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PREASSESSMENT SCREEN
Moss-American Site

I. Introduction

The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA or Superfund) and the Clean Water Act (CWA) allow state and federal agencies which are trustees for natural resources to assess monetary damages against parties responsible for a discharge of oil or hazardous substances. These damages are designed to compensate for injuries to natural resources that have not been, nor are expected to be, addressed by response actions under Superfund. The money may cover the cost of environmental restoration as well as the cost of assessing the extent of natural resource damage.

Federal regulations (43 CFR, Part 11) describe procedures for evaluating, planning, collecting data and carrying out the assessment and remediation of natural resource damages. The first step in the process is a Preassessment Screen, which is a brief evaluation of whether a detailed damage assessment should be conducted to be based on readily available information about the site in question (Natural Resources Damages Assessment, Final Rules, August, 1986).

The is a preassessment screen for the Moss-American site which is located in northwestern Milwaukee County (Figure 1). The site is being evaluated for remedial action under Superfund. Briefly, the cause of contamination is the preservation treatment of wood products with a fuel oil - creosote mixture. Soil, groundwater and the bottom sediments of the Little Menomonee River are contaminated with a mixture of organic compounds at high concentrations.

Potentially Responsible Parties under CERCLA include Kerr-McGee Corporation, which purchased the facility in 1963 and operated it until it closed in 1976, and the Chicago and Northwestern Railroad and Milwaukee County which are considered PRPs because they are the current owners of the property.

Figure 2 shows current conditions on the site. It shows the extent of disturbance affecting the site. Some wetlands, mainly persistent emergent vegetation, and woodlands are found on the site. The 100-year floodplain of the Little Menomonee River occupies part of the eastern portion of the site.

Substance Release Information

Table 1 lists the hazardous substances associated with wood preserving operations. The compounds of greatest concern are carcinogenic (cancer causing) polyaromatic hydrocarbons (having multiple ring structures), although other organic contaminants are also present in the soils, groundwater and sediments. These substances are components of creosote, and of the fuel oil

used in the preservation process. Creosote itself is a byproduct of the production of coke from coal(Remedial Investigation).

The site was used for wood preserving operations from 1921 until 1976. After treatment, wood was loaded onto railcars parked on drip tracks and later transferred to an open storage area. Figure 3 shows the layout of the plant when it was in operation.

Liquid wastes from the process were originally discharged to the river. In 1971, the liquid wastes were diverted to the sanitary sewer. Before the sewer connection the wastewater was treated in settling ponds. In 1971 the sludge residue in the ponds was dredged and buried in a landfill in a field northeast of the river. The river sediments were also dredged at this time and creosote-contaminated sediments were spread along the west bank of the river.

In 1978 the facility was demolished. Oil saturated soil was removed and shipped to a hazardous waste facility for disposal. Two other stretches of the river south of the site were dredged in the late 1970's.

Remedial investigations of the site have shown substantial contamination of soils in several areas of the site, as well as contamination of shallow groundwater, mainly in the west central part of the site. River sediments show highly elevated levels of carcinogenic PAH's and other organic compounds all the way to the confluence with the Menomonee River.

There are no estimates available for the total quantity of oil and creosote compounds released at the site. Because of previous soil removal and dredging operations, it is also difficult to estimate the total contamination remaining at the site and in the Little Menomonee River.

Onsite concentrations of carcinogenic PAH's range up to 1,900,000 ug/kg of soil at the processing building site. Noncarcinogenic PAH's at that sampling site are up to 30,000,000 ug/kg. A series of figures from the Remedial Investigation Report show the distribution and concentration of the contaminants of concern. Contamination is concentrated in three areas; the processing and treated storage area, the middle of the site running south from the river, a potential solid waste pile towards the southeast of the site and around a river dredging landfill area towards the northeast part of the site (Figure 4).

River sediments are also highly contaminated, mainly with PAH's. Other contaminants such as Dibenzofuran, benzene, toluene and xylene (BTX) compounds and chlorinated volatile organic compounds were also present along with the metals arsenic, lead and zinc. Concentrations in sediment samples down the river to the Menomonee River varied widely, but most samples exceeded 1,000 ug/kg for both groups of PAH's. Far fewer samples showed concentrations of BTX's and chlorinated VOC. BTX concentrations were all lower than 1000 ug/kg,

while VOC concentrations ranged from less that 1000 to more than 10,000 (Remedial Investigation).

III. Preliminary Identification of Resources Potentially at Risk

Relevant Factors

Several of the circumstances of the discharge of contaminants from the site can affect the potential pathways of exposure. There were several areas where contaminants reached the soil surface. These included the wood treating area, the drip tracks and the outside treated storage area. Drainage features from these areas carried contaminants into the Little Menomonee River, and direct discharge of processing wastes without treatment occurred for many years. The situation is further complicated by landfilling and dredging activities which transferred contaminated soil and sediment from portions of the site and river to other areas.

The presence of a confining layer of clay soils has partly contained the plume of contaminated groundwater, but it continues to spread in shallow soil layers and discharge into the river.

Because the site is part of an extensive vegetated corridor running north to south from mainly rural to urban areas, there is considerable potential for wildlife passing through the site to have been exposed to contaminated soil or sediment. Urban drainage, including storm sewers and open channels may have contributed to the spread of contaminated sediments down the Little Menomonee River. The presence of several upstream discharge sources including an abandoned landfill which burned underground from 1968 to 1973 and a petroleum tank-farm may have contributed to background levels of organic contaminants.

Toxicity Characteristics

Creosote, and its component compounds can produce acute toxic effects, such as chemical burns. Many of the polyaromatic hydrocarbons in the mixture are known carcinogens. They have been linked to human and animal cancers including skin cancer due to repeated dermal exposure (RI & FS; Mace, 1989). Liquid creosote and its vapors are strong irritants to body tissues and may be toxic by excessive inhalation or ingestion. When creosote burns it produces heavy, toxic and irritating black smoke.

The major human health hazard is from prolonged inhalation of high concentrations of vapor in air. Ingestion and direct eye contact can also produce toxic effects. Vapors irritate the nose and throat, and high concentrations in air may cause mental impairment, respiratory difficulty, convulsions and possibly, cardiovascular collapse. Ingestion can produce a number of adverse effects ranging from salivation and vomiting to cyanosis, mild convulsions, and possibly death (Emergency Action Guide, American Association of Railroads, 1984).

Potential Exposure Pathways

Humans, wildlife, fish and other terrestrial and aquatic life may be exposed to the contaminants described earlier, and that exposure could produce adverse effects. These could include acute symptoms, such as the chemical burns which affected persons who waded in the Little Menomonee river in the early 1970's. Chronic effects occur over a long period of time. These could include cancer or other diseases. Risk assessment studies done for the Remedial Investigation showed increases of the lifetime probability of cancer based on three human exposure scenarios which assumed that no remedial action to clean up the site occurred.

The scenarios were trespassing on the site, river recreational use (both under current conditions) and potential future use for residential development. Exposure pathways for the trespass scenario were ingestion of contaminated soil and inhalation of contaminated dust particles. For the recreational and residential scenarios ingestion was the main pathway.

Reference doses of various chemicals, which indicate the potential for adverse effects, were not exceeded. Potential lifetime cancer risks were increased above the background level. Table 2 summarizes these scenarios and risk levels. Excess lifetime cancer risk is the additional increase in the probability of developing cancer during one's lifetime over the background probability of developing cancer. For example, a 1×10^{-6} excess lifetime cancer risk means that for every million people exposed to the carcinogen over a lifetime of 70 years, on average, one extra case of cancer would be expected.

Adverse effects on plants and animals are more difficult to predict. The PAH's released by this facility have been associated with tumors and other similar diseases in brown bullheads in Ohio. For phenanthrene, one of the substances being released, acute toxic values for nine aquatic species have been established. These range from 96 ug/L for hydra to higher than the highest value tested for fathead minnows (Pimepheles promelas). The acute value for bluegill sunfish, a species which is likely to be found in the Little Menomonee River, was 234 ug/L. Daphnia magna showed adverse reproductive effects at 163 ug/L. Even aquatic plants showed reduced growth, with Lemna minor exhibiting 36% reduced frond production at a concentration of 658 ug/L Diatoms and algae may also be susceptible (USEPA, 1988).

Terrestrial wildlife could be exposed by contact with contaminated soil, ingestion of soil, sediment and water (especially for animals such as raccoons and mink, which are often found near water). Bioaccumulation, in which quantities of contaminants increase in animals further up the food chain, is also a potential exposure pathway. Again, predators are likely to have the highest exposures, especially wide-ranging omnivores like raccoons which eat terrestrial and aquatic food. The burrowing and ground-living terrestrial

animals have a higher chance of exposure, as do aquatic organisms which burrow into or live on the sediments.

Because the Little Menomonee River flows through an urbanizing area with mixed land uses, it is possible that peak storm flows running off into the stream are dislodging and mixing contaminated sediments frequently. This would tend to maintain exposures of animals in the river, and distribute the contaminated sediments down the stream (Mace, 1989).

Feasibility Studies have shown that soil, groundwater and river sediments all exceed 10^{-6} risk levels for carcinogenic PAH's. A total of 210,000 cubic yards of soil on the site exceeds that level. Groundwater on the site is contaminated for a thickness of 8 to 14 feet with a total surface area of 500,000 square feet. While contamination is limited to the shallow surficial aquifer, this contamination is discharging to the Little Menomonee River. The total volumes of river sediment exceeding calculated 10^{-6} and 10^{-4} risk levels are 15,000 and 3,500 cubic yards, respectively.

Based on the information discussed above, it can be concluded that the quantity and concentration of the injurious substance released at the Moss-American site was sufficient to cause injury, to humans and to natural resources.

Potentially Affected Resources

Aquatic

The Moss-American site is located in the Granville Subwatershed of the Little Menomonee River. The watershed begins at the Milwaukee/Ozaukee County line, north of the site and extends to the confluence with the Menomonee River. Most of the land use in this watershed is urban or developing urban. Most of the riparian land in Milwaukee County is owned by the County park system.

Fish communities range from sportfish to very tolerant forage fish. Black bullheads, northern pike and small sunfish species are found in the subwatershed. Most of the sportfish are found north of the site in an area of marsh and pond habitat downstream of County Line Road. Fishable populations of white suckers are also present. The DNR has recommended raising the use classification for the river to full fish and aquatic life and developed recommendations for habitat improvements that would allow development of a sport fishery and other recreational uses of the stream.

Considerable past disturbances including channelization and other effects of urbanization, have degraded the quality of habitat available in the lower reaches of the Little Menomonee. Those reaches which have been allowed to return to more natural conditions have shown improvement in fish and macroinvertebrate populations.

At and downstream from the site, there are significant decreases in aquatic plant, benthic macroinvertebrate and fish populations compared to upstream control sampling stations. Benthic invertebrates were often absent from creosote saturated sediments. In the absence of the creosote contamination caused by the Moss-American facility, this reach of stream would be capable of supporting a community of aquatic plants, invertebrates and forage fish species, with good potential for the establishment of a sport fish population. The areas north of the site containing existing sport fish communities can easily provide a source of sport fish to become established in the affected area (Steven Mace, DNR, personal communication; Mace, 1989).

The floodplain vegetation consists of mesic woodlands, shrubs and some grassy meadows. Outside the parkway there are residential and commercial land uses. On the site south of Brown Deer Road there is an area of emergent wetland classified as E2K by the Wisconsin Wetland Inventory.

Within the lowland hardwood forest in the northwestern portion of the site are several ephemeral ponds lying within the floodplain of the Little Menomonee River. Theses ponds have a diverse complement of wetland vegetation and may provide habitat for frogs and other aquatic animals.

Generally, the wildlife habitat in the portions of the site not occupied by the railroad yards (mainly along the river) provide good quality urban wildlife habitat. Evidence of use by deer and raccoons was seen. Songbirds were also common in the area. Muskrats and other marshland wildlife were not in evidence, probably because of the lack of extensive marsh vegetation and open water. Evidence of wood ducks was not seen in field inspection of the site. This is somewhat unusual given the wooded streamside habitat on the site. It is possible that the lack of aquatic insects and other organisms that would provide food for adults and young discouraged nesting in this stretch of the river.

Potential uses of the site include active and passive recreation. Being part of County Parkway lands represents a commitment for much of the site and the Little Menomonee River corridor to activities such as hiking, nature observation, bicycling, picnicking and fishing. Currently, the contaminated sediments in the stream are preventing full development and use of the parkway. Contact with the sediments has and is dangerous because of the potential for chemical burns. Development of a fishery, as the DNR reports indicate, is being prevented by the contamination rendering the area unhabitable by aquatic plants, invertebrates and most fish species.

It also appears possible that the contamination is preventing full use of the area by wildlife, especially wood ducks and other species which feed on aquatic invertebrates.

Contamination also appears to be contributing to the general poor water quality of the Menomonee River below the confluence with the Little Menomonee. Creosote-laden sediments redisturbed by stormwater flows are probably being

carried downstream into the Menomonee River. This resuspension may also be contributing to the lack of fish colonization in this reach of the Little Menomonee, both by preventing the establishment of forage species, and by releasing potentially toxic quantities of material into the water column during flood events.

While there are other causes of degradation, the creosote contamination is clearly the most important factor in preventing the committed uses of the site and the river corridor from being realized.

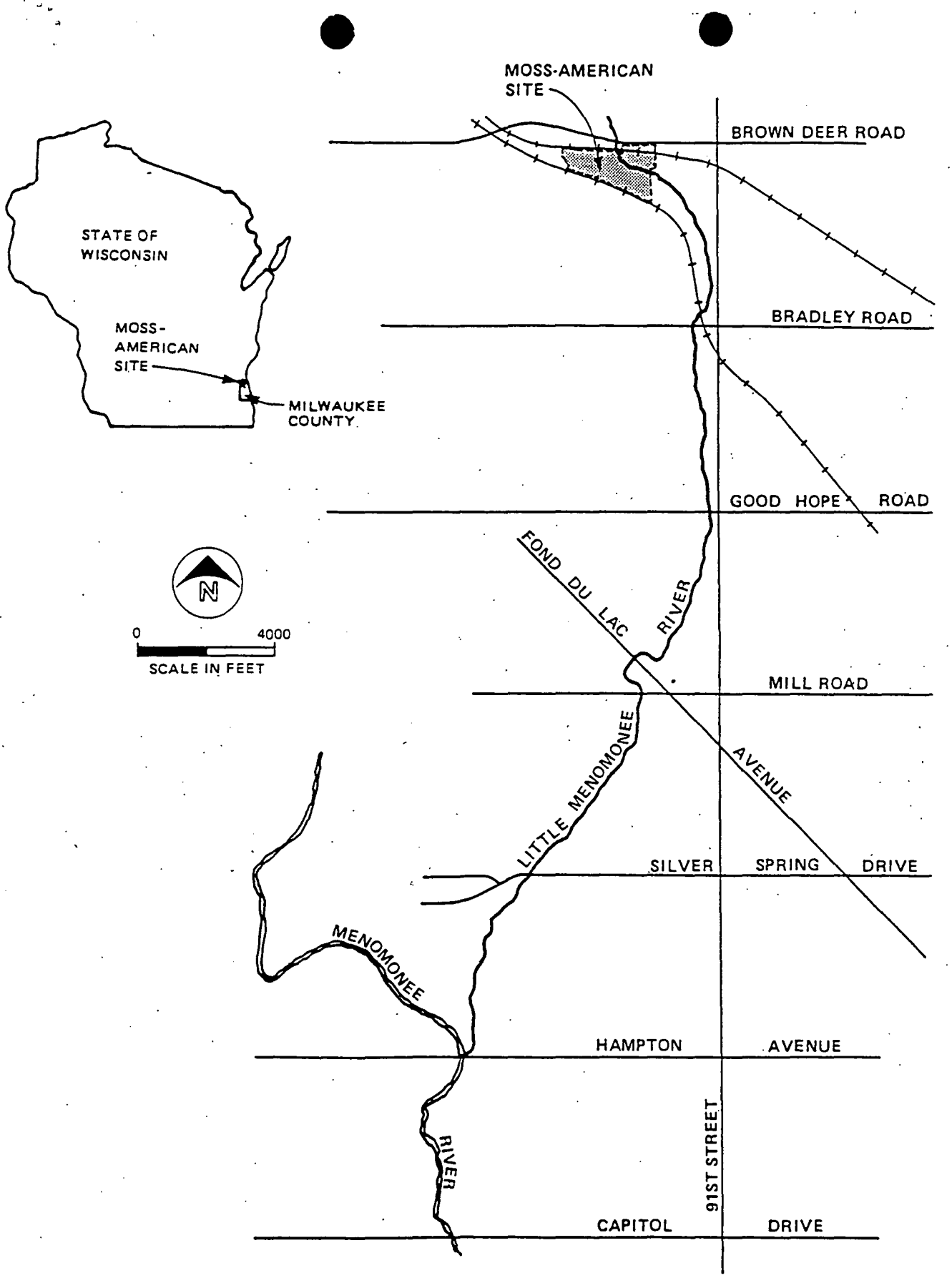

FIGURE 1
LOCATION MAP
MOSS-AMERICAN RI
EXECUTIVE SUMMARY

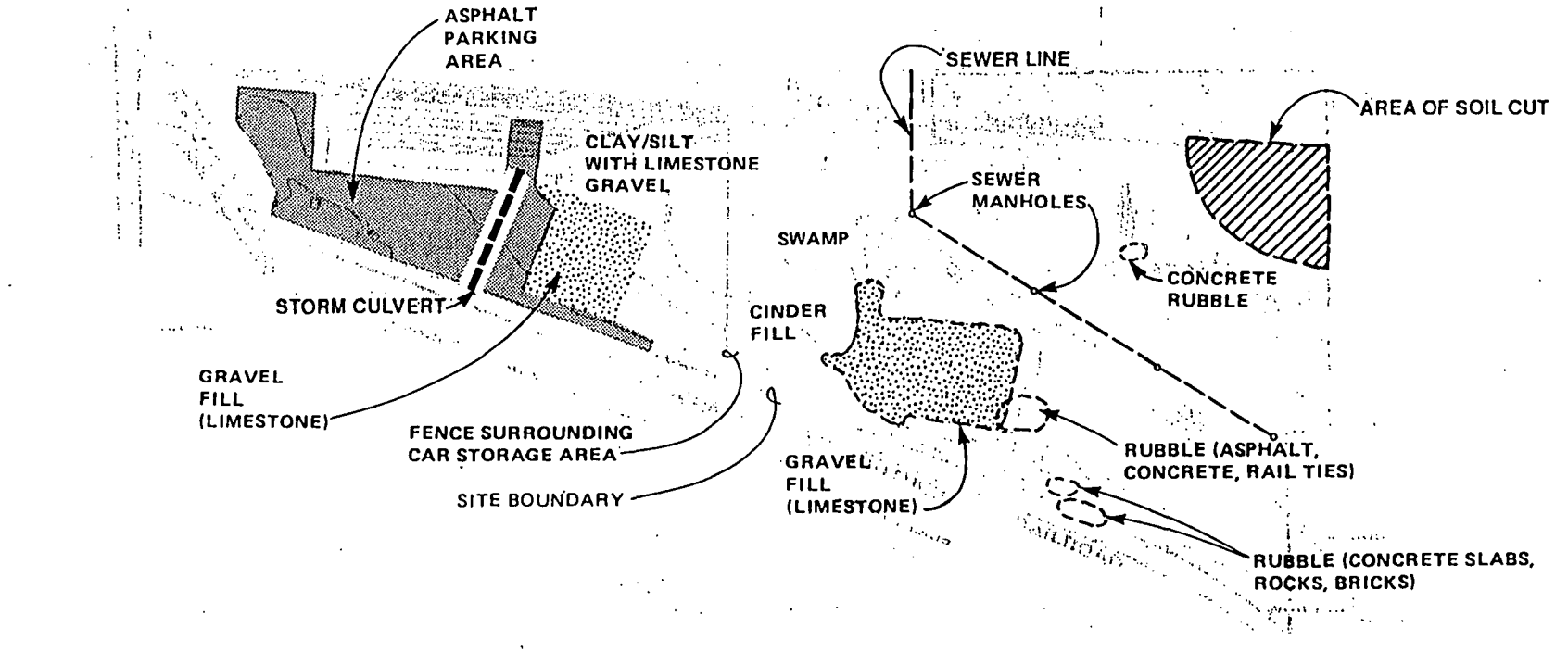

FIGURE 2
EXISTING CONDITIONS: 1987
MOSS-AMERICAN Ri

Table 1
CHEMICAL COMPOSITION OF UNITED STATES CREOSOTE

Compound or Component	Percent of Total
Naphthalene	3.0
Methyl naphthalene	2.1
Diphenyl dimethylnaphthalene	---
Biphenyl	0.8
Acenaphthene	9.0
Dimethylnaphthalene	2.0
Diphenyloxide	---
Dibenzofuran	5.0
Fluorene-related compounds	10.0
Methyl fluorenes	3.0
Phenanthrene	21.0
Anthracene	2.0
Carbazole	2.0
Methylphenanthrene	3.0
Methyl anthracenes	4.0
Fluoranthene	10.0
Pyrene	8.5
Benzofluorene	2.0
Chrysene	3.0
Total	90.4

Source: McGinnis, July 1987.

Table 3-2
ORGANIC COMPOUNDS IN FOUR REPRESENTATIVE CONTAMINANT GROUPS

Carcinogenic PAH[a]	Noncarcinogenic PAH	BTX	Chlorinated VOC[b]
Benzo[a]anthracene	Naphthalene	Benzene	Methylene Chloride
Chrysene	2-Methylnaphthalene	Ethylbenzene	Chloroform
Benzo[b]fluoranthene	Acenaphthene	Toluene	1,1,1-Trichloroethane
Benzo[k]fluoranthene	Acenaphthylene	Total Xylenes	Tetrachloroethene
Benzo[a]pyrene	Phenanthrene	(m,o,p-xylene)	1,1-Dichloroethane
Indeno[1,2,3-cd]pyrene	Anthracene		
Dibenzo[a,h]anthracene	Fluoranthene		
Benzo[g,h,i]perylene	Pyrene		
	Fluorene		

[a] PAHs considered carcinogenic by the U.S. EPA.
[b] Chlorinated VOCs detected during the investigation.

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