INTERIM ACTION RECORD OF DECISION

for the

Koppers Co., Inc. (Charleston Plant) NPL Site
Charleston, Charleston County, South Carolina
March 1995

RECORD OF DECISION DECLARATION

SITE NAME AND LOCATION

Koppers Co., Inc. (Charleston Plant) NPL Site
Charleston County, Charleston, South Carolina

STATEMENT AND BASIS OF PURPOSE

This decision document presents the selected Interim Remedial Action for the Koppers Co., Inc. (Charleston Plant) NPL Site in Charleston, South Carolina, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

The State of South Carolina concurs with the selected Interim Remedial Action.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Interim Action ROD, may present imminent and substantial endangerment to public health, welfare or the environment.

DESCRIPTION OF THE INTERIM REMEDY

The interim remedy is designed to address the principal threat posed by the site in the short-term while a final long-term remedial solution for the site is being developed. The primary objective of the interim action is to mitigate off-site migration of nonaqueous phase liquid (NAPL) from the Former Treatment Area to the eastern end of the Milford Street Drainage Ditch and to mitigate a current/future potential risk to human health posed by exposure to sediments and surface waters of the Milford Street and Hagood Avenue Drainage Ditches. The interim action remedy will be consistent with, and an integral component of, the final site-wide remedy.

The major components of the selected interim remedy include:

- An interceptor trench and sump to eliminate off-site migration of NAPL to the eastern end of the Milford Street Drainage Ditch;
- Collection and treatment of recovered groundwater/NAPL and discharge to a selected discharge point;

- Permanent reconstruction of the Milford Street Drainage Ditch to eliminate exposure to sediment and to mitigate potential NAPL migration;

- Inspection of the subsurface drainage system which connects the Milford Street and Hagood Avenue drainage systems, followed by necessary repairs to mitigate the existing drainage system as a conduit for potential migration of constituents and NAPL to the Hagood Avenue Drainage System;

- Permanent reconstruction of the Hagood Avenue Drainage Ditch to eliminate exposure to sediment; and

- Extraction well technology to mitigate off-site migration of NAPL in the intermediate water-bearing unit underlying the Former Treatment Area.

STATUTORY DETERMINATIONS

This interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this limited-scope action, and is cost-effective. Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and thus is in furtherance of that statutory mandate. Because this action does not constitute the final remedy for the site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions are planned to fully address the threats posed by the conditions at this site. Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of this site and of this remedy will be ongoing as EPA continues to develop final remedial alternatives.

Richard D. Green (signature) — 29 MAR 95

Richard D. Green, Associate Director
Office of Superfund and Emergency Response
Waste Management Division
EPA-Region IV

DATE

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1.0 SITE NAME, LOCATION, AND DESCRIPTION

The Koppers Co., Inc. (Charleston Plant) Superfund site (hereinafter referred to as "the site") is located in the Charleston Heights section of Charleston, SC and lies to the north of downtown Charleston on the west side of the peninsula formed by the Ashley and Cooper Rivers. The general location of the site is depicted in Figure 1. The site is approximately 102 acres in size and consists of a number of parcels of property that currently contain a variety of commercial operations. The present use of the area surrounding the site to the north, south, and east consists of a mixture of industrial, commercial and residential properties. The Ashley River borders the site to the west. The total resident, student, and worker population within a 4-mile radius of the site is approximately 150,000.

The specific boundaries of the site are illustrated on Figure 2. The parcel of property bound to the north by Milford Street, to the south by Braswell Street, to the east by Interstate 26, and to the west by the Ashley River represents an approximate 45 acre parcel. This 45 acre parcel was previously owned by the Koppers Company from 1940 to 1978 and was used during their wood-treating operations. In 1988, BNS Acquisitions, Inc. acquired the outstanding common stock of Koppers Co., Inc. In 1989, BNS Acquisitions merged into Koppers Company, Inc., with Koppers Company, Inc. being the surviving corporation. The company underwent a name change to Beazer Materials and Services, Inc. and in 1990, that name was changed to Beazer East, Inc. (Beazer).

The remaining portion of the site, which comprises approximately 57 acres located south and adjacent to the former Koppers property, was never owned by Koppers. These 57 acres were part of a larger tract of land (the entire area south of Braswell Street) owned by the Ashepoo Phosphate Works, which operated a phosphate plant there beginning around the turn of the century. The property was used for phosphate and fertilizer operations by a series of owners until 1978. In 1984, a fish kill occurred in the Ashley River after a barge canal was dredged on the property and sediments released to the river. EPA incorporated these 57 acres into the site boundaries to determine the environmental impact that the dredging operations had on the Ashley River and surrounding environment.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 Wood-Treating Operations

Wood-treating operations at the site began in the early 1900's, when a wood-treating facility was built in the eastern portion of the site. Koppers acquired the property (north of Braswell Street, south of Milford Street, and adjacent to the Ashley River) in 1940 and continued to operate it as a wood-treating facility until 1977 when wood-treating operations ceased. In 1978, the property was sold to Braswell Shipyards, Inc. (now known as Braswell Services Group, Inc.) which

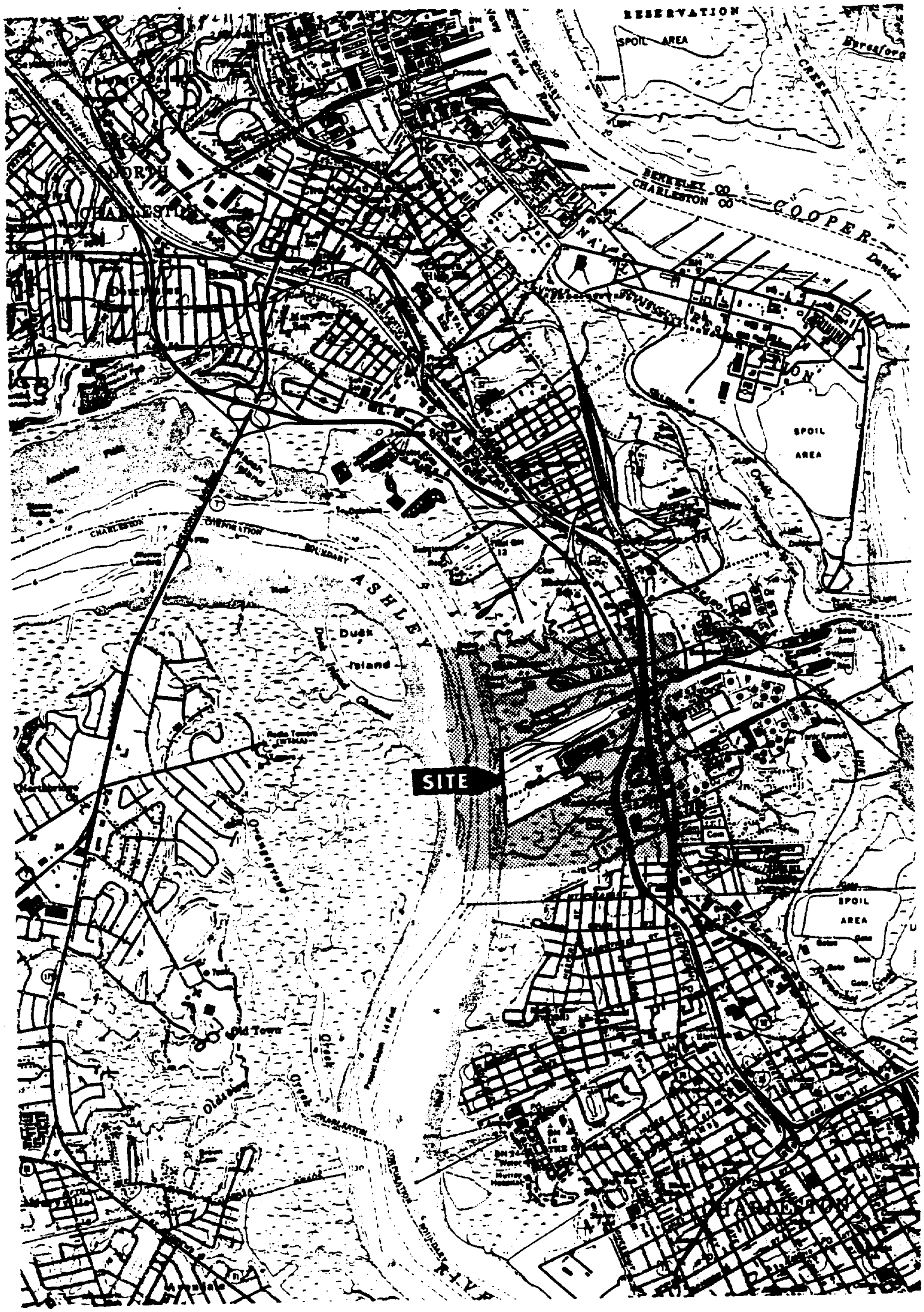

FIGURE 1
SITE AREA MAP
Koppers Co., Inc. (Charleston Plant) Site

Source: Beazer East, Inc., Pittsburgh, PA

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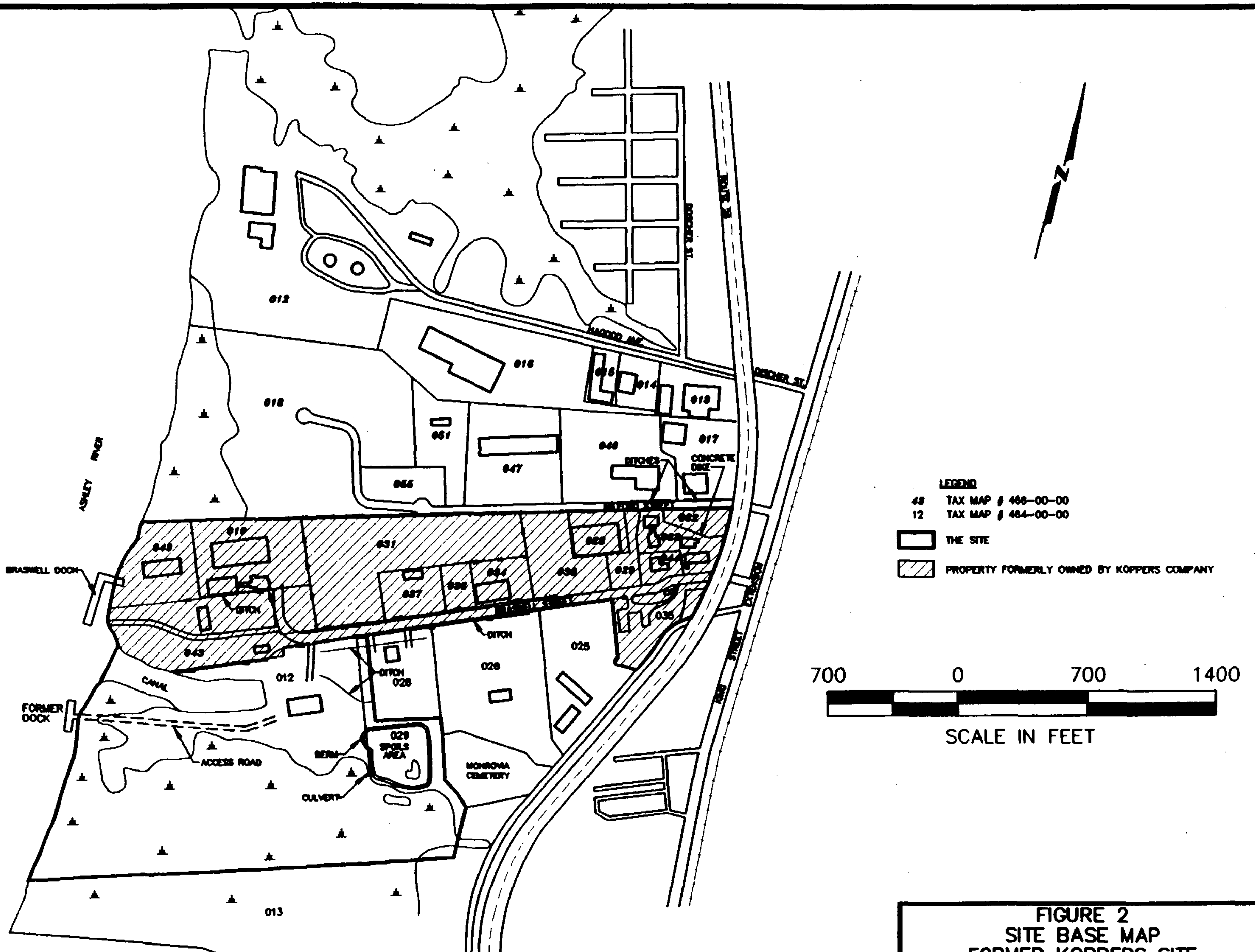

SOURCE: BEAZER EAST, INC. PITTSBURG, PA 1995

FIGURE 2
SITE BASE MAP
FORMER KOPPERS SITE
CHARLESTON, SC

subdivided the property into a number of parcels and sold all but two. Braswell Shipyards later re-acquired one of the parcels and, since 1978, has operated a military ship cleaning, repair, and refurbishing business on two parcels in the northwest corner of the site. In 1994, Beazer acquired the three parcels from Braswell Shipyards, Inc.

Koppers' wood-treating operations consisted primarily of treating raw lumber and utility poles with creosote. For short periods of time, pentachlorophenol (penta) and copper chromium arsenate (CCA) were also used as preservatives in the wood-treating process. The plant processed poles for utilities such as the power company and the telephone company, foundation pilings for construction of buildings, docks and wharfs, and railroad ties, cross ties, switch ties, bridge timbers, and other railroad materials. The volume of wood treated at the site was approximately 200,000 cubic feet per month.

The majority of wood-treating operations were conducted in the eastern portion of the site, now identified as the former Treatment Area (See Figure 3). In the Former Treatment Area, Koppers maintained numerous above-ground storage tanks for the storage of wood-preservatives. The tank farm area in the northeastern corner of the Former Treatment Area contained six above-ground storage tanks ranging in size from 50,000 to 650,000 gallons. Koppers also maintained six above-ground working tanks, four of which were on an elevated platform, located east of the treatment building. When penta and CCA were in use, separate working tanks contained these preservatives. When needed, the creosote was pumped through a pipeline from the storage tanks in the tank farm to the working tanks. The wood-preservatives were then cycled between the working tanks and the treatment cylinders during the treatment process.

Once the virgin lumber was sized, seasoned, or otherwise made ready for treatment, it was pressure treated in one of four pressure treating cylinders. One pressure treating cylinder was dedicated to treating with both penta and CCA, and the remaining three were used exclusively for creosote. All treating cylinders were cylindrical vessels 133 feet long and 8 feet in diameter with a door at one end. Generally, the wood was loaded onto tram cars which were pushed into the cylinders. The cylinder was sealed, a vacuum was applied to remove most of the air from the cylinder and wood cells, and the wood was impregnated with the wood-preservative. At the end of the treatment process, the excess wood-preservative was pumped from the cylinder to the working tanks for re-use. A final vacuum was then placed on the treatment cylinder and any additional wood-preservative drawn out of the wood. The cylinder door was then opened and the trams, loaded with treated wood, were pulled from the cylinder onto the drip tracks.

The Drip Track Area (Figure 3) extended from the Treatment Area in the eastern portion of the site to approximately two thirds of the way to the Ashley River and parallel to the southern Koppers property boundary. The drip tracks were elevated above the rest of the site by 5 to 6 feet. These tracks

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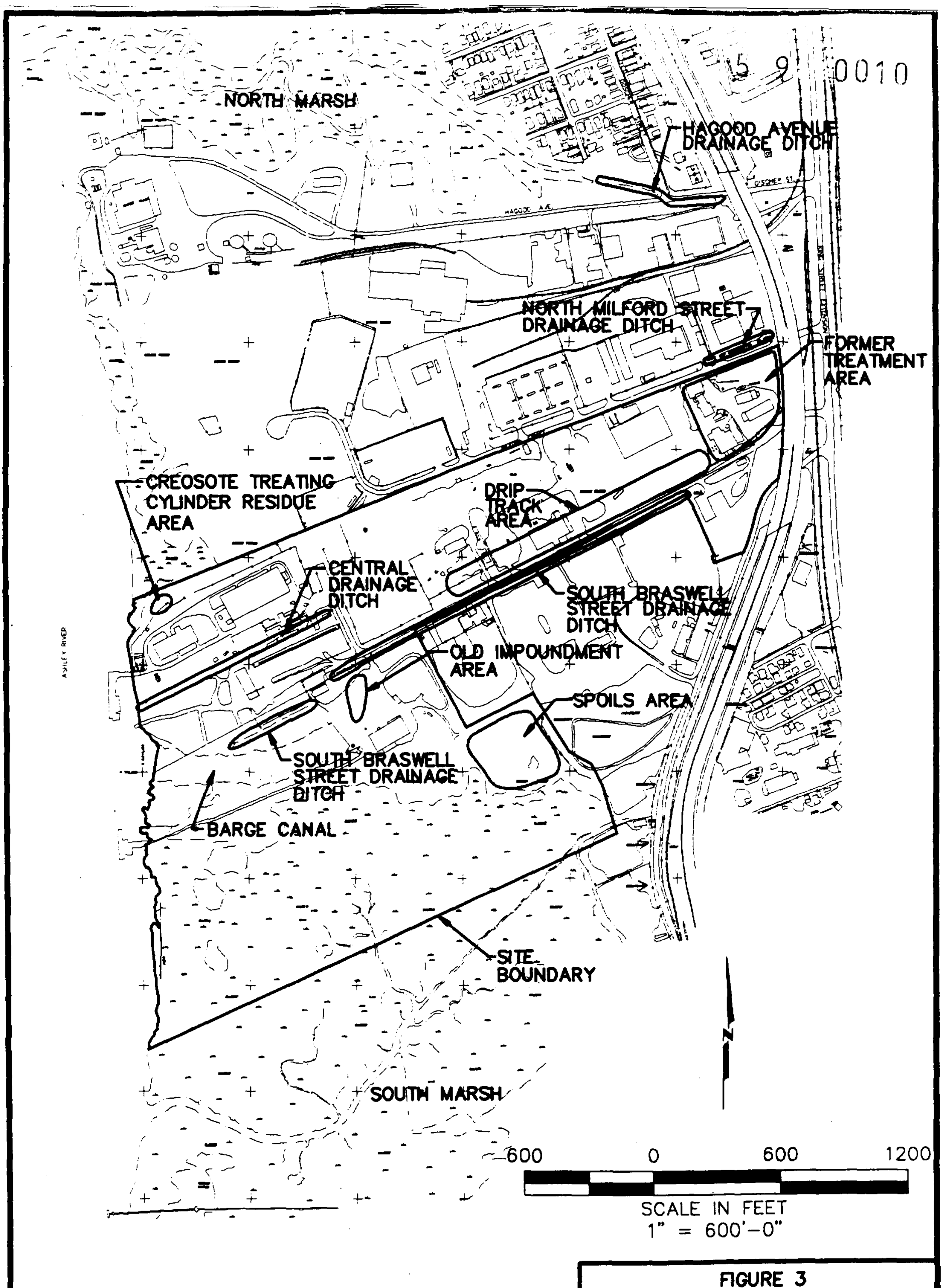

FIGURE 3
SITE BASE MAP
FORMER KOPPERS SITE
CHARLESTON, SC

SOURCE: BEAZER EAST, INC., PITTSBURGH, PA., 1995

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were constructed at this elevation when the facility was built to facilitate manual movement of treated wood during off loading to a vehicle for transport from the site. Treated wood was either shipped directly to the customer or stored on-site.

During the treatment process, wastewater was generated when steam was used to remove moisture from the wood and from the boiler system. The wastewater from the treatment process contained oils, creosote, and other solids. The wastewater was recovered in a sump pit located adjacent to the treatment cylinders and pumped to a series of six Separation Tanks located near the Treatment Area just south of Braswell Street. Creosote, which has a density greater than water, would settle to the bottom of the sump pit and Separation Tanks. This creosote was recovered, pumped to a dehydrator to remove excess moisture, and then to the working tanks for re-use. Water from the Separation Tanks was discharged to a ditch, now known as the South Braswell Street Drainage Ditch, which flowed eastward to the Ashley River. On occasion, the volume of the Separation Tanks was not sufficient to handle all the material coming from the sump pit and creosote would overflow into the South Braswell Street Drainage Ditch. Historical aerial photographs and sampling conducted during the RI indicate that creosote constituents were transported with wastewater and surface water run-off along the South Braswell Street Drainage Ditch into the Old Impoundment Area (Figure 3). After the mid 1960's, wastewater from the Separation Tanks was discharged to the publicly owned treatment works (POTW).

Residues that settled to the bottom of the treatment cylinders were removed periodically when accumulations interfered with the treatment processes. Most of the material removed was sand and bark which were coated with creosote. The creosote residue was transported by rail and deposited in the northwestern corner of the site in an area now referred to as the Creosote Treating Cylinder Residue Area (Figure 3). This practice was discontinued in the mid 1960's when residue materials were hauled off-site by a private waste hauler. In addition, a four-acre tract of land in the northwest corner of the former Ashepoo Phosphate Works property (south of Braswell Street) was leased by Koppers from 1953 to 1968 for the stated purpose of depositing sawdust, bark, and other wood waste materials resulting from stripping operations.

2.2 Subsequent Site Operations

Subsequent to Koppers' operations, the Former Treatment Area was used by several industries leasing the properties. The creosote storage tanks in the Tank Farm Area were used by Fed-Serv Industries in the early 1980's to store waste oil. From 1978-1982, Pepper Industries utilized the working tanks to store ship bilge and tank wastes.

As discussed above, Braswell Shipyards has operated a commercial and military ship cleaning, repair, and refurbishing business on the northwest corner of the site since 1978. In operating this shipyard, Braswell has been required to pump bilges and to handle solvents and paint. Braswell operations also include ship paint removal using "Black Beauty" or "Black Diamond" carbon blasting. The parcel of property just south of Braswell Shipyards is used by Parker Marine, Inc. for prefabrication of marine structures.

The 57 acre parcel south and adjacent to the former Koppers property was used by a series of owners to produce fertilizers and phosphates from around the turn of the century to 1978. In November 1984, after obtaining a permit from the U.S. Army Corps of Engineers, Southern Dredging dredged a barge canal approximately 1000 feet inward from the Ashley River (Figure 3). Slurry material from the canal dredging was pumped approximately 700 feet east of the barge canal and deposited in a bermed spoils area. Water was allowed to flow over a culvert into the South Tidal Marsh while solids settled out and were deposited in the bermed spoils area. As a result of this dredging operation, South Carolina regulatory personnel responded to the presence of exposed creosoted poles, highly turbid water and an oily sheen on the Ashley River adjacent to the canal. Approximately 100 dead fish were observed in the Ashley River within ¼ mile downstream of the canal. It is believed that this barge canal was dredged in the area formerly leased by Koppers for the disposal of wood waste materials resulting from their stripping operations.

2.3 Previous Removal Actions and Investigations

The first area to be investigated on-site was the Pepper Industries facility which utilized the former working tanks and wood treatment building. After Pepper Industries abandoned the property in November 1982, Braswell Shipyards notified the South Carolina Department of Health and Environmental Control (SCDHEC) that the tanks were leaking their contents. Sampling and analysis indicated that the tanks contained various oils, contaminated water, and oily sludges. Under an Administrative Order on Consent (AOC) issued by SCDHEC in August 1983, Pepper Industries began a cleanup operation in the working tank area, but later declared bankruptcy and ceased all cleanup activities. Braswell Shipyards performed a cleanup operation of the Pepper Industries property in January 1987, during which they removed all the tanks and containers on the property and arranged for proper disposal of the wastes. Koppers financed half the expense of this cleanup operation.

Historical investigations conducted from 1983-1985 by SCDHEC and EPA-Region IV revealed numerous releases of waste oil from the storage tanks in the Tank Farm Area leased by Fed Serv Industries. Under an AOC issued by EPA in March 1985, Fed Serv, Koppers and a suite of other entities initiated emergency response actions at the former Tank Farm Area. The activities conducted at this time included proper disposal of material in the tanks, dismantling of the tanks, and excavation and disposal of soils.

As a follow-up to Site Inspections conducted by EPA and SCDHEC regarding activities conducted by Pepper Industries, Fed Serv, and Southern Dredging, EPA initiated a Site Inspection in

1988 on the former Koppers Wood Treating Plant to gather the necessary information required to prepare the Hazard Ranking System (HRS) package. Based upon the results of this investigation, the Koppers Co., Inc. (Charleston Plant) Site received a HRS score of 50 due to the release of wood-treating constituents via the surface water pathway. The site was proposed for inclusion on the National Priorities List (NPL) in February 1992 and became Final in December 1994.

In January 1993, Beazer entered into an AOC with EPA for the performance of a Remedial Investigation/Feasibility Study (RI/FS) at the site. Beazer retained ENSR Consulting & Engineering (ENSR) of Acton, MA to conduct the work required to complete the RI/FS process. EPA and SCDHEC provided oversight of all work conducted during the RI/FS. The RI Report and Technical Memorandum for Interim Remedial Measures were prepared by ENSR and accepted as Final by EPA in January 1995. The data presented in these reports, which is summarized in this Interim Remedial Action Record of Decision (ROD), provides the rationale for proceeding with interim action in the Former Treatment Area of the site.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

In late April 1993, EPA conducted community interviews to determine the public's concerns related to the Koppers site. In May 1993, EPA issued a fact sheet to local citizens and public officials announcing the initiation of RI/FS activities at the site. Concurrent with the release of this fact sheet, the Final RI/FS Work Plan documents were submitted for public review to the information repositories located at EPA's office in Atlanta, GA and the Charleston County Main Library in Charleston, SC. On May 25, 1993, EPA held an RI Kick-Off Public Meeting at the Charleston Public Works Building in Charleston, SC to provide a description of the Superfund process, the work to be performed, and to answer any questions regarding the site.

In January 1995, EPA released a summary publication titled, *"Superfund Remedial Investigation Findings and Proposed Interim Remedial Action Fact Sheet"* to local citizens and public officials. This fact sheet is attached to this document as Appendix C. The stated purpose of this fact sheet was to provide the reader with a description of the site and a brief history, summarize the findings of the RI and the human health Baseline Risk Assessment, and outline EPA's proposed approach for Interim Remedial Action at the site. The Final RI Report, Final Human Health Baseline Risk Assessment (BRA), Technical Memorandum for Interim Remedial Measures and other site related documents were assembled in an Administrative Record (AR) and submitted to the information repositories above for public review and information concurrent with the release of the fact sheet.

A notice to area citizens regarding the availability of the site AR, EPA's proposed approach for interim remedial measures, and initiation of the 30-day public comment period was published in Charleston's daily newspaper, *The Post and Courier*, on January

19, 1995. A formal public comment period was held from January 20 through February 21, 1995. EPA held a public meeting on January 26, 1995 at the Charleston Public Works Building to present the results of the RI, BRA, and rationale behind the proposed interim remedial action. This meeting was attended by approximately 50 people.

A response to comments received during the January 26, 1995 meeting and 30-day public comment period is included in the Responsiveness Summary, which is attached to this Interim Action ROD as Appendix B. This decision document presents the selected Interim Remedial Action for the Koppers Co., Inc. (Charleston Plant) NPL site, chosen in accordance with CERCLA, amended by SARA, and in accordance with the National Contingency Plan. The decision for this site is based on the materials in the AR and comments received during the public comment period.

4.0 SCOPE AND ROLE OF THE INTERIM ACTION WITHIN SITE STRATEGY

The primary objective of the interim action is to mitigate off-site migration of nonaqueous phase liquid (NAPL) from the Former Treatment Area to the eastern end of the Milford Street Drainage Ditch in order to expedite remediation of a potential risk to human health and the environment. The means by which this objective will be accomplished are divided into four fundamental steps and are described in detail in Section 9.0 - The Selected Remedy of this decision document.

The interim action is designed to address the principal threat posed by the site in the short-term while a final long-term remedial solution for the site is being developed. Following completion of the site-wide Feasibility Study, EPA will issue a Proposed Plan for a final remedial action at this site. The final remedy will address unacceptable risk levels posed to human health and the environment by other media (surface/subsurface soil, sediment, surface water) in addition to groundwater. The interim action will provide valuable operational data to optimize site-wide remediation of the NAPL and groundwater. To the extent possible, the Interim Action is designed to be compatible with the final remediation plans for this site. Under the current schedule, the Final ROD for this site is expected to be issued by early 1996.

5.0 SUMMARY OF SITE CHARACTERISTICS

This interim action is concerned with mitigation of off-site migration of NAPL from the Former Treatment Area. Therefore, this section provides a summary of those site characteristics most related to this general area of the site. The reader is referred to the Final RI Report and Technical Memorandum for Interim Remedial Measures for a more detailed, comprehensive description of site characteristics and contamination present.

5.1 Geology and Hydrogeology

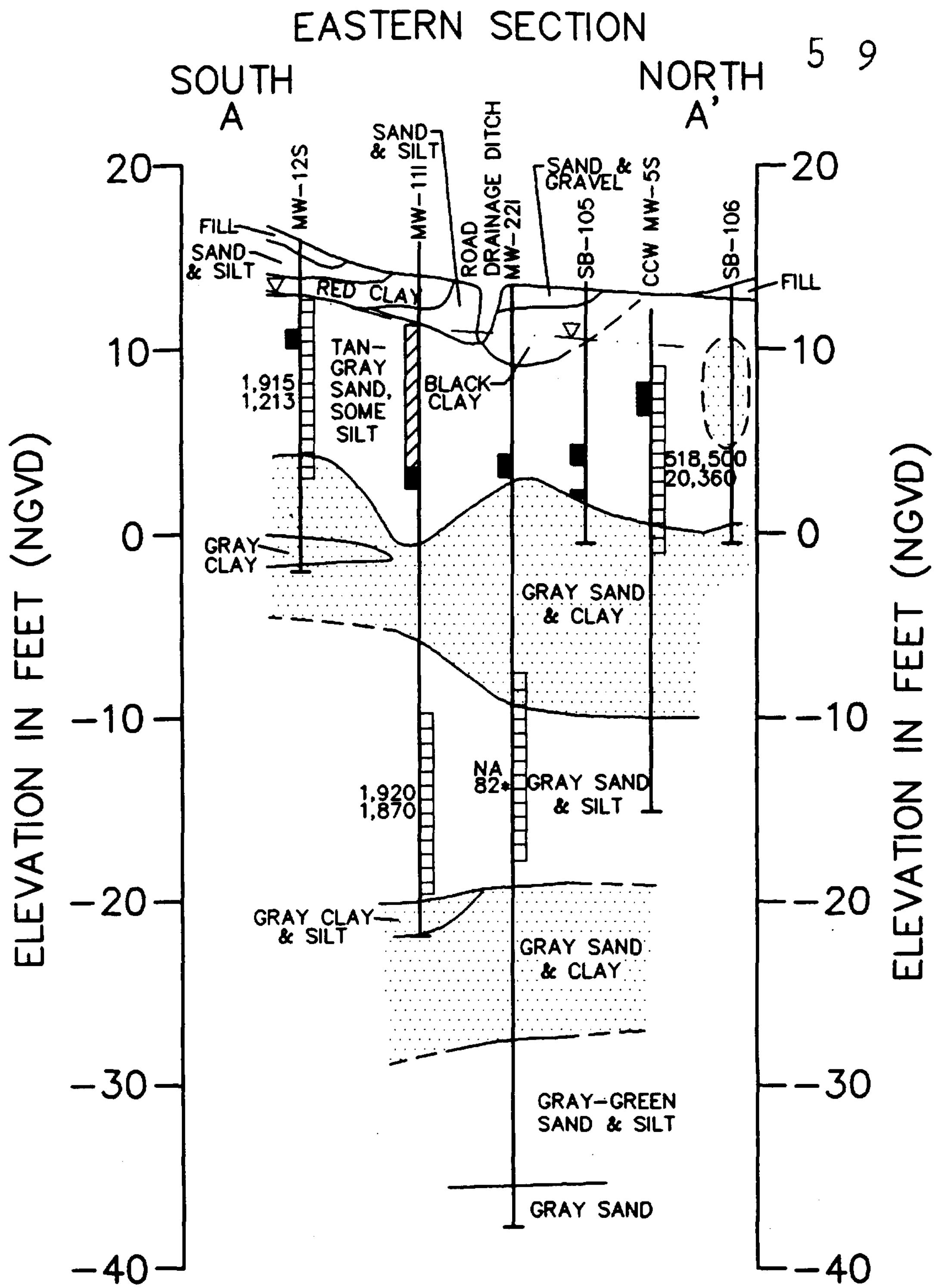
Boring logs from the RI and past investigations have been used to develop an understanding of the stratigraphy and hydrogeology underlying the Former Treatment Area. Three cross-sections on Figures 4, 5, and 6 illustrate the subsurface stratigraphy of the Former Treatment Area. Please refer to Figure 9 in Section 5.2 for applicable boring and monitoring well locations in the Former Treatment Area of the site.

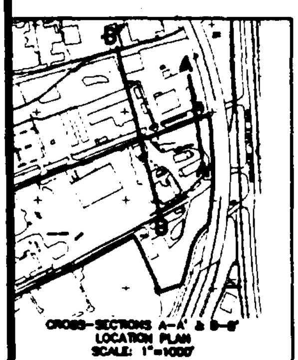
The eastern north-south cross section (transect A-A' on Figure 4) best illustrates the first three lithologic units. the first unit observed in a tan-gray silty sand extending to depths of 11 to 16 feet below grade. Grain size analyses indicate that this unit, hereinafter referred to as the shallow-water bearing zone, is made up of 0.0 to 14.6 percent gravel, 81.4 to 95.4 percent sand, and 4.0 to 4.6 percent silt/clay. Beneath the shallow-water bearing zone is a 5 to 13 foot thick sand and clay unit referred to as the shallow clay zone. Based on boring logs, this zone is believed to extend north at least as far as CCW MW-5S and south to MW-20D. The third lithologic unit, called the intermediate water-bearing zone, is a gray sand and silt unit. Grain size analysis of this unit indicates that it is made up of 5.5 percent gravel, 90.5 percent sand and 4.0 percent silt/clay.

The fourth lithologic unit encountered is a gray clay to gray sand and clay located beneath the intermediate water-bearing zone. The top of this intermediate clay zone is located about 33 to 38 feet below grade and the unit ranges in thickness from 3 to 9 feet. The intermediate clay zone extends beneath the entire Former Treatment Area. The fifth lithologic unit, the deep water-bearing zone, is a gray-green sand and silt 5 to 14 feet thick. The Cooper Marl is the sixth unit encountered and is located approximately 56 to 58 feet below grade in the Former Treatment Area. The Cooper Marl formation is reportedly 260 feet thick in the study area.

The east-west cross section (Figure 6) illustrates that the shallow clay zone pinches out somewhere between SB-99 and CPW W-1I. As a result, the shallow and intermediate water-bearing zones are one unit in the western portion of the Former Treatment Area. The western north-south cross section (transect B-B' on Figure 5) shows that the shallow/intermediate water-bearing unit reaches depths of 32 to 38 feet below grade and extends south to MW-09I and north to CPW W-5D.

Due to the discontinuity of the shallow clay zone, the shallow and intermediate water-bearing zones are considered to be on interconnected unit. The water table in this zone is located between 2.5 and 7.5 feet below grade. Groundwater in the shallow/intermediate zone flows to the north with a gradient of approximately 0.006 (See Figure 7). A pumping test performed on PW-01S indicates that this zone has a transmissivity of approximately 0.0834 ft^2/min and a hydraulic conductivity of 0.0076 ft/min (3.9 x 10^{-3} cm/sec) resulting in a predicted groundwater flow velocity of approximately 80 ft/yr to the north. A flexible wall permeameter test indicates that the shallow clay





LEGEND

- WELL BORING AND SCREEN LOCATION
- NAPL SATURATED SOILS
- STRINGERS OF NAPL IN SOILS
- 1,920 PHASE I SAMPLING / 1,870 PHASE II SAMPLING — TOTAL PAH CONCENTRATION IN GROUNDWATER (ug/L)
- NA — NOT AVAILABLE
- * — VALUE CALCULATED BASED ON ONE-HALF OF DETECTION LIMIT
- ▽ — WATER TABLE FOR SHALLOW/INTERMEDIATE WATER BEARING UNIT AS MEASURED 3/9/94
- LOW PERMEABILITY ZONES

VERTICAL EXAGGERATION 20:1

9

0 180

SCALE IN FEET

SOURCE: BEAZER EAST, INC. PITTSBURG, PA 1995

FIGURE 4
NORTH-SOUTH
GEOLOGIC CROSS-SECTION A-A'
FORMER KOPPERS SITE
CHARLESTON, SC

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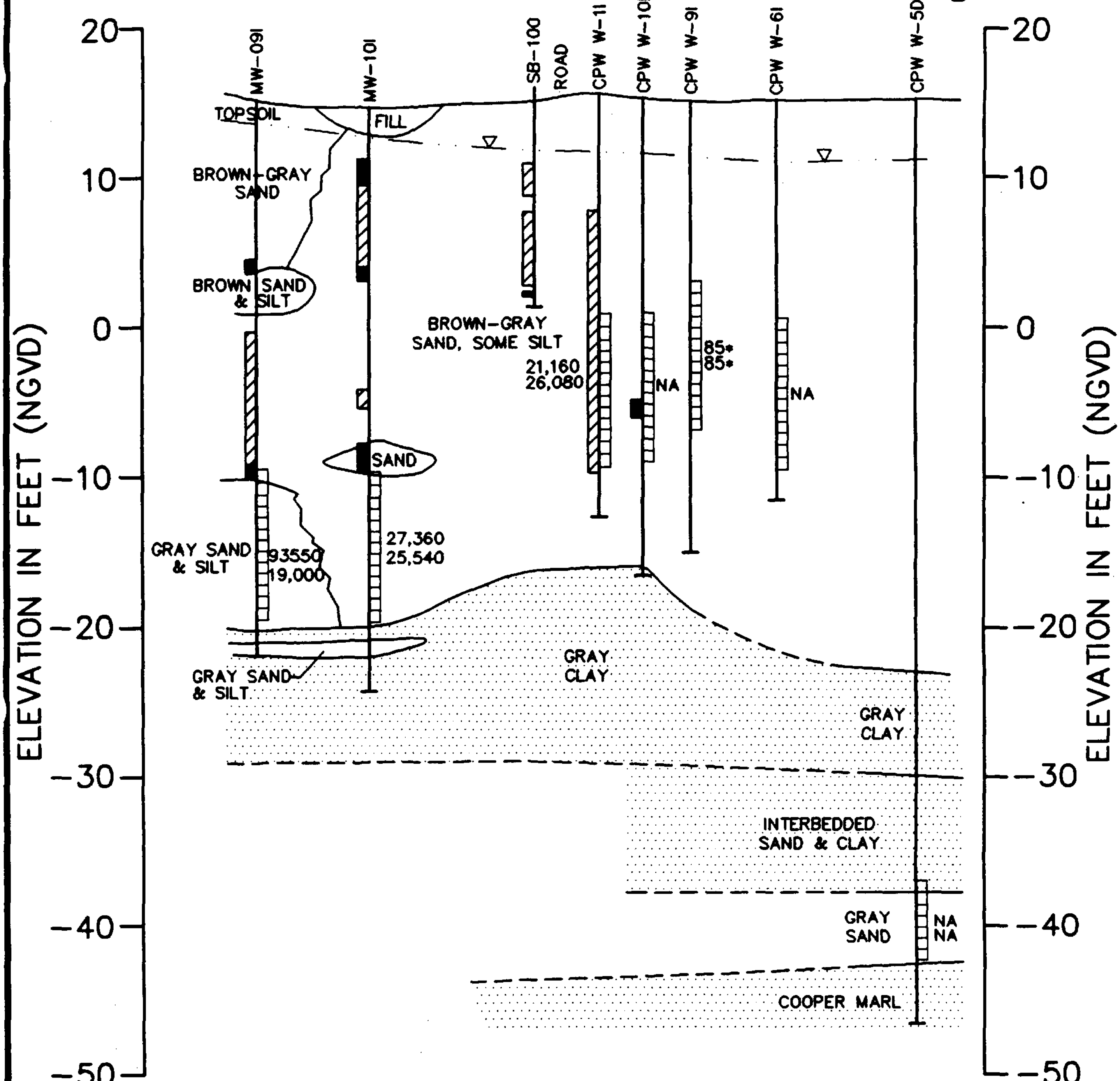
WESTERN SECTION

SOUTH
B

NORTH
B'



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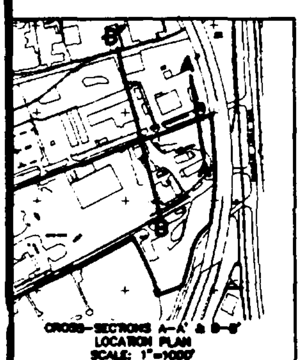
VERTICAL EXAGGERATION 20:1

10 / 0 / 200 SCALE IN FEET



SOURCE: BEAZER EAST, INC. PITTSBURG, PA 1995

FIGURE 5
NORTH-SOUTH
GEOLOGIC CROSS-SECTION B-B'
FORMER KOPPERS SITE
CHARLESTON, SC

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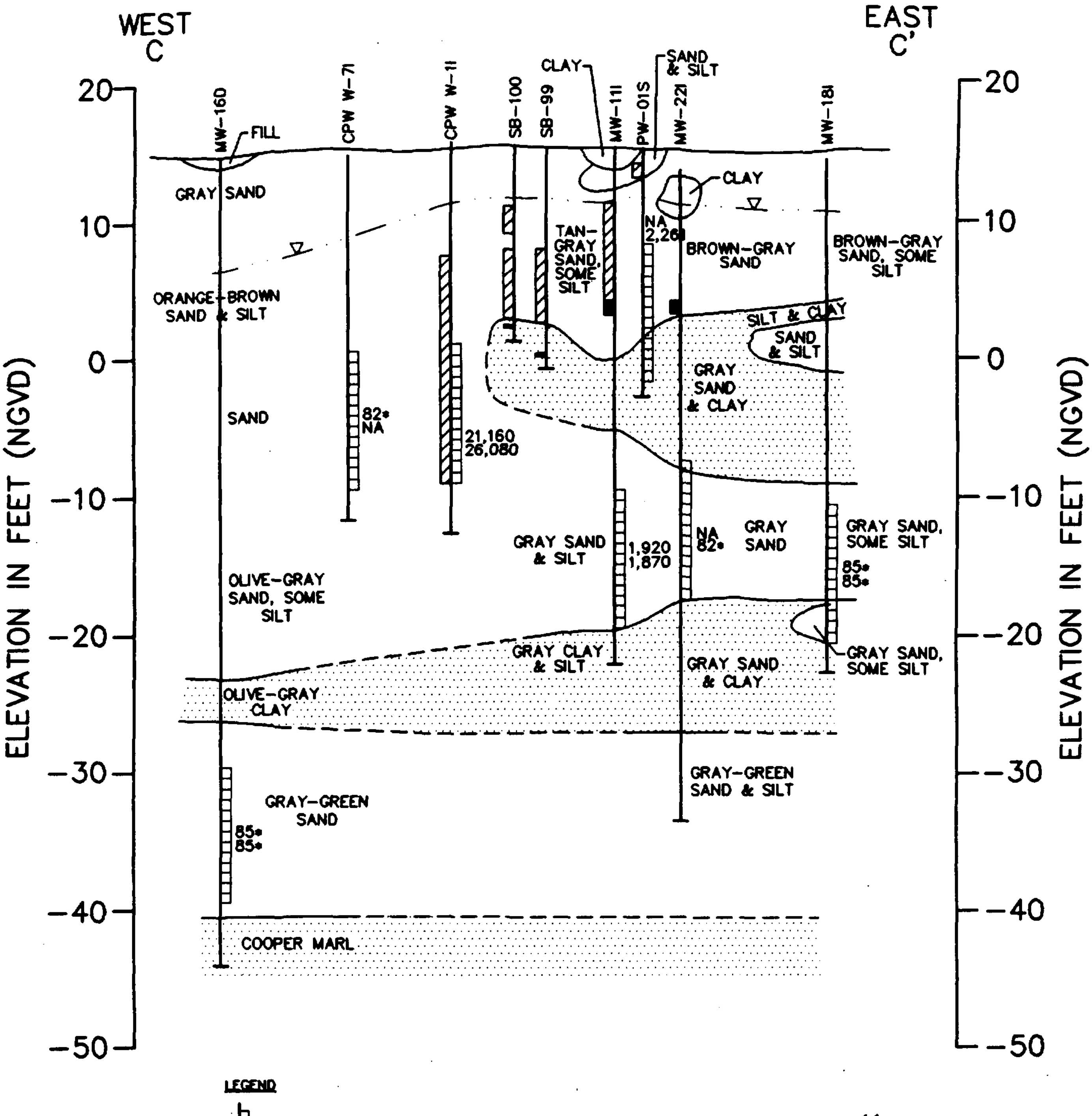

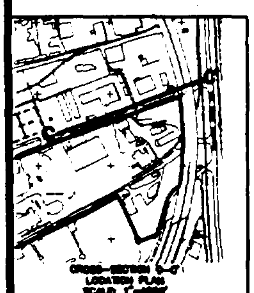

FIGURE 6
EAST-WEST
GEOLOGIC CROSS-SECTION C-C'
FORMER KOPPERS SITE
CHARLESTON, SC

SOURCE: BEAZER EAST, INC. PITTSBURG, PA 1995

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LEGEND

- ▲ SHALLOW OR INTERMEDIATE BORING/MONITORING WELL
- △ DEEP BORING/MONITORING WELL
- ◉ DRIVE POINT MINI-WELL
- ○ DITCH TRANSECT DRIVE POINT
- ←—— DIRECTION OF GROUNDWATER FLOW
- —-3.0 WATER TABLE CONTOUR (DASHED WHERE INFERRED) AND ELEVATION (NGVD)
- ▲ 3.58 MEASURED WATER LEVEL ELEVATION (NGVD)

NOTES

- • NON-SURVEYED LOCATION

HORIZONTAL SURVEYED DATUM REFERENCED TO SOUTH CAROLINA STATE PLANE COORDINATE POSITION.

VERTICAL SURVEYED DATUM REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM (NGVD).

SITE BOUNDARY IS NOT SURVEYED

SITE BOUNDARY (SOUTH OF BRASWELL STREET) BASED ON JANUARY 7, 1980 PLAT OF BRASWELL SHIPYARDS.

SOURCE: BEAZER EAST, INC. PITTSBURG, PA 1995

FIGURE 7
WATER TABLE MAP OF
SHALLOW AND INTERMEDIATE WELLS
MARCH 9, 1994
FORMER KOPPERS SITE
CHARLESTON, SC

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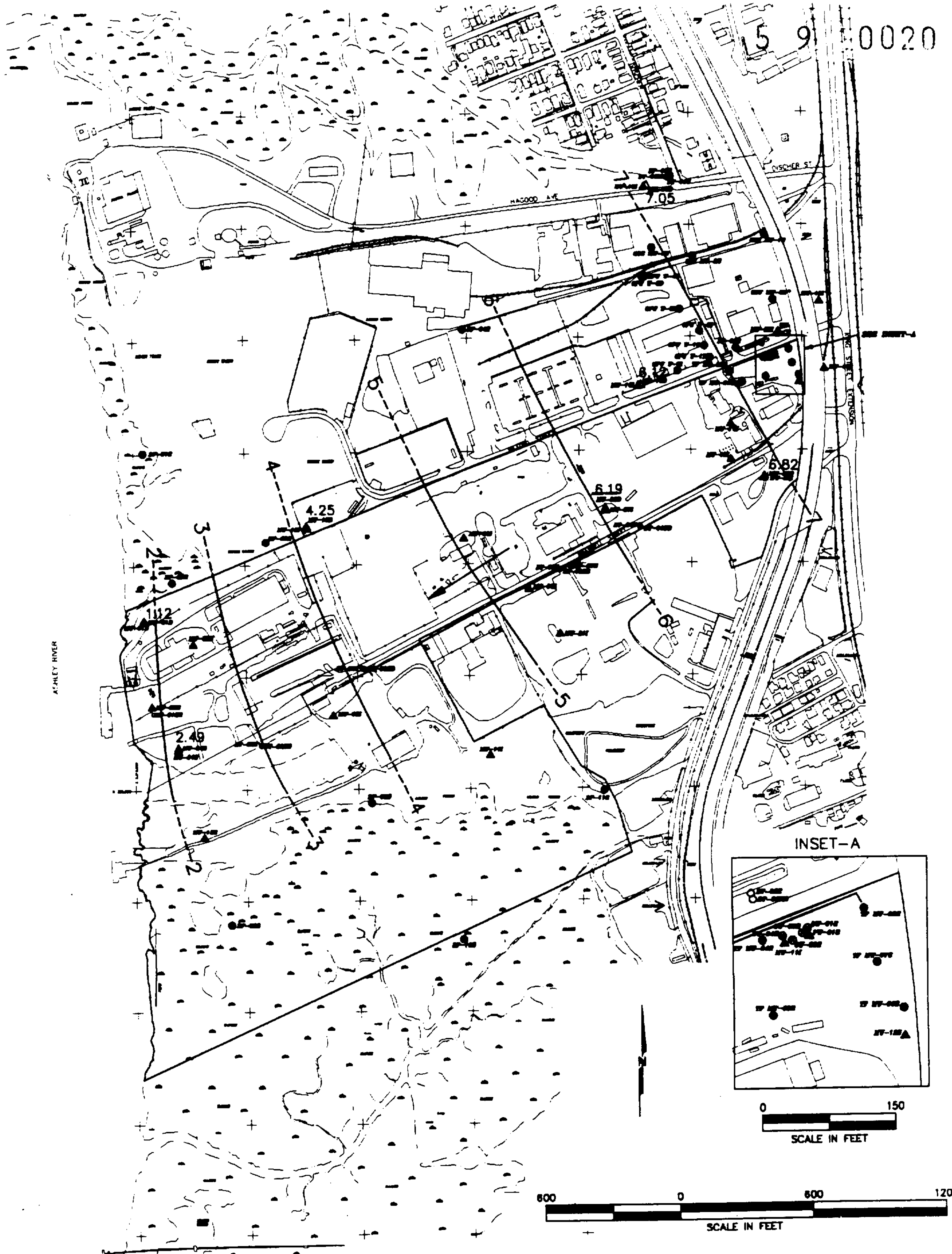

LEGEND
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SOURCE: BEAZER EAST, INC. PITTSBURG, PA 1995

FIGURE 8
PIEZOMETRIC MAP OF DEEP WELLS
MARCH 9, 1994
FORMER KOPPERS SITE
CHARLESTON, SC

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zone has a vertical permeability of 5.9 x 10^{-8} ft/min (or 3.0 x 10^{-8} cm/sec).

The deep water-bearing zone is considered separate from the shallow/intermediate water-bearing zones because it is consistently separated from the overlying units by the intermediate clay zone, and because it has a different groundwater flow direction and chemistry. The piezometric surface of the deep water-bearing zone is found between 8.3 and 10.7 feet below grade, and a downward gradient exists between the shallow/intermediate and the deep water-bearing zones. Groundwater in the deep zone flows to the southwest with a gradient of 0.017 (See Figure 8). Slug tests indicate that the deep water-bearing zone has a hydraulic conductivity of 0.0024 ft/min (1.2 x 10^{-3} cm/sec), resulting in a predicted groundwater flow velocity of approximately 72 ft/yr to the west. A flexible wall permeameter test indicates that the intermediate clay has a vertical permeability of 2.6 x 10^{-7} ft/min (1.3 x 10^{-7} cm/sec).

5.2 Occurrence and Characteristics of NAPL

The subsurface of the Former Treatment Area contains potentially recoverable quantities of NAPL and is considered a definite source area of constituents detected in the sediments and surface waters of the Milford Street Drainage Ditch, the Hagood Avenue Drainage Ditch and the headwaters of the North Tidal Marsh. Although it appears that creosote is the primary component of the NAPL, other releases associated with subsequent operations may have contributed to this problem by altering the composition and/or physical properties of the creosote. Figure 9 provides an illustration of the horizontal extent of NAPL and the approximate extent of dissolved constituents as determined from monitoring wells and boring logs.

Review of boring logs and drainage ditch transect logs has provided information on the probable vertical location of NAPL in the subsurface of the Former Treatment Area. NAPL includes both light nonaqueous phase liquids (LNAPL) and dense nonaqueous phase liquids (DNAPL). Three primary issues relating to NAPL occurrence in the Former Treatment Area have been considered: 1) the location of NAPL in relation to the discontinuous shallow clay zone; 2) the pathway for NAPL migration to the Milford Street Drainage Ditch and; 3) the potential for NAPL migration through a subsurface storm drain to the Hagood Avenue Drainage Ditch and headwaters of the North Tidal Marsh. These issues are discussed further below and the methodology by which they will be addressed form the basis of EPA's Interim Remedial Action.

The location of NAPL in relation to the shallow clay zone is most easily observed on the three cross sections (Figures 4, 5, and 6). A cross hatched and solid black pattern were added to the left side of each boring to indicate where stringers of NAPL and NAPL, respectively, were observed in the borings. Furthermore, the total polynuclear aromatic hydrocarbon (PAH) concentrations in groundwater are listed next to each well screen.

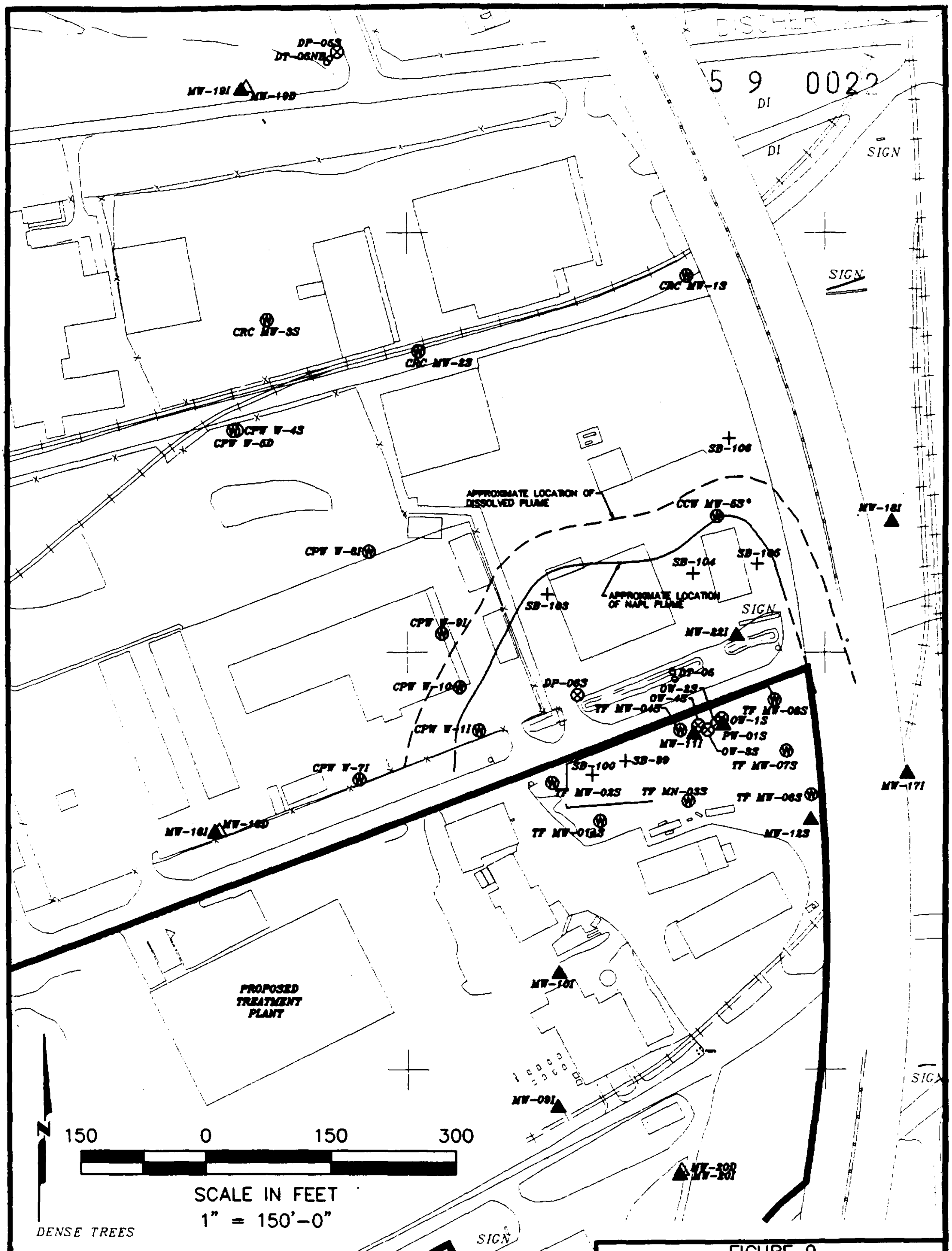

FIGURE 9
IRM AREA MAP
FORMER KOPPERS SITE
CHARLESTON, SC

SOURCE: BEAZER EAST, INC. PITTSBURG, PA 1995

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The eastern north-south cross section of the Former Treatment Area (Figure 4) indicates that the NAPL is restricted to the shallow-water bearing zone, above the shallow clay zone. The total PAH concentrations are relatively high in shallow wells MW-12S and CCW MW-5S, where NAPL was observed near the well screen, and relatively low in intermediate well MW-22I, where NAPL was not observed near the well screen. The total PAH concentration in MW-11I is relatively elevated, possibly because it is near the edge of the shallow clay unit (Figure 6). The boring logs and groundwater data, therefore, indicate that in the eastern portion of the Former Treatment Area, NAPL is limited to the shallow water-bearing zone.

In the western portion of the Former Treatment Area where there is no shallow clay zone (Figure 5), NAPL is observed at various depths in the shallow/intermediate water-bearing zones. Borings MW-09I and MW-10I clearly illustrate that NAPL tends to pool wherever a coarse-grained lens overlies a fine-grained lens. Moreover, groundwater PAH concentrations were relatively high in the shallow/intermediate wells observed to contain NAPL, and relatively low elsewhere.

The east-west cross section (Figure 6) gives an overall picture of the NAPL being restricted to the shallow water-bearing unit in the eastern portion of the Former Treatment Area. At the point where the shallow clay zone ends, NAPL can migrate into the intermediate water-bearing zone. The concentrations of PAHs in groundwater indicate that NAPL may be present beneath the western edge of the shallow clay unit (MW-11I), but it is not present further east beneath the shallow clay zone, nor does NAPL appear to be present in the deep water-bearing zone anywhere in the Former Treatment Area.

The second issue related to NAPL occurrence regards the pathway of NAPL migration to the surface drainage ditch located just north of Milford Street (the Milford Street Drainage Ditch). Survey information and water level measurements indicate that the eastern portion of the Milford Street Drainage Ditch intersects the water table. This is illustrated on north-south cross section A-A' (Figure 4). Boring logs and drainage ditch transect logs suggest that soils located within the water table fluctuation zone are stained with NAPL. This observation, combined with the absence of any continuous NAPL saturated lens in the unsaturated zone between the property boundary and the drainage ditch, suggests that NAPL is migrating along the water table to the drainage ditch.

The last issue considered was the transport mechanism for NAPL to reach the Hagood Avenue Drainage Ditch located approximately 1,000 feet north of the Former Treatment Area. NAPL has been observed in the Hagood Avenue Drainage Ditch which feeds into the North Tidal Marsh. The headwaters of the North Tidal Marsh contain surface water and sediment which exceed screening level ecological benchmarks for PAHs, among other constituents. Information on the storm drain system in the area indicates that water in the eastern end of the Milford Street Drainage Ditch enters a culvert at the east end of Milford

Street. This culvert is connected to a subsurface storm drain line that runs approximately parallel to I-26 then connects with the Hagood Avenue Drainage Ditch. Therefore, NAPL and other site-related constituents are transported off-site from the source area (i.e. the Former Treatment Area) through this drainage system and ultimately into the Hagood Avenue Drainage Ditch and North Tidal Marsh system.

6.0 SUMMARY OF SITE RISKS

CERCLA directs EPA to protect human health and the environment from current and potential future exposures to hazardous substances at the site. The Human Health Baseline Risk Assessment has been completed for the site and is included in the AR located at the information repositories. This section will focus only on the human health risks addressed by EPA's Interim Remedial Action. Preparation of the Baseline Ecological Risk Assessment is currently underway, and therefore, risks posed by the site to ecological receptors will not be addressed in the Interim Remedial Action ROD.

The exposure scenarios applicable to this interim action include the future on-site worker and current off-site resident. Applicable exposure pathways for the above scenarios include incidental ingestion and dermal contact with the surface waters and sediments of the Milford Street and Hagood Avenue Drainage Ditches. Incidental ingestion and dermal contact with surface soils were evaluated for the future on-site worker and current off-site resident during the Baseline Risk Assessment. However, this exposure pathway is not applicable to the interim action and quantitative risk information relating to exposure to surface soils will not be presented in this section.

EPA employed a reasonable maximum exposure (RME) approach to estimate the potential exposures and associated risks at the site. The RME is the highest exposure that is reasonably expected to occur at the site and is intended to estimate a conservative exposure case that is still within the range of possible exposures. The risks posed by potential exposure to contaminants in the surface waters and sediments in the Milford Street and Hagood Avenue Drainage Ditch were quantified by combining the contaminant exposure point concentrations and assumptions regarding exposure frequency, duration and magnitude with contaminant-specific toxicity values. Carcinogenic and non-carcinogenic risks were then calculated for the exposure pathways and scenarios above.

The carcinogenic risk range EPA has set for Superfund cleanups to be protective of human health is 1×10^{-4} to 1×10^{-6}. For example, a cancer risk of 1×10^{-6} indicates that an individual has a 1 in 1,000,000 (or 1 in 10,000 for 1×10^{-4}) incremental chance of developing cancer as a result of site-related exposure to a carcinogen over a 70 year lifetime under the specific exposure conditions assumed in the Baseline Risk Assessment. EPA generally uses the benchmark risk level of 1×10^{-4} for the cumulative risk to a single receptor to trigger action for contaminated media. Noncancer exposure estimates were developed using EPA reference doses to calculate a Hazard Index (HI). A HI greater than 1 indicates that contaminants are present at concentrations that could produce harmful effects.

It was assumed that the future on-site worker would be exposed to surface waters and sediments of the Milford Street Drainage Ditch 24 days/year (exposure frequency) for a 25 year duration. Moreover, is was assumed that the current off-site resident would be exposed to surface waters and sediments of the Hagood Avenue Drainage Ditch 24 days/year, with an exposure duration of 6 years for the child and 24 years for the adult. Exposure assumptions for other pertinent parameters such as body weight, ingestion rate, and parts of body exposed can be found in the Baseline Risk Assessment.

The resultant carcinogenic and non-carcinogenic risks for the future on-site worker and current off-site resident are presented in Table 1 below. Exposure to surface waters and sediments of the Milford Street and Hagood Avenue Drainage Ditches resulted in unacceptable carcinogenic risks under both exposure scenarios. The carcinogenic risks for the future on-site worker and current off-site resident are 7×10^{-3} and 1×10^{-1}, respectively. Furthermore, child exposure to surface waters and sediments of the Hagood Avenue Drainage Ditch resulted in an unacceptable non-cancer HI of 10,000. As indicated on Table 1, the high risks for both scenarios are driven primarily by dermal contact with surface waters of the Milford Street and Hagood Avenue Drainage Ditches. The primary contaminants of concern (COCs) are constituents related to wood-treating operations and PAHs associated with the presence of NAPL in these drainage ditches as described in Section 5.2 above.

EPA is proceeding with Interim Remedial Action at this site to mitigate off-site migration of NAPL and to achieve significant risk reduction quickly while a final remedial solution for the site is being developed. The interim action will consist of source control in the Former Treatment Area combined with reconstruction of the Milford Street and Hagood Avenue Drainage Ditches to mitigate the risks associated with exposures to sediments and surface waters of these ditches. Furthermore, the goal of the interim action is to reduce COC concentrations in the surface water of the Hagood Avenue Drainage Ditch to adequately protective levels, thereby mitigating adverse impacts associated with discharge to the headwaters of the North Tidal Marsh.

TABLE 1 5 9 0026
LIFETIME CARCINOGENIC AND NON-CARCINOGENIC RISKS
FOR EXPOSURE SCENARIOS APPLICABLE TO INTERIM REMEDIAL ACTION

Exposure Pathway	Future On-Site Worker (Milford St. Drainage Ditch)		Current Off-Site Resident (Hagood Avenue Drainage Ditch)	
	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
SURFACE WATER				
• Incidental Ingestion	Not Evaluated	Not Evaluated	1×10^{-4}	0.06 (adult) 9.0 (child)
• Dermal Contact	7×10^{-3}	0.2	1×10^{-1}	0.4 (adult) 10,000 (child)
SEDIMENT				
• Incidental Ingestion	2×10^{-5}	0.2	6×10^{-5}	0.3 (adult) 1.0 (child)
• Dermal Contact	9×10^{-6}	0.08	1×10^{-5}	0.1 (adult) 0.1 (child)
TOTAL CANCER RISK/HI	7×10^{-3}	0.5	1×10^{-1}	0.9 (adult) 10,000 (child)

7.0 DESCRIPTION OF ALTERNATIVES

EPA considered two alternatives before proposing the Interim Remedial Action. The alternatives are briefly summarized below.

No-Action: CERCLA requires EPA to consider a "no-action" alternative at every site for which a remedial action is proposed, to serve as a baseline for comparison with other alternatives. Under the No-Action alternative, EPA would take no further action at this time to mitigate off-site migration of NAPL and to protect human health and the environment in the short-term. However, these remedial action objectives, among others, would be satisfied in the Final ROD for the site. There are no costs associated with the No-Action alternative.

Interim Remedial Action: The Interim Remedial Action alternative was developed to protect human health and the environment in the short-term while a final long-term remedial solution for the site is being developed. The Interim Remedial Action will be consistent with, and an integral component of, the Final remedy for the former Treatment Area and the entire site. The Interim Remedial Action was developed to satisfy a remedial action objective identified in the Final RI Report which stated, "*Remove or otherwise control the discharge of NAPL from the Former Treatment Area to the eastern end of the Milford Street Drainage Ditch and by doing so remove or otherwise control the discharge of NAPL and other dominant transport mechanisms to the Hagood Avenue Drainage Ditch and the North Tidal Marsh.*". Moreover, permanent reconstruction of the Milford Street and Hagood Avenue Drainage Ditches conducted during the Interim Remedial Action will protect human health by mitigating exposure to sediments and surface waters of these ditches.

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The conceptual approach and performance standards of the Interim Remedial Action are described in Section 9.0 of this ROD. A detailed design effort, consistent with this conceptual approach, will be conducted to support procurement of construction contractors necessary for implementation of the interim remedy. In general, the interim action is a four-step approach designed to meet the following objectives:

Shallow Water-Bearing Unit

Step 1A - **Objective:** Eliminate future off-site migration of NAPL to the Milford Street Drainage Ditch.

Approach: An interceptor trench will be installed at the location of the storm water drainage ditch on Milford Street. Groundwater and NAPL will be pumped from this trench to hydraulically control groundwater and NAPL migration. As part of this installation, the storm water drainage ditch will be permanently reconstructed, thereby eliminating potential human exposure to sediments and surface waters of the Milford Street Drainage Ditch. Groundwater monitoring wells will be installed to evaluate the induced capture zone of the trench. Groundwater and NAPL recovered from the trench will be pumped to a water treatment plant located at 1961 Milford Street. The water treatment plant will be designed, installed and operated to meet all appropriate regulatory effluent standards of the chosen discharge option. Treated groundwater will be discharged to either: 1) the North Charleston Sewer District (NCSD); 2) the Ashley River via an appropriate National Pollution Discharge Elimination System (NPDES) permit; or 3) another EPA/SCDHEC approved discharge option. The North Charleston Sewer District is the preferred discharge point for treated groundwater, however flexibility must be preserved in the event that final approval from NCSD cannot be obtained.

Step 1B - **Objective:** Mitigate the drainage system as a conduit for potential NAPL migration to the Hagood Avenue Drainage Ditch.

Approach: An inspection survey will be conducted on the subsurface drain pipe that connects the Milford Street and Hagood Avenue Drainage Ditches. Measures will be implemented to clean and/or repair this drain pipe as necessary, to mitigate its potential to act as a conduit, or preferential flow path, for NAPL migration to the Hagood Avenue Drainage Ditch.

Step 1C - **Objective:** Eliminate potential exposure to constituents in sediments of the Hagood Avenue Drainage Ditch.

Approach: The Hagood Avenue Drainage Ditch will be permanently reconstructed to prevent future migration of NAPL and to eliminate potential human exposure to surface waters and sediments of this drainage ditch. The method of reconstruction will be determined by experience gained from reconstruction of the Milford Street Drainage Ditch.

Intermediate Water-Bearing Unit

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Step 2 - **Objective:** Mitigate off-site migration of NAPL in the intermediate water-bearing unit underlying the Former Treatment Area.

Approach: Conventional groundwater recovery technology or innovative/experimental well technology will be utilized to hydraulically contain NAPL in the intermediate water-bearing unit underlying the Former Treatment Area. This well(s) will be installed south of Milford Street and in an area where the shallow clay unit is not present.

A cost estimate, expressed in 1994 dollars, for the Interim Remedial Action was developed based upon conceptual engineering and design. The capital costs for the interim action, which includes the direct (construction) and indirect costs (non-construction) incurred in the first year, are estimated at $1,350,000. Yearly Operation and Maintenance (O&M) costs are estimated at $138,000. The total present worth cost for the interim action was estimated at $3,060,000. The total present worth cost represents a sum of money invested in the base year at an assumed interest rate of 7%, and if disbursed as needed, would be sufficient to cover all costs of the interim action over its planned life.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

EPA conducts a comparative analysis to evaluate the relative performance of each alternative in relation to nine criteria. The purpose is to identify and clearly understand the advantages and disadvantages of the two alternatives considered in the above Section 7.0. This evaluation is more limited in scope and depth than would be the case if the interim action was to be the final remedy for this site. The comparative analysis utilizing the nine evaluation criteria is presented below.

1. **Overall Protection of Human Health and the Environment** addresses the degree to which an alternative provides adequate protection of human health and the environment and describes how risks posed through exposure pathways are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

- The No-Action Alternative would not provide adequate protection of human health and the environment in the short-term while a final long-term remedial solution is being developed. As documented in Section 6.0, potential human health risks do exist from exposure to sediments and surface waters of the Milford Street and Hagood Avenue Drainage Ditches.

- The Interim Remedial Action will protect human health and the environment in the short-term while a final long-term remedial solution is being developed. The Interim Remedial Action shall mitigate off-site NAPL migration and eliminate potential human health risks by permanently reconstructing the Milford Street and Hagood Avenue Drainage Ditches.

2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** addresses whether or not an alternative complies with all legally applicable or relevant and appropriate state and federal requirements, standards, criteria and limitations which are collectively referred to as "ARARs".

- Interim remedial actions, followed by a final ARAR-compliant ROD, must attain ARARs only if they are within the scope of that action. For example, the primary goal of this Interim Remedial Action is to mitigate off-site migration of NAPL in the Former Treatment Area. Therefore, groundwater quality standards such as Maximum Contaminant Levels (MCLs) are not ARARs since the objective of the action is containment, not cleanup. However, requirements related to discharge of the treated groundwater are ARARs and will be met by this interim action. Furthermore, solid materials generated by the reconstruction and remediation of the Milford Street/Hagood Avenue Drainage Ditches and any necessary repair to the subsurface drain pipe between Milford Street and Hagood Avenue shall be handled and disposed of in accordance with ARARs.

3. **Long-Term Effectiveness and Permanence** refers to the residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time.

- The long-term effectiveness of the interim action cannot be evaluated at this point. However, the interim action will provide valuable operational data to optimize site-wide remediation of NAPL/groundwater. The long-term effectiveness and permanence of the Interim Remedial Action will be evaluated, considered, and modified as necessary during the Final ROD for this site.

4. **Reduction of Toxicity, Mobility, or Volume** addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element.

- Installation of the interceptor trench, sump pump and intermediate water-bearing zone recovery well will reduce the mobility of NAPL and contaminated groundwater underlying the Former Treatment Area. Moreover, treatment of the NAPL/groundwater in the water treatment plant will reduce the toxicity and volume of NAPL/groundwater.

5. **Short-Term Effectiveness** refers to the period of time needed to complete the remedy and any adverse impacts on human health and the environment that may be posed during construction and implementation of the remedy.

- No adverse short-term impacts are expected to result from this interim action. Site work will adhere to a site-specific Health and Safety Plan to reduce any potential short-term risks to workers, nearby property owners, and residents.

6. **Implementability** refers to the technical and administrative feasibility of implementing an alternative, including the availability of various services and materials required for its implementation.

- The required construction technology for implementation of the Interim Remedial Action is proven and the necessary materials/services are readily available. The administrative requirements for implementation are manageable. Special attention must be devoted to nearby businesses and property owners to minimize disruptions to their operations during construction of the interim remedy.

7. **Cost** consists of the capital (up front) costs of implementing an alternative, plus the costs to operate and maintain the alternative in the long-term. Under this criterion, the cost-effectiveness of each alternative is evaluated and compared to other alternatives under consideration.

- The total estimated capital cost of the Interim Remedial Action is $1,350,000 with annual O&M costs of $138,000. The total present worth cost of the Interim Remedial Action is $3,060,000. The interim action provides a high degree of cost-effectiveness given that: 1) remedial activities implemented under this Interim ROD would be required under the Final ROD for the site; and 2) data gathered and lessons learned during implementation of the interim action will optimize the site-wide remediation strategy.

8. **State Acceptance** addresses whether the South Carolina Department of Health and Environmental Control (SCDHEC) concurs with, opposes, or has comments on the alternative selected by EPA.

- SCDHEC has participated actively during the RI process at the site and concurs with EPA's Interim Remedial Action. The State concurrence letter is attached to this document as Appendix A.

9. **Community Acceptance** addresses whether the public agrees with EPA's Interim Remedial Action.

- A public meeting was held on January 26, 1995, to present the results of the RI, the human health Baseline Risk Assessment and the proposed approach and rationale for Interim Remedial Action at the site. Comments received at the meeting were generally supportive of the interim action. A response to comments received, and a verbatim transcript of the meeting is attached to this document as Appendix B.

9.0 THE SELECTED REMEDY

59 0031

Based upon the requirements of CERCLA, the NCP, consideration of the alternatives, and public and State comments received, EPA has decided to proceed with Interim Remedial Action at the site. Generally, the stated purpose of this Interim Remedial Action is three-fold: 1) Mitigate off-site migration of NAPL from the Former Treatment Area to the eastern end of the Milford Street Drainage Ditch; 2) Expedite remediation of a potential human health risk due to exposure to sediments and surface waters of the Milford Street and Hagood Avenue Drainage Ditches; and 3) Provide operational and implementation data needed to optimize a cost-effective site-wide remediation.

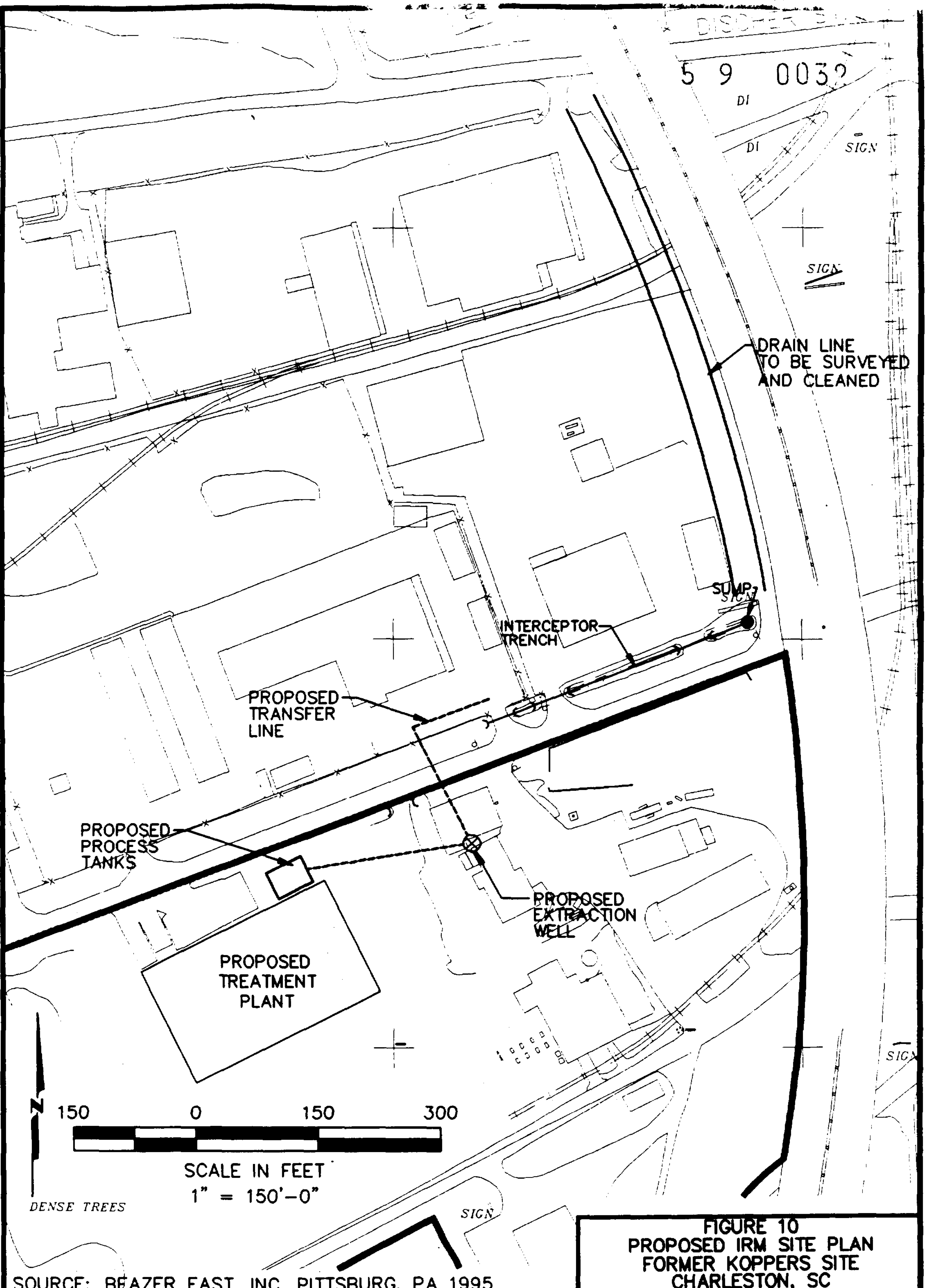
This interim action is consistent with EPA's guidance regarding groundwater remediation at sites with NAPL contamination. This guidance document titled, "*Guidance for Evaluating the Technical Impracticability of Groundwater Restoration, OSWER Directive 9234.2-25, September 1993*", promotes the use of a phased approach to groundwater remediation at sites with NAPL contamination such as creosote. Interim actions are encouraged at NAPL sites to remove and/or control the source area (i.e. NAPL zone) and to control plume migration. This Interim Remedial Action shall be properly designed, constructed, operated and monitored to remove and/or control the NAPL source area underlying the Former Treatment Area and contain the aqueous contaminant plume. The interim action will not only reduce risks posed by human exposure to the sediments and surface waters of the Milford Street and Hagood Avenue Drainage Ditches, but will also provide useful information in evaluating the restoration potential of the site during the Final ROD.

As delineated in Section 7.0, the Interim Remedial Action consists of 4 incremental steps designed to satisfy distinct objectives. This section presents the Performance Standards for each incremental step of the interim remedy and delineates the ARARs that must be met for each step. A detailed design shall be conducted to fully describe how the Performance Standards and ARARs listed below will be met during implementation of the Interim Remedial Action. The implementation sequence of the interim action shall occur in the order presented below.

9.1 Performance Standard 1: Eliminate Off-Site Migration of NAPL to the Eastern End of the Milford Street Drainage Ditch

The conceptual layout of the Interim Remedial Action is illustrated in Figure 10. In order to achieve the above Performance Standard, an interceptor trench will be installed in close proximity to the current location of the Milford Street Drainage Ditch. The trench will be installed to the shallow clay unit to a depth of approximately 15 feet below the ground surface. The cross-sections on Figures 11 and 12 provide a general schematic of the interceptor trench. The interceptor trench will consist of a continuous trench approximately 350 feet in length filled with highly permeable backfill. The trench will be constructed with a machine capable of digging, installing perforated drainage pipe and backfilling in one continuous pass.

5 9 0032



SOURCE: BEAZER EAST, INC. PITTSBURG, PA 1995

FIGURE 10
PROPOSED IRM SITE PLAN
FORMER KOPPERS SITE
CHARLESTON, SC

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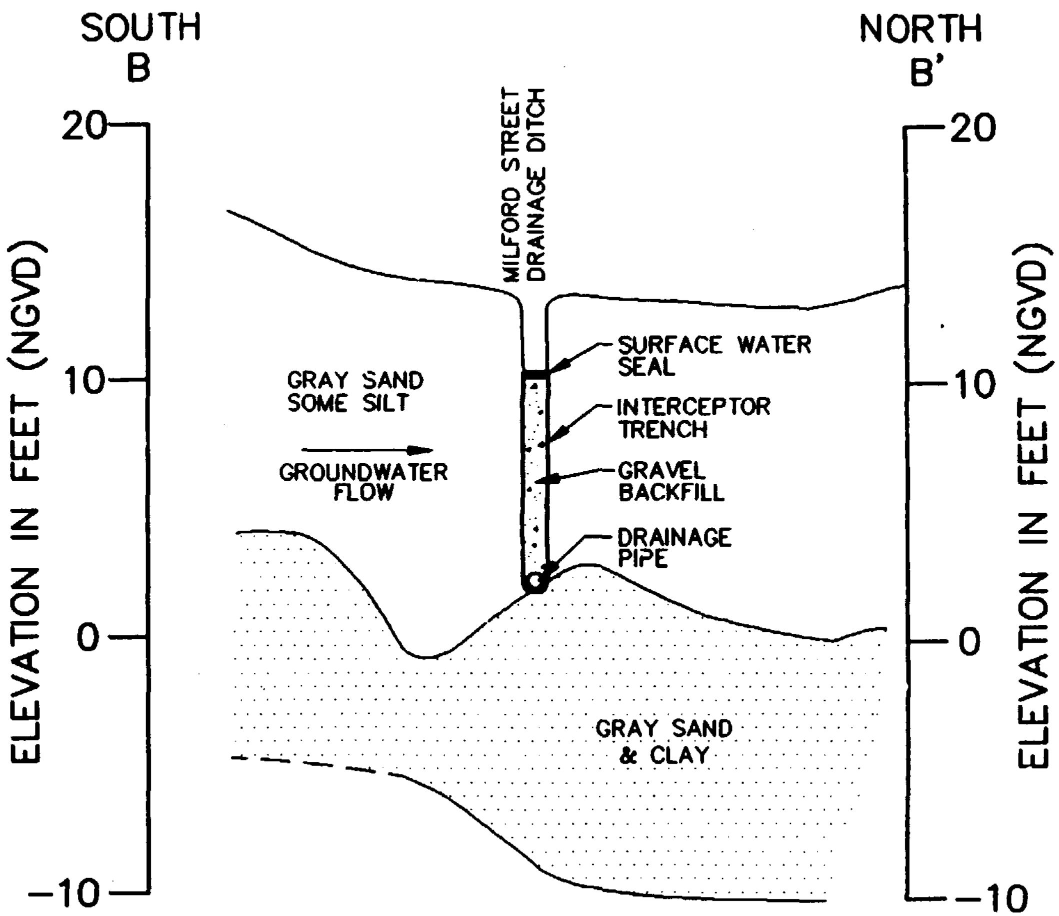

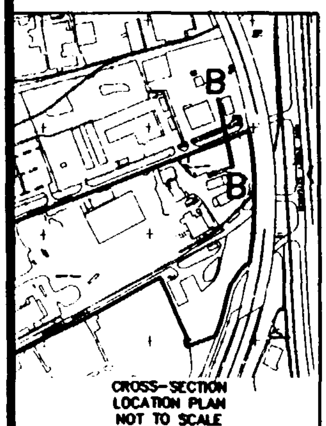

SOURCE: BEAZER EAST, INC., PITTSBURGH, PA., 1995

NOT TO SCALE

FIGURE 11
NORTH-SOUTH CROSS SECTION
FORMER KOPPERS SITE
CHARLESTON, SC

5 9 0033

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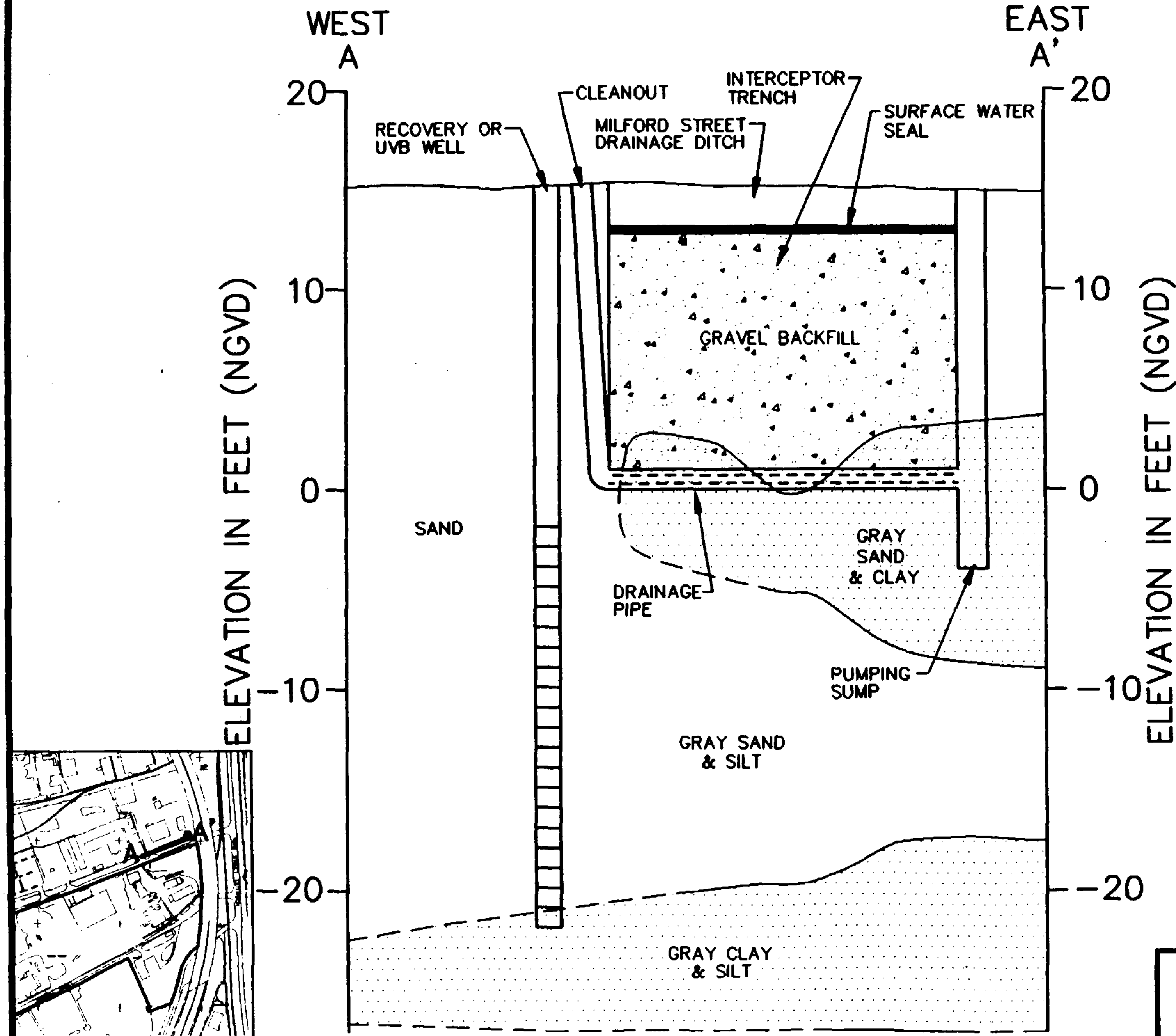

SOURCE: BEAZER EAST, INC., PITTSBURGH, PA., 1995

NOTE: LOCATION OF INTERMEDIATE WELL IS SHOWN FOR ILLUSTRATION PURPOSES ONLY.

NOT TO SCALE

FIGURE 12
EAST-WEST CROSS SECTION
FORMER KOPPERS SITE
CHARLESTON, SC

59 0034

The drain pipe will be sloped such that all groundwater will flow by gravity into a sump pump at one end of the trench. This conceptual layout may be modified in the detailed design phase so long as Performance Standard 1 is achieved.

Groundwater and NAPL will be pumped from the interceptor trench/sump to hydraulically control NAPL/groundwater migration in the shallow water-bearing unit. A monitoring network and sampling strategy shall be implemented to evaluate the induced capture zone of the trench and to verify that NAPL source control in this area has been achieved. Groundwater and NAPL recovered from the trench will be conveyed to a water treatment plant located at 1961 Milford Street. The water treatment plant shall be designed, constructed, operated, and maintained to meet the ARARs of the selected discharge option. Effluent from the water treatment plant will be discharged to either: 1) the North Charleston Sewer District's (NCSD) publicly owned treatment works (POTW); 2) the Ashley River via an appropriate NPDES permit; or 3) another EPA/SCDHEC approved discharge option. The preferred discharge point of treated effluent is the NCSD POTW, however final approval has not yet been received. Therefore, flexibility must be preserved regarding the type of treatment necessary to achieve the required discharge limits of the selected discharge point. The treatment technology employed to meet the required discharge limits shall be specified in the detailed design document.

As discussed in Section 6.0, surface water and sediments in the Milford Street Drainage Ditch are found at concentrations greater than those deemed adequately protective of human health. A range of surface sediment cleanup goals for the constituents of concern based on protection of the future on-site worker are listed in Table 2. Permanent reconstruction of the Milford Street Drainage Ditch shall be conducted to remove contaminated soils on the bottom and sidewalls of the ditch and eliminate the NAPL migration pathway. Therefore, permanent reconstruction shall attain the sediment cleanup goals listed in Table 2 and eliminate potential human health risks associated with exposure to sediments and surface waters of the Milford Street Drainage Ditch.

Vertical excavation limits during permanent reconstruction of the Milford Street Drainage Ditch shall be the observed water table. Limits to horizontal excavation shall be instituted when visually impacted material in the vadose zone has been removed, or upon encroachment to subsurface utilities and/or road-side. Where technically practicable, subsurface soils in the vadose zone in the immediate area of the trench shall be excavated to achieve the subsurface soil cleanup goals identified to be protective of the Future Utility Worker in the Final Human Health Baseline Risk Assessment. Prior to the placement of a permanent structure on the Milford Street Drainage Ditch, excavation confirmation sampling and analysis shall be conducted to document residual contaminant concentrations in the vadose zone, if any.

TABLE 2 SURFACE SEDIMENT CLEANUP GOALS PROTECTIVE OF HUMAN HEALTH				
Constituent	Protective Carcinogenic Risk Range Sediment Concentration (mg/kg)			Interim Soil Cleanup Level
	10^{-6}	10^{-5}	10^{-4}	
HAGOOD AVENUE DRAINAGE DITCH - CURRENT OFF-SITE RESIDENT				
Arsenic	7.7	77	770	
B(a)P-TE	1.6	16	160	
Dioxin TEQ	0.0001	0.001	0.01	
Lead				500[1]
MILFORD STREET DRAINAGE DITCH - FUTURE ON-SITE WORKER				
Arsenic	30.3	303	3030	
B(a)P-TE	5.2	52	520	
Dieldrin	2.39	23.9	239	
Dioxin TEQ	0.0004	0.004	0.04	
Lead				500[1]

1 - Represents EPA interim soil cleanup level of residential soil. Source: EPA's Final Baseline Risk Assessment, 1994

All soil removed during installation of the interceptor trench and reconstruction of the Milford Street Drainage Ditch shall by handled, treated, and/or disposed of in full accordance with all ARARs including, but not limited to, requirements related to its characteristics (40 CFR 261.2 - Subpart C) and/or class listing (40 CFR 261.3 - Subpart D). Furthermore, all construction activities shall be conducted in a manner which provides adequate short-term protection and minimizes disruptions to businesses that utilize Milford Street for access.

9.2 Performance Standard 2: Mitigate the Drainage System as a Conduit for Potential NAPL and Constituent Migration to the Hagood Avenue Drainage System

The subsurface storm drain which connects the Milford Street and Hagood Avenue drainage systems shall be cleaned, inspected, and repaired as necessary to prevent NAPL and/or constituent migration. The origins of all pipes in this section shall be determined. Existing storm sewer routing details shall be confirmed through an inspection of surface features, observations of visible inflows and outflows, and visual inspection from any manholes.

Following this preparatory work, this section of storm drain shall be cleaned. Immediately after cleaning, the storm drain system shall be visually inspected for leaks with a camera. The camera view shall be monitored from the surface and recorded on a video cassette. Locations of features observed with the camera should be recorded relative to a reference feature, such as a manhole or catch basin. The recorded camera survey, inspector notes, photographs of the manholes and catch basins, and a sewer map showing the inspection findings shall be submitted to EPA and SCDHEC in a letter report. This report shall include recommendations for repairs and future action, if any, based upon the inspection findings.

EPA and SCDHEC shall have an opportunity to review and comment on the repair recommendation report. Following mutual agreement on future course of action, the storm sewer pipe(s) shall be repaired as necessary.

9.3 Performance Standard 3: Eliminate Potential Exposure to Sediments of the Hagood Avenue Drainage Ditch

Permanent reconstruction of the Hagood Avenue Drainage Ditch shall be conducted to meet the above Performance Standard 3. As discussed in Section 6.0, surface water and sediments in the Hagood Avenue Drainage Ditch are found at concentrations greater than those deemed adequately protective of human health. A range of surface sediment cleanup goals for the constituents of concern based on protection of the current off-site resident are listed in Table 2. Permanent reconstruction of the Hagood Avenue Drainage Ditch shall be conducted to remove contaminated soils on the bottom and sidewalls of the ditch. Therefore, permanent reconstruction shall attain the sediment cleanup goals listed in Table 2 and eliminate the potential human health risks associated with exposure to sediments and surface waters of the Hagood Avenue Drainage Ditch.

Vertical excavation limits during permanent reconstruction of the Hagood Avenue Drainage Ditch shall be the observed water table. Limits to horizontal excavation shall be instituted when visually impacted material in the vadose zone has been removed, or upon encroachment to subsurface utilities and/or road-side. Where technically practicable, subsurface soils in the vadose zone in the immediate area of the trench shall be excavated to achieve the subsurface soil cleanup goals identified to be protective of the Future Utility Worker in the Final Human Health Baseline Risk Assessment. Prior to the placement of a permanent structure on the Hagood Avenue Drainage Ditch, excavation confirmation sampling and analysis shall be conducted to document residual contaminant concentrations in the vadose zone, if any.

An additional goal of Performance Standard 3 is to reduce constituent concentrations in the surface water of the Hagood Avenue Drainage Ditch to adequately protective levels, thereby mitigating adverse impacts associated with discharge to the headwaters of the North Tidal Marsh. This issue, together with mitigating other dominant transport mechanisms, is important considering the potential for future remediation efforts in the headwaters of the North Tidal Marsh. A monitoring program shall be developed and implemented to evaluate the effectiveness of the Interim Remedial Action in mitigating constituent transport mechanisms to the headwaters of the North Tidal Marsh.

All soil removed during permanent reconstruction of the Hagood Avenue Drainage Ditch shall be handled, treated, and/or disposed of in full accordance with all ARARs including, but not limited to, requirements related to its characteristics (40 CFR 261.2 - Subpart C) and/or class listing (40 CFR 261.3 - Subpart D). Furthermore, all construction activities shall be conducted in a manner which provides adequate short-term protection and minimizes disruptions to businesses and residents that utilize Hagood Avenue for access.

9.4 Performance Standard 4: Mitigate Off-Site Migration of NAPL in the Intermediate Water-Bearing Unit Underlying the Former Treatment Area

Groundwater recovery technology will be utilized to hydraulically contain the groundwater and NAPL in the intermediate water-bearing zone beneath the Former Treatment Area. The recovery technology employed may consist of conventional groundwater extraction well(s) and/or innovative well technology. The location for the recovery well(s) will be selected after evaluation of the NAPL distribution and operation of the interceptor trench. This well will likely be located south of Milford Street where the shallow clay unit pinches out.

A monitoring program shall be implemented to collect detailed information regarding aquifer response to operation of the above extraction well(s). The data and information gathered while working to meet the requirements of this Performance Standard shall play an integral role in determining the optimal method to attain hydraulic source control in the intermediate water-bearing zone beneath the Former Treatment Area. This information will be evaluated and considered by EPA during development of the site-wide remedy in the Final ROD for the site.

A detailed design report shall be prepared which fully delineates how the above Performance Standards and ARARs will be met during implementation of the Interim Remedial Action. This report will serve as the foundation from which construction bids will be solicited from qualified contractors. This report shall be submitted to EPA and SCDHEC for review, comment and approval prior to initiating the bid process for construction of the Interim Remedial Action. Construction on the interceptor trench is tentatively scheduled to begin in late 1995. The estimated total capital cost of the Interim Remedial Action is $1,350,000 with annual O&M costs of $138,000/year. The total present worth for the interim action is estimated at $3,060,000.

10.0 STATUTORY DETERMINATIONS

This section of the Interim Action ROD describes how EPA's Interim Remedial Action meets the statutory requirements as delineated in Section 121 of CERCLA.

10.1 Protection of Human Health and the Environment

EPA's Interim Remedial Action will reduce the current/future potential human health risks associated with dermal contact and incidental ingestion of sediments and surface waters of the Milford Street and Hagood Avenue Drainage Ditches. This will be accomplished by installation of an interceptor trench for NAPL source control on the Milford Street Drainage Ditch combined with permanent reconstruction of the Milford Street and Hagood Avenue Drainage Ditches. The interim remedy is consistent with EPA guidance regarding remediation of sites with NAPL contamination by utilizing an early action and a phased approach to reduce the primary risks and gain source control. Therefore, the Interim Remedial Action is adequately protective of human health and the environment.

10.2 Compliance with ARARs

The Interim Remedial Action will meet all ARARs discussed in Section 9.0 of this document. Primarily, these ARARs relate to soil excavation and management during remedy implementation and effluent discharge limits of the selected discharge option. Compliance with all ARARs which may apply to site-wide remediation will be addressed in the final ROD for the site.

10.3 Cost Effectiveness

EPA believes the interim action will substantially reduce the risks posed to human health and the environment at an estimated present worth cost of $3,060,000. The interim action is cost effective in that it mitigates further NAPL/groundwater migration while a final long-term solution is being developed. Moreover, data gathered during the interim action will assist in developing optimal and cost-effective strategies for the final remedial action at this site.

10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

Although this remedy is not the final action for the site, it does represent the maximum extent to which permanent solutions and treatment can be practicably applied to the site. Reconstruction of the Milford Street and Hagood Avenue Drainage Ditches shall be permanent so as to alleviate the need to re-visit these areas during the final remedial action. The water treatment portion of the interim action will permanently reduce influent contaminant concentrations to appropriate standards and will be designed accordingly to accommodate site-wide remediation plans. Furthermore, the use of innovative technology to hydraulically control off-site migration of NAPL in the intermediate water-bearing zone will be evaluated during the fourth step of the interim action.

10.5 Preference for Treatment as a Principal Element

Although this remedy is not the final action for the site, the Interim Remedial Action will fulfill the preference for treatment as a principal element, through extraction and treatment of recovered groundwater and NAPL.

Appendix A

State of South Carolina
Interim Action Concurrence Letter

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

NSRB

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March 28, 1994

John H. Hankinson, Jr.
Regional Administrator
U.S. EPA, Region IV
345 Courtland Street
Atlanta, GA 30365

RE: Koppers Site - Interim Action Record of Decision

Dear Mr. Hankinson:

The Department has reviewed the Interim Action Record of Decision (ROD) dated March 27, 1995 for the Koppers Co, Inc. (Charleston Plant) NPL site and concurs with the ROD. In concurring with this ROD, the South Carolina Department of Health and Environmental Control (SCDHEC) does not waive any right or authority it may have under federal or state law. SCDHEC reserves any right and authority it may have to require corrective action in accordance with the South Carolina Hazardous Waste Management Act and the South Carolina Pollution Control Act. These rights include, but are not limited to, the right to ensure that all necessary permits are obtained, all clean-up goals and criteria are met, and to take a separate action in the event clean-up goals and criteria are not met. Nothing in the concurrence shall preclude SCDHEC from exercising any administrative, legal and equitable remedies available to require additional response actions in the event that: (1)(a) previously unknown or undetected conditions arise at the site, or (b) SCDHEC receives additional information not previously available concerning the premises upon which SCDHEC relied in concurring with the selected remedial alternative; and (2) the implementation of the remedial alternative selected in the ROD is no longer protective of public health and the environment.

The State concurs with the selected interim action of: 1) Installation of an interceptor trench and sump to eliminate off-site migration of NAPL to the eastern end of the Milford Street drainage ditch; 2) Collection and treatment of recovered groundwater/NAPL and discharge to approved discharge point; 3) Permanent reconstruction of the Milford Street drainage ditch to eliminate exposure and migration of contamination; 4) Inspection and repair of the existing drainage system; 5) Permanent reconstruction of the Hagood Avenue drainage ditch to eliminate exposure to contamination; and 6)Extraction and treatment of groundwater/NAPL from the intermediate water-bearing unit underlying the Former Treatment Area.

State concurrence on this interim action remedial alternative is based on the alternative meeting all applicable clean-up criteria. Concurrence of the Interim Action ROD does not constitute concurrence of the Second Quarter 1996 Site-wide ROD.

Sincerely,

R. Lewis Shaw

R. Lewis Shaw, P.E.
Deputy Commissioner
Environmental Quality Control

cc: Hartsill Truesdale
Keith Lindler
Gary Stewart
Richard Haynes
Billy Britton
Wayne Fanning, Trident EQC

Appendix B

Responsiveness Summary

1.0 INTRODUCTION

The Responsiveness Summary provides a written summary of significant comments, criticisms, and new relevant information that was submitted to EPA during the formal public comment period. The Responsiveness Summary is an integral component of the Interim Action Record of Decision and represents the final step in selection of the interim remedy for the Koppers Co., Inc. (Charleston Plant) Site. This document allows EPA to reassess its initial determination that the Interim Remedial Action provides the best balance of trade-offs by factoring in any new information or points of view expressed by the community and local officials during the public comment period. These comments may prompt EPA to modify aspects of the preferred alternative or decide that another alternative provides a more appropriate balance.

A brief background on community involvement at the Koppers site in Charleston is provided in Section 1.1. A summary of oral comments received during the January 26, 1995 public meeting in Charleston, South Carolina is presented in Section 1.2. Written comments received from the public during the formal comment period are summarized in Section 1.3. Section 2.0 of the Responsiveness Summary provides EPA's response and concluding remarks to all public comments received on the EPA's Interim Remedial Action and supporting documentation.

1.1 BACKGROUND OF COMMUNITY INVOLVEMENT

EPA's efforts to inform the local citizens and public officials of current activities and the highlights of community participation in the Superfund process at the site were presented in Section 3.0 of the ROD. In late April 1993, EPA conducted community interviews to determine the public's concerns related to the Koppers site. Up to that point, residents near the site knew little or nothing of the former Koppers operation. In fact, two environmental issues not related to the Koppers site seemed to be of most concern to the citizens interviewed by EPA. These issues centered around the construction of an aquarium on the Cooper River side of the peninsula near a former coal gasification plant and the June 1991 explosion at the Albright Wilson Chemical Plant which is approximately 1 mile from the site.

The former Koppers site and adjacent property has been subdivided into numerous parcels on which active businesses are located. Owners of these parcels have expressed concern about depressed property values and what might happen to their business operations when cleanup activities begin. In fact, several property owners on and near the site have taken or are taking legal action against Beazer East Inc. for recovery of damages incurred as a result of contamination on-site. Beazer East has obtained access agreements from all property owners necessary to fulfill the objectives of the RI. EPA has assisted in this endeavor, and has remained in frequent contact with specific property owners to ensure that certain requests/concerns are adequately addressed.

EPA has made a concerted effort to ensure that the residents of local communities, primarily the Rosemont and Four-Mile Hibernian communities, stay abreast of current activities at the site and findings of the RI. A special meeting was conducted with residents of these community associations on the night of January 25, 1995, prior to the formal public meeting required by law on January 26. EPA and SCDHEC officials met with these individuals to present the findings of the RI, a summary of the risks posed by exposure to sediment/surface water of the Hagood Avenue Drainage Ditch, and EPA's proposed approach to interim action at the site.

The representatives from the Rosemont and Four-Mile Hibernian communities expressed some concern over the estimated potential risks posed by contact with sediment/surface water of the Hagood Avenue Drainage Ditch, but stated they did not believe children or adults came in frequent contact with this drainage ditch. However, a request was made to post warning signs along this drainage ditch and portions of the North Tidal Marsh to mitigate possible exposure in the short-term, prior to implementation of the interim action. This request is currently under evaluation by EPA and SCDHEC. Some concern was also expressed regarding the potential for site-related contamination to be transported into neighborhood yards which backup to the North Tidal Marsh during abnormally high flood tides. Otherwise, the local community group was generally supportive of EPA's proposed interim action and were pleased that something was being done to rectify environmental problems in the area. Furthermore, the Four-Mile Hibernian Community has formally expressed an interest in applying for a Technical Assistance Grant to facilitate their understanding of the future work conducted at the Koppers site.

EPA also held an informal meeting with representatives of the City of Charleston's Commissioner of Public Works (CPW) on the morning of January 26, 1995. CPW owns and operates a maintenance facility just north of Milford Street. Throughout the RI process, EPA has maintained a dialogue with CPW because NAPL migrating from the Former Treatment Area has been noted in the subsurface underlying their property. Representatives of CPW were supportive of EPA's proposed interim action, but requested that proper steps be taken to assure access to their facility is maintained during construction of the interceptor trench. Discussions also focused on the effects that the capture zone induced by the interceptor trench would have on the plume of gasoline constituents migrating from the former location of underground fuel storage tanks on the CPW property.

1.2 SUMMARY OF PUBLIC COMMENTS RECEIVED AT JANUARY 26, 1995 PUBLIC MEETING

In January 1995, EPA released a summary fact sheet titled, "*Superfund Remedial Investigation Findings and Proposed Interim Remedial Action*", to local citizens and public officials on the Koppers site mailing list. This fact sheet described EPA's proposal for proceeding with interim action at the Koppers site

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and rationale supporting this action. In addition, this fact sheet announced the initiation of the formal 30-day public comment period from January 20 through February 21, 1995 and the date, time and place of the public meeting.

On January 26, 1995, EPA held a public meeting at the Charleston Public Works Building in Charleston, South Carolina to present the results of the RI, the human health Baseline Risk Assessment, and the proposed approach to Interim Remedial Action at the site. The meeting was attended by approximately 50 people. Pursuant to the requirements of Section 117 of CERCLA, a verbatim transcript of this meeting was kept. This transcript is included as Attachment 1 to this Responsiveness Summary.

While not explicitly stated, the attendees at the meeting seemed generally supportive of EPA's Interim Remedial Action to mitigate off-site migration of NAPL and to reduce human health risks associated with exposure to sediments and surface waters of the Milford Street and Hagood Avenue Drainage Ditches. No major opposition to EPA's proposal was implied or otherwise stated. The remaining text under this section provides a general summary of the nature of comments/questions received during the question and answer period of the public meeting, followed by EPA's paraphrased response.

Comment/Question: What about the human health aspect of the cleanup? Is there going to be a study of the people that live along the North Tidal Marsh or a health assessment?

EPA Response: It was explained that the human health risk assessment has been completed. The potential risks associated with exposure to sediments/surface waters of the Hagood Avenue Drainage Ditch provided the justification to proceed with early action in this area. It was further explained that the Agency for Toxic Substances and Disease Registry has been consulted regarding short-term risks associated with exposure and has concluded that concentrations of contaminants are not present in the drainage ditch at levels that present a human health threat in the short-term (while a final solution is being developed).. Based upon the information available to date, a person-to-person health assessment will not be conducted.

Comment/Question: The communities in the neck area of Charleston, particularly the Rosemont community, seem to have a high frequency of cancer cases. The community needs to be more enlightened on what's really going on beneath the surface because they don't know what they're being exposed to.

EPA Response: EPA believes community outreach is important, which is why a special meeting was held with Rosemont last night to inform those people who may potentially exposed to surface water/sediment in the Hagood Avenue Drainage Ditch.

Comment/Question: What is the benchmark (ecological screening criteria) for PAHs in sediment?

EPA Response: There are two benchmarks of relevance, the ER-L (Environmental Effects Range Low) and the ER-M (Environmental Effects Range Median). I can't recall these numbers off the top of my head, but would be happy to get them for you immediately after the meeting.

Comment/Question: Are the levels of PAHs and other contaminants present at Koppers similar to those found at the aquarium site, and if so, why have the investigative strategies been treated differently.

EPA Response: Yes, the levels of PAHs and other contaminants present at both sites are similar. The Calhoun Park site investigation has been challenging given the fact that the City of Charleston is proposing to build an aquarium adjacent to a parcel of land that was formerly used for coal gasification. However, remediation strategies at sites can vary so long as the end result is adequate protection of human health and the environment. Since this question is unrelated to the Koppers site, I would be happy to discuss this with you following the meeting.

Comment/Question: What will happen to the soil/sediment excavated during drainage ditch excavation?

EPA Response: The details are still being worked out, but the material will either be stockpiled for later treatment or disposed of off-site appropriately.

Comment/Question: Will the EPA proposed cleanup option permit use of the property by active businesses surrounding the Former Treatment Area during and after construction?

EPA Response: Disruptions to neighboring businesses will be minimized to the maximum extent possible during and after construction. This will require cooperation by all parties involved, but will be manageable.

1.3 SUMMARY OF WRITTEN COMMENTS RECEIVED DURING FORMAL COMMENT PERIOD

During the 30-day formal comment period, written comments were received from Beazer East, Inc. and the South Carolina Department of Health and Environmental Control (SCDHEC). These written comments are attached to this Responsiveness Summary as Attachment 2. As such, these comments will become part of the Administrative Record for this site.

In a letter dated February 7, 1995, Mr. Richard Haynes transmitted comments from SCDHEC. The comments in this letter focused on the RI Report and provided several reasons supporting SCDHEC's disapproval of the RI Report. The issue of most significance related to a statement made in the Executive Summary of the RI Report which stated that because of the salinity of groundwater in MW-13S, the groundwater in this area will not require remediation. This statement was apparently made due to a misunderstanding of South Carolina Water Classifications and Standards regarding classification of groundwater where concentrations of total dissolved solids (TDS) exceed 10,000 parts per million (ppm).

The groundwater collected from MW-13S, which is located south of the barge canal and approximately 300 feet from the Ashley River, had a salinity value within the range for sea water. According to the above standards, all groundwaters of the state are classified as Class GB until reclassified through proper administrative procedures. Therefore, the quality standards for Class GB groundwaters set forth in the State Primary Drinking Water Regulations, R.61-58.5 must be enforced. However, Beazer East can petition SCDHEC to reclassify groundwater in the portion of the site where the concentration of TDS exceeds 10,000 ppm. In response to this SCDHEC comment, the subject statement in the RI Report will be revised and the appropriate administrative procedures to reclassify groundwater in applicable portions of the site will be explored.

In a letter dated February 20, 1995, Ms. Shannon Craig transmitted comments from Beazer. The comments in this letter focused on the Interim Remedial Action and the Human Health Baseline Risk Assessment prepared by EPA. Beazer also recognizes the importance of NAPL source control in the Former Treatment Area and the need to reduce potential risks in the short-term posed by exposure to sediment/surface water in the Milford Street and Hagood Avenue Drainage Ditches. EPA acknowledges that this interim action is likely to be an important part of the final remedy for the Former Treatment Area. Beazer states that the North Charleston Sewer District is the preferred option for discharge of treated groundwater, but requests flexibility to pursue other options should final approval not be granted. This flexibility has been incorporated into the Interim Action ROD.

In the aforementioned letter, Beazer discussed a wide range of uncertainties in the toxicity and exposure values used in the Baseline Risk Assessment. Most of these uncertainties are well recognized as relevant to the current status of the science of risk assessment. Beazer has concluded that the assumptions and values used in the risk assessment, when considering the uncertainties, generally over-estimate the risk posed, perhaps to a large degree. Much of the claimed over-estimation is discussed relative to differences in the Reasonable Maximum Exposure (RME) values used and typical (or average) values for the exposure parameters.

The use of RME is consistent with CERCLA regulations and represents EPA's intention to be protective of individuals exposed at the "high end" of the risk curve. Therefore, EPA makes no claim that its risk assessment methodology produces actual risk values. On the contrary, the risk values in the Baseline Risk Assessment are intended to be values that the Agency believes, with a high degree of confidence, do not under-estimate the risk. The appropriateness of the degree of conservatism reflected in the Agency's risk assessment methodology and the values chosen specifically for the Baseline

Risk Assessment for this site are likely to remain as an area of different opinions by the stakeholders.

2.0 CONCLUSION

Community and State of South Carolina acceptance are modifying criteria that are considered in the remedy selection process. EPA has given serious consideration to all comments received, written and oral, during the 30-day public comment period, and has consulted with the State of South Carolina. The State of South Carolina concurs with EPA's Interim Remedial Action and no community opposition was noted. Based upon these considerations, EPA has determined that the Interim Remedial Action provides the best balance between all remedy selection criteria and selects this interim action remedy. A subsequent Final ROD is planned to fully address the threats posed by this site.

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Attachment 1

Verbatim Transcript
January 26, 1995 Public Meeting

REGION IV

PUBLIC INFORMATION MEETING

FOR THE KOPPERS COMPANY CHARLESTON PLANT

SUPERFUND SITE

JANUARY 26, 1995 - 7:00 PM

CHARLESTON PUBLIC WORKS BUILDING

CHARLESTON, SC

A. WILLIAM ROBERTS, JR., & ASSOCIATES

MS. PEURIFOY: Good evening. My name is Cynthia Peurifoy. I'm with the Environmental Protection Agency out of Atlanta, Georgia. I would like to welcome you here tonight for our proposed plan meeting for proposed interim action on the Koppers Company, Charleston Plant Superfund Site. I'd like to introduce some people to you tonight that are here.

First of all, this is Craig Zeller. He is the remedial project manager for the site for EPA. We also have Mr. Jan Rogers who is our section chief for the South Carolina section of the remedial program, and we have Kevin Koporec who is here. He is an expert on risk assessments for EPA, so he can answer all of your questions. For the South Carolina Department of Health and Environmental Control we have Mr. Gary Stewart, Mr. Billy Britton, Mr. Richard Haynes and also Mr. Wayne Fanning.

I want to go over some things with you tonight. First of all, I'd like to talk to you about the technical assistance grant program which is a grant of $50,000 that can be given to affected communities to hire technical advisors. This advisor can review site-related documents, meet with the groups to explain and communicate concerns and comments to the EPA, potentially irresponsible parties, et cetera.

The recipient of the grant must contribute 20 percent, but it can be made through cash, donated supplies, volunteer services or other means. There must be a plan prepared for this grant as far as how you're going to use the funds and you can also hire someone to handle your administrative tasks related to the grant. Tag funds may not be used to develop new information nor sampling nor underwrite legal actions. Groups must be nonprofit and must be incorporated and must live near the site. I have some information over on the table about the technical assistance grants program and I can help you in any way you like.

We are in a public comment period right now in the proposed interim action, which is until February 21st. It can be extended for an additional 30 days upon request. We have a site information repository established at the Charleston County main library. The documents are available at the public document area. I went there today; they're there. There is a lot of stuff there to look at there, and I'd encourage you to get out and take a look at it.

We also have an 800 number which you can call us at for updates, information, comments, whatever. It's 1-800-435-9233.

A little bit about tonight's meeting. As you know, we have a court reporter here. It's very important that we get all of your questions and comments, so I'd like to encourage you to identify yourself when you have a question or comment. State your name and make sure that she can hear you. The comments that we get tonight will be put into a document that's called a responsiveness summary which will be a part of the record of decision for this action.

I'd like to now turn it over to Mr. Zeller.

MR. ZELLER: Thanks. Like Cynthia said, my name is Craig Zeller. I am the project manager with EPA in Region 4, Atlanta, and I have been assigned here with the task to try explain about five volumes of information that represent about this much (indicating) in linear feet in hopefully about 45 minutes. My hope and my goal here is at the end of this discussion that you all have a sound understanding of what we have found out here. It is a rather large site, rather interesting site, and if you at any time have any questions -- government bureaucrats like to talk in acronyms and all kinds of slang terms associated with environmental science stuff -- so if you don't understand something I'm saying, please stop me and I'll try to explain it.

Like I said, I'm going to try to go through these first five items here talking about the former Koppers site and what they did out there for a good 50 years or so, talk about the findings of the remedial investigation which was conducted to find the nature and extent of contamination at the site, go into a baseline risk assessment summary which we'll try to summarize with respect to what we found as far as concentrations and what that means to the human health and potential risk posed and what we really want to talk about tonight is EPA and the company responsible out here is going forward with the proposed interim action.

What I can explain is this is one piece of the puzzle. It's a short-term remedy that we want to get implemented now while a final long-term correction or remedy is under way. That's what we want to talk about today and that's what the 30-day comment period is all about.

After that I'm going to kind of give you a good idea on the future schedule and the objectives for the remedial action that we've established. When I get done talking, I want to give Sharon Craig who is with Beazer East, Inc. -- they are the company that is taking over Koppers and the liability of the Koppers Company and they have been cooperating with EPA and the state in conducting this investigation so far -- so I wanted to give her an opportunity to address the crowd. At that time we'll sit down and then it's your turn to ask some questions and hopefully we can provide very good answers.

What is the Koppers site? The Koppers site is or was approximately a 45-acre parcel. They treated wood on this parcel that is bound to the east by Interstate 26, to the north by Milford Street, to the south by Braswell Street and to the west by the Ashley River. That approximate pie shape there represents about 45 acres.

From the period of 1940 to 1978 Koppers in their name operated a wood-treating plant there. They primarily treated wood with creosote which consists of a wide range of compounds we call polynuclear aromatic hydrocarbons, but they also treated wood using chromium copper arsenate, which we call CCA, and pentachlorophenol. In general, the wood-treating process I guess could be described as bringing virgin wood in; pine, timbers, railroad ties, whatever it may be, they were brought in and stored on-site. Normally the virgin wood was stored generally in the central portion of the site. It was brought in by rail for a while, but when the trucks got moving along, they were also brought in on semis as well.

The majority of all the treatment activity took place in this area we're calling the former treatment area. In the former treatment area there were several aboveground storage tanks, upwards of 12 storage tanks, that held the raw creosote.

Raw creosote was pumped from the storage tanks that were in this area to a set of working tanks. From the working tanks, the creosote was pumped into pressure cylinders or vessels. These vessels were rather large in nature. They were 130 feet long and about eight feet high. They had a big door on them. They would rail in the wood, shut the door, screw it real tight like a big safe, pressure it, suck out all of the water out of the wood and then impregnate it with the wood preservative of choice. As I mentioned, primarily that was creosote but on occasion for a short period of time they did use the other two, CCA and pentachlorophenol.

Another brief description of the process following treatment in this general area of the former treatment area, treated wood would then be rolled out of here on the drip-track area where it was allowed to drip or dry and then it would be stockpiled on-site for shipment to the ultimate user.

Treated wood was used by the railroad -- industry for railroad ties. It was used by the building industry for foundation pilings, all kinds of construction materials such as that. Some other interesting features here: Following treatment in the treatment area, there were some attempts to recycle the material. Material that was recovered from the treatment cylinders themselves were recovered in the sump pump and pumped back to the working tanks.

Wastewater -- there was a lot of water that was generated in this process -- was collected and pumped across the street to this little separation tank area. There was a series of six separation tanks where the water was collected there. It was put into a dehydrator. Basically they tried to boil the water off and collect any creosote that was left.

On occasion these tanks would overflow and run down to Braswell, what we now call the south Braswell Street drainage ditch. This thing was lined with wood plumes and this creosote in the water and all the residuals from these tanks would run down this ditch and sometimes overflow, we believe from a review of the historical area photographs we found, generally in the old impoundment area and then subsequently out into the south marsh and there is some information to support that it may have been diverted for a while over into the central drainage ditch and then subsequently out into the Ashley River.

For a while through the main part of the operations up to the mid '60s, residual creosote from the cylinders was taken over here and buried in the western area of the site that's now currently owned by Braswell Shipyards. We call this place the creosote treating cylinder residue area. Some other interesting facts of this site was that in 1984 under a permit with the U.S. Army Corps of Engineers, Southern Dredging came in and dredged the barge canal through this area of the site. This was just done in November of 1984. Well, this dredging activity exposed numerous creosoted poles and highly turbid

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water and released a lot of sediments which was purportedly documented to have resulted in a fish kill. A South Carolina regulatory group responded to a reported fish kill in that area and collected approximately 100 dead fish.

Again under a permit, with this dredging permit, all the spoils from this area were pumped approximately 700 feet deep to the spoils area. This is a very primitive fed sedimentation basin. Berms were pushed up to be about three or four feet high, water was pumped in there, the sediment had fallen to the bottom then water was skimmed off the top and drained here into south tidal marsh. That's kind of a brief history. We have split this site up, but if you look at this whole site that is outlined here, as I mentioned, the pie-shaped wedge that sits right through here is about 45 acres.

When this site became proposed to the National Priorities List, which is EPA's list of the most serious abandoned hazardous waste sites in the U.S., when it was proposed, we expanded the site boundaries to include this area right here which is approximately 57 acres. Our sole purpose for doing that was to investigate the potential damage or impacts that this barge dredging incident could have had on that property. So when you look at the whole kit and caboodle, you're looking at about 102 acres, so it's a rather large Superfund site in the whole grand scheme of things.

We've split this thing up into general areas of focus that throughout this presentation I'll keep referring to you. Starting from the north, we call this the Hagood Avenue drainage ditch; as I -- mentioned, the former treatment area; the North Milford Street drainage ditch; the drip-track area; the old impoundment; the spoils area. This is the south tidal marsh, the north tidal marsh up there; the Ashley River, central drainage ditch, creosote residual; those are some of the areas that you want to keep looking at.

Moving on, how did we get here? As I mentioned, this Superfund site was proposed for inclusion on the National Priorities List, EPA's quote, unquote, Superfund list, in February of '92. It was finalized just this December. It became final on the NPL in December of '94. We felt pretty strongly about that proposed listing and that's why we started the work in January of 1993. In January of 1993 EPA and the responsible party for this site entered into an agreement. We call it an

Administrative Order on Consent. As far as the agreement, Beazer, Inc. agreed to fully conduct the remedial investigation and feasibility study phase of this project.

In essence what this means is that the objective of the RI is to go and find the nature and status of this contamination. The feasibility study, which we're currently entering -- they're ending the RI phase right now, that's why I'm here today summarizing the results and we're jumping into the feasibility study which is an engineering study designed to look at feasible alternatives that are cost effective and result in a degree of risk reduction. This RI process started approximately two years ago.

In June through August of '93 we conducted the Phase I field program which was the actual recovery well and the whole nine yards were installed. We conducted a Phase II program in February and May of last year. That was based on results of the phase I and provided more focused study as opposed to a site-wide study -- It's a 102-acre facility -- and then started focusing on areas that we call areas of concern.

There was some supplemental fieldwork

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that was done out there this past September. The supplemental investigation was conducted to support the development and conceptual value and the proposed hearing on remedial action that we'll get into here briefly.

But as a result of all these field programs that were conducted, you can see we collected a lot of samples which resulted in a lot of data which I'm trying to summarize to you today in a very comprehensive yet understandable manner. Through this investigation we collected surface soil samples from 145 locations across the site and subsurface soil samples which were taken from about 6 inches below land surface to the water table which on average extends to about four feet below land surface across the site.

We collected 215 samples in the subsurface areas. The geologic groundwater investigation included collection of 91 samples from what we call piezometers, 11 drive-point wells and 29 conventional wells. A piezometer is basically a tube stuck in the ground; it's designed to measure water, water level, how deep is the water. It gives you an idea on where water may be flowing. Drive-point wells are nothing but a real quick and dirty conventional monitoring well. Now a conventional monitoring takes a lot of time, takes a lot of money to install but it does give you highly reliable groundwater data.

We collected surface water at 60 locations across the site, in the Ashley River, the north tidal marsh and the south tidal marsh, across all the drainage ditches on-site all encompassed. Sediment was collected to depths up to three feet at 90 locations and there was also a fairly extensive ecological study that attempted to evaluate what types of effects the contamination present would have on the ecological receptors of this area. That consisted of an eight week caged oyster study where we actually took clean, fresh oysters, set them out in locations or areas that we were interested in and set them out there for a good month and picked them up afterwards and analyzed the muscle tissue. Oysters being filter feeders, we wanted to see if they had sucked in and blown out stuff and collected that stuff over a period of time.

We also sampled indigenous mussels that were inhabiting the local marshlands. We did some sediment toxicity testing with two test PCs, which basically consisted of collecting sediments in

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various portions across the site, subjecting it to a ten-day toxicity test to see if these animals survived or if they died, and I'll go into the results of that study.

Real briefly to summarize the results of the RI report, first let's look at surface water features. They're very important on this property just due to the fact that groundwater is only 4 feet below land surface. Let's start in the north portion quickly. This is the former treatment area. There is a Milford Street ditch that runs -- we call this the eastern portion of the ditch -- it runs easterly at this point in time where it connects into a subsurface drain pipe that runs essentially parallel to I26. The subsurface pipe carries water from the site into this Hagood Avenue ditch and then water and constituents from the site are subsequently transported in the Hagood Avenue ditch.

There's kind of a divide here in the Milford Street ditch. The western end of this then flows towards the Ashley River; however, the constituents that we're worried about at this point in time appear not to have affected this ditch as much as this area.

Another ditch that I mentioned, the South

Braswell ditch, this ditch carries run-off from the eastern portion of the site. Currently it runs down through here, is run under a subsurface culvert under Braswell Street and then it's channeled out through the barge canal and subsequently to the Ashley River. It's a big concern for us. The central drainage ditch still has water in it and carries run-off from the site, about the western third, into the Ashley River. Then there's another surface water ditch here that's not marked, but it is important, that comes along the southern portion of the property. This is Monrovia Cemetery. It comes through here and discharges into the south tidal marsh. So those are the surface features that we're most worried about. It's got some physical characteristics and I'll get into the chemicals later.

This is the ground water flow direction in the shallow intermediate aquifer. There are three water-bearing units in the subsurface of the site. To simplify matters, there's a shallow water-bearing unit that is encountered about four feet below land surface. It extends approximately about 15 feet below land surface in this area of the site.

The shallow clay layer then pinches it

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out in this area of the site. In this area it's not present. Groundwater; then it's separated by the intermediate zone, then there's an intermediate clay that's approximately 35 feet below land surface. Below that there is a deep water-bearing unit and it's approximately ten to 15 feet thick in some areas and it sits above the Cooper formation. The Cooper formation is a very interesting geological feature of this area. On average it's encountered about 55 feet below land surface in this area. It's an enormous clay layer that's reportedly 260 feet thick in this area. We would not expect contaminants to go below that. It's an enormous clay layer, and it's been very efficient at holding things where they are.

The shallow or intermediate water-bearing zone or the aquifer and the groundwater in this northeastern area, the groundwater is flowing in this direction. These numbers here are actually water levels and as, you can simplify things, water flows downhill and this would be the so-called groundwater mound in this area. And as you can see, it flows 10, 11, 12. This is just a map that we've generated based on water level measurements in the 29 wells being put in.

The groundwater in this shallow unit

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flows this way, but there appears to be a divide in the site around this vicinity and then water on the western two-thirds of this site then flows westward towards the Ashley River.

Real briefly about the groundwater quality in this area, we've characterized what we would call two distinct source areas. Source areas are areas where we can actually find black creosote-type product. Now, the source areas that we've defined are the former treatment area, which is no surprise due to the fact that the majority of all the treatment took place in this area.

The wells that were installed in this area have been largely impacted. There are detectable quantities of black liquid type material or oil. Oil is heavier than water, so it is sinking down until it finds a clay lens or something that won't allow it to pass through.

Another area that we've defined as a source area here is the former impoundment area. We have also detected nonaqueous phase liquids or oil down about 35 feet below land surface in this area as well. Those are the two source areas.

The two areas of groundwater that we're concerned with in the shallow intermediate zones are

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the former treatment area and the impoundment area.

Now, the deep water-bearing zone is separated, as I mentioned, by that intermediate clay lens, and it seems to be separate altogether. The intermediate clay layer appears to have separated these two aquifers very well because we've measured completely different groundwater chemistries and just by flow direction. This deeper aquifer that sits -- right above the Cooper is flowing straight to the Ashley River and for the most part, this deep aquifer has been relatively unaffected by previous site activities.

I want to talk about the surface and subsurface soil concentrations that we found. According to baseline risk assessments, there were five chemicals of concern that pose potential risk to human health in the environment at this point in time. These were creosote compounds. And the way EPA looks at creosote compounds, we summarize these things into what we call benzo (a) pyrene toxicity equivalents. All we've done is look at the compounds. The family compounds that make creosote are called poly aromatic hydrocarbons. There are 17 compounds primarily that make up creosote. Seven of those compounds are potential carcinogens to humans, so all this BAP, benzo (a) pyrene, toxicity equivalent is looking at the seven carcinogenic PAHs and it translates it into one concentration. So it's a nice summary parameter that we can use to present the results to people that care about this kind of stuff.

But back to the point, there was five chemicals or five constituents that were present in enough concentration that caused us concern. Those were the benzo (a) pyrenes, chromium, lead, arsenic, dioxin and pentachlorophenol. This one here shows the concentrations of benzo (a) pyrene. What I've tried to do is I've come in here with my red pen and tried to show you -- in the surface soil now, in the top six inches of soil -- trying to show you what we're going to classify as a hot spot. Red equals hot.

So as you can see, we've got some high concentrations, again, no surprise here, in the former treatment area, in the drip-track area, in that little isolated portion, near the old impoundment area, up on the Braswell portion of the property and then interestingly enough along this south road that was never really owned by Koppers and never really received creosote-type compounds. I'll get into that in a little bit.

That was benzo (a) pyrene in the surface soil. This was pentachlorophenol, which I mentioned was a wood preservative of choice for a while used for an unknown period of time. As you can see, pentachlorophenol is detected right where the former penta tank was at. Our highest concentrations were really only detected at that point. We had a small trace in here, but the highest concentrations were consequently right where the former treatment tank was at.

Now, as a result of penta, there is a contaminant that is a potential carcinogen to humans; it's called dioxin, which is this map. The dioxin is found as a trace constituent of, technical grade pentachlorophenol. When it's sold, it has it in it. Now, we also found dioxin above health base standards right where we found the pentachlorophenol, so we have a good handle on that. That's in the surface soil again.

This is the concentrations of arsenic in the soil where we were originally looking for arsenic on this site because Beazer told us that they used a wood preservative called CCA, chromium copper arsenate. Well, interestingly enough the highest levels of arsenic we detected were down here along this south road just south of the barge canal. This is what we're going to call the hot spots for arsenic. There were concentrations detected out there above human health standards. We will address those, but the interesting portion is that the highest concentration appeared to be in areas that Beazer never used, but we think we know where that's coming from.

Also, the lead concentrations look very similar. We didn't expect lead to be a contaminant that would have been associated with wood preservatives, but we analyzed for it anyhow. Again, we found lead down here on this barge canal road. Down here are the hot spots with the letter on that road where also the arsenic is. That was the surface soil.

I want to get into subsurface soil across the site and these look very similar in nature. This is subsurface for benzo (a) pyrene. Again, your hot spots are in the same general areas that the surface were, the former treatment area, up here where the storage tanks were at, through the drip tracks, the impoundment and then some isolated areas here. You can see this is where we thought the creosote residual area was at, and we feel that we've seen some evidence that that was the case there, benzo (a) pyrene creosote compounds.

This is arsenic again in the subsurface and, very similar to the surface, you can see the highest concentrations of arsenic again are down here on the road. There are some levels of arsenic above human health standards in this former treatment area, but again, the area of highest concern is down here on the south barge canal.

This is lead and you will see a similar pattern developing. Again, the highest levels of lead, which would not be attributed to wood-treating operations, are down there on the South Braswell Road. And then dioxin, again, was detected above the human health base standards in the area where the former treatment deck was at.

That's the surface soil. That gives you a good idea of those concentrations. What's going to happen now? All the isoplat lines you saw in there are above human health standards, so we're entering into an engineering phase now where we're going to look at stopping those exposure pathways by numerous options. We're going to evaluate capping that material; excavating that material and replacing it with clean fill; excavating that material and possibly treating it; that type of thing.

We will excavate that material -- we will treat that material to come in compliance with EPA's acceptable risk range. How much we actually clean is still to be debated based on some costs and risk analysis. It will be within EPA's risk range. It is a matter of how much we take out, and I can get into that later.

This is, very quickly, the sediment results that are very interesting. This was arsenic. There were numerous contaminants above the ecological screening level benchmarks that we've used at this phase. We are in the process right now of developing formal ecological cleanup numbers. We have these for human health numbers and those are what I just showed you. We're going through an ecological risk assessment that will give us cleanup goals for surface waters and sediments and possibly groundwater of this area.

Now, we have a good number of contaminants that have exceeded these screening level benchmarks. All they tell you is that this contaminant is at a concentration that may be a problem to you. I have picked out a few of these as indicators because these patterns are very similar as they were in the surface and subsurface soil. But what these dots mean, the bigger the dot, the higher it is over our ecological benchmark.

These circles right here that are clear would be right in that fringe area. We're not as concerned about these sediment samples. What we are concerned about are these, where these pop up. And what we see -- and this is concentrations of arsenic that pop up. This is concentrations of arsenic and sediment. Again, we expected to find some arsenic here on-site. Each one of these tiers is a different level in the sediment, so this would be 0 to 6 inches. This was 6 inches to 12 inches. This was one foot to two foot, and this was two foot to three foot, so as you can see for that particular sample, concentrations are getting higher as you progress deeper.

Now, this is arsenic. This was actually a very big surprise to us. We didn't really expect to find this. Well, it turns out that arsenic and lead, which I'll show you next, can be traced back to former fertilizer/phosphate manufacturers. They were a direct component of that process. Well, coincidentally enough there were former fertilizer plants located historically to the north and to the south. There was a former fertilizer plant that was located down in this area and also up in this area where you're seeing the high levels of arsenic.

This is lead, very similar distribution for lead. Again, this area in the south marsh, you're seeing high lead concentrations, high lead concentrations here where another former fertilizer plant was and then we also we have some lead concentrations in the headwaters of this north marsh.

The total PAHs or creosote compounds are kind of what we expected to see. We found elevated concentrations of creosote-type compounds in the headwaters of this north marsh. These are actually carried from the site to this area. Our estimates are about the first 800 to 1,000 feet of the headwaters of that north marsh have been impacted by creosote-type compounds.

As you can see here in the Ashley River, the shoreline of the Ashley River and this adjacent stretch of the Ashley River, approximately 1,500 feet of the Ashley River riverfront has been impacted by creosote-type constituents in the sediments. They are present at depths to three feet in that sediment. We have not attempted at this point in time to define the vertical extent of that contamination, but we intend to do that here in the next few months. We're going to go back out in the field and possibly do some lab recording out there.

Also there's some PAH compounds detected in the barge canal as we'd expect and also some PAH compounds detected near the dredge spoils area and the berm spoils area where that stuff would have come off during that incident.

This shows a little schematic on the ecological assessment that we did and whether or not these sediments were toxic to the test organisms that we looked at or the test species. The N means it was nontoxic or no significant toxicity was demonstrated. The left alphabetic number here was one test species and the right was another, so where you have down here a pair of Ts, that means that that sediment from the south, from the headwaters of the south tidal marsh was toxic to both organisms that we looked at.

Other toxicity that was observed was also here in the headwaters of the north marsh. It demonstrated toxicity for one of the organisms we looked at. We had toxicity demonstrated in the

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sediments of the Ashley River adjacent to the site, and we also had toxicity to the ecological receptors here in the south tidal marsh.

Like I said, we are in the process of developing cleanup goals for sediment and those will be incorporated into the feasibility.

But what does all this mean, Craig? These are all levels and you've got some nice red figures for us, but what does all this mean? We're trying to get a handle on it ourselves in the baseline risk assessment summary and we looked at potential exposure pathways for humans on the site. The exposure pathways that we evaluated were incidental ingestion and dermal contact with surface/subsurface soils on-site. We looked at groundwater ingestion as a potential possibility just in case there was a future on-site resident that may locate on our site. Case in point, that all the water in the area for potable use is supplied by the city. Everybody in this area is on city water.

We did conduct some recovery well surveys. We looked at all available records and we did conduct some surveys there; exposure pathways incomplete.

We also looked at incidental ingestion

and dermal contact with the surface water while wading in the river, while possibly coming in contact with surface water in the ditches on the site, and we also looked at possible ingestion of fish or shellfish in the area, and last but not least, we also looked at incidental ingestion and dermal contact with the sediments.

Carcinogenic risks, we looked at specs from exposure to soil and subsurface soils and all these are exposure pathways that we looked at two ways; carcinogenic risk and noncarcinogenic risk.

EPA classified carcinogenic risks under class A, B1, B2, C, D or E. A means that it is a known human carcinogen. Class E would be it's not classified. There's no evidence of carcinogenics to humans. Most of the constituents, the ones that we looked at -- the creosote constituent, lead, and those -- are classified as B2 carcinogens, which is it's a probable human carcinogen based on sufficient studies conducted on animals. It's insufficient based on human tests.

Now, this is where it gets confusing and sometimes I get lost here. EPA has defined its protected risk range, as you will hear people talk about as one times the ten to minus four or one times

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ten to minus six. If the risk is calculated to fall within that range, it's acceptable. If it falls outside of ten to the minus six, it's acceptable and also if it falls in between there.

Now, this is an incremental chance. What this means is that if you, under the exposure pathways that were evaluated, if your risk falls outside of that range -- let me explain it this way. One in 10,000 or one in one million. Now your exposures to this contaminant on-site result in a one in one hundredth chance of dying by exposures of this contaminant present on-site. That is unacceptable to EPA, and the EPA Commission has to do something about that; but that's defined as an incremental chance.

Everybody in this room, by living on God's green Earth, your chances of developing cancer are .3, so if you were exposed to soils on this site and your incremental chance went up to one in one hundred or .01. Your chance now of developing cancer in relation to the site exposure has gone to .31.

We also looked at non-carcinogenic risks, which we looked at exposure estimates, referenced those, and those are calculated to be hazardous. If you have an HI greater than one after you sum this all up, we conclude that that could cause adverse health effects.

Let me try to tell you what this all means here. Under the exposure pathways, either of the scenarios that we looked at, on top here we hypothetically developed exposure scenarios for a current on-site worker, a future on-site worker, a future utility worker and a current off-site resident. We looked at the potential exposure pathways that this person may be exposed to. We looked at the exposure to surface soils, subsurface soils, surface water and sediment.

Now what we did, then, is you make assumptions on the frequency that this person may be exposed and the duration that this person may be exposed. These are all thrown into a very complicated mathematical formula and at the bottom you get the numbers that are down here. Now, the shaded numbers that I have shaded here are unacceptable risks as defined by EPA. EPA has mandated in the law to do something about that. Let me go through this.

The current on-site worker, for instance, we assume that in the eastern portion of the site this current on-site worker would be exposed to surface soil samples 25 days a year. And then in the middle or the western portion of that site, we'd assume that he would be exposed to this stuff 250 days a year. The difference here being that the eastern portion of the site now is heavily paved, whereas the middle and the western portion of that site are primarily unpaved; so we tried to reduce the exposure frequency.

This person was assumed to be a duration of exposure of 15 years and this person would also be assumed to be exposed to the surface water two days a year for 15 years and also sediment. Those numbers are all calculated. We calculated unacceptable risk for the current on-site worker to be five times ten to the minus four or out of EPA's risk range. The accepted risk range would be one times ten to the minus four.

We also calculated an unacceptable noncancer HI of two. Anything under one we expect to be okay. That's the least extreme. Now, going to the worst scenario that we've seen or the highest risk that we've calculated for this site, where the so-called current off-site resident or the person that's not necessarily living on-site now but may occasionally trespass on the site or may be occasionally exposed to site-related constituents.

What we looked at was the adult and child exposure scenarios, exposure to surface soil on-site for the adult possibly wandering across the site and coming into contact there and primarily the surface water/sediment pathways. Now, what we calculated there was one times ten to the minus one risk range. That's well outside of EPA's risk range that says, EPA, you must do something about that.

Also, we calculated fairly high hazard indexes for -- greater than one up to 10,000 -- for the child that was playing in the Hagood Avenue ditch over a period of six years and was coming in contact with that stuff for 24 days a year. So we looked at those risks and we said, these are something that we have enough data on the table now that we should do something about this. And this is really the topic of where we're at now. This gets into the proposed interim action.

This is what EPA has proposed to do in the short term. What we want to do here now is we want to reduce the potential for short-term human health risks in that northeastern area associated with the dermal contact/incidental ingestion of surface waters and sediments in that Hagood Avenue ditch and the Milford Street ditch, while a final long-term remedial solution for the site is being developed.

We have enough information now that we feel that we can go ahead with this piece of the remedy. This is one piece of the remedy, that is not the final remedy. The final one will come likely in the next year.

But what we want to do here, and I'll go through these four steps. These four steps are in that fact sheet that some of you may or may not have, but step 1A is what we're calling eliminate the future migration of NAPL, nonaqueous phase liquid, creosote, oil, whatever you want to call it, to the Milford Street drainage ditch.

As I mentioned, creosote is traveling along that Milford Street drainage ditch and it's being carried along that subsurface culvert in the subsurface drainage pipe that runs between Milford and Hagood and then is transported to the Hagood Avenue ditch. The way we want to do that is construct an interceptor trench, reconstruct the ditch and treat the collected water. Step two would be mitigate the drainage system as a conduit for potential migration to the Hagood Avenue ditch. What I'm referring to is that subsurface drain pipe that

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runs between Milford and Hagood. We're going to go in there and inspect that ditch, inspect that pipe, see if there are any leaks, see if there's any product in that pipe and repair that as necessary.

Now, that repair is yet to be determined but the two extremes would be doing nothing if we see no leaks or that we see so many leaks that it may make sense just to pull the thing out and reconstruct it altogether. There's no way for us to know that now and we will determine that on the official inspection.

Step 1C then would be eliminate the potential exposure to the sediments that are currently in that Hagood Avenue ditch. And the way we're going to do that is we're going to reconstruct that ditch. We're going to go in there and we're going to pull out those contaminated sediments, remediate them to health base levels and reconstruct that ditch so that we don't have that problem anymore.

Then step two, finally, we're going to go back to the former treatment area and then look at mitigating the off-site migration in the intermediate zone, and we'll do that by a recovery well. Let me mention here that the cost right now on estimates are

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an upfront cost of $1.35 million, total operation and maintenance cost, annual cost of $138,000 a year for a total present worth value of just over $3 million.

Let's look at what I just talked about, and I'll go through those steps one more time so you get a good idea of what we're talking about here. This is the former treatment area. As I mentioned, the NAPL is in this area, subsurface here. A large majority of it is concentrated about 15 feet below land surface and it's moving in this direction. So what we propose to do is put an interceptor trench approximately 350 feet in length, it will be about one and a half feet wide. What we intend to do is with a machine come in in one continuous path, excavate this trench down about 15 feet below land surface and install a drain pipe at the bottom of that drainage ditch, on top of that shallow clay layer, and then backfill it with a pervious gravel so that it will create a preferential flow path so that we're going to recover all that groundwater and free product in this interceptor trench in the sump pump. The sump pump will be located at one end. Right now for illustration purposes it's right here.

This sump pump, then, at a rate of five gallons per minute, will recover material from this area, pump it back to a warehouse that's currently located at 1961 Milford Street, it sits right down there, and that water will be treated in accordance with all regulatory discharge requirements and right now we're working on negotiations with the North Charleston Sewer District to discharge that to them. So that will be in full accordance with the North Charleston Sewer District and will be to all applicable standards.

So what we're trying to do, as you can see, is right now via subsurface borings we have delineated where this black creosote is in the subsurface and we estimate it to about 150 feet north of Milford Street. So what we're trying to do here is induce a capture zone to reverse the gradient on that stuff and pull that stuff back and stop it right there.

We also have a dissolved constituent that is a little bit further out there. To give you an idea real quickly on the subsurface there for those who are interested, here is a subsurface cross-section that extends down. In the inset down there you'll see cross-section AA is the easternmost.

Now, the interesting thing about that is

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that here in the eastern section you can see the shallow clay is present. Now, via all the borings we put in, coming down here, these little black sections here were where we have actually observed creosote and NAPL in the subsurface.

Here in the western section you can see that we don't have that shallow clay. The shallow clay is gone. We do have the intermediate clay and some of the wells we put in that area, these wells are actually located in the former treatment area and we do have stringers and visible NAPL in some of those areas.

Let me show you another cross-section. This runs parallel to Milford Street. This is a really good illustration of what we're going to do. You can see here the shallow clay layer benches out. Here it is. We're proposing to install that trench on top of this shallow clay. You can see that we have some NAPL in here and we also have some NAPL that's rolling over that and also sticking in this one well here. As you progress in this direction, we don't have NAPL that far over.

Here is a cross-section that's running north and south through that area, and over here on the left this is where the groundwater flow will be coming in. We're going to want that groundwater flow to run into this interceptor trench and the gravel backfill and percolate down in this drainage pipe where we're going to collect it. On top of this you'll see that's where the Milford drainage ditch is going to be and we're going to put a new drain pipe on top of that. Likely it will be a precast concrete drain that's going to be raised above the water table, hopefully, so that we stop all transport mechanisms.

So what we're doing here is very simple. Let's stop the source; let's stop the source and head it off at the path so to speak. Then after we stop the source effectively, which is step 1A, let's go in and rectify the problem that the source has caused over the past years and that is to mitigate the potential pathways along that subsurface drain pipe and let's go get those sediments in the Hagood Avenue ditch that have been impacted by this past transport mechanism.

What we want to do on step 2 then is to come in and where we have a potential for NAPL to migrate in this intermediate water-bearing zone we want to come with a recovery well, screen in that intermediate zone and recover all the impacted water

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that's in that area so that's kind of the fourth step of four.

As you can see here, here is a good cut of what this interceptor trench is going to look like. You can see the gravel backfill, the Milford Street ditch on top of it and then the perforated drain pipe where the stuff will collect, actually infiltrate down there and collect in there and it will be directed to the sump pump and be pumped up to the building and be treated at that time and be discharged into the North Charleston Sewer District.

That's in general what we're proposing to do and let me just keep on rolling here. I'll finish here in a few minutes and you can ask us all the questions you want. What we're going to do is reduce the human health exposures to surface and subsurface soils to levels being protective by EPA. We're also going to reduce the potential human health risk posed by contact with the sediments that are in those ditches. This is all the stuff we're doing now in the feasibility study.

We're going to remove and control the discharge of free product to that Milford Street ditch, and the way we're going to do that is the subject of our proposed interim action which I just

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presented to you. We also want to remove or otherwise control NAPL that would be below the water table north of the former treatment area, material that may be north of Milford Street, we also want to try and reverse that gradient and pull it back and stop any more further migration of that material.

We want to address the dissolved phase contaminants that appears to be emanating from the source area in the northeastern area. We want to control the source area that's in the impoundment area. As I mentioned, we have another distinct source here, the old impoundment area where NAPL is detected a good 30 feet below the land surface there. Our concern there would be NAPL could potentially be transported to the Ashley River and/or the barge canal; so, again, we want to head that off at the path as well.

We want to mitigate the surface water and sediment transport mechanisms that are currently ongoing that have apparently impacted that south tidal marsh, and we also want to satisfy the ecological remedial action objective that is currently being developed right now.

Where does this lead us? We're going to head back out in the field approximately in March.

The objective of this fieldwork will be basically twofold, but the primary purpose of this is we're going to head back out in the south tidal marsh and see if we can't find the source of this lead and arsenic that we've detected in the sediment and surface waters of that area. We believe that material is coming from land and property formerly owned by the fertilizer/phosphate companies there. That's not confirmed yet, but that's our suspicion based on an understanding of that historical area and photographs, the samples that we've collected and a general understanding of that fertilizer/phosphate product.

We will determine or attempt to determine what the source areas are during that classification. As I mentioned, we're also tossing around the idea of going back out in the Ashley River and doing some deep coring in the Ashley to see if we can't find the extent of contamination in that area, the volume that we're potentially looking at to remediate.

As I mentioned, the proposed plan public comment period on the proposed interim remedy that we're planning to go ahead with runs to the 21st of February. I would be very interested in hearing any written or oral comments that you all may have. You can express them here tonight to me, you can write to me, you can call me, whatever is most convenient to you; but I am interested in what you have to say about that.

Following that formal comment period we're going to respond to all comments received in response to this summary and wrap up the formal decision in what we call a Record of Decision. We're hoping to be done with that by March of 1995. We will continue detailed design on that remedy, and we hope to start construction on that thing by late fall, early winter, 1995.

That's a fairly aggressive schedule, but if we can get cooperation by all parties, there's no reason we shouldn't. We've had that all the way through this process, and we think, weather permitting, of course, that we can get out there and do that.

As I mentioned, the ecological risk assessment is ongoing. The idea of that whole assessment is to develop cleanup goals for the sediments and the surface waters and potentially groundwater that can be protective of ecological receptors in the area. The results of that will be incorporated into the feasibility study and then we will evaluate the volume of material that we have to deal with at that time.

I hope to be back here in approximately a year. We hope to wrap up that feasibility study late summer, early fall this year, and I hope to be back here, like I said, in about a year with a big remedy. I think it's key to understand that what we're proposing now is just one part of the puzzle. It's not the entire solution, but we think we have enough data at this point in time to go ahead with this remedy that would address the highest risks that we've detected at the site and we've calculated for this site.

The big picture then, as I mentioned, will focus on the north and south marsh, the drainage ditches, the on-site surface and subsurface soils, the Ashley River, the barge canal. In general, that's what the big picture will entail -- and also source control of the impound.

Let me sit down here and at this point I'll turn it over to Sharon Craig real quickly if she has anything she wants to say, and then we'll stay around and answer questions for as long as you all have questions.

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MS. CRAIG: Craig has done such a good job there really isn't too much for me to add but to introduce myself to you again. I was here back in the end of May 1993, and I have the opportunity to be here with you today and I hope to be here with you when we come back in about a year.

This has been a very productive, busy time for the EPA, the state, the trustees and Beazer. I'd like to introduce my project manager, engineering consultant, Doug Simmons, if you want to stand up. A lot of the productivity, I think, is as a result of his hard work. We've all worked very hard trying to reach common goals and that's been to finish the remedial investigation in a reasonable period of time so that we know what the extent of the constituents are so that we can move forward with the engineering studies, the feasibility studies so that we can really do what we want to do which is remediate the site.

Beazer is totally in favor of the interim measures; in fact, we're working with the state and the EPA to make sure that happens as quickly as possible. I just want you to know that I intend to be here for quite a while as the corporate representative for Beazer. If you have any questions

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for me directly, you can reach me in Pittsburgh at a telephone number I'll give you, if you want to write that down, or you can contact EPA, and Craig Zeller will put you in touch with me. My telephone number is (412) 227-2684. I'm busy, but I will try to get back to you if you call me. I will be happy to come back to Charleston and meet with any of you, if you so desire, to answer questions.

I can come with the EPA. That's what my job is, so I'll be here. Thank you.

MR. ZELLER: You might want to mention how Beazer became --

MS. CRAIG: Koppers Company, Inc. that had been the former owners of this site and treated wood here sold the site in 1978. In 1988 there was a takeover by a British firm headed by Brian Beazer, hence our new name. We're the old Koppers Company and all of the different industries that were owned by Koppers were sold off except for the aggregate which was what Mr. Beazer really wanted and the liabilities and that's where I come in.

I'm one of five program managers. I've been with Koppers, Keystone and now Beazer for ten years. My father worked for the company, and I hope to be with the company until I retire; maybe here in

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Charleston, I don't know. It's a nice area. I like the people. I like everyone I've met. It's been productive, hard work, but I'm really looking forward to moving forward on this site and seeing that we can get this remediated as quickly, as painlessly but as fast as we can. Thank you very much.

MR. ZELLER: Well, that kind of ends the formal presentation, but if we did something too fast or didn't adequately summarize it, or maybe you're more confused than you ever thought you could be, I'm here to straighten you out; so if you have any questions, please ask them now.

MEMBER OF AUDIENCE: You told us about the cleanup site and what you're planning on doing in the ecological area. What about the human aspect of it all? Is there going to be study of the people that live along this marsh or a health assessment of them or what?

MR. ZELLER: Well, we've completed the health assessment portion of it as far as trying to quantify what the potential risks would be based on the exposure and duration that we talked about. As far as a person-by-person study, no, that's not part of the plan at this point in time. But we do plan on cleaning up those sediments in the Hagood Avenue

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marsh to at least human health base standards and if the ecological standards come out to be lower or more stringent, we may even go to those, particularly in the ecological areas like in the marsh area itself. But those areas will be cleaned up to levels deemed adequately protective of human health. That's our mission. That's what the law says we have to do.

MEMBER OF AUDIENCE: Just pursuing this question a little further, do you know if there are any other agencies that have an interest in doing what she suggested in terms of an actual health assessment?

MR. ZELLER: When we first learned about those risks, then we were concerned about them, of course, as we always are when we see risks that high or elevated in the acceptable range, so we consulted with a liaison agency we have called the Agency for Toxic Substances & Disease Registry, ATSDR, it's a mouthful.

But what we were concerned about the risks that we looked at is long-term risks. We were looking at exposure durations of six to 24 years to the surface soil and sediments. What we were worried about is in the next year while we start our construction and as we get under way with our

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four-step process that we're proposing, is there a short-term -- less than a year -- is there a short term carcinogenic risk or a non-carcinogenic risk, and they came back to me. They actually looked at maximum concentrations detected in those waters, not a statistical average, they actually took the max, and their response to me was that there is no concern for the short term for the people in that area.

MEMBER OF AUDIENCE: Given that they've been exposed to that for -- I mean the place closed nearly 24 -- I mean two years ago, there's a long-term exposure which your study identifies.

MR. ZELLER: Right. We spoke with the Rosemont group last night about this issue and things we may do to stop exposures if they are happening. There's been some discussion about posting that area in the interim as far as please don't -- the question we need to answer is are there people wading in those ditches? Are there people walking in those ditches and being exposed to that material there, whether it be surface water or sediment? And EPA, if we're going to err, we're going to err on the conservative side which is why we make an exposure assumption.

The last thing we want to do is underestimate the risks because that's an error that we really can't afford to make. So what we've tried to do is make some fairly conservative exposure assumptions, that is, exposure assumptions were 24 days a year for a six-year period. So you have to ask yourself, does that actually happen? We want to be conservative, again, and based on the exposure assumptions, we're going to try remediation of that area and that's the way our program works.

Now, has there been a long-term exposure up there at that plant? Granted, it had been in operation for a good 50 years. That's hard for us to answer. I know in other sites where there has been a big concern on that, where there's a widespread concern about, say, lead blood levels, I've known of those types of programs that are established where you can come in and people can get their levels monitored and stuff.

The thing that's hard to characterize is that cancer, as I mentioned, the baseline risk of developing cancer by living on God's green Earth is .30. What we're calculating is an unacceptable incremental risk, but how do you classify that? If your baseline risk is .30 living on God's green Earth and then we're calculating incremental risks of, say, .05, where's the cause and effect? It's hard to say. I don't know. It could be that this gentleman smokes a pack of cigarettes a day. Who knows? It's hard to predict people and we're trying to work within the law as defined and stay within the EPA's acceptable risk range area.

MEMBER OF AUDIENCE: I have a statement. I'm from the four mile area adjacent to the Rosemont community. I stated last night in a meeting with the EPA that where that ditch is located, the house that sits on the ditch, there's a young guy that died there at a young age with cancer. I know that you can't blame chemicals for cancer just because of the fact that it's in your backyard. The first thing you're going to not blame is the chemicals because nobody is going to accept the responsibility. This is what we get from the EPA and actually society as a whole. It's just how they're geared up to believe things.

It seems to me that if there's a chemical in a ditch next to a house that is known to cause cancer and someone in that house dies from cancer, the first thing you should look at is that chemical, not the last thing you look at is that chemical; but this is what the Rosemont community is facing. You mentioned five different chemicals. Has anyone actually told the community what they've been exposed to or what they may have been exposed to so they'll know what to look for to know if they do have a problem?

MR. ZELLER: Our Congressmen, when they wrote this law, that was what they envisioned of the program.

MEMBER OF AUDIENCE: Well, the Rosemont area, I'll speak on record for this, I've lived in that area most all my life, for some 20 plus years and the people there experience cancer-related deaths all the time. It's about the norm, like everybody knows somebody who has either died in their family from some type of cancer or a neighbor that has; so to actually rule out affective -- like you say chemicals haven't caused near one of those deaths, I think it would be ludicrous, but you know, I'm not a scientist. I think that the community needs to be more enlightened on what's really going on beneath the surface because they don't know that they're being exposed to, chemicals right outside of the ditch. There's people walking on the grass where that ditch is. I don't say people go into the ditch, but people walk daily where that ditch is because it's right near a group of homes.

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MR. ZELLER: The outreach efforts, that's why we scheduled the meeting last night, to try and reach them. That's why we had a special info meeting last night to try to reach those individuals who we thought needed to be informed of these findings. We're not trying to hide these findings by any means, that's why we scheduled that meeting last night. We tried to address your concerns regarding surface water. The primary pathway and the pathway that is the dominant pathway there is through that surface water ditch. Now, unless people are coming in contact with the surface water and the sediments in that ditch, you literally almost have to get in there. We did talk last night about the potential for high waters and could that disperse contaminants and what have you. We've looked at the primary transport pathway.

We do have sediments that show a direct nice little demarcation through that ditch and about to the 800,000 feet mark to that north tidal marsh. We may breathe that. Now, we're not worried about airborne transport. The pathway of concern according to our risk assessment and that I firmly believe from the results is that you are at risk if you have dermal contact with that surface water.

MEMBER OF AUDIENCE: Isn't it hard to believe that a little kid living next to a ditch with a chemical in it wouldn't actually come in contact with that chemical without anyone knowing?

MR. ZELLER: Yes, we were all kids at one time. We've all played in ditches. We assumed that a child age one through six would play in that ditch 24 days a year, basic living.

MEMBER OF AUDIENCE: The tests that you did, were those samples taken from that ditch, the shellfish, were those taken from the ditch?

MR. ZELLER: The toxicity tests?

MEMBER OF AUDIENCE: Yes.

MR. ZELLER: The toxicity testing was done more in the headwaters. I'll show you.

MEMBER OF AUDIENCE: Because that portion of the property there, the residents crab, they catch shrimp along that stretch of marsh because it borders their property and this is something they've been doing for years, you know, decades.

MR. ZELLER: The toxic sediments that we determined for the one test was up in this area, so in the ditch that you're talking about -- this is Rosemont -- and the ditch that is really a surface ditch at this point is generally in this area. We have samples. As you can see, we had six and we had a good six or seven samples in that area. We've got it covered pretty well. We feel like we've got a good handle on what's happening. I believe there is a shellfish advisory for that entire area. That I can follow up on with the state, people I work with; so I can find out what that is.

We mentioned that yesterday, as far as talking about posting that and making that known. The key issue is realizing what the exposure pathway is. Once you know that, let's stop it. Let's inform the citizens that you don't want to be doing this and that's what you need to do to stop it. You can tell people that smoke cigarettes the surgeon general warns that cigarettes could be bad for your health, but a lot of people still do, but at least that warning is there. Now, that's what we want to do.

We told you that we would seriously evaluate that. I know that my colleagues at the State of South Carolina are dealing with the impossible right now, so --

MEMBER OF AUDIENCE: You talked about the screening criteria. What is the benchmark for acceptable levels for PAHs?

MR. ZELLER: Well, there's two levels.

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We call them environment effects range low and environment effects range medium -- feel free to jump in here if I'm misspeaking, Beazer people. The way they were developed, there were all kinds of studies done and Dr. X, College of Charleston, will look at this one species or test organism and then he or she would subject this test organism to these differing levels of the same contaminant but of varying degrees. What the 50 range means is that that's the median so at that concentration, 50 percent of the population died, that's the median; is that right?

MEMBER OF AUDIENCE: That's what an LT 50 is. The ERM range is of all of the studies that were done, 50 percent of those studies indicated toxicity at that level. The ERL is the 10 percent.

MR. ZELLER: To answer the question, what is the ERM for PAHs?

MEMBER OF AUDIENCE: I don't know off the top of my head.

MR. ZELLER: I could get that for you.

MEMBER OF AUDIENCE: And I think 44,000.

MEMBER OF AUDIENCE: Was the average level of contaminant found of PAHs found? It's usually expressed in milligrams per kilograms.

MR. ZELLER: Yes.

MEMBER OF AUDIENCE: So what was the level you found, if you can give me that; if not, what was the worst case scenario and what was the hot spot?

MR. ZELLER: Well, the highest concentrations we found were in the river actually right adjacent to the site, and I can't, quote, pull the number off, but at the end of this meeting I'll show you the actual concentrations, no problem, I've got them right there on the map.

MEMBER OF AUDIENCE: Well, that seems to be -- you said the five elements that you found, the worst contaminant that you found --

MR. ZELLER: Well, PAHs, just because of the creosote, yes, there was a lot of PAHs in the sediment; for instance, in the south tidal marsh, that number I do recall, I think it was 41,400 parts per million or milligrams per kilogram of lead in that sediment. That's a lot of lead in that and the way the common conversion is, that is 10,000 EPM is 1 percent, so that's 4.1 percent.

MEMBER OF AUDIENCE: I don't know that you're the person to ask this question to, but one of the things that's going on in Charleston is that the Charleston Koppers site which is a proposed aquarium is very similar to this site in that there was creosote contaminant or PCPs and I just wondered if someone from the EPA or DHEC can tell us why EPA took that off their hazard ranking of priorities list when in fact it appears that there's significant work to be asked of Beazer to do on this site.

MR. ZELLER: Well, Jeff could talk about that, my supervisor, Jeff. That project is also -- under a colleague of mine that works on that. I don't know if that actually is a true story, that it's been taken off the NPL. Or was it ever --

MR. ROGERS: The aquarium site never was on the list.

MEMBER OF AUDIENCE: Was it not being considered?

MR. ROGERS: It was only looked at because there was a consideration that it was contaminated from past operations at the aquarium site unrelated to coal gasification and those activities did not result in enough contamination that it would have ever ranked as an NPL site. It dates back to the Navy's operation or utilization of the property during World War II and some other things; so it was like any other site that's identified in the country that may have contamination. It's evaluated and at least preliminarily scored to see if it has merit for putting it on the National Priority List.

The thing going on over there is you do have an NPL site right across the street, Calhoun Park, and the contamination from that site has gone over and affected those areas to some extent, mostly in the subsurface groundwater, but certainly via some surface migration pathways out into the shallow intertidal sediments along the waterfront. So what you've got is an activity trying to deal with the NPL site mostly concentrated as a problem over at the Calhoun Park area with some migration over under the aquarium property and what's going on is there's no contamination per se. The site in and of itself wouldn't rank. The site doesn't become an NPL site; the site becomes an area of contamination related to an NPL site.

MEMBER OF AUDIENCE: But isn't that why you added this 57 extra acres to the 42 because it was adjacent and there was --

MR. ROGERS: That technically is not part of that official NPL site. That's being brought in because of commingling and contribution and any number of other things going on as we went out there

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and looked, traced the creosote.

MEMBER OF AUDIENCE: It sounded similar, the migration.

MR. ROGERS: Yes, but this property isn't part of the NPL site either. It's being incorporated. Under the NPL process, we rank a site. We don't change the dimensions or configuration of the site. What we do is go out and start identifying areas of contamination related to the operation that caused it to be a site, and we will deal with cleanup within the area of contamination, but it doesn't necessarily make the other property an NPL site.

MEMBER OF AUDIENCE: I know that there was a study from DHEC that they found 13,000 milligrams per kilogram of PAHs on the aquarium site itself. Now, whether or not that migrated, I'm not a scientist.

MR. ROGERS: I don't remember the numbers. Those pretty much are all attributable to coming from across the street.

MEMBER OF AUDIENCE: But I guess my question, is there, wherever they came from --

MR. ROGERS: And they'll be cleaned up in relation to the Calhoun Park site. The controversy right now is is it safe to build an aquarium on an area that's contaminated. Well, the nature of the contamination and where it is suggests that it both can exist while -- well, the aquarium can exist while the cleanup is going on related to the migration and the contamination over there.

MEMBER OF AUDIENCE: But, again, unfortunately we've never had this discussion about the aquarium site, so when you're talking about dermal contact, are you talking about people going in and actually constructing an aquarium and the PAHs are there? That would be certainly my concern as a citizen, trying to protect them from that, when in fact that's one of the risks that you've listed.

MR. ZELLER: Yes, that's definitely a risk that we evaluate. I'm not familiar with that risk assessment --

MEMBER OF AUDIENCE: Yeah, and that's probably not fair to do but --

MR. ROGERS: We can talk about it after the main meeting here. We've looked at the nature of that construction and the fact -- and certainly the city has looked at it more than we have -- to make sure that in fact there would not be an undue risk created by building it and causing any kind of worsening of the problem and also in the process of building it causing any undue exposure to the workers as it's constructed.

MEMBER OF AUDIENCE: Well, I think because they're putting up the sand block, is that something that you envision?

MR. ZELLER: That's very possible. We're looking at similar concentrations on the order of -- magnitude of what you just mentioned, and they're all similar contaminants and that's what it possibly could be. The big problem that comes is right now we've been looking at elevated concentrations down to three feet. How deep do you have to go? I will tell you that if we have to go for instance 15 feet and we've got 1,800 feet of riverfront and we dredge all the way to the channel and you get four million cubic yards of material and you want to treat it and your cost is $500 million, chances are we won't spend $500 million. We will give that to President Clinton to reduce the deficit but that's the type of valued engineering that goes into this thing. So some possibilities exist that we may combine some response action where we may go in and excavate three feet and then come back over with large enough grain sizes that aren't going to be carried away in the Ashley

River.

Those are all options that will be evaluated and the options really range from doing nothing to doing the extraordinary which I just described, which is dredging the entire area, not just the contaminated material, but there are an established set of criteria. Two of them are community acceptance, does the community want this-- done, and state acceptance, does DHEC like this. The other seven are really related to costs, can it be done, is the technology proven, does it apply to an EPA regulation and other federal regulations. There's seven of them, but I can't cite them off the top of my head. They're there, and it's a fairly detailed process and that's what we're going into now, a feasibility detail stage and that's very similar to what we're going to do with the soils.

We've established this protective risk range that bracket these numbers. Now we're going to go in and look at ways that we can cost effectively reduce that potential to human health risk, cost effective as well as can we do it.

The two big issues are risk -- the one big issue is risk reduction. The way the Superfund program is heading now is are you getting a large

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degree of risk reduction for the money spent. That's where we're trying to go at. We want to get a big bang for our bucks so to speak. Those will be evaluated in detail.

MEMBER OF AUDIENCE: I have another question.

MR. ZELLER: Okay.

MEMBER OF AUDIENCE: I know you said -- you're going to clean up the Hagood Street ditch and last night we talked about a fence and it seemed like that was not the thing to do, but while you're excavating the stuff out of this ditch, this pile, mound or something, what would happen to the soil and sediment during the time you're working?

MR. ZELLER: During the time we're working?

MEMBER OF AUDIENCE: Yes.

MR. ZELLER: We have to work out those details. The soil, we're going to either stockpile it or treat it later or take it off site.

MEMBER OF AUDIENCE: That's what I was saying.

MR. ZELLER: If we stockpile it, we will secure that. We'll cover that. We have talked about potential locations for this thing, but I know where you're going to and we don't want to create an attractive nuisance for people to come in and say, wow, isn't this nice, and there's areas that we can take that to stockpile and make sure it's secure; but that's the type of stuff that we will evaluate in this detailed design because we had a meeting today with the City of Charleston and they said, hey, this is real close, right across the street from our maintenance garage. You're talking about putting this interceptor trench here, but we've got trucks coming in and out of there all day. You're going to have to work with us here. Well, we will.

Those are all concerns and issues that we'll have to deal with during that time, during the detail design, but those are the things and that's why it's nice to come here and hear the concerns the community has so that we can effectively address those in the upcoming months so that when we get out there, hopefully we've done our homework and everything goes real smoothly.

MEMBER OF AUDIENCE: While the cleanup is going on, or the assessment and the cleanup you proposed, will that permit use of the site or the surrounding sites and areas?

MR. ZELLER: We have to work with

existing property owners.

MEMBER OF AUDIENCE: So use will continue?

MR. ZELLER: To the maximum extent possible, yes. There may be -- it's tricky. It's going to be tricky, but we can manage it, definitely. There's a lot of business in that area, as you know. It will be tricky, and it's going to-- take some cooperation and patience by all parties involved, but I'm sure we can get through that no problem.

Anybody else? Okay. Well, I really do appreciate your time. I hope everyone has a handle on what's going on. We'll be here for a while. If you want to talk one on one, no problem.

(The meeting was concluded at 8:30 PM.)

Attachment 2

Written Comments Received During 30-Day Formal Comment Period

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

5 9 0118

February 7, 1995

Craig Zeller
Remedial Project Manager
U.S. EPA, Region IV
345 Courtland Street
Atlanta, GA 30365

RE: Final RI Report for the Koppers Site

Dear Mr. Zeller:

The Final RI Report has been reviewed as requested. I am of the understanding that the RI Report has been approved by the EPA as being final and is in the depository. Therefore, the State offers these comments to be included in the Administrative Record for this site. Attached are additional comments from our Hydrogeologist, Billy Britton, for this site.

The majority of our comments in my December 14, 1994 letter to you on the revised RI Report have not been addressed. Overall, the RI Report does a good job of presenting the massive amount of data and conclusions. The conclusion and recommendations section is a major improvement and for the most part we are in agreement with those conclusions and recommendations. However, we feel that there are significant areas that have not been resolved to our satisfaction.

One main problem that the State has with the RI Report is the fact that the "Dead Zone" in the South Marsh is not discussed in detail in the final report. This comment has been presented to the EPA from both Billy Britton and myself of DHEC and Jane Settle of DNR on the draft RI, revised RI, and now the final RI Reports. The dead zone is not specifically mentioned in the RI Report, which only presents the data from this area and does not describe it in detail. This area is of major ecological concern to both DHEC and DNR. Therefore, we feel that the dead zone should be discussed and a hypothesis presented for its occurrence in the RI Report.

Another area of concern, commented on by both Billy Britton and myself, is the test pit excavations done in the former Koppers Treatment Area. The text states that a black liquid was not discovered in these pits. I agree that initially these pits did not reveal the creosote or black liquid when first excavated. However, these pits were left open for a period of time and the creosote liquid did leach into the pits at a slow rate. This condition was observed by DHEC and EPA personnel onsite. The text as currently written is misleading and should be changed to reflect the actual conditions.

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I have requested in previous comments that a figure showing a "blow-up" view of the Braswell Street drainage ditch in the area of the Old Impoundment be included in the RI Report. The figure should show where the orginal ditch was discovered in the RI, the current ditch, old impoundment, and where aerial photographs show connection to the impoundment. This figure would be helpful to the reader to get an understanding of the drainage pathway past and present.

A few other minor comments of mine were not addressed in addition to the one mentioned previously. Therefore based on these comments and the attached comments, the State does not approve of the RI Report. If you have any questions, please call me at (803) 896-4070.

Sincerely,

Richard A. Haynes, P.E.
Site Engineering Section
Bureau of Solid and Hazardous Waste Management

cc: Billy Britton
Gary Stewart

South Carolina
DHEC
Department of Health and Environmental Control
2600 Bull Street, Columbia, SC 29201

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MEMORANDUM

TO: Richard Haynes, Engineer
Site Engineering Section
Division of Site Engineering and Screening
Bureau of Solid and Hazardous Waste Management

FROM: Billy Britton, Hydrologist *BB*
Superfund Section
Division of Hydrogeology
Bureau of Solid and Hazardous Waste Management

DATE: February 6, 1995

RE: Final Remedial Investigation Report
Koppers-Charleston NPL Site
SCD 980 310 239
Charleston County

The referenced document was reviewed by the Division of Hydrogeology (Division), as requested. As a result of this review, it is apparent that the Potentially Responsible Party failed to address eight of the twelve comments included in the memorandum from Britton to Haynes dated December 14, 1994 regarding the Revised Remedial Investigation report. The writer is not satisfied with the report as currently written , and, as a result, will reiterate each comment that has not been addressed for the Administrative Record that will be kept on this site. The Division's comments are provided below. One additional comment (comment #9) is also included in this memorandum.

1) The third paragraph on page 2-7 discusses the test pits excavated in the vicinity of the aeration reservoir in the former Koppers Treatment Area during Phase II of the remedial investigation (RI). In the discussion, the text states that test pits TP-07A through TP-07G were excavated in an effort to located a black liquid encountered during a previous response action undertaken in 1985. The text notes that no black liquid was encountered in test pit TP-07A, but it fails to note that a black liquid with the odor of creosote was encountered in test pits TP-07C through TP-07G. Revise the text to reflect that the black liquid was encountered in the vicinity of the aeration reservoir. This comment has been made on each of the three versions of this document.

2) Section 2.3.4 on page 2.8 discusses the investigation of an underground concrete

structure located adjacent to the former Koppers Treatment Area. The structure was determined to contain from three inches to four feet of non-aqueous phase liquid (NAPL). This structure contains NAPL and should be included in the discussions of NAPL sources that take place later in this document. This comment has been made on each of the three versions of this document.

3) Figures 3-16, 3-17, 3-20, 3-21, 3-22, and 3-23 plot the drawdown produced in the observation wells over the duration of the pumping test conducted during Phase II of the RI. In each of these time versus drawdown plots a boundary effect is apparent. What is this boundary effect attributed to? The RI Report did not include any explanation of boundary effects. This comment was made previously on the Revised RI Report.

4) Section 4.12.1 fails to mention that volatile organic compounds (VOCs) were detected in and north of the Former Treatment Area at concentrations above SDWA MCLs. This oversight should be corrected. This comment was made previously on the Revised RI Report.

5) Section 4.12.3 describes the results of the RI in the Drip Track Area. However, the results from samples collected from the eastern portion of the Drip Track Area, are not discussed in Section 4.12.3. Instead, the eastern portion of the Drip Track Area is included in Section 4.12.1 which discusses the Former Treatment Area. The eastern portion of the Drip Track Area should be discussed in Section 4.12.3. It is more appropriate. This comment was made previously on the Revised RI Report.

6) Figures depicting total VOCs and total semi-volatile organic compounds (SVOCs) would be useful in addition to the figures currently presented in Section 4. This comment was made previously on the Revised RI Report.

7) Section 5.2.2.3 on Page 5-11 states that it is unlikely that there are large amounts of creosote migrating through the subsurface because creosote is only slightly denser than water and has a moderate interfacial tension, the geology of the site is heterogeneous, and there is a lack of significant accumulations of creosote. The Division disagrees with this statement for the following reason. Large amounts of creosote have already migrated onto two properties located north of Milford Street, and there is no evidence to support the conclusion that the creosote has stopped migrating. This comment was made previously on the Revised RI Report.

8) The area of dead vegetation located in the South Marsh is discussed very little in the report and no hypothesis is proposed to explain its occurrence. This area should be discussed further in Section 4. An adequate discussion of this area should include a suspected cause and a probable source for the dead vegetation.

9) The discussion located at the top of page ES-10 states that because of the salinity of the groundwater in the vicinity of the land between the south tidal marsh and the barge canal groundwater in this area will not require remediation. The writer wishes to clear up any misunderstandings which may have occurred regarding the classification of groundwater in the south tidal marsh or, for that matter, any portion of the site where concentrations of total dissolved solids exceed 10,000 parts per million. As stated in Regulation 61-68, Water Classifications and Standards, all groundwaters of the state are classified as Class GB until reclassified through proper administrative procedures. Therefore, the quality standards for Class GB groundwaters set forth in the State Primary Drinking Water Regulations, R.61-58.5 must be enforced. However, the Potentially Responsible Party can petition the Department to reclassify groundwater in the portion of the site where the concentration of total dissolved solids exceeds 10,000 parts per million. The writer will make every effort to provide assistance in this matter.

Beazer

BEAZER EAST, INC., 436 SEVENTH AVENUE, PITTSBURGH, PA 15219

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VIA FEDERAL EXPRESS

20 February 1995

Mr. Craig Zeller
Remedial Project Manager
U.S. Environmental Protection Agency - Region IV
345 Courtland Street, NE
Atlanta, GA 30365

Dear Mr. Zeller:

Beazer East, Inc. (Beazer) appreciates the opportunity to comment on the Interim Remedial Action approach and the Human Health Baseline Risk Assessment (BRA) for the Kopper Co., Inc. (Charleston Plant) Site.

Interim Remedial Action

As a primary participant in developing the Interim Remedial Action approach, Beazer East Inc. (Beazer) fully endorses and supports the proposed work. The Interim Remedial Action is a significant step towards final clean-up of the site. Beazer believes that the Fact Sheet accurately reflects the site conditions and general aspects of the Interim Remedial Action. However, some issues bear further clarification and emphasis.

The Interim Remedial Action is anticipated to be consistent with, and a major part of, the final remedy for the former treatment area. The need to provide permanent remedies was a fundamental consideration when developing the Interim Remedial Action. Reconstruction and lining of the Milford Street and Hagood Avenue ditches will permanently eliminate the potential for contact with constituents of concern in the ditches. The proposed interceptor trench will provide positive control of groundwater and nonaqueous phase liquids as well as providing removal and treatment of nonaqueous phase liquids and dissolved phase constituents in groundwater. Beazer requests that the Environmental Protection Agency, Region I (EPA) and the South Carolina Department of Health & Environmental Control (SCHDEC) acknowledge that this Interim Remedial Action is likely to be an important part of the final remedy for the former treatment area.

The Fact Sheet accurately reflects the goals and conceptual design of the Interim Remedial Action. The need for minor changes in the design may become necessary during the detailed design work. The North Charleston Sewer District is stated as the discharge point for treated groundwater in the fact sheet. While this is the preferred option at this time and Beazer is actively pursuing this option, final approval has not yet been received. Beazer requests the flexibility to propose other appropriate discharge options. Other minor design changes may also be proposed. For example, the location of the collection sump for the interceptor trench may be moved from the east end of the trench to the west end of the trench. This change is being considered to reduce the length of transfer lines required to convey water to the treatment plant. None of the design changes under consideration fundamentally change the goals or expected performance of the Interim Remedial Action. Design documents for the Interim Remedial Action will be submitted for regulatory review.

In order to implement the Interim Remedial Action as quickly as possible, assistance from EPA and SCDHEC in streamlining the design review and permitting processes is requested. Beazer looks forward to working with the EPA and SCDHEC on implementation of this important project.

Human Health Baseline Risk Assessment

Beazer has reviewed the Human Health Baseline Risk Assessment (BRA) for the Koppers Company, Inc. (Charleston Plant). Beazer is concerned about the limited discussion of the potential risks presented in the BRA. As pointed out in a revised Uncertainty and Limitations Section (attached to this letter) that includes a semi-quantitative analysis of the uncertainty surrounding the estimates of potential risks shown in the BRA, potential risks to typical workers and typical offsite residents will be substantially lower than those for the reasonable maximum exposures (RME) shown in the BRA. One reason for this overestimation is that the RME assumptions are designed to significantly overestimate potential risk and are thus not intended to be representative of the potential risks of typical people. Another reason is that exposure pathways, such as potable use of shallow groundwater, were included in the BRA, even though they never occur.

Beazer believes a thorough discussion of potential exposures of the typical worker and offsite resident is critically important in helping the public put into perspective the RME risks estimated in the BRA. Beazer is very concerned that the BRA does not provide an accurate and representative description of potential typical risks at this site, and how they differ from the RME exposures presented in the document.

Beazer appreciates the opportunity to submit these comments in the IRM and the BRA and is willing to discuss our findings with you at your convenience.

Very truly yours,

Shannon K. Craig/avb

Shannon K. Craig
Program Manager - Environmental Group

SKC/avb

Attachment

cc: Paul D. Anderson (with enclosures)
Donald C. Bluedorn II, Esquire (with enclosures)
Billie S. Flaherty, Esquire (with enclosures)
John E. Frey, Esquire (with enclosures)
Douglas E. Simmons (with enclosures)
Robert E. Stepp, Esquire (with enclosures)
Elizabeth H. Warner, Esquire (with enclosures)

7.0 Uncertainties and Limitations

7.1 Introduction

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One of the principal objectives of the uncertainty analysis is to discuss the assumptions and procedures that introduce the greatest amount of uncertainty into the results of the baseline risk assessment (BRA). Another principal objective is to assess, quantitatively if possible, the contribution of these assumptions and procedures to the overestimation or underestimation of potential risk.

The uncertainty surrounding the estimates of potential risk at this site can be viewed as arising from four general areas. These parallel the four steps of the risk assessment process and are discussed below:

- Data evaluation;
- Selection of exposure pathways and input parameters;
- Derivation and selection of toxicity parameters; and,
- Procedures used to estimate potential risk.

The uncertainty analysis presented in the this section is primarily qualitative although for several of the key potential receptors (current on-site worker, trespasser, current utility worker and current off-site resident) a semi-quantitative analysis of the uncertainty surrounding their potential exposure is presented.

7.2 Data Evaluation

The purpose of data evaluation is to determine which constituents, if any, are present at the site at concentrations requiring further investigation. Uncertainty with respect to data evaluation can arise from many sources, such as the quality of the data used to characterize the site, the process used to select data to use in the risk assessment, and the statistical treatment of data. Typically, the data evaluation process includes data gathered during site-wide sampling of all environmental media at a site.

At the former Koppers site, surface and subsurface soil, sediment, surface water, and groundwater were analyzed in two phases of sampling. Phase I data for all constituents and Phase II dioxin data were used as the basis of the baseline risk assessment.

The sampling plan was designed to provide sufficient samples in all media to result in a high level of confidence in the representativeness of the data set. Given the number of samples in the data set for all media and the spatial distribution of the samples taken, it is likely that most, if not all, constituents present in environmental media at the site were detected during sampling. However, despite extensive sampling and analysis, it is possible, although not likely, that constituents present at the site were not detected in analyses. This possibility introduces some uncertainty into the BRA. For a constituent to be present but not detected at the site, at least one of two conditions would need to be true. Either the constituent would need to be present in so few locations that the extensive sampling conducted at the site missed these locations, or the constituent would need to be present at a concentration too low to be detected. If either (or both) of these two conditions were true, the constituent would likely not fulfill the frequency of detection or concentration criteria used to select constituents of potential concern in the baseline risk assessment.

7.2.1 COPC Selection Process

The screening process used to select COPCs to evaluate in the BRA was intended to include all constituents with concentrations high enough to be of concern for the protection of public health. Given that the screening procedure compared the maximum constituent concentration to screening criteria, it is unlikely constituents posing a potential public health concern have been excluded from the BRA. Quite the opposite is likely to be the case: many of the constituents included in the BRA are not likely to pose a potential concern to public health. The results of the BRA demonstrate that the screening procedure used was sufficiently conservative so that potential sources of public health threats were not overlooked.

7.2.2 Estimation of Exposure Point Concentrations

The primary sources of uncertainty associated with estimating exposure point concentrations (EPCs) involve the biased nature of some of the sampling conducted at the site and the statistical techniques used to summarize the data.

The sampling bias arises because sampling at the site was not conducted in a random fashion. Rather, more samples were taken from areas where, a priori, higher constituent concentrations were expected to occur. This often leads to overestimates of actual EPCs and overestimation of potential exposures and risks. To account for this bias in soil sampling, the BRA employed a "nearest neighbor" approach, in which weighted average concentrations were used to calculate EPCs in soil. The weighting procedure treats all locations equally, whether the location is represented by one sample or several. This procedure reduces some of the potential to overestimate EPCs due to the biased sampling conducted at the site.

The second important source of uncertainty involves the statistical methods used to estimate EPCs and the assumptions inherent in these statistical methods. Generally, an upper bound estimate of the mean concentration is used to represent the EPC instead of the measured mean concentration. This is done to account for the possibility that the true mean is higher than the measured mean because unsampled areas of the site may have higher constituent concentrations. Ninety-five percent upper confidence limit (UCL) concentrations were calculated in the baseline risk assessment using the H-statistic. Exposure point concentrations were assumed to equal the 95% UCL, or the maximum detected concentration in cases where the calculated UCL exceeded the maximum.

The UCL calculation assumes constituent concentrations are randomly distributed, that we have no knowledge about the causes of their distribution, and that there is a 95% chance that the actual mean concentration is lower than the calculated UCL concentration. The assumption that concentrations are randomly distributed means that it is possible concentrations higher than those previously found may exist on the site. Moreover, because the H-statistic assumes a lognormal distribution, the higher concentrations could be substantially greater than those detected to date. Given the available knowledge about the historical operations at the site, about the sources of constituents detected at the site, and about the distribution of constituents at the site confirmed by the Phase I and II data, these assumptions are likely false.

An example of this is provided by UCL concentrations calculated using the H-statistic which exceed the maximum detected concentration by a substantial margin and are, for some constituents, predicted to be greater than one part per part. These anomalous results likely occur because the statistical technique assumes much higher concentrations than those detected could exist when they actually do not. In most cases, the locations with highest concentrations were identified and detected during sampling, based on information about the sources of constituents at the site. Given that distributions of constituents at the site are well characterized by site investigation data, it may be more appropriate to use alternative procedures to estimate EPCs, such as further subdivision of the site into areas of roughly similar concentrations or use of a weighted mean concentration to calculate EPCs.

Because the assumptions upon which the procedures used in the BRA to calculate EPCs do not hold at this site, the calculated EPCs represent concentrations that are greater than 95% UCLs. In other words, the chance that the actual mean is less than the EPC is greater than 95 percent. Consequently, potential exposures and risks at this site, if any, are likely to be overestimated by the EPCs used in the BRA.

7.2.3 Uncertainty Associated with Dioxin EPC

The treatment of dioxin data at this site introduces an additional measure of uncertainty into the BRA. For constituents other than dioxin, samples were taken from all relevant environmental media from all portions of the site. Because dioxin sampling is costly, however, dioxin samples were taken primarily from areas in which dioxin was anticipated to occur. Such areas were identified based on knowledge of historical industrial activities at the site. In particular, the areas where pentachlorophenol had been used or stored. When the biased dioxin data is evaluated using the same approach as for other constituents, the resulting EPC is biased upwards, in comparison to other constituents, because sampling was not conducted in a random manner and few samples were available from locations where dioxin was not expected to be found.

As a result of the statistical procedures employed in the baseline risk assessment, the EPC used to represent dioxin in surface soil from Zone A is the maximum detected concentration (20 ug/kg) obtained from a location expected to have an elevated dioxin concentration. Locations having lower concentrations of dioxin are not accounted for resulting in an overestimate of the actual concentration of dioxin in Zone A surface soil. This in turn leads to an overestimate of receptors' potential exposures and subsequent potential risk, if any, provided that receptors do not preferentially contact the small portion of Zone A assumed to have this maximum concentration. Available information about the site indicates that current workers in Zone A have little, if any, contact with surface soil. Moreover, no evidence exists suggesting current workers in this zone would preferentially contact soil from this particular portion of Zone A.

In order to develop a more realistic concentration in Zone A, a weighted average dioxin concentration in Zone A surface soil was derived based on several factors, including actual detected levels of dioxin, the magnitude of detected concentrations of pentachlorophenol and their proximity to detected dioxin concentrations, and historical information about the site. As stated above, it was anticipated that elevated concentrations of dioxin may be present in locations where pentachlorophenol was formerly used.

Based on this information, Zone A was divided into three concentric rings. The innermost ring represents locations where pentachlorophenol and, therefore, dioxin, concentrations were expected to be highest, given available knowledge about historical operations at the site. This ring includes the locations where the maximum concentrations for both dioxin (20 ug/kg) and pentachlorophenol (460,000 ug/kg) were detected. The maximum detected dioxin concentration was used to represent the innermost ring. The middle ring represents areas where pentachlorophenol and dioxin were detected at intermediate concentrations. Dioxin was detected in this ring at concentrations of 6, 7.5, and 8 ug/kg (duplicates were averaged at one location). The middle ring also includes pentachlorophenol concentrations ranging from 4,700 to 12,000 ug/kg. As a conservative measure, a concentration of 8 ug/kg was selected to represent the middle ring. The outermost ring represents areas where dioxin concentrations were expected to be equal to the lowest concentration detected on-site. Dioxin was detected in one sample in the outermost ring at 0.7 ug/kg. At locations other than Zone A, dioxin was detected at concentrations of 0.8 ug/kg (Zone C) and 0.004 ug/kg (off-site). A conservative estimate of concentration of 1 ug/kg was used to represent the outermost ring in Zone A.

The concentration of dioxin in Zone A surface soil was determined by combining the representative concentrations from each of the three rings within the zone on an area weighted basis. The innermost ring, with the highest dioxin concentrations, was assumed to comprise 5% of the area within Zone A, the middle ring, with intermediate dioxin concentrations, comprised 20% of Zone A, and the outer ring, with the lowest dioxin concentrations, comprised 75% of Zone A. Making these assumptions, the resulting Zone A surface soil dioxin concentration was estimated to be 3.35 ug/kg. This concentration is 6-fold lower than the EPC of 20 ug/kg, equal to the maximum detected concentration, used in the BRA to represent the entire zone. This suggest that potential exposures and risks, if any, associated with receptors contacting dioxin in Zone A surface soils may be about six times lower than estimated by the BRA, because of how the dioxin EPC was calculated.

7.3 Exposure Pathways and Input Parameters

The BRA employed several exposure scenarios including those associated with the site as it is at present and several future scenarios. The future scenarios included the site remaining industrial/commercial, having a hypothetical marina developed on the site, and being developed for residential use. Within each of these scenarios, several pathways were investigated generally including ingestion of and dermal contact with soils, sediments and surface waters. Some of the scenarios included consumption of fish from the Ashley River and consumption of groundwater.

7.3.1 Selection of Exposure Scenarios and Pathways

A comprehensive conceptual model of the site was developed in the BRA. This identified the possible current and future exposure scenarios and the primary exposure pathways within each scenario. The BRA estimated potential risks associated with these scenarios even though several of them (future residential development and future marina development) are very unlikely to ever happen at this site given current and predicted land use. Similarly, consumption of groundwater is also almost certain to never occur at this site given the quality of the groundwater and the availability of a public water supply. To the extent the potential risk associated with these unlikely hypothetical future scenarios and pathways were estimated using default assumptions, the potential risks associated with the site have been overestimated.

Default assumptions were also employed by the BRA to estimate potential risks to future on-site commercial and utility workers. The default assumptions are designed to overestimate potential risk. Site-specific information about current workers indicates that their potential exposures are substantially lower than would be predicted by standard default assumptions. To the extent future on-site and utility workers are similar to current on-site and utility workers, their potential exposures and risks, if any, have been overestimated by the default assumptions employed in the BRA.

7.3.2 Selection of Exposure Parameters

The assumptions used to estimate the potential exposure to COPC can be surrounded by a great deal of uncertainty either because limited information about a particular exposure parameter is available or the parameter varies between people. Typically when limited information is available, a conservative (i.e. health protective) estimate of the parameter is employed. This leads to an overestimate of potential exposure, and ultimately of potential risk. This may be appropriate, however, to assure risk managers charged with protecting the public's health that actual risks are not underestimated. One consequence of making conservative assumptions is that the potential exposure of a typical person can be overestimated and that the estimates of potential exposure presented in a risk assessment are not representative of a typical person.

In many cases it is possible to develop at least a semi-quantitative estimate of the degree to which a typical person's potential exposure is overestimated. The selection of an upper bound for an exposure parameter implies that sufficient information is available to determine what values of the parameter overestimate exposure, what values underestimate exposure and what values represent typical exposures. This range of values can be based upon professional judgement, site-specific information, or generic information collected from the literature.

For this site, the degree to which the potential exposure of typical individuals is overestimated by the BRA is evaluated for four current receptors: on-site worker; utility worker; trespasser; and, off-site resident child. The evaluation is performed by estimating the difference between the value used in the risk assessment and the value assumed to represent a typical receptor for each of the exposure parameters that determines potential exposure. Tables 7-1 to 7-4 present a summary of the following: range; typical value; value used in the risk assessment; basis for the selection of the risk assessment value; and the difference between the values, for each parameter used to estimate potential exposure. The typical value represents either the average of data used to define a particular parameter (for example, in estimating COPC concentration, or soil ingestion rate) or a value that is assumed to represent a typical receptor (for example, the exposure frequency, or the amount of skin exposed to sediment, water or soil).

By comparing the typical value to the value used in the risk assessment, the difference between the two can be determined, as can the degree to which a particular parameter contributes to either an over- or underestimate of potential exposure. Thus, for the on-site worker, the soil ingestion rate used in the risk assessment overestimates soil ingestion of a typical worker by about 1.25-fold (Table 7-1). Combining the differences of all the parameters for a particular receptor leads to an estimate of the degree to which the receptor's potential exposure is over- or underestimated by the assumptions used in the risk assessment. For the on-site worker in Zone A, the potential exposure to dioxin via soil ingestion to a typical worker is about 275 times lower than estimated in the BRA and potential dermal exposures are about 865 times lower than estimated in the BRA (Table 7-1) suggesting that the typical risks to on-site workers are likely to be less than one in one million. Parallel comparisons for cPAH, arsenic and pentachlorophenol indicate that a typical current worker's potential risks from these COPC in Zone A surface soil are also several hundred fold lower than estimated in the BRA (Table 7-1) and likely to be less than one in one million.

When potential exposure of other current receptors (utility worker and trespasser) to COPC in surface soils using "typical" constituent concentrations and exposure parameters, the findings are similar to those discussed above. The potential exposures, and therefore also the potential risks, are likely to be several hundred fold lower than estimated in the BRA and are likely to be less than one in one million for most COPC (Tables 7-2 and 7-3).

The results of such comparisons for potential surface water and sediment exposures also indicate that the typical receptor is likely to have substantially smaller exposures to COPC than estimated in the BRA. **(The magnitude will depend upon the mean sediment and surface water concentrations provided by Black and Veatch. Until those are available it is not possible to determine whether the potential risks from COPC in sediment and surface water to the typical receptor just a little or substantially lower than the RME estimates in shown in the BRA.)**

While the risk assessment overestimates the potential risk to the typical or average receptor, it is important to point out that potential risk is determined by an individual's specific behaviors and characteristics. As shown in Tables 7-1 through 7-5, behaviors which lead to greater potential exposure than estimated in the risk assessment are possible. This makes it possible that some receptors may have potential exposures greater than those estimated in the risk assessment. This will only occur if all of the characteristics of the receptor lead to exposures that are equal to, or greater than, those used in the risk assessment. While theoretically possible, this is unlikely to occur. In general, the exposure assumptions lead to an overestimate of potential risk.

(Note the differences between typical and RME receptor' exposure assume the site-specifc information developed (on worker exposure frequency and duration and dioxin concentration in Zone A soils) by Beazer and provided to EPA will be

employed in the BRA. If not, then the magnitude of overestimation will be larger than indicated by the discussion above.)

7.3.3 Definition of Exposure Zones

In order to estimate a receptor's potential exposure at a site, it is necessary to determine the geographical location where the receptor is assumed to be exposed. Once the area of interest has been defined, the appropriate data can be selected and the exposure point concentration can be calculated. Ideally, areas of exposure should be defined based on actual exposures or known behaviors of receptors at the site. Often, however, this information is unavailable. Lacking absolute knowledge about the activities that occur at the site or about behaviors of receptors at or near the site, it is necessary to make some assumptions. Such assumptions add to the uncertainty in the baseline risk assessment.

At the former Koppers site, knowledge about the historical activities that occurred at the site was used to define the exposure areas evaluated in the baseline risk assessment. Potential exposure to soil was evaluated in three on-site zones, corresponding to former industrial activities at the site. Zone A represents the portion of the site where wood treating operations took place, Zone B represents the portion of the site where raw wood was stored prior to being treated, and Zone C represents the portion of the site where treated wood was stored prior to shipping. Using available information about historical activities at the site to evaluate potential exposure to soil (particularly in Zones A and B) reduces some of the uncertainty associated with breaking up the site into exposure areas. Zone C, however, is a very large area and encompasses not only portions of the site formerly used for treated wood storage but also for industrial activities unrelated to Koppers or woodtreating. Because of the size of Zone C and the variety of current and historical industrial operations that have occurred there, the potential for exposure to soil is not consistent among portions within Zone C. The variability in both constituent concentrations and the potential for exposure in Zone C, in comparison to Zones A and B, results in additional uncertainty relating to the exposures and risks estimated for this zone.

Surface water and sediment were evaluated at the site in Zones A, B, C, and D. Zone A comprises the ditch along Hagood Avenue north of the site, Zone B includes on-site surface water and sediment locations not including portions proximal to the Ashley River, Zone C comprises on-site surface water and sediment locations proximal to the Ashley River, and Zone D includes surface water and sediment locations in the Ashley River. Zones B and C are very large areas, each encompassing several distinct areas of surface water and sediment. For example, Zone C includes surface water locations on-site as well as in the marsh areas north and south of the site. As described above for soil zones, it is likely such large zones include widely diverse constituent concentrations and potentials for exposure. This approach introduces some uncertainty into the risk assessment.

7.4 Toxicity Assessment

The BRA evaluated both noncarcinogenic (assumed to have a threshold) and carcinogenic (assumed to be without a threshold) health effects. EPA has derived reference doses (RfDs) for the evaluation of potential noncarcinogenic effects and cancer slope factors (CSFs) for the evaluation of potential carcinogenic effects. Two of the most important sources of uncertainty in dose-response assessment include animal-to-human extrapolation and high-to-low dose extrapolation.

7.4.1 Animal-to-Human Extrapolation

Ideally, human data sets would be used to derive dose-response factors used in the BRA, however, such data sets are often unavailable. For many constituents, animal studies provide the only reliable information on which to base an estimate of adverse health effects. Extrapolating animal data to humans introduces a great deal of uncertainty into the risk assessment. This uncertainty can be reduced if the fate of and mechanism by which a constituent causes adverse effects is known in both animals and humans. When the fate and mechanism are unknown, uncertainty increases. To account for this uncertainty, conservative assumptions are made and uncertainty factors are incorporated in deriving noncarcinogenic dose-response factors. Uncertainty factors are used to account for uncertainty in extrapolating both from animals to humans and from the subchronic exposures often used in laboratory experiments to chronic exposures, and to protect sensitive members of the population. The effect of these assumptions is that overestimation of potential health effects in humans is far more likely than underestimation.

Lacking knowledge about a constituent's fate in humans, it is possible that an effect not revealed in an animal experiment will manifest itself in humans. In this case, the dose-response factor can underestimate potential health effects in humans. On the other hand, effects observed in animal experiments may not be observed in humans, resulting in an overestimate of the potential health effects in humans.

7.4.2 High-to-Low Dose Extrapolation

The concentration of constituents to which people are potentially exposed at CERCLA sites is usually much lower than the levels used in the studies from which dose-response relationships are developed. Estimating potential health effects at such sites, therefore, requires the use of models that allow extrapolation of health effects from high experimental to low environmental doses. These models contain assumptions that may introduce a large amount of uncertainty.

For instance, the EPA CSFs are derived using the upper 95% confidence limit of the slope predicted by the linearized multistage model. EPA recognizes that this method produces conservative risk estimates and that other mathematical models exist. Several dose-response models are available for low-dose extrapolation. These include the probit, the multi-hit, the logit, and the multistage models. These models are generally statistical in character and have little biological basis. Int he Guidelines for Carcinogen Risk Assessment, EPA states:

> No single mathematical procedure is recognized as the most appropriate for low-dose extrapolation in carcinogenesis. When relevant biological evidence on mechanism of action exists (e.g. pharmacokinetics or target organ dose), the models or procedures employed would be consistent with the evidence. When data and information are limited,

however, and when much uncertainty exists regarding the mechanism of carcinogenic action, models or procedures that incorporate low-dose linearity are preferred when compatible with the limited information.

EPA policy is to use the linearized multistage model unless there is adequate scientific justification for using another model. Many countries and some U.S scientists have determined that such justification exists for dioxin.

EPA emphasizes in the guidelines that the upper-bound estimate generated by the linearized multistage model leads to a plausible upper limit to the risk that is consistent with some proposed mechanisms of carcinogenesis. Such an estimate, however, does not give a realistic prediction of the risk. The true risk is unknown and may be as low as zero.

7.5 Risk Characterization

In the risk characterization, the estimated potential exposures are combined with the assumed dose-response information to estimate the potential for adverse human health effects to occur. Two important sources of uncertainty associated with this step of the risk assessment process are potential exposure to multiple constituents and the combination of upper-bound exposure and toxicity estimates.

7.5.1 Exposure to Multiple Constituents

Each complete exposure pathway has associated with it, potential risks from several constituents. USEPA guidance requires that each receptor's total potential carcinogenic risk be estimated by combining the potential risk from each constituent and pathway of interest for that receptor unless there is reason to believe the constituents interact synergistically or antagonistically. For virtually all combinations of constituents, little or no evidence of interaction is available. Therefore, it is not clear whether the assumption of additivity leads to an over- or underestimate of potential risk.

For noncarcinogens, USEPA recommends summing hazard indices only for those constituents with similar toxic endpoints. The toxic endpoint is defined as the most sensitive noncarcinogenic health effect used to derive the dose-response value. As a screening step in this baseline risk assessment, all hazard indices for a receptor have been summed, regardless of the toxic endpoint of the constituents. This approach will overestimate potential risk for some groups of constituents, because mechanisms of action and toxic endpoints in the human body may differ for certain constituents. If the sum of all hazard indices for a receptor is less than one, it is not necessary to perform a toxic endpoint-specific analysis. If, however, the total hazard index for a receptor exceeds one, such an analysis should be conducted. As shown in Table 5-3, hazard indices for several receptors exceed one. In many cases, the hazard indices for the individual COPC themselves exceed one. In other cases, however, a toxic endpoint-specific analysis would reduce some of the uncertainty associated with the estimated noncarcinogenic risks.

7.5.2 Combination of Several Upper-Bound Assumptions

Generally, the goal of a baseline risk assessment is to estimate the potential risk associated with Reasonable Maximum Exposures. USEPA guidance describes Reasonable Maximum Exposures as lying between the 90th and 99th percentiles of the distribution of potential risk. Many of the assumptions used in the BRA, by themselves, describe behaviors or characteristics that would lead to conservative but not unreasonable estimates of potential risk, and would likely fall within the range USEPA has defined as representing Reasonable Maximum Exposures. When several conservative assumptions are combined, however, the result in many cases is an estimate of potential risk that falls above the range of risk defined as Reasonable Maximum Exposure. This is likely the case for many of the receptors evaluated in the BRA.

This is best illustrated by a simple example. Assume potential risk depends on three variables (soil ingestion rate, constituent concentration in soil, and constituent CSF). The mean, upper 95% bound, and maximum values are available for each variable. Multiplying the three maximum values results in a bounding estimate of risk that clearly lies outside EPA's range of Reasonable Maximum Exposures. Consider the effect, however, of multiplying the upper 95% bound values. This assumes the 5% of the people most sensitive to the potential carcinogenic effects of the constituent will also ingest soil at a rate exceeding the rate for 95% of the population, and that all the soil these people eat will have a constituent concentration that we are 95% confident exceeds the average concentration on-site. The consequence of these assumptions is that the estimated potential risk is representative of 0.0125% of the population (0.05 x 0.05 x 0.05 = 0.000125 x 100 = 0.0125%). Put another way, these assumptions overestimate risks for 9,999 out of 10,000 people, or 99.99% of the population. The conservative nature of the potential risks estimated by the superfund risk assessment process is not generally recognized. In reality, the estimates are more conservative than outlined above, because many more than three upper 95% assumptions are used to estimate potential risks from each exposure pathway presented in the baseline risk assessment.

Because the BRA employed upper 95% bounds and maxima for most exposure and toxicity assumptions it is likely to overestimate the potential of a typical member of the potentially exposed populations by 100-fold or more. This does not mean that no one can have a potential risk greater than estimated by the BRA. It does suggest, however, that there is little chance that potential risks have been underestimated, and that the potential risks for most people have been overestimated.

TABLE 7-1
Current On-Site Worker

Parameter	Range	Typical Value	RME Value Used	Rationale for RME Value Used	Difference between RME and Typical Values
Surface Soil Exposure Pathway					
Concentration in Surface Soil (mg/kg)					
Zone A Pentachlorophenol	0.18 - 167	24.4	167	Maximum grid concentration.	6.8
Zone A CPAH	44.3	16.4	44.3	Maximum grid concentration.	2.7
Zone A Dioxin	0.0007-0.02	0.00335	0.02	Maximum grid concentration.	6
Zone A Arsenic	3.4 - 152	32.3	152	Maximum grid concentration.	4.7
Soil Ingestion Rate (mg/d)	1.8 - 437.1	40	50	Recommended by USEPA (1991)	1.25
Soil Adherence (mg/cm2)	0.2 - 1	0.6	1	Range is from USEPA (1992). Value used is recommended "upper limit".	1.67
Skin Exposed (cm2/d)	0 - 10,000	1000	2300	Professional judgement	2.3
Exposure Frequency (days/year)	0 - 250	< 1 *	25 *	Upper bound based on site-specific data.	25
Exposure Duration (years)	0 - 15	10 *	15 *	Upper bound based on site-specific data.	1.5
Body Weight (kg)	44 - 107	68.7	70	Recommended by USEPA (1989).	0.98
Surface Water Exposure Pathway					
Concentration in Water (mg/L)					
Zones B/C CPAH	0.196		0.196	95% UCL concentration.	
Zones B/C Arsenic	0.002 - 2.6		0.112	95% UCL concentration.	
Zones B/C Pentachlorophenol	0.003 - 0.13		0.018	95% UCL concentration.	
Skin Exposed (cm2)	0 - 10,000	1000	2300	Professional judgement	2.3
Exposure Time (hr/d)	0 - 8	< 0.5	2.6	Natl average time spent swimming while on vacation.	5.2
Exposure Frequency (days/year)	0 - 50	< 1 *	2 *	Upper bound based on site-specific data.	2
Exposure Duration (years)	0 - 15	10 *	15 *	Upper bound based on site-specific data.	1.5
Body Weight (kg)	44 - 107	68.7	70	Recommended by USEPA (1989).	0.98
Sediment Exposure Pathway					
Concentration in Sediment (mg/kg)					
Zone B/C Arsenic	3.1 - 604		84.2	95% UCL concentration.	
Zone B/C Carbazole	0.073 - 130		84.3	95% UCL concentration.	
Zone B/C CPAH	72.9		72.9	95% UCL concentration.	
Zone B/C Pentachlorophenol	0.48 - 47		47	Maximum detected concentration.	
Zone B/C Dieldrin	0.006 - 4.5		4.5	Maximum detected concentration.	
Sediment Ingestion Rate (mg/d)	1.8 - 437.1	40	100	Recommended by USEPA (1991) for soil.	2.5
Sediment Adherence (mg/cm2)	0.2 - 1	0.6	0.6	Range is from USEPA (1992). Value chosen using professional judgement.	1
Skin Exposed (cm2/d)	0 - 10,000	1000	2300	Professional judgement.	2.3
Exposure Frequency (days/year)	0 - 50	< 1 *	2 *	Upper bound based on site-specific data.	2
Exposure Duration (years)	0 - 15	10 *	15 *	Upper bound based on site-specific data.	1.5
Body Weight (kg)	44 - 107	68.7	70	Recommended by USEPA (1989).	0.98

* Assumes baseline risk assessment incorporates recommended site-specific exposure parameters.

TABLE 7-2
Current Utility Worker

Parameter	Range	Typical Value	RME Value Used	Rationale for RME Value Used	Difference between RME and Typical Values
Surface Soil Exposure Pathway					
Concentration in Surface Soil (mg/kg)					
Zone A Pentachlorophenol	0.18 - 167	24.4	152	Maximum grid concentration.	6.8
Zone A CPAH	44.3	16.4	44.3	Maximum grid concentration.	2.7
Zone A Dioxin	0.0007-0.02	0.00335	0.02	Maximum grid concentration.	6
Zone A Arsenic	3.4 - 152	32.3	152	Maximum grid concentration.	4.7
Soil Ingestion Rate (mg/d)	1.8 - 437.1	40	50	Recommended by USEPA (1991)	1.25
Soil Adherence (mg/cm2)	0.2 - 1	0.6	1	Range is from USEPA (1992). Value used is recommended "upper limit".	1.67
Skin Exposed (cm2/d)	0 - 10,000	1000	2300	Professional judgement	2.3
Exposure Frequency (days/year)	0 - 10	< 1 *	1 *	Upper bound based on site-specific data.	5
Exposure Duration (years)	0 - 25	10 *	25 *	Upper bound based on site-specific data.	2.5
Body Weight (kg)	44 - 107	68.7	70	Recommended by USEPA (1989).	0.98
Subsurface Soil Exposure Pathway					
Concentration in Subs. Soil (mg/kg)					
Zone A Pentachlorophenol	0.084 - 210	47	210	Maximum grid concentration.	4.5
Zone A CPAH	172	61	172	Maximum grid concentration.	2.8
Zone A Dioxin	2E-6 - 0.027	0.0022	0.027	Maximum grid concentration.	12.3
Zone A Arsenic	0.63 - 734	91.7	734	Maximum grid concentration.	8
Soil Ingestion Rate (mg/d)	1.8 - 437.1	40	50	Recommended by USEPA (1991)	1.25
Soil Adherence (mg/cm2)	0.2 - 1	0.6	1	Range is from USEPA (1992). Value used is recommended "upper limit".	1.67
Skin Exposed (cm2/d)	0 - 10,000	1000	2300	Professional judgement	2.3
Exposure Frequency (days/year)	0 - 10	< 1 *	1 *	Upper bound based on site-specific data.	5
Exposure Duration (years)	0 - 25	10 *	25 *	Upper bound based on site-specific data.	2.5
Body Weight (kg)	44 - 107	68.7	70	Recommended by USEPA (1989).	0.98

* Assumes baseline risk assessment incorporates recommended site-specific exposure parameters.

TABLE 7-3
Current Trespasser

Parameter	Range	Typical Value	RME Value Used	Rationale for RME Value Used	Difference between RME and Typical Values
Surface Soil Exposure Pathway					
Concentration in Surface Soil (mg/kg)					
Zone A Pentachlorophenol	0.18 - 167	24.4	167	Maximum grid concentration.	6.8
Zone A CPAH	44.3	16.4	44.3	Maximum grid concentration.	2.7
Zone A Dioxin	0.0007-0.02	0.00335	0.02	Maximum grid concentration.	6
Zone A Arsenic	3.4 - 152	32.3	152	Maximum grid concentration.	4.7
Soil Ingestion Rate (mg/d)	1.8 - 437.1	40	100	Recommended by USEPA (1991)	2.5
Soil Adherence (mg/cm2)	0.2 - 1	0.6	1	Range is from USEPA (1992). Value used is recommended "upper limit".	1.67
Skin Exposed (cm2/d)	0 - 10,000	1000	2300	Professional judgement	2.3
Exposure Frequency (days/year)	0 - 52	6	24	Professional judgement	4
Exposure Duration (years)	5.0 - 70	5	24	Professional judgement.	4.8
Body Weight (kg)	44 - 107	68.7	70	Recommended by USEPA (1989).	0.98
Surface Water Exposure Pathway					
Concentration in Water (mg/L)					
Zones B/C CPAH	0.196		0.196	95% UCL concentration.	
Zones B/C Arsenic	0.002 - 2.6		0.112	95% UCL concentration.	
Zones B/C Pentachlorophenol	0.003 - 0.13		0.018	95% UCL concentration.	
Skin Exposed (cm2)	0 - 10,000	2000	6380	Professional judgement	3.19
Exposure Time (hr/d)	0 - 8	0.5	2.6	National average time spent swimming while on vacation.	5.2
Water Ingestion Rate (L/hr)	0 - 0.01	< 0.01	0.01	Professional judgement	2
Exposure Frequency (days/year)	0 - 52	2	24	Professional judgement.	12
Exposure Duration (years)	5.0 - 70	5	24	Professional judgement.	4.8
Body Weight (kg)	44 - 107	68.7	70	Recommended by USEPA (1989).	0.98
Sediment Exposure Pathway					
Concentration in Sediment (mg/kg)					
Zone B/C Arsenic	3.1 - 604		84.2	95% UCL concentration.	
Zone B/C Carbazole	0.073 - 130		84.3	95% UCL concentration.	
Zone B/C CPAH	72.9		72.9	95% UCL concentration.	
Zone B/C Pentachlorophenol	0.48 - 47		47	Maximum detected concentration.	
Zone B/C Dieldrin	0.006 - 4.5		4.5	Maximum detected concentration.	
Sediment Ingestion Rate (mg/d)	1.8 - 437.1	40	100	Recommended by USEPA (1991) for soil.	2.5
Sediment Adherence (mg/cm2)	0.2 - 1	0.6	0.6	Range is from USEPA (1992). Value chosen using professional judgement.	1
Skin Exposed (cm2/d)	0 - 10,000	1000	3100	Professional judgement.	3.1
Exposure Frequency (days/year)	0 - 52	2	24	Upper bound based on site-specific data.	12
Exposure Duration (years)	5.0 - 70	5	24	Upper bound based on site-specific data.	4.8
Body Weight (kg)	44 - 107	68.7	70	Recommended by USEPA (1989).	0.98

TABLE 7-4
Current Off-site Resident Child

Parameter	Range	Typical Value	RME Value Used	Rationale for RME Value Used	Difference between RME and Typical Value
Sediment Exposure Pathway					
Concentration in Sediment (mg/kg)					
Zone A CPAH	25.2		25.5	Maximum detected concentration.	
Zone A Dioxin	0.001		0.001	Maximum detected concentration.	
Sediment Ingestion Rate (mg/d)	3 - 1854	86	200	Recommended by USEPA (1991b) for soil.	2.33
Sediment Adherence (mg/cm2)	0.2 - 1	0.6	0.6	Range is from USEPA (1992) for soil. Value chosen using professional judgement.	1
Skin Exposed (cm2/d)	0 - 7300	1000	1870	Professional judgement	1.87
Exposure Frequency (days/year)	0 - 52	< 1	24	Professional judgement.	24
Exposure Duration (years)	0 - 6	6	6	Professional judgement.	1
Body Weight (kg)	7.0 - 20	12.9	15	Recommended by USEPA (1989) for ages 1-4.	0.86
Surface Water Exposure Pathway					
Concentration in Water (mg/L)					
Zone A CPAH	0.252		0.252	Maximum detected concentration.	
Zone A Dioxin	8.5E-05		8.5E-05	Maximum detected concentration.	
Skin Exposed (cm2)	0 - 7300	2000	3735	Professional judgement	1.87
Exposure Time (hr/d)	0 - 8	0.5	2.6	National average time spent swimming while on vacation.	5.2
Water Ingestion Rate (L/hr)	0 - 0.01	< 0.01	0.01	Recommended by USEPA (1989).	2
Exposure Frequency (days/year)	0 - 52	6	24	Professional judgement	4
Exposure Duration (years)	0 - 6	6	6	Professional judgement.	1
Body Weight (kg)	7.0 - 20	12.9	15	Recommended by USEPA (1989) for ages 1-4.	0.86

KOPPERS SUPERFUND SITE MAILING LIST COUPON

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If you have had a change of address and would like to continue to receive site related information or would like for EPA to add your name and address to the mailing list for the Koppers Superfund Site, please complete this self-addressed form. If you have any questions regarding this mailing list, please call Cynthia Peurifoy at 1-800-435- 9233.

NAME: Beazer East, Inc. (Ms. Shannon Craig)

ADDRESS: 436 Seventh Avenue

Pittsburgh, PA 15219

TELEPHONE: (412) 227-2684

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Interim Remedial Action for the Koppers Co., Inc. (Charleston Plant) Superfund Site is important in helping EPA select an interim remedy for the site. You may use the space below to write your comments, then fold and mail. A response to your comment will be included in the Responsiveness Summary.

Please see the attached comments.

Appendix C

Superfund Remedial Investigation Findings and Proposed Interim Remedial Action Fact Sheet January 1995

SUPERFUND REMEDIAL INVESTIGATION FINDINGS AND PROPOSED INTERIM REMEDIAL ACTION FACT SHEET

Koppers Co., Inc. (Charleston Plant) Site
Charleston, Charleston County, South Carolina

U. S. Environmental Protection Agency, Region IV, Atlanta, GA **January 1995**

Terms specific to the Superfund process (in **bold** print) are defined in a glossary at the end of this publication.

INTRODUCTION

This fact sheet is one in a series developed by the Region IV Office of the United States Environmental Protection Agency (EPA) to inform citizens and local officials of current activities at the Koppers Co., Inc. (Charleston Plant) Superfund Site in Charleston, South Carolina. In a similar fact sheet dated May 1993, EPA briefly summarized the Superfund process, the site background and history, and the work planned for the **Remedial Investigation (RI)**. This fact sheet will provide the reader with a description of the site and a brief history, summarize the findings of the RI and the human health **Baseline Risk Assessment**, and outline EPA's proposed approach for Interim Remedial Action at the Koppers Co., Inc. site.

EPA is issuing this fact sheet as part of its public participation responsibilities under Section 117(a) of the **Comprehensive Environmental Response, Compensation and Liability Act (CERCLA**, more commonly known as Superfund). This fact sheet summarizes information that can be found in greater detail in the Final Remedial Investigation Report, the Final Human Health Baseline Risk Assessment, and Final Technical Memorandum for Interim Remedial Measures contained in the **Administrative Record** located at the established **information repositories**. The reader is referred to the information repositories listed at the end of this publication for a more detailed account of this subject matter.

SITE DESCRIPTION AND HISTORY

The Koppers site is located in the Charleston Heights section of Charleston, SC and lies to the north of downtown Charleston on the west side of the peninsula formed by the Ashley and Cooper Rivers. The general location of the site is depicted on Figure 1 located at the end of this publication. The site is approximately 102 acres in size and consists of a number of parcels of property that currently contain a variety of commercial operations. The present use of the area surrounding the site to the north, south, and east consists of a mixture of industrial, commercial and residential properties. The Ashley River borders the site to the west. The total resident, student, and worker population within a 4-mile radius of the site is approximately 150,000.

The specific boundaries of the site are illustrated on Figure 2. The parcel of property bound to the north by Milford Street, to the south by Braswell Street, to the east by Interstate 26, and to the west by the Ashley River represents an approximate 45 acre parcel. This 45 acre parcel was previously owned by the Koppers Company from 1940 to 1978 and was used during their wood-treating operations. The plant treated poles for use by utilities, foundation pilings for the construction of buildings, docks, wharfs, railroad ties, and other railroad construction materials. The majority of wood-treating operations were conducted in the eastern portion of the site, now identified as the former Treatment Area (Figure 2).

Proposed Interim Remedial Action
Public Comment Period:
January 20 - February 21, 1995

Public Meeting
Date: January 26, 1995
Time: 7:00 PM
Place: Charleston Public Works Building
103 St. Philip Street
Charleston, SC

In the former Treatment Area, Koppers maintained several above ground storage tanks in the Tank Farm Area and Working Tank Area for the storage of wood-preservatives. Wood-preservatives were pumped from the Working Tanks into cylindrical pressure treating vessels. In the treatment vessels, moisture was removed from the virgin wood under a vacuum and impregnated with the wood preservatives. **Creosote** was the primary preservative used over the life of the plant. Pentachlorophenol (penta) and Copper Chromium Arsenate (CCA) were also used to a lesser degree. Following pressure treatment, excess creosote was recovered from the cylinders and stored in the Working Tanks for reuse. Wastewater from the treatment process which contained oils, creosote and other solids was collected in a sump pit and pumped to the Separation Tanks. Creosote was recovered in the Separation Tanks via a dehydrator and pumped to the Working Tanks for use. Trams loaded with treated wood were then pulled to the Drip-Track Area and stored on the 45-acre parcel until it was shipped off-site for sale.

The practice of treating wood at the Koppers site resulted in numerous discharges to the environment. Wastewater from the Separation Tanks flowed eastward toward the Ashley River into a ditch, now known as the South Braswell Street Drainage Ditch. Historical aerial photographs and sampling conducted during the RI indicate that creosote constituents were transported with wastewater and surface water run-off along the South Braswell Street Drainage Ditch into the Old Impoundment Area (See Figure 2). Residues from the creosote treatment cylinders were filled in the northwest portion of the 45-acre parcel (Treatment Cylinder Residue Area) until the mid-1960's. Koppers also entered into a five year agreement in 1953 to lease a four acre tract of land south of Braswell Street near the present day Barge Canal for the purpose of depositing saw dust, bark, and other wood waste materials resulting from stripping operations.

The remaining portion of the site, which comprises approximately 57 acres located south and adjacent to the former Koppers property, was never owned by Koppers. These 57 acres were part of a larger tract of land (the entire area south of Braswell Street) owned by the Ashepoo Phosphate Works, which operated a phosphate plant there beginning around the turn of the century. The property was used for phosphate and fertilizer operations by a series of owners until 1978. In November 1984, Southern Dredging dredged a barge canal approximately 1000 feet inward from the Ashley River on this property just south of Braswell Street. Material from the canal dredging was piled approximately 700 feet east of the barge canal in a bermed spoils area. As a result of this dredging operation, South Carolina regulatory personnel responded to the presence of exposed creosoted poles, highly turbid water and an oily sheen on the Ashley River adjacent to the canal. Approximately 100 dead fish were observed in the Ashley River within ¼ mile downstream of the canal. EPA incorporated these 57 acres into the site boundaries to determine the environmental impact that the dredging operations had on the Ashley River and surrounding environment.

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Subsequent to Koppers' operations on-site, the former Treatment Area was used by several industries. The former creosote storage tanks were used by FedServ Industries to store waste oil. Historical investigations conducted from 1983-1985 by the South Carolina Department of Health and Environmental Control (SCDHEC) and EPA revealed spilled waste oil on the ground immediately surrounding the six storage tanks. In 1985, cleanup and remedial activities were undertaken. These activities included disposal of materials in the tanks, dismantling of the tanks and excavation and disposal of contaminated soil. From 1978 to 1982, Pepper Industries used the former Working Tanks to store ship bilge and tank wastes. These tanks were dismantled in 1987. In 1988, EPA conducted a Site Inspection to gather the necessary information required to prepare the **Hazard Ranking System (HRS)** package. Based upon the results of this investigation, the Koppers Co., Inc. (Charleston Plant) Site was proposed for inclusion on the **National Priorities List (NPL)** in February 1992. The site became Final on the NPL in December 1994.

REMEDIAL INVESTIGATION SUMMARY

In January 1993, Beazer East, Inc. (formerly Koppers Co., Inc.) entered into an Administrative Order on Consent (AOC) with EPA for the performance of a **Remedial Investigation/Feasibility Study (RI/FS)**. Beazer East, Inc. retained ENSR Consulting & Engineering of Acton, MA to conduct the work required to complete the RI/FS process. EPA and SCDHEC provided oversight of all work conducted during the RI/FS.

The overall objective of the RI was to fully define the nature and extent of contamination present on-site. This objective was accomplished by the implementation of an extensive two-phase field program. Phase I field work was conducted from June-August 1993. The Phase II field program was based upon the results of Phase I and was conducted from February-May 1994. Furthermore, a supplemental field investigation was conducted in September 1994 in the former Treatment Area to support the conceptual design of the proposed Interim Remedial Action discussed below.

Environmental samples were collected and submitted for chemical analyses from the following media of concern: surface soil, subsurface soil, geologic/groundwater, surface water, sediment, and ecological receptors. Surface soil samples were collected from a total of 145 locations across the site. A total of 215 subsurface soil samples were collected via borings and test pit excavations from the zone extending immediately above the water table to approximately 60 feet below land surface (BLS). The geologic/groundwater investigation consisted of 91 groundwater samples collected from 7 piezometers, 11 drive-point wells, and 29 conventional groundwater monitoring wells. Surface water samples were collected from 60 locations in the Ashley River, adjacent tidal marshes, the Barge Canal, and drainage ditches on- and off-site. Sediment samples were collected from 90 locations in the same areas of interest as surface water. The ecological receptor investigation included an 8-week caged oyster study at 10 locations in the Ashley River, adjacent tidal marshes and Barge Canal; sampling and analysis of indigenous mussel populations at 4 locations; and sediment toxicity testing from 8 locations.

The discussion below provides the reader with a brief, qualitative summary of the physical characteristics of the site and the nature and extent of contamination as determined from the RI field program described above. The reader is encouraged to visit the information repositories or attend the upcoming EPA meeting on January 26, 1995 for a more detailed, quantitative account of this subject matter.

- The site geology is composed of a series of water-bearing units and clay-confining units as follows: 1) a layer of fill, 2) a shallow water-bearing unit, 3) a shallow clay unit, 4) an intermediate water-bearing unit, 5) an intermediate clay unit, 6) a deep-water bearing unit, and 7) the Cooper Marl clay formation, encountered at depths ranging from 55 to 67 feet below land surface (BLS).

- The shallow clay is found intermittently across the site. In the western portion of the site, the intermediate water-bearing unit is absent and the shallow and intermediate clay units are contiguous.

- The shallow and intermediate water-bearing units act as one hydrologic unit which generally flows to the nearest surface water body. A groundwater divide is present near the central portion of the site. Groundwater east of this divide, underlying the former Treatment Area, flows north toward the North Tidal Marsh. Groundwater west of this divide flows toward the Ashley River. Predicted groundwater flow velocity is approximately 80 ft/yr to the north and 67 ft/yr to the west.

- Groundwater flow in the deep water-bearing unit is west toward the Ashley River at a predicted velocity of approximately 72 ft/yr.

- Within a 1 mile radius of the site, groundwater in water-bearing units above the Cooper Marl is not used for residential or industrial supply. Industrial wells within a 3-mile radius are open to formations beneath the Cooper Marl. The Cooper Marl clay confining unit is reportedly 260 feet thick in the study area.

- Polynuclear Aromatic Hydrocarbons, or PAHs (Please see definition for **creosote** in glossary), pentachlorophenol, **dioxin**, arsenic and lead are present in surface/subsurface soil on-site at concentrations greater than those deemed to be adequately protective of human health.

- The highest concentrations of PAHs in surface/subsurface soil were found in two definite source areas, the former Treatment Area and Impoundment Area. A third possible source area was identified near the Creosote Residual Area.

- Distribution of pentachlorophenol and dioxin in surface/subsurface soil is limited to the area which formerly contained the penta storage tank in the Treatment Area.

- The highest levels of lead and arsenic in surface/subsurface soil detected during the RI were found to the south of the 45 acre parcel in areas not associated with wood treating operations. Specifically, these areas include the road just south of the Barge Canal and property formerly owned by fertilizer/phosphate companies. These historical operations may be the source of elevated levels of lead and arsenic detected.

- The subsurface of the former Treatment Area contains potentially recoverable quantities of **Non-aqueous phase liquid (NAPL)** and is considered a definite source area of constituents detected in sediments and surface waters of the headwaters of the North Tidal Marsh. Creosote is the primary component of the NAPL, but other releases associated with subsequent operations may have contributed to this problem.

- NAPL has been observed in the Hagood Avenue Drainage Ditch which feeds the North Tidal Marsh. NAPL is introduced into this system via discharge from the source area into the eastern end of the Milford Street Drainage Ditch. NAPL is then transported via a subsurface culvert which runs approximately parallel to I-26 then empties into the Hagood Avenue Drainage Ditch.

- The Impoundment Area is a definite source area with potentially recoverable quantities of NAPL. NAPL has been observed in the South Braswell Street Drainage Ditch which discharges to the Barge Canal.

- NAPL has been observed in Ashley River sediments north of the Braswell Shipyard dock. Possible sources include the Creosote Residual Area, historical discharges via the Central Drainage Ditch, and tidal transport from the Barge Canal.

- Sediments of the Hagood Avenue, Milford Street, South Braswell Street, and Central Drainage Ditches exceed levels deemed protective of human health. Primary constituents of concern include arsenic, PAHs, and lead.

- The headwaters of the North Tidal Marsh contain surface water and sediment which exceed screening level ecological benchmarks. Primary constituents of concern include PAHs, lead, arsenic, copper, mercury, zinc, and several pesticides. Sediments collected from this area demonstrated significant toxicity for one of two test species evaluated.

- Sediments collected to a depth of 3 feet in the Ashley River approximately 900 feet upstream and downstream of the Central Drainage Ditch contain concentrations of PAHs which exceed screening level ecological benchmarks. Sediments collected in the Ashley River near the Barge Canal demonstrated significant toxicity for both test species evaluated.

- The marsh area north of Braswell Shipyard and adjacent to the Ashley River contains concentrations of sediment which exceed ecological benchmarks. Primary constituents of concern include PAHs, arsenic, lead, and copper.

- Sediments collected to a depth of 3 feet in the Barge Canal exceed screening level ecological benchmarks for PAHs.

- Sediments in the headwaters of the South Tidal Marsh contain concentrations which exceed screening level ecological benchmarks. The highest sediment concentrations of lead and arsenic detected during the RI were found in the headwaters of this marsh. Historical fertilizer/phosphate operations are the likely source of these primary constituents of concern. Other inorganic constituents and PAHs were present in this area at concentrations exceeding ecological benchmarks. Sediments from 3 locations in this area demonstrated significant toxicity for both test species evaluated.

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HUMAN HEALTH BASELINE RISK ASSESSMENT SUMMARY

CERCLA directs EPA to protect human health and the environment for current and potential future exposure to hazardous substances at the site. A human health Baseline Risk Assessment was conducted to evaluate the potential current and future human health impacts associated with exposure to constituents detected at the site. An Ecological Risk Assessment is currently underway that will evaluate whether site constituents pose potential current/future exposure impacts to sensitive ecological receptors.

The human exposure pathways which were evaluated included: 1) incidental ingestion and dermal contact with surface/subsurface soils; 2) groundwater ingestion and inhalation; 3) incidental ingestion and dermal contact with surface water including consumption of fish caught from neighboring surface waters; and 4) incidental ingestion and dermal contact with sediment. Current and future exposure scenarios that were evaluated included: 1) current/future on-site worker; 2) current/future on-site utility worker; 3) current off-site resident who trespasses on-site; 4) future on-site resident; and 5) future marina worker. Future land-use plans developed by the City of Charleston recommend heavy industrial uses for the area of the site, which has historically been the area's use.

EPA evaluated constituents detected on-site according to their potential to produce either cancer and/or non-cancer health effects. The carcinogenic risk range EPA has set for Superfund cleanups to be protective of human health is 1×10^{-4} to 1×10^{-6}. For example, a cancer risk of 1×10^{-6} indicates that an individual has a 1 in 1,000,000 (or 1 in 10,000 for 1×10^{-4}) incremental chance of developing cancer as a result of site-related exposure to a carcinogen over a 70 year lifetime under the specific exposure conditions at the Site. EPA generally uses the cumulative benchmark risk level of 1×10^{-4} for all exposures relating to a particular medium to trigger action for that medium. Noncancer exposure estimates were developed using EPA reference doses to calculate a Hazard Index (HI). A HI greater than 1 indicates that constituents are present at concentrations that could produce harmful effects.

Exposures associated with the pathways described above resulted in unacceptable carcinogenic and non-carcinogenic risks. Carcinogenic risks for the current on-site worker (including utility worker) ranged from 5×10^{-4} to 2×10^{-6}. Non-cancer HI's for the current on-site worker ranged from 0.001 to a maximum of 2 for the current on-site worker exposed to surface soils in the former Treatment Area. Carcinogenic risks for the future on-site worker (including utility worker) ranged from 8×10^{-3} to 3×10^{-5}. Non-cancer HI's for the future on-site worker ranged from 0.03 to a maximum of 20 for the future worker exposed to surface soils in the former Treatment Area. Carcinogenic risks for the current off-site resident were calculated to be 1×10^{-1}. Non-cancer HI's for the adult off-site resident were 10, while the HI for the off-site child resident was 1,000. The high risks for the current off-site resident scenarios were driven by dermal contact exposure with drainage ditch surface waters, specifically the Hagood Avenue Drainage Ditch located to the north of the site. The exposure frequency for the current off-site resident was 24 days/year with an exposure duration of 6 years for the child and 24 years for the adult.

PROPOSED INTERIM REMEDIAL ACTION

EPA is proposing an Interim Remedial Action (IRA) to protect human health and the environment in the short-term, while a final long-term remedial solution for the site is being developed. The objective of EPA's proposed IRA is to remove or otherwise control the discharge of NAPL from the former Treatment Area to the eastern end of the Milford Street Drainage Ditch. The proposed action will also mitigate the discharge of NAPL and other dominant transport mechanisms to the Hagood Avenue Drainage Ditch and North Tidal Marsh.

Figure 3 provides an illustration of the former Treatment Area and conceptual layout of the proposed IRA. Vertical cross-sections provided in Figures 4 and 5 illustrate the subsurface stratigraphy of the former Treatment Area. The subsurface in this area can be described as follows:

- A shallow water-bearing unit extends to depths of 11-16 feet BLS. The water table in this area was encountered between 2 and 7.5 feet BLS.

- A shallow clay unit ranging in thickness from 5 to 13 feet underlies the shallow water-bearing zone. As shown on Figure 5, this shallow clay unit pinches out in the western portion of the former Treatment Area.

- An intermediate water-bearing unit extends to depths of 32-38 feet BLS. Due to the discontinuity of the shallow clay unit, the shallow and intermediate water-bearing zones are considered one unit in the western portion of this area.

- An intermediate clay unit ranging in thickness from 3 to 9 feet underlies the intermediate water-bearing zone. The intermediate clay unit extends beneath the entire former Treatment Area.

- A deep water-bearing zone is present in this area, but is considered separate from the shallow/intermediate water-bearing zone due to different groundwater flow directions and chemistry. Wells installed into the deep water-bearing zone in this area did not indicate the presence of site-related constituents.

Data collected during the RI field program confirmed the presence of a NAPL plume approximately 150 feet north of the Milford Street Drainage Ditch. In the eastern portion of the former Treatment Area, NAPL is restricted to the shallow water-bearing zone, above the shallow clay unit. At the point where the shallow clay unit ends, NAPL can migrate into the intermediate water-bearing zone. The concentrations in monitoring wells in this area suggest NAPL may be present beneath the western edge of the shallow clay unit.

EPA and SCDHEC are proposing to proceed with interim action in the former Treatment Area in order to reduce potential human health risks associated with dermal contact with surface waters and sediments of the Hagood Avenue and Milford Street Drainage Ditches. The proposed conceptual approach for the IRA is outlined below:

<u>Shallow Water-Bearing Unit</u>

<u>Step 1A</u> - Objective: Eliminate future off-site migration of NAPL to the Milford Street Drainage Ditch.

Proposed Approach: An interceptor trench will be installed at the location of the storm water drainage ditch on Milford Street. Groundwater and NAPL will be pumped from this trench to hydraulically control groundwater and NAPL migration. As part of this installation, the storm water drainage ditch will be reconstructed to: 1) elevate the bottom above the static (prior to pumping) water table and; 2) remove sediments and reconstruct the ditch side walls and bottom, to mitigate residual NAPL from entering the drainage ditch. Groundwater monitoring wells will be installed to evaluate the induced capture zone of the trench. Groundwater and NAPL recovered from the trench will be pumped to a water treatment plant located at 1961 Milford Street. The water treatment plant will be designed and installed to meet all appropriate regulatory discharge standards prior to discharge to the North Charleston Sewer District.

Step 1B - Objective: Mitigate the drainage system as a conduit for potential NAPL migration to the Hagood Avenue Drainage Ditch.

Proposed Approach: An inspection survey will be conducted on the subsurface drain pipe that connects the Milford Street and Hagood Avenue Drainage Ditches. Measures will be implemented to clean and/or repair this drain pipe as necessary.

Step 1C - Objective: Eliminate potential exposure to constituents in sediments of the Hagood Avenue Drainage Ditch.

Proposed Approach: The Hagood Avenue Drainage Ditch will be remediated/reconstructed to prevent future migration of NAPL. The method of reconstruction will be determined by experience gained from reconstruction of the Milford Street Drainage Ditch. Methods may include removal of sediments, raising the bottom of the ditch above the water table and/or installing liners.

Intermediate Water-Bearing Unit

Step 2 - Objective: Mitigate off-site migration of NAPL in the intermediate water-bearing unit underlying the former Treatment Area.

Proposed Approach: A groundwater recovery well screened within the intermediate water-bearing unit will be used to hydraulically contain NAPL. As shown on Figure 3, this well will be installed south of Milford Street and in an area where the shallow clay unit is not present.

Implementation of the IRA is proposed as a component of the Final site-wide remediation. This interim action will be followed by a Final **Record of Decision (ROD)** that will provide long-term protection of human health and the environment, fully address the principal threats posed by the site, and address the statutory preference for treatment that reduces the toxicity, mobility, or volume of wastes. By implementing the interim action in a step wise approach, an evaluation of each step can be completed to provide an opportunity to incorporate the results into subsequent steps of the interim action and in the Final site-wide remediation.

Following completion of the public comment period, EPA will prepare an Interim Remedial Action ROD and will respond to all public comments received on the proposed approach in a Responsiveness Summary. The IRA ROD is scheduled for completion by March 1995. Construction of the IRA treatment system is scheduled to begin by late 1995. The estimated total capital cost for the IRA is $1,350,000. Annual operation and maintenance (O&M) costs are estimated at $138,000/year. Total present worth for the IRA, which accounts for a series of yearly O&M expenditures by using an appropriate discount factor, is $3,060,000.

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FUTURE ACTIVITIES

Additional field work is necessary to determine the source of elevated concentrations of inorganics, specifically lead and arsenic, detected in sediments of the headwaters of the South Tidal Marsh. Based upon a review of historical aerial photographs, elevated concentrations of lead and arsenic in surface/subsurface soil samples collected from property formerly owned by the former fertilizer/phosphate companies to the south, and a general understanding of the fertilizer/phosphate manufacturing processes, EPA believes that the parcels of property formerly owned by these companies may by the source of lead and arsenic currently present in the South Tidal Marsh. The scope of this field work is currently in the planning stages and is expected to begin in early March 1995.

An Ecological Risk Assessment has been initiated to determine whether site-related constituents pose potential hazards to populations of ecological receptors inhabiting or frequenting the wetlands of the site and/or the reach of the Ashley River adjacent to the site. This ecological risk assessment will provide a basis to determine environmentally protective sediment, surface water and groundwater cleanup levels for those constituents found to pose potential hazards to populations of ecological receptors inhabiting the wetlands of the site and/or the adjacent reach of the Ashley River. Appropriate sediment, surface water and groundwater cleanup goals will be incorporated into Remedial Action Objectives for protection of the environment. Recommended Remedial Action Objectives addressing ecological risk will be delineated and addressed in the Feasibility Study to be completed by Summer 1995.

A Feasibility Study has been initiated to identify, develop and evaluate remedial alternatives to satisfy the following objectives:

- Reduce potential human health risks from exposure to surface and subsurface soils to levels deemed adequately protective by EPA. This objective may be achieved by one or a combination of general response actions consisting of containment, capping, removal, disposal, institutional controls, and/or treatment of soils with unacceptable levels of constituents.

- Reduce potential human health risks from exposure to sediments to levels deemed to be adequately protective by EPA. This objective will be achieved by one or a combination of general response actions consisting of containment, capping, removal, disposal, and/or treatment of sediments with unacceptable levels of constituents.

- Remove or otherwise control the discharge of NAPL from the former Treatment Area to the eastern end of the Milford Street Drainage Ditch and by doing so remove or otherwise control the discharge of NAPL and other dominant transport mechanisms to the Hagood Avenue Drainage Ditch and the North Tidal Marsh. The means by which this will be accomplished are the subject of EPA's proposed Interim Remedial Action.

- Remove or otherwise control NAPL present below the water table off-site and to the north of the former Treatment Area.

- Mitigate the further migration of dissolved-phase constituents from the NAPL source area in the former Treatment Area.

- Remove or otherwise control the discharge of NAPL and other dominant transport mechanisms from the Old Impoundment Area to the South Braswell Drainage Ditch, Barge Canal and surrounding area.

- Mitigate the surface water and sediment transport mechanisms which have adversely impacted the headwaters of the South Tidal Marsh.

The Feasibility Study is scheduled to be completed and released to the public by Summer 1995. Concurrent with the release of the Feasibility Study document, EPA will issue its preferred remedial alternative, or Proposed Plan, for public review and comment. The final remedy for the Koppers Co., Inc. (Charleston Plant) Site, as presented in the ROD, is expected by the end of 1995.

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OPPORTUNITY FOR COMMUNITY INVOLVEMENT

Concurrent with the release of this fact sheet, EPA has initiated a 30-day public comment period from January 20, 1995 to February 21, 1995 for submission of written and oral comments on the proposed Interim Remedial Action and all supporting documentation located in the information repositories listed below. All comments, written and oral, should be directed to Craig Zeller, EPA Remedial Project Manager for the Koppers Site, at the address and telephone number below. Upon timely request, EPA will extend the public comment period by 30 additional days.

EPA will hold a public meeting at 7:00 PM on January 26, 1995 to present the information contained in the RI Report, Human Health Baseline Risk Assessment and proposed conceptual approach for Interim Remedial Action in the former Treatment Area. The meeting will be held at the Charleston Public Works Building located at 103 St. Philip Street, Charleston, South Carolina. Representatives from EPA, SCDHEC and Beazer East, Inc. will be available to answer any questions the public may have regarding the information available and future activities planned for the site. EPA will also accommodate requests for informal meetings during the public comment period, to further explain the findings of the RI and the proposed Interim Remedial Action. Individuals interested in arranging briefings should contact EPA's Community Relations Coordinator for the site.

FOR MORE INFORMATION CONTACT:

Craig Zeller
Remedial Project Manager

Cynthia Peurifoy
Community Relations Coordinator

U.S. Environmental Protection Agency - Region IV
345 Courtland Street, NE., Atlanta, GA 30365
(404)347-7791 or 1-800-435-9233
****

Richard Haynes, P.E.
SC Department of Health & Environmental Control
2600 Bull Street, Columbia, SC 29201
(803)896-4070

ADMINISTRATIVE RECORD AND INFORMATION REPOSITORIES

Charleston County Main Library
404 King Street
Charleston, SC 29402
(803)723-1645

U.S EPA Region IV Records Center
345 Courtland Street, NE
Atlanta, GA 30365
(404)347-0506

Administrative Record - A file which contains all information used by EPA to make its decision on the selection of a response action under CERCLA. This file is required to be available for public review and a copy is to be established at or near the site, usually at the information repository. A duplicate file is maintained in a central location such as a regional EPA and/or state office

Baseline Risk Assessment - An assessment which provides an evaluation of the potential risk to human health and the environment in the absence of remedial action.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The Act created a trust fund, known as Superfund to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Creosote - is an oily, translucent, brown to black liquid with a sharp smoky or tarry odor. It is a very complex mixture of organic compounds, is practically insoluble, and denser than water. Creosote is primarily comprised of a family of chemicals known as Polynuclear Aromatic Hydrocarbons (PAHs). Of the 17 PAHs of which creosote is composed, 7 are potentially carcinogenic to humans.

Dioxin - is found as a trace constituent in technical grade pentachlorophenol and is classified as a probable human carcinogen.

Hazard Ranking System (HRS) - A scoring system used by EPA to evaluate relative risks to public health and the environment. A score is calculated based on actual or potential release of hazardous substances through all media present (i.e. the air, soils, surface water, sediments, groundwater). If a site scores above 28.5, the site is proposed for inclusion on the National Priorities List.

Information Repository - Materials on Superfund and a specific site located conveniently for local residents.

National Priorities List (NPL) - EPA's list of uncontrolled or abandoned hazardous waste sites eligible for long-term clean up under the Superfund Remedial Program.

Non-Aqueous Phase Liquid (NAPL) - Fluids such as chlorinated solvents, creosote, coal tar wastes and pesticides which do not mix with water. NAPLs are generally classified as LNAPL (lighter that water) or DNAPL (density greater than water). As a result of widespread production, transportation, use and disposal of hazardous NAPLs, particularly since 1940, there are numerous NAPL contamination sites in the United States.

Remedial Investigation/Feasibility Study (RI/FS) - Two distinct but related studies, normally conducted together, intended to define the nature and extent of contamination at a site and to evaluate appropriate site-specific remedies.

Record of Decision (ROD) - A public document that explains which clean up alternative will be used at a National Priorities List site and the reasons for choosing the cleanup alternative over other possibilities.

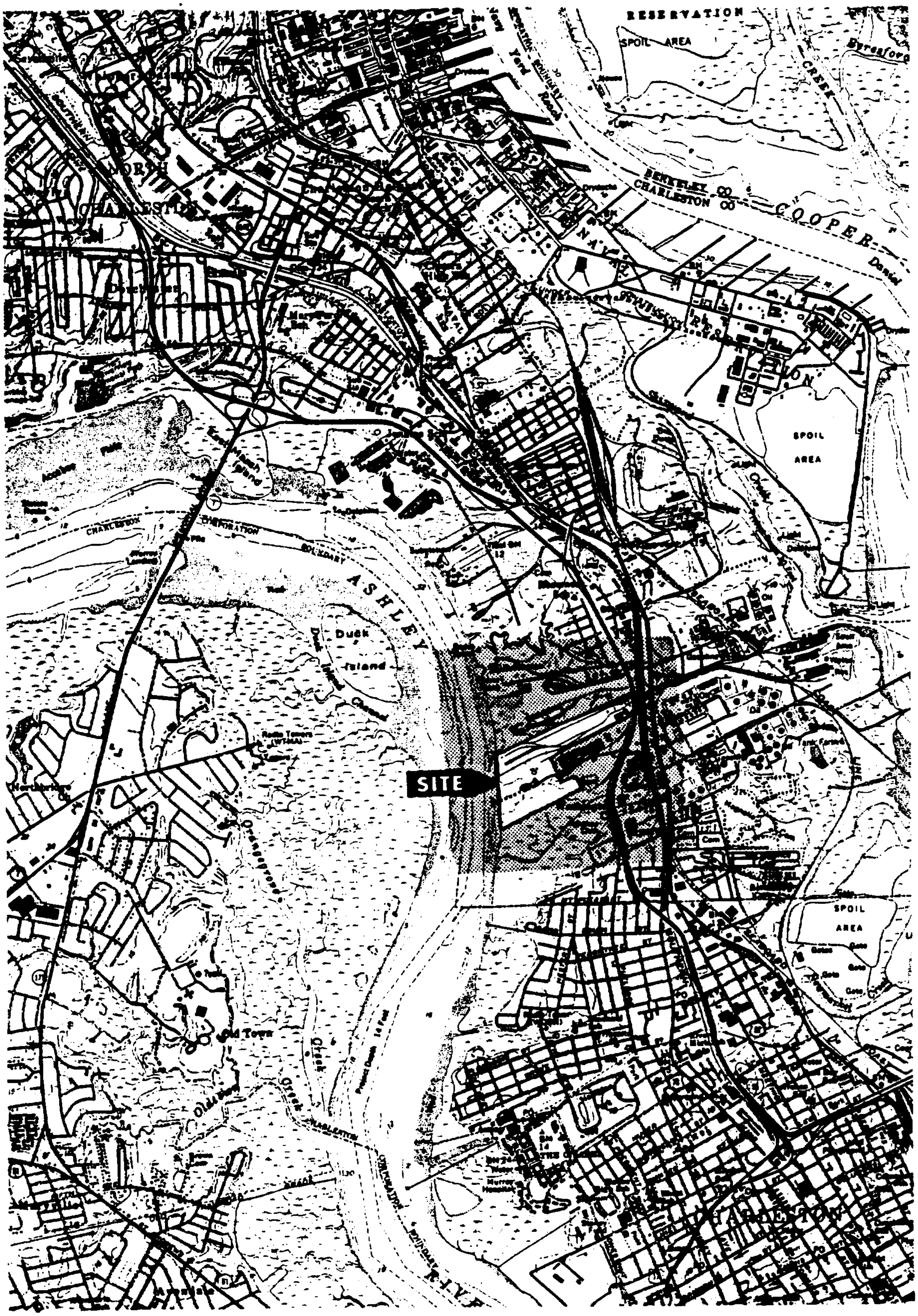

FIGURE 1
SITE AREA MAP
Koppers Co., Inc. (Charleston Plant) Site

Source: Beazer East, Inc., Pittsburgh, PA

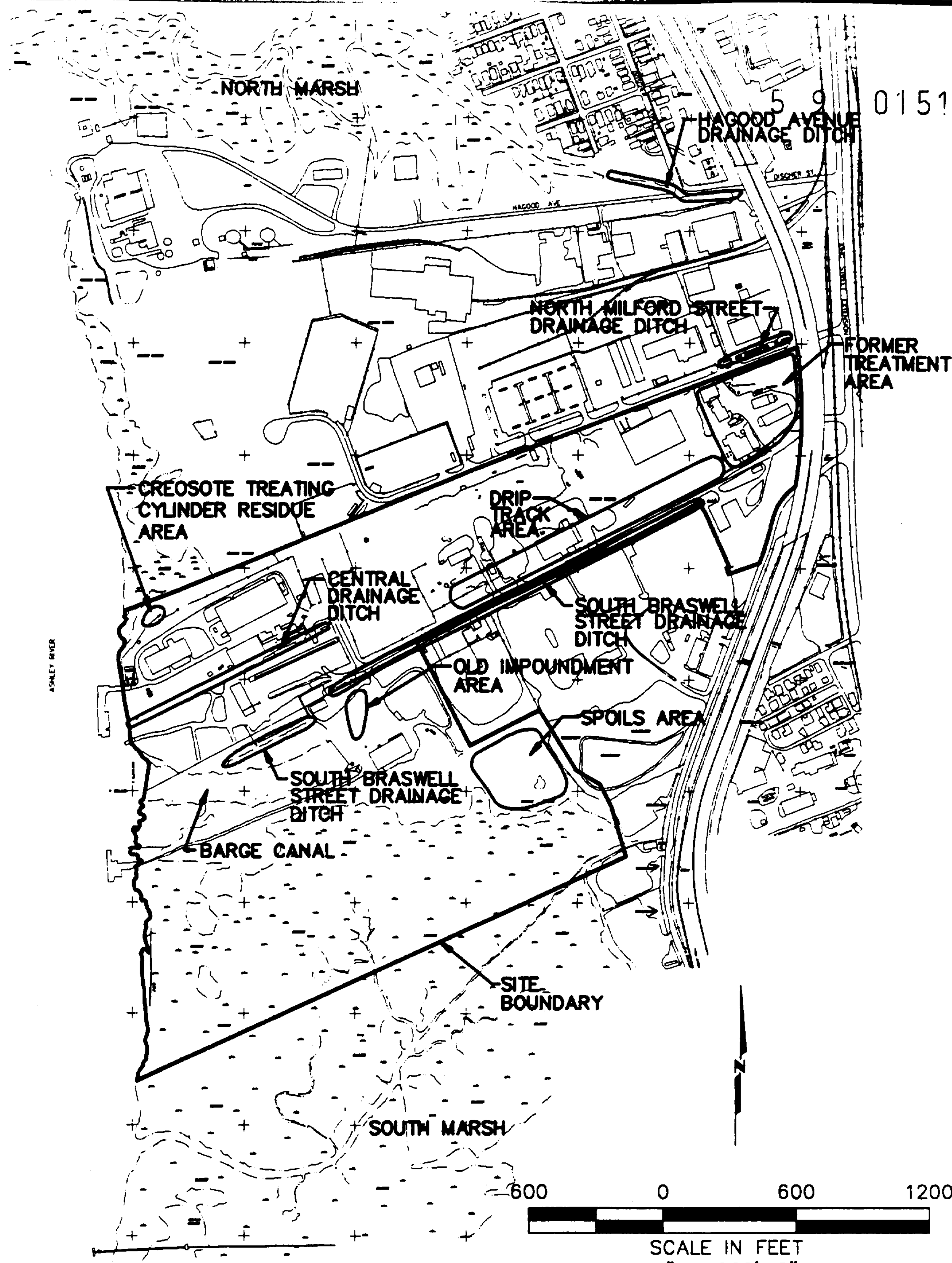

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FIGURE 2
SITE BASE MAP
KOPPERS CO., INC.
(CHARLESTON PLANT) SITE

SOURCE: BEAZER EAST, INC., PITTSBURGH, PA., 1995

08456BA

084569A

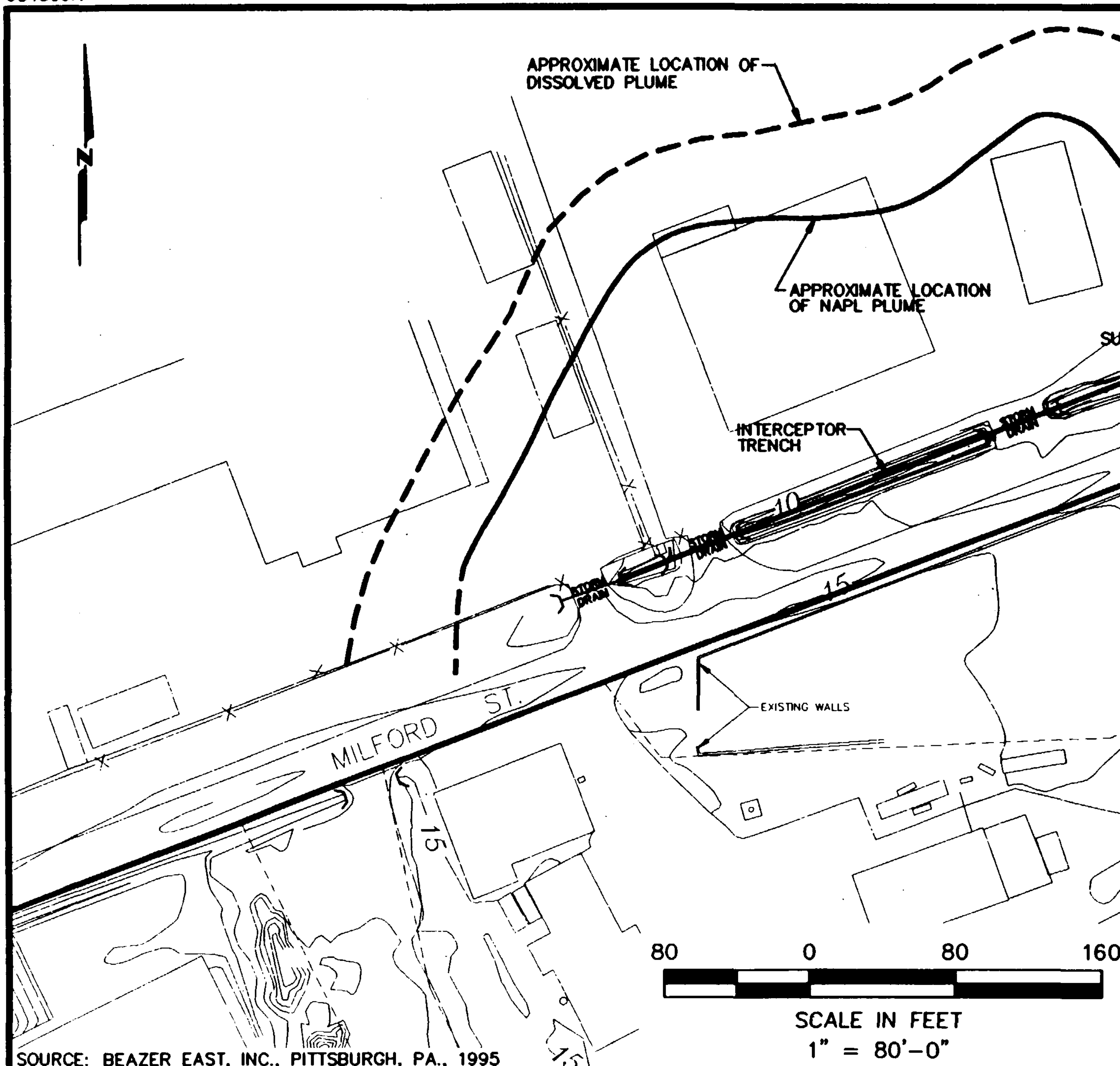
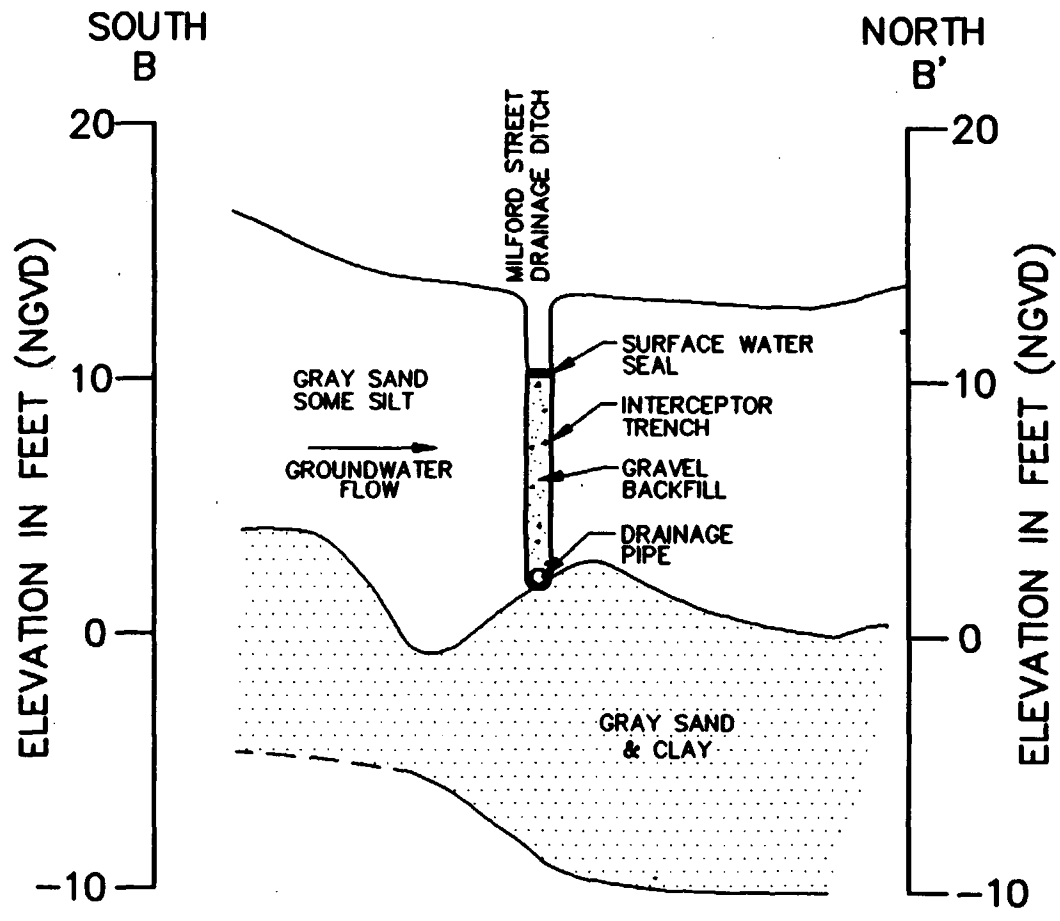
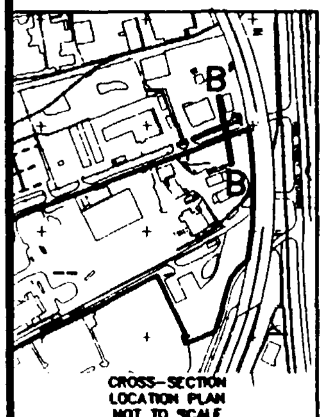


FIGURE 3
INTERIM REMEDIAL ACTION BASEMAP
KOPPERS CO., INC.
(CHARLESTON PLANT) SITE

084570A





SOURCE: BEAZER EAST, INC., PITTSBURGH, PA., 1995

NOT TO SCALE

FIGURE 4
NORTH-SOUTH CROSS SECTION
KOPPERS CO., INC.
(CHARLESTON PLANT) SITE

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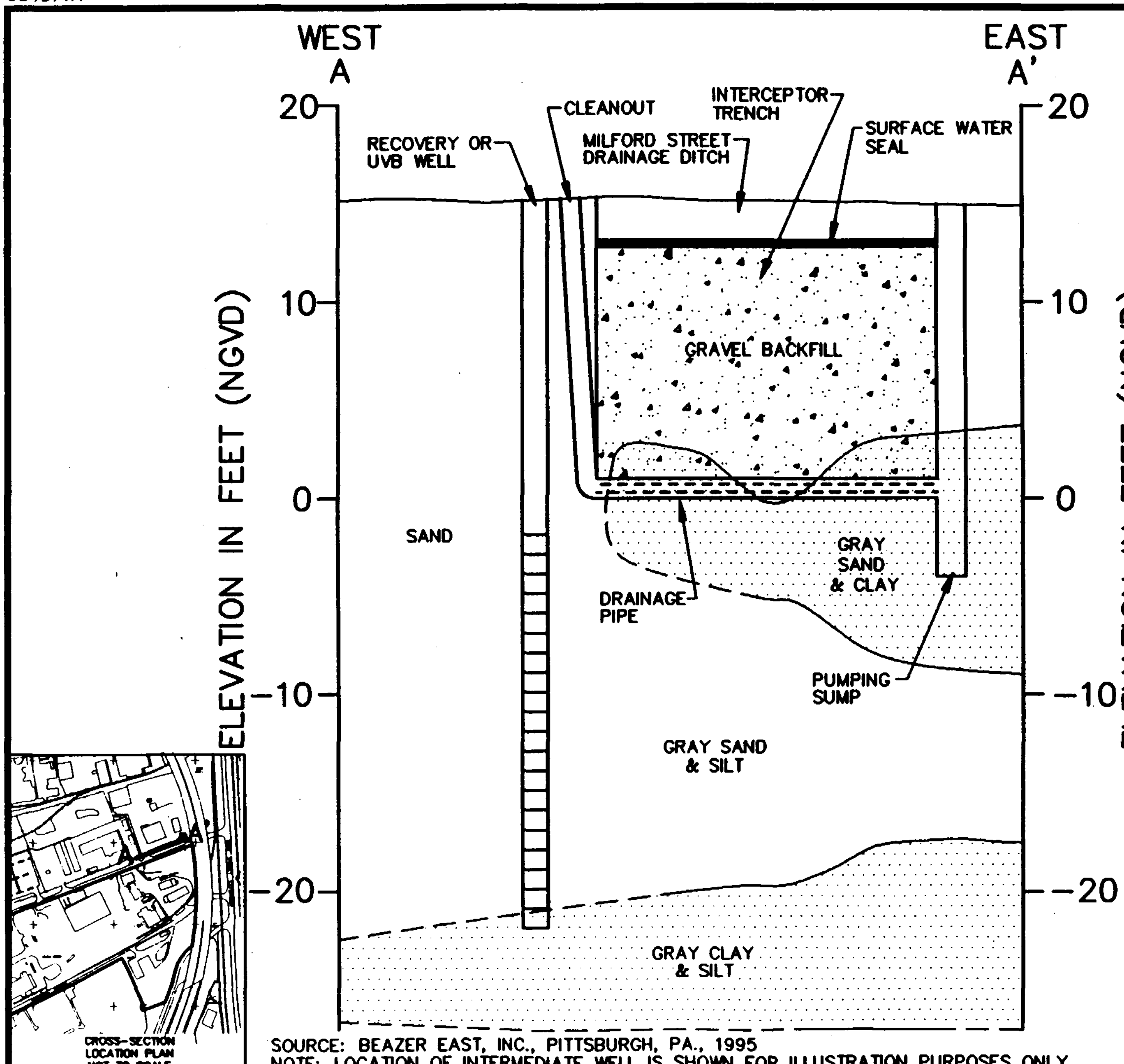

SOURCE: BEAZER EAST, INC., PITTSBURGH, PA., 1995
NOTE: LOCATION OF INTERMEDIATE WELL IS SHOWN FOR ILLUSTRATION PURPOSES ONLY.

NOT TO SCALE

FIGURE 5
EAST-WEST CROSS SECTION
FORMER KOPPERS CO., INC.
(CHARLESTON PLANT) SITE

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KOPPERS SUPERFUND SITE MAILING LIST COUPON

If you have had a change of address and would like to continue to receive site related information or would like for EPA to add your name and address to the mailing list for the Koppers Superfund Site, please complete this self-addressed form. If you have any questions regarding this mailing list, please call Cynthia Peurifoy at 1-800-435- 9233.

NAME: ____________________

ADDRESS: ____________________

____

TELEPHONE: (   ) - ____________________

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Interim Remedial Action for the Koppers Co., Inc. (Charleston Plant) Superfund Site is important in helping EPA select an interim remedy for the site. You may use the space below to write your comments, then fold and mail. A response to your comment will be included in the Responsiveness Summary.

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KOPPERS CO., INC. (CHARLESTON PLANT) SUPERFUND SITE

PROPOSED INTERIM REMEDIAL ACTION PUBLIC COMMENT SHEET

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Fold on dashed lines, staple, stamp and mail

Name ____________________________

Address __________________________

City ____________ **State** ___ **Zip** _____

Place Stamp Here

Cynthia Peurifoy, Community Relations Coordinator
North Superfund Remedial Branch/Waste Division
U. S. EPA, Region 4
345 Courtland Street, NE
Atlanta, GA 30365