

## Declaration for an Amendment to the Record of Decision

### Purpose

The purpose of this decision document is to present an amendment to the Record of Decision (ROD) for the Moss-American Site, which is located in Milwaukee, Wisconsin. This decision was reached in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Contingency Plan (NCP).

### Basis

The decision to amend the ROD is based upon the administrative record. The index attached to the amended ROD identifies the items that comprise the administrative record upon which the selection of the amended portion of the remedial action is based.

### Description of the Amendment

The ROD amendment for the Moss-American site has three principal components: 1) changes in soil treatment technology, 2) potential changes in cleanup standards, and 3) changes in cover design and requirements.

#### Soil Treatment Technology

First, the ROD is amended to replace the biodegradation treatment system with low temperature thermal desorption. As described in the ROD originally developed for this site, areas of more highly contaminated soils were to undergo treatment utilizing biodegradation in the form of a bioslurry technique prior to consolidation and containment with less contaminated soil areas.

#### Cleanup standards

Second, the ROD amendment allows for the utilization of new cleanup standards for the portion of the site referred to as the "former wood preserving facility" owned by the Union Pacific Railroad and Milwaukee County, provided certain conditions are met. The ROD amendment recognizes that it may be appropriate to adopt industrial or recreational exposure scenarios for site users exposed to contaminants of concern in surface soils. Portions of the site owned by Union Pacific Railroad, and upland site areas of the former wood preserving facility owned by Milwaukee County could utilize an industrial usage risk exposure scenario if deed restrictions are signed and recorded which limit the use of the property. If appropriate land use restriction are obtained, then Union Pacific site property and upland areas of Milwaukee County site property can use the industrial soil cleanup standards established in Wisconsin Administrative Code NR 720 for direct contact and for the protection of groundwater. For Milwaukee County property which is part of the former wood preserving facility and which is located in the floodplain of the Little Menomonee River, a recreational exposure scenario may be appropriate if deed restrictions are signed and recorded which limit the use of the property to recreational uses. If this type of

land use restriction is effectuated, then soil cleanup standards established under ch. NR 720, for recreational land use can be utilized. Control measures attendant to appropriate soil erosion and runoff protection shall also be employed so that contaminants associated with those soils do not pose an undue threat to sediment quality in the nearby Little Menomonee River. U.S. EPA expects that it would take no longer than 180 days after the date of issuance of this decision to secure necessary deed restrictions. If the appropriate land use restrictions and maintenance agreements can not be obtained for any given portion of the former wood preserving facility within this 180- day timeframe, then soil cleanup standards established under Wisconsin Administrative Code NR 720 for residential land use, or the soil cleanup standards set forth in the 1990 ROD must be attained for that portion of the Site. Soils exceeding those standards shall be excavated, and if necessary, treated, prior to consolidation in a new disposal unit established pursuant to Hazardous Waste Corrective Action Management Unit (CAMU) requirements.

### Cover

Finally, reconsideration is also given herein to the appropriate means of containing treated residuals, from the more highly contaminated soils and sediments, as well as soils with low levels of contamination. Given the nature of the primary contaminants of concern, a waiver was considered and granted in the original ROD so as to allow usage of a relatively permeable soil cover. The theory behind this decision was that the flushing action allowed by such a cover would drive the remaining relatively low levels of contaminants out of the soil mass and into the groundwater, such that groundwater cleanup goals could be attained in a relatively short time span, on the order of five to ten years. However, pre-design field work at the site indicated not only that free product creosote was present near the soil/groundwater interface, but also that it was present in relatively large extractable quantities. Creosote associated with groundwater is a subset of those contaminants known as dense nonaqueous phase liquids (DNAPLs). The presence of such materials complicates groundwater management.

Beginning in 1995, efforts began at the site to extract such DNAPLs, and arrange for their off-site shipment. Some soil zones selected for thermal desorption treatment were chosen because of their association with free-product creosote. Hence, DNAPL control efforts have been/will be conducted. In 1997, an Explanation of Significant Differences (ESD) was issued to revise the groundwater remedy to include containment components utilizing sheet walls and in-situ treatment of groundwater. This will effectively minimize the spread of contaminants and DNAPL materials in the soils and groundwater regardless of the amount of infiltration into the contamination zone. Therefore, the need for flushing is minimized, and the groundwater restoration should be relatively unaffected by the amount of infiltration allowed through a cover system. The design of any cover system should be based on what is protective of human health and the environment, given the nature of the material to be covered, and what meets applicable and relevant and appropriate requirements (ARARs). As set forth in the section of this document concerning soil cover and Corrective Action Management Unit (CAMU), depending on the level of soil treatment provided, a clay cap topped with a suitable frost-protection soil layer or a simple soil cover may be used to replace the soil cover originally selected. A new disposal unit will be established pursuant to CAMU requirements under Wisconsin Chapter NR 636. CAMU allows consolidation and placement of certain hazardous remediation wastes without triggering new disposal events which would otherwise require application of land disposal requirements, and

liner and leachate collection systems, provided that the activity is protective of human health and the environment. Given the expected level of soil treatment efficiency, a CAMU can be utilized, without the subsurface synthetic membrane and leachate collection system that would constitute a hazardous waste containment cell.

#### Statutory Determinations

The selected remedy in this amendment is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. The 1990 ROD justified a waiver pursuant to Section 121(d)(4)(B) for a Subtitle C cap and for the State double-liner/leachate collection system requirement on the basis that an impermeable cap and liner would pose a greater risk to health and the environment by prolonging groundwater treatment and time needed to achieve groundwater goals. Given the greater presence of DNAPLs found since that time, waiver of a relatively impermeable cap is no longer justified. However, given the source control measures to be taken regarding soils, and the establishment of a CAMU, a double-liner /leachate collection system is not required. The remedy satisfies the statutory preference for treatment as a principal element. Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted within five years after the commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The State of Wisconsin has indicated it will provide conditional concurrence with this Record of Decision Amendment. The State of Wisconsin's letter indicating this position will be included in the Administrative Record for the site.

9/30/98  
DATE

William E. Muno  
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## **Introduction**

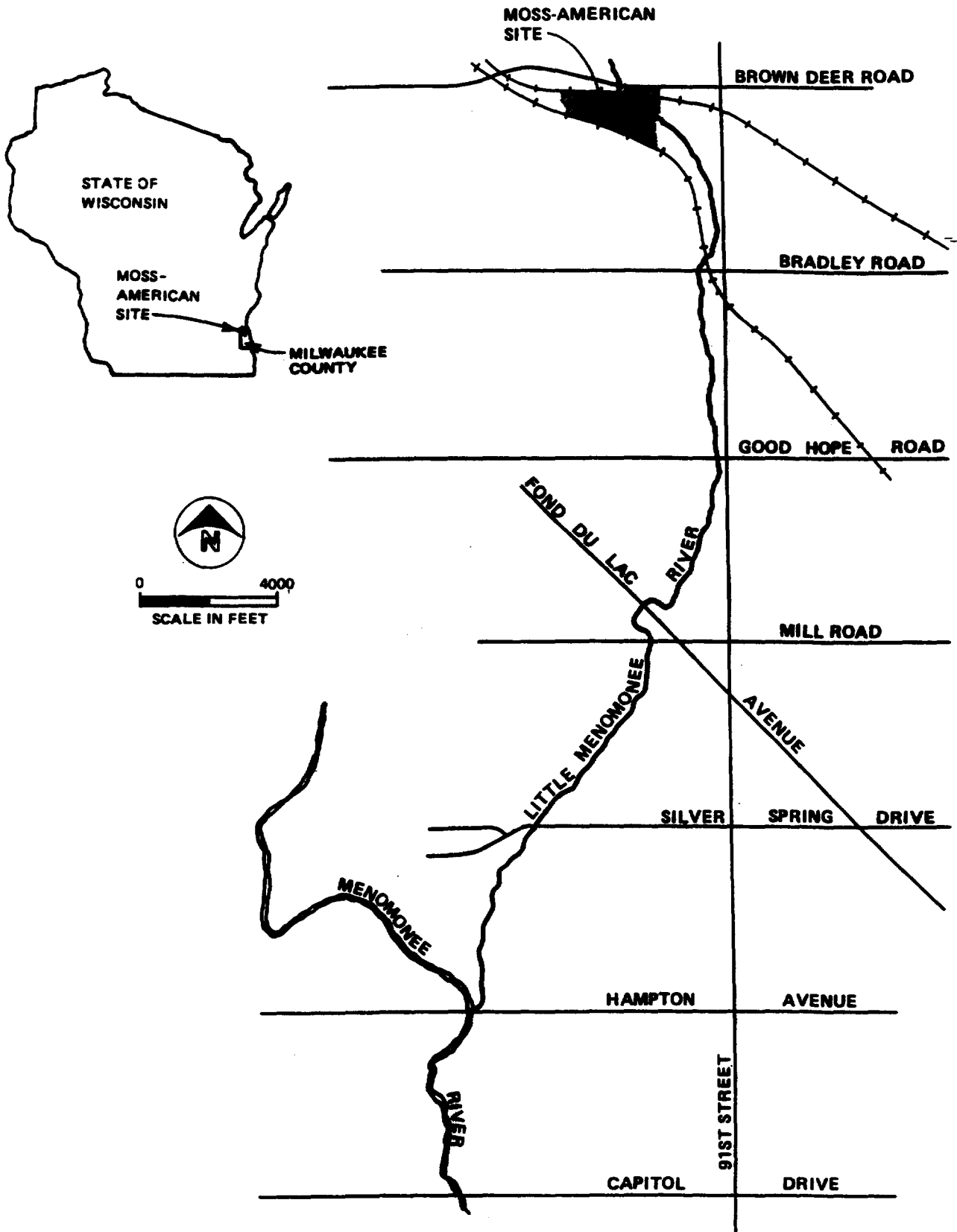
The eighty-eight acre Moss-American site includes the former location of the Moss-American creosoteing facility, several miles of the Little Menomonee River - a portion of which flows through the eastern half of the site - and adjacent flood plain soils (see Figures 1 and 2). The site is located in the northwestern section of the City of Milwaukee, County of Milwaukee, State of Wisconsin, at the southeast corner of the intersection of Brown Deer and Granville Roads, at 8716 Granville Road. Approximately 65 acres of the site are undeveloped Milwaukee County park land. Approximately 23 acres are owned by the Union Pacific Railroad, and are used as an automobile and other light vehicle transport, loading/unloading, and storage area.

The original ROD for the site was signed on September 27, 1990. The ROD addressed the collection and treatment of contaminated groundwater, excavation and treatment by soil washing/bioslurry techniques of more highly contaminated soils and sediments, consolidation of the treatment residuals with and containment of other contaminated soils, and the creation of a new river channel with subsequent filling in of the existing channel. Exposure scenarios used to evaluate health risks associated with the Moss-American site were site trespass scenario, river recreational use scenario, and a residential development scenario.

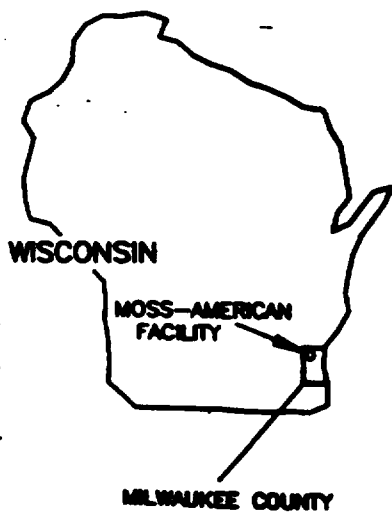
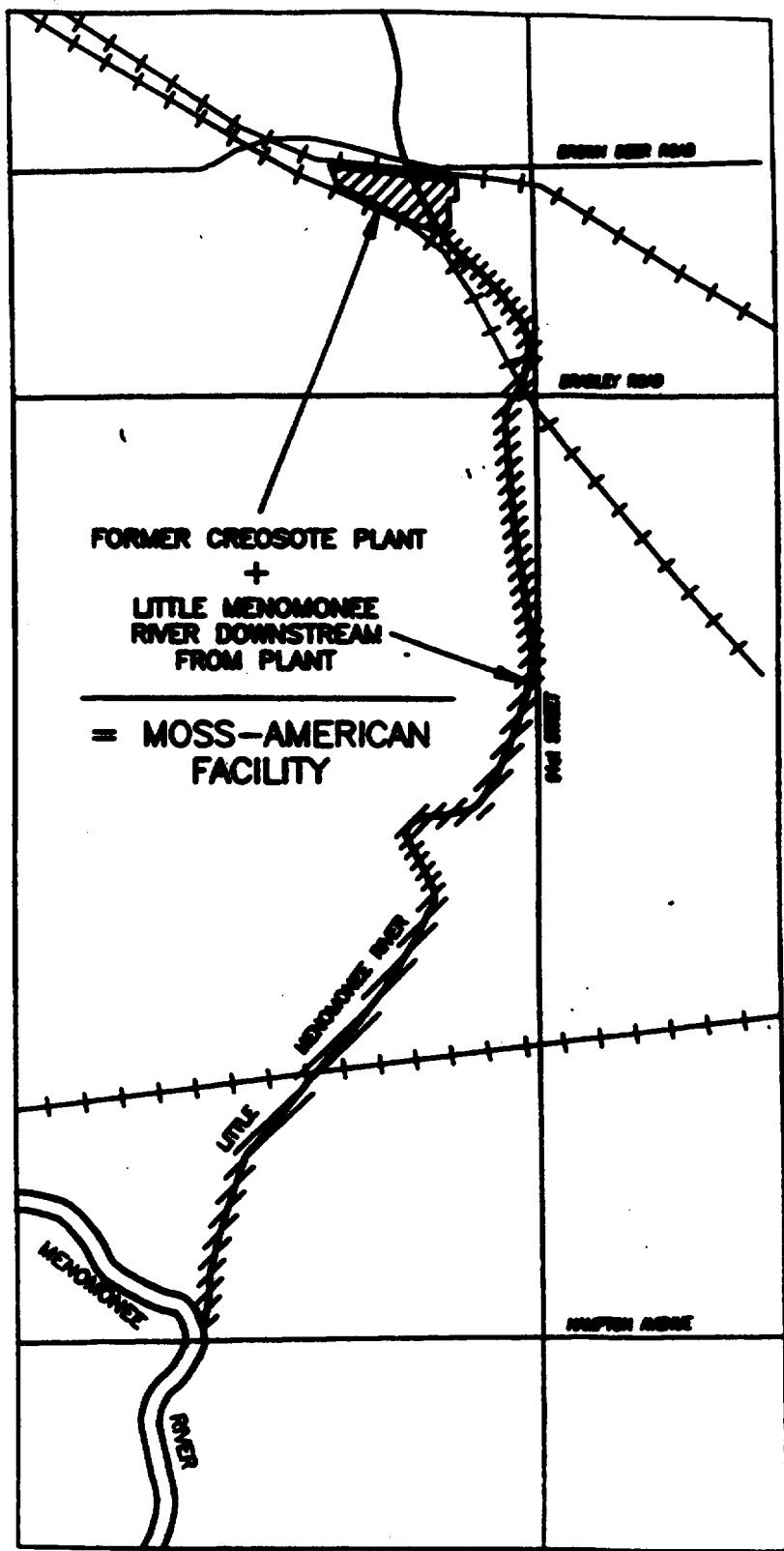
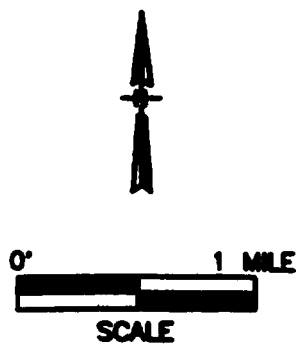
This document amends the original ROD in three limited ways.

Based upon site-specific pre-design treatability work, technical literature, and developments at certain other creosote sites being addressed under CERCLA, it appears unlikely that the bioslurry technique can attain soil cleanup standards and that selection of a new combination of treatment/containment measures so as to attain such standards is warranted. The remedy is amended to replace the bioslurry reactor with low temperature thermal desorption.

The Risk Assessment scenarios allow for the adoption of removal cleanup standards based on more realistic site use assumptions with the consequent application of new State ARARs for such uses. Since a portion of the site is in fact owned by an industrial entity, and since the United States Environmental Protection Agency (U.S. EPA) has received information indicating that such land usage classification is apt to continue, it appears appropriate to consider adoption of an industrial usage exposure scenario for that portion of the site now owned by the Union Pacific Railroad, provided that the necessary deed restrictions are obtained. There has been industrial development near this portion of the County property, located on the former wood preserving facility. Hence, for upland areas of Milwaukee County land which are part of the former creosote site and which are generally adjacent to Union Pacific property, the removal cleanup standards may be based on an industrial exposure scenario, if certain deed restrictions and assurances are secured within 180 days. (If requested, U.S. EPA - after consultation with WDNR



**FIGURE 1**  
**LOCATION MAP**  
**MOSS-AMERICAN**



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FIGURE 2

- may consider a brief extension of this timeframe). Within the former wood preserving facility, those Milwaukee County lands falling within the floodplain of the Little Menomonee River may be governed by soil removal cleanup standards based on recreational usage, if certain deed restrictions are secured. This is consistent with the system of parklands and trails maintained by Milwaukee County downstream of the former wood preserving facility and as discussed more fully in the Park and Open Space plan adopted by Milwaukee County in 1991. If necessary deed restrictions for a given portion of the site can not be obtained within 180 days from the date of this ROD Amendment, then the soil removal cleanup standard shall be the residential cleanup standard as established by NR 720, or the original 1990 ROD remedy shall be carried out.

Due to findings of free product and DNAPLs in the groundwater, U.S. EPA has reconsidered the appropriate means of containment for treated residuals, from more highly contaminated soils and sediments, as well as soils with lower levels of contamination. As flushing is no longer desirable, both the appropriate cover and the manner of addressing State liner and leachate collection system requirements have been reconsidered.

The lead agency for the remedial action at this site is the U.S. EPA. The State of Wisconsin's Department of Natural Resources (WDNR) is the support agency. This ROD amendment will become part of the Administrative Record file established for the Moss-American site.

These changes were precipitated by a more realistic assessment of Site conditions and treatment effectiveness gained from predesign findings. The treatment technology is being changed to thermal desorption because the innovative technology selected in the original ROD did not achieve cleanup standards in predesign tests. Although the topic of thermal desorption was noted briefly in the Moss-American Feasibility Study, thermal desorption treatment was not considered in detail in either the Proposed Plan developed in 1990, nor discussed in the original ROD. U.S. EPA concluded that the public could not have logically foreseen that the Agency might select this treatment technique in lieu of those previously discussed. In reviewing the soil treatment, U.S. EPA will consider more realistic risk assessment scenarios, consistent with current policy, provided new State ARARS can be met. The soil containment system also had to be reconsidered due to findings of DNAPLs and free product in the groundwater. Predesign field work at the site verified not only the presence of free-product creosote near the soil/groundwater interface, but also indicated that such materials are present in relatively large extractable quantities. Creosote associated with groundwater is a subset of those contaminants known as DNAPLs. The presence of such materials complicates groundwater management. Groundwater management has already been directed at efforts to enhance DNAPL removal since 1995 via the utilization of extraction wells and collection tanks. DNAPL management will continue through the selection of certain soil zones associated with the presence of free-product creosote for treatment. Since the degree of subsurface contamination has been found to be considerably larger than originally envisioned, the permeable cover selected in 1990 will be replaced by an impermeable cover constructed consistent with ARARS.

Therefore, in keeping with CERCLA section 117, 42 U.S.C. § 9617, and section 300.435(c)(2)(ii) of the NCP, 40 C.F.R. § 300.435(c)(2)(ii), the lead agency proposed an amendment to the ROD and allowed the public opportunity to comment on the proposed changes if such changes alter basic features of the ROD. For the original ROD, a public comment period was initiated on June 4, 1990 and extended to August 6, 1990. For the proposed ROD amendments, a public comment period was initiated on March 9, 1998 and was extended to May 8, 1998. A public meeting to consider the proposed plan and possible ROD amendments was held at Vincent High School near the site on March 18, 1998. Approximately 45 members of the public attended this meeting.

A response to the comments received during this period is included in the Responsiveness Summary, which is a part of this ROD amendment.

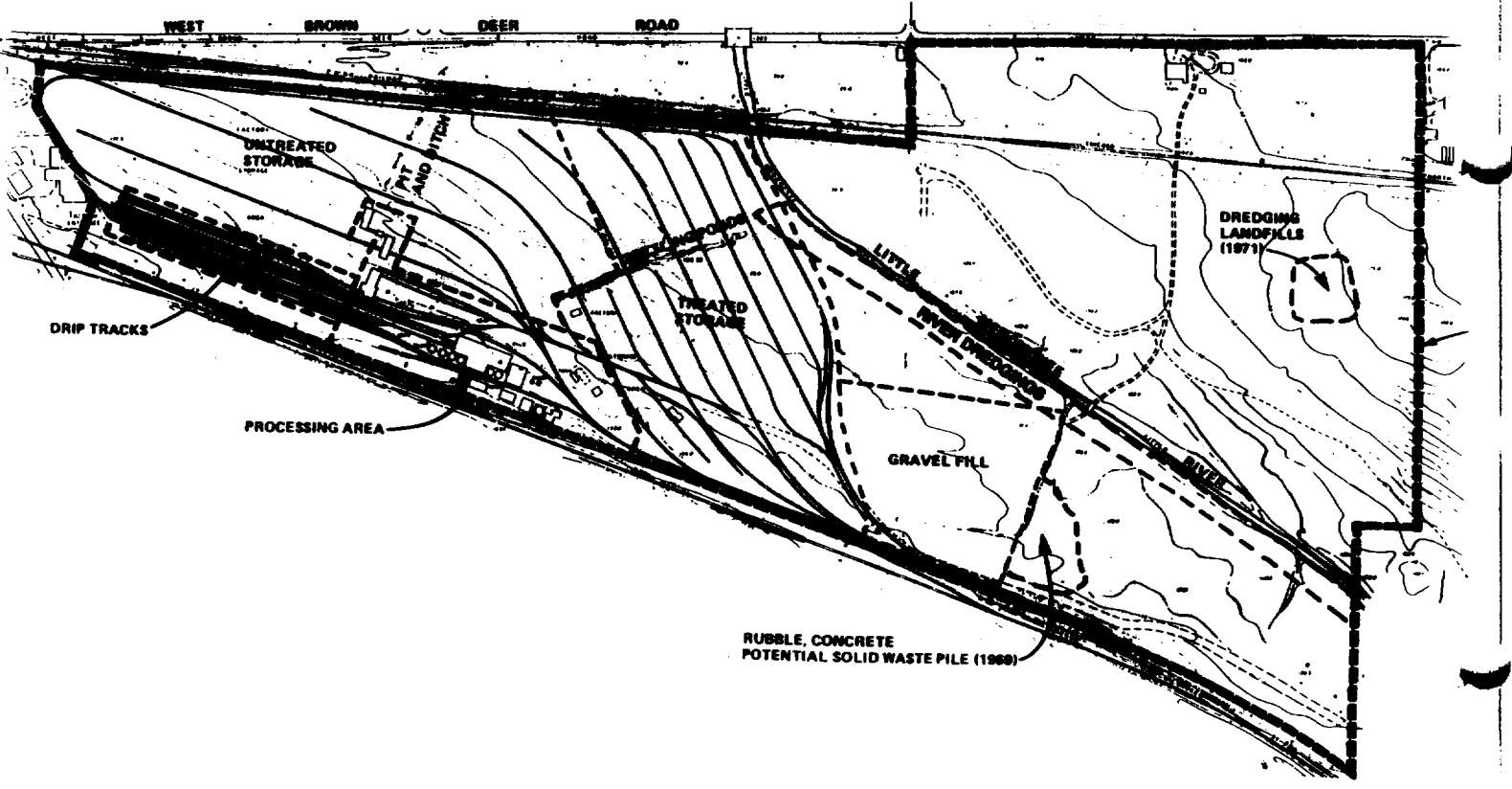
The information repository and administrative record are available locally for this site at the Mill Road Library, which is located at 6431 North 76th Street, Milwaukee, Wisconsin.

### **Site History**

In 1921, the T. J. Moss Tie Company established a wood preserving facility west of the Little Menomonee River. The plant preserved railroad ties, poles, and fence posts with creosote, a mixture of numerous chemical compounds, derived from coal tar. While No. 6 fuel oil was also used, no evidence of pentachlorophenol usage was noted at the Moss-American site. Operations at a creosote plant often involve storage facilities for both creosote and fuels, a boiler used to make steam to heat the creosote and aid in application to the wood through usage of heat and pressure, incoming timber unloading/storage, transportation of timber to the creosote application facility by rail car, and subsequent storage in a drying area. After these processes were complete, the treated timbers could be shipped to customers. Potential for release of materials exists throughout the storage, application, and drying processes. See Figure 3 for an approximate location on site of where these processes were conducted.

Kerr-McGee purchased the facility in 1963 and changed the facility's name to Moss-American. The name was changed again in 1974 to Kerr-McGee Chemical Corporation - Forest Products Division. In 1998, the name of this company changed to Kerr-McGee Chemical LLC; it shall be referred to as KMC throughout the rest of this document.

From 1921 to 1971, the facility discharged wastes to settling ponds that ultimately discharged to the Little Menomonee River. These discharges ceased when the plant diverted its process water discharge to the Milwaukee sanitary sewerage system. Production at the facility ceased in 1976.



**FIGURE 3**  
**PAST PROCESS OPERATION AREAS**

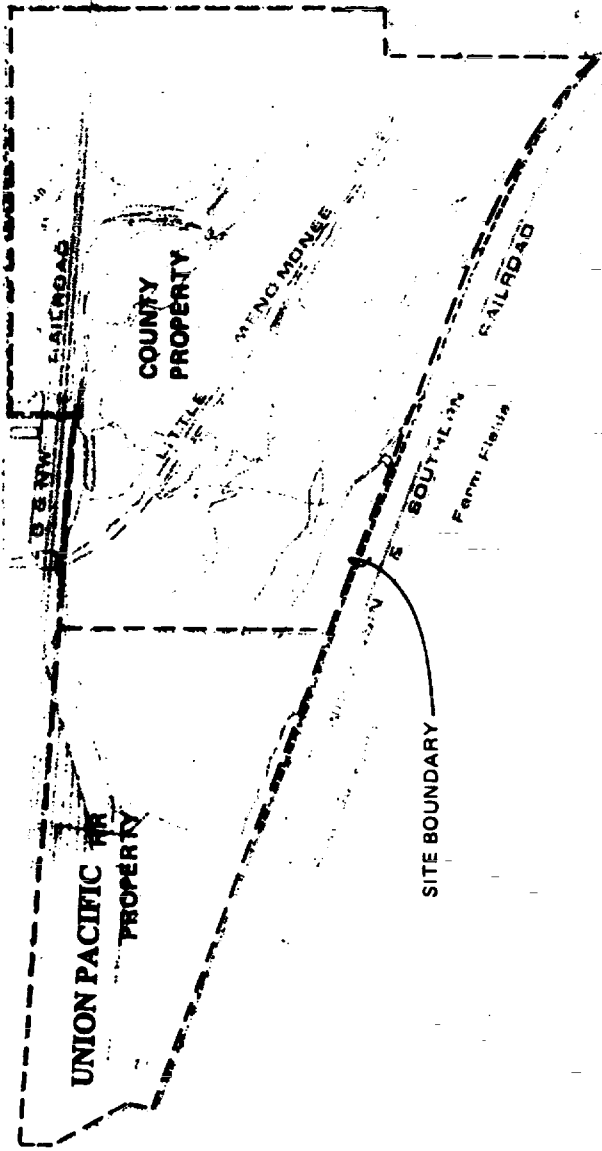
Under WDNR order, KMC cleaned out eight former settling ponds and dredged about 1,700 feet of river to remove creosote-contaminated soil and sediment. During 1972 to 1973, three different dredging efforts were conducted in the Little Menomonee River within the first mile downstream of the facility.

In 1983, the facility was placed on the National Priorities List (NPL) pursuant to Section 105 of CERCLA. U.S. EPA initiated a negotiation period with potentially responsible parties (PRPs) associated with the site to determine if the performance of a Remedial Investigation/Feasibility Study (RI/FS) would be privately conducted. However, such discussions did not result in settlement of this matter. Therefore, U.S. EPA determined in 1987 that it would conduct the RI/FS.

Following development of the 1990 ROD, U.S. EPA again entered into discussions with potentially responsible parties. On December 30, 1991, the United States lodged a consent decree with the Federal District Court for the Eastern District of Wisconsin in Milwaukee. This Consent Decree, which was signed by U.S. EPA, the State of Wisconsin and KMC, calls for implementation of the Remedial Design and Remedial Action set forth in the ROD by KMC. The County of Milwaukee and the Chicago and Northwester Railroad (later the Union Pacific Railroad) submitted comments on the Consent Decree. The County of Milwaukee filed objections to the Consent Decree and sought to intervene in the proceeding in 1992. U.S. EPA responded to the comments and objections in its 1993 Motion to Enter. The County withdrew its objections in February 1996, after reaching an agreement with U.S. EPA on past costs. The decree was entered by the Court in March 1996. See Figure 4 for an indication of current property ownership at the former creosote plant.

Despite limited site access during the 1991-1996 time frame, KMC has moved on with the accomplishment of certain tasks called for in the Statement of Work made a part of the decree. These include certain treatability study and predesign tasks examining issues related to verifying the presence and extent of free-product residues of creosote associated with soils just above the groundwater table, or as "pools" collecting at the soil/groundwater interface; refining estimates on the extent of contaminated sediment in the Little Menomonee River; refining estimates on the extent of contaminated soil on site; and further investigating and evaluating groundwater conditions on site, notably on the east side of the Little Menomonee River.

Based on the predesign results, U.S. EPA issued correspondence to KMC requesting that initial priority be given to removing the free product. Design, construction and installation of a removal system featuring use of extraction wells, conductivity probes to distinguish between creosote and groundwater, and supplementary storage tanks was undertaken in 1995. In 1997, U.S. EPA developed and WDNR concurred with issuance of an Explanation of Significant Differences (ESD) which would allow KMC to utilize an in-situ form of groundwater treatment known as a funnel and gate system. This involves placement of more porous soils to preferentially direct



NOTE: LOCATIONS ARE APPROXIMATE.

**FIGURE 4** PROPERTY OWNERSHIP at FORMER CREOSOTE PLANT

groundwater flow, and introduction of air/oxygen, microbes and nutrients, if necessary, so as to enhance biological degradation of organic contaminants within groundwater. Groundwater polycyclic aromatic hydrocarbon (PAH) content appears to be mostly the 2-3 ring variety which may be successfully treated by a biological approach. In contrast, more complex 4-6 ring PAH compounds are more strongly associated with site soil. Such heavier compounds tend to resist biological attack. The funnel and gate concept is considered innovative and as such, treatment results will be monitored by U.S. EPA to gauge treatment efficiency. Design calls for three tiers of two gates each at which treatment will be provided. Steel sheet piling will be driven into the ground near the Little Menomonee River as a further containment aid. Should results indicate that supplementary groundwater control measures may be necessary, U.S. EPA will require KMC to conduct further action. The funnel and gate system and in-situ treatment may have an operation and maintenance cost advantage compared to other more conventional approaches.

Given that the presence of free-product creosote may lengthen the time needed to accomplish groundwater management goals, which remain unchanged from the 1990 ROD, U.S. EPA believes it is fair to allow an innovative approach in this circumstance. Design is now final for groundwater collection/treatment portions of the cleanup project and, in April 1998, U.S. EPA indicated conditional approval of such design.

If there are discharges to surface water from the remedy, appropriate discharge standards for all contaminants of concern must be met. These standards are currently being developed.

Additional information was required concerning stockpile base pad construction materials and associated geomembrane liners and protective layers to assure appropriate interim storage of excavated soils should groundwater construction commence ahead of soils treatment portions of the remedy. U.S. EPA and WDNR have worked with KMC concerning such details, and upon receipt of further details submitted in June-July 1998, U.S. EPA indicated approval of temporary stockpile design on July 27, 1998.

### **Changes to the Remedy**

#### **Thermal Desorption and Bioslurry Consideration**

The soil treatment technology is being changed because the bioslurry technique may not be able to achieve the treatment cleanup levels set forth in the ROD.

The treatability study concerning the projected removal efficiency of the bioslurry technique indicates, for samples analyzed, that total PAHs were reduced from levels of 1100-1600 mg/kg to around 320 mg/kg, and that carcinogenic PAHs (CPAH) were reduced from a range of 390-550 mg/kg to around 170 mg/kg. This means that there could be considerable difficulty in attaining

the performance goal of 6.1 mg/kg CPAH established in the 1990 ROD. The administrative record indicates (see notes of Brown Wood Preserving discussion) that other creosote sites have had difficulty achieving single-digit part per million CPAH levels with biodegradation techniques. Qualitatively, treatment techniques such as biodegradation for creosote contaminated soils tend to most successfully attack the 2 and 3 ring member, and to some degree the 4-ring PAH compounds, while being far less successful with the 5 and 6-ring PAH compounds.

A portion of the PRP data (see site bioslurry treatability pilot report, administrative record update #5 document # 37, August 1993) seems to support this pattern. There occurred a marked drop off in removal efficiency in dealing with the more complex PAH ring compound benzo(k)fluoranthene, as opposed to the simpler ring compounds noted elsewhere in that report. U.S. EPA has made similar findings at other wood preservative sites. (see administrative record notes concerning the sites L.A. Clarke & Sons - Virginia and American Creosote Works - Florida)

Some reports obtained from the Gas Research Institute discuss thermal desorption processes used to treat contaminants at manufactured gas plant sites. Because of the similarity of contaminants between such sites and creosote facilities, adoption of such treatment techniques at creosote sites such as Moss-American may be warranted. These reports also contained references which indicated that a possible limiting factor in the application of water-based biodegradation techniques to PAHs is the inadequacy of the process in desorbing PAH contaminants from soil particles into solution where they can be metabolized by the biological process.

In 1992, U.S. EPA first began to issue policy papers regarding a concept known as presumptive remedy. In 1995, U.S. EPA's Office of Research and Development developed a paper indicating that thermal desorption was regarded as one of the presumptive remedies for a wood preserving Superfund site such as Moss-American. As the U.S. EPA's experience has grown, noticeable patterns have begun to emerge with regard to pollutants found at certain types of sites, concerning expected similar contaminant effects, and relative degrees of success in dealing with such contaminants. Presumptive remedies build on this experience, and represent approaches which can be chosen with a fair degree of confidence regarding their application at a given class of site. One advantage in utilizing the presumptive remedy approach is that it can shorten and simplify site investigation, feasibility study, and remedy selection efforts.

In October 1997, U.S. EPA issued a document entitled "Treatment Technology Performance Data for Remediation at Wood Preserving Sites." This document examined removal efficiencies realized by a wide variety of treatment technologies at wood preservative sites in both the U.S. and Canada. Of particular interest was an examination of the results of bioslurry treatment of creosote contaminated soils at a site in Mississippi compared to the treatment efficiency results utilizing thermal desorption technology at a Canadian creosote site. Results indicated that for the

more complex CPAH compounds of indeno(1,2,3-cd)pyrene, benzo(a)fluoranthene (two varieties), and benzo(a)pyrene, bioslurry treatment yielded a removal efficiency of from 33-39 percent. In comparison, thermal desorption removal efficiencies were at 99.9 percent for these same compounds. These compounds are of interest because they constitute four of the eight carcinogenic PAH compounds of concern identified at the Moss-American Site.

KMC has had experience utilizing the thermal desorption technique at other creosote sites where waste management has been required. KMC has submitted results concerning the degree of contaminant removal efficiency to U.S. EPA. These results indicate a range of 95-98 percent removal efficiency predicted. Hence, while all site conditions are not replicable, there is a basis by which U.S. EPA may predict that employment of the thermal desorption technique has a reasonable opportunity for a successful outcome.

The amended remedy will utilize the technique of thermal desorption for on-site treatment of contaminated soils/sediments. To differentiate this treatment technique from conventional incineration, thermal desorption has as its objective the driving off of contaminants from the waste mass, rather than the destruction of such contaminants. There is no combustion in the primary unit of the waste itself. Instead some portion of the organic contaminants are volatilized and then the gases driven off undergo further treatment, such as through an afterburner, condenser, or sorption unit. It should be noted that if the influent contaminated soil could be classified as a hazardous waste, and if the resultant contaminant-containing gases are managed via flare or afterburner, then that flare or afterburner must achieve the removal efficiency of 99.99 percent as would be expected of appropriate emission control involving hazardous waste combustion. In thermal desorption, the temperature 600 degrees Fahrenheit (F) is seen as something of a "breakpoint." Below this temperature, it is assumed that the main application is for volatiles. From 600-1150 degrees F, semivolatiles, PAHs, and PCBs are being attacked, also. At the Canadian site discussed previously, the operating temperature was 900 degrees F at 85 minutes retention time. 1150 degrees F is considered about the upper range for thermal desorption application. At these lower temperatures, compared to the temperatures of some 2200-2300 degrees F realized in a full incineration unit, metals such as lead do not volatilize, making an easier emissions control situation. After thermal desorption treatment, the residuals are soils, not ash. Unfavorable site characteristics include excessive clay/silt content in the soil, many large diameter rocks, and excessive moisture content - since energy is wasted driving away water.

One possible solution to deal with soils with higher than desirable clay/silt content is to mix in coarser soils prior to treatment. Thermal desorption is best applied when the organic contaminants do not make up more than 10 percent of the soil matrix. After treatment, dust generation may become a problem, so water is added to dampen the treated material. To prevent combustion, sometimes an inert gas such as nitrogen is injected countercurrent to the flow of treated material. Following treatment at projected removal efficiencies, the residual soils shall be

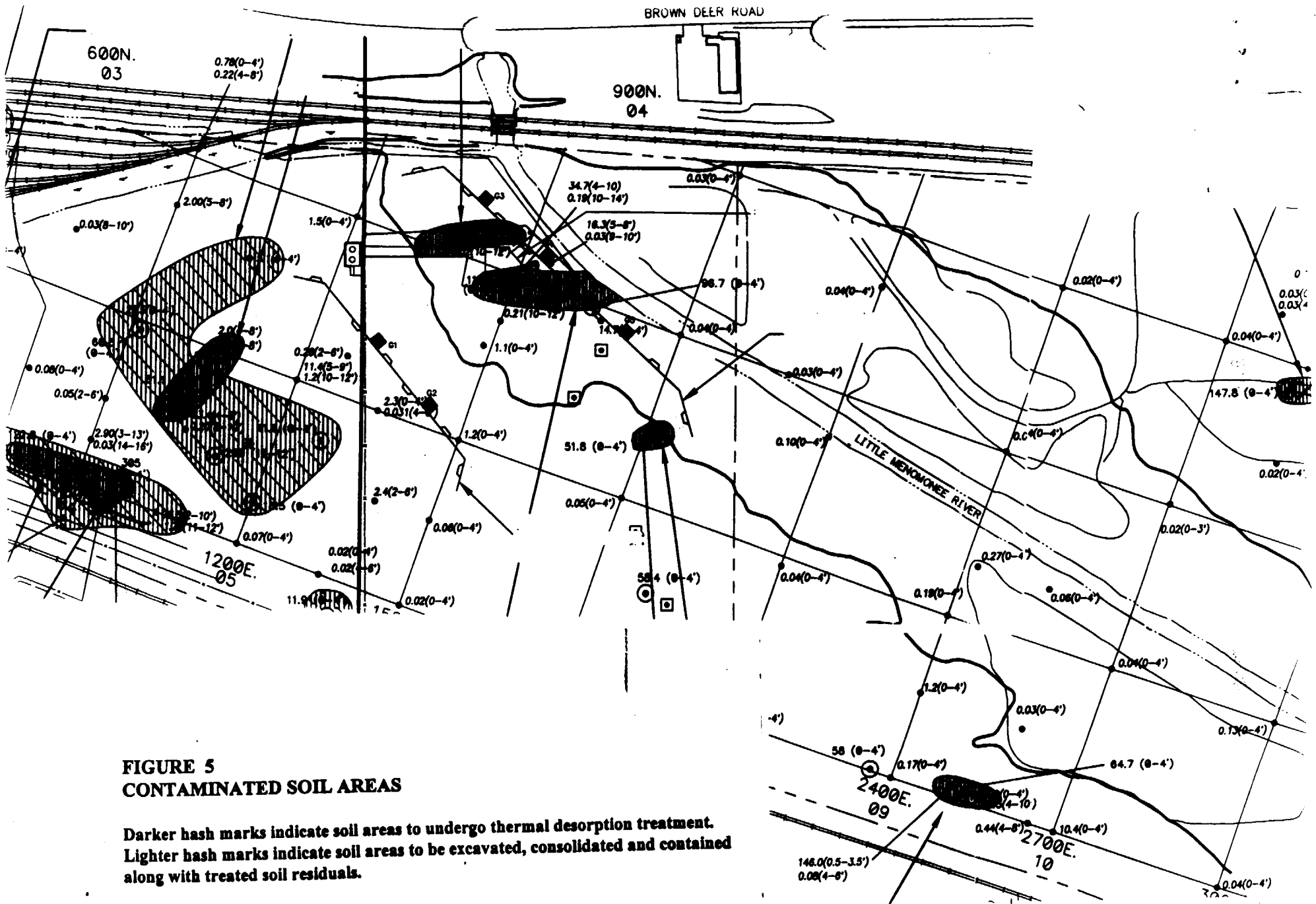
suitable for replacement on site. Prior to commencing operation, treatability study or predesign work may be necessary to define optimum operating conditions.

Cost data gathered with regard to thermal desorption application at the Moss-American site indicates a range of approximately \$75-100 per cubic yard. Some 20-30,000 cubic yards of the more highly contaminated site soils and sediments are expected to undergo treatment using this technique. In comparison, the cost of a bioslurry treatment system for the site was recently estimated at \$150-200 per cubic yard.

### **Areas to Undergo Thermal Desorption**

Site soil areas to undergo thermal desorption treatment would be selected for one of three reasons: 1) Direct contact "hot spots" (> 78 mg/kg CPAHs (approximately 78 parts per million (ppm)), 2) groundwater contaminant source areas having the presence of free-product creosote, and 3) soils containing contaminants exceeding Wisconsin generic residual contaminant levels (RCLs) for benzene/toluene/ethyl benzene/xylene (BTEX) and PAHs in soils which pose a source threat in attaining groundwater cleanup goals. It should be noted that these BTEX compounds occur less frequently and at levels well below CPAH compounds. However, such compounds will be considered in an effort to comply with soil cleanup standards developed since the original ROD. Residual contaminant levels (RCLs) in soils of 1.5 ppm for toluene, 2.9 ppm for ethyl benzene, 4.1 ppm for xylene, 5.5 ppb for benzene and for three PAH compounds: 0.4 ppm for naphthalene, 100 ppm for fluorene, and 48 ppm for benzo(a)pyrene are considered to pose no further threat as a source of contaminants to groundwater. Accordingly, U.S. EPA hereby adopts these RCLs for this Site. More darkly shaded areas depicted in Figure 5 indicate areas which may undergo thermal desorption treatment according to discussion in this paragraph, however, this figure may not represent the full aerial extent accurately, so further discrete soil sampling will be necessary to define these areas prior to excavation.

Additionally, it is also appropriate to consider the implications of groundwater monitoring results now being conducted quarterly since the commencement of remedial action work at the site. Results received in June 1998 indicate that while many groundwater monitoring wells at the Moss-American site are relatively free of significant contaminant levels, three wells indicated notable groundwater contamination. These wells are MW-4S, MW-7S, and TW-09. Under NR 140, preventive action limits (PALs) have been established for three PAH compounds - naphthalene (PAL of 8 ppb), fluorene (PAL of 80 ppb), and benzo(a)pyrene (PAL of 0.02 ppb). Naphthalene levels at these three monitoring wells were particularly high, with concentrations of 2080 ppb at MW-4S, 6470 ppb at MW-7S, and 3080 ppb at TW-09. Residual contaminant levels of 0.4 ppm, 100 ppm, and 48 ppm have been established for groundwater protection for naphthalene, fluorene, and benzo(a)pyrene, respectively. U.S. EPA also adopts these RCLs at the Site. In addition to the areas discussed in the previous paragraph as requiring thermal treatment, U.S. EPA makes note of the following points from Remedial Investigation sampling



**FIGURE 5  
CONTAMINATED SOIL AREAS**

Darker hash marks indicate soil areas to undergo thermal desorption treatment. Lighter hash marks indicate soil areas to be excavated, consolidated and contained along with treated soil residuals.

for surface soils where levels of PAHs discussed in this paragraph pose a threat of further groundwater contamination:

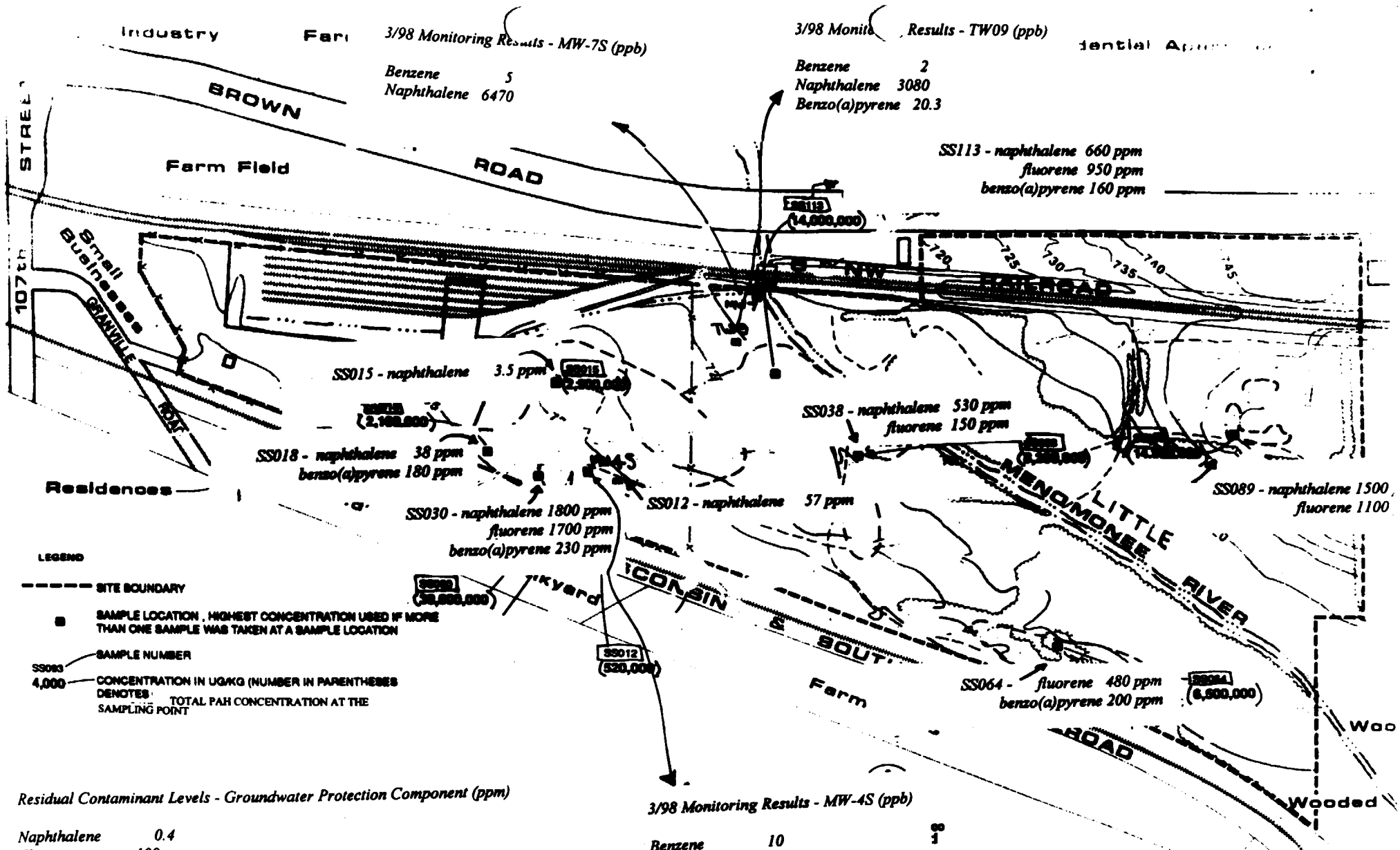
SS012 - naphthalene	57 ppm		
SS015 - naphthalene	3.5 ppm		
SS018 - naphthalene	38 ppm		benzo(a)pyrene 180 ppm
SS030 - naphthalene	1800 ppm	fluorene 1700 ppm	benzo(a)pyrene 230 ppm
SS038 - naphthalene	530 ppm	fluorene 150 ppm	
SS064 -		fluorene 480 ppm	benzo(a)pyrene 200 ppm
SS089 - naphthalene	1500 ppm	fluorene 1100 ppm	
SS113 - naphthalene	660 ppm	fluorene 950 ppm	benzo(a)pyrene 160 ppm

There were exceedances of RCLs for groundwater involving two volatile organic compounds at two of the points just discussed. At SS089, xylene(s) were found at a concentration of 14 ppm compared to the groundwater RCL of 4.1 ppm. At SS030, benzene was detected at a concentration of 100 ppb, compared to the groundwater RCL of 5.5 ppb.

Approximate location of these points is provided in Figure 6. U.S. EPA notes that there may indeed be some overlap of areas to undergo thermal desorption between Figures 5 and 6. However, further discrete soil sampling should be conducted before treatment occurs in areas of the site that may not have been adequately characterized by past sampling efforts to determine if groundwater RCLs are currently exceeded and after treatment in the excavated areas to ensure that unacceptable threats to groundwater have been successfully addressed through attainment of the groundwater RCL.

U.S. EPA observes that successful thermal desorption treatment is a two-step process where first treatment must attain either the appropriate contaminant range or the pertinent reduction removal efficiency depending on the initial threshold value for the contaminant type in question. Achieving this degree of treatment ensures successful compliance with the treatability variance values as further discussed in the "Treatability Variance Adjustment" section of this document. A second step involves comparison to the residual contaminant level for compounds promulgated under NR 140. Attainment of the groundwater RCL allows designation of a CAMU, whereby soils can be disposed without a liner and leachate collection system.

Because of the linkage between certain RCLs and PALs, U.S. EPA hereby adopts promulgated PALs for naphthalene, fluorene, and benzo(a)pyrene as supplementary groundwater restoration ARARs in addition to the BTEX compounds previously cited.



**FIGURE 6**  
**AREAS IN EXCESS OF GROUNDWATER RCLS/PALS**

### **Allowance for Adoption of Industrial or Recreational Exposure Scenarios for Soils Risk Consideration**

If requisite deed restrictions are secured within 180 days of the date of this ROD, EPA will allow residual levels based upon nonresidential scenarios. If requested, U.S. EPA - after consultation with WDNR - may consider a brief extension of this timeframe.

At the time of development of the original ROD for the Moss-American site, exposure scenarios were developed so as to describe potential human exposures for current and potential site uses and conditions. These scenarios considered degree of risk posed through exposure to site contaminants via site trespassing, river recreational usage of the site, and the possibility of residential development of the site.

#### **Industrial Usage**

A risk scenario that was not explored during development of the original ROD was the risk posed to an industrial worker at the site, and what the level of cleanup appropriate to protect such a user.

Since about 1980-1981, and continuing to the present time, the Union Pacific Railroad has utilized the western 23 acres of the site for an automobile and other light vehicle transport, loading/unloading, and storage area. Much of the Union Pacific property has been paved with asphalt.

Since the time of the original ROD development, U.S. EPA has instituted a series of administrative reforms associated with Superfund sites designed to make remediation more fair. In October 1995, U.S. EPA announced certain administrative reforms intended to ensure that risk assessments are grounded in reality and make use of "real world" information about the site. Since a portion of the site is in fact owned by an industrial entity, and since the Agency has received information indicating that such land usage classification is apt to continue, it is appropriate to consider adoption of an industrial usage exposure scenario for that portion of the site now owned by the Union Pacific Railroad. In correspondence received from the Railroad, that entity has indicated its willingness to enter into written deed restrictions so as to preclude residential development of lands it owns, and limit its usage to an industrial use. Chapter NR 700, Wis. Adm. Code, series requires the use of deed instruments where soil contaminants above levels that would be acceptable for residential use remain at a site so the remedy is protective of human health. U.S. EPA therefore expects KMC to pursue such deed restrictions from Union Pacific, which would have the effect of limiting future land development on this site parcel to industrial usage. If applicable restrictions are secured, the Union Pacific property can be considered as industrial. If such deed restrictions are not secured within the expected 180 days timeframe after the effective date of this amendment, then the residential scenario and cleanup

standards for direct contact user protection established by NR 720 shall be obtained or the original 1990 ROD standards shall be met.

The other major site property owner is Milwaukee County. For purposes of this ROD amendment, U.S. EPA will categorize Milwaukee County property associated with the site into two portions as noted in the site consent decree between the United States and Milwaukee County. Appendix 2 of that decree denotes the former creosote plant and the Little Menomonee River and its floodplain downstream from the plant as comprising the Moss-American facility. This ROD amendment will deal only with that portion of Milwaukee County property that is part of the former creosote plant. U.S. EPA may make a determination on land usage along the Little Menomonee River and its floodplain downstream from the plant at a later date.

The County property at the former creosoteing plant is located adjacent to the Union Pacific property. U.S. EPA is aware that in 1997 an easement was sought concerning a portion of Milwaukee County property on the "former creosote plant" area for which industrial development was projected. In addition, the decree between the United States and Milwaukee County provided that there would be no residential use of the former wood preserving plant property during the implementation of the remedy. A Park and Open Space plan adopted by the County in 1991 calls for enhanced recreational opportunity in river corridor settings such as the Little Menomonee. Hence, for the former creosote plant, U.S. EPA considered industrial and recreational scenarios. For non-floodplain areas on Milwaukee County property located on the former creosote plant, U.S. EPA believes an industrial exposure cleanup scenario is appropriate, providing necessary deed restrictions are obtained in accordance with ch. NR 720 within 180 days. This is consistent with nearby uses and potential development. A worker engaged in industrial activity on the site would be most likely to be affected by the direct contact pathway for contaminants associated with site soils. As noted above for Union Pacific deed restriction discussion, U.S. EPA would therefore expect KMC to pursue such deed restrictions from Milwaukee County as well. If KMC obtains such deed restrictions consistent with NR 720, U.S. EPA will adopt an industrial scenario for this property. If execution of such deed restriction is not possible within the expected 180 days timeframe after the effective date of this amendment, then the residential scenario and cleanup standards for direct contact user protection established by NR 720 shall be obtained or the original 1990 ROD remedy shall be carried out. A deed restriction limiting future land use to recreational use would be required under ch. NR 720. U.S. EPA would also insist that deed restriction as a part of appropriate institutional control under CERCLA for the floodplain portion of the former creosote plant in order to protect users of this portion of the site from an unacceptable direct contact risk.

**Remediation Levels - Industrial**

In considering a new exposure scenario, it is also appropriate to consider developments in pertinent soil cleanup levels which have been promulgated since the original ROD. Effective April 1, 1995, the State of Wisconsin promulgated Chapter NR 720 concerning soil cleanup standards. The purpose of this particular chapter is to establish soil cleanup standards for the remediation of soil contamination. Chapter NR 720 requires that all soil contaminant pathways be addressed, which include air, groundwater, surface water, and direct contact.

Calculations done under Chapter NR 720 indicate soil cleanup must be performed to the level of 3.1 mg/kg (or ppm) of total carcinogenic PAHs for an industrial usage scenario so as to minimize any excessive direct contact threat posed to such a site user. Interim Guidance as noted in WDNR Publication RR-519-97 indicates alternatives to the direct use of generic RCLs for individual PAHs may be appropriate and acceptable in some cases, such as establishing RCLs for the direct contact pathway. Hence, U.S. EPA believes it is appropriate to utilize an overall total PAH approach, rather than listing individual direct contact RCLs in this instance. If obtaining a deed restriction from a given property owner is not possible within the expected 180 days timeframe after the effective date of this amendment, then the direct contact total CPAH value considered protective for residential usage is 1.9 ppm. Discussion has already been provided in the section on Thermal Desorption and Bioslurry Consideration as to U.S. EPA's expectations regarding pertinent compounds and levels to be attained such that potential source threat to groundwater is properly managed.

**Background Considerations - Soil and Sediment**

Amendment of the original residential cleanup value for direct contact threat, calculated at 0.061 ppm for the site at the time of the original ROD, is appropriate for another reason. Since that time, U.S. EPA has received information (see administrative record WDNR information on soil/sediments) that there is a notable distinction between background CPAH levels which may be expected in urban versus non-urban areas. Literature sources indicate that in general a range of 1-4 ppm CPAH represents background soil conditions for an urban area such as Milwaukee. On a site specific basis, Pre-design Task # 2 indicates that the background soil CPAH range for the Moss-American site is from 0.46-3.5 ppm. Hence, it is not realistic to expect cleanup to a level which in all likelihood cannot be attained or sustained in such a setting. This ROD amendment views that all discussions herein concerning exposure assumptions, soil standards and management schemes outlined apply to a site area designated as the "Northeast Landfill" as well as other site areas.

At the time of the 1990 ROD, a "to be considered" value of 3 ppm as a sediment quality criterion for CPAH in sediments was derived. However, both the ROD and the consent decree noted that this value could be subject to change pending investigation of what might constitute a maximum probable background (MPB) value, and to utilize the higher of those values. Considering the

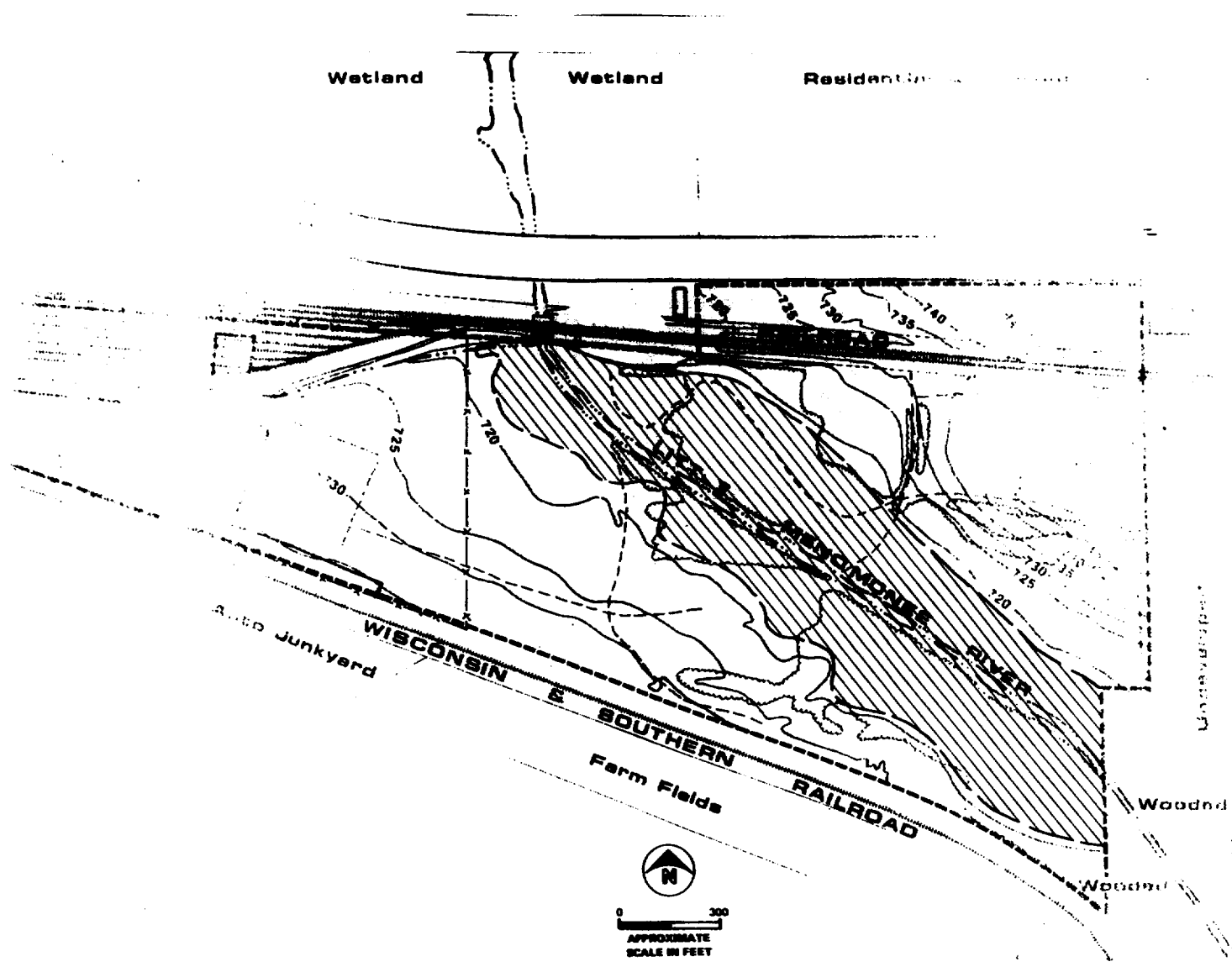
urban setting of the Little Menomonee River in the vicinity of the site and the sampling and analysis work done to establish the MPB, the WDNR has informed U.S. EPA (see March 4, 1998 correspondence) that it now believes a value of 15 ppm CPAH represents a reasonable sediment MPB for the Little Menomonee River.

U.S. EPA believes that a dynamic situation exists between the Little Menomonee River and its floodplain. This means that surface soils having excessive CPAH concentrations could be viewed as a possible threat to attainment of sediment quality goals. In the same way, deposition from the river could contaminate the floodplain, and consideration of realistic expectation of post-sediment management remediation must be made concerning any further floodplain remediation. U.S. EPA notes that only a very small portion of the site floodplain is likely to be affected by the current ROD amendment - namely that portion which is also a part of the former wood preservative facility. See Figure 7 in contrast to Figure 2. For this portion of the floodplain, EPA will adopt a removal cleanup level of 15 ppm CPAH if appropriate deed restrictions are secured within 180 days of the effective date of this ROD amendment.

#### **Recreational usage of the Site**

As noted above, a Park and Open Space plan adopted by the County in 1991 which calls for enhanced recreational opportunity in river corridor settings such as the Little Menomonee. For Milwaukee County property which is located in the floodplain of the Little Menomonee River and is a part of the former creosote plant, U.S. EPA believes that a recreational exposure scenario may be applied. This is consistent with the system of parklands and trails maintained by Milwaukee County downstream of the former wood preserving facility. Industrial development is not likely within the floodplain. Applying the procedures in NR 720 to determine a site-specific RCL, a cleanup level of approximately 49 ppm CPAH provides sufficient direct contact protection for the recreational user. However, U.S. EPA will not adopt 49 ppm CPAH as the cleanup value for County-owned floodplain land on the former creosote plant. Chapter NR 720 series requires the soil to surface water pathway be addressed. After considering needed erosion control measures and sediment remediation values, U.S. EPA adopts a figure of 15 ppm CPAH to be the surface water RCL for the entire former creosote plant and the recreational cleanup value for the County owned portion of the site in the floodplain.

NR 216 substantive requirements, including the development of an erosion control plan, would apply during construction stages of the work. To be considered after construction would be suitable measures to control soil erosion to prevent transport of contaminated soil from all disturbed areas on the entire site. For all disturbed areas that will not be covered to prevent direct contact exposures, such measures may include, but are not limited to, placement of 6" of topsoil and the establishment of a good vegetated cover and/or the collection and management of all runoff from those areas in units such as sedimentation basins.



**FIGURE 7  
FLOODPLAIN PORTION  
COUNTY PROPERTY ON  
FORMER CREOSOTE SITE**

As was previously discussed for needed deed restrictions for industrial land usage, U.S. EPA would expect KMC to pursue recreational deed restrictions from Milwaukee County as well. If execution of such deed restriction is not possible within 180 days after the effective date of this amendment, then the residential scenario and cleanup standards for direct contact user protection established by NR 720 shall be obtained or the original 1990 ROD remedy shall be carried out.

#### **Permeable Soil Cover - Waiver Withdrawal and Establishment of a CAMU**

At the time of original development of the remedy, a waiver under Section 121(d)(4)(B) of CERCLA 42 U.S.C. was invoked for State requirements dealing with design, operation, and closure of hazardous waste landfills. The State of Wisconsin concurred with that waiver. The reasoning behind the waiver in the 1990 ROD was that placement of an impermeable cap over the mass of treated/untreated soil, sediment and debris would result in greater risk to health and the environment by significantly prolonging the time it would take to achieve groundwater management objectives. In such a situation, the remedial action's effectiveness in reducing risk would be in question. It was reasoned that a permeable cover would enhance groundwater remediation by encouraging a flushing action.

However, predesign field work at the site in 1994 verified not only the presence of free-product creosote near the soil/groundwater interface, but also indicated that such materials were present in relatively large extractable quantities. The presence of such materials complicates groundwater management.

At the Moss-American site, the greatest concentrations of free-product creosote are located near monitoring wells MW-8S and TW-07. The area between these two wells is approximately 1 acre in size. Predesign sampling done in 1994 indicated that free-product creosote was present at depths between 6 and 12 feet below the ground surface. The free product recovery system installed by KMC in 1995 has recovered approximately 10,000 gallons of concentrated creosote plus oily wastewater thus far. It has also been explained earlier in this document that one of the primary reasons for selecting a given soil area for thermal desorption treatment is that soil's association with free-product creosote. Soil areas to undergo treatment for reasons other than the presence of free-product are expected to undergo excavation to a working depth of four feet. However, those soil areas associated with free product will be excavated to a depth of about 9-10 feet, unless there is obvious indication of a "hot spot" free-product area extending below the groundwater table in which case efforts to remove free-product will continue. Verification sampling after initial excavation and treatment will refine final excavation depths. A revision to the groundwater remedy under an Explanation of Significant Differences (ESD) was adopted in 1997 that includes containment components utilizing sheet wall with in-situ treatment of the groundwater. This will effectively minimize the spread of contaminants and DNAPL materials in the soils and groundwater regardless of the amount of infiltration into the contamination zone. Therefore, the need for allowing flushing is minimized, the groundwater restoration should be

relatively unaffected by the amount of infiltration allowed through a cover system and the design of any cover system should be based on what is protective of human health and the environment given the nature of the material to be covered and complies with ARARs. Therefore, the following cover designs shall be utilized:

A. Soils picked up for treatment, which include soils that exceed the NR 720 groundwater RCLs for the BTEX and PAH contaminants, >78 mg/kg CPAHs, to be contained after treatment to at least groundwater RCL levels for all contaminants or less, provided appropriate deed restrictions and maintenance agreements are obtained within the expected 180 days timeframe after the effective date of this amendment:

Section NR 504.07 cover (CAMU reconsolidation disposal unit)

B. Soils left in place that do not exceed the criteria under A, but exceed NR 720 direct contact RCLs for the land use at that portion of the site, provided appropriate deed restrictions and maintenance agreements are obtained within the expected 180 days timeframe after the effective date of this amendment (There is also an option to pick up, and, if necessary, treat these soils and consolidate them in the CAMU reconsolidation area):

Existing (as of the effective date of this amendment) asphalt pavement or 2 feet of clean soil and 6 inches of vegetated topsoil (NR 720 performance standard covers for in place soils)

Soils in the floodplain under B. that remain in place and exceed the direct contact RCL for recreational usage shall be covered with 2 feet of clean soil and 6 inches of vegetated topsoil, provided appropriate deed restrictions and maintenance agreements are obtained within 180 days after the effective date of this amendment, and provided that the necessary floodplain easements are obtained for filling in the floodplain. If the floodplain easements cannot be obtained, these soils shall be removed so that the remaining soils may not exceed the NR 720 residential direct contact RCL values for all the contaminants of concern. This timeframe may be extended upon the approval of U.S. EPA in consultation with the WDNR.

C. (Alternative to A only) Soils under A, which would all be picked up and treated to at least direct contact levels and groundwater RCLs specified in this amendment for all contaminants or less provided appropriate deed restrictions and maintenance agreements are obtained within the expected 180 days timeframe after the effective date of this amendment:

Six inches of vegetated topsoil (CAMU reconsolidation disposal unit)

D. Soils under A and soils under B are required to all be picked up and treated to at least direct contact levels specified in this amendment for all contaminants or less if appropriate deed

restrictions and maintenance agreements are not obtained within the expected 180 timeframe days after the effective date of this amendment:

Six inches of vegetated topsoil (CAMU reconsolidation disposal unit)

The design of the s. NR 504.07 cover system includes a clay cap (approximately 24 inches thick) topped with a suitable frost-protection soil layer (approximately 18 inches thick) A cross-section of such cover is depicted in Figure 8.

While Section 3004(o) of RCRA, 42 U.S.C. 6924(o), only requires a double-liner and leachate collection system for new, replacement or expanded landfills, the authorized State requirements at Wis. Admin. Code. s. NR660.13(10) (formerly 181.44(10)(4), 42(8) and 44(13)) also require a double liner and leachate collection system for existing landfills.

U.S. EPA and WDNR have previously determined that certain wastes on the Moss-American site are listed under the Resource Conservation and Recovery Act as hazardous wastes K001 and U051. RCRA requirements are considered applicable if, as established in the WDNR NR 600 rule series, activities being considered as part of the remedy constitute treatment, storage, or disposal as defined by RCRA. Excavation and disposal activities will require compliance with RCRA waste management standards.

The CAMU rule within RCRA, at 40 CFR 264 Subpart S [264.552], however, allows movement of contaminated material within an area of contamination without triggering requirements for "generated" hazardous waste. In essence, this allows consolidation of contaminated soils and sediments containing listed or characteristic waste without triggering the land disposal restriction or minimum technology requirements (MTRs) of RCRA. This concept is needed for an alternative such as that featured in this ROD amendment where consolidation from several points around a site is expected to occur followed by containment under a cover.

Wisconsin has adopted the CAMU rule in NR 636. A key criterion for establishing a CAMU in NR 636.40(3)(b) states that for waste management activities associated with the CAMU, there may not be the creation of unacceptable risk to humans and the environment from exposure to hazardous waste or its constituents. Contaminated soil and sediment areas depicted on Figures 5 and 6 constitute a CAMU for the site. Should the s. NR 504.07 cover be used (A., above), the CAMU reconsolidation disposal unit would be designed to be as small as possible to minimize the cost of a new cover system, so the disposal unit should be located within the CAMU, but will be considerably smaller than the areas depicted on these figures.

U.S. EPA observes that while the thermal desorption treatment technique may be successfully employed as a means of dealing with PAH materials in sediments, it will be necessary to determine if other potential contaminants such as heavy metals and organics are present and

# Cover Descriptions

## Amendment Featuring Thermal Desorption Treatment

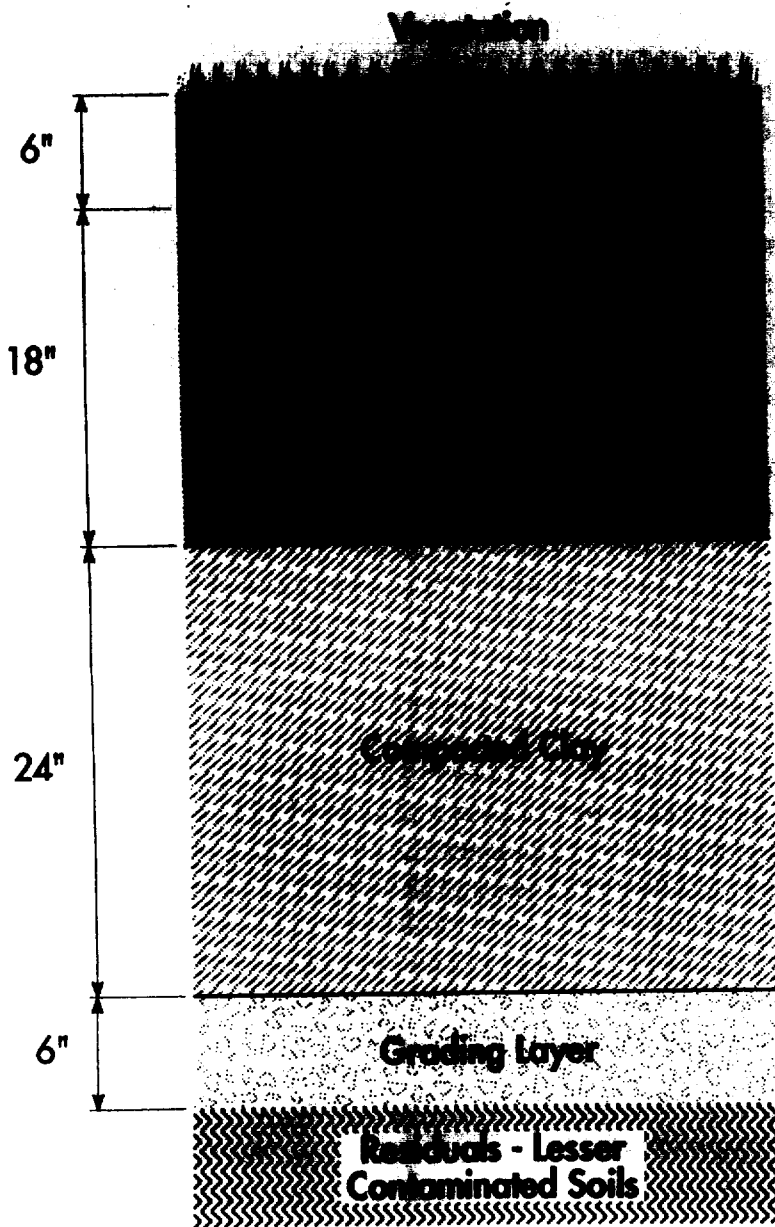


FIGURE 8



would require attainment of RCLs pertaining to such compounds before containment could occur. If it is not possible to achieve the RCLs for these contaminants, then the sediments will have to be managed off-site at a permitted or licensed hazardous waste facility or U.S. EPA may consider issuing an ESD to change the design of the CAMU redisposal unit to include a liner and leachate collection system.

In summary, the original underlying premise of invoking a waiver for what normally would have been installation of an impermeable cap is no longer valid. The theory that promoting a flushing action so that groundwater management may only be required for a relatively few years is no longer correct. In utilizing the CAMU as allowed under federal and State law, a liner and leachate collection system is not necessary. Provided the groundwater component of the RCL for the BTEX compounds, naphthalene, fluorene, and benzo(a)pyrene are attained, a CAMU is appropriate for this Site. Treated sediment may contain other contaminants that would also need to meet groundwater RCLs or the sediment will have to be managed off-site unless an ESD is issued for changing the design of the CAMU disposal unit to include a liner and leachate collection system.

Unlike some materials which undergo relatively rapid decomposition and which may be disposed through the technique of land disposal, more complex PAH compounds may undergo degradation slowly unless specific steps are taken to hasten the process. Hence, U.S. EPA will require cover maintenance to extend into perpetuity.

#### **Treatability Variance Adjustment**

The 1990 ROD contained Table 3, which discussed treatability variance concepts. In order to be acceptable for land disposal, threshold concentrations for certain constituents of concern were established. If the concentration of a given contaminant exceeded that threshold value, then it had to be treated so as to achieve an appropriate removal efficiency range. If the initial concentration were below the threshold value, then an acceptable post-treatment concentration range may be specified. Table 3 listed various contaminants of concern, and provided expected reduction efficiencies or post-treatment concentrations viewed as acceptable for land disposal. Based on subsequent guidance, "Obtaining a Soil and Debris Treatability Variance for Remedial Actions", Superfund Publication # 9347-3-06FS, as well as further insight as to what should be considered contaminants of concern at the site, U.S. EPA modifies the table as follows:

- Benzene and ethylbenzene were not previously listed. U.S. EPA adds these constituents, and notes that like toluene/xylene previously listed, land disposal is appropriate if treatment reduces concentration by 90% or to below 10 ppm, pending initial contaminant status regarding a threshold value of 100 ppm. Utilizing the CAMU concept discussed elsewhere in this document, in order for these volatile compounds to undergo land disposal without further aid of liner or leachate collection system, the groundwater RCL of 1.5 ppm for toluene, 4.1 ppm for xylene(s),

2.9 ppm for ethylbenzene, and 5.5 ppb for benzene must be attained. Upon review of soil concentrations found in the Remedial Investigation for these substances, and given the expected reduction efficiency of the thermal desorption technology, U.S. EPA believes these values may be achieved.

- No threshold value was provided for carcinogenic PAH. The guidance document cited above lists 400 ppm for PAHs as the threshold value. A reduction efficiency of 90% was cited previously. The guidance document now cites 95% removal efficiency for substances exceeding the threshold value, and an acceptable range of 0.5-20 ppm for substances falling below the threshold value. This will replace the 6.1 ppm figure cited in Table 3.

- Fluorene had not been previously listed as a contaminant of concern. U.S. EPA is hereby adding fluorene as a contaminant of concern.

- Utilizing the CAMU concept discussed elsewhere in this document, for the PAH compounds naphthalene, fluorene, and benzo(a)pyrene, these compounds may undergo land disposal without further aid of liner or leachate collection system provided that they fall below their respective groundwater RCLs of 0.4 ppm, 100 ppm, and 48 ppm. Upon review of soil concentrations found in the Remedial Investigation for these substances, and given the expected reduction efficiency of the thermal desorption technology, U.S. EPA believes these values may be achieved.

### **Evaluation of Alternatives**

The following section outlines the nine decision criteria that were used to evaluate the original selected remedy and the amended remedy. Based on current information, the amended remedy provides the best balance of benefits measured against these decision criteria. This section discusses the anticipated performance of the amended remedy compared to the decision criteria.

#### **1) Overall protection of human health and the environment**

This criterion addresses whether or not an alternative provides adequate protection of human health and the environment and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

#### **Comparative Analysis**

##### **a. Change in Soil Cleanup Level for Portions of the Site**

Information in the Administrative Record indicates that employment of an industrial or

recreational usage scenario for respective portions of the site is justified, because of indications that such usage is likely or will continue into the foreseeable future. Appropriate deed restrictions will be required to ensure that the land usage remains industrial or recreational. Compared to residential usage, industrial and recreational usages involve less frequent number of instances of exposure per unit time. Hence, risk assessment involving an industrial/recreational exposure scenario will result in calculation of an acceptable contaminant concentration higher than a residential scenario. Adoption of such scenario for the site seems justified in this instance, since the amended remedy still maintains overall protection to human health and the environment. If necessary deed restrictions for a given portion of the site can not be obtained within 180 days from the date of this ROD Amendment, then the soil removal cleanup standard shall be the residential cleanup standard as established by NR 720, or the original 1990 ROD remedy shall be carried out.

**b. Means of Soil Treatment**

The overall remedy involves a combination of treatment/containment methods so as to achieve performance standards. The amended remedy employs a different means of soil treatment, i.e., thermal desorption versus bioslurry, than the originally selected remedy. The expected reduction in contaminant levels to be brought about by usage of thermal desorption, coupled with other remedy provisions, should ensure that the criterion of protection of human health and the environment is maintained.

**c. Revoking of the Waiver of RCRA Subtitle C Cap Requirements Regarding Treated Soils/Sediments Residuals and Less Contaminated Soils**

A waiver of the need to utilize RCRA Subtitle C cap requirements was invoked at the time of original ROD development. At that time it was reasoned that placement of an impermeable cap over the mass of treated/untreated soil, sediment and debris would result in greater risk to health and the environment by significantly prolonging the time it would take to achieve groundwater management objectives. It was reasoned that a permeable cover would enhance protectiveness by the relatively prompt groundwater remediation which might be encouraged through a flushing action.

However, predesign field work at the site in 1994 verified not only the presence of free-product creosote near the soil/groundwater interface, but also indicated that such materials are present in relatively large extractable quantities.

The presence of such free-product creosote in quantities significantly larger than contemplated in the original ROD makes relatively prompt attainment of groundwater remediation goals doubtful. The revised groundwater remedy will effectively minimize the spread of contaminants and DNAPL materials in the soils and groundwater regardless of the amount of infiltration into

the contamination zone. Therefore, the need for allowing flushing is minimized, the groundwater restoration should be relatively unaffected by the amount of infiltration allowed through a cover system and the design of any cover system should be based on ARARs and what is protective of human health and the environment given the nature of the material to be covered.

## 2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This criterion addresses whether or not an alternative will meet all of the ARARs pertaining to federal and state environmental laws and regulations and/or justifies the invoking of a waiver of such ARARs. ARARs are considered frozen at the time of remedy selection. However, in considering ROD amendments, newer pertinent regulations developed since the original remedy are to be analyzed. The following paragraphs consider ARARS of note since the original ROD.

### Comparative Analysis

Air emission treatment requirements, Wisconsin Administrative Code Chapter NR 445, were considered in the original ROD. A thermal desorption unit is denoted as a miscellaneous hazardous waste treatment unit under either federal or state hazardous waste management regulations. With regard to WDNr regulations, such unit is denoted in Chapter NR 670, which will now be added to appropriate site ARARs. Air emissions from such a unit are regulated under Chapter NR 665. Of particular note is the instance where the thermal desorption unit utilizes an afterburner or a flare as a means of controlling volatilized contaminants that have been driven off the soil mass. In this case, since the soil being put into the unit constitutes a hazardous waste, then the degree of removal efficiency using a flare must attain 99.99 percent, the same as would be expected for hazardous waste incineration. Since thermal desorption operates by driving contaminants off soil, appropriate emission control of soil dusts must be met.

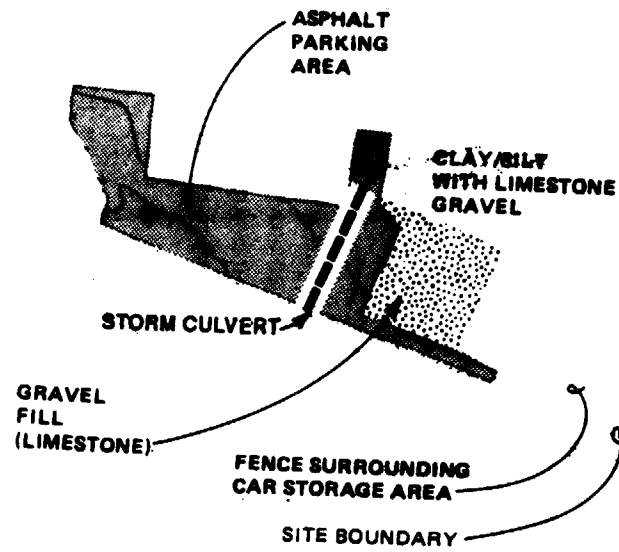
By a combination of treatment and containment, site soils must attain both 1) direct contact protection levels as established for site users under Chapter NR 720, this value being 3.1 ppm for direct contact for industrial usage and 1.9 ppm for residential usage, and 2) levels established pursuant to Chapter NR 720 so that the treated soils will not become a source of groundwater contamination under NR 140 standards. Since recent groundwater monitoring has indicated exceedances of three PAH compounds for which PALs have been promulgated under NR 140, PALs for naphthalene, fluorene, and benzo(a)pyrene are adopted in this ROD amendment. As noted previously in this document, these values are respectively 8, 80, and 0.02 ppb, respectively. It is appropriate to do so because of the concept of connection between these PALs and the groundwater source protection component of the residual contaminant level in NR 720. U.S. EPA also adjusts the PAL originally set for benzene. At the time of the 1990 ROD, the PAL value was 0.067 ppb. Since that time, WDNr has now established that a PAL of 0.5 ppb as protective. In situations where an industrial RCL is to be used, Section NR 720.11(1)(c), Wis. Adm. Code, requires that a deed restriction be recorded to prevent future non-industrial land

uses. A deed restriction will also be required by U.S. EPA under CERCLA as appropriate institutional control for adoption of recreational usage and cleanup to such standards for a portion of the site property.

The asphalt cover over portions of Union Pacific property would not constitute a cover complying with either federal or state solid or hazardous waste management rules. However, U.S. EPA is mindful of administrative reforms which seek to promote productive future site utilization. Provided that this material is not excavated and adequate maintenance/repair of asphalt paving can be assured, U.S. EPA will not seek further cover of this material. See Figure 9 for the approximate location of this area. Section NR 720.19(2), Wis. Adm. Code, allows a soil performance standard remedy to be selected in place of a level which complies with an approved RCL. One such example of compliance would be in arranging for permanent engineering control, such as defined asphalt inspection and maintenance schedules, to be established. Should a performance standard for a portion of the site be invoked, a deed restriction must be recorded to prevent activity that would compromise the performance standard, such as excavation. A maintenance agreement is required to assure continuing adequate protectiveness. Section NR 720.19 seems especially pertinent to necessary asphalt maintenance scheduling and to measures which may be taken to control erosion and undue runoff which may interfere with subsequent sediment management goals.

Unlike regulations in Chapters NR 720, 670 and 665, Chapter NR 216 may not necessarily be directly applicable to the Moss-American situation. For one thing, Chapter NR 216 concerning soil erosion/runoff protection measures has a threshold value of 5 acres of construction activity disturbance, which may or may not occur at the site. For another, Subchapter III is defined in the "applicability" section as being intended for construction sites with a "point source" discharge of storm water. Excavation and treatment of "hot spot" areas for thermal desorption may constitute only sheet runoff if soils are successfully treated. It is appropriate to seek good drainage around a containment cap, however, and such runoff could be construed as a point source pending its configuration. Remaining surface soils, particularly on County land, should not serve as future sources of sediment contamination. Therefore, the control measure concepts within Chapter NR 216 must be followed in site planning efforts.

The Moss-American site is relatively complex, with facets of the remedy addressing various environmental media. It was presumed at the time of the 1990 ROD and in the Consent Decree calling for remedial design/construction activity that it might be necessary to handle, stage and store soils and sediments. For example, predesign task #17 included in the Statement of Work attached to the Decree notes that "...The staging and storage methods may include open piles and/or covered piles and enclosed areas..." in managing soils and sediments. It may also have been presumed that most site remediation work would proceed concurrently, in which case pile storage of soils or sediments for a lengthy time would not have been a major consideration. However, U.S. EPA believes it is important to recognize the possibility that site remediation may



0 600  
SCALE IN FEET

**FIGURE 9**  
**ASPHALT PAVED PORTION OF SITE**

proceed in a phased fashion. In that case, excavation done for the purpose of installing hardware for one phase of site work may be held for a lengthier period of time until other soils (or sediments) management can be completed. Portions of some highly contaminated soil areas intended to undergo thermal desorption treatment may require excavation and storage for other phases of the remedy, such as groundwater management. However, if such stockpile may also be classified as a hazardous "waste pile" for waste management purposes, then the waste pile needs to have adequate foundation, leachate control, liner, and wind dispersal safeguards as may be called for in federal and state regulation. "Waste piles" are addressed in Subpart L of the hazardous waste section of the federal Resource Conservation and Recovery Act (RCRA), and in Chapter NR 655 of Wisconsin hazardous waste management rules. Federal RCRA regulations, at 40 C.F.R. § 264.251(b) allow exemption from certain waste pile design and operating requirements provided that the pile owner/operator sufficiently justifies an alternate design and operating practice, and the State waiver provision at Wisc. Admin. Code § NR 680.04 can be exercised accordingly. U.S. EPA believes such justification has been provided in this instance. In recent correspondence concerning approval of temporary stockpiling procedures, U.S. EPA and WDNR have indicated that soil treatment capabilities shall be on-line in no more than two construction seasons from July 1998. U.S. EPA notes that the 1990 ROD indicated that soil, debris, and sediment undergoing extraction, treatment or redeposition may trigger RCRA requirements in placement and disposal of such material. In that case, the remedy is expected to comply with standards contained in the State authorized RCRA program and in the self-implementing Federal RCRA requirements.

U.S. EPA notes that ch. 636 of the Wisconsin hazardous waste management rules, which justifies conditions under which a CAMU may be utilized, becomes an ARAR when a CAMU is invoked. A CAMU is invoked to allow consolidation of contaminated soils from different portions of the site, as well as the picking up and treatment - and subsequent placement - of contaminated soils in units with alternative designs. With a CAMU, liners and leachate collection systems are not required. U.S. EPA and the State have determined that CAMU is appropriate at this Site provided that the groundwater RCL component is achieved for all the BTEX compounds, naphthalene, fluorene, and benzo(a)pyrene. Treated sediment may contain other contaminants that would also need to meet groundwater RCLs or the sediment will have to be managed off-site or an ESD issued for changing the design of the CAMU disposal unit to include a liner and leachate collection system.

### **3) Long-Term Effectiveness and Permanence**

This criterion refers to the expected residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time, once cleanup objectives have been met.

### Comparative Analysis

By invoking concepts of treatment of free-product creosote soil areas, seeking further means of potential groundwater contaminant control, and seeking erosion protection measures that avoid future sediment contamination problems, the amended remedy would appear to offer enhanced long-term effectiveness and permanence in comparison to the original remedy. The original remedy also did not contemplate the attainment of the groundwater component of the residual contaminant level. Given the soil contaminants present at the site, the original treatment technique of bioslurry would appear to have relatively little chance of achieving desired treatability variance ranges/efficiencies. In comparison, the thermal desorption technique appears to have a greater opportunity to achieve not only the desired treatability variance ranges/efficiencies, but also the pertinent groundwater RCLs. Employment of the thermal desorption technique so as to attain groundwater RCLs therefore justifies no usage of liners/leachate collection facilities.

#### **4) Reduction of Toxicity, Mobility, or Volume through Treatment**

This criterion is the anticipated performance of the treatment technologies an alternative may employ.

### Comparative Analysis

#### Comparison of Bioslurry Treatment with Thermal Desorption:

All alternatives featuring an element of treatment will achieve reductions in toxicity, compared to approaches which feature only containment or imposition of institutional controls. The technique of thermal desorption appears to have the potential to yield significantly superior treatment results compared to that of a bioslurry approach for management of highly contaminated soils and sediments. As noted, the bioslurry approach should effectively address that subset of PAHs composed of 2 and 3-ring compounds. Such compounds may comprise the more mobile PAHs, such as naphthalene. Treatment effectiveness utilizing the bioslurry technique diminishes with increasing PAH molecular weight. While these heavier compounds are not relatively mobile, they present toxicity concerns. The literature indicates that the more complex PAH compounds also tend to be the more carcinogenic compounds. The thermal desorption process may therefore help to achieve superior results in terms of reducing toxicity in comparison to a bioslurry approach. Also, by amending the remedy to consider additional compounds and thereby protecting groundwater from further contaminant sources, the amended remedy is superior in terms of reduction of contaminant mobility.

### 5) **Short-term Effectiveness**

This criterion involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup objectives are achieved.

#### Comparative Analysis

##### Comparison of Bioslurry Treatment with Thermal Desorption:

At the time of development of the original ROD, it was projected that a 15-day retention time in the bioslurry treatment unit would be necessary for a given batch of contaminated soil or sediment to attain the desired cleanup goal of 6.1 ppm carcinogenic PAHs. It was noted further that biological treatment is temperature dependent, and that treatment might not continue through the winter months. In comparison, the retention time for batch treatment within a thermal desorption unit would be on the order of hours. Hence the time to learn if effective treatment is being provided will be reduced. Furthermore, as noted within pilot work conducted on site soils using the bioslurry approach, it is doubtful that the cleanup goal of 6.1 ppm carcinogenic PAHs can be attained using the bioslurry approach.

##### Change in removal cleanup standards based on risk assessment scenarios:

Elsewhere in this document, U.S. EPA has indicated that it believes it is reasonable from an administrative standpoint to accomplish the obtainment of all necessary deed restrictions within an expected 180 days timeframe. However, in conjunction with discussion in the ARARs decision criterion above, it is also important from a technical standpoint that obtaining necessary deed restrictions be accomplished within the expected 180 days timeframe. As was noted in ARARs discussion, U.S. EPA's approval concerning temporary stockpiling procedures was predicated on the basis that it would take no more than two construction seasons from July 1998 to bring soil treatment capabilities on-line. Therefore, U.S. EPA believes it is important to secure deed restriction in a timely fashion.

### 6) **Implementability**

This criterion is the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the given option.

#### Comparative Analysis

##### Comparison of Bioslurry Treatment with Thermal Desorption:

In designing a bioslurry approach to soils and sediments treatment, consideration of site-specific sizing concerns would be an important design component. Materials of construction and site-specific pumping and valving considerations must be considered. The bioslurry treatment unit would be, in essence, a permanently constructed site feature. In contrast, thermal desorption units are not normally built "from scratch." Rather, it is presumed that vendor-developed mobile equipment would be utilized for thermal desorption remedial action. Remedial design efforts in implementing such alternative may be less rigorous than for a bioslurry approach. Design for a thermal desorption unit would focus not so much on what the individual components of a desorption system are and how they need to be fitted together, but rather on operating experiences from other pertinent sites, such as removal efficiencies realized and degree of emission control brought about, as well as necessary verification sample planning. As noted, the thermal desorption equipment is expected to be a vendor supplied mobile unit. Vendor capacity and availability are therefore prime considerations regarding implementability. Current indications are that vendor availability should not pose undue difficulty. Expediency in design of a soils treatment unit is an important consideration. Final groundwater design management plans have now been received. Construction of the groundwater funnel and gate in-situ treatment system is to some degree contingent on progress in remediating those site soil areas associated with the presence of free-product creosote. Adoption of the thermal desorption approach would appear to hold an implementability advantage with regard to groundwater treatment progress as well.

### Cover Systems

In discussion of withdrawal of the waiver extended in the previous ROD, and in CAMU discussion (see pp. 14-15 of this document), U.S. EPA established a "tiered" system of containment under the CAMU intended to encourage more efficient soil treatment in exchange for less complex containment measures. Covers range from clay with a frost protection layer to soil to relatively simple erosion control measures when total attainment is realized of all groundwater RCLs and pertinent direct contact protection measures. Materials needed for construction of various cover types are all considered commercially available.

### 7) Cost

This criterion includes estimated capital costs, as well as operation and maintenance costs.

### Comparative Analysis

In comparison to the bioslurry treatment approach estimated to cost about \$150-200 per cubic yard of soil treated, the thermal desorption approach is estimated to cost approximately \$75-100 per cubic yard. Additionally, if groundwater RCLs are met then it will not be necessary to add a

subsurface synthetic membrane and leachate collection system as a means of containing treated soil residuals plus lesser areas of contaminated soils. As noted in the discussion of Implementability above, ultimate cost of appropriate containment measures is dependent on the degree of efficiency realized in thermal desorption.

**8) State Acceptance**

This criterion indicates aspects of the recommended alternative and other alternatives to which the state support agency (WDNR) favors or objects, and comments regarding state ARARs or the proposed use of waivers. While WDNR indicated general agreement with the broad concepts noted in the proposed plan - usage of thermal desorption and consideration of industrial or recreational usage scenarios - WDNR did not concur with the proposed plan issued by U.S. EPA which solicited public comment concerning the potential ROD amendment. WDNR requested a 30 day extension of the public comment period. U.S. EPA did in fact extend the public comment period. Within the Responsiveness Summary, U.S. EPA believes it has satisfactorily provided a reply to WDNR concerns. U.S. EPA has included certain details in the ROD amendment not included in the proposed plan so as to indicate its intention of conducting the remedy in accordance with pertinent ARARS. The State of Wisconsin has indicated it will provide conditional concurrence with this Record of Decision Amendment. The State of Wisconsin's letter indicating this position will be included in the Administrative Record for the site.

**9) Community Acceptance**

This criterion indicates the public support of a given alternative. This criterion is discussed in the Responsiveness Summary. Numerous oral and written comments were received at the March 18, 1998 public meeting. Written comments were also received both before and after the meeting. The majority of comments indicated that U.S. EPA should adopt the changes discussed in this amendment. Union Pacific appears to favor usage of an industrial usage scenario to guide cleanup on its property. Milwaukee County does not appear to favor at this time any change in exposure scenario with regard to its property. There will be opportunity for discussion between the property owners and KMC to determine what deed restrictions can be developed concerning respective property.

**Statutory Determinations**

The amended remedy complies with the requirements of CERCLA Section 121 by considering and controlling site risks associated with direct contact with soil contaminants, and has beneficial

impact with regard to associated contaminated groundwater and sediment measures. The action will not cause unacceptable short-term risk or cross-media impacts. There are no chemical, action or location-specific ARARs identified for this action that were not previously considered in the administrative record. The amended remedy is cost effective. The amended remedy also considers Superfund administrative reforms and presumptive remedy information not available at the time of the original ROD. The amended remedy should also significantly reduce treatment costs compared to the original means of soils treatment specified.

The 1990 ROD justified a waiver pursuant to Section 121(d)(4)(B) for a Subtitle C cap and for the State double-liner/leachate collection system requirement on the basis that an impermeable cap and liner would pose a greater risk to health and the environment by prolonging groundwater treatment and time needed to achieve groundwater goals. Given change in the groundwater remedy under the 1997 ESD, waiver of a relatively impermeable cap is no longer justified. However, in making usage of alternative reconsolidation unit designs, U.S. EPA invokes the CAMU concept. U.S. EPA notes that ch. 636 of the Wisconsin hazardous waste management rules, which justifies conditions under which a CAMU may be utilized, is a means of meeting this ARAR. A CAMU is invoked to allow consolidation of contaminated soils from different portions of the site, as well as the picking up and treatment - and subsequent placement - of contaminated soils in units with alternative designs. With a CAMU, liners and leachate collection systems are not required. Pursuant to ch. 636, the condition which should exist such that an unacceptable risk is not created is attainment of pertinent RCLs prior to containment efforts.

The amended remedy provides the best balance of tradeoffs with respect to the evaluation criteria. The amended remedy satisfies the preference for treatment as a principal element of the remedy.

### **Documentation of Significant Changes**

The Proposed Plan for consideration of substitution of thermal desorption technology, allowance for adoption of industrial or recreational exposure scenarios, and difference in relatively permeable versus non-permeable capping materials at the Moss-American site was issued for public comment on March 9, 1998. The Proposed Plan identified Alternative 2 - usage of thermal desorption technology, adoption of industrial or recreational exposure scenarios, usage of impermeable capping materials - as the recommended alternative. U.S. EPA has reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary.