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March 1989

EPA

Superfund Record of Decision:

Amnicola Dump, TN

50272-101

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Amnicola Dump site is an 18-acre inactive construction debris disposal site located in Chattanooga, Tennessee. The site is located along the east bank of the Tennessee River, approximately 0.5 mile upstream of the intake for the primary drinking water source for the city of Chattanooga. The site is bordered on the north by dense vegetation and vegetation- covered debris, and on the south by an industrial research facility. The site drains westerly towards the river. During the 1930s the Amnicola Dump site was reportedly used for clay mining operations, resulting in several water-filled pits. During the period of 1957-1964 construction debris and other unidentified wastes were occasionally disposed of in many of the open pits. The site was then operated as a dump by the city of Chattanooga until 1973, predominantly receiving construction debris including a substantial amount of waste wood which was subsequently incinerated onsite. The ashes eventually filled 12 acres of the 18-acre site. The only industrial waste reportedly disposed of at the site was latex waste. Unauthorized waste dumping and concerns about leachate discharge in proximity to the drinking water intake area led to closure of the site in 1973. Closure included covering, grading slopes, filling depressions, draining standing water, applying rip-rap along the western perimeter, constructing drainage ditches, and seeding the entire surface area of the fill. The current owner and operator has been burning,
(See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision - Amnicola Dump, TN
First Remedial Action - Final
Contaminated Media: soil and debris
Key Contaminants: PAHs

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 68
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(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

16. Abstract (continued)

storing, and handling creosoted railroad ties, contributing to elevated PAHs in surface soil. The primary contaminants of concern affecting the soil, debris, and ground water are organics including PAHs, and metals including chromium.

The selected remedial action for this site includes excavating and screening 600 yd3 of contaminated soil/debris with onsite solidification/fixation of 400 yd3 of contaminated soil and 200 yd3 of debris (debris exceeding cleanup goals or LDR requirements will be disposed of offsite), followed by onsite disposal of solidified mass; monitoring of ground water for 4 years; conducting a public health assessment 5 years after completion of the remedial action; and implementation of institutional controls including ground water and land use restrictions. The estimated present worth cost for this remedial action is $640,000 with O&M of $384,000.

8904c

RECORD OF DECISION

Remedial Alternative Selection

SITE NAME AND LOCATION

Amnicola Dump Site
Chattanooga, Tennessee

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Amnicola Dump site, Chattanooga, Tennessee, developed in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. The following documents form the basis for selection of the remedial action:

- Remedial Investigation Report, Amnicola Dump Site
- Feasibility Study Report, Amnicola Dump Site
- Summary of Remedial Alternative Selection
- Responsiveness Summary
- Staff Recommendations and Reviews

DESCRIPTION OF THE REMEDY

The function of this remedy is to reduce the risks associated with exposure to contaminated, on-site surface soils.

The major components of the selected remedy include:

Surface Soil

- Excavation of contaminated surface soil and debris
- Screening of debris from the soil
- Treatment of contaminated soil by solidification/ fixation
- Restoration of the ground surface to its original condition

General

- Imposition of ground water use restrictions within a reasonable distance from the site
- Imposition of land use restrictions on the site
- Quarterly ground water monitoring for four years
- Public Health Assessment conducted five years following remedial action

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. However, because treatment of contaminated ground water was not found to be necessary, hazardous substances will remain in the ground water above health-based levels. The absence of ground water users at or downgradient of the Amnicola Dump site, and the fact that discharge of ground water to the Tennessee River will not result in a significant increase of contaminants in that surface water body, precludes the need for ground water remediation. Therefore, Alternate Concentration Limits (ACLs) have been established for the site.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

3-30-89
Date

Patrick M. Tobin
Acting for Greer C. Tidwell
Regional Administrator

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

AMNICOLA DUMP SITE
CHATTANOOGA, TENNESSEE

PREPARED BY:
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ATLANTA, GEORGIA

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

AMNICOLA DUMP SITE
CHATTANOOGA, TENNESSEE

PREPARED BY:
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ATLANTA, GEORGIA

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AMNICOLA DUMP SITE
HAMILTON COUNTY, TENNESSEE

1.0 INTRODUCTION

The Amnicola Dump site was included on the National Priorities List (NPL) in September 1983 and has been the subject of a Remedial Investigation (RI) and Feasibility Study (FS) performed by the U.S. Environmental Protection Agency (EPA), Region IV. The RI Report, which examines the quality of air, soil, surface water, sediment, and ground water at the site, was issued to the public in January 1989. The FS Report, which develops and examines alternatives for site remediation, was also issued in draft form to the public information repository in January 1989.

This Record of Decision has been prepared to summarize the remedial alternative selection process and to present the recommended remedial alternative.

1.1 Site Location and Description

The Amnicola Dump site is an 18-acre inactive construction debris disposal site located in Chattanooga, Tennessee (Figure 1). The site is located at latitude 35^{o} 03'04" and longitude 85^{o} 16'35" along the Tennessee River. The site is approximately 0.5 miles upstream of the intake for the Tennessee-American Water Company which is the primary water drinking water source for the City of Chattanooga.

The site is bordered on the south by Syn-Air Research (an industrial research facility), on the west by the Tennessee River, on the north by dense vegetation and vegetation-covered debris (scrap metal, railroad ties, etc.), and on the east by the Amnicola Highway. A berm, which extends 15 to 25 feet in height, separates the river from the landfill. Two breaks have been noted in the berm. An on-site pond, located in the northwestern corner of the site, occupies approximately four acres between the landfill and the berm (Figure 2). Located largely within the 100-year floodplain, the site drains westerly towards the river with a slope of approximately three to five percent.

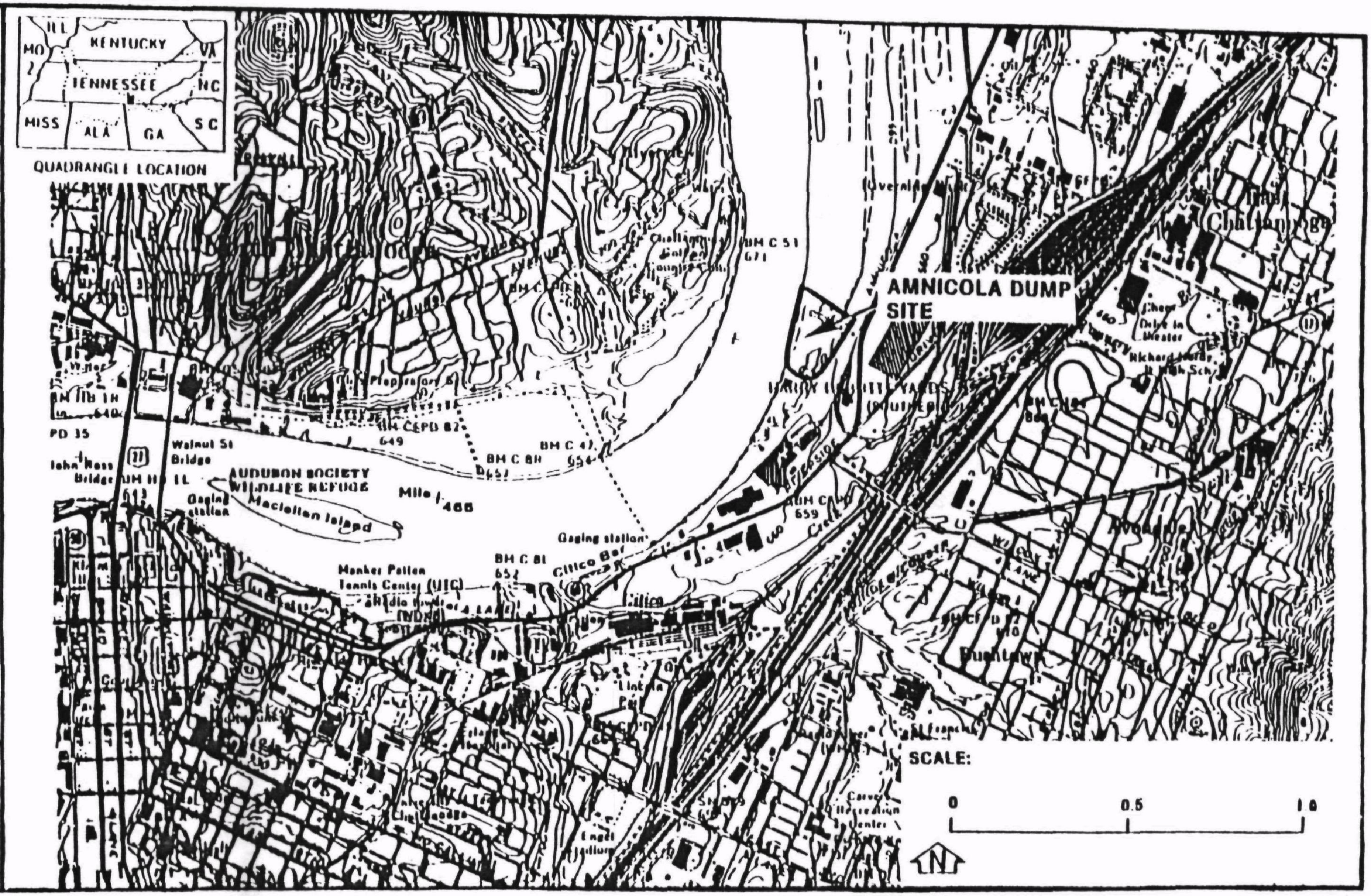
Amnicola Equipment & Materials Sales, a salvage business operating on the surface of the landfill, is located on an upland area. This area, which is relatively flat (less than one percent slope), is approximately 30 to 35 feet above the main river channel.

1.2 Site History

SITE LOCATION

AMNICOLA DUMP

Figure No. 1-1



Source: Chattanooga USGS Topographic Quadrangle (105 - SE) Map

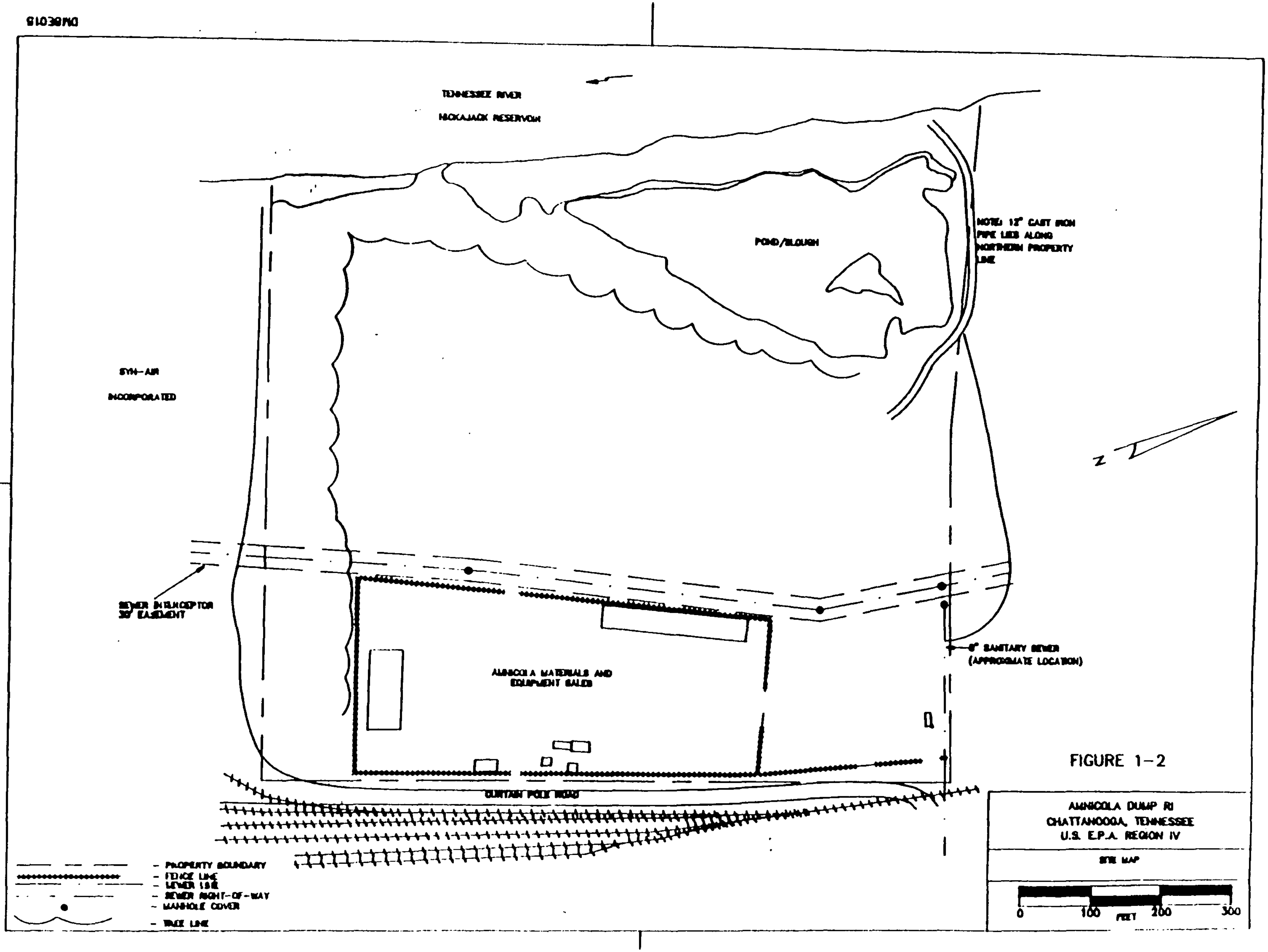

TENNESSEE RIVER
NICKAJACK RESERVOIR
POND/SLOUGH
NOTE: 12" CAST IRON
PIPE LIES ALONG
NORTHERN PROPERTY
LINE
SYN-AIR
INCORPORATED
SEWER INTERCEPTOR
30' EASEMENT
AMNICOLA MATERIALS AND
EQUIPMENT SALES
8" SANITARY SEWER
(APPROXIMATE LOCATION)
CURTAIN POLE ROAD
- PROPERTY BOUNDARY
- FENCE LINE
- SEWER RIGHT-OF-WAY
- MANHOLE COVER
AMNICOLA DUMP RI
CHATTANOOGA, TENNESSEE
U.S. E.P.A. REGION IV
SITE MAP
0
100
200
300
FEET
N

FIGURE 1-2

During the 1930's the Amnicola Dump site was reportedly used for clay mining operations. These operations resulted in several water-filled pits along the western boundary of the site in the present-day pond area. During the period 1957-1964, construction debris and other unidentified wastes were occasionally disposed in many of the open pits. This resulted in a large portion of the pits being filled.

During 1964 to 1970 the area was revegetated (it is not known whether this revegetation occurred naturally). The Amnicola site was operated as a dump from mid-1970 to September 1973 by the City of Chattanooga. Construction debris, with 25 percent or less household-type waste, was disposed on-site during this period. A substantial portion of wood waste brought on-site was incinerated by an air-curtain destructor. The ashes were then disposed on-site. Approximately 12 acres of the 18-acre site were eventually filled.

Consolidated Latex, Inc., formerly located on the south border of the site, allegedly disposed of latex waste in the southwest corner of Amnicola Dump. In 1971, the Tennessee-American Water Company noted the dumping of the latex waste at the site as well as the presence of a strong styrene-like odor during one leachate sampling event. Concern arose because of the proximity of the water company's intake, 0.5 miles downstream, to this leachate stream and latex dumping location. Latex waste is the only industrial waste reportedly disposed at the site.

On June 2, 1971, the Tennessee Department of Solid Waste Management (DSWM) recommended closure of the dump. The recommendation was based on unauthorized wastes from garbage trucks being dumped in the water-filled pits.

In May 1972, EPA provided the City with recommended actions required to eliminate the discharge of leachate from the site into the Tennessee River. Elevated levels of iron, manganese, total Kjeldahl nitrogen, and total organic carbon were detected in the leachate stream. EPA recommended closure of the site. During the summer of 1973, the City finalized closure which included covering, grading slopes, filling depressions, draining standing water, applying rip-rap along the western perimeter, construction of drainage ditches, and seeding the entire surface area of the fill.

From 1971 through 1976, the Tennessee-American Water Company conducted weekly leachate tests for inorganic analysis on the storm-water runoff entering the river at River Mile 465.8. Analyses included heavy metals, manganese, iron and specific conductance. Little or no pattern in the parameter concentrations was apparent. Conductivity values were elevated; some metals were detected but not elevated significantly above background levels.

In July 1979, EPA, Tennessee Department of Health and Environment (TDHE) personnel and local officials conducted a site visit at the Amnicola Dump. According to the trip report, the overall condition of the site was good. However, there was some discoloration of water observed in the drainage ditch. EPA recommended an evaluation of historial water data and further water sampling.

In May 1982, MCI/Consulting Engineers was tasked by the TDHE to conduct a study of the leachate originating from the Amnicola Dump site. The sampling point was the combined leachate stream, less than 20 feet from the confluence with the Tennessee River at River Mile 465.8. The results showed trichloroethylene, vinyl chloride, and 1,2 trans-dichloroethylene.

The Amnicola Dump site was proposed for inclusion on the National Priorities List (NPL) in December 1982. The site was finalized on the NPL in September 1983. The primary factor contributing to this score was the proximity of the site to Tennessee-American Water Company's water intake, which supplies water to the majority of Chattanooga.

In December 1986, EPA Region IV noted that site conditions varied from previous site reports. EPA Region IV reported that the site was being used as a storage area for heavy equipment, railroad ties, scrap metal, and several large dumpsters. The cap had been cleared of vegetation, much of the rip-rap along the bank had been removed, and discolored water (leachate) was noted in the southwest corner of the site.

In January 1987, EPA Region IV, Environmental Services Division (ESD) sampled leachate and surface drainage at the site. The analytical results indicated that the leachate streams contained elevated levels of 10 inorganic compounds (barium, strontium, titanium, zinc, chromium, manganese, calcium, magnesium, iron, and sodium). Although several trace organic compounds were found, the only major organic contaminants were bis (2-ethylhexyl) phthalate at 82 ug/l and chloroform at 7.4 ug/l. ESD concluded that, based on the results of the finished water sample collected from the Tennessee-American Water treatment plant, no impact on the Chattanooga water supply from the Amnicola Dump site was evident.

EPA Region IV personnel initiated the RI/FS of the Amnicola Dump site in July 1987; the field investigation portion of the RI was performed between January and March 1988. Both the RI and FS Reports were submitted in draft form to the public information repository in Chattanooga, TN in January 1989.

2.0 ENFORCEMENT ANALYSIS

The Amnicola Dump site was included on the National Priorities

List (NPL) in September 1983. Potentially Responsible Parties (PRPs) were notified of the commencement of the Amnicola Dump RI/FS in 1987. The PRPs declined to participate in the RI/FS and EPA assumed the lead at that time.

The majority of PRPs identified at the Amnicola Dump site were associated with the alleged disposal of latex wastes at the site. The Remedial Investigation did not detect latex waste constituents in any of the media sampled. The RI did, however, detect polyaromatic hydrocarbons (PAHs) in surface soil. The Public Health Evaluation concluded that the risks associated with ingestion of surface soils contaminated with PAHs at the Amnicola Dump site exceed the Agency's 10^{-4} to 10^{-7} risk range. Thus, remediation of surface soils is required. The PAHs in surface soil were not responsible for the site's placement on the NPL. The primary factor contibuting to the site's placement on the NPL was the proximity of Amnicola Dump to the water intake for the Tennessee American Water Company and the alleged disposal of latex waste at the site. PAHs in surface soils at the Amnicola Dump site have been attributed to the burning, storage and handling of creosoted railroad ties on-site by the current site owner and operator, Southern Foundry and Amnicola Equipment and Materials Sales, respectively.

The RI also detected the presence of chromium at 89 ppb (39 ppb above the Maximum Concentration Limit of 50 ppb) and bis(2-ethylhexyl)phthalate at 370 ppb (70 ppb above the 10^{-4} risk level of 300 ppb). Both compounds were detected in one monitoring well during one sampling event and are attributed to the contents of the landfill. The recommended alternative provides for the monitoring of ground water for a period of four years following remedial action completion. This monitoring will allow for the development of a sufficient ground water data base upon which a public health assessment will be performed five years following remedial action completion. Alternate Concentration Limits (ACLs) have been established at the site and reflect the low levels of contaminants that enter the Tennessee River on a sporadic basis. No ground water remediation is required; however, if ACLs are exceeded during the four year period of monitoring, a need for remediation may be identified during the subsequent public health assessment.

In summary, remediation at the Amnicola Dump site is required as a result of contaminants introduced subsequent to the site's placement on the NPL. Monitoring of ground water is required due to low levels of contaminants attributed to the dump. Thus, Remedial Design/Remedial Action (RD/RA) notice letters will be sent to the PRPs upon selection of the remedy. Preliminary discussions with Southern Foundry and the City of Chattanooga on RI/FS completion and RD/RA activities commenced in March 1989.

3.0 CURRENT SITE STATUS

3.1 Environmental Setting

3.1.1 Bedrock

The bedrock unit beneath the site is the Murfreesboro limestone, an Ordovician-age limestone of the Stones River Group. Bedrock was encountered at an average depth of 34 feet below ground surface. Depth to bedrock decreases from northeast to southwest, ranging from 64 feet at the east end of the site to 32 feet adjacent to the Tennessee River.

The uppermost portion of the Murfreesboro limestone is a weathered rock with numerous clay-filled fractures. This uppermost unit is approximately 10 feet thick. Rock coring into the limestone bedrock allowed visual observation of the Murfreesboro limestone and determination of weathered zone thickness. The limestone is medium-gray to grayish-brown, hard, and contains numerous fractures.

Although there are many geologic faults with surface traces present in Hamilton County, all are considered geologically inactive, thereby posing no seismic risk. The seismic activity present in Hamilton County is the result of periodic releases of stress in rocks at great depth.

3.1.2 Soils

Unconsolidated sediments (soils) overlying limestone bedrock in the general site vicinity include silts, clays, and sands of Quarternary Age. These sediments were deposited in a fluvial environment directly related to the meandering of the Tennessee River.

These sediments can be categorized into two fairly distinct units: the uppermost unit (Unit 1 which is 15 - 30 feet thick) consisting primarily of sandy clayey silts and the unit immediately overlying the limestone bedrock (Unit 2 which is 2 - 22 feet thick) consisting of sandy, clayey silts and silty sands with interbedded sand lenses.

3.1.3 Ground Water

Hydrologic characteristics of the subsurface were investigated by analysis of information obtained during the RI. The unconfined alluvial formation (shallow aquifer) underlying Amnicola Dump site comprises the ground water of primary concern. Ground water of the alluvial aquifer beneath the site flows primarily through Unit 2, which consists of sandy clayey silts and silty sands with interbedded sand lenses immediately overlying the limestone bedrock. Depth to ground water averages 34 feet.

Ground water of the alluvial formation flows primarily in response to the major hydrologic feature near the site, the Tennessee River. Ground water flows westerly towards the Tennessee River and under the waste material, intersecting it only briefly at the on-site pond. Ground water recharges the pond, maintaining its level within ± 2 feet.

Ground water for municipal, industrial and commercial purposes is available from the alluvium, colluvium and residuum aquifers in the Hamilton County area; however, the majority of Chattanooga is serviced by the Tennessee-American Water Works (TAWW). TAWW supplies drinking water to approximately 60,000 customers and the water supply for this system is located 0.5 miles downstream from the Amnicola Dump on the Tennessee River.

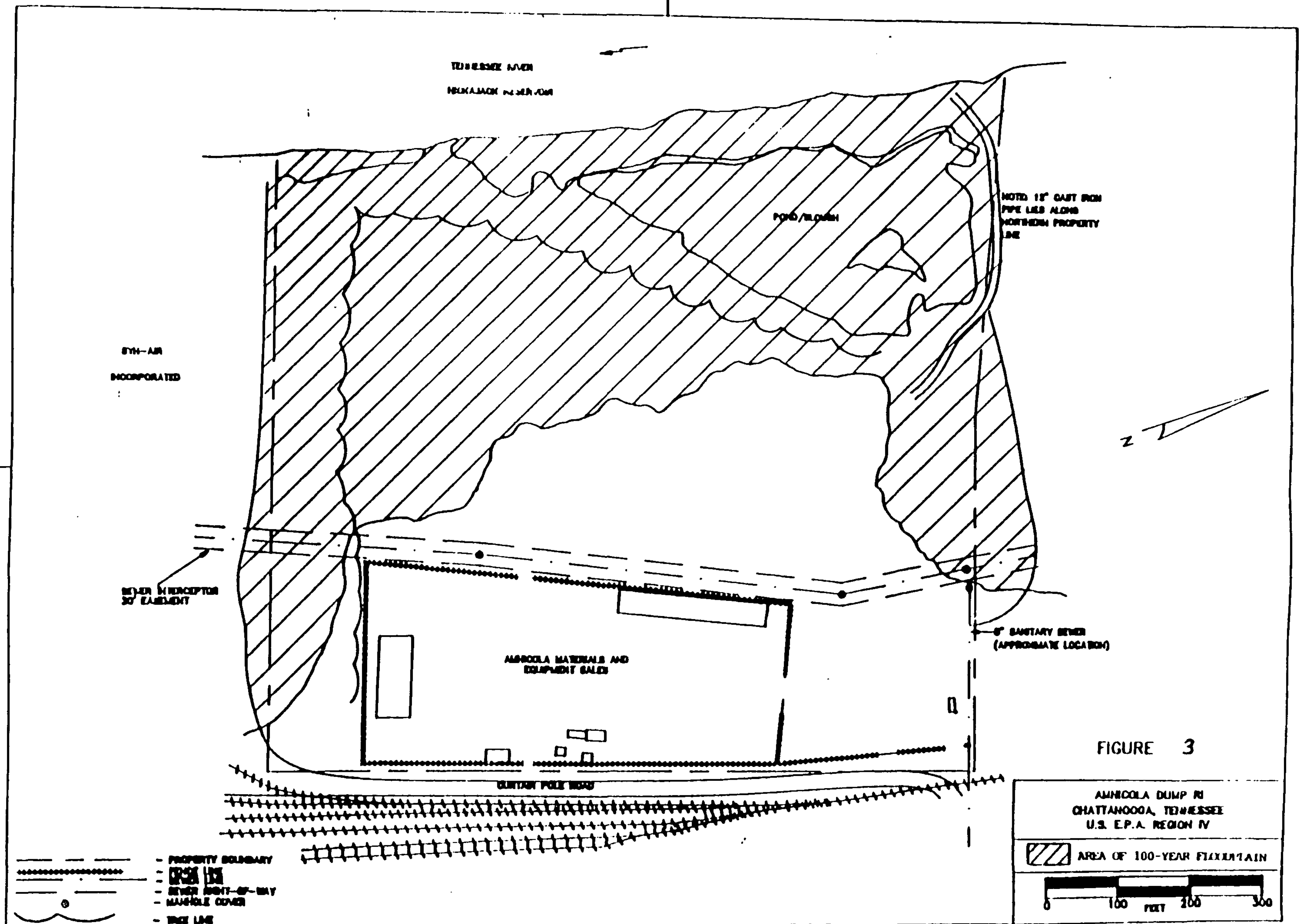
Wells were identified at two of the fifty-one industries and businesses located within a one-half mile radius of the site east of the river; both wells are used exclusively for industrial purposes and do not provide a route of exposure to the occupants of the building. Furthermore, the two industrial wells are cased into bedrock and do not draw a substantial portion of water from the contaminated alluvial aquifer beneath the Amnicola Dump site. A review of TAWW's records indicated no known private wells in the area. Personal communications within TDHE indicate that few, if any, residents within the survey area have wells on their property.

3.1.4 Surface Water

The Amnicola Dump site is bounded on the west by the Tennessee River near river mile 466. Historically, Nick-A-Jack Reservoir (Tennessee River) levels are regulated by the Tennessee Valley Authority to control flooding. Hurricanes or other significant rainfall events can, however, disrupt the usual rainfall patterns and, subsequently, the reservoir levels. The 10-, 50-, and 100-year flood elevations for the Tennessee River at the site have been calculated by TVA to be 655.3, 657.1, and 658.1 feet above mean sea level (msl), respectively. The occurrence of a 100-year flood would cause approximately one-half of the site (western half) to become submerged. The area of the 100-year floodplain is shown in Figure 3.

3.2 Surface Soil Contamination

Site investigations, conducted prior to the initiation of the RI field program, indicated that present, and perhaps past, activities on the landfill cap may have resulted in surface soil



TENNESSEE RIVER
NICKAJACK RESERVOIR
SYN-AIR
INCORPORATED
POND/SLOUGH
NOTE: 12" CAST IRON PIPE LIES ALONG NORTHERN PROPERTY LINE
N
SEWER INTERCEPTOR 30' EASEMENT
8" SANITARY SEWER (APPROXIMATE LOCATION)
AMNICOLA MATERIALS AND EQUIPMENT SALES
CURTAIN POLE ROAD
PROPERTY BOUNDARY
FENCE LINE
SEWER RIGHT-OF-WAY
MANHOLE COVER
TREE LINE
AMNICOLA DUMP RI
CHATTANOOGA, TENNESSEE
U.S. E.P.A. REGION IV
AREA OF 100-YEAR FLOODPLAIN
0
100
200
300
FEET

FIGURE 3

contamination. To determine what contaminants may have been present or introduced, twenty five surface soil samples were collected on and adjacent to the landfill cap.

There were numerous organic contaminants associated with the surface soil samples collected from the site. The majority of the compounds were extractable organics that most likely originated from the creosote railroad ties that were stored and burned on-site by the present owner; approximately 100 extractable organic compounds were detected in the surface soil samples. Table 1 lists the maximum concentration of contaminants of concern in surface/subsurface soil samples. The majority of compounds detected were polynuclear aromatic hydrocarbons (PAHs) and are associated with coal tar or creosote products (i.e. railroad ties). Concentrations ranged from an estimated 150 ug/kg of acenaphthylene to 46,000 ug/kg of fluoranthene. The PAHs were detected in all surface soil samples collected from the site; however, the highest concentrations were detected in areas where railroad ties were stored (before and during the RI) and in areas where railroad ties were once burned. Data on carcinogenic PAH compounds detected in surface soil samples is given in Table 2. It should also be noted that the use of front-end loaders and other heavy equipment has probably resulted in the spreading of PAH contamination over the entire surface of the site. This is apparent from the analytical results of the random samples collected from the grid system. The origin of the pesticides/PCBs detected in several of the surface soil samples is unknown. The highest PCB concentration was detected at a concentration of 17,000 ug/kg. However, the exposure risk level has been determined to be in the acceptable 10^{-4} to 10^{-7} range.

The creosote wood products brought on-site by Amnicola Equipment & Material Sales is the apparent source of PAHs detected in surficial soil samples. A target population of workers and visitors to the site could pose a complete pathway of exposure through ingestion of contaminated soil. Activities using heavy equipment with considerable traffic across the contaminated site would create high airborne particulate levels. Additionally, a future use scenario could include residential development of the landfill area, allowing exposure of children through the soil ingestion pathway. Respiratory absorption through inhalation or dermal absorption by skin exposure are thought to be insignificant relative to the much more important ingestion route.

Using the mean PAH soil level, the plausible and maximum exposure scenarios yielded risk levels of 2.8×10^{-5} and 1.6×10^{-4}, respectively, under the current-use scenarios. The future-use residential development scenario yielded an upper

TABLE 1

MAXIMUM CONCENTRATION OF CONTAMINANTS OF CONCERN

IN SURFACE/SUBSURFACE SOIL SAMPLES

Chemical	Sample Location No.	Concentration in Test Sample mg/kg	Concentration in Control Sample mg/kg
Arsenic	AD-006/007	12.	ND[a]
Cadmium	AD-059	2.	NA
Chromium	AD-020	58.	29.00
PAHs[b]	AD-014	123.	ND
Lead	AD-078	460.	35.00
Mercury	AD-024	.62	.15
Cyanide	AD-057	.41	NA
Heptachlor	AD-057	.0024	ND
Gamma-DHK(Lindane)	AD-057	.013	ND
Dieldrin	AD-006	.059	ND
DDT[c]	AD-057	1.49	ND
PCB	AD-015	17.	ND
Chlordane	AD-057	.63	NA

a - ND = Not detected

b - PAH value is sum of the detected concentrations of carcinogenic polynuclear aromatic hydrocarbons

c - includes DDT and DDE/DDD metabolites

TABLE 2

CARCINOGENIC PAH COMPOUNDS DETECTED IN SURFACE SOIL SAMPLES
AMNICOLA DUMP SITE

Chemical	Frequency of Detection	Min. - Max. (ug/kg)	Mean (ug/kg)	Control (Background) Concentration (ug/kg)
Benzo(a)anthracene	14/15	310J - 2600	2391	ND
Chrysene	14/15	360J - 2400	2778	ND
Benzo(b and/or k)fluoranthene	14/15	360J - 2400	2778	ND
Benzo-a-pyrene	14/15	300J - 2500	2255	ND
Ideno(1,2,3,-cd)pyrene	13/15	290J - 9300	1125	ND
Dibenzo(a,h)anthracene	8/15	200J - 1900	307	ND

NOTES: (1) Frequency of detection is the number of samples in which the chemical was detected over the total number of samples.

(2) Geometric means are calculated using one-half the minimum estimated sample concentration for non-detect sample concentrations.

J - estimated value

ND - not detected

bound risk of 2.2 x 10^{-4}. The calculated upper bound risks are outside the Agency's acceptable risk range of 10^{-4} to 10^{-7}, thus, remediation of surface soil is required.

3.3 Ground Water Contamination

Organics and inorganics were detected in monitoring well samples. Table 3 lists those compounds detected in ground water at the Amnicola Dump site. Four contaminants are regulated by MCLs under the Safe Drinking Water Act. Compared to the appropriate ARARs (MCLs), chromium exceeded the level considered safe for lifetime exposure through drinking water. The 0.09 ppm detected is approximately two times the MCL standard. Bis(2-ethylhexyl)phthalate (maximum concentration observed was 370 ppb) exceeded the 10^{-4} excess cancer risk level of 300 ppb in one monitoring well on one occasion. The trihalomethanes identified in some of the wells can be attributed to monitoring well installation procedures.

No ground water users are located on or downgradient of the site. The low concentrations of contaminants discharging into the River are diluted below human health and aquatic protection standards. Recreational use of the river adjacent to the landfill would not be expected to produce exposure to these contaminants at levels of concern. Based upon the establishment of Alternate Concentration Limits (See Section 4.2), the current levels of ground water contaminants will not result in adverse impacts to human health or the environment; thus, no remediation of ground water is required.

3.4 Subsurface Soil

Subsurface soil samples were collected to determine if any contaminants could be detected at the cap-fill interface. Subsurface soil samples were also collected during the track-hoe excavation work and at selected monitoring wells to identify what contaminants may have and may still be migrating from the site in the surficial ground water.

Lead was detected in several subsurface soil samples at concentrations from 100 mg/kg to 460 mg/kg. Numerous extractable organic compounds were detected in the subsurface soil samples collected from the site. The concentration of compounds detected in the samples ranged from presumptive evidence of benzanthracenone detected at an estimated concentration of 100 ug/kg to di-n-butylphthalate detected at 51,000 ug/kg. The majority of organic compounds detected were polynuclear aromatic hydrocarbons (PAHs). These compounds were identified in the shallow subsurface soil samples collected with hand augers. The majority of compounds detected in five of the

TABLE 3

GROUND WATER CONTAMINANTS

Contaminant	Concentration (ug/L)
Caprolactum	2.0
Diethyltetrahydrofuran	30.0
Chloroform	8.6
Bromodichloromethane	4.6
Ethyl Ether	5.0
Chromium	89.0
Bis(2-ethylhexyl)phthalate	370.0
Bis(dimethylethyl)methylphenol	10.0

ten trench samples were also PAHs. No PAH compounds were detected in the split spoon samples collected from the perimeter of the site during monitoring well installation.

Shallow subsurface soil samples collected with hand augers from the cap-fill interface had the greatest number of extractable organic compounds identified and at the highest concentrations. The cap-fill interface was not well defined, and the contamination at these shallow depths may have resulted from the operation of heavy equipment on the site by Amnicola Equipment & Materials Sales personnel. The extractable organic contamination identified in the trench samples probably resulted from the material disposed at the site.

Remediation of subsurface soils, however, is not necessary due to the incomplete exposure pathway associated with these soils.

3.5 Surface Water, Sediment and Leachate

The Tennessee River and the pond on the dump site are considered Class III waters by the State of Tennessee and are to be protected as a habitat for fish and aquatic life. Surface water, sediment and leachate samples were collected during the RI to identify any contaminants that may pose an environmental and/or human health hazard on-site or by migrating from the site via surface water and leachate drainage. Samples were collected from the Tennessee River and on-site from the pond, drainage ditches and leachate points.

Numerous organic and inorganic contaminants were detected in several of the leachate samples and soil samples contaminated by leachate collected during the RI. However, the majority of the contaminants detected in the sediment samples can probably be attributed to the railroad ties that were stored on the site. The analysis of an upstream-downstream pair (relative to the dump site) of river water samples showed almost identical contaminant results. The findings were indicative of background levels and showed no indication of river water degradation by the dump site.

One surface water sample contained significant levels of inorganic compounds. A ditch sample taken near the southwestern corner of the site contained barium, chromium and lead at 820 ppb, 150 ppb, and 660 ppb, respectively. This sample also contained a PAH compound at 1.4 ppb.

Of the four pond water samples, two contained significant levels of a carcinogen, bis(2-ethylhexyl)phthalate. A lifetime exposure for humans (through accidental ingestion) of 4×10^{-5} (within the acceptable risk range) would be associated with these pond concentrations. The concentration of bis(2-ethylhexyl)phthalate is higher than the fresh water quality criteria limit for phthalate esters. Phthalates were not detected in the other two pond water samples and were not detected in any of the four pond sediment samples. The source of this compound is not known. A bioassay with daphnids using undiluted water from the pond drainage ditch did not detect toxicity. Additional sampling of the pond water will be performed during remedial design to resolve this unusual pattern of phthalate findings in two pond samples in the absence of sediment detection.

Chromium, nickel and lead occurred in most samples at approximately three times the background level. There is no reasonably likely scenario that would result in ingestion of the quantities of sediment required at the site to exceed the acceptable daily intake.

Complete pathways of human exposure to pond water and sediments and leachate do not appear to exist since these waters are not used for drinking, recreation or fishing; therefore remediation of these media is not required. However, a decision regarding remediation of surface waters, based on environmental concerns, will be determined using analytical data collected during remedial design.

4.0 CLEANUP CRITERIA

The extent of contamination was defined in Section 3.0, CURRENT SITE STATUS. This section establishes health-based cleanup goals for surface soil contaminants at Amnicola Dump as well as defining Alternate Concentration Limits (ACLs) for ground water.

4.1 Surface Soil Cleanup Criteria

Health-based surface soil cleanup goals have been based on current and potential future site use scenarios.

Current-use scenarios considered include:

- Direct contact with on-site soil by part-time outdoor workers and frequent visitors to the site.
- Direct contact with on-site soil by full-time outdoor workers.

Future-use scenarios include:

- Direct contact with on-site soil by future on-site residents.

Soil cleanup goals were developed for both practical and worst-case scenarios. The sum of seven carcinogenic PAHs present in surface soil was used to calculate a CDI and cleanup goal for both scenarios.

Soil PAH (total carcinogenic) cleanup levels for adult practical, adult worst case, and child resident exposure scenarios were calculated; the results are presented in Appendix A. The assumptions for each of the scenarios can be found in the Public Health Assessment section of the Amnicola Dump RI Report. The equation used towards calculating risk related soil cleanup goals is also presented in Appendix A.

Due to the limited and conflicting data available relating to absorption rates after oral exposure, two "acceptable" soil cleanup goals were calculated based on 100% and 25% absorption.

In light of the conflicting literature available on absorption rates, and in keeping with the position of using conservative assumptions when in doubt, soil cleanup goals which incorporate a 100% absorption rate were used. Finally, the established soil cleanup goal was based upon the following considerations:

- Amnicola Dump is located in an industrial setting. Although considered in the Public Health Evaluation, the likelihood of future development of the site for residential purposes appears to be remote. Therefore, child resident values were not considered further.

- In light of the conservative positions taken during the Public Health Evaluation, adult practical values were selected.

- A comparison was made of CERCLA sites within and outside of Region IV to determine the cleanup levels that were selected at sites exhibiting similar land use and types of contaminants (creosote compounds). A cleanup goal of 100 ppm was the most consistently used.

Thus, a soil cleanup goal of 100 ppm has been established for the Amnicola Dump site.

4.2 Alternate Concentration Limits

Although ground water is only slightly contaminated at the Amnicola Dump site, Alternate Concentration Limits (ACLs) were established to address the potential impact of this contamination.

Section 121(d) of the Superfund Amendments and Reauthorization Act (SARA) requires that the selected remedial action establish a level or standard of control which complies with all ARARs.

At the Amnicola Dump site, ground water discharges into the Tennessee River and, therefore, beyond the boundaries of the site. Applicable statutory language concerning cleanup standards under CERCLA is found in Section 121 (d)(2)(B)(ii) of SARA. SARA does not allow any increase in contaminants in off-site surface water. Since cleanup goals must be based on some finite number, the reduction calculation presented in Appendix B reflects the large dilution factor in the Tennessee River.

To relate health-based standards for contaminant concentrations to potential receptors, a current-use scenario was employed. Under an evaluation of the current-use scenario, there are no direct receptors of ground water at or downgradient of the site. Rather, the closest potential receptors are associated with surface water use at a location where affected ground water discharges to the Tennessee River.

To calculate probable ACLs for the various contaminants in the ground water system, a relatively straight-forward mass-balance approach was used. The analysis involves an initial assumption that observed levels of contaminants will remain constant as ground water flows from the source area to a discharge zone at the Tennessee River.

A second assumption is that ground water enters the surface water regime in the Tennessee River and undergoes a process of dilution in a mixing zone. Mixing of the two sources of water is assumed to occur instantaneously throughout the entire volume of the mixing zone (one-quarter of the cross-sectional flow of the Tennessee River), resulting in an output flow and concentration that can be calculated based on a continuity, or mass balance approach.

The average reservoir flow rate over 65 years is reported to be on the order of 30,030 cubic feet per second (cfs). The flow rate through one quarter of the reservoir was used to estimate the diluted concentration of contaminants in the Tennessee River. The point of exposure is the property boundary where the site meets the Tennessee River.

The recommended ACLs are presented in Table 4 and represent a one order-of-magnitude increase in maximum detected concentrations of contaminants in ground water. The resulting diluted concentrations in the Tennessee River due to this one order-of-magnitude increase would still be nondetectable. The purpose of the one order-of-magnitude increase is to prevent unnecessary remedial action in ground water due to seasonal fluctuations in ground water quality.

TABLE 4

RECOMMENDED ALTERNATE CONCENTRATION LIMITS (ACLs)
FOR THE AMNICOLA DUMP SITE

Contaminant	Maximum Detected Concentration in Ground Water (ppb)	Projected Concentration in Tennessee River (ppb)	ACL (ppb)
Caprolactum	2	3.7E-07	20
Diethyltetrahydrofuran	30	5.6E-06	300
Chloroform	8.6	1.6E-06	86
Bromodichloromethane	4.6	8.5E-07	46
Ethyl ether	5.0	9.3E-07	50
Chromium	89	1.6E-05	890
Bis(2-ethylhexyl)phthalate	370	6.8E-05	3700
Bis(dimethylethyl)-methylphenol	10	1.9E-06	100

The key to obtaining ACLs at the Amnicola Dump site is to develop an enforceable restriction on ground water use within a reasonable distance of the site. The exact distance and method for the restriction will be developed during the Remedial Design.

A quarterly monitoring program will be conducted for only those constituents detected in ground water during the RI. This program will continue for 4 years so that an adequate ground water data base is available for the public health assessment that will be conducted 5 years following remedial action implementation.

5.0 ALTERNATIVES EVALUATION

The principal remedial action objective at the Amnicola Dump site is control or treatment of contaminated soil to mitigate the current and potential future pathways of exposure.

Even though PAH-contaminated soil was introduced subsequent to the ranking and placement of the Amnicola Dump site on the National Priorities List (NPL), it has been Agency policy to identify all hazardous wastes present at NPL sites, determine if the concentrations pose, or could pose, a human health threat either now or in the future, and to evaluate potential ecological effects of site-related contaminants. It is, therefore, insignificant that PAHs were not initially responsible for the site's placement on the NPL.

Furthermore, once treatment or control measures are implemented at the site, assurances are necessary to prevent re-introduction of additional contaminants. Institutional controls, such as deed or land use restrictions should be applied to the site to provide for its long-term integrity.

An additional remedial action objective is to provide for the monitoring of ground water quality in order to develop a ground water data base as well as imposition of ground water use restrictions within a reasonable distance of the site.

The following five remedial action alternatives were considered:

Alternative 1: (No Action)

- Monitoring of surface water and ground water quality for 30 years
- Fencing of the area of contamination
- Imposition of land and ground water use restrictions
- Public Health Assessment every five years
- Cost $ 1,100,000

Alternative 2: (Clay Cap)

- Placement of clay and topsoil over area of contamination
- Construction of drainage diversion ditches around the cap
- Fencing of the capped area
- Imposition of land and ground water use restrictions
- Monitoring of ground water quarterly for four years and semi-annually thereafter for 26 years
- Public Health Assessment conducted five years following remedial action
- Cost $ 900,000

Alternative 3: (Solidification/Fixation)

- Excavation and screening of contaminated soil/debris
- Treatment of contaminated soil on-site
- Debris disposal off-site if contaminated; allowed to remain on-site if sampling confirms it is clean
- Imposition of land and ground water use restrictions
- Monitoring of ground water quarterly for four years
- Public Health Assessment conducted five years following remedial action
- Cost $ 640,000

Alternative 4: (Off-Site Incineration)

- Excavation and screening of contaminated soil/debris
- Transportation of soil off-site for incineration
- Debris disposed off-site if contaminated; allowed to remain on-site if sampling confirms it is clean
- Monitoring of ground water quarterly for four years
- Public Health Assessment conducted five years following remedial action
- Cost $ 1,100,000

Alternative 5: (Off-Site Disposal)

- Excavation of contaminated soil/debris
- Transportation of soil/debris to RCRA landfill
- Monitoring of ground water quarterly for four years
- Public Health Assessment conducted five years following remedial action
- Cost $ 610,000

ALTERNATIVE NO. 1 - NO ACTION

Description

The no action alternative implies leaving the site in its present condition without disturbing contaminated surface soils. Associated with the no action alternative would be continued monitoring of surface water and ground water quality at the site, allowing identification of any changes in site conditions which could include the migration of contaminants off-site. Should changes be discovered which increase the risks associated with the site, this alternative could be reassessed and, if necessary, alternative actions taken.

Also included in this alternative is the installation of a fence around the perimeter of the 7,500 square feet area of surface soil contamination located at the northeast corner of the on-site pond. Warning signs would be posted on the fence and land use restrictions would be imposed on the site owner/ operator to prevent the accumulation of additional areas of contamination exceeding the surface soil cleanup goals as a result of the continuous handling, storage or burning of creosoted railroad ties.

A public health assessment would be performed every five years to evaluate potential changes in risk associated with no action at the site. Monitoring will be assumed to continue for 30 years, which is the minimal design life for an EPA remedial action.

Short-Term Effectiveness

No additional risk to public health or the environment would result from implementation of this alternative. The installation of a fence would require approximately two weeks.

Long-Term Effectiveness and Permanence

Little in the way of risk reduction would occur with this alternative. The potential for trespass in the area of contamination would remain; thus, the ingestion exposure pathway would remain. This alternative does not meet SARA's preference for permanence and treatment.

Reduction of Toxicity, Mobility or Volume

This alternative provides no treatment or reduction in toxicity, mobility or volume of contaminated surface soils.

Implementability

Institutional controls such as land use restrictions could be implemented within the current Federal, State and local regulatory framework.

Fence construction could be implemented in a straightforward manner requiring no research or engineering and requiring as little as two weeks for fence construction.

Existing wells at the site would be used for the monitoring of ground water quality. In 10 to 15 years, well casings and screens may need to be replaced.

Cost

The total present worth cost for this alternative is estimated to be $ 1,100,000, the vast majority of which consists of O & M.

This alternative is not the least expensive alternative. At most Superfund sites, the costs of monitoring are significantly less than the costs for site remediation. However, at the Amnicola Dump site, the volume of contaminated soil is so small that several of the more detailed remediation alternatives are less expensive than the less detailed no action alternative which includes long-term monitoring of ground and surface water. In addition to monitoring ground and surface water for 30 years, the no action alternative includes conducting a public health assessment every 5 years for 30 years.

Compliance with ARARs

This alternative does not comply with CERCLA requirements; ARARs would not be achieved since the exposure pathway of soil ingestion would remain.

Overall Protection of Human Health and the Environment

The Public Health Evaluation concludes that ingestion of contaminated surface soils is the greatest concern at the Amnicola Dump site. Ingestion of soils above the established cleanup goal is not acceptable and the no action alternative would not provide an effective, long-term barrier to the ingestion exposure pathway.

State and Community Acceptance

No preference for this alternative was communicated to EPA by either State personnel or the community.

ALTERNATIVE NO. 2 - LOW PERMEABILITY COVER

Description

Construction of a low permeability (clay) cover at the Amnicola Dump site would involve the placement of clay and topsoil over areas of contaminated surface soil that exceed the established soil cleanup goals.

Due to the absence of "clean" clay fill on-site, approximately 600 cubic yards of clay would be hauled to the site and placed over the area of surface soil contamination. Approximately two feet of this low hydraulic conductivity material would be placed, compacted, and then covered with a one-foot layer of vegetative fill. Again, due to the absence of acceptable topsoil material on-site, approximately 300 cubic yards of this material would be hauled to the site.

Little in the way of re-contouring of the current ground surface would be required prior to construction of the cap. The current surface of the area of concern slopes one to two percent to the west (towards the on-site pond and Nick-a-Jack Reservoir). The cap contour would match the current slope, resulting in adequate drainage of precipitation. Drainage diversion ditches would be constructed around three sides of the capped area to promote runon of surface water towards the on-site pond and away from the capped area. These drainage ditches would be lined with rip-rap to control erosion.

Once constructed, the capped area would be fenced to help protect its long-term integrity.

Land use restrictions would be imposed on the site to prevent the accumulation of additional areas of contamination that exceed the established surface soil cleanup goals as a result of the handling, storage or burning of creosoted railroad ties.

Monitoring of ground water quality of the site would be performed quarterly for a period of four years and semi-annually for 26 years thereafter. A public health assessment would be conducted by EPA five years after implementation of the remedial action to evaluate potential changes in risk associated with the site.

Ground water use restrictions would be imposed within a reasonable distance from the site in keeping with the establishment of ACLs.

Short-Term Effectiveness

A low permeability cover is a reliable, low maintenance procedure for limiting infiltration and reducing the mobility of contaminants. The soil exposure pathway would be immediately broken and risk from the site would be within the acceptable risk range.

Minimal risk would be associated with the construction of this remedy; erosion control measures would be implemented during construction to prevent excessive sediment loading of the adjacent on-site pond and Nick-a-Jack Reservoir.

Long-Term Effectiveness and Permanence

This alternative would provide a continued, effective reduction of risk posed by ingestion of contaminated surface soils. A low permeability cover would minimize infiltration of surface water, thereby significantly reducing the migration potential of contaminants. The potential for downward migration of contaminants would remain; however, the relatively immobile nature of PAHs, along with the minimization of surface water infiltration, should prevent the formation of additional exposure pathways.

Periodic maintenance of the cap would enhance the long-term reliability of this alternative. Maintenance would consist of repairing any areas of erosion and maintaining a healthy vegetative cover.

Approximately one-half of the Amnicola Dump site lies within the 100-year floodplain of the Tennessee River (Nick-a-Jack Reservoir); all of the contaminated area of concern lies within this floodplain. Although river elevations are regulated by the Tennessee Valley Authority, extremely heavy rainfall events over a short duration could cause flooding of portions of the Amnicola Dump site, specifically, the capped area, thereby compromising the long-term integrity of the cap.

Reduction of Toxicity, Mobility or Volume

This alternative would provide no treatment which would significantly reduce the toxicity, mobility or volume of the contaminants. Preventing surface water infiltration would reduce the migration potential of contaminants.

Implementability

Implementation of this alternative would involve the use of standard earth moving and compacting equipment. Site access would be obtained with little difficulty; no temporary roads or permits would be required for on-site activities. Only minor clearing and grading operations would be required prior to cap construction. Labor and materials for this alternative are readily available and would be obtained locally.

Institutional controls such as land use restrictions could be implemented within the current Federal, State and local regulatory framework.

Implementation time can be expected to take approximately two months. Existing wells at the site would be used for the monitoring of ground water quality. In 10 to 15 years, well casings and screens may need to be replaced.

Cost

The total present worth cost of this alternative is estimated to be $ 900,000 which includes $ 684,000 for O & M.

Compliance With ARARs

Capping of the entire Amnicola Dump landfill surface was not considered because 1) Amnicola Dump was used as a construction debris disposal site and never as a permitted Solid Waste Disposal facility; and 2) levels of contaminants exceeding soil cleanup goals were confined to one isolated area of the site. Thus, closure of the entire dump in accordance with Subtitle D Solid Waste regulations is neither applicable nor relevant and appropriate.

Land Disposal Restrictions would not be triggered because contaminants would be capped in-place; no placement of contaminants would occur.

This alternative does not comply with SARA's preference for treatment.

Overall Protection of Human Health and the Environment

This alternative would effectively break the soil ingestion exposure pathway.

State and Community Acceptance

No preference for or objections to this alternative were communicated to EPA by either State personnel or the community.

ALTERNATIVE NO. 3 - SOLIDIFICATION/FIXATION

Solidification/Fixation of contaminated surface soils would initially involve the excavation of approximately 600 cubic yards of contaminated soils and debris. Sampling will be performed during the remedial design to confirm actual lateral and vertical extent of soil contamination.

Numerous debris in the subsoil of the contaminated area would require on-site materials handling prior to solidification processes. This debris, such as bricks, broken concrete, scrap metal, and wood, may require off-site disposal at a permitted disposal facility. Land Disposal Restrictions for CERCLA debris may not be in effect at the time of construction and the debris could be disposed of at a permitted landfill without prior treatment. However, the levels of contaminants on the debris may not exceed cleanup goals (or Land Disposal Restriction requirements if they are in effect), thereby allowing the debris to remain on-site.

Once debris has been removed, approximately 400 cubic yards of soil would require treatment.

Mixing of the soil with stabilizing agents would be performed on-site and above-grade. The mixed material would be placed back in the excavated area and covered with a 12-inch thick layer of vegetated topsoil. Due to the lack of acceptable topsoil on-site, approximately 300 cubic yards of material would be hauled to the site. The finished ground surface would match the existing ground contour.

Treatability or bench scale studies would be necessary to determine which solidification agents are most effective for the Amnicola Dump waste.

Land use restrictions would be imposed on the site to prevent the accumulation of contamination that exceed the surface soil cleanup goals as a result of the handling, storage or burning of creosoted railroad ties. Ground water use restrictions would be imposed within a reasonable distance of the site in keeping with the establishment of ACLs.

A quarterly monitoring program to analyze for those ground water constituents of concern would be implemented for a period of four years. A public health assessment would be conducted by EPA five years after remedial action implementation. Following this assessment, monitoring activities would be terminated, provided that the public health assessment does not identify a need for further remedial action or monitoring.

Short-Term Effectiveness

Solidification of contaminants would immediately break the ingestion exposure pathway. This alternative would involve minimal risk to workers during construction with the exception of potential exposure of site workers to contaminated dust during excavation. Exposure risks would be minimized through the use of wetting agents or water. Continuous air monitoring would be performed to ensure site worker safety.

Erosion control measures would be implemented during excavation activities to prevent sediment and contaminant loading of the on-site pond and Nick-a-Jack Reservoir.

Long-Term Effectiveness and Permanence

All contaminated soil exceeding the established cleanup goals would be immobilized and the soil ingestion exposure pathway broken. Solidification would produce a monolithic block of waste with high structural integrity. Stabilizing agents should mechanically lock up the PAH compounds within a solidified matrix resulting in reduced surface area and negligible contaminant loss over a long period of time. Leaching tests have shown that solidification is an effective means to prevention of contaminant migration.

The organic compounds at Amnicola Dump (sum of six carcinogenic compounds was less than 125 ppm in the area of concern) should not interfere with the setting, curing, and performance of the solidified material.

Long-term management and monitoring would not be required with this alternative.

Reduction of Toxicity, Mobility or Volume

Solidification would significantly reduce the mobility of contaminants and comply with SARA's preference for treatment.

Implementability

Implementation of this alternative would involve the use of standard earth moving and cement mixing equipment. Special equipment would be required, however, to separate debris from the waste prior to solidification processes. Site access would be obtained with little difficulty; no temporary roads or permits would be required for these on-site activities. Minor clearing operations would be required prior to excavation activities. Labor and materials (assuming Portland cement or lime-based pozzolan is used) are readily available and could be obtained locally.

Institutional controls such as land use restrictions could be implemented within the current Federal, State and local regulatory framework.

An implementation time of approximately two months can be expected following remedial design which would include a treatability or bench-scale study requiring up to three months to complete.

Cost

The total present worth cost for this alternative is estimated to be $ 640,000 which includes $ 384,000 for O & M.

Compliance With ARARs

This alternative achieves SARA's preference for treatment and, as demonstrated by the ACL calculations, is protective of human health and the environment.

Overall Protection of Human Health and the Environment

This alternative is protective of human health and the environment since all contaminants exceeding the established soil cleanup goal will be immobilized and the soil ingestion exposure pathway broken.

State and Community Acceptance

The State accepts this alternative for achieving the remedial action objectives; however, the State has withheld concurrence pending a further review of Tennessee's Alternate Concentration Limit policy and its applicability to ground water contaminants at the Amnicola Dump site. Only one comment from the community was received during the public comment period. This resident felt too much money was being spent on site remediation.

ALTERNATIVE NO. 4 - OFF-SITE INCINERATION

Description

This alternative involves the off-site incineration of contaminated soils and off-site disposal of incineration residuals.

Approximately 600 cubic yards of contaminated soil would be excavated to a depth of two feet below ground surface. Sampling will be performed during remedial design to confirm the actual lateral and vertical extent of contamination.

Numerous debris in the subsoil of the contaminated area would require on-site materials handling prior to shipment of the waste off-site. For estimation purposes, it was assumed that 50% of the excavated material consists of debris. This debris (approximately 325 cubic yards), such as wood, scrap metal, concrete blocks, etc., may require off-site disposal at a permitted landfill or allowed to remain on-site. Off-site disposal would be necessary if sampling indicates the debris contains concentrations of contaminants exceeding the cleanup goals. However, if Land Disposal Restrictions are in effect at the time of remedial action implementation, disposal at an off-site location will be necessary if contaminants exceed LDR treatment standards.

Subsoil debris would undergo on-site materials handling processes such as screening to remove debris and reduce particle size to two inches or less, depending upon the incineration facility used. Once debris has been removed, and assuming a 20% volume expansion of soil during excavation, approximately 350 - 400 cubic yards of soil would remain to be treated.

All feed material would be containerized in 30-gallon fiber or polyethylene drums or 55-gallon steel drums prior to transportation. All transportation loads would be manifested and carried by licensed hazardous waste haulers. Permits for the incineration facility would be verified prior to initiating the process.

Once excavation activities have been completed, the excavated area would be backfilled with clean fill hauled in from an off-site location and the ground restored to its original contour.

Land use restrictions would be imposed on the site to prevent the accumulation of additional areas of contamination that exceed the surface soil cleanup goals as a result of the handling, storage or burning of creosoted railroad ties. Ground water use restrictions would be imposed witihin a reasonable distance from the site in keeping with the establishment of ACLs.

A quarterly monitoring program to analyze for those ground water constituents of concern would be implemented for a period of four years. A public health assessment would be conducted by EPA five years after remedial action implementation. Following this assessment, monitoring activities would be terminated, provided that the public health assessment does not identify a need for further remedial action or monitoring.

Short-Term Effectiveness

Incineration of contaminated soils would immediately break the soil ingestion exposure pathway.

This alternative would involve minimal risk with the exception of short term exposure to site workers. These potential impacts can be reduced by implementation of a site-specific health and safety plan including the use of wetting agents during excavation activities. Continuous air monitoring would be performed to ensure site worker safety. In addition, there is some risk to the general population associated with transportation of the materials.

Erosion control measures would be implemented during excavation activities to prevent sediment and contaminant loading of the adjacent on-site pond and Nick-a-Jack Reservoir.

Long-Term Effectiveness and Permanence

All contaminated soil exceeding the established cleanup goals would be detoxified and delisted. The soil ingestion exposure pathway would be broken. Removal of contaminated soil will eliminate the need for installation of any long-term treatment or containment technologies.

Reduction of Toxicity, Mobility or Volume

Implementation of this alternative will result in total reduction of toxicity, mobility and volume of site contaminants.

Implementability

Implementation of this alternative would involve the use of standard earth moving and hauling equipment. Special equipment would be required, however, to separate debris from the waste prior to transportation.

Site access would be obtained with little difficulty; no temporary roads would be required for on-site activities. Labor and resources are readily available and could be obtained locally. Transportation loads would require manifests and transportation by licensed hazardous waste haulers. Permits for the incineration facility would require verification; verification of the unit's ability to accept waste within the required timeframe would be necessary.

The greatest difficulty with this alternative would be locating a facility to accept the screened-out debris. For costing purposes, it is assumed that the debris would be transported to the Chemical Waste Management Inc. RCRA facility in Emelle, Alabama and that Land Disposal Restrictions for CERCLA debris are not in effect at the time of remedy implementation. However, these restrictions for CERCLA debris may not be in effect at the time of construction and the debris could be disposed at a permitted landfill without prior treatment. If sampling indicates that the levels of contaminants on the debris do not exceed cleanup goals (or Land Disposal Restriction requirements if they are in effect), the debris may remain on-site.

Total implementation time is estimated to take no longer than six weeks.

Institutional controls such as land use restrictions could be implemented within the current Federal, State and local regulatory framework.

Cost

The total present worth cost of this alternative is estimated to be $ 1,100,000 which includes $ 384,000 for O & M.

Compliance With ARARs

This alternative would comply with SARA's preference for treatment and, as demonstrated by the ACL calculations, is protective of human health and the environment.

Transportation of all contaminated soil would be in accordance with appropriate Federal and State regulations. The treatment and disposal facility receiving the contaminated soil would be in compliance with all ARARs.

Overall Protection of Human Health and the Environment

This alternative is protective of human health and the environment since all contaminants exceeding the established soil cleanup goal would be removed from the site, detoxified, and delisted. The soil ingestion exposure pathway would be broken.

State and Community Acceptance

No preference for or objection to this alternative was communicated to EPA by either State personnel or the community.

ALTERNATIVE NO. 5 - OFF-SITE DISPOSAL

Description

Off-site disposal would involve the excavation of approximately 600 cubic yards of contaminated soils down to two feet below ground surface. This material contains numerous debris such as wood, scrap metal, broken concrete, etc. that were identified during the RI field sampling program. Actual extent and depth of contaminated material to be excavated will be determined during remedial design.

Excavated wastes would be stockpiled in a staging area that would serve as a place for loading and decontamination. Wastes should not require stockpiling for more than two or three days; thus, no special pads or drainage devices would be required.

The wastes would be manifested by a licensed hazardous waste hauler and transported to an approved RCRA Subtitle C hazardous waste landfill.

Once excavation activities have been completed, the excavated area would be backfilled with clean material hauled in from an off-site location and the ground surface restored to its original contour.

Land use restrictions would be imposed on the site to prevent the accumulation of additional areas of contamination that exceed the surface soil cleanup goals as a result of the handling, storage or burning of creosoted railroad ties. Ground water use restrictions would be imposed within a reasonable distance from the site in keeping with the establishment of ACLs.

A quarterly monitoring program to analyze for those ground water constituents of concern would be implemented for four years. A public health assessment would be conducted by EPA five years after remedial action implementation. Following this assessment, monitoring activities would be terminated, provided that the public health assessment does not identify a need for further remedial action or monitoring.

Short-Term Effectiveness

Off-site disposal of contaminants exceeding the established soil cleanup goals would immediately break the ingestion exposure pathway.

This alternative would involve minimal risk with the exception of short-term exposure to site workers. These potential impacts can be reduced by implementation of a site-specific health and safety plan and the use of wetting agents during excavation activities. Continuous air monitoring would be performed to ensure site worker safety. In addition, there is some risk to the general population associated with transportation of the materials.

Erosion control measures would be implemented during excavation activities to prevent sediment and contaminant loading of the adjacent on-site pond and Nick-a-Jack Reservoir.

Long-Term Effectiveness and Permanence

All contaminated soils exceeding the established soil cleanup goals would be removed form the site; however, risk from these soils would be transferred from the Amnicola Dump site to another location. No long-term monitoring or O & M requirements are anticipated.

Reduction of Toxicity, Mobility or Volume

This alternative provides no reduction of toxicity, mobility or volume of contaminated soils.

Implementability

Implementation of this alternative would involve the use of standard earth moving and hauling equipment.

Site access would be obtained with little difficulty; no temporary roads would be required for on-site activities. Labor and resources are readily available and could be obtained locally. Transportation loads would require manifests and transportation by licensed hazardous waste haulers.

The greatest difficulty with this alternative would be locating a facility to accept the waste. For costing purposes, it is assumed that the waste would be transported to the Chemical Waste Management Inc. RCRA facility in Emelle, Alabama.

Land Disposal Restrictions, however, may take effect before this alternative could be implemented in which case the soil/debris may require treatment prior to disposal. For cost estimation purposes, it is assumed that Land Disposal Restrictions are not in effect at the time of remedy implementation. If sampling indicates that the levels of contaminants on the debris do not exceed cleanup goals (or Land Disposal Restriction requirements if they are in effect), the debris may remain on-site.

Implementation time, including excavation, hauling, and site restoration is estimated to take no longer than three weeks.

Cost

The total present worth cost for this alternative is estimated to be $ 610,000 which includes $ 384,000 for O & M.

Compliance With ARARs

This alternative would not comply with SARA's preference for treatment.

Transportation of all contaminated soil would be in accordance with appropriate Federal and State regulations. The disposal facility would be in compliance with all ARARs.

Overall Protection of Human Health and the Environment

This alternative is only partially protective of human health and the environment since all risk would be removed from the Amnicola Dump site but transferred to another location.

State and Community Acceptance

No preference for or objection to this alternative was communicated to EPA by the community. The State commented that this Off-Site Disposal would also be an acceptable alternative.

6.0 RECOMMENDED ALTERNATIVE

6.1 Description of Recommended Alternative

The recommended alternative, Alternative # 3, for remediation of contamination at the Amnicola Dump site, includes the following components:

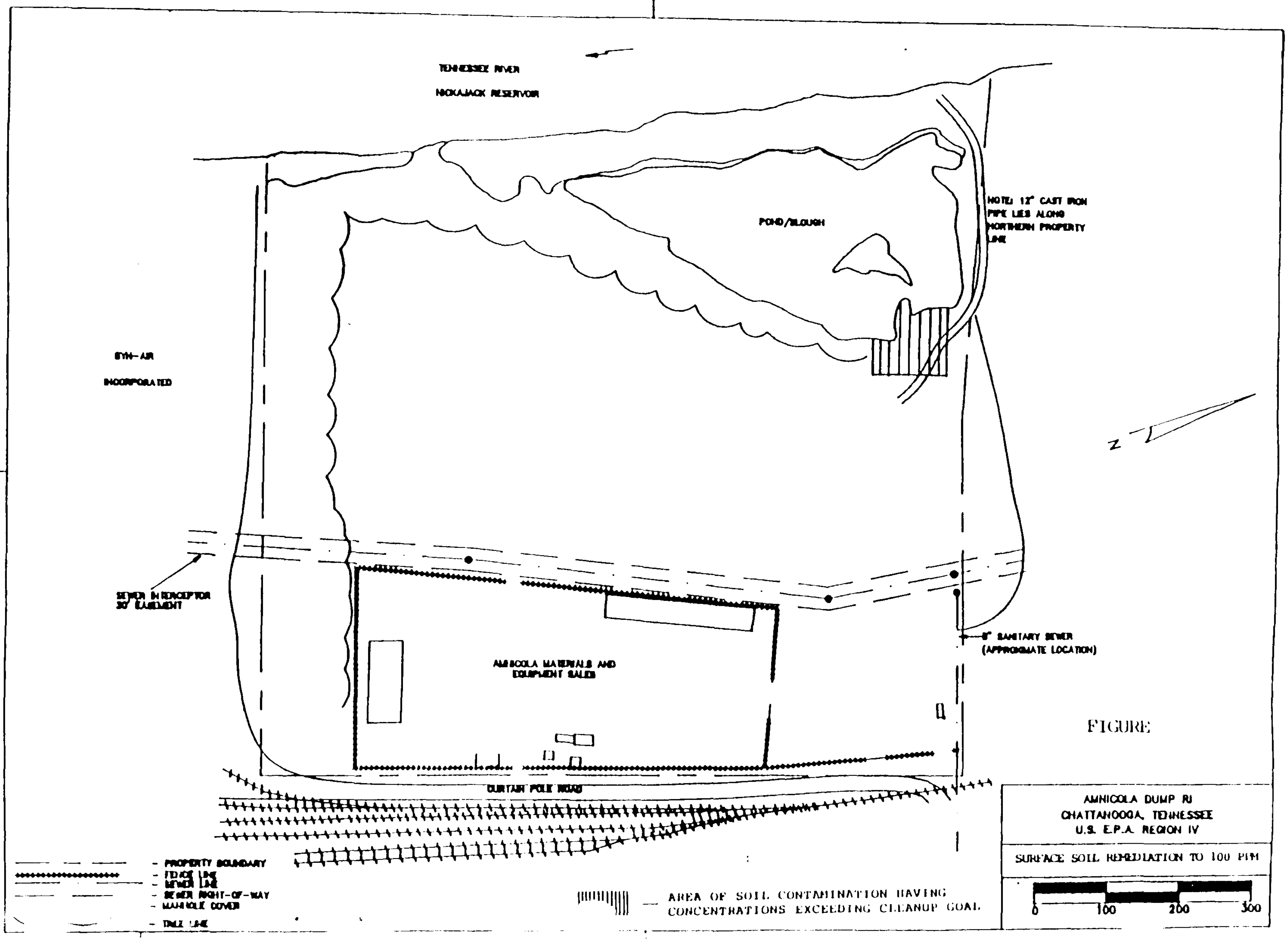
- Excavation and screening of contaminated soil/debris
- Treatment of contaminated soil on-site
- Debris disposed off-site if contaminated; allowed to remain on-site if sampling confirms it is clean
- Placement of solidified mass on-site, above the ground water table, and outside the 100-year floodplain
- Monitoring of ground water quality for four years
- Public health assessment conducted five years after remedial action

Contaminated soil/debris would be excavated from a location in the northwest corner of the Amnicola Dump site (Figure 4). PAHs at this location were detected at a concentration of 123 ppm, 23 ppm above the 100 ppm cleanup goal that has been established for PAHs at the Amnicola Dump site. While the levels of PAHs above this cleanup goal of 100 ppm are believed to be confined to this one location, biased sampling in the area of concern, as well as random site-wide sampling, will be conducted during remedial design to determine if heavy equipment traffic on-site has distributed contaminants elsewhere on-site.

Additionally, surface water samples would be collected from the on-site pond during the remedial design. Additional samples are necessary in light of the conflicting data obtained during the RI concerning the presence of bis(2-ethylhexyl)phthalate in two pond water samples. Should bis(2-ethylhexyl)phthalate be detected at significant concentrations during the remedial design sampling, the Record of Decision would be re-evaluated and appropriate actions taken to mitigate the threat or potential threat to aquatic life, if necessary.

Following remedial design, an estimated 600 cubic yards of soil/debris would be excavated and the debris (wood, metal, concrete, etc.) screened. Approximately 400 cubic yards of contaminated soil would remain to be treated. Sampling of the debris will be performed during remedial action to determine if the debris contains concentrations of contaminants exceeding either the cleanup goal or Land Disposal Restriction requirements (if LDRs are in effect at the time of remedy implementation), whichever is more stringent. If sampling indicates that the debris does not contain concentrations of contaminants above the applicable standard, the debris will be re-deposited on-site.

Mixing of the contaminated soil with stabilizing agents such as cement, kiln dust, etc. would be performed on-site and above-grade.


TENNESSEE RIVER
NICKAJACK RESERVOIR
POND/SLOUGH
NOTE: 12" CAST IRON PIPE LIES ALONG NORTHERN PROPERTY LINE
SYN-AIR INCORPORATED
N
SEWER INTERCEPTOR 30' EASEMENT
8" SANITARY SEWER (APPROXIMATE LOCATION)
AMNICOLA MATERIALS AND EQUIPMENT SALES
CURTAIN POLE ROAD
FIGURE
AMNICOLA DUMP RI
CHATTANOOGA, TENNESSEE
U.S. E.P.A. REGION IV
SURFACE SOIL REMEDIATION TO 100 PPM
0
100
200
300
- PROPERTY BOUNDARY
- FENCE LINE
- SEWER LINE
- SEWER RIGHT-OF-WAY
- MANHOLE COVER
- TREE LINE
AREA OF SOIL CONTAMINATION HAVING CONCENTRATIONS EXCEEDING CLEANUP GOAL

Solidification/fixation of contaminated soil should facilitate a chemical or physical reduction of the mobility of contaminants. A bench-scale treatability test would be conducted to select the proper additives and their ratios and to determine the curing time required to set the waste adequately. Leaching tests and compressive strength tests would also be conducted to determine the integrity of the solid end product.

Actual attainment of cleanup goals, like any other remedial alternative, using the solidification/fixation technology will not be known until remedial action has been completed. However, creosote type wastes have been successfully treated by solidification/fixation and it is very reasonable to assume that at least a 19% reduction in the concentration of PAHs from the leachate that may migrate from the solidified mass can be achieved. A 19% reduction would reduce the concentration of contaminants to the cleanup goal of 100 ppm.

The solidified mass would be placed in an area of the site above the ground water table and outside the 100-year floodplain. A 12-inch thick layer of topsoil would then be placed over the solidified mass and the ground surface restored to its original condition.

Land use restrictions would be imposed on the site to prevent the accumulation of contamination that exceed the surface soil cleanup goals as a result of the handling, storage, or burning of creosoted railroad ties.

SARA Section 121(d)(2)(b)(ii) provides for the establishment of Alternate Concentration Limits (ACLs) under certain circumstances. One of the criteria for establishment of ACLs is the existence of institutional controls that preclude human exposure to the contaminated ground water at any point between the site boundary and all known and projected points of entry of such ground water into surface water. The point of entry for the Amnicola Dump site is the property boundary where the site meets the Tennessee River. Therefore, the key to obtaining ACLs at the Amnicola Dump site is to develop enforceable restrictions on ground water use within a reasonable distance of the site. The exact distance and method for the restriction would be developed during the remedial design phase.

A quarterly monitoring program to analyze for those ground water constituents of concern would be implemented for a period of four years. A public health assessment would be conducted by EPA five years after remedial action implementation. Following this assessment monitoring activities would be terminated, provided that the public health assessment does not identify a need for further remedial action or monitoring.

All of the alternatives, with the exception of the No Action alternative, would immediately break the soil ingestion exposure pathway. Minimal risk is associated with remedy construction for each alternative; however, solidification, off-site incineration, and off-site disposal would require additional precautionary measures to ensure the safety of workers. Off-site Disposal and Off-Site Incineration add a slight risk to the general public due to hauling activities. Given the relative immobility of site contaminants and media they are contained in (soil), this risk would be minimal in the event of an accident.

All alternatives, with the exception of the No Action alternative, would require temporary erosion control measures to prevent impact to the adjacent on-site pond and Nick-a-Jack Reservoir during remedial action.

Alternatives 2 through 5 provide an equal degree of short-term effectiveness.

Solidification and Off-Site Incineration provide the greatest degree of long-term elimination of risk posed by contaminants at the Amnicola Dump site.

The Low Permeability Cover Alternative would also provide long-term protection to public health and the environment but the potential exists for rare, but nonetheless possible, flood events which could compromise the integrity of the cap.

Off-Site Disposal merely transfers the risk to another location but would offer some protection by proper disposal in a permitted hazardous waste facility. Fencing (No Action) provides little in the way of prevention of long-term exposure to site contaminants.

By detoxifying contaminants, the Off-Site Incineration alternative offers maximum reduction of toxicity, mobility, and volume and is thereby the most effective in achieving this criteria. Solidification would provide a significant reduction of contaminant mobility.

Alternatives 1 and 2 offer no or minimal reduction in toxicity, mobility or volume of contaminants at the Amnicola Dump site.

The fence construction, monitoring and land use restriction components of Alternative 1 would make this alternative the least difficult to implement.

The Low Permeability Cover would present fewer difficulties than Alternatives 3 through 5 because no permits would be required and all activities could be performed with standard, readily available equipment and resources.

Off-Site Disposal would require licensed hazardous waste haulers and location of an approved RCRA facility to accept the waste. Standard, readily available equipment could also be used.

Both Solidification/Fixation and Off-Site Incineration alternatives require licensed hazardous waste haulers (debris only for the Solidification/Fixation alternative) and the use of special equipment for screening of debris from the waste. However, Off-Site Incineration involves the location of a licensed incineration unit that would accept the waste within the required timeframe. Solidification/Fixation would require a treatability or bench-scale study but this could be performed during the remedial design with minimal impact to project schedule.

Off-Site Incineration is estimated to be the most expensive treatment alternative. The Solidification/Fixation and Off-Site Disposal alternative are similar in cost and are the least expensive alternatives. The alternatives which included the most limited remediation alternatives, No Action and Capping, are not the least expensive alternatives. This is due to the extensive long-term monitoring requirements not included in the other alternatives.

Cost estimates for Solidification/Fixation are perhaps the least accurate. This is due to the large variability in unit costs attributable to difficulty in estimating operating parameters before completion of treatability studies, and the very small volume of soils to be remediated.

All alternatives, with the exception of the No Action alternative, are protective of human health and the environment; however, only Solidification/Fixation and Off-Site Incineration comply with SARA's preference for treatment.

Off-Site Icineration and Off-Site Disposal involve compliance with additional ARARs associated with the transportation of hazardous materials. Alternatives 4 and 5 involve incineration and disposal, respectively, at approved facilities only.

Off-Site Incineration and Solidifcation/Fixation alternatives both offer the greatest degree of overall protection of human health and the environment. Off-Site Incineration involves slightly greater risk due to the transportation requirements.

No Action provides the least protection while Capping and Off-Site Disposal fall somewhere in the middle.

Thus, EPA believes that Alternative 3 presents the best balance among the effectiveness, implementability, and cost factors for this site. Further, this remedy meets all applicable federal and state standards.

6.2 Operation and Maintenance

Overall implementation of this remedy is estimated to take 1 month following remedial design. Ground water monitoring will be performed for four years following remedial action. A public health assessment will be conducted within 5 years of remedial action. Monitoring activities would be terminated after the 4-year monitoring period, provided that the public health assessment does not identify a need for further monitoring or remedial action.

6.3 Cost of Recommended Alternative

The present worth cost of this remedy is estimated to be $ 640,000. The capital cost would be approximately $ 256,000. The total present worth of the O & M costs is estimated to be $ 384,000.

6.4 Schedule

The planned schedule for remedial activities at the Amnicola Dump site is as follows:

April 1989	Initiation of Remedial Design
September 1989	Initiation of Remedial Action
October 1989	Remedial Action Completed/ O & M Initiated

Note: This schedule assumes that EPA will conduct the Remedial Design/Remedial Action. Should the Potentially Responsible Parties accept EPA's offer to conduct the RD/RA, this schedule will not apply and a new schedule would be negotiated through a Consent Decree.

6.5 Future Action

Following completion of remedial action, O & M activities will be initiated. O & M activities are estimated to take 4 years followed by a public health assessment within 5 years of remedial action implementation. Currently, there are no known state or federal regulations or guidelines that restrict the use of a site containing solidified waste. As long as the ground water and land use restrictions are adhered to, site use will be dictated by the site owner.

During Remedial Design, soil samples will be collected at the

Amnicola Dump site. Sampling will include random, site-wide surface soil as well as biased sampling in the area of concern. Biased sampling will be conducted to gain a more accurate vertical and lateral extent of contamination for use in design considerations. Random, site-wide sampling will be conducted to determine if site conditions have changed since the 1988 site sampling.

Should sampling indicate that soil contamination is no longer present (e.g. traffic over the site by the on-site salvage business has dispersed contaminants), surface soil remediation may not be required. Site-wide sampling may indicate that additional hot spots are present on-site. If additional areas containing concentrations of contaminants above 100 ppm are discovered during remedial design, the scope of soil remediation will be expanded to include these areas. If soil contamination above 100 ppm in the area of concern is no longer present, or if additional areas are discovered, the remedy will be re-evaluated. This re-evaluation may result in a change in the selected alternative or the decision to take no action at the site. Such actions would be public-noticed and a comment period held prior to implementation of these actions.

6.6 Consistency With Other Environmental Laws

- SARA Section 121 Cleanup Standards - Section 121 governs ground water cleanup standards and allows the establishment of ACLs provided that there is no significant increase in contaminants in off-site surface water. Section 121 also specifies that the point of human exposure may not be beyond the boundaries of the site when establishing ACLs unless:

  - There are known and projected points of entry of contaminated ground water into surface water;

  - There will be no measured or projected increase of contaminants from the ground water in the surface water at the point of entry, and;

  - There are institutional controls that preclude human exposure to ground water.

  Institutional controls will be put in place within a reasonable distance of the Amnicola Dump site to preclude human consumption of ground water. There are currently no ground water users on or downgradient of the site. Should the concentration of contaminants in ground water meet or slightly exceed the established ACLs, the resulting concentration of these contaminants in the Tennessee River will still be non-detectable. Thus, there will be no significant increase of contaminants in surface water.

- Fish and Wildlife Coordination Act - Requires adequate protection of fish and wildlife if any stream or other body of water is modified. Additionally, actions in floodplains are required to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values.

  Actions such as silt fencing will be undertaken during remedial action to avoid sediment and/or contaminant loading of the Tennessee River or on-site pond.

- Endangered Species Act - Requires action to conserve endangered or threatened species for activities in critical habitats upon which these species depend.

  Those species identified by the U.S. Department of Interior - Fish and Wildlife Service (See Appendix C) as federally listed endangered (E) and/or threatened (T) which may occur in the area of influence of remedial action at Amnicola Dump include:

  Snail Darter (T), Orange-footed pearly mussel (E), and Pink mucket pearly mussel (E). Remedial action at Amnicola Dump will be implemented in a manner resulting in no impact to threatened and endangered species or surface water quality of the Nick-a-Jack reservoir.

- National Historical Preservation Act - Requires that action be taken to preserve or recover historical or archaeological data which might be destroyed as a result of site activities.

  There is no information to indicate that the Amnicola Dump site contains any sites which may be considered to be of historic or archaeological significance (Appendix D).

- 40 CFR Section 264.99 Compliance Monitoring Program - Establishes criteria for monitoring ground water quality when contaminants have been detected. This involves development of a ground water quality data base sufficient enough to characterize seasonal fluctuations in ground water quality at the site.

- Land Disposal Restrictions (LDRs) - The LDRs are applicable to the waste on-site if the soils are excavated and removed or excavated and treated. In alternatives where the LDRs are applicable, the soil must be treated to the interim treatment levels prior to land disposal.

LDRs for CERCLA soil and debris will be adhered to if they are in effect at the time of remedial action. Should LDRs be in effect at the time of remedial action, and if the concentration of contaminants on the excavated debris exceeds LDR standards, the debris will be treated prior to disposal.

7.0 COMMUNITY RELATIONS

Community relations activities have remained an important aspect throughout the RI/FS. On December 15, 1987, a public information meeting was held at the Chattanooga Hamilton County Bicentennial Library in Chattanooga, TN to inform the community of EPA's activities during the RI/FS process. Prior to the December 15 meeting, public notices, fact sheets, and press releases were issued.

On January 30, 1989, the final draft RI and FS reports were submitted to the public information repository in Chattanooga. A public meeting was held at the Chattanooga Hamilton County Bicentennial Library in Chattanooga on February 13, 1989 to present the findings of the RI and EPA's preferred remedial alternative. Prior to the February 13 meeting, EPA issued press releases, public notices, fact sheets, and a proposed plan. Following the February 13 meeting, a public comment period was held for 21 days, ending on March 5, 1989.

Comments and EPA responses are included in the Responsiveness Summary portion of this Record of Decision. The Record of Decision will be placed in the public information repository and a public notice will be issued stating the basis and purpose of the selected alternative. When EPA approves the design for the selected alternative, a fact sheet will be issued explaining the final engineering design. A fact sheet will be issued again before construction of the design begins.

8.0 STATE INVOLVEMENT

As required by CERCLA, Section 104(C), the State must assure payment of ten percent of all costs of remedial action. Remedial action has been defined in SARA as including all construction and implementation activities until site remediation is completed. Activities required to maintain the effectiveness of the remedy following completion of the remedial action is considered operation and maintenance (O & M). If surface water or ground water treatment is part of the remedy, only the first ten years of such treatment will be considered as remedial action; the remaining period of treatment will be a part of O & M activities. The State is required to pay 100 percent of all O & M following completion of the remedial action. EPA and the State may enter into an agreement whereby EPA would fund 90 percent of O & M costs, for a period not to exceed one year, until the remedy is determined to be operational and functional.

A summary of State cost-sharing obligations for the recommended alternative at the Amnicola Dump site is shown in Table 5. The State of Tennessee's cost-sharing responsibility is estimated to be $ 25,300 for remedial action and $ 297,600 for O & M.

9.0 SIGNIFICANT CHANGE TO THE PROPOSED PLAN

CERCLA section 117(b) requires that the final remedial action plan (i.e., ROD) be accompanied by a discussion of any significant changes (and the reasons for such changes) in the proposed plan and a response to each of the significant comments, criticisms, and new data submitted [on the RI/FS report and the Proposed Plan].

If significant changes are made to the Proposed Plan, EPA must document the significant changes, and the reasons for the significant changes, in the ROD. EPA also must make the determination if the significant changes could have been reasonably anticipated based on the RI/FS Reports and the Proposed Plan. Where such changes could not reasonably have been anticipated by the public, EPA must provide an additional opportunity for public comment.

A significant change was incorporated to the recommended alternative (Solidifcation/Fixation) subsequent to the public meeting and release of the Proposed Plan. The cost for the recommended alternative was presented at the Public Meeting and in the Proposed Plan as $ 415,500, which included $ 127,500 for Operations and Maintenance (O & M). Revised cost estimates were received on all alternatives evaluated in the Feasibility Study subsequent to the issuance of the Proposed Plan. As presented in this ROD, the estimated cost for Solidification/Fixation is now $ 637,000, which includes $ 384,000 for O & M.

Ground water monitoring was added to the treatment alternatives subsequent to EPA's peer review of the draft Feasibility Study Report. The additional costs associated with this new component was underestimated. The contractor preparing the revised cost estimates could not provide final costs prior to the public meeting and issuance of the Proposed Plan. The public meeting date was already established when the need for revised cost estimates was identified. Thus, a significant change in the cost of the recommended alternative resulted.

The estimated cost of the recommended alternative increased by $ 221,500 and could have been reasonably anticipated by the public. On page 5-12 of the Feasibilty Study report that was sent to the public information repository, the following statement was made: "Revised cost estimates will be prepared and included in the Final FS Report following the public comment period." It was also noted on page 5-12 that the addition of ground water monitoring to the treatment alternatives was the reason for cost uncertainty.

Therefore, the estimated cost for the recommended alternative increased significantly (53%) as a result of the addition of ground water monitoring to the treatment alternatives just prior to the public meeting. This increase could have been reasonably anticipated by the public based on the information in the FS Report. Subsequently, there is no need for an additional public comment period.

TABLE 5

STATE COST-SHARING OBLIGATIONS
AMNICOLA DUMP SITE

ACTIVITY	EPA	STATE	TOTAL
CONSTRUCTION CAPITAL COSTS	$ 227,700	$ 25,300	$ 253,000
FIRST YEAR O & M	86,400	9,600	96,000
REMAINING O & M	0	288,000	288,000
TOTAL	314,000	322,900	637,000

RESPONSIVENESS SUMMARY

AMNICOLA DUMP SITE, CHATTANOOGA, TENNESSEE

This community relations responsiveness summary is divided into the following sections:

SECTION I. Overview: This section discusses EPA's recommended alternative for remedial action and public reaction to this alternative.

SECTION II. Background on Community involvement and Concerns: This section provides a brief history of community interest and concerns raised during remedial planning activities at the Amnicola Dump site.

SECTION III. Summary of Major Comments Received During the Public Comment Period and EPA Responses to Those Comments: Both the comment and EPA's response are provided.

SECTION IV. Remaining Concerns: This section describes remaining community concerns that EPA should be aware of in conducting the remedial design and remedial action at the Amnicola Dump site.

I. OVERVIEW

With the issuance of the Proposed Plan to the public in February 1989, EPA presented its preferred alternative. This alternative addresses surface soil and ground water contamination at the site. The recommended alternative specified in the Record of Decision (ROD) includes: solidification/fixation of contaminated surface soils, imposition of land and ground water use restrictions, and the monitoring of ground water.

Only three sets of comments were received during the public comment period; two from residents, and the third from one of the Potentially Responsible Parties. Therefore, it is difficult to assess the community's preference for remediation of the site. One of the residents did, however, feel that the alternative cost too much and that no action was more appropriate.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

The Amnicola Dump site is located in an industrial area of the city of Chattanooga. The nearest resident is located approximately one mile to the northeast of the site. Community interest at the Amnicola Dump site is low as was indicated by participation at the December 1987 and February 1989 public meetings, the low number of inquiries received throughout the RI/FS, and the low number of comments received during the public comment period.

There are no active environmental or citizen groups following the progress of the site. This can probably be attributed to the location of the site in an industrial surrounding and the fact that the Remedial Investigation, as well as numerous sampling events prior to the RI, concluded that the site was having no negative impact on the surface water quality of the Tennessee River.

III. SUMMARY OF PUBLIC COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND EPA'S RESPONSES TO THOSE COMMENTS

1. A comment was made that remediation costs for the recommended alternative were too high, that EPA must stop putting millions into "non-dangers". An article in the Chattanooga News-Free Press, dated February 15, 1989, on the Amnicola Dump site was referenced in the comment. This article stated that "...the [Superfund] emphasis [should] be put on major problems while simply fencing and posting warning signs might be sufficient to avoid any danger from those [Amnicola Dump] of less magnitude."

EPA Response

The Public Health Evaluation, using Agency guidelines and policy for determining site risks, identified an unacceptable level of risk to site workers, site visitors, and potential future on-site residents if soil was ingested in the area of concern over a number of years. Fencing and warnings signs around the area of concern might deter ingestion of soil in that area; however, it is Agency policy to monitor a site for 30 years if contaminants are left in place above health-based levels. Therefore, fencing the area (No Action) would cost more than treatment of waste and not meet Superfund's preference for treatment. Solidification/Fixation represents the most cost-effective alternative for site deletion from the National Priorities List.

2. A comment was made that EPA should reconsider bioremediation as a treatment alternative. The following questions were also raised: (1) Was the sampling technique accurate and clean enough that PAHs were not introduced to greater depths of soil;

(2) Is it not likely that contamination is actually in the first 6" horizon;

(3) Was EPA's concern over clay soil from the standpoint of cap integrity breach;

(4) Did your bioremediation option consider tilling in composted organic material and turning a couple of times; and,

(5) Your risk assessment assumed that the PAH levels assumed that the PAH levels remained constant over 30 years. Will they not likely degrade before 30 years is up.

EPA Response

(1) Surface soil sampling at the Amnicola Dump site was conducted in accordance with U.S. EPA Region IV Standard Operating Procedures. Sample AD014, collected in the area requiring remediation, was collected from the top six inches of soil. PAHs were not introduced to greater depths during this sampling.

(2) Yes. It is likely that the PAHs of concern are in the top six to twelve inches. However, for the purposes of estimating volume of soil requiring cleanup, it was assumed that soil contamination above the cleanup goal existed at depths of up to two feet below ground surface. Traffic from the salvage business on-site may have forced the PAHs to greater depths than would have occurred naturally. Thus, a two foot depth was assumed. Sampling in the area of concern will be conducted during remedial design to get a more accurate vertical and lateral extent of contamination.

(3) This question is not understood. The concern over clay arose because of clay's impact on the feasibility and implementability of bioremediation. Bioremediation is most effective on sandy soils. Bioremediation was eliminated from further consideration during the screening of alternatives because of implementability and effectiveness concerns in light of the other more effective treatment technologies.

(4) Yes. Bioremediation was also screened out because it was felt that the large number of debris (scrap metal, concrete, bricks, etc.) in the surface and subsurface soil would inhibit the implementability of this technology. Tilling of the soil would require screening of the soil/debris mixture first.

(5) It is possible that the PAH compounds will degrade over 30 years. But there are no assurances that, if degradation is occurring, it will reduce the concentration of PAHs below the soil cleanup goal. Natural degradation is not a treatment technology.

3. A request to re-rank the site was made. It was felt that, given the results of the Remedial Investigation, the site would not receive a high enough score to be on the National Priorities List (NPL). An additional statement was made that the original factors used in the model to rank the site were flawed and the model should be refigured using the correct data.

EPA Response

To simply re-rank the site every time additional information is gathered on a site is neither the most efficient use of Agency resources nor is it the appropriate method for site deletion from the NPL. It is irrelevant that the PAHs that are driving site cleanup were not initially responsible for the site's placement on the NPL.

An unacceptable level of risk is associated with the potential ingestion of contaminated surface soil at the Amnicola Dump site; remediation of the defined area of concern is therefore justified and required.

Ranking of the site used information available at that time, along with assumptions as to the landfill's potential contents. Some assumptions, in the absence of extensive technical information gathered during a remedial investigation, are necessary to assess a site's potential risk to human health or the environment. To have assumed, during the ranking process, that the landfill did not contain hazardous wastes (in light of reports of hazardous waste disposal at the site and sample analyses of leachate streams), would have been irresponsible. The absence of latex wastes at the site can be explained as follows: (1) Either the reports concerning the disposal of latex waste at the site were false and the leachate sample analyses that indicated latex constituents present were not representative of site conditions, or (2) the latex wastes were flushed from the site and diluted in the Tennessee River below detectable quantities.

4. A comment was made that the site poses no hazard to the population. The following statements were used in an attempt to justify this claim:

(1) Only one soil sample from the site showed contamination in exce of EPA guidance on acceptable levels. Even that sample was marginally above acceptable limits. It was only by the assumption o an unrealistic level of contact with PAHs at the site that action was indicated under the "reasonable worst case".

(2) The study assumed that the PAHs were composed of 100% of the most dangerous of the PAHs, even though this substance comprised 20% or less of the total PAHs found on the site.

EPA Response

The site does pose an unacceptable level of risk to site workers, site visitors, and potential future site residents due to potential ingestion of contaminated surface soils.

(1) True, only one sample, AD014, contained a total carcinogenic PAH concentration above the soil cleanup goal. However, every surface soil sample collected, with the exception of the control sample, contained PAHs; thereby indicating that sample AD014 is representative of site conditions. It is irrelevant that the concentration of PAHs was only marginally above the cleanup goal. Whether the soil cleanup goal was exceeded by only 23 ppm (as in the case at Amnicola Dump) or by 2300 ppm, remediation is still required. The soil cleanup goals at the site ranged from 1.2 ppm to 122 ppm. It is felt that the cleanup goal selected, 100 ppm, is

appropriate for the waste type and industrial setting of Amnicola Dump. An "unrealistic" level of contact was not used. The public health evaluation followed standard Agency guidance, as outlined in the Superfund Public Health Evaluation manual, in calculating site risk.

(2) For PAHs, the approach adopted by EPA and used as the basis of the risk assessment is to divide the PAHs into two subclasses, carcinogenic and non-carcinogenic PAHs, and to apply a cancer potency factor derived from oral bioassays on benzo(a)pyrene to the subclass of carcinogenic PAHs. AD014 was comprised of 20% benzo(a)pyrene. Six other PAHs comprised the remaining 80%. Their carcinogenic potency is considered to be less than benzo(a)pyrene but this relationship cannot be adequately quantitated with the limited data available. Considering this uncertainty, it has been Agency policy to apply benzo(a)pyrene cancer potency values to PAH risk assessment procedures.

5. A comment was made that there is inadequate evidence that the railroad ties are a source of the PAHs. The following statements were used in an attempt to justify this claim:

(1) There was no consideration of the concept that burning at the landfill or the disposing of industrial material containing PAHs was the source.

(2) Burning of the type formerly conducted at the site, as well as industrial and construction wastes such as tar paper, are sources of PAH contamination.

(3) The fact that PAHs were found throughout the site and no creosote was found anywhere on the property should have caused further inquiry into their source. The EPA did not fully investigate to determine the source of these PAHs but erroneously made assumptions regarding their source.

<u>EPA Response</u>

(1) This statement is not true. All waste disposal practices at the Amnicola Dump site were evaluated during the Remedial Investigation. EPA is aware of the types of debris disposed at the dump as well as the practice of burning and disposing of wood wastes during the dump's period of operation, 1970 to 1973. EPA is also aware of the types of operations conducted by Amnicola Equipment and Materials Sales, the salvage operation currently located on the surface of the dump. Photographs and site visits indicated that creosoted railroad ties were burned, stored and handled on-site. Burn spots were observed, photographed and sampled. This type of activity most likely resulted in PAH contamination of the surface soils. Wood waste burning and disposal between 1970 and 1973 did result in the deposit of ashes throughout the site but in the interior of the dump.

The surface soil samples that contained the PAHs were collected in the top six to twelve inches, either on the bottom of the clay cap that once covered the site or on the surface of the dump. PAHs were also detected in subsurface soil samples within the dump area. These PAHs could possibly be attributed to past wood burning practices or other types of disposal, but subsurface PAHs are not driving remediation of the site. PAHs are often associated with creosote or coal tar products. Thus, the source of surface soil contamination by PAHs was attributed to the burning of creosoted railroad ties.

(2) See the above response.

(3) The fact that PAHs were found throughout the site does not preclude the railroad ties as a source. The observed traffic at the site by the on-site operation has spread the PAHs from their burning and storage location to other areas of the site.

6. A comment was made that there is inadequate explanation of how the Agency came up with the cost figures as many of the costs appear to be overestimated and undocumented.

EPA Response

The commenter is encouraged to review Section 5 of the Feasibility Study report, Cost Analysis, and Appendix B of the Feasibility Study Report, Present Worth Costing of Remedial Alternatives. All of the assumptions, general and specific, that went in to the calculation of costs for site remediation and O & M are provided in Appendix B.

IV. REMAINING CONCERNS

The community's concerns surrounding the Amnicola Dump site should be addressed through community relations support during the Remedial Design/Remedial Action (RD/RA).

Community relations support during the RD/RA should consist of making available final documents (i.e., Remedial Design Work Plan, Remedial Design Report, etc.) in a timely manner to the public information repository and issuance of fact sheets upon selection of a remedy and prior to remedial action. The community should be aware that at any time during the remedial design or remedial action, if new information is obtained on site conditions, the remedy will be re-evaluated to determine its effectiveness in protecting public health and the environment. If changes are necessary to the Record of Decision, these changes will be public noticed prior to implementation of the changes.

Community relations activities should remain an active aspect of the RD/RA phase of this project.

APPENDIX A

EQUATION FOR CALCULATING
RISK RELATED SOIL CLEANUP LEVELS

$$C_{soil} = D_t \times \frac{1}{(A_i \times I_i) + (A_d \times I_d) + (A_h \times I_h)} \times \frac{BW}{F}$$

C_{soil} = soil clean-up level (mg contaminant/kg soil)

D_t = acceptable daily dose (mg/kg/day)

A_i = absorption factor from oral exposre, (unitless)

I_i = intake by incidental oral ingestion of soil (kg/day)

A_D = absorption factor from dermal exposure (unitless)

I_D = soil deposition on exposed skin (kg/day)

A_h = absorption factor from respiratory exposure (unitless)

I_H = soil dust inhalation exposure (kg/day)

BW = body weigth (kg)

F = Frequency of exposure (days exposed/days lived (70 yrs.)

Soil clean up levels for total carcinogenic PAHs considering soil ingestion exposures described in the PHE

Upper bound risk level	Adult practical		Adult Worst Case		Child Resident	
	Soil levels (mg/kg) — absorption level					
	100%	25%	100%	25%	100%	25%
10^{-6}	1.2	4.9	0.2	0.84	0.02	0.87
10^{-5}	12.0	49.0	2.0	8.40	2.00	8.70
10^{-4}	122.0	490.0	20.0	84.00	20.00	87.00

APPENDIX B

ATTACHMENT
GROUND-WATER DILUTION ESTIMATE AND ACLs

Reference: Superfund Exposure Assessment Manual, EPA/540/1-88/001. Flow Characteristics of Tennessee Streams, USGS & TN Dept. of Conservation, 1965.

1. Estimate ground-water discharge rate across front of landfill into Nickajack Reservoir.

Q=KiA where Q = ground-water discharge in cfd;
K = average hydraulic conductivity of unconfined aquifer in ft/d;
i = hydraulic gradient across site (dimensionless).

K = 13 gpd/sq. ft. = 1.738 ft/d. [see RI].
i = (24.0 ft - 22.2 ft)/700 ft = 0.00257 [MW-3 to MW-5, 3-9-88].
A = 35 ft x 950 ft = 33,250 sq. ft.

Q = (1.738 ft/d)(0.00257)(33,250 sq. ft.) = 148.5 cfd = 0.00172 cfs.

2. Estimate flow in affected portion of Nickajack Reservoir.

Reservoir flow rate = 1200 cfs [lowest mean discharge, in cfs, of record]. Consider flow rate through one-quarter of reservoir [see ACL guidance document, p. 6-3, July, 1987].

Q(reservoir) = 1200 cfs / 4 = 300 cfs.

3. Estimate diluted concentration in one-quarter of cross-sectional flow of Nickajack Reservoir.

C = [(Ce)(Qe)]/Qt where C = reservoir concentration (ppb);
Ce = contaminant concentration in ground water (ppb);
Qe = ground-water discharge (cfs);
Qt = total flow (ground-water discharge plus reservoir flow) in cfs.

Equation reference: p. 53, Superfund Exposure Assessment Manual.
Dilution factor = Qe/Qt = 0.00172/300.00172 = 5.7E-06.
The dilution factor multiplied by the contaminant concentration in ground water will result in the diluted concentration in one-quarter of the reservoir flow.

Contaminant	Ce (ppb)	C (ppb)	ACL (ppb)
Caprolactam	2	1.1E-05	20
Diethyltetrahydrofuran	30	1.7E-04	300
Chloroform	8.6	4.9E-05	86
Bromodichloromethane	4.6	2.6E-05	46
Ethyl ether	5.0	2.9E-05	50
Chromium	89	5.1E-04	890
Bis(2-ethylhexyl)phthalate	370	2.1E-03	3700
Bis(dimethylethyl)methylphenol	10	5.7E-05	100

APPENDIX C

Site:
Break: 16 1
Other:

United States Department of the Interior
FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES FIELD OFFICE
100 OTIS STREET, ROOM 224
ASHEVILLE, NORTH CAROLINA 28801

June 17, 1987

IN REPLY REFER TO
LOG NO. 4-2-87-406

Mr. Thomas M. Roth
Remedial Project Manager
Emergency and Remedial Response Branch
U.S. Environmental Protection Agency
345 Courtland Street
Atlanta, Georgia 30365

ERRB/RAS
RECEIVED
JUN 19 1987
EPA-REGION IV
ATLANTA, GA

Dear Mr. Roth:

Your May 19, 1987, letter regarding the proposed remedial investigation of the Amnicola Dump hazardous waste site in Hamilton County, Tennessee, was received May 28, 1987. We have reviewed the project as requested with regard to endangered and threatened species.

The attached page lists the federally listed endangered (E) and/or threatened (T) and/or species proposed for listing as endangered (PE) or threatened (PT) which may occur in the area of influence of this action.

The legal responsibilities of a Federal agency under Section 7 of the Endangered Species Act of 1973 (as amended) were detailed in material sent to you previously. If you would like another copy of this material, or if you have questions, please contact us at 704/259-0321 (FTS 672-0321).

Your concern for endangered species is appreciated, and we look forward to working with you on endangered species matters in the future.

Sincerely yours,

V. Gary Henry

V. Gary Henry
Acting Field Supervisor

CC:
Mr. Bob Hatcher, Tennessee Wildlife Resources Agency, Nashville, TN
Mr. Dan Eager, Program Administrator, Ecological Services Division, Tennessee Department of Conservation, 701 Broadway, Nashville, TN 37219
Field Supervisor, ES, FWS, Cookeville, TN

Site: ____
Break: 16.1
Other: ____

United States Department of the Interior
FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES FIELD OFFICE
100 OTIS STREET, ROOM 224
ASHEVILLE, NORTH CAROLINA 28801

IN REPLY REFER TO
LOG NO. 4-2-87-406

ERRB/RAS
RECEIVED
JUN 19 1987
EPA-REGION IV
ATLANTA, GA

LISTED SPECIES

FISHES

Snail darter - *Percina tanasi* (T)

CLAMS

Orange-footed pearly mussel - *Plethobasus cooperianus* (E)
Pink mucket pearly mussel - *Lampsilis orbiculata* (E)

STATUS REVIEW SPECIES

"Status Review" (SR) species are not legally protected under the Endangered Species Act, and are not subject to any of its provisions, including Section 7, until they are formally proposed or listed as endangered/threatened. We are including these species in our response for the purpose of giving you advance notification. These species may be listed in the future, at which time they will be protected under the Endangered Species Act. In the meantime, we would appreciate anything you might do to avoid impacting them.

PLANTS

False foxglove - *Aureolaria patula*
Carey's saxifrage - *Saxifraga careyana*

APPENDIX D

Site:
Break: 3.1
Other:

EMER. RESP.
RECEIVED
JAN 02 1986
EPA-REGION IV
ATLANTA, GA.

TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF CONSERVATION
701 BROADWAY
NASHVILLE, TENNESSEE 37203
615/742-6716

December 16, 1985

Jack E. Raven
Environmental Protection Agency, Region IV
345 Courtland Street
Atlanta, Georgia 30365

Re: Intergovernmental Review, Amnicola Dump Site, Chattanooga, Hamilton County, CH# 86-0477

Dear Mr. Raven:

The above proposed undertaking has been reviewed with regard to National Historic Preservation Act compliance by the participating federal agency or its designated representative. Procedures for implementing Section 106 of the Act are codified at 36 CFR 800 (44 FR 6068-6081, Jan. 30, 1979).

Based on the information available, it is our opinion that due to the location, scope, and nature of the undertaking the project will have no effect on National Register or eligible properties. Therefore, unless project plans are changed or National Register eligible properties are discovered during project implementation, no additional action is necessary to comply with the Act.

The applicant or federal agency should keep this letter as evidence of compliance with Section 106. Any questions or comments should be directed to Joe Garrison. Your cooperation is appreciated.

Sincerely,

Herbert L. Harper

Herbert L. Harper,
Executive Director and
Deputy State Historic
Preservation Officer

HLH:jk