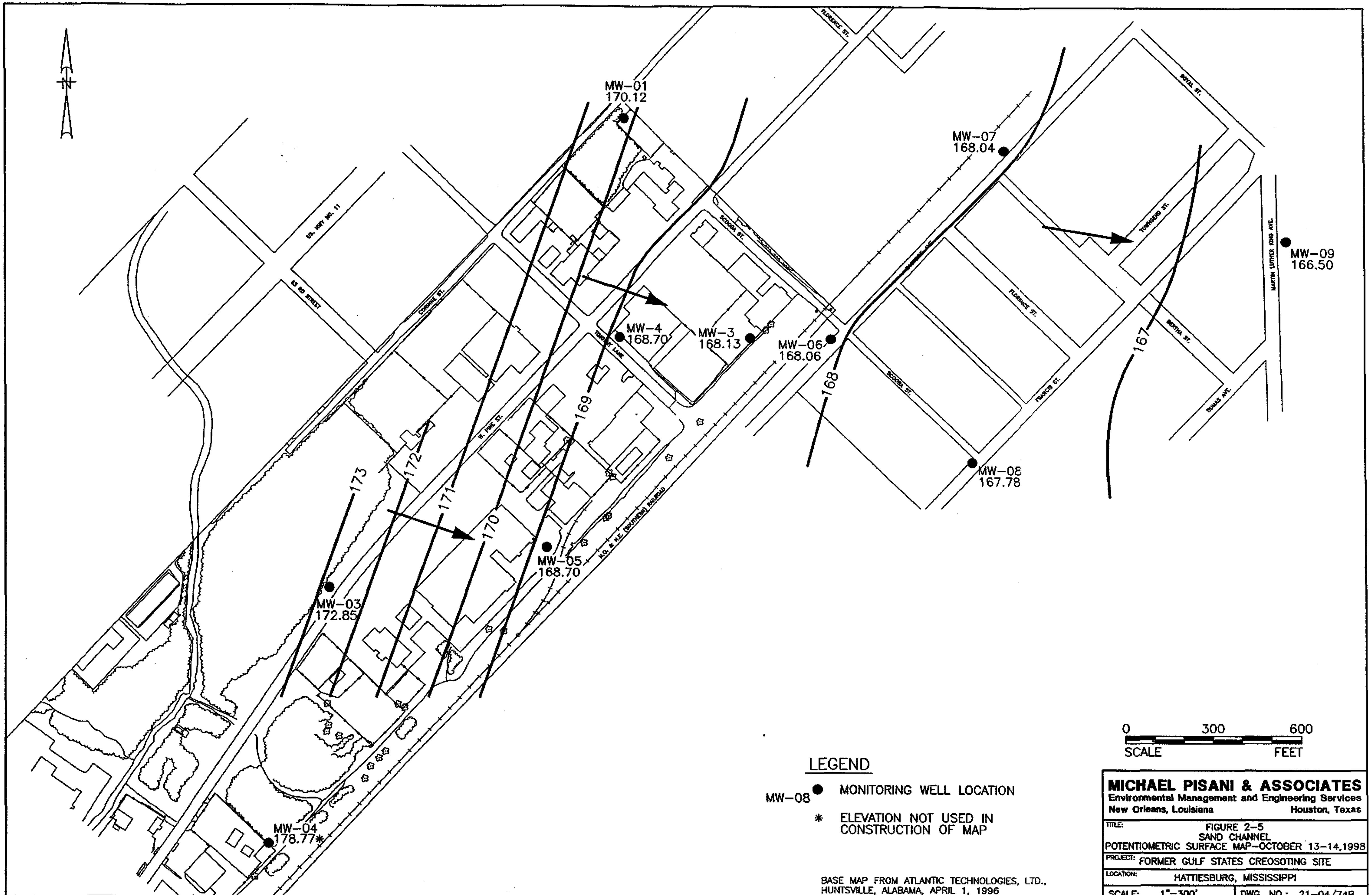
LOCATION: HATTIESBURG, MISSISSIPPI

SCALE: 1"=200'/1"=20' | DWG. NO.: 21-04/72B

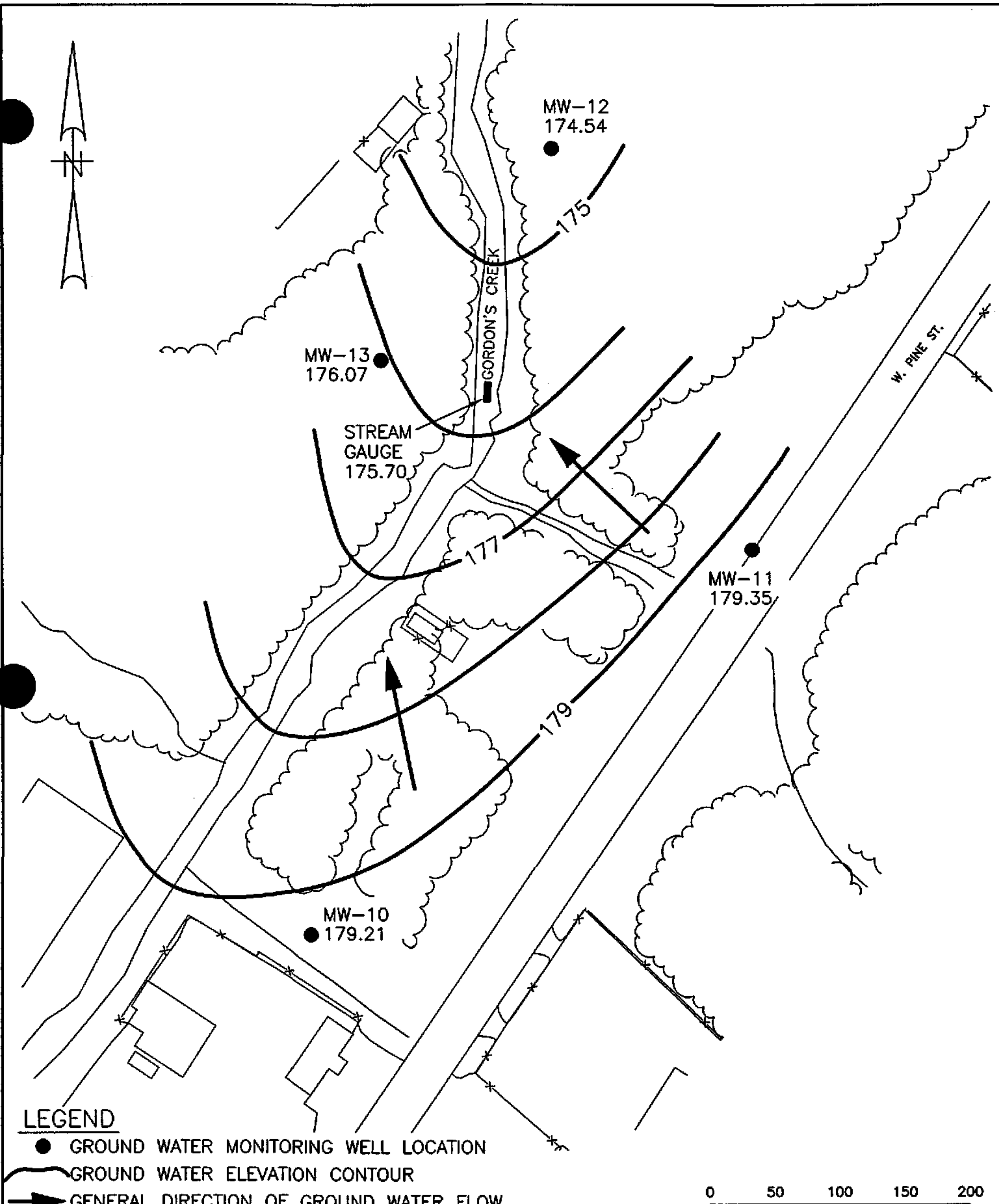


MICHAEL PISANI & ASSOCIATES
Environmental Management and Engineering Services
New Orleans, Louisiana — Houston, Texas

TITLE: FIGURE 2-4 FILL AREA CROSS-SECTIONS	
PROJECT: FORMER GULF STATES CREOSOTING SITE	
LOCATION: HATTIESBURG, MISSISSIPPI	
SCALE: 1"=200'/1"=20'	DWG. NO.: 21-04/738



MICHAEL PISANI & ASSOCIATES Environmental Management and Engineering Services New Orleans, Louisiana — Houston, Texas	
TITLE: FIGURE 2-5 SAND CHANNEL POTENTIOMETRIC SURFACE MAP-OCTOBER 13-14,1998	
PROJECT: FORMER GULF STATES CREOSOTING SITE	
LOCATION: HATTIESBURG, MISSISSIPPI	
SCALE: 1"=300'	DWG. NO.: 21-04/748



...E MAP FROM ATLANTIC TECHNOLOGIES, LTD.,
...TSVILLE, ALABAMA, APRIL 1, 1996

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

SCALE: 1"=100' DWG. NO.: 21-04/75A

FIGURE 2-6
FILL AREA
POTENTIOMETRIC SURFACE MAP – OCTOBER 13-14, 1998

FORMER GULF STATES CREOSOTING SITE
HATTIESBURG, MISSISSIPPI

hydrocarbons, including creosote) of subsurface soils on a continuous basis. In addition, correlation soil samples were collected and analyzed to confirm ROST results. The ROST system was demonstrated to be an excellent screening tool for determining the presence or absence of creosote and also the relative total concentration of creosote constituents (i.e., low, medium, or high).

Tables summarizing analytical data from the Phase I and Phase II RI are provided in Appendices A and B to this document, respectively. Figures 2-7 through 2-11 depict benzo(a)pyrene equivalence values in soil within the following depth intervals: zero to 2 feet, 2 to 5 feet, 5 to 10 feet, 10 to 15 feet, and 15 to 20 feet. The use of benzo(a)pyrene equivalence is a toxicity equivalence factor (TEF) approach for assessment of potentially carcinogenic PAHs. This approach assigns each of the seven potentially carcinogenic PAHs (CPAHs) an "estimated order of potential potency" based on its toxicity relative to benzo(a)pyrene in laboratory studies. U.S. EPA provides this methodology as a tool for assessing risk associated with CPAHs in the document *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons*, EPA/600/R-93/089, July 1993.

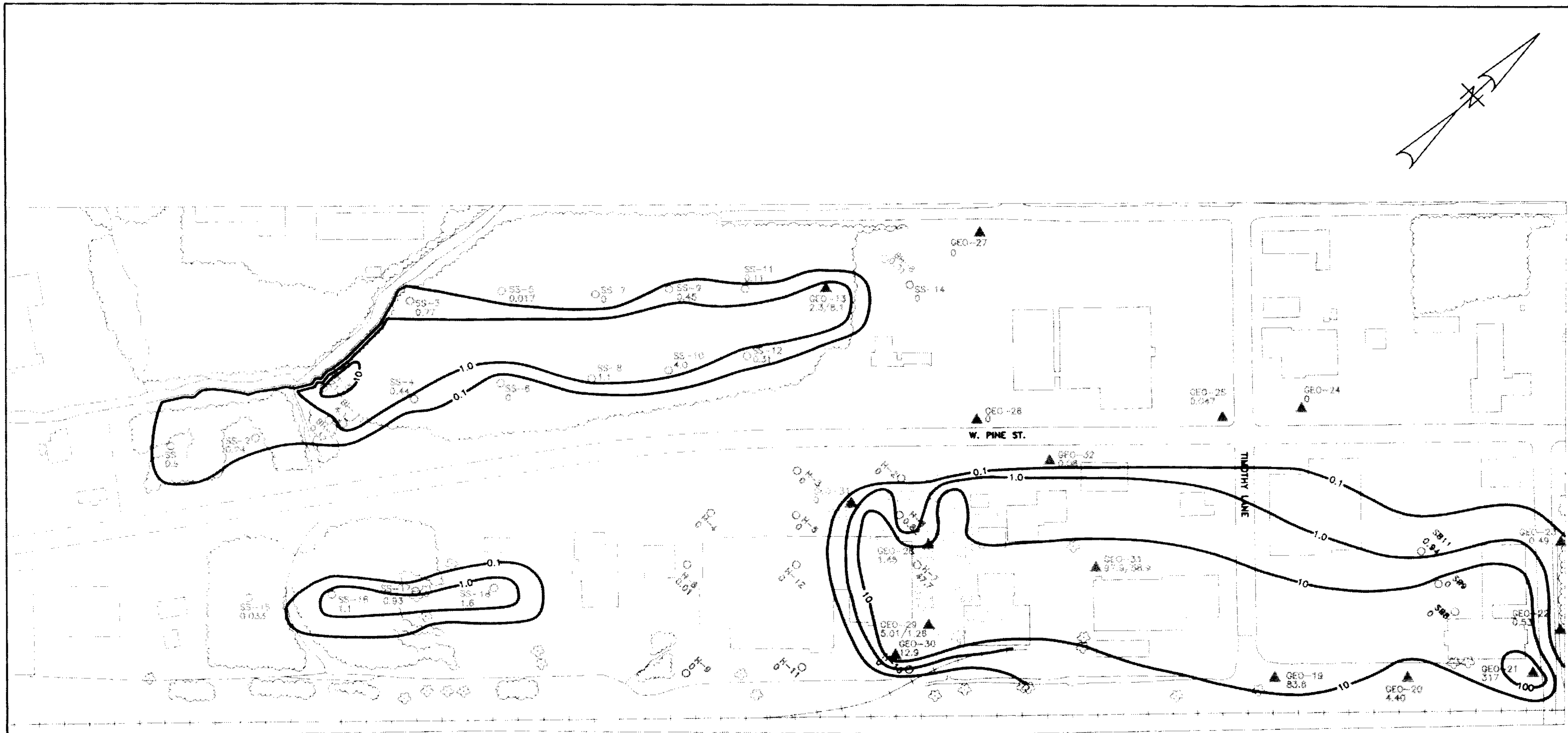
Figure 2-12 depicts naphthalene concentrations in ground water samples. Naphthalene is the single most prevalent creosote constituent in ground water at the site, and is a good indicator parameter due to its solubility and thus its mobility.

Figure 2-13 depicts total non-carcinogenic PAH and benzo(a)pyrene equivalence values in surface water samples collected from the two offsite drainage pathways (Gordon's Creek and the northeast drainage ditch). Figure 2-14 depicts benzo(a)pyrene equivalence values in sediment samples.

The tables and figures cited above provide the basis for the following discussions regarding the nature and extent of impacted media at the site.

2.2.1 Fill Area

Soil. The approximate extent of creosote-impacted soil within the fill area, based on the ROST data and subsurface soil results, is depicted by the shaded area on Figure 2-15. The vertical and lateral extent of impacted soil within the fill area appear to be dictated by the placement of fill materials and by the alternating sand and clay layers beneath the area. The approximate surface area underlain by impacted soils is 2.1 acres. The upper 3 to 4 feet of soil in the fill area is generally not impacted. Evidence of creosote impact extends into the upper saturated sand beneath the fill area. The thickness of creosote-impacted soil varies by location and ranges from several feet to as much as 15 feet.



SITE INSPECTION,
1/92 BY MDEQ FOR EPA

SOIL GAS AND SOIL SAMPLING,
5/90 BY ROY F. WESTON FOR EPA

PHASE II INVESTIGATION OF PROCESS
AREA, 1994 BY EPS FOR VAN SLYKE

PHASE II INVESTIGATION OF GIBSON'S
SHOPPING CENTER, 6/94 BY BONNER
FOR MS. THOMAS

PRELIMINARY SUBSURFACE INVESTIGATION OF
RYAN MOTORS/RSCO REALTY, 10/94 BY
BONNER ANALYTICAL TESTING

ADDITIONAL INVESTIGATION OF GIBSON'S
SHOPPING CENTER, 7/95 BY BONNER
FOR MS. THOMAS

SOIL BORING ASSESSMENT,
6/96 BY TDS

REMEDIAL INVESTIGATION, BY MP&A
FOR KMCC

LEGEND

- SS-7 ○ HISTORICAL SOIL BORING/SAMPLE
- GEO-26 ▲ PHASE II RI SOIL BORING/SAMPLE
- —0.1— BENZO(a)PYRENE ISOCONCENTRATION LINE (mg/kg)

NOTE:
CONTOUR LINES BETWEEN KNOWN POINTS ARE INTERPOLATIONS AND MAY NOT ACCURATELY REPRESENT CONSTITUENT CONCENTRATIONS.

SCALE 0 100 200 300 400 FEET

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 2-7 BENZO(A)PYRENE EQUIVALENCE (mg/kg) IN 0-2' SOIL SAMPLES	
PROJECT: FORMER GULF STATES CREOSOTING SITE	
LOCATION: HATTIESBURG, MISSISSIPPI	
SCALE: 1"=200'	DWG. NO.: 21-04/76B

SITE INSPECTION, 1/92 BY MDEQ FOR EPA

SOIL GAS AND SOIL SAMPLING, 5/90 BY ROY F. WESTON FOR EPA

PHASE II INVESTIGATION OF PROCESS AREA, 1994 BY EPS FOR VAN SLYKE

PHASE II INVESTIGATION OF GIBSON'S SHOPPING CENTER, 6/94 BY BONNER FOR MS. THOMAS

PRELIMINARY SUBSURFACE INVESTIGATION OF RYAN MOTORS/RSCO REALTY, 10/94 BY BONNER ANALYTICAL TESTING

ADDITIONAL INVESTIGATION OF GIBSON'S SHOPPING CENTER, 7/95 BY BONNER FOR MS. THOMAS

SOIL BORING ASSESSMENT, 6/96 BY TDS

REMEDIAL INVESTIGATION, BY MP&A FOR KMCC

LEGEND

- SB-12 ○ HISTORICAL SOIL BORING/SAMPLE
- GEO-26 ▲ PHASE II RI SOIL BORING/SAMPLE
- MW-3 ● HISTORICAL MONITOR WELL
- —0.1— BENZO(a)PYRENE ISOCONCENTRATION LINE (mg/kg)

NOTE:
CONTOUR LINES BETWEEN KNOWN POINTS ARE INTERPOLATIONS AND MAY NOT ACCURATELY REPRESENT CONSTITUENT CONCENTRATIONS.

0 100 200 300 400
SCALE FEET

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

TITLE:	FIGURE 2-8 BENZO(A)PYRENE EQUIVALENCE (mg/kg) IN 2-5' SOIL SAMPLES
PROJECT:	FORMER GULF STATES CREOSOTING SITE
LOCATION:	HATTIESBURG, MISSISSIPPI
SCALE: 1"=200'	DWG. NO.: 21-04/77B

SITE INSPECTION,
1/92 BY MDEQ FOR EPA

SOIL GAS AND SOIL SAMPLING,
5/90 BY ROY F. WESTON FOR EPA

PHASE II INVESTIGATION OF PROCESS
AREA, 1994 BY EPS FOR VAN SLYKE

PHASE II INVESTIGATION OF GIBSON'S
SHOPPING CENTER, 6/94 BY BONNER
FOR MS. THOMAS

PRELIMINARY SUBSURFACE INVESTIGATION OF
RYAN MOTORS/RSCO REALTY, 10/94 BY
BONNER ANALYTICAL TESTING

SOIL BORING ASSESSMENT,
6/96 BY TDS

REMEDIAL INVESTIGATION, BY MP&A
FOR KMCC

LEGEND

SB5 ○	HISTORICAL SOIL BORING/SAMPLE
GEO-26 ▲	PHASE II RI SOIL BORING/SAMPLE
MW-1 ●	HISTORICAL MONITOR WELL
—0.1—	BENZO(a)PYRENE ISOCONCENTRATION LINE (mg/kg)

NOTE:
CONTOUR LINES BETWEEN KNOWN POINTS
ARE INTERPOLATIONS AND MAY NOT ACCURATELY
REPRESENT CONSTITUENT CONCENTRATIONS.

0 100 200 300 400
SCALE FEET

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 2-9
BENZO(A)PYRENE EQUIVALENCE (mg/kg)
IN 5-10' SOIL SAMPLES

PROJECT: FORMER GULF STATES CREOSOTING SITE

LOCATION: HATTIESBURG, MISSISSIPPI

SCALE: 1"=200' | DWG. NO.: 21-04/78B

SITE INSPECTION,
1/92 BY MDEQ FOR EPA

SOIL GAS AND SOIL SAMPLING,
5/90 BY ROY F. WESTON FOR EPA

PHASE II INVESTIGATION OF PROCESS
AREA, 1994 BY EPS FOR VAN SLYKE

PHASE II INVESTIGATION OF GIBSON'S
SHOPPING CENTER, 6/94 BY BONNER
FOR MS. THOMAS

PRELIMINARY SUBSURFACE INVESTIGATION OF
RYAN MOTORS/RSCO REALTY, 10/94 BY
BONNER ANALYTICAL TESTING

SOIL BORING ASSESSMENT,
6/96 BY TDS

REMEDIAL INVESTIGATION, 1997 BY MP&A
FOR KMCC

LEGEND

B-1 ○ HISTORICAL SOIL BORING/SAMPLE

● HISTORICAL MONITOR WELL

—0.1— BENZO(a)PYRENE ISOCONCENTRATION LINE (mg/kg)

NOTE:
CONTOUR LINES BETWEEN KNOWN POINTS
ARE INTERPOLATIONS AND MAY NOT ACCURATELY
REPRESENT CONSTITUENT CONCENTRATIONS.

0 100 200 300 400
SCALE FEET

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 2-10 BENZO(A)PYRENE EQUIVALENCE (mg/kg) IN 10-15' SOIL SAMPLES
PROJECT	FORMER GULF STATES CREOSOTING SITE
LOCATION:	HATTIESBURG, MISSISSIPPI
SCALE: 1"=200'	DWG. NO.: 21-04/79B

SITE INSPECTION,
1/92 BY MDEQ FOR EPA

SOIL GAS AND SOIL SAMPLING,
5/90 BY ROY F. WESTON FOR EPA

PHASE II INVESTIGATION OF PROCESS
AREA, 1994 BY EPS FOR VAN SLYKE

PHASE II INVESTIGATION OF GIBSON'S
SHOPPING CENTER, 6/94 BY BONNER
FOR MS. THOMAS

PRELIMINARY SUBSURFACE INVESTIGATION OF
RYAN MOTORS/RSCO REALTY, 10/94 BY
BONNER ANALYTICAL TESTING

ADDITIONAL INVESTIGATION OF GIBSON'S
SHOPPING CENTER, [illegible] BY BONNER
FOR MS. THOMAS

[illegible]

SOIL BORING ASSESSMENT,
6/96 BY TDS

REMEDIAL INVESTIGATION, 1997 BY MP&A
FOR KMCC

LEGEND

B-2 ○ HISTORICAL SOIL BORING/SAMPLE

MW-1 ● HISTORICAL MONITOR WELL

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

0 100 200 300 400
SCALE FEET

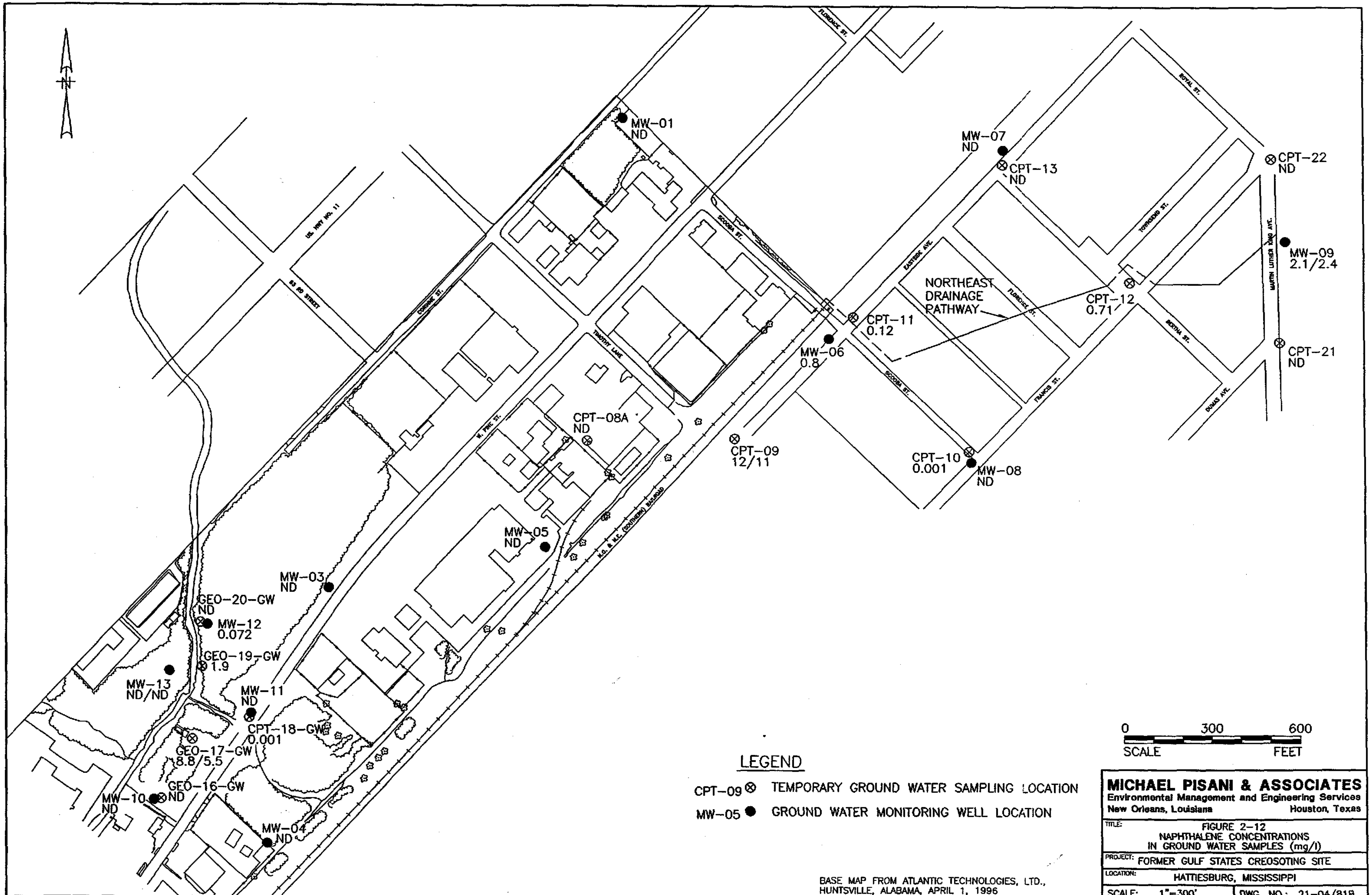
MICHAEL PISANI & ASSOCIATES
Environmental Management and Engineering Services
New Orleans, Louisiana Houston, Texas

TITLE: FIGURE 2-11
BENZO(A)PYRENE EQUIVALENCE (mg/kg)
IN 15-20' SOIL SAMPLES

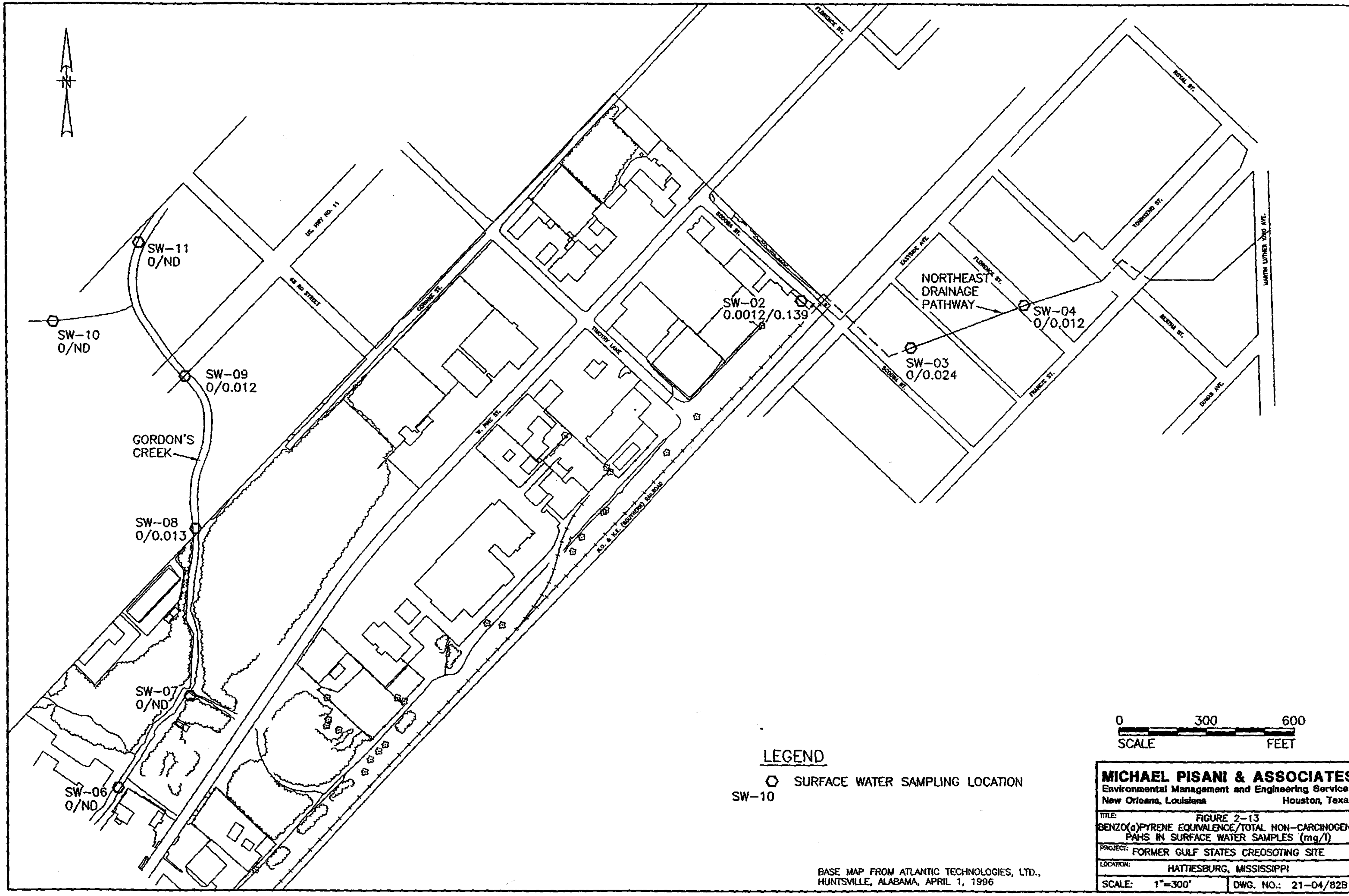
PROJECT: FORMER GULF STATES CREOSOTING SITE

LOCATION: HATTIESBURG, MISSISSIPPI

SCALE: 1"=200' DWG. NO.: 21-04/808



N
MW-01
ND
MW-07
ND
CPT-13
ND
CPT-22
ND
MW-09
2.1/2.4
NORTHEAST
DRAINAGE
PATHWAY
CPT-12
0.71
CPT-11
0.12
MW-06
0.8
CPT-21
ND
CPT-08A
ND
CPT-09
12/11
CPT-10
0.001
MW-08
ND
MW-05
ND
MW-03
ND
GEO-20-GW
ND
MW-12
0.072
GEO-19-GW
1.9
MW-13
ND/ND
MW-11
ND
CPT-18-GW
0.001
GEO-17-GW
8.8/5.5
GEO-16-GW
MW-10
ND
ND
MW-04
ND
U.S. HWY NO. 11
SCOOBA ST.
TIMOTHY LANE
W. PINE ST.
EASTSIDE AVE.
FLORENCE ST.
ROYAL ST.
TOWNSEND ST.
MARTIN LUTHER KING AVE.
BERTHA ST.
FRANCIS ST.
DUMAS AVE.
0 300 600
SCALE FEET
LEGEND
CPT-09 TEMPORARY GROUND WATER SAMPLING LOCATION
MW-05 GROUND WATER MONITORING WELL LOCATION
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 2-12
NAPHTHALENE CONCENTRATIONS
IN GROUND WATER SAMPLES (mg/l)
PROJECT: FORMER GULF STATES CREOSOTING SITE
LOCATION: HATTIESBURG, MISSISSIPPI
SCALE: 1"=300'
DWG. NO.: 21-04/818



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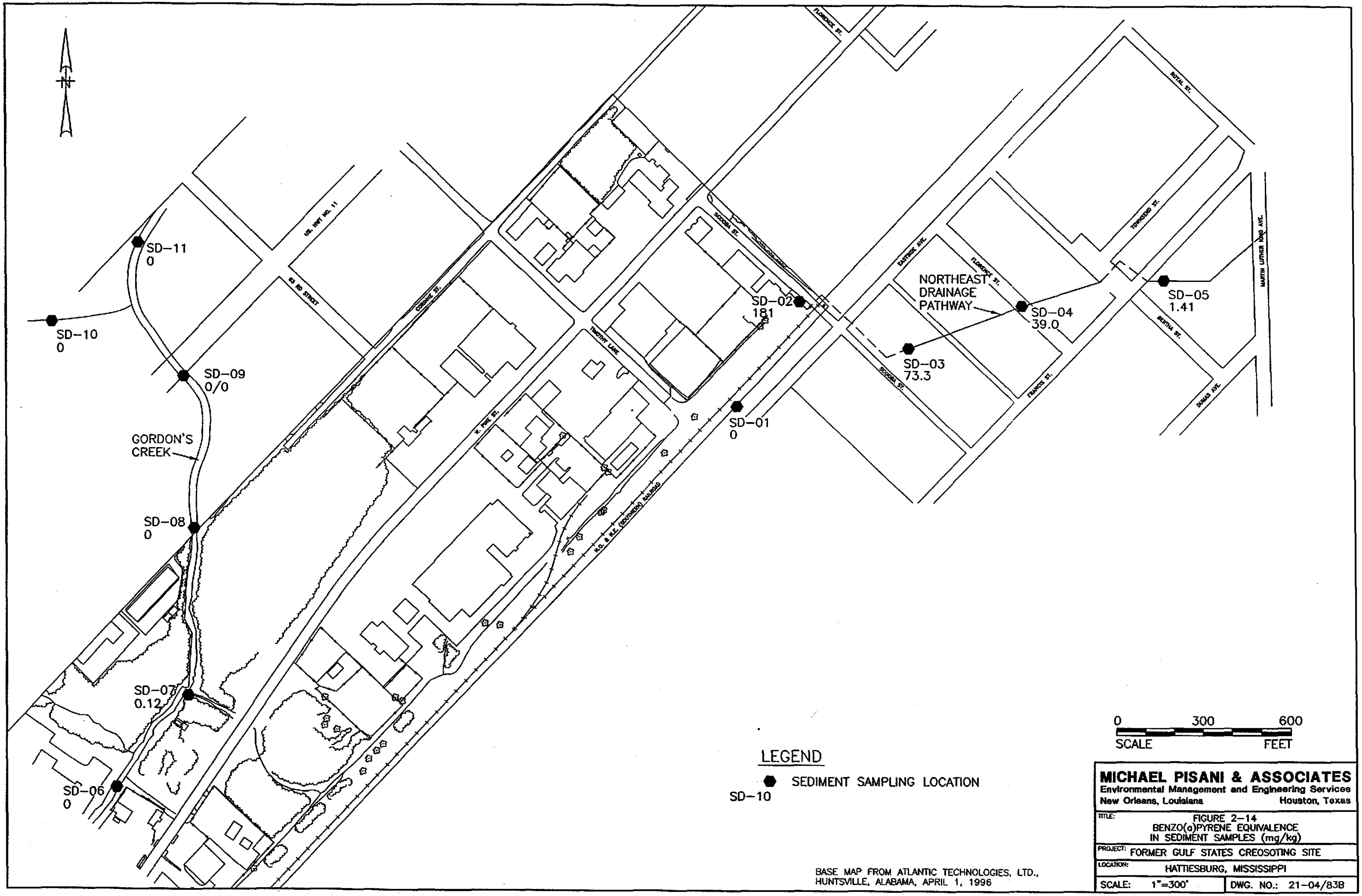
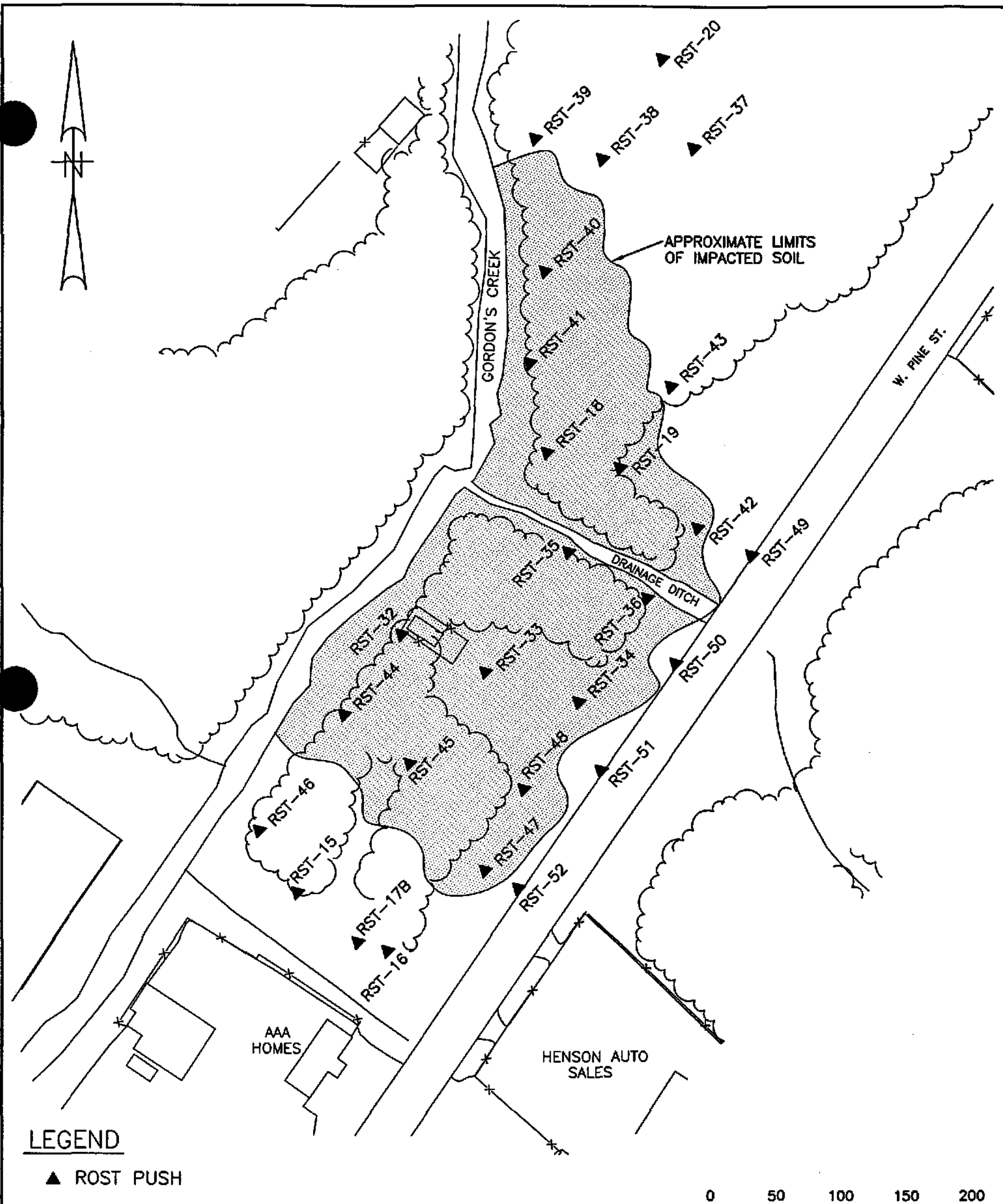
Environmental Management and Engineering Services
New Orleans, Louisiana — Houston, Texas

TITLE:	FIGURE 2-13 BENZO(a)PYRENE EQUIVALENCE/TOTAL NON-CARCINOGENIC PAHS IN SURFACE WATER SAMPLES (mg/l)
PROJECT:	FORMER GULF STATES CREOSOTING SITE
LOCATION:	HATTIESBURG, MISSISSIPPI
SCALE: 1"=300'	DWG. NO.: 21-04/82B



N
SD-11
0
SD-10
0
SD-09
0/0
GORDON'S CREEK
SD-08
0
SD-07
0.12
SD-06
0
SD-02
181
SD-01
0
SD-03
73.3
SD-04
39.0
SD-05
1.41
NORTHEAST DRAINAGE PATHWAY
US. HWY NO. 11
CORINNE ST.
W. PINE ST.
TIMOTHY LANE
SCOOBA ST.
FLORENCE ST.
EASTSIDE AVE.
ROYAL ST.
TOWNSEND ST.
MARTIN LUTHER KING AVE.
BERTHA ST.
FRANCIS ST.
DUMAS AVE.
LEGEND
SEDIMENT SAMPLING LOCATION
SD-10
BASE MAP FROM ATLANTIC TECHNOLOGIES, LTD., HUNTSVILLE, ALABAMA, APRIL 1, 1996
0
300
600
SCALE
FEET
MICHAEL PISANI & ASSOCIATES
Environmental Management and Engineering Services
New Orleans, Louisiana
Houston, Texas
TITLE: FIGURE 2-14
BENZO(a)PYRENE EQUIVALENCE
IN SEDIMENT SAMPLES (mg/kg)
PROJECT: FORMER GULF STATES CREOSOTING SITE
LOCATION: HATTIESBURG, MISSISSIPPI
SCALE: 1"=300'
DWG. NO.: 21-04/838



E MAP FROM ATLANTIC TECHNOLOGIES, LTD.,
TSVILLE, ALABAMA, APRIL 1, 1996

MICHAEL PISANI & ASSOCIATES **Environmental Management and Engineering Services** **New Orleans, Louisiana** **Houston, Texas**	FIGURE 2–15 APPROXIMATE EXTENT OF IMPACTED SOIL FILL AREA
SCALE: 1"=100' DWG. NO.: 21-04/84A	FORMER GULF STATES CREOSOTING SITE HATTIESBURG, MISSISSIPPI

Ground Water. The results of Phase II ground water sampling activities confirmed that the area containing impacted ground water is almost identical to the overlying area of impacted soil delineated during the Phase I RI. Figure 2-12 shows that monitoring wells MW-10, MW-11, and MW-12 establish the limits of impacted ground water in the fill area. Data from monitoring well MW-13 indicates that impacted fill area ground water has not migrated across Gordon's Creek.

NAPL. No NAPLs have been detected in any of the fill area monitoring wells. However, brown oily liquids were observed in several borings advanced within the fill area. These liquids appear to constitute a thin layer of NAPL at the interface of the first water-bearing sand and the first competent clay layer, at depths generally ranging from 6 to 12 feet below land surface (bls). This "perched" NAPL zone is apparently the source of the intermittent seeps of oily liquids into Gordon's Creek and the tributary ditch transecting the fill area.

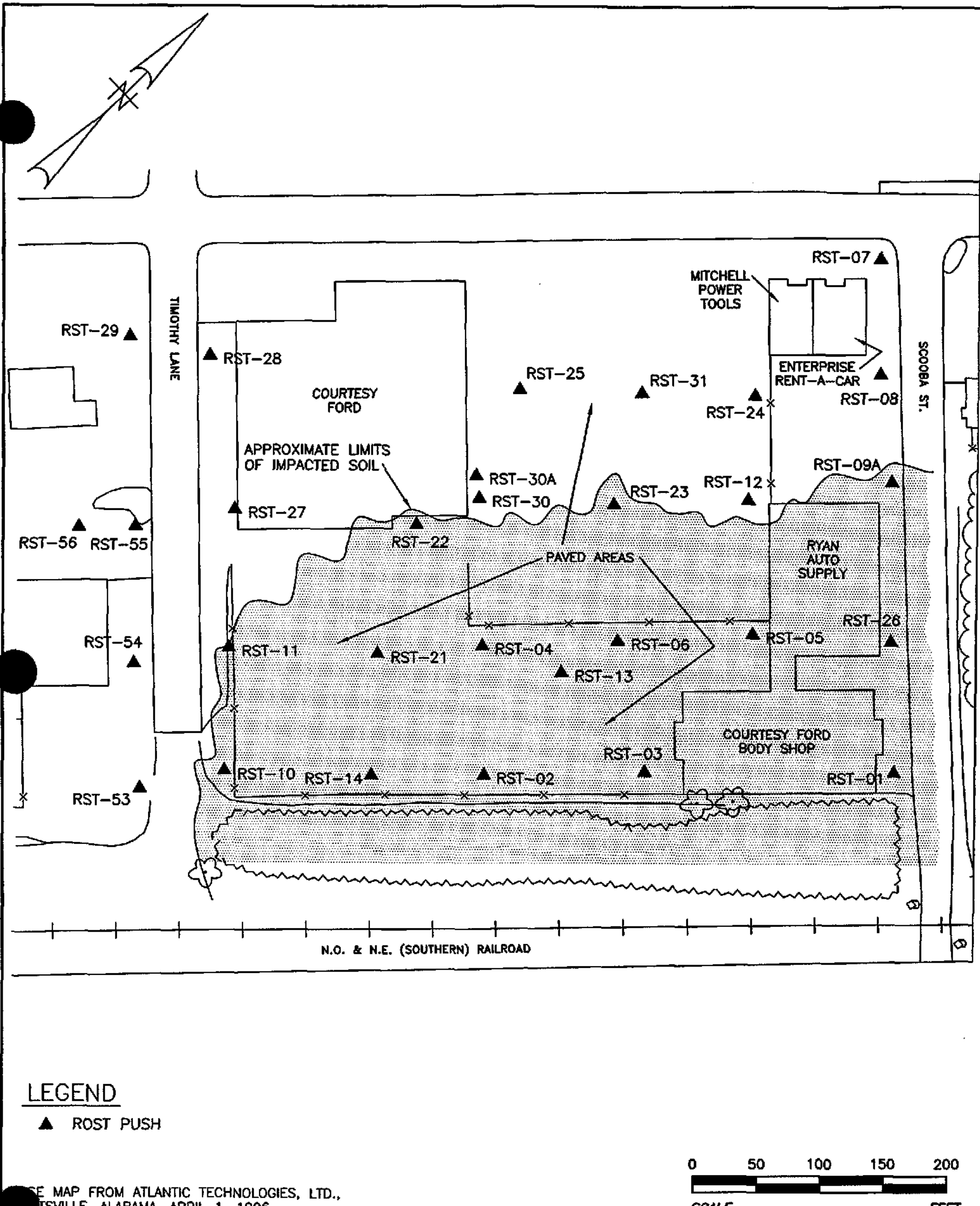
2.2.2 Former Process Area

Soil. ROST and subsurface soil analytical data indicate that creosote-impacted soils within the former process area are confined to areas beneath and/or immediately adjacent to former wood treating operational features. These features, as identified from historical Sanborn maps and aerial photographs, include a settling basin, steel oil storage tanks, the treating room, and oil dumping tanks. Former wood treating operational features were confined to an area currently bounded by Timothy Street on the southwest, the Southern railroad ditch on the southeast, Scooba Street on the northeast, and a line roughly parallel to and approximately 200 feet east of West Pine Street on the northwest.

The approximate extent of impacted soil within the former process area, based on the ROST data and subsurface soil results, is depicted by the shaded area on Figure 2-16. It appears that the migration of creosote constituents was limited by the low permeability of the upper clay, the highly adsorptive nature of the constituents, and the adsorbing capacity of the upper clay. The approximate surface area underlain by impacted soils is 3.4 acres. The depth of impacted soil in this area varies by location but ranges from approximately 5 feet bls to as deep as the top of ground water (20 to 25 feet bls).

The vast majority of impacted soils within the former process area is currently covered with asphalt or large building structures. This precludes direct contact with impacted soils and minimizes the infiltration of rainwater through these soils. The only unpaved area containing impacted soils is an approximately 50-foot wide strip of property between the Courtesy Ford parking lot and the Southern railroad right-of-way.

Ground Water. Results of the RI indicate that ground water in the uppermost water-bearing zone beneath the former process area has been impacted by former wood treating operations. Analytical data from onsite monitoring wells indicate that impacted ground water does not extend westward or significantly southward from the former process area.



SE MAP FROM ATLANTIC TECHNOLOGIES, LTD.,
TSVILLE, ALABAMA, APRIL 1, 1996

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

SCALE: 1"=100' | DWG. NO.: 21-04/85A

FIGURE 2-16
APPROXIMATE EXTENT OF IMPACTED SOIL
FORMER PROCESS AREA

FORMER GULF STATES CREOSOTING SITE
HATTIESBURG, MISSISSIPPI

Creosote constituents, most notably naphthalene, were reported in samples from several downgradient wells and temporary well points. As shown on Figure 2-12, the concentrations of these constituents generally decrease with distance from the former process area. The presence of site constituents in CPT-12-GW and MW-09 is attributed to the vertical migration of constituents from the northeast drainage ditch and is not the result of lateral migration via the ground water pathway.

NAPL. Dense non-aqueous phase liquids (DNAPLs) were measured in two wells within the former process area (MW-1 and MW-2) during the RI. However, although numerous ROST pushes were advanced to the top of the underlying clay in the former process area, no elevated ROST responses were recorded at the base of the sand channel. The ROST data demonstrate that the presence of DNAPL in these two wells is not indicative of a measurable layer of DNAPL at the base of the former process area sand channel.

A review of the boring logs and well construction diagrams for wells MW-1 and MW-2 provides a possible explanation for the presence of DNAPL in the two wells. Results of this review indicate that while the majority of the screen for the two wells is set within the uppermost portion of the former process area sand channel, the screen and filter pack extend upward into the creosote-impacted upper clay unit. This construction furnishes a preferential migration pathway for creosote entrained in the upper clay, i.e., into the filter pack, through the well screen, and into the well. The base of the well then acts as a sump for the accumulation of DNAPL. This explanation is consistent with scenarios known to exist at other wood treating sites.

During a 1994 investigation by Environmental Protection Systems, black oily liquids were reported in several borings, most notably borings SB4, SB7, and SB8. A review of historical Sanborn maps indicates that borings SB7 and SB8 were drilled in areas containing "oil dumping tanks" and "steel oil storage tanks," respectively. These borings met refusal at 12 feet and 2 feet, respectively, suggesting that tank remnants or foundations may still be present in the subsurface at these locations. SB4 met refusal on "treated wood timbers" at 5.5 and 3 feet at two locations before achieving target depth at a third. This suggests that treated wood and other debris may be present in the subsurface at this location.

2.2.3 Northeast Drainage Ditch

Elevated concentrations of creosoting constituents were reported in sediment samples collected at distances up to 1,000 feet downstream of the site in the northeast drainage ditch. However, as shown on Figure 2-14, constituent concentrations decreased dramatically with distance from the site.

3.0 Summary of Risk Assessment Findings

Using data generated during the Remedial Investigation, a baseline human health risk assessment was conducted to evaluate site risks (*Human Health Risk Assessment for the Former Gulf States Creosoting Site, Hattiesburg, Mississippi*, Environmental Standards, Inc., November 12, 1999). The risk assessment focussed on onsite concerns (i.e., risks posed by impacted media on the original 81-acre site). A summary of risk assessment findings is presented in this section.

3.1 Hazard Identification and Conceptual Site Model

As discussed in Section 2.0, residual levels of creosote constituents, mostly PAHs, are present in the fill area and the former process area. As the first step in the risk assessment process, a conceptual site model (CSM) was developed to aid in determining the potential receptors and exposure units to be evaluated under current and future land use. These receptors were identified to be infrequent site visitors, maintenance workers, and construction workers.

Under current and/or future land use assumptions, the receptors identified above may potentially contact the following impacted media:

Receptor	Impacted Media
• Infrequent site visitor	• Fill area surface soils • Former process area drainage ditch surface water, sediment, and surface soil
• Maintenance worker	• Fill area surface soils (mowing) • Former process area surface soils (shallow digging) • Former process area drainage ditch surface water, sediment, and surface soil (ditch maintenance)
• Construction worker	• Fill area surface and subsurface soils • Former process area surface and subsurface soils

In the risk assessment, surface soils were defined as those present from zero to one foot bls. Subsurface soils were defined as those present from one foot bls to 16 feet bls.

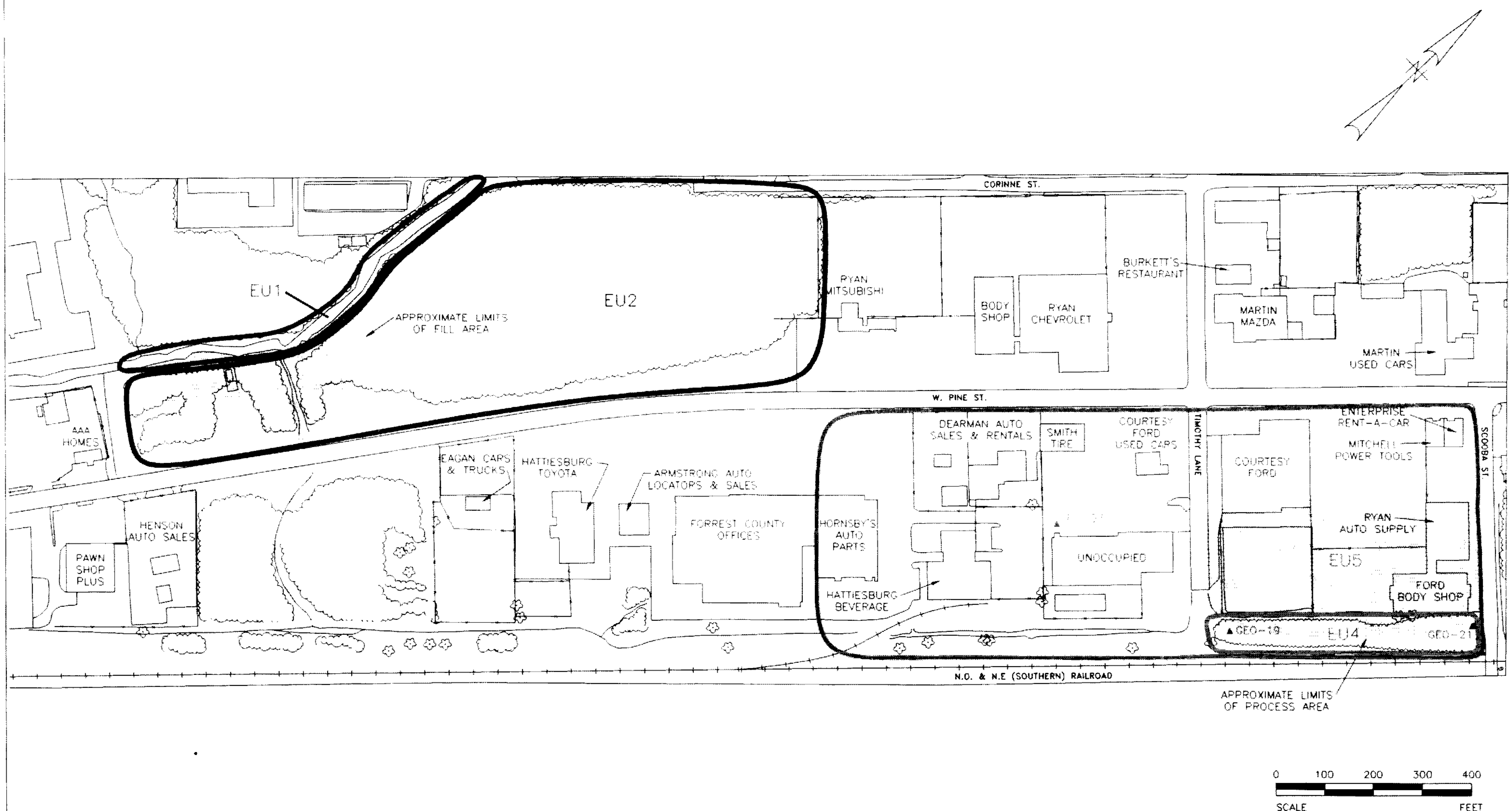
3.2 Data Evaluation

To characterize potential exposures to site constituents, the site was divided into five exposure units (EUs). Each exposure unit outlines potentially affected areas of the site and adjacent onsite locales that may be frequented by individuals for occupational and/or site access purposes. The exposure units are depicted on Figure 3-1. Areas of the site most impacted were included in at least one of the five EUs while areas with relatively low or non-detectable concentrations of residuals were not included in an EU. Figure 3-2 depicts current subleases that comprise the five EUs. Land use restrictions will be imposed on the lands covered by these subleases.

The risk assessment considered exposure of receptors to impacted media in the five EUs as follows:

Exposure Unit	Receptor
• EU1 (Gordon's Creek)	• Infrequent site visitor (surface water and sediment)
• EU2 (Fill area)	• Infrequent site visitor (surface soil) • Maintenance worker (surface soil) • Construction worker (surface and subsurface soil)
• EU3 (Exposed area east of West Pine St.)	• Infrequent site visitor (surface soil) • Maintenance worker (surface soil) • Construction worker (surface and subsurface soil)
• EU4 (Former process area drainage ditch)	• Infrequent site visitor (surface water, sediment, and surface soil
• EU5 (Former process area and drip track, including EU4)	• Maintenance worker (surface soil) • Construction worker (surface and subsurface soil)

The data were then evaluated statistically to determine chemicals of potential concern (COPCs) and exposure concentrations for each EU. As expected, COPCs were predominantly PAHs and some phenolic compounds.



▲ SAMPLE LOCATIONS WITH MAXIMUM BENZO(A)PYRENE SOIL CONCENTRATIONS IN EU5

BASE MAP FROM ATLANTIC TECHNOLOGIES, LTD., HUNTSVILLE, ALABAMA, APRIL 1, 1996
BASED ON A MAP PROVIDED BY MICHAEL PISANI AND ASSOCIATES

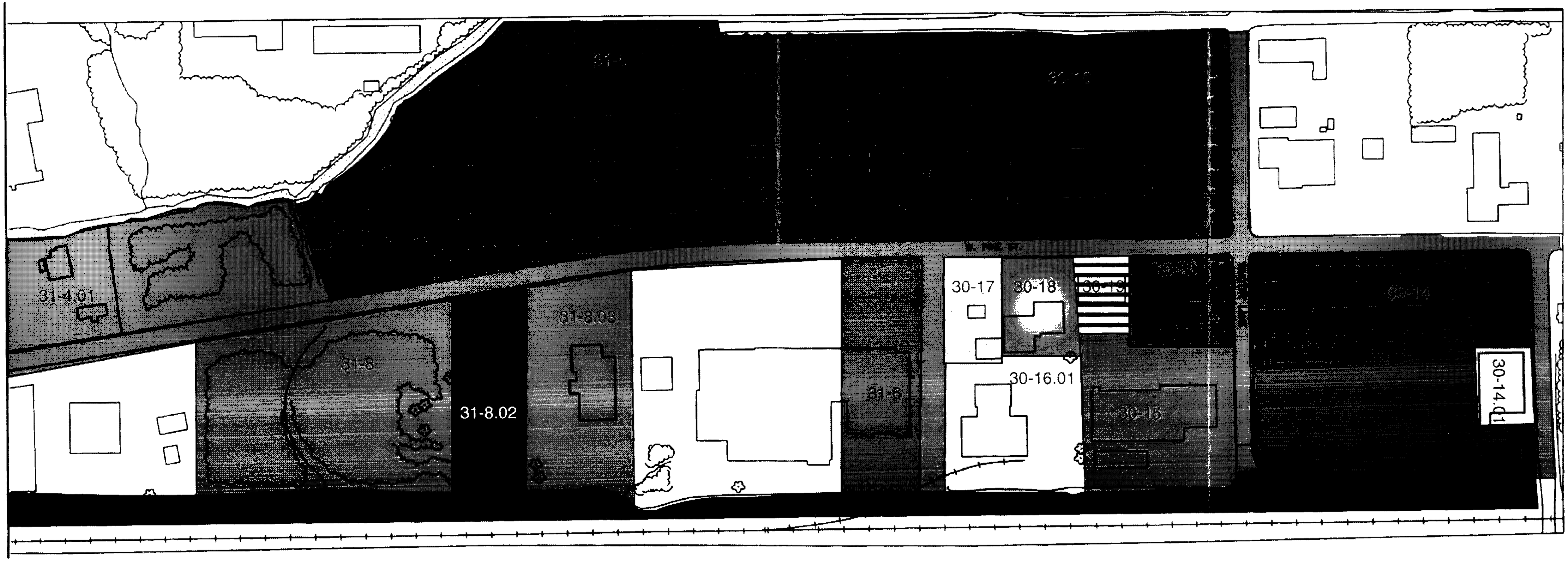
ENVIRONMENTAL STANDARDS, INC.

TITLE: FIGURE 3-1
SITE MAP AND EXPOSURE UNIT DELINEATION

PROJECT: FORMER GULF STATES CREOSOTING SITE

LOCATION: HATTIESBURG, MISSISSIPPI

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



30-14 B.E. & Judith R. Mixon

30-20 Courtesy Motors, Inc.

31-6 O.M.T. Properties, Inc.

30-14.01 Ryan Supply Company

30-16.01 Hattiesburg Beverage Company, Inc.

31-4.01, 31-8, 31-8.03, streets Industrial Park, Inc.

30-10, 31-5, 30-13 RSCO Realty Corp.

30-15 The Corr-Williams Company

30-17 Semian M. Dearman & Joyce H. Dearman

30-19 Mahlon H. Yarbrough & Dorothy C. Yarbrough

30-18 David L. Dearman & Tamara B. Dearman

31-8.02 Robert L. Touchstone, Jr. & Randa D. Touchstone

Hattiesburg Municipal Separate School District

Figure 3-2
Subleases covering impacted areas

3.3 Exposure Assessment

The first component of the exposure assessment was the identification of potential receptors, each of which is discussed below.

Infrequent Site Visitor - Since the majority of the property occupied by the EUs is not currently fenced or guarded, the general public has access to most areas at any given time. It is possible that an individual traversing the site may contact impacted surface soil in EU1, EU2, EU3, or EU4, or may contact impacted surface water/sediment in EU 1 or EU4. For this reason, exposures of visitors to these impacted media were assessed for the visitor scenario.

Maintenance Worker - Currently, maintenance activities are most likely limited to the developed portions of the site. Of these, the former process area and adjacent former drip track area (EU5) were most impacted by historical creosoting operations. Although these areas are mostly paved or built upon, it is possible that maintenance activities may require some shallow digging in unpaved areas; therefore, exposures to surface soils in EU5 were assessed. As a conservative measure, surface soil data from locations in paved areas were evaluated in conjunction with surface soil data from exposed areas in EU5. If the currently undeveloped portions of the site (EU2 and EU3) become developed in the future, similar maintenance activities may be required and, therefore, exposures to surface soils in EU2 and EU3 were also assessed.

Construction Worker - Although there are currently no major construction activities at the site, such activities may hypothetically occur in the future. The three most affected areas of the site, EU2, EU3, and EU5, were selected to address hypothetical future construction worker scenarios. Construction workers may be exposed to both surface and subsurface soils during activities such as excavating. Subsurface soils, for purposes of the risk assessment, were defined as those soils 16 feet bls and shallower. Subsurface soil samples at the site were collected at various depth intervals, one of which was 14 to 16 feet. Excavating equipment (e.g., backhoes) can generally reach to about 15 feet bls; consequently, the 14 to 16 foot depth interval presented a logical break in the site data and was used to define the extent of subsurface soils. Available subsurface soil data were utilized for this exposure scenario.

The second component of the exposure assessment was the calculation of chemical exposure/intake. EPA and Mississippi Commission for Environmental Quality (MDEQ) exposure factors were used where appropriate to determine general intake. Site-specific exposure factors were incorporated where default values were not applicable to site conditions. EPA-approved paradigms were used to calculate daily intakes of site constituents.

3.4 Toxicity Assessment

A toxicity assessment was performed to evaluate the available toxicity information to be utilized in the risk assessment. Since exposure to a COPC does not necessarily result in adverse health effects, toxicity values derived from a dose-response relationship were used to estimate the potential for the occurrence of adverse effects in individuals exposed to various constituent levels. Toxicity values for COPCs were obtained using the following hierarchy developed in accordance with MCEQ guidance:

1) The *Integrated Risk Information System* (IRIS, 1999) database
2) The Health Effects Assessment Summary Tables (HEAST, U.S. EPA, 1997)
3) U.S. EPA Region III's Risk-Based Concentration (RBC) tables.

3.5 Risk Characterization

The objective of the risk characterization is to determine potential risk to receptors by combining the results of the exposure and toxicity assessments. Both non-carcinogenic effects and carcinogenic risks are determined through the risk characterization. The following is a summary of the risk assessment findings.

The results of the baseline human health risk assessment indicate risk values exceeding the U.S. EPA/MDEQ no further action threshold value of $1x10^{-6}$ for the infrequent site visitor exposed to soils in EU4, and the maintenance worker and construction worker exposed to soils in EU5, as a result of the presence of residual benzo(a)pyrene equivalents. To determine the extent of remediation necessary to reduce these risks to levels below the no further action threshold, soil data in EU5 were closely examined.

In EU5, the surface sample locations contributing most to elevated risk levels for the maintenance worker scenario were GEO-19/0-1', GEO-21/0-1', and GEO-33/0-1' (see Figure 3-1). Benzo(a)pyrene equivalent concentrations at these locations contributed most to the maintenance worker risk estimates. Sample location GEO-33/0-1' is located within a paved area in a parcel of land southwest of Courtesy Ford (Figure 3-1). Pavement in this area precludes direct contact with surface soils; therefore, it is not anticipated that current or future maintenance workers will have access to surface soils in or around sample location GEO-33/0-1'. Sample locations GEO-19/0-1' and GEO-21/0-1' are located between the fenced Courtesy Ford property and the railroad tracks to the southeast of Courtesy Ford (Figure 3-1).

For the maintenance worker scenario, elimination of contact with the three maximum concentrations of benzo(a)pyrene equivalents would reduce risk levels in EU5 to below the no further action threshold of $1x10^{-6}$. Existing pavement already precludes direct contact with surface soils at location GEO-33/0-1'. Implementing a remedy to preclude contact with surface soils (specifically at sample locations GEO-19/0-1' and GEO-21/0-1') along the drainage ditch in the vicinity of EU4 would significantly reduce current risk levels. The risk level associated with benzo(a)pyrene equivalent residuals was recalculated excluding the three maximum benzo(a)pyrene equivalent concentration sample locations in EU5. A re-evaluation of risks excluding contact with the most affected soils indicates risk levels below the *de minimis* lower range of the target risk level.

Benzo(a)pyrene equivalents in soil sample locations GEO-21/0-1' and GEO-21/2-3' contributed most to the elevated risk levels for the construction worker scenario in EU5. Implementing a remedy to preclude contact with soils down to 3 feet bls at sample location GEO-21 would significantly reduce current risk levels. The remedy for the construction worker scenario in EU5 can be implemented in conjunction with the remedy for the maintenance worker scenario in EU5 since sampling location GEO-21 is a risk driver for both scenarios. By implementing a remedy that would preclude contact with sample locations GEO-21/0-1' and GEO-21/2-3', cancer risk levels for the construction worker scenario in EU5 would be reduced to below the *de minimis* risk level of 1×10^{-6}. Implementation of a remedy precluding contact with GEO-19/0-1', as a result of the EU5 maintenance worker exposures, would further reduce construction worker risk levels.

Benzo(a)pyrene equivalents in soil sample locations GEO-21/0-1' and GEO/19/0-1' contributed most to the elevated risk levels for the infrequent site visitor scenario. Implementing a remedy to preclude contact with soils at sample locations GEO-21/0-1' and GEO/19/0-1' down to one foot bls would significantly reduce risk levels to below the *de minimis* risk level of 1×10^{-6}. The remedy for the infrequent site visitor can be implemented in conjunction with the remedy for the maintenance worker scenario in EU 5 since sampling locations GEO-21 and GEO-19 are risk drivers for both scenarios.

4.0 Feasibility Study

The Feasibility Study (FS) serves as a mechanism for evaluating potential remedial options at uncontrolled hazardous substance sites. The FS is conducted in two phases: 1) development and screening of alternatives, and 2) detailed analysis of alternatives.

4.1 Development and Screening of Alternatives

The NCP requires that alternatives be developed that protect human health and the environment by recycling waste or by eliminating, reducing, and/or controlling risks posed by a site. The number and type of alternatives should be determined at each site taking into consideration the scope, characteristics, and complexity of the problems at the site. The steps in the development and screening of alternatives include the following: identification of ARARs, identification of remedial action objectives, development of general response actions, identification of screening technologies and process options, and assemblage of selected technologies into alternatives.

4.1.1 Identification of ARARs

CERCLA Section 121 requires that remedial actions comply with the requirements of all federal and duly established state environmental regulations. These regulations are referred to as Applicable or Relevant and Appropriate Requirements (ARARs). Requirements that are applicable to a release or remedial action include those that specifically address the hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at the site.

Relevant and appropriate requirements include those that are not applicable but may address problems or situations sufficiently similar to the circumstances of the release or remedial action and/or are well suited to the site. In addition to ARARs, other advisories, criteria, or guidance may be considered for a particular site. This category is referred to as the To Be Considered (TBC) category. Materials that fall into this category may also be used to develop the final remedy for the site.

The ARARs for the site are divided into three categories: chemical specific, location specific, and action specific. Chemical specific ARARs include regulations governing materials possessing certain chemical or physical characteristics or containing specific chemical compounds. Location specific ARARs are activity restrictions or design requirements based on the geographic or physical position of the site. Action specific ARARs are technology based and establish performance or design criteria for the management of the remedial action. ARARs and TBCs for the site are presented in Tables 4-1 through 4-4.

T[illegible]4-1
Potential Chemical Specific ARARs

Former Gulf States Creososting Site
Hattiesburg, Mississippi

Standard, Requirement Citation, or Limitation	Citation	Description	Applicable	Relevant and Appropriate
Federal ARARs				
Safe Drinking Water Act				
National Primary Drinking Water Standards	40 CFR Part 141	Establishes health based standards for public water systems (maximum contaminant levels). MCLGs set at zero are not appropriate for target remedial goals at CERCLA sites.	No	Yes
National Secondary Drinking Water Standards	40 CFR Part 143	Establishes welfare based standards for public water systems (secondary maximum contaminant levels).	No	No
Clean Water Act	33 USC 1251 - 1376			
Water Quality Criteria	40 CFR Part 131	Sets criteria for water quality based on toxicity to aquatic organisms and human health.	No	Yes
Resource Conservation and Recovery Act (RCRA) as amended	42 USC 6905, 6912, 6924, 6925			
RCRA Ground Water Protection	40 CFR Part 264	Provides for the protection of ground water at solid waste management units.	No	Yes
RCRA SWMU Requirements	40 CFR Part 257	Provides for ground water protection standards, general monitoring requirements and technical requirements.	No	Yes
Hazardous Remediation Waste Management Requirements (HWIR-Media)	40 CFR Part 264, 270	Provides for corrective action management unit, staging piles, and remedial action plans	No	Yes
Clean Air Act	40 USC 1857			
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Act sets primary and secondary air standards at levels to protect public health and public welfare, respectively.	No	Yes
State ARARs				
Voluntary Cleanup and Redevelopment Program	MCA Section 49-35-21	Establishes risk-based remediation requirements.	Yes	No
Mississippi Ambient Air Quality Standards	APC-S-4	Establishes ambient air quality standards.	Yes	No

-2

Potential Action Specific ARARs

Former Gulf States Creososting Site
Hattiesburg, Mississippi

Standard, Requirement Citation, or Limitation	Citation	Description	Applicable	Relevant and Appropriate
Federal ARARs				
Clean Water Act	33 USC 1251 - 1376			
Requires use of Best Available Treatment Technology (BACT)	40 CFR 122	Use of best available technology economically achievable is required to control discharge of toxic pollutants to POTW.	Yes	No
National Pollutant Discharge Elimination System Permit Regulations	40 CFR 122 Subpart C	Use of best available technology economically achievable is required to control discharge of toxic pollutants to POTW.	Yes	No
Discharge must be consistent with the requirements of a water quality management plan approved by EPA.	40 CFR 122	Discharge must comply with EPA approved Water Quality Management Plan.	Yes	No
Discharge must be monitored and meet water quality standards	40 CFR 122	Discharge must comply with Water Quality Criteria.	Yes	No
Resource Conservation and Recovery Act (RCRA) as amended	42 USC 6905, 6912, 6924, 6925			
Identification of Hazardous Waste	40 CFR 261	Federal requirement for identification and classification of hazardous wastes.	No	Yes
Treatment of Hazardous Waste in a unit	40 CFR 264	Rules and requirements for the treatment of hazardous wastes.	No	Yes
Requirements for Generation, Storage, Transportation, and Disposal of Hazardous Waste	40 CFR 263, 264	Regulates storage, transportation, and operation of hazardous waste generators.	No	Yes
Land Disposal Restrictions	40 CFR 268	Establishes treatment standards for hazardous wastes and alternative treatment standards for contaminated soil.	No	Yes
Closure and Post Closure Requirements	40 CFR 264	Establishes standards for clean closure, closure with waste inplace, and post closure care.	No	Yes
Incineration	40 CFR 264.340 - 345	Establishes performance standards for incinerators.	No	Yes
State ARARs				
Wastewater regulations for NPDES Permits, Underground Injection Control Permits, Water Quality Based Effluent Limitations and Water Quality Certification		Establishes state standards for discharge of wastewater.	Yes	No
Hazardous Waste Management Regulations		Establishes state standards for generators and transporters of hazardous waste.	No	Yes
Solid Waste Management Regulations		Establishes minimum state criteria for all facilities that manage solid waste.	No	Yes
Mississippi Air Emission Regulations for the Prevention, Abatement and Control of Air Contaminants	APC-S-1	Establishes state standards for control of air emissions	Yes	No

T[illegible]-3
Potential Location Specific ARARs

Former Gulf States Creososting Site
Hattiesburg, Mississippi

Standard, Requirement Citation, or Limitation	Citation	Description	Applicable	Relevant and Appropriate
Federal ARARs				
Clean Water Act				
Dredge or Fill Requirements	40 CFR 230	Requires permit for discharge of dredged or fill material into aquatic environment	No	No
Resource Conservation and Recovery Act (RCRA) as amended				
Location Standards	40 CFR 264.18 (b)	A TSD facility must be designed, constructed, operated, and maintained to avoid washout.	No	Yes
Fish and Wildlife Coordination Act				
Floodplain Management	40 CFR 6.302	Actions that are to occur in a floodplain should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial value.	No	No
Wetlands Protection	40 CFR 6, Appendix A	Requires that activities should be conducted to avoid to the extent possible adverse impacts associated with the destruction or modification of wetlands.	No	No
Sole Source Aquifer	Pub L No. 100-572 (1988)	Establishes procedures for development, implementation and assessment of programs designed to protect sole or principal source aquifers.	No	No

Table 4-4
To Be Considered Criteria and Guidance

Former Gulf States Creososting Site
Hattiesburg, Mississippi

Standard, Requirement Citation, or Limitation	Document No.	Date	Description
Federal TBCs			
RCRA Ground Water Monitoring Technical Enforcement Guidance Document	EPA/530-SW-86-055	September 86	Describes the essential components of a ground water monitoring system to meet the goals of RCRA.
Management of Remediation Waste under RCRA memorandum from Fields to RCRA/CERCLA Senior Policy Managers	None	October 14, 1998	Describes policy for evaluating material to determine if a material is a listed hazardous waste.
Treatment Technology Performance and Cost Data for for Remediation of Wood Preserving Sites	EPA/625/R-97/009	October 97	Presents data on remedial alternatives for wood preserving sites including cost and performance data.
OSWER Directives on RCRA	Various	Various	Describe USEPA policy and procedures including guidance and clarification.
Regulatory Development Branch Memorandums on RCRA	Various	Various	Provides interpretations on RCRA regulatory issues.
State TBCs			
Guidance for Remediation of Uncontrolled Hazardous Substance Sites in Mississippi	None	September 90	Presents the process for remediation of uncontrolled hazardous substance sites in Mississippi.

4.1.2 Identification of Remedial Action Objectives

The objectives of any proposed remedial actions for specific media at the site must include the following:

1. Identify those site-related COPCs that may pose risks to human health and the environment;
2. Define the scenarios of potential human and environmental exposure to site-related COPCs including the exposure route and the receptor;
3. Define an acceptable contaminant level or range of levels for each exposure route identified in the baseline risk assessment.

Site-related COPCs that may pose risks to human health or the environment have been identified through completion of Phase I and Phase II Remedial Investigations at the site. The baseline risk assessment defined the scenarios for actual and potential exposure of human receptors and the environment to site-related COPCs.

The acceptable range of contaminant levels for each exposure route has been defined as cumulative site carcinogenic risk level of less than 10^{-6} cancer risk for each individual COPC. This objective can be accomplished by either reducing the actual exposure of the site-related constituents to human and environmental receptors, by reducing concentrations of site-related COPCs, or by a combination thereof.

4.1.3 Development of General Response Actions

General response actions are defined as actions that satisfy the remedial action objectives. General response actions for the impacted media at the site include the following:

1. No action
2. Institutional control
3. Containment
4. Removal
5. Onsite treatment
6. Offsite treatment
7. In situ treatment
8. Onsite disposal
9. Offsite disposal

4.1.4 Identification and Screening of Technologies and Process Options

Remedial technologies and process options for soil and ground water are identified and screened in Table 4-5 and 4-6, respectively. These technologies and process options were rejected or retained for further evaluation and analysis based on technical implementability and best professional judgement. In general, one representative process option was selected for each technology type.

Table 4-5

Soil Technologies and Process Options
Initial Screening

Former Gulf States Creososting Site
Hattiesburg, Mississippi

General Response Actions	Technology	Process Option
No Action	No Action	No Action
Institutional Controls	Site Access and Use Restrictions	Land Use Restrictions
		Fencing
	Environmental Monitoring	Air, Soil, and Surface Water Monitoring
Containment	*Capping*	Asphalt
		Concrete
		Clay
	Barrier System	Vertical Barrier
	Gradient Control	Extraction Wells
		Subsurface Drains
	Surface Controls	Surface Water Diversion/Collection System
Removal	Excavation	Removal of Subsurface Soils
	Recovery	NAPL Recovery
Onsite Treatment	Biological	Land Farming
Offsite Treatment	Thermal	Incineration
In Situ Treatment	Biological	In Situ Bioremediation
Onsite Disposal	Disposal	Onsite RCRA landfill
Offsite Disposal	Disposal	Industrial Waste Landfill
		RCRA Hazardous Waste Landfill

Table 4-6

Ground Water Technologies and Process Options
Initial Screening

Former Gulf States Creosoting Site
Hattiesburg, Mississippi

General Response Actions	Technology	Process Option
No Action	No Action	No Action
Institutional Controls	Ground Water Use Restrictions	State Imposed Use Restrictions
	Environmental Monitoring	Ground Water Monitoring
Containment	Gradient Controls	Extraction Wells
		Injection Wells
Removal	Extraction	Extraction Wells
	Recovery	NAPL Recovery System
Onsite Treatment	Physical/Chemical	Activated Carbon
		Filtration
Offsite Treatment	Thermal	Incineration
In Situ Treatment	Biological	In Situ Bioremediation
Onsite Disposal	Discharge	Surface Water
Offsite Disposal	Discharge	POTW
	Recycle	Reuse NAPLs

Process options selected during the screening process include EPA presumptive remedies. Presumptive remedies for soils, sediments, and sludges at wood preserving sites include biological treatment, thermal desorption, and incineration. EPA has identified these presumptive remedies because they were highly effective at treating similar wastes at other CERCLA sites. EPA guidance indicates that presumptive remedies are expected to be used at all appropriate sites except under unusual site-specific circumstances.

4.1.5 Assemblage of Selected Technologies into Alternatives

Based on the results of the identification and screening of technologies and process options, selected technologies have been assembled into alternatives. The definition of each alternative is presented in Sections 4.1.5.1 and 4.1.5.2.

4.1.5.1 Soil Remedial Action Alternatives

S-1 No Action - Site is left in its current condition. The NCP requires that the No Action alternative be retained and used as a baseline alternative for comparison.

S-2 Cap System - Installation of a cap system over the contaminated soil to prevent direct contact and minimize infiltration and contaminant migration.

S-3 NAPL Recovery System and In Situ Biological Treatment - Installation of a NAPL recovery system combined with in-place biological treatment of the contaminated soil.

S-4 Limited Removal and Offsite Disposal - Limited excavation of contaminated soils by conventional methods and disposal in an approved waste landfill.

S-5 Removal and Offsite Disposal/Treatment - Excavation of contaminated subsurface soils by conventional methods, treatment by approved methods (e.g., incineration, thermal desorption), and disposal in an approved waste landfill.

4.1.5.2 Ground Water Remedial Action Alternatives

GW-1 No Action - Site is left in its current condition. The NCP requires the No Action alternative be retained and used as a baseline alternative for comparison.

GW-2 Natural Attenuation and Ground Water Monitoring – Monitoring of certain ground water parameters that are indicative of the natural attenuation of contaminants. In addition, contaminant levels are monitored over time to observe meaningful trends.

GW-3 NAPL Recovery and Offsite Disposal – Installation of a NAPL recovery system combined with offsite disposal or recycling.

GW-4 Gradient Control and Physical/Chemical Treatment - Extraction wells pump contaminated ground water and effectively contain the spread of contaminant migration. In addition, the ground water is treated by physical/chemical treatment, if necessary, and discharged to the POTW.

GW-5 Vertical Barrier System, Extraction, and Physical/Chemical Treatment - Installation of a vertical barrier around the perimeter of the contaminated soil and ground water to minimize the contaminant migration, combined with the extraction and physical/chemical treatment of the contaminated ground water.

4.2 Detailed Analysis of Alternatives

The detailed analysis of alternatives phase consists of the evaluation and presentation of information necessary to select an appropriate site remedy. During the detailed analysis, alternatives are assessed against nine specific evaluation criteria (see Section 4.2.1).

(Note: Since the available site data was determined to be adequate to evaluate remedial alternatives, no treatability investigations were conducted. However, prior to implementation, treatability studies may be conducted to determine the most effective process option for a selected technology).

4.2.1 Overview of Evaluation Criteria

Overall Protection of Human Health and the Environment
This evaluation criterion is used to determine if the alternative provides adequate protection of human health and the environment. The comparison of alternatives presented herein considered the results of the baseline risk assessment in evaluating whether an alternative meets this requirement.

Compliance with ARARs
This evaluation criterion is used to determine if an alternative meets all federal and state ARARs. Each alternative was evaluated to determine whether it complied with the ARARs presented in this report.

Long Term Effectiveness
The evaluation of alternatives under this criterion addresses the results of remedial action in terms of the residual risk at the site after the completion of the remediation. This criterion includes the following two components:

1. Magnitude of residual risk from untreated waste or treatment residuals
2. Adequacy and reliability of controls used to manage untreated wastes and treatment residuals

Reduction of Toxicity, Mobility, and Volume through Treatment
This evaluation criterion addresses the statutory preference for selecting a remedy that permanently reduces toxicity, mobility, or volume of the hazardous substance at the site.

Short Term Effectiveness

This evaluation criterion addresses the risks associated with the construction and implementation of the alternative. This criterion also addresses the environmental impacts of the alternative and the time until remedial objectives are achieved.

Implementability

This evaluation criterion is used to evaluate the technical and administrative feasibility of implementing an alternative and the availability of various services and materials. The technical feasibility analysis is based on the following factors:

1. Construction and operation
2. Reliability of technology
3. Ease of undertaking additional remedial action

Administrative feasibility is based on the activities needed to coordinate with other parties and agencies. The availability of various services and materials includes the following:

1. Adequate offsite treatment, storage capacity, and disposal services
2. Necessary equipment and specialists
3. Potential for obtaining competitive bids
4. Prospective technologies

Cost

This evaluation criterion is used to compare the cost of the alternatives, including capital costs and operations and maintenance. An order of magnitude cost estimate should be used to compare the cost of the alternatives.

State Acceptance

This evaluation criterion addresses the technical and administrative issues and concerns of the support agency regarding each alternative.

Community Acceptance

This criterion evaluates the issues and concerns the public may have regarding each of the alternatives.

4.2.2 Analysis of Alternatives

4.2.2.1 Descriptions of Alternatives for Soil

S-1 No Action

Consideration of this alternative is required by the NCP. The site is left in its current condition and no funds are expended for monitoring, control, or remediation. This alternative is used as a baseline alternative for comparison.

S-2 Cap System

This alternative would include the installation of a cap system over the contaminated soil to minimize the infiltration and migration of contaminants from the soil. This alternative would involve containment by concrete, asphalt, or clay cap, which would also require surface drainage controls. The collected water would drain into existing drainage features at the site. The cap would eliminate or greatly reduce the infiltration of precipitation through contaminated soil to ground water. This alternative would require periodic ground water monitoring to monitor the effectiveness of the remedy.

S-3 NAPL Recovery and In Situ Biological Treatment
This alternative would involve the installation of a NAPL recovery system. The separate phase material in the soil would be collected and recovered for offsite treatment and disposal. In addition, in situ biological treatment would be incorporated to enhance biodegradation of the contaminants in the soil by providing electron acceptors (e.g., oxygen and nitrate), nutrients, moisture, and other amendments to the soil.

S-4 Limited Removal and Offsite Disposal
This alternative consists of limited excavation of contaminated soils by conventional methods and disposal in an approved waste landfill. In order to minimize the disruption of current site activities, a limited excavation of contaminated surface soils would be undertaken in areas where soils are not currently capped or contained. The excavated materials would be analyzed and profiled for offsite disposal in an approved waste landfill.

S-5 Removal and Offsite Treatment/Disposal
This alternative consists of excavation of contaminated soils by conventional methods and disposal in an approved waste landfill. All contaminated soils would be excavated and removed from the site for disposal at an approved landfill. The potential exists that materials excavated from the site may require thermal treatment (e.g., thermal desorption, incineration) prior to disposal.

4.2.2.2 Descriptions of Alternatives for Ground Water

GW-1 No Action
Consideration of this alternative is required by the NCP. The site is left in its current condition and no funds are expended for monitoring control, or remediation. This alternative is used as a baseline alternative for comparison.

GW-2 Natural Attenuation and Ground Water Monitoring
In this alternative, certain ground water parameters that are indicative of the natural attenuation of contaminants would be monitored. Contaminant levels would also be monitored over time to observe meaningful trends. It is anticipated that contaminants would naturally attenuate after source material is removed or controlled. In addition, periodic ground water monitoring of all existing wells would be implemented. Monitoring would continue for a period of approximately 5 years.

GW-3 Vertical Barrier, NAPL Recovery, and Offsite Disposal
This alternative would consist of installation of a vertical barrier around the perimeter of the contaminated soil and ground water to minimize the contaminant migration, combined with

NAPL recovery. A NAPL recovery system would be installed behind the vertical barrier for the collection and removal of NAPL. Once recovered, the material would be managed for offsite disposal or recycle.

GW-4 Gradient Control and Physical/Chemical Treatment
Under this alternative, extraction wells would pump contaminated ground water to provide containment and control of the contaminated ground water plume. The contaminated ground water would be treated by a physical/chemical treatment (e.g., separation, filtration, activated carbon) and discharged to the POTW or re-injected to provide additional containment of the contaminant plume. Implementation of this alternative would require aquifer testing and detailed ground water flow modeling.

GW-5 Vertical Barrier, Extraction, and Physical/Chemical Treatment
This alternative would consist of installation of a vertical barrier around the perimeter of the contaminated soil and ground water to minimize the contaminant migration, combined with physical/chemical treatment (e.g., separation, filtration, activated carbon) of the contaminated ground water. This alternative would consist of construction of a vertical barrier by sheet piling to minimize the potential for migration of contaminants. In addition, physical/chemical treatment would be used to treat the water and discharge to the POTW. Implementation of this alternative may require aquifer testing and detailed ground water flow modeling.

4.2.3 Comparison of Alternatives

Seven of the nine criteria outlined in Section 4.2.1 were used to evaluate each alternative. Evaluation of state and community acceptance were not addressed in this feasibility study. A summary of the evaluation of each alternative is presented for soil and ground water in Tables 4-7 and 4-8, respectively.

4.2.3.1 Comparison of Alternatives for Soil

Overall Protection of Human Health and the Environment
Alternatives S-3, S-4, and S-5 would provide the most protection to human health and the environment. Alternative S-4 is acceptable but may need to be combined with more protective ground water alternatives. Alternative S-2 would also be protective of human health and the environment by preventing direct contact with contaminated soil.

Compliance with ARARs
All alternatives, except S-1 No Action, meet the requirements of the ARARs presented in this report.

Long Term Effectiveness
Alternatives S-3 and S-5 provide the highest degree of long term effectiveness because both alternatives use treatment to reduce the hazards posed by site contamination. Alternative S-2 and S-4 provide some long term effectiveness. Alternative S-2 would require periodic

Table

Evaluation of Remedial Alternatives for Soil

Former Gulf States Creosoting Site
Hattiesburg, Mississippi

Criteria	S-1 No Action	S-2 Cap System	S-3 NAPL Recovery and In Situ Biological Treatment	S-4 Limited Removal and Offsite Disposal	S-5 Removal and Offsite Treatment/Disposal
Overall Protectiveness	No significant reduction in risk and presents a continued potential source of ground water contamination.	Reduces dermal contact and soil ingestion risk by eliminating exposure pathway.	Reduces risk by removal and treatment.	Reduces risk by excavation and disposal	Reduces risk by excavation, treatment, and disposal
Compliance with ARARs	Does not meet any ARARs since there is no action.	Meets all ARARs	Meets all ARARs	Meets all ARARs	Meets all ARARs
Long Term Effectiveness	Risk will remain and potentially increase.	Risk eliminated as long as cap is maintained. Inherent hazard of waste remains. Reliability of cap can be high if maintained.	Risk reduced through removal and treatment.	Risk reduced through removal and disposal.	Risk reduced through removal, treatment, and disposal.
Reduction of Toxicity, Mobility, or Volume	None, except through natural attenuation since there is no action.	Containment would reduce the mobility of contaminants but no reduction in toxicity or volume achieved.	Removal and treatment reduce the toxicity, mobility and volume of the contaminants.	Removal would reduce the toxicity, mobility, and volume of contaminants at the site. Toxicity and volume will be transferred to an approved disposal facility	Removal would reduce the toxicity, mobility, and volume of contaminants at the site. Toxicity will be reduced via treatment prior to disposal in an approved disposal facility.
Short Term Effectiveness	*Continued impact from existing* conditions	*Temporary increase in dust and* odor due to construction of containment.	*Temporary increase in dust and* odor due to construction of recovery system and treatment. Remedy may require longer time period to accomplish remedial action objectives.	*Temporary increase in dust and* odor due to construction of containment.	*Temporary increase in dust and* odor due to construction of containment.
Implementability	No approval, services, or capabilities required.	Services and capabilities readily available.	Services and capabilities readily available. May require specialized services and materials for implementation of in situ biological treatment.	Services and capabilities readily available.	Services and capabilities readily available.
Cost	None	Medium	Medium	Medium	High

T[illegible]4-8

Evaluation of Remedial Alternatives for Ground Water

Former Gulf States Creososting Site
Hattiesburg, Mississippi

Criteria	GW-1 No Action	GW-2 Natural Attenuation and Ground Water Monitoring	GW-3 Vertical Barrier, NAPL Recovery, and Offsite Disposal	GW-4 Gradient Control Physical/Chemical Treatment	GW-5 Vertical Barrier, Extraction, and Physical/Chemical Treatment
Overall Protectiveness	No significant reduction in risk and presents a continued source of offsite migration.	No significant reduction in risk and presents a continued source of offsite migration.	Reduces risk by removal	Reduces risk by containment and treatment	Reduces risk by containment and treatment
Compliance with ARARs	Does not meet any ARARs since there is no action.	May not meet ground water protection standards set forth in RCRA and Mississippi regulations.	Meets all ARARs	Meets all ARARs	Meets all ARARs
Long Term Effectiveness	Risk will remain and potentially increase.	Risk will remain and potentially increase. Biodegradation of contaminants will occur with favorable conditions.	Risk reduced through removal.	Risk reduced through treatment and containment.	Risk reduced through treatment and containment.
Reduction of Toxicity, Mobility, or Volume	None, except through natural attenuation since there is no action.	No reduction in toxicity, mobility, or volume.	Removal would reduce the toxicity and volume of contaminants.	Containment would reduce the mobility of contaminants and treatment reduces the toxicity and volume.	Containment would reduce the mobility of contaminants and treatment reduces the toxicity and volume.
Short Term Effectiveness	Continued impact from existing *conditions*	Remedy may require longer time period to accomplish remedial action objectives.	Temporary increase in dust and odor due to installation of recovery system.	Temporary increase in dust and odor due to installation of vertical barrier.	Temporary increase in dust and odor due to installation of vertical barrier.
Implementability	No approval, services, or capabilities required.	Services and capabilities readily available.	Services and capabilities readily available.	Services and capabilities readily available.	Services and capabilities readily available.
Cost	None	Low	Medium	Medium	Medium

inspection and maintenance of the cap system to ensure continued control of infiltration and prevention of direct contact with site contaminants.

Reduction of Toxicity, Mobility, and Volume through Treatment
Alternatives S-3 and S-5 use treatment and removal to reduce the mass of contaminated material at the site. Alternative S-4 uses no treatment technology but only transfers the contaminated soil to an approved disposal facility where it would be contained. Alternative S-2 does not reduce toxicity but controls by containment and would cause reduction of toxicity in the ground water by natural attenuation.

Short Term Effectiveness
Alternative S-3 is anticipated to have the greatest short term effectiveness. These options present the least amount of risk to workers, the community, and the environment. Alternatives S-4 and S-5 could release organic compounds during excavation and loading activities. However, remedial alternatives S-2, S-4, and S-5 could be implemented in a relatively short period of time. Alternative S-3 can be initiated in the same time frame as the other alternatives, but would require the most time to achieve remedial action objectives.

Implementability
All remedial alternatives are fairly simple to implement. Alternative S-3 is more complex due to the in situ biological treatment component. Alternative S-2 would require implementation of an inspection and maintenance program after completion of the project. All alternatives would require some ground water monitoring program to determine the effectiveness of the remedy with regard to migration of contaminants.

Cost
Unit costs from estimating guidance and EPA case studies were used to develop order of magnitude cost estimates for each alternative. Alternative S-5 was the most expensive alternative. Alternatives S-2, S-3, and S-4 were significantly lower than Alternative S-5.

It is important to note that there are significant costs associated with imposing land use restrictions on the impacted portions of the site. Except for alternative S-5, all the soil alternatives considered would require the implementation of land use restrictions.

4.2.3.2 Comparison of Alternatives for Ground Water

Overall Protection of Human Health and the Environment
All alternatives, except GW-1 No Action, provide protection to human health and the environment. Alternatives GW-3, GW-4 and GW-5 are most protective due to the use of treatment or offsite disposal. Alternative GW-3 would remove source material but rely on natural attenuation to reduce concentrations in the ground water.

Compliance with ARARs
All alternatives, except GW-1 No Action and GW-2 Natural Attenuation and Ground Water Monitoring, meet the requirements of the ARARs presented in this report. Alternative GW-1 and GW-2 may not meet the requirements for ground water protection set forth in RCRA

and the Mississippi Voluntary Cleanup and Redevelopment Program but may be acceptable when combined with other alternatives.

Long Term Effectiveness
Alternatives GW-3, GW-4 and GW-5 provide the highest degree of long term effectiveness due to the use of treatment and installation of recovery systems. Alternative GW-2 would rely on natural attenuation, which may be appropriate when combined with a more protective soil remedy.

Reduction of Toxicity, Mobility, and Volume through Treatment
Alternatives GW-4 and GW-5 use treatment to reduce the toxicity and volume. In addition, these alternatives use barrier systems to reduce the mobility of contaminated ground water. Alternative GW-3 uses a recovery system to reduce the toxicity and volume of the contaminants and a vertical barrier to reduce the mobility of the contaminants. Alternative GW-2 does not reduce the contaminant mobility and would use natural attenuation to reduce toxicity and volume.

Short Term Effectiveness
Alternatives GW-3 and GW-5 are anticipated to have the greatest short term effectiveness since they incorporate extraction of NAPL. Extraction of NAPL would remove a source of contamination in the ground water and may improve the effectiveness of the physical/chemical treatment system. The time required to accomplish remedial action objectives would be shorter with alternatives GW-3, GW-4 and GW-5.

Implementability
Alternatives GW-2 would be the simplest to implement since it only requires the implementation of a ground water monitoring program. Alternative GW-3 would be more complex due to the installation of the vertical barrier and recovery system. Alternatives GW-4 and GW-5 are the most complex. These alternatives would require installation and operation of extraction and injection wells.

Cost
Unit costs from estimating guidance and EPA case studies were used to develop order of magnitude cost estimates for each alternative. Alternatives GW-4 and GW-5 were most expensive due to anticipated material use with physical/chemical treatment. Alternatives GW-3 was less expensive due to the reduced cost of operating the recovery system and reduced amount of material to be managed. GW-2 was the least expensive remedial alternative.

It is important to note that there are significant costs associated with imposing land use restrictions on the impacted portions of the site. All the ground water alternatives considered would require the implementation of land use restrictions, at least until such time that constituent concentrations were reduced to levels below appropriate risk-based goals.

4.3 Selection of Preferred Remedy

The preferred alternatives for each area of the site are presented below. The selected alternatives are based on the comparison of alternatives combined with risk management considerations developed from the results of the baseline risk assessment. In some cases, a combination of alternatives was selected due to considerations of overall protection of human health and the environment, long term effectiveness, and cost.

4.3.1 Fill Area

Remedial alternative S-3, NAPL Recovery and In Situ Biological Treatment, is selected for soil in the fill area. The recovery of NAPL will allow natural biodegradation to occur more rapidly. Biological treatment is one of the presumptive remedies for the site.

For the ground water beneath the fill area, alternative GW-3, Vertical Barrier, NAPL Recovery, and Offsite Disposal, is selected. This remedy is selected due to the presence of perched NAPLs and in consideration of the shallow geology and hydrogeology beneath the fill area. In addition to the selected alternative, a ground water monitoring program will be implemented to continue the assessment of ground water conditions at the site.

4.3.2 Former Process Area

Remedial alternative S-3, NAPL Recovery and In Situ Biological Treatment, is selected for the soil in the former process area. Prior to undertaking remedial activities, additional investigations will be conducted to determine the presence and "recoverability" of NAPL. In areas where the existing asphalt cap or building foundations preclude direct contact with impacted soils, NAPL recovery will be undertaken. The asphalt pavement will also be inspected periodically and evaluated for overall integrity. In areas where impacted surface soils are exposed, in situ biological treatment will be performed. This remedy was selected because of short term effectiveness and ease of implementation, and will result in minimal disruption of the existing use of the property.

For ground water at the former process area, alternative GW-2, Natural Attenuation and Ground Water Monitoring is selected. This remedy was selected because of the limited offsite impact and the lack of potential receptors.

4.3.3 Northeast Drainage Ditch

For the sediment and soil in the northeast drainage ditch, alternative S-4, Limited Removal and Offsite Disposal, is selected. This remedy will eliminate the potential for direct contact with impacted media. After removal of the affected soil and sediment, a culvert will be installed to provide for drainage. The area surrounding the culvert will then be backfilled and planted with grass.

5.0 Recommended Remedial Action

The following subsections describe the specific tasks that will be completed to achieve remedial action objectives for the fill area, former process area, and northeast drainage ditch. In addition to the specific remedial actions described in Sections 5.1 through 5.3, institutional controls (e.g., land use restrictions and operational restrictions) will be imposed on those portions of the property depicted on Figure 3-2 to ensure that: a) the future use of the impacted areas of the former site is consistent with their current use (i.e., commercial and/or industrial); and b) current and future site owners and/or lessees of the impacted areas are advised of the presence of creosote-impacted media and restrictions on land use.

5.1 Fill Area

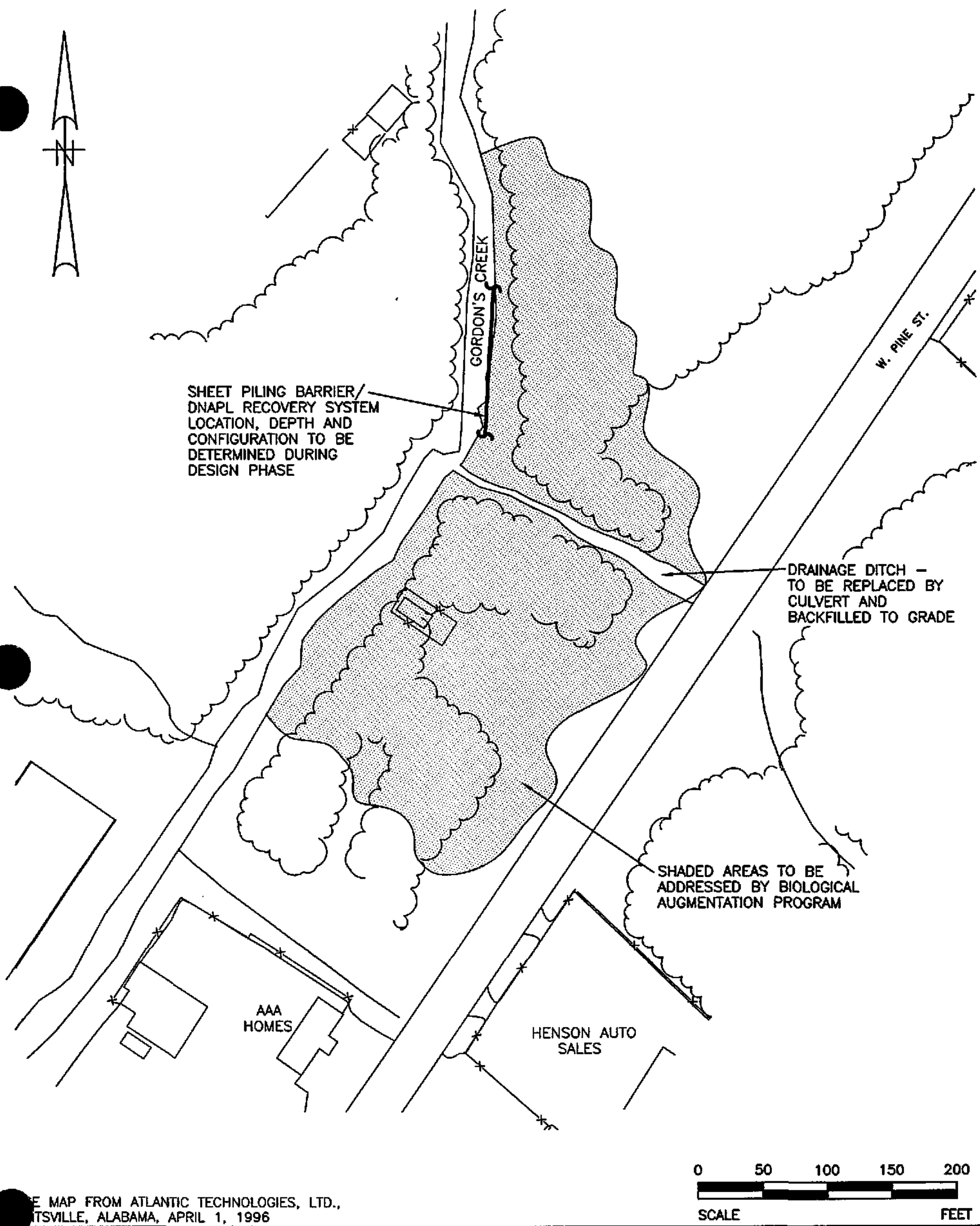
The remedial action objectives for the fill area are to: 1) eliminate the intermittent seepage of oily liquids from the fill area into Gordon's Creek; 2) collect and remove DNAPL perched on a shallow clay layer; and 3) reduce the mass of creosote constituents through accelerated biological degradation.

The migration of DNAPL will be prevented by the placement of a low-permeability vertical barrier constructed of steel sheet pilings. DNAPLs that accumulate behind the sheet piling barrier will be collected and removed utilizing a recovery system installed on the upgradient side of the sheet piling barrier. The natural attenuation of creosote constituents in fill area subsurface soils and ground water behind the sheet piling barrier will be augmented with biological treatment, addition of inorganic nutrients, phytoremediation plantings, and/or other measures designed to stimulate in situ biological degradation.

5.1.1 Culvert Installation

The fill area is bisected by a drainage ditch that runs from the Southern railroad ditch under West Pine Street to Gordon's Creek. DNAPL, impacted subsurface soil, and impacted ground water are present between West Pine Street and Gordon's Creek on both sides of the drainage ditch (see Figure 5-1). As part of the fill area remedy, a sheet piling barrier will be installed along the bank of Gordon's Creek to prevent periodic seepage of DNAPL to the creek. In order to allow for continued surface drainage, the drainage ditch between West Pine Street and Gordon's Creek will be backfilled and replaced with a concrete culvert, routed along the original ditch and through the sheet piling barrier.

The culvert will direct surface drainage through the sheet piling barrier at an elevation well above any perched DNAPLs in the fill area. The culvert will be wrapped in a polyethylene liner and placed on a sand bed within the base of the existing ditch. The sand bed and culvert will be constructed to slope toward Gordon's Creek. The culvert pipe will be covered with sandy soil backfill, seeded with native grass seed, and fitted with grated storm water inlets. The culvert, culvert bedding, and backfill material will be placed in accordance with applicable City of Hattiesburg specifications for storm water collection and conveyance systems.



E MAP FROM ATLANTIC TECHNOLOGIES, LTD.,
TSVILLE, ALABAMA, APRIL 1, 1996

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

SCALE: 1"=100' | DWG. NO.: 21-04/87A

FIGURE 5-1
CONCEPTUAL CLOSURE DIAGRAM
FILL AREA

FORMER GULF STATES CREOSOTING SITE
HATTIESBURG, MISSISSIPPI

5.1.2 Sheet Piling Barriers

The sheet piling barrier will be constructed to prevent seepage of DNAPLs into Gordon's Creek. The actual configuration of the barrier will be determined based on pre-design investigations described below.

In determining the appropriate depth for the sheet piling barrier, it is important to consider the geology of the fill area. The geology beneath the fill area consists of the following zones, in descending order:

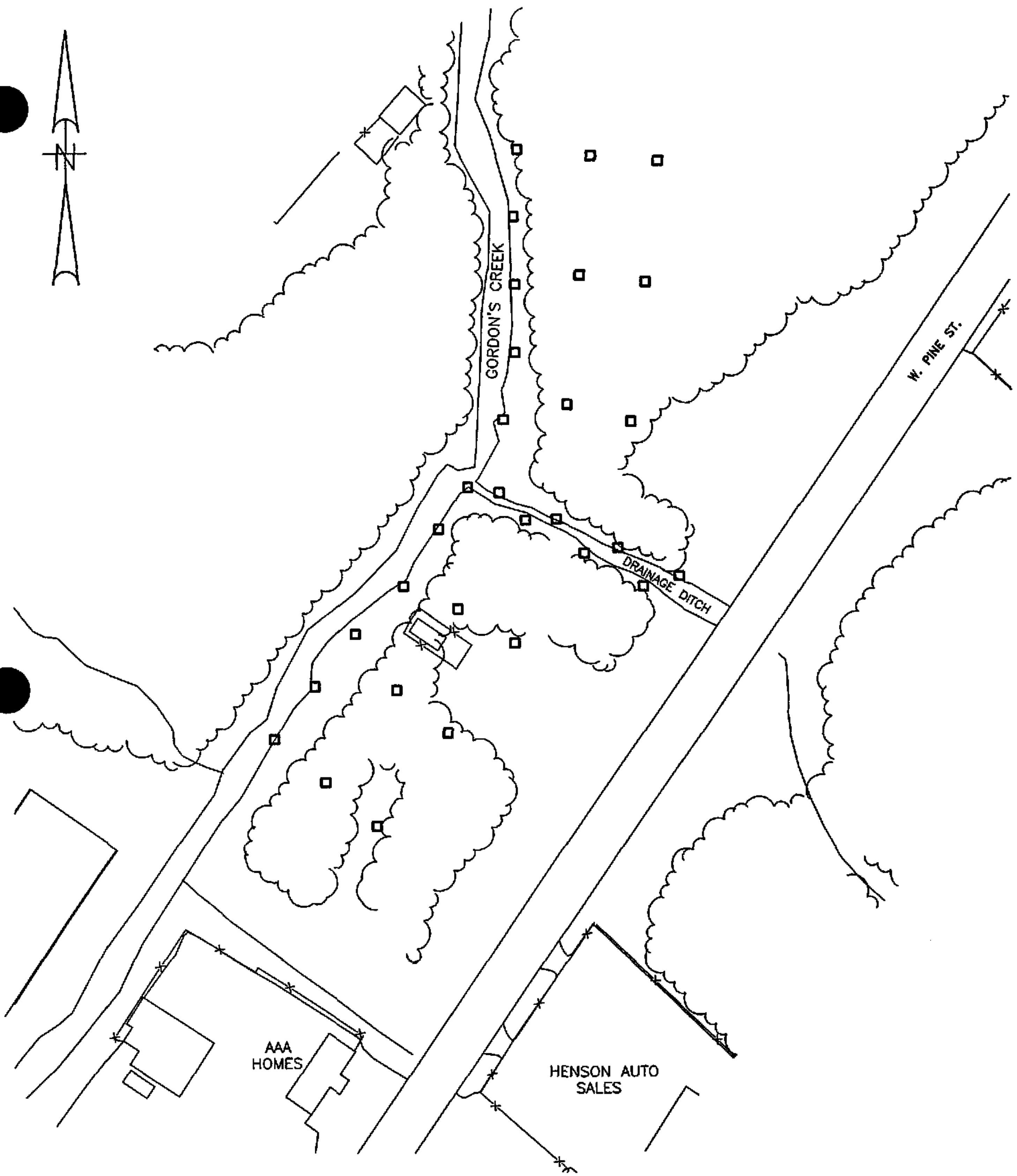
- a layer of surficial clay (1 to 8 feet thick)
- the first sand, which is the uppermost water-bearing zone and is in direct hydraulic connection with Gordon's Creek (ranges from 2 to 13 feet thick, but is typically 5 to 9 feet thick)
- an intermediate clay layer (ranges from 3 to 13 feet thick, but is typically 6 to 11 feet thick). This is the clay upon which the DNAPL is perched.
- the second sand, which may or may not be hydraulically connected with the first sand (ranges from 1 to 10 feet thick, but is typically 4 to 7 feet thick)
- the Hattiesburg clay (the top of which is encountered at depths ranging from 21 to 28 feet bls; published reports indicate this zone is between 120 and 200 feet thick in the Hattiesburg area

Prior to initiating the proposed remedial construction activities, a soil boring program will be undertaken in the fill area. The purpose of this program is to evaluate the thickness and lateral continuity of the intermediate clay layer and to delineate the extent of perched DNAPLs. Geoprobe borings will be advanced to the base of the intermediate clay at the approximate locations depicted on Figure 5-2. Observations will be made regarding the presence of DNAPL and subsurface debris/obstructions in each boring. If it is determined that the intermediate clay is continuous and sufficiently thick, the sheet pilings will be driven to a depth that keys the sheet piling barrier into the intermediate clay layer. If this is not the case, the sheet piling barrier may be driven into the Hattiesburg clay.

5.1.3 Recovery System

A recovery system will be installed on the upgradient side of the sheet piling barrier to collect and remove DNAPLs that accumulate behind the sheet piling barrier. It is anticipated that the recovery system will consist of the following elements:

- concrete sumps placed at regular intervals behind the barrier to allow for the collection of DNAPLs. The base of the sumps will be set approximately 2 to 3 feet into the intermediate clay, with perforations or slots at the sand/clay interface to allow DNAPLs to flow into the sumps.
- drop tubes extending from the base of each sump to land surface. Drop tubes will be equipped with appropriate hardware (e.g., cam-locks or other "quick-connects") at the surface to allow for easy hook-up to a portable recovery system or vacuum truck.



LEGEND

□ PROPOSED BORING LOCATION

E MAP FROM ATLANTIC TECHNOLOGIES, LTD.,
TSVILLE, ALABAMA, APRIL 1, 1996

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

SCALE: 1"=100' | DWG. NO.: 21-04/88A

FIGURE 5-2
PROPOSED SOIL BORING LOCATIONS
FILL AREA

FORMER GULF STATES CREOSOTING SITE
HATTIESBURG, MISSISSIPPI

Figure 5-3 is a schematic drawing of the proposed sheet piling barrier and recovery system. As with the sheet piling barrier, the actual configuration of the system will be determined during the design phase. The final design for the recovery system will be submitted to MDEQ for review and approval prior to installation.

5.1.4 Biological Augmentation

Natural attenuation of creosote constituents in subsurface soils and ground water will be augmented by stimulating the in-situ biologically-mediated degradation of creosote constituents. In-situ subsurface biodegradation will be stimulated through the addition of inorganic nutrients (e.g., nitrogen and phosphorus compounds). The nutrients will be added as aqueous solutions by either subsurface injection or through surface infiltration. Air or oxygen-saturated liquids may also be injected from the surface to further stimulate metabolic activity of aerobic microbes in the soil and groundwater.

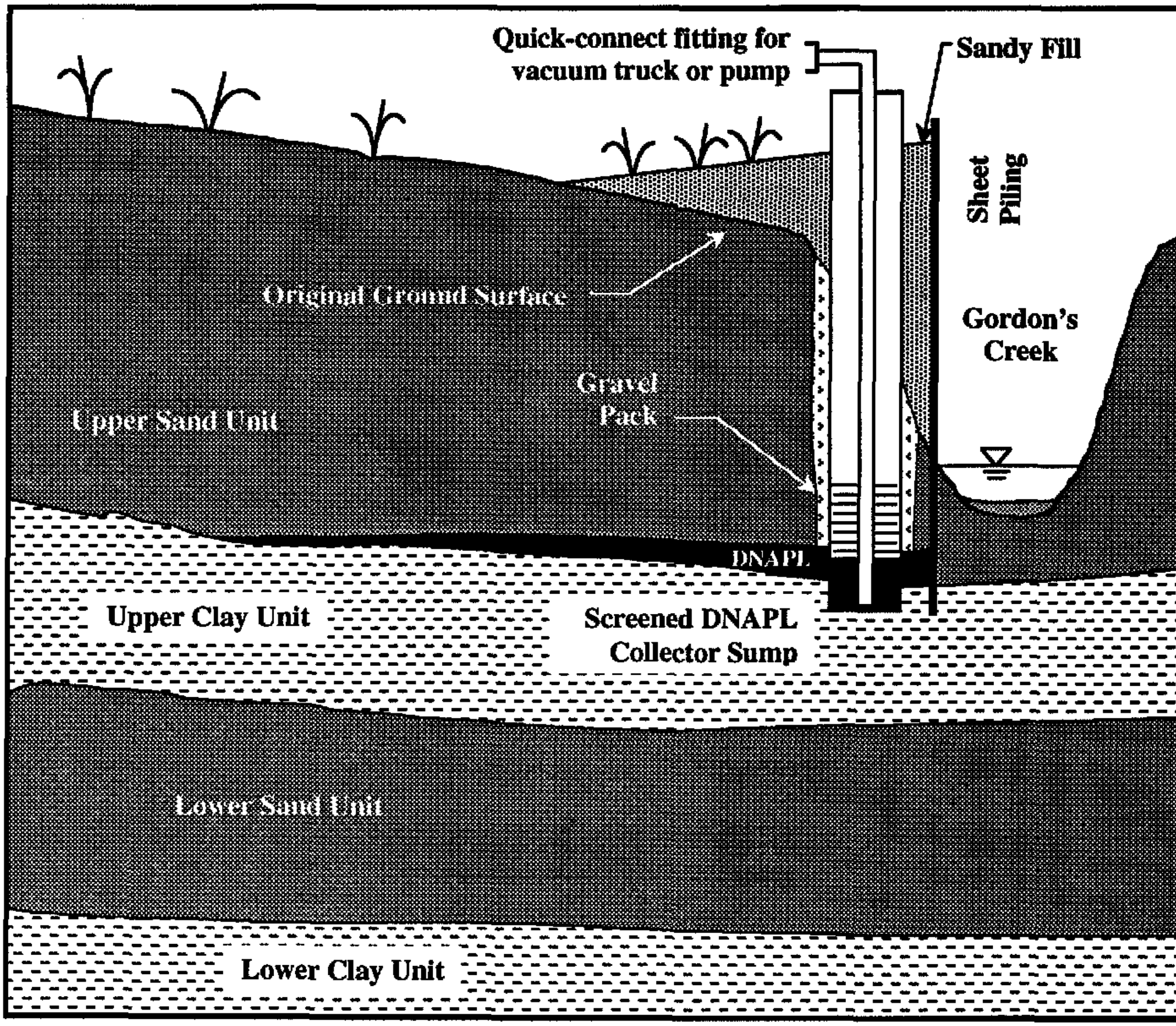
Indigenous microbial populations in the subsurface may also be augmented with the application of acclimated microbes. If this technique is employed, the microbes would be placed in uniformly spaced borings advanced to ground water and backfilled with sandy soil. The high permeability of the sandy soil would stimulate aerobic biological activity through the passive diffusion of atmospheric oxygen into the subsurface.

The subsurface attenuation of creosote constituent concentrations in the subsurface may also be augmented at the surface through uniformly-spaced phytoremediation plantings. Phytoremediation is the remediation of impacted soil or ground water using plants. Trees with high ground water uptake rates (e.g., cottonwoods, poplars or eucalyptus) have gained popularity in recent years to phytoremediate contaminated sites. The physical mechanisms of phytoremediation include: control of impacted ground water migration by root absorption; degradation of organic contaminants in the soil/root zone; and degradation or volatilization of absorbed organic constituents.

Bench-scale testing or pilot tests in the field may also be conducted to evaluate the feasibility of biologically augmenting natural attenuation of creosote constituents in the fill area. If performed, the testing will also include the collection of design data for developing a cost-effective biological treatment program to augment the fill area DNAPL recovery system.

5.2 Former Process Area

The remedial action objectives for the former process area are to: 1) extract NAPLs from shallow subsurface soils; 2) reduce concentrations of creosote constituents in surface soils located between Courtesy Ford and the Southern railroad; 3) after reducing constituent concentrations in surface soils, preclude contact of surface water and potential receptors with residuals; and 4) demonstrate that natural attenuation of constituents in ground water is occurring.



E: LOCATION, DEPTH AND CONFIGURATION OF SHEET PILING BARRIER AND
DNAPL RECOVERY SYSTEM TO BE DETERMINED DURING DESIGN PHASE

MICHAEL PISANI & ASSOCIATES *Environmental Management and Engineering Services* New Orleans, Louisiana Houston, Texas	FIGURE 5-3 DNAPL RECOVERY SYSTEM SECTION VIEW FORMER GULF STATES CREOSOTING SITE HATTIESBURG, MISSISSIPPI
SCALE: NTS DWG. NO.: 21-04/93A	

Additional investigations will be undertaken to determine the presence and "recoverability" of non-aqueous phase liquids (NAPLs) within the former process area. To the extent possible, NAPLs will be recovered by vacuum extraction and will be sent offsite for treatment and disposal. Creosote-impacted surface soils (i.e., soils from 0 to 2 feet bls) in the unpaved area between Courtesy Ford and Southern railroad will be biologically treated then capped with concrete. Ground water monitoring necessary to demonstrate natural attenuation of creosote constituents will also be performed.

5.2.1 NAPL Investigations and Response

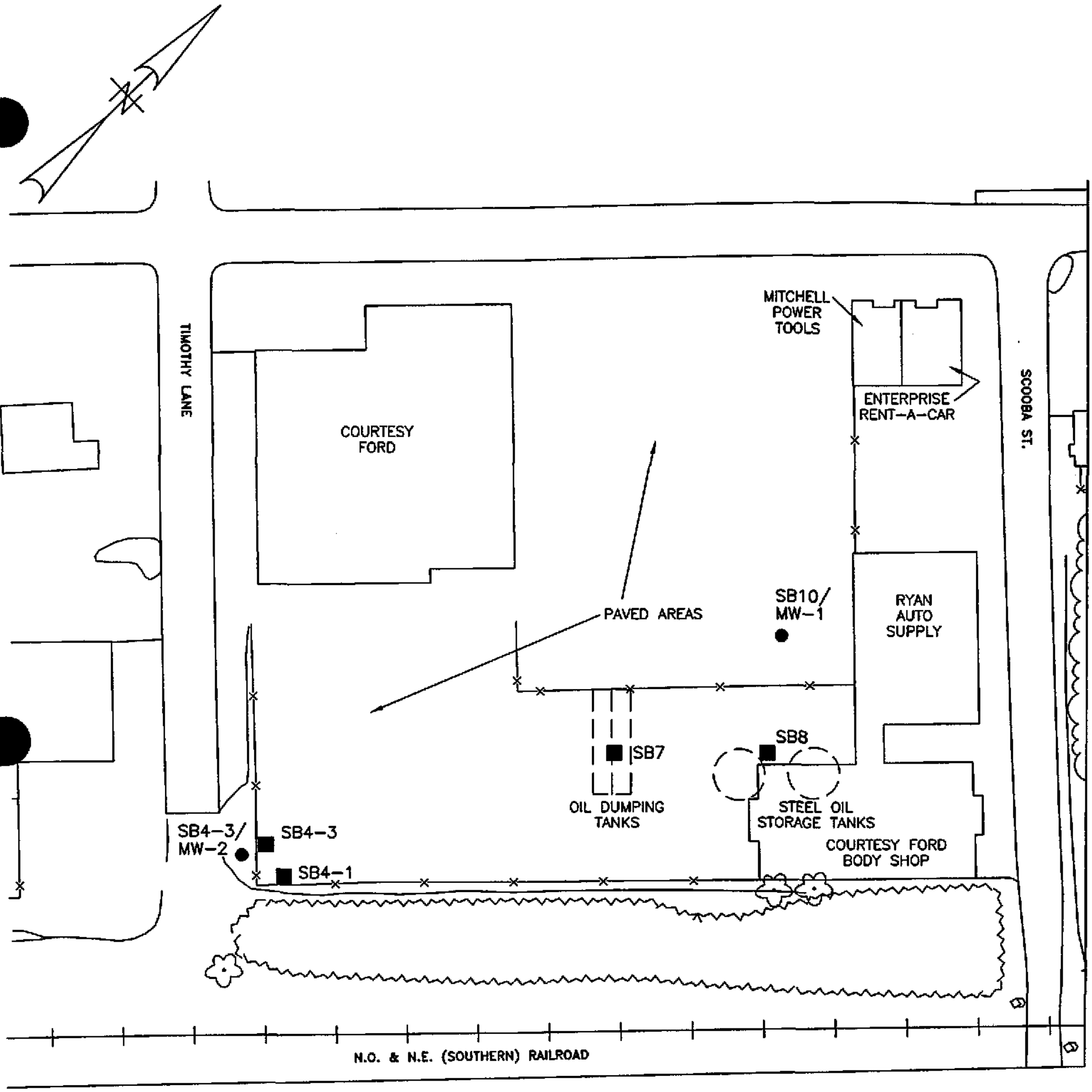
During previous investigations, the presence of NAPL has been reported in several soil borings and monitoring wells within the former process area. The locations of these borings and wells are depicted on Figure 5-4. As documented in Section 2.2.2, the suspected sources of NAPL in these borings/wells are as follows:

Boring/Well	Suspected Source
MW-1, MW-2	Improper well construction providing a preferential migration pathway for creosote entrained in the upper clay
SB4-1, SB4-2, SB4-3	Buried treated wood in the shallow subsurface
SB7	Remnants of "oil dumping tanks"
SB8	Remnants of "steel oil storage tanks"

The suspected sources listed above will be addressed during the NAPL investigations as outlined below.

Monitoring Wells - DNAPLs have been measured in monitoring wells MW-1 and MW-2 during previous investigations. However, the results of ROST screening did not indicate the presence of a DNAPL layer at the base of the sand channel. Furthermore, these two wells were improperly constructed to monitor for DNAPLs due to the following:

- no surface casing was installed in either borehole to seal off the creosote-impacted upper clay layer
- at both wells, the screen and filter pack extend upward 5 to 6 feet into the creosote-impacted upper clay layer
- the sand channel is present from depths of 22 to 41 feet bls at MW-1 and 23 to 42 feet bls at MW-2. Screened intervals for both wells are 20 to 30 feet bls. In order to monitor for DNAPLs, the wells should have been screened at the base of the first water-bearing zone.



LEGEND

■ SOIL BORING FROM 1994 EPS INVESTIGATION

● MONITORING WELL FROM 1994 EPS INVESTIGATION

0 50 100 150 200

SCALE FEET

...SE MAP FROM ATLANTIC TECHNOLOGIES, LTD.,
...NTSVILLE, ALABAMA, APRIL 1, 1996

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

SCALE: 1"=100'	DWG. NO.: 21-04/89A

FIGURE 5-4
AREAS/FEATURES TO BE ADDRESSED DURING NAPL INVESTIGATION
FORMER PROCESS AREA

FORMER GULF STATES CREOSOTING SITE
HATTIESBURG, MISSISSIPPI

It appears very likely that improper well construction procedures created a preferential migration pathway for creosote entrained in the upper clay to enter wells MW-1 and MW-2. In order to test this hypothesis, the improperly-constructed wells will be plugged and abandoned and replaced with wells installed appropriately to monitor for DNAPLs in the base of the sand channel.

Wells MW-1 and MW-2 are both constructed of 4-inch diameter PVC well materials. Each well will be overdrilled using hollow stem augers to the total depth of each well. An attempt will be made to remove the PVC well materials from the borehole. If this is not possible, the well will be destroyed by overdrilling with a "stinger". To facilitate complete filling of the borehole, cement-bentonite grout will be injected from the bottom of the borehole to land surface.

Attempts will be made to install replacement wells at locations within 20 feet of MW-1 and MW-2. Initially, an approximately 12-inch borehole will be drilled to a depth coincident with the base of creosote-impacted clay, but no deeper than 3 feet above the top of the sand channel. A string of 10-inch diameter surface casing will be placed in the borehole and grouted in place. The surface casing grout will be allowed to set for a minimum of 24 hours before continuing with well installation procedures.

Once the surface casing is in place, 4.25-inch I.D. hollow stem augers will be used to drill an approximately 8-inch borehole to a depth coincident with the base of the sand channel. Replacement monitoring wells will be constructed of 2-inch diameter stainless steel well materials. A 5-foot section of 0.01-inch machine-slotted screen with a bottom cap will be installed in the bottom 5 feet of the sand channel, with 2-inch diameter stainless steel riser to land surface. A silica sand filter pack will be poured to a height approximately 2 feet above the top of the well screen, with a 3-foot layer of bentonite pellets installed above the filter pack. The remainder of the borehole will be grouted to land surface with cement-bentonite grout. Due to the vehicular traffic in the Courtesy Ford lots, the replacement wells will be completed using flush-mounted drive boxes with watertight manhole covers.

Once the wells have been installed and developed, they will be allowed to recover for a period of at least two weeks before they are gauged for the presence of DNAPL. If DNAPL is not present, it will be assumed that the presence of DNAPL in MW-1 and MW-2 resulted from improper well construction. If DNAPL is detected in the replacement wells, a program to address DNAPLs will be proposed to MDEQ for review and approval.

<u>Historical Operational Features</u> - During a 1994 investigation by Environmental Protection Systems (EPS), black oily liquids were reported in several borings, most notably borings SB4, SB7, and SB8. A review of historical Sanborn maps indicates that borings SB7 and SB8 were drilled in areas containing "oil dumping tanks" and "steel oil storage tanks," respectively. These borings met refusal at 12 feet and 2 feet, respectively, suggesting that tank remnants may still be present in the subsurface at these locations. SB4 met refusal on "treated wood timbers" at 5.5 and 3 feet at two locations before achieving target depth at a third. This suggests that treated wood and other debris may be present in the subsurface at that location.

Activities to be undertaken in the vicinity of these three features focus on the identification and removal of pooled, recoverable NAPLs (i.e., liquids, not creosote-impacted soils). The objective of these activities is to mitigate the potential for subsurface NAPLs to act as continuing sources of ground water contamination.

Historical aerial photographs may be used to determine the precise locations of the "oil dumping tanks" and "steel oil storage tanks." Once the coordinates of these features are determined, a professional land surveyor may be used to locate and mark the outline of the tanks on the asphalt. A direct-push soil sampler (i.e., Geoprobe or similar device) will then be used to delineate the actual extent of the structure and the area containing pooled NAPLs. Based on this field evaluation, vacuum extraction well points may be installed within or immediately adjacent to the tank remnants. If possible, NAPL will be recovered periodically from these features using a portable recovery system until such time that significant volumes are no longer recoverable.

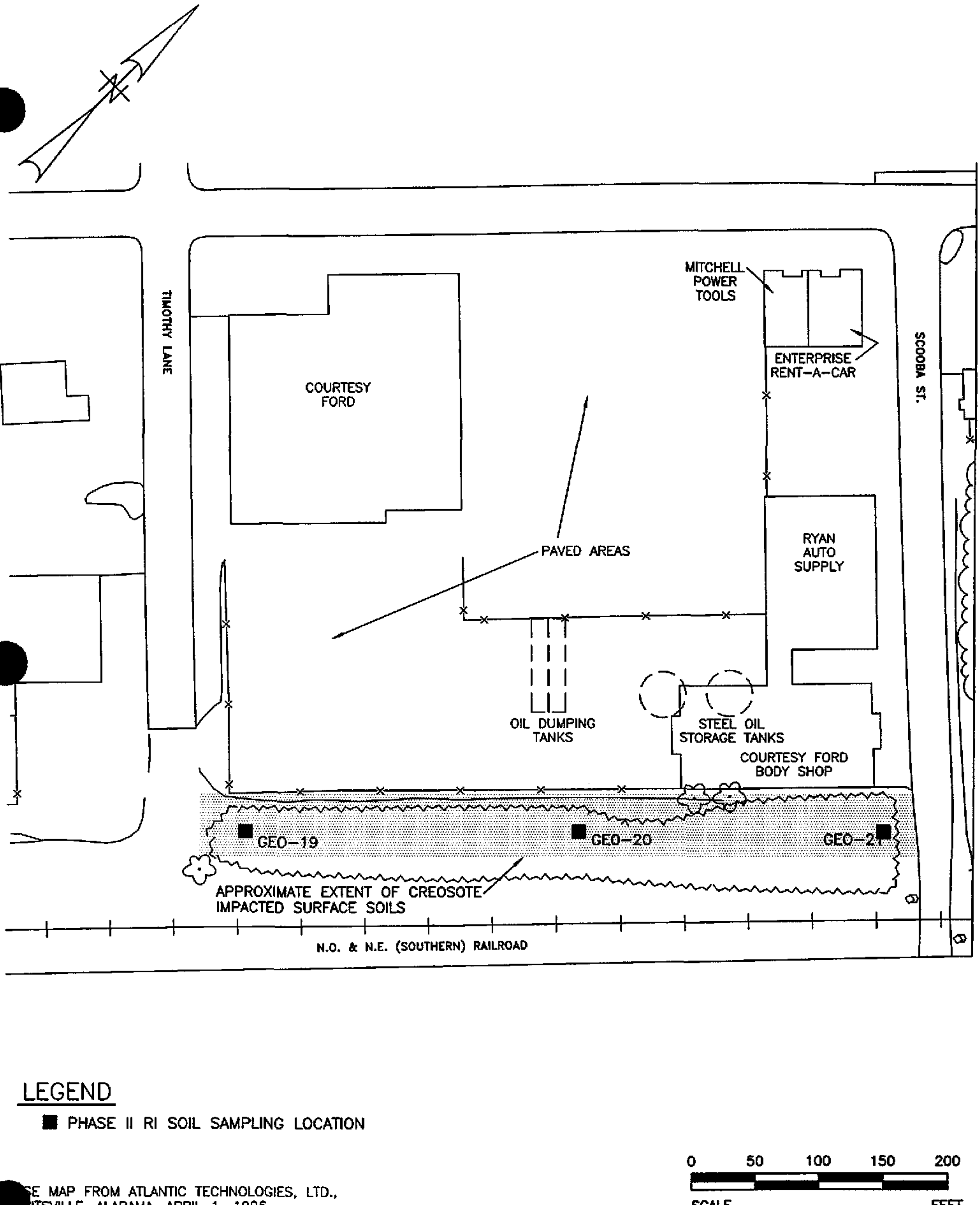
The area in the southern corner of the former process area that potentially contains treated wood timbers is harder to define, in that it does not show up on historical aerial photographs. In order to delineate the area containing pooled NAPLs, direct-push borings will be advanced within the approximately 50- by 50-foot area that includes borings SB4-1, SB4-2, and SB4-3. If it is determined that significant volumes of recoverable NAPL are present, vacuum extraction well points may be installed within this area. Again, NAPL will be recovered periodically from this area using a portable recovery system until such time that significant volumes are no longer recoverable.

5.2.2 Surface Soil Cleanup

The results of the risk assessment indicate that impacted surface soils between Courtesy Ford and the Southern railroad pose potential risks to infrequent site visitors, maintenance workers, and hypothetical future construction workers. However, calculations indicate that by implementing a remedy that would preclude contact with impacted surface soils, cancer risk levels for all receptors would be reduced to below the *de minimis* risk level of 1×10^{-6}. The recommended remedial action plan for this area, therefore, is to biologically treat creosote-impacted soils, then cover the treated soils with concrete paving.

Based on existing data, the approximate extent of exposed, creosote-impacted surface soils is shown on Figure 5-5. Prior to implementing biological treatment, this area will be cleared of brush and other vegetation. Then, to stimulate oxygenation of creosote-impacted soils, soils will be tilled to a depth of approximately 2 feet bls. The area will also be graded to control surface water run-on to, and run-off from, the treatment area.

Inorganic nutrients are essential for all biological processes. Insufficient nutrients can slow the rate of biological degradation of organic constituents. The principal inorganic nutrients are nitrogen and phosphorus, and these nutrients will be applied initially to enhance biodegradation rates.



SE MAP FROM ATLANTIC TECHNOLOGIES, LTD.,
NTSVILLE, ALABAMA, APRIL 1, 1996

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

SCALE: 1"=100' | DWG. NO.: 21-04/90A

FIGURE 5-5
APPROXIMATE EXTENT OF CREOSOTE IMPACTED SURFACE SOILS
FORMER PROCESS AREA

FORMER GULF STATES CREOSOTING SITE
HATTIESBURG, MISSISSIPPI

In order to evaluate the effectiveness of bioremediation on creosote-impacted soils, a soil monitoring program will be implemented. Subsequent to the completion of tilling and grading, soil samples will be collected to establish baseline levels of creosote constituents in soils. One sampling location per approximately every 2,500 square feet will be staked and flagged. Samples will be collected from 0 to 12 inches and 12 to 24 inches below grade at each location, and will be analyzed for PAHs. Soil sampling events will be conducted approximately every six months (spring and fall events) during the first two years of the program. Data will be reviewed and evaluated subsequent to each event to monitor the progress of bioremediation.

Once it has been determined that PAHs in exposed soils have been bioremediated to the maximum extent practicable, a concrete paved cover will be installed to preclude contact of surface water or potential receptors with remaining soil residuals. The existing drainage ditch between Courtesy Ford and the Southern railroad will be replaced with a concrete-lined ditch. A polyethylene line may be placed over the soil residuals prior to pouring concrete. The concrete cover will be inspected periodically for cracks, and cover maintenance will be performed, as necessary.

5.2.3 Monitored Natural Attenuation

Monitored natural attenuation (MNA) is a potentially viable technology for addressing site constituents in ground water beneath the former process area. MNA is a proven and widely-accepted remedial technology whereby natural processes such as biodegradation, dispersion, dilution, sorption, and volatilization combine to remediate impacted media. A growing volume of data and case studies supports the viability of this technology and provides the basis for evaluating the occurrence and effectiveness of MNA.

A detailed evaluation will be conducted in an attempt to demonstrate the presence of natural attenuation processes in the subsurface environment, as well as the ability of these processes to effectively address site constituents in ground water. As recommended by the U.S. EPA, a three-tiered approach will be utilized in this evaluation:

1. Historical ground water chemistry data will be reviewed and additional data will be collected and evaluated in an attempt to demonstrate a trend of decreasing contaminant mass or concentrations over time at appropriate monitoring locations
2. Hydrogeologic and geochemical data will be collected to demonstrate indirectly the type(s) of natural attenuation processes active at the site and the rate at which these processes will reduce contaminant levels
3. If necessary to demonstrate biological degradation processes, field or microcosm studies may be conducted to demonstrate directly the occurrence of a particular natural attenuation process and its ability to degrade site constituents

The initial sampling event conducted as part of the MNA demonstration will be comprised of two elements: 1) sampling for site-specific constituents (Target Compound List volatile and semivolatile organic compounds, or TCL VOCs and SVOCs), and 2) a preliminary biogeochemical characterization program to determine what aerobic and anaerobic biological processes may be remediating site constituents. The VOC and SVOC data will be used to update the existing ground water database. The biogeochemical data will be evaluated to determine if biodegradation processes are occurring and if these processes are sufficient to limit migration and reduce constituent concentrations. The analytical program for the biogeochemical characterization program consists of field parameters and water quality indicator parameters. Field parameters, including pH, specific conductance, temperature, dissolved oxygen, and redox potential, will be measured using an instrument equipped with a low-flow sampling flow-through cell. In addition, a field testing kit will be used to collect ferrous iron data. Analyses for water quality parameters to be conducted at a fixed-base laboratory include dissolved permanent gases, common cations and anions, organic carbon, chemical and biological oxygen demand, inorganic nutrients, and others.

Upon receipt of final laboratory data, a report documenting field activities and presenting the results of the MNA evaluation process will be issued. The report will present an interpretation of field and laboratory analytical results, with appropriate tables and figures to support the text. The report will also include recommendations for conducting further studies, if appropriate.

5.3 Northeast Drainage Ditch

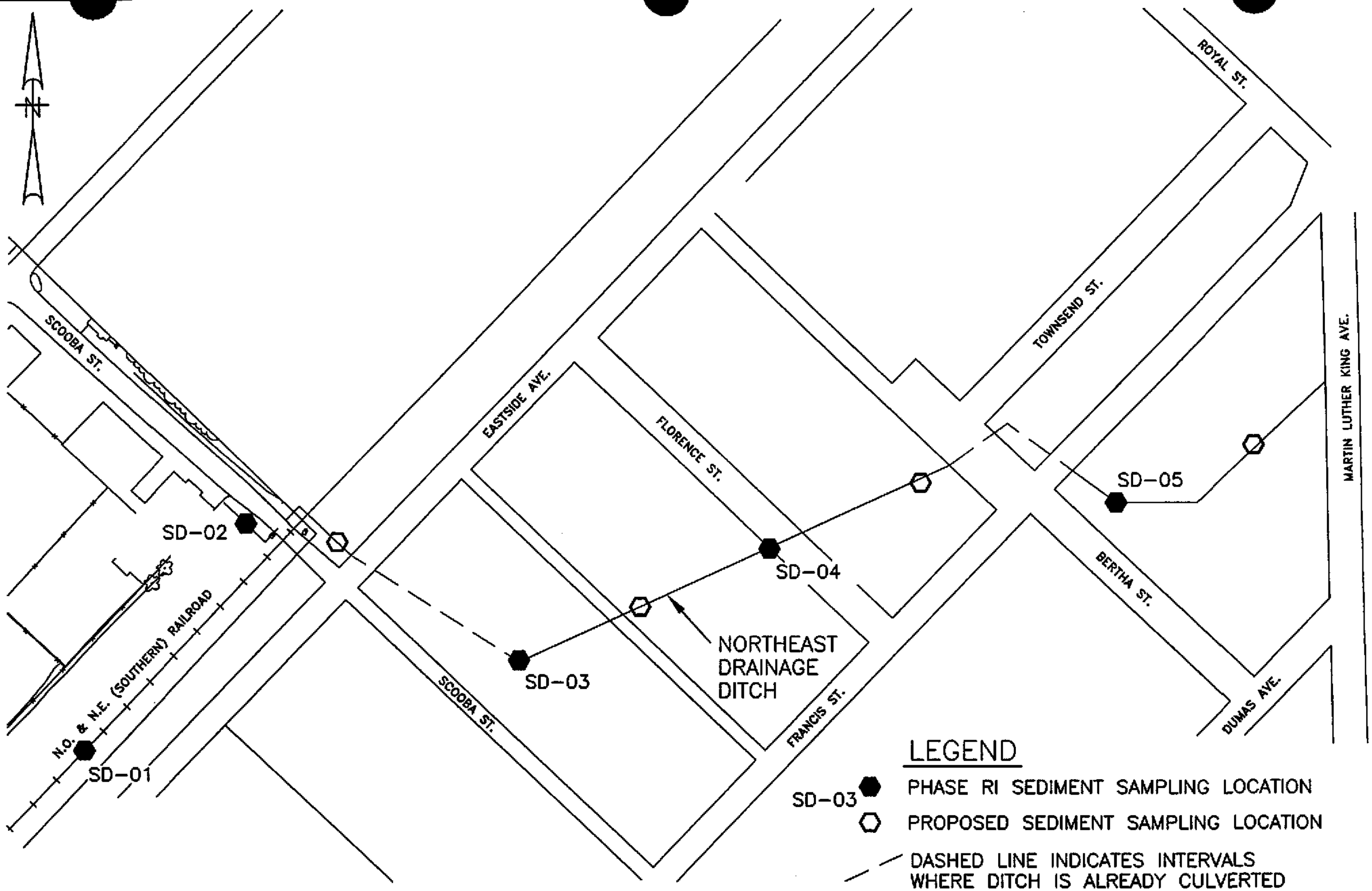
Sediment sampling data from the northeast drainage ditch indicate the presence of elevated concentrations of creosote constituents in this offsite drainage pathway. Although sediments were not addressed in the risk assessment, the recommended remedial action will include measures to minimize direct contact with impacted ditch sediments.

Additional sediment sampling will be conducted to further delineate the extent of impacted sediment in the northeast drainage ditch. Based on those delineation results, creosote-impacted sediment and soils within and adjacent to the ditch will be removed and transported to an approved offsite disposal facility. A concrete culvert with grated drains will then be installed in the excavated ditch to provide for drainage. The culvert will be backfilled with clean soil and seeded with grass.

5.3.1 Sediment Sampling

During the Phase II RI, surface water and sediment samples were collected from the northeast drainage ditch at approximately 500-foot intervals to a distance approximately 1,500 feet downstream of the site. Creosoting constituents were detected in sediment samples collected at distances up to 1,000 feet downstream of the site in the northeast drainage ditch, but the concentrations of those constituents decreased dramatically with distance from the site.

Sediment samples will be collected at locations depicted on Figure 5-6. Sediment samples will be collected from the uppermost 6 inches of sediment and will be analyzed for TCL SVOCs. In addition, samples of impacted sediment will be collected for disposal facility waste profiling analyses, including hazardous waste characteristics. It is anticipated that the excavated sediment will be classified as non-hazardous industrial waste, and therefore can be transported offsite to a permitted industrial solid waste landfill for disposal.



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.: 21-04/91A

FIGURE 5-6
PROPOSED SEDIMENT SAMPLING LOCATIONS
NORTHEAST DRAINAGE DITCH

FORMER GULF STATES CREOSOTING SITE
HATTIESBURG, MISSISSIPPI

5.3.2 Sediment and Soil Cleanup

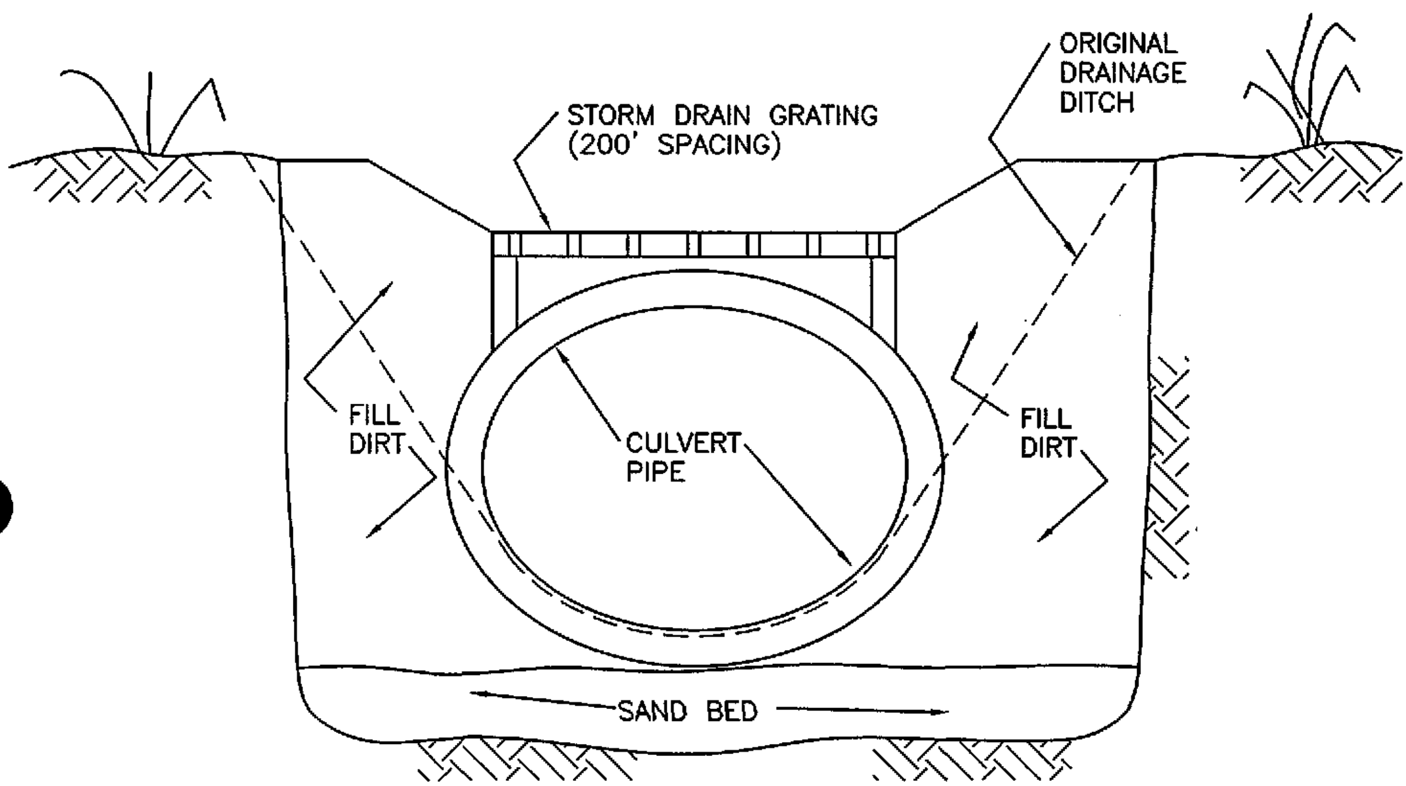
The data from the ditch sampling efforts described above will be evaluated to determine how much of the ditch sediments will be removed. Once the areas to be excavated have been defined, the areas will be cleared of brush and other vegetation. Also prior to initiating removal activities, work areas will be designated for equipment storage, truck loading, and potential stockpiling of impacted materials.

Excavation will be conducted using a trackhoe, with soil either loaded directly into trucks for immediate transportation and offsite disposal or stockpiled onsite for subsequent transportation and offsite disposal. If ditch sediments contain large volumes of free liquids, sediments may be mixed with a sufficient amount of portland cement to meet transportation and disposal requirements for free liquid content.

5.3.3 Installation of Culvert

Excavated sections of the northeast drainage ditch will be replaced with galvanized corrugated steel or precast concrete culvert pipe. The pipe will be covered with sandy soil backfill, seeded with native grass seed, and fitted with grated storm water inlets every 200 feet (or as specified by the City of Hattiesburg). To facilitate storm water collection, the surface of the backfilled culvert trench will be graded to direct surface flow to the nearest storm water collection grating.

The average dimensions of excavated portions of the drainage ditch are anticipated to be approximately 5 feet wide by 5 feet deep. The maximum diameter of the culvert is expected to be 36 inches. However, the culvert, culvert bedding and backfill material will be placed in accordance with applicable City of Hattiesburg specifications for storm water collection and conveyance systems. Figure 5-7 shows a conceptual cross-section view of culvert placement in an excavated portion of the drainage ditch.



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New Orleans, Louisiana Houston, Texas

SCALE: NTS | DWG. NO.: 21-04/92A

FIGURE 5-7
CULVERT SECTION VIEW

FORMER GULF STATES CREOSOTING SITE
HATTIESBURG, MISSISSIPPI