



# **Superfund Record of Decision:**

Cabot/Koppers, FL

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16. Abstract (Limit: 200 words) <p>The 99-acre Cabot/Koppers site is a pine tar and charcoal generation facility in Gainesville, Alachua County, Florida. The site is underlain by shallow and intermediate aquifers. Land in the site vicinity is used for commercial and residential purposes. The site is comprised of 2 distinct areas, the inactive Cabot Carbon property to the southeast, and the industrial zoned and currently operating Koppers area to the west. North Main Street borders the entire site to the west as does a drainage ditch, which drains into nearby Springstead and Hogtown creeks. Pine tar and charcoal generation operations began at the Cabot Carbon facility in the early 1900s and generated a large number of blended solvents as by-products. Resultant wastewaters were treated onsite in a lagoon. The Koppers portion of the site has been operated since 1916 as a wood preserving operation, primarily for utility poles and timbers. The main processing facilities at the Koppers area include a tank farm, a former cooling water pond, cylinder drip tracks, a wastewater management system comprised of a north and south lagoon, a wood shavings pile, and drying kilns. Between 1980 and 1989, various site investigations by the State, EPA and private parties identified soil contamination in the three lagoons, the inactive cooling pond, the drip tracks, and a wood shavings pile.</p> <p>(See Attached Page)</p>				
17. Document Analysis a. Descriptors Record of Decision - Cabot/Koppers, FL First Remedial Action - Final Contaminated Media: soil, gw Key Contaminants: VOCs (benzene), other organics (oils, PAHs, phenols), metals (arsenic, chromium)				
b. Identifiers/Open-Ended Terms				
c. COSATI Field/Group				
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Abstract (Continued)

Ground water contamination also was identified in both the onsite shallow and intermediate aquifers. In addition, in 1986 the State identified organics and heavy metal contamination in offsite soil west of the site. This Record of Decision (ROD) addresses contaminated onsite soil and ground water. The primary contaminants of concern affecting the soil and ground water are VOCs including benzene; other organics including oils, phenols, and PAHs; and metals including arsenic and chromium.

The selected remedial action for this site includes excavating 6,400 cubic yards of onsite contaminated soil from the north and south Koppers lagoon areas, treating the soil using soil washing and bioremediation if necessary, followed by solidifying/stabilizing the residual material and disposing of these residuals onsite; treating soil from the cooling pond and drip track areas by in-situ bioremediation; lining the North Main Street ditch to prevent further discharge of leachate (if the ditch is to remain intact); pumping and treatment of ground water followed by offsite discharge to a publicly owned treatment works (POTW); operating and maintaining the North Main Street lift station as needed until the ground water remediation system renders it superfluous; monitoring ground water and surface water; and implementing institutional controls including land use restrictions. The estimated present worth cost for this remedial action is \$4,192,000, which includes an annual O&M cost of \$388,000.

PERFORMANCE STANDARDS OR GOALS: Chemical-specific soil cleanup goals were developed based on ground water protection and include carcinogenic PAHs 0.59 mg/kg, phenol 4.28 mg/kg, arsenic 27 mg/kg, and chromium 92.7 mg/kg. Chemical-specific ground water cleanup goals include carcinogenic PAHs 0.003 ug/l (health-based), phenol 2,630 ug/l, arsenic 50 ug/l, chromium 50 ug/l (MCL), and benzene 1 ug/l (State). Total noncarcinogenic risk will result in a HI < 1.0.

## RECORD OF DECISION

### DECLARATION

#### SITE NAME AND LOCATION

Cabot Carbon/Koppers Site  
Gainesville, Alachua County, Florida.

#### STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Cabot Carbon/Koppers Site, in Gainesville, Florida, developed with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. This decision is based on the Administrative Record for this site.

The State of Florida concurs with the selected remedy.

#### 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 ROD, may present an imminent and substantial endangerment to public health, welfare and the environment.

#### DESCRIPTION OF THE REMEDY

The remedial action is proposed as both the first, and the final remedial action for the site. The function of this remedy is to treat, where feasible, contamination down to health based levels and to prevent exposure to those contaminants in areas where treatment is infeasible.

The major components of the selected remedy are as follows:

- o Excavation of contaminated soils from the former North and South Lagoons on the Koppers facility;
- o Soils washing of the soils from the former North and South Lagoons, bioremediation and, if appropriate, solidification/stabilization of residual materials, and deposition of treated soils back onsite;
- o In situ bioremediation and institutional controls for process areas on Koppers facility, including the former Cooling Pond and Drip Track Areas;
- o Institutional Controls for the former Cabot Carbon facility;

- o Extraction of contaminated groundwater from shallow aquifer, pretreatment if necessary, and discharge into Gainesville Treatment Utility (GRU) system. A plan for satisfying NPDES requirements will be developed in the Remedial Design, as a contingency against GRU not allowing this discharge;
- o Provision for lining of North Main Street Ditch to prevent further discharge of leachate into the Ditch and Springstead and Hogtown Creeks; to be implemented if Ditch is, in the long term, to remain intact;
- o Continued Operation and Maintenance of the North Main Street lift station until implementation of groundwater remediation system renders it superfluous; —
- o Confirmatory sampling of the intermediate aquifer, Springstead Creek, old Cabot lagoons area, and Wetlands/lagoon area.

#### STATUTORY DETERMINATIONS

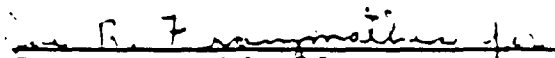
The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective.

This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. Four source areas are undergoing treatment technologies that will reduce the volume, toxicity and mobility of contaminants. For these source areas, this remedy satisfies the statutory preference for treatment as a principal element of the remedy. However, existing structures located on several of the source areas prevent effective treatment technologies from being implemented. For these source areas, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. For the groundwater remedy, this remedy does satisfy the statutory preference for treatment as a principal element of the remedy.

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

SEP 27 1990

Date

  
Greer C. Tidwell  
Regional Administrator

**RECORD OF DECISION**  
**SUMMARY OF REMEDIAL**  
**ALTERNATIVE SELECTION**

**CABOT CARBON/KOPPERS SITE**  
**GAINESVILLE, ALACHUA**  
**COUNTY, FLORIDA**

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

## TABLE OF CONTENTS

1.0	Introduction.....	1-1
2.0	Site Name, Location and Description.....	1-1
2.1	Area Land Use.....	1-1
2.2	Regional Geology.....	1-2
2.2.1	Regional Geologic Setting.....	1-2
2.2.2	Site Specific Geology.....	1-3
2.2.3	Soil Types.....	1-3
2.2.4	Surface Water.....	1-4
2.2.5	Climate.....	1-4
2.2.6	Local Habitat.....	1-4
2.2.7	Protected Species.....	1-5
3.0	Site History and Enforcement Activities.....	1-6
3.1	Cabot Carbon Operations.....	1-6
3.2	Koppers Operations.....	1-8
4.0	Community Relations.....	1-10
4.1	Community Profile.....	1-10
4.2	History of Community Concern.....	1-11
4.3	Key Issues and Community Concerns.....	1-15
4.3.1	Proposed Widening of North Main Street.....	1-15
4.3.2	Ground, Drinking and Surface Water.....	1-15
4.3.3	North Main Street Ditch.....	1-16
4.3.4	Schedules.....	1-16
4.3.5	Proposed Developed.....	1-16
4.3.6	Health Effects.....	1-16
4.3.7	Airborne Toxins.....	1-17
4.3.8	EPA Communications.....	1-17
5.0	Summary of Site Characteristics.....	1-17
5.1	Investigative History.....	1-17
5.1.1	Explanation.....	1-17
5.1.2	EPA 1980.....	1-17
5.1.3	EPA 1983.....	1-19
5.1.4	University of Florida.....	1-22
5.1.5	Koppers 1984.....	1-22
5.1.6	Koppers 1986.....	1-23
5.1.7	FDER 1986.....	1-26
5.1.8	IT - RI - 1987.....	1-26
5.2	Supplemental RI - 1989.....	1-31
5.2.1	Explanation.....	1-31
5.2.2	Indicator Chemical Selection.....	1-31
5.3	Groundwater.....	1-32
5.3.1	Aquifer Characterizatuions.....	1-32
5.3.2	Groundwater Quality Assessment.....	1-33
5.3.3	Soil/Source Characterization.....	1-35

5.4	Surface Water and Sediment Assessment.....	1-36
5.4.1	Surface Water.....	1-36
5.4.2	Sediment Investigation.....	1-36
5.4.3	Air Investigation.....	1-36
6.0	Risk Assessment	
6.1	Introduction.....	1-36
6.2	Indicator Chemical Selection.....	1-37
6.3	Exposure Assessment.....	1-37
6.3.1	Definition.....	1-37
6.3.2	Onsite Exposure Pathways To Workers.....	1-38
6.3.2.1	Direct Contact.....	1-38
6.3.2.2	Incidental Ingestion.....	1-38
6.3.2.3	Inhalation.....	1-38
6.3.3	Potential Onsite Exposure to the General Public.....	1-39
6.3.3.1	Direct Contact.....	1-39
6.3.3.2	Inhalation.....	1-39
6.3.4	Potential Offsite Exposures to the General Public.....	1-40
6.3.4.1	Direct Contact.....	1-40
6.3.4.2	Direct Ingestion of Aquatic Organisms...	1-40
6.3.4.3	Inhalation.....	1-41
6.3.4.4	Groundwater.....	1
6.3.5	Environmental Receptors Exposure Pathways..	1-
6.3.5.1	Terrestrial Exposure.....	1-41
6.3.5.2	Aquatic Exposure.....	1-42
6.3.6	Summary.....	1-42
6.4	Toxicity Assessment.....	1-42
6.4.1	Reference Doses.....	1-42
6.4.2	Chronic Hazard Index (HI).....	1-42
6.4.3	Weight-of-Evidence Categories.....	1-42
6.4.4	Carcinogenic Potency Factor.....	1-42
6.5	Risk Characterization.....	1-43
6.5.1	Introduction.....	1-44
6.5.2	Risk Results.....	1-44
6.5.3	Environmental Risks.....	1-45
6.6	Feasibility Study Risk Results.....	1-46
6.6.1	Explanation.....	1-46
6.6.2	Risk Analysis For FDOT Workers During Soil Excavation.....	1-46
6.6.3	Risk Analysis for Offsite Disposal of Soils From North Main Street Ditch.....	1-46



7.0	Cleanup Criteria.....	1-47
7.1	Explanation.....	1-47
7.2	Groundwater Cleanup Criteria.....	1-47
7.3	Soils Cleanup Criteria.....	1-48
7.4	Surface Water Cleanup Criteria.....	1-49
8.0	Summary of Alternatives.....	1-49
8.1	Areas to be Remediated.....	1-49
8.2	Summary of Remedial Alternatives.....	1-50
8.2.1	No-Action.....	1-50
8.2.2	Limited Action - Water Use Restrictions.....	1-50
8.2.3	Groundwater Extraction and Treatment.....	1-50
8.2.4	Groundwater Containment, Treatment and Disposal.....	1-51
8.2.5	Onsite Landfill.....	1-51
8.2.6	Asphalt Capping.....	1-52
8.2.7	Removal and Offsite Disposal.....	1-52
8.2.8	Excavation and Onsite Treatment.....	1-52
8.2.9	In Situ Solidification/Stabilization.....	1-52
8.2.10	Source Containment.....	1-52
8.2.11	Source Treatment and Containment.....	1-52
8.2.12	In Situ Biodegradation.....	1-53
8.2.13	Soils Washing.....	1-53
8.2.14	Incineration.....	1-53
8.3	Screening of Remedial Alternatives.....	1-53
8.3.1	Screening Criteria.....	1-53
8.3.1.1	Effectiveness.....	1-53
8.3.1.2	Implementability.....	1-53
8.3.1.3	Cost.....	1-54
8.3.2	Alternative Screened Out.....	1-54
9.0	Summary of Comparative Analysis of Alternatives.....	1-54
9.1	Glossary of Evaluation Criteria.....	1-55
9.2	Overall Protection of Human Health And the Environment.....	1-55
9.3	Compliance with ARARs.....	1-55
9.4	Long-Term Effectiveness.....	1-56
9.5	Reduction of Toxicity, Mobility, or Volume.....	1-56
9.6	Short-Term Effectiveness.....	1-56
9.7	Implementability.....	1-56
9.8	Cost.....	1-57
9.9	State Acceptance.....	1-57
9.10	Community Acceptance.....	1-57
10.0	Selected Remedy.....	1-57
11.0	Statutory Determinations.....	1-59
11.1	Introduction.....	1-59
11.2	Protection of Human Health and the Environment....	1-60
11.3	Attainment of ARARs.....	1-60
11.4	Cost Effectiveness.....	1-61
11.5	Utilization of Permanent Solutions and Alternative	

Treatment Technologies to the Maximum Extent Practicable.....	1
11.6 Preference for Treatment as a Principle Element....	1-

RECORD OF DECISION  
CABOT CARBON/KOPPERS SITE  
GAINESVILLE, FLORIDA

**1.0 INTRODUCTION**

The Cabot Carbon/Koppers Site (CC/K) was proposed for the National Priorities List (NPL) in October, 1981 and finalized in August 1983. A map of the site can be found on Figure 1.2-1. In 1983, EPA issued a Cooperative Agreement grant to the Florida Department of Environmental Regulation for the performance of a Remedial Investigation and Feasibility Study (RI/FS). During the implementation of the RI, the Florida Department of Transportation (FDOT) announced that they were going to widen North Main Street, which runs along the eastern border of the site, from two lanes to four lanes. This elicited a flurry of public opposition because the public was concerned that widening the road would cause exposure to contaminants that the road overlay. FDOT later decided to put the project on hold until EPA had selected a remedial action.

In 1987, the initial RI was completed. The EPA and FDER decided that additional data gathering activities were necessary before a comprehensive FS could be written. However, the Cooperative Agreement fund was depleted. The lead was then switched back to EPA, which then started negotiations with two major potentially responsible parties (PRPs) (Cabot Carbon Corporation and Beazer Inc. (formerly Koppers)) for the supplemental RI and the FS. The Consent Order between EPA and the PRPs for this work was signed in October 1988. The RI was approved in September 1989, the Risk Assessment (RA) was approved in February 1990 and the Feasibility Study in May 1990. The public comment period started August 8, 1990, and finished September 7, 1990. The public meeting to describe the preferred alternative was held August 14, 1990.

**2.0 SITE NAME, LOCATION AND DESCRIPTION**

**2.1 Area Land Use**

The site is located within the northern part of the city limits of Gainesville, Florida. The Koppers half of the site is zoned industrial; it is the only parcel of land zoned industrial, and is currently operating, in that area. The closest area zoned industrial is the Gainesville Industrial Area, which is several miles to the north. The former Cabot Carbon property, along with the marshy area to the north of the old Cabot facility and property east and south of the site are zoned commercial. The land to the immediate west of the site is zoned single family

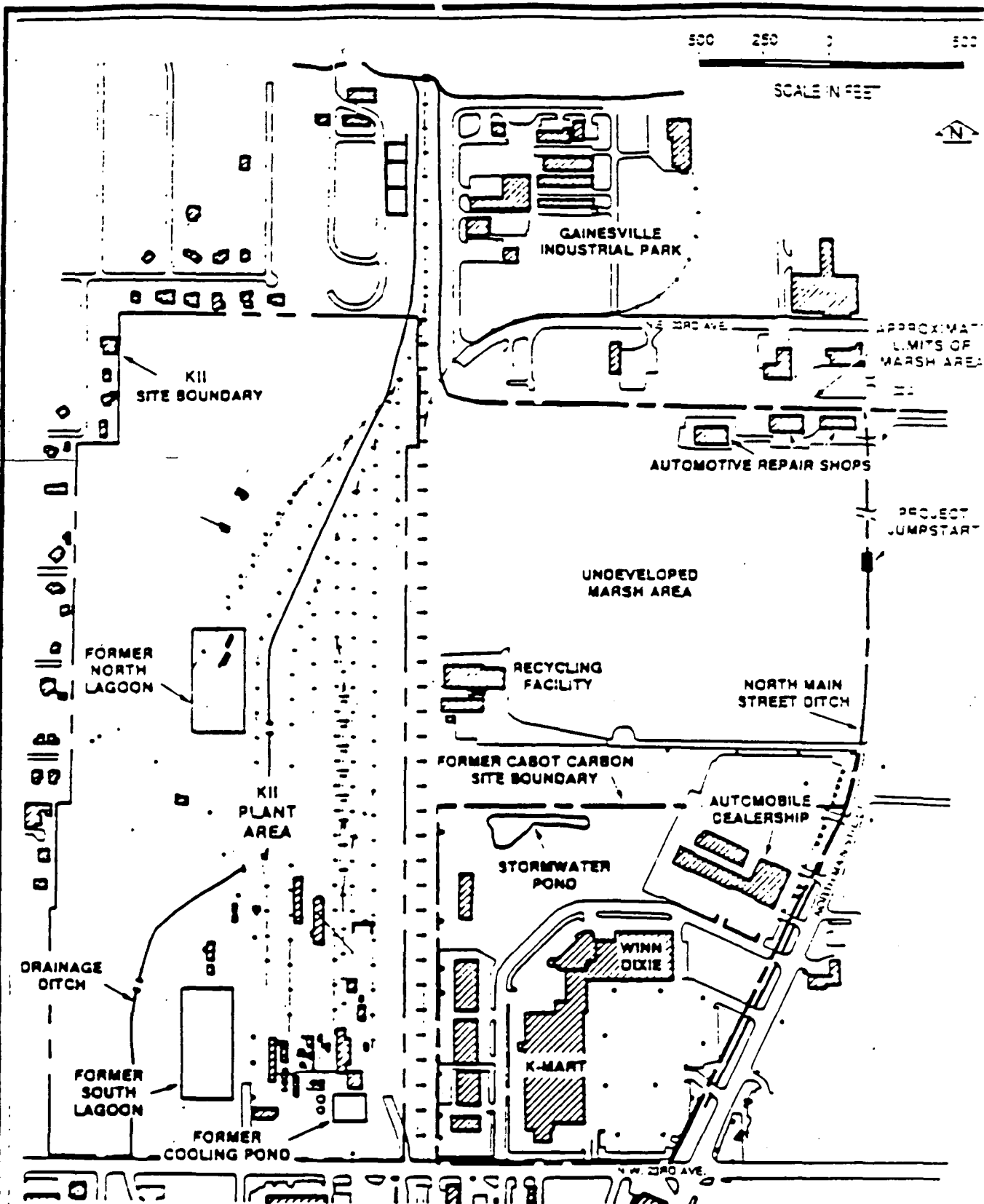


Figure 1.2-1  
SITE PLAN

SOURCE: HUNTER/VESE, 1988.

CABOT CARBON/KOPPERS

Remedial Investigation

and multiple family residence. To the north-northwest of the site are scattered small businesses and a trailer park. To the west and northwest of the site, the adjacent property is residential, consisting primarily of single family housing. Commercial facilities border the site to the south and east along NW 23rd Avenue and North Main Street. To the northeast, the adjacent land is primarily undeveloped and heavily vegetated.

The Gainesville Regional Utilities (GRU) northern well field and treatment facility is located approximately 2.5 miles northeast of the site area. The facility, which is the municipal supply for the city of Gainesville, draws water from the Floridan aquifer.

The site area is relatively flat, ranging in elevation from 165 to 185 feet above mean sea level (ft-msl). Low, swampy areas are prevalent in the northeastern quadrant of the site and to the east and northeast of the site in the undeveloped land segments. The primary surface water drainage in the area is Springstead Creek, which parallels the northern boundary of the site. Springstead Creek flows into Hogtown Creek. The North Main Street ditch, which flows into Springstead Creek, bounds the site along the eastern and northeastern perimeters. A secondary drainage ditch runs northeast through the KII property and discharges into Springstead Creek, a tributary of Hogtown Creek.

## 2.2 REGIONAL GEOLOGY

### 2.2.1 Regional Geologic Setting

Alachua County is underlain by several hundred feet of unconsolidated to semiconsolidated marine and nonmarine deposits of sand, clay, marl, gravel, limestone, dolomite, and dolomitic limestone. The oldest formation bearing fresh water in the area is the Lake City Limestone of Eocene Age. This unit is overlain by the younger Avon Park Limestone and Ocala Group (both of Eocene Age), the Miocene-Age Hawthorn Formation, and Plio-Pleistocene terrace deposits.

The principal geologic structure in central peninsular Florida is the Ocala Uplift, an anticlinal fold or arch whose crest traverses southwest of Alachua County. The Ocala Group, an extensive sequence of limestones and dolomites, is exposed at the ground surface approximately 5 miles southwest of the Cabot Carbon/Koppers site. From this area of limestone exposures, the ground surface rises to the northeast as the Ocala Group is overlain by the Hawthorn Formation and Plio-Pleistocene terrace deposits in the vicinity of the Cabot Carbon/Koppers site.

There are three aquifer systems in Alachua County: (1) the water-table aquifer, (2) the secondary artesian aquifer, and (3) the Floridan aquifer. The water-table aquifer is composed of Plio-Pleistocene sands and clayey sands. The secondary artesian aquifer is limited vertically and laterally in extent and consists primarily of a few limestone and sand units within the clays of the Hawthorn Formation. The Floridan aquifer is comprised of several hundred feet of limestone and underlies the entire county. This aquifer is the most productive because it transmits and stores water more easily. The aquifer is confined where it is overlain by the Hawthorn Formation; it is unconfined where the Ocala Limestone is near the surface. In the immediate vicinity of the site, it is projected that the depth to the top of the Floridan aquifer is approximately 200 to 250 ft.

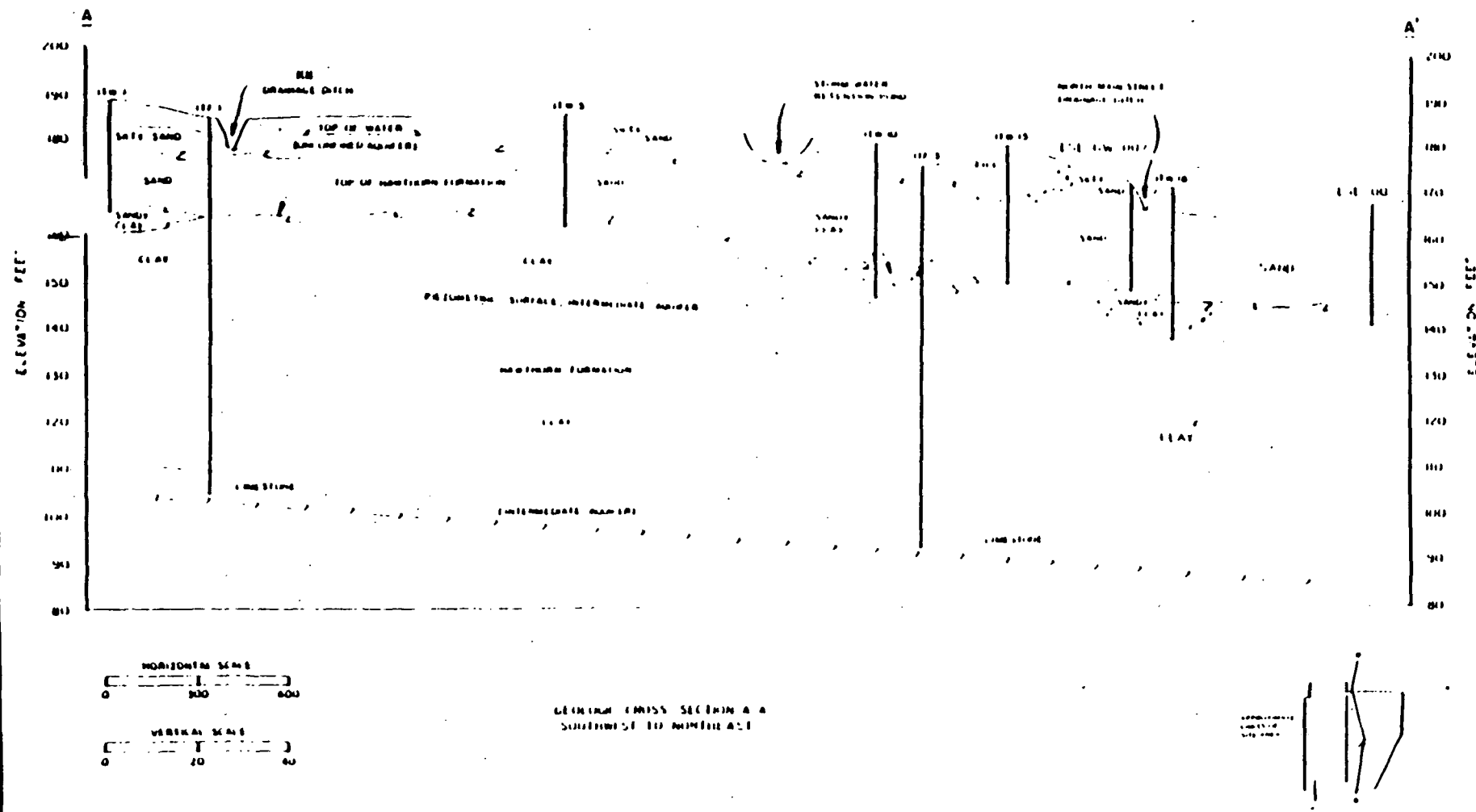
### 2.2.2 Site Specific Geology

Based upon the subsurface data available from the previous site investigations, two cross sections have been constructed to illustrate geologic conditions at the Cabot Carbon/Koppers site (see Figures 2.2-2 and 2.2-3). The surficial Pliocene and Pleistocene sediments that underlie the site consist of fine-to-medium sand, silt, and clay. This unit is approximately 25 to 30 ft in thickness and exhibits increased clay content with depth. Underlying these surficial deposits is the Hawthorn Formation, which consists of a dense, light green, marine clay in the upper 10 ft, becoming interbedded with sandy clay stringers and phosphatic limestone. The surface of this unit appears to be dipping toward the northeast. A limestone unit, as determined from gamma logging, was encountered at a depth of 60 to 65 ft grading from thin seams of interbedded clay, sand, and limestone into massively bedded fossiliferous limestone (IT, 1987).

### 2.2.3 Soil Types

The soils that make up the Cabot Carbon/Koppers site belong to the Millhopper-Urban Land Complex and the Wauchula-Urban Land Complex (Thomas et al., 1985). The term "complex" indicates that each mapping unit is an undifferentiated mix of the two soil types; in these cases, the individual soil series of the Urban Land.

The Millhopper Complex covers the majority of the Cabot Carbon property and the eastern two thirds of the KII property. This complex is characteristically drier than the Wauchula Complex with the water table expected to be below 60 inches for most of the year. Permeability is rapid in the surface and subsurface layers and slow in the subsoil layer.



**Figure 2.2-2  
GEOLOGIC PROFILE A-A'**

SOURCES: IT, 1987; HUNTER/USE, 1988

**CABOT CARBON/KOPPERS**  
**Remedial Investigation**





The Wauchula Complex covers up approximately one third of the area. This complex is wetter than the Millhopper Complex, where the water table usually is within 40 inches of the surface. Permeability is rapid in the sand surface and subsurface layers and slow to moderately slow in the loamy subsoil.

#### 2.2.4 Surface Water

The Cabot Carbon/Koppers site lies within the Hogtown Creek drainage basin, which covers an area of 15.6 square miles ( $\text{mi}^2$ ). The contact between the upland plateau and the transitional physiographic regions occurs at the scarp carved by erosion associated with Hogtown Creek drainage. Hogtown Creek drains southward across the transition zone into the western plains region, where it ultimately discharges directly to the Floridan aquifer by way of Haile Sink, approximately 10 miles downstream of the site area.

The Cabot Carbon/Koppers site has two drainage ditches which discharge to the Hogtown Creek system. The North Main Street ditch extends to the north along the eastern boundary of the site and discharges into Springstead Creek, which parallels the site's northern boundary. The second site drainage ditch transverses the KII property and also discharges into Springstead Creek at the northern property boundary. Springstead Creek discharges into Hogtown Creek north of the site.

#### 2.2.5 Climate

The climate in north-central Florida is humid and subtropical. Summer temperatures are fairly uniform; afternoon temperatures generally reach  $90^{\circ}\text{F}$ . Winter temperatures vary from day to day and frost and freezing temperatures normally occur several times a year. Mean annual precipitation is approximately 53 inches; with over half of that coming in the months of June through September. During this time of year, precipitation usually occurs during thunderstorms that can drop 2 to 3 inches of rain in several hours.

#### 2.2.6 Local Habitat

Locally, the most significant feature influencing species composition on the Cabot Carbon/Koppers site is past and present land use management. As described previously, the site consists of approximately 99 acres of industrial and commercial activities, which limit or exclude the occurrence of natural resources. Retail commercial establishments occur on the former Cabot Carbon property within the southeastern portion of the site; consisting of support buildings, roadways, parking lots,

and isolated landscaped areas. The KII facility dominates the western portion of the site supporting industrial-related buildings and structures, railroad siding, and nonvegetated open areas.

Within these two developed portions of the site, features exhibiting more natural conditions, although altered, include forested land (13 acres), an old field/rural community (7 acres), and wetlands (2 acres). These communities are found on Millhopper and Wachula soils and introduced fill material. Under natural conditions, Millhopper and Wachula soils exhibit moderate to poor drainage. Drainage of surface water has been enhanced by man made ditches, which convey surface and shallow groundwater to the north to Springstead Creek. Drainage patterns influence plant community composition and have resulted in the limited occurrence of onsite wetlands.

Within the northeast undeveloped portion of the site, a forested area covering approximately 30 acres represents second growth conditions and supports both wetland and upland species. A review of historic aerial photos indicates that much of this area had been marsh and swampland, but effective drainage has allowed upland species to colonize.

#### 2.2.7 Protected Species

No federally protected species were observed on or in the vicinity of the Cabot Carbon/Koppers site during site investigations. Based on a review of habitat requirements, known ranges of protected species, and an assessment of onsite resources, no federally protected species are expected to use site resources to a significant degree.

State of Florida-listed species potentially occurring on or in the vicinity of this site include little blue heron (Egretta caerulea), snowy egret (E. thula), tricolored heron (E. tricolor), which are species of special concern, and Southeastern American Kestrel (Falcon sparverious paulus); designated as threatened.

Wetland habitats onsite may provide resources available to wading birds, but because of the limited size of wetlands, utilization by wading birds is expected to be minimal. No nesting activity or sign of past use by wading birds was observed or is expected.

In Florida, the preferred habitat of the Southeastern American Kestrel includes pine forests and clearings where dead trees are present, providing sites for roosting, nesting, and hunting.

Additional habitats used include open areas of river bottoms, coastal regions, suburban areas, and cities. An American kestrel (Falcon sparverius) was observed during assessment of site resources.

Kestrels feed primarily on large insects, although small rodents, reptiles, and birds are also important prey. Because of its position in the food chain, potential exists for the accumulation and concentration of chemicals. Kestrels are territorial and occur in naturally low densities. For this reason, the Cabot Carbon/Koppers site does not represent a resource for a significant number of kestrels. As such, conditions found onsite should not represent a significant factor to the status of the Southeastern American Kestrel.

### 3.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

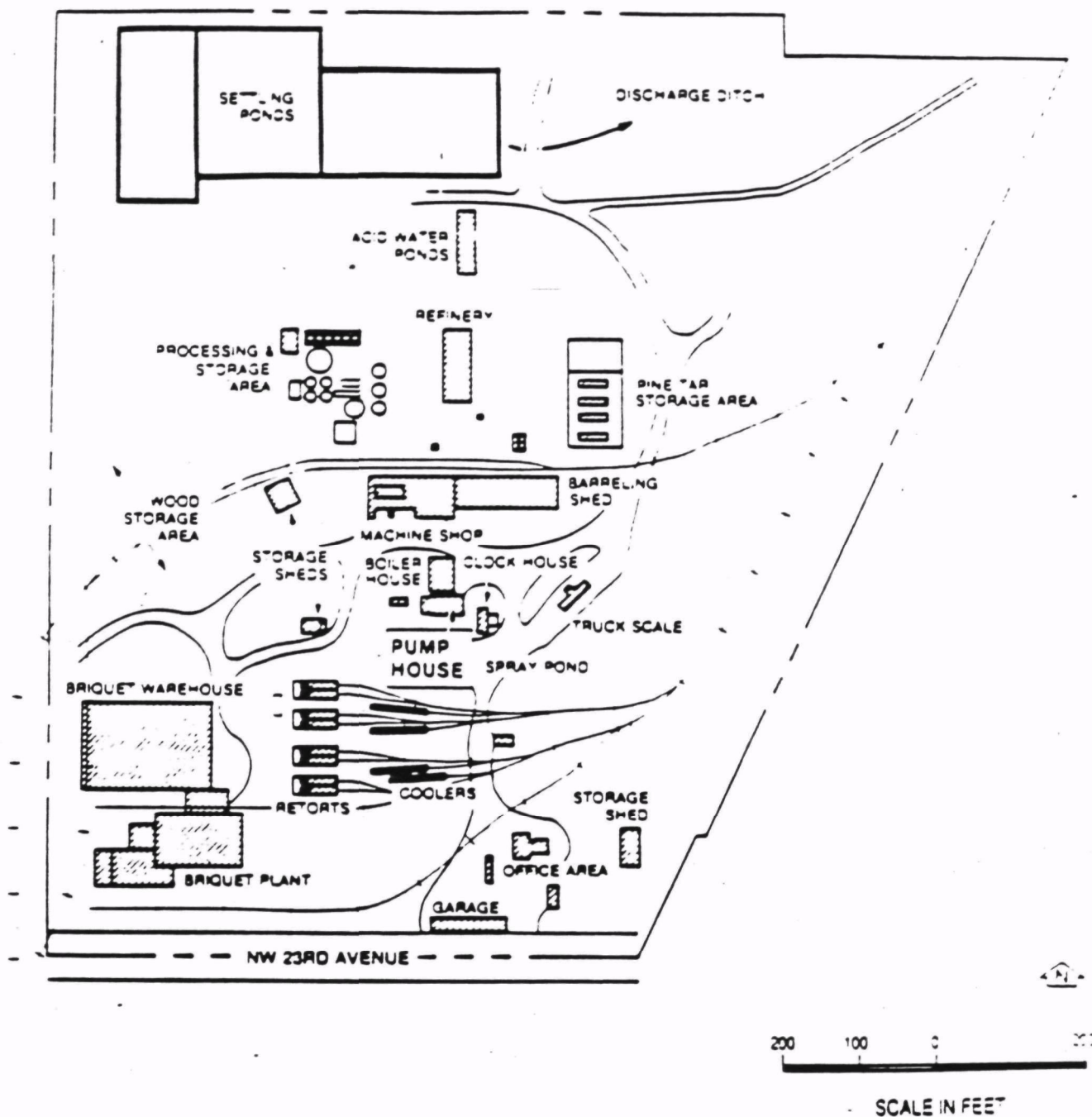
#### 3.1 Cabot Carbon Operations

The facility that existed on the former Cabot Carbon property has been in operation since the early 1900s. The various names it operated under, as shown on the Sanborn maps kept at UF, were: the Williamson Chemical Company; the Florida Industrial Corporation; and the Retort Chemical Co. The Cabot Carbon Company bought the operation in the mid 1940s and continued to operate the pine tar and charcoal generation facility in the southeast quadrant area. The processing, which consisted of the destructive distillation of pine stumps, resulted in the generation of a large number of liquid products that in the past had been marketed collectively as blended solvents. It was estimated that the distillation of one ton of softwood produced:

- Pine Oil [35 to 40 gallons (gal)],
- Turpentine (4 to 6 gal),
- Pine tar (20 to 30 gal),
- Charcoal [350 to 400 pounds (lb), and
- Pyroligneous acid.

The Cabot Carbon process generated an estimated 6,000 gal of crude wood oil and pitch per day. This destructive process is no longer used by the forest products industry because the major products, turpentine and pine oil, can be obtained in better quality and at a lower cost from other processes such as extraction.

The general layout of the Cabot Carbon facilities is presented in Figure 1.2-3. As shown, the facilities included a series of retorts, briquette processing and storage facilities, a machine shop, a barreling shed, office and garage areas, and a series of storage bins and tanks. Railroad sidings serviced the retort



**Figure 1.2-3**  
**PLAN OF CABOT CARBON SITE DURING**  
**GAINESVILLE OPERATIONS**

SOURCE: HUNTER/ESI, 1989.

**CABOT CARBON/KOPPERS**

**Remedial Investigation**

areas and the briquette processing and storage facilities. The plant facilities also included a boiler house, locker room, pump house and showers. It was projected that the site was serviced by a series of three groundwater wells located in the vicinity of the pump house. The exact location, size, and depth of these wells are unknown. The site also contained three small settling ponds of earthen construction that were located within the property. The overflow from these ponds was generally directed to a drainage ditch that flowed in an easterly direction across the northern boundary of the site.

For the destructive distillation process, only resinous softwoods, especially longleaf and slash pine, were used due to the value of the products obtained from the resin content. Stumpwood from logged-off areas and pitchy portions of fallen trees were the preferred materials. For the Cabot Carbon operations, a series of retorts were used in the destructive

distillation process. The retorts were built in sections of two, with three condensers from each retort built along the outside wall. The heat source was oil. The carts or buggies, which held almost 5 cords of wood, were sealed in the retort, and steam was used to sweat out or purge any noncondensable explosive gas mixtures. The actual firing resulted in temperatures between 750 to 800 degrees Fahrenheit ( $^{\circ}\text{F}$ ), which were maintained for 15 hours for complete distillation. The residue was charcoal that had been reduced to 20 percent by weight and 30 percent by volume. The charcoal was cooled for approximately 24 hours in special air-tight sheet iron buildings and then stockpiled onsite.

The products from the retorts were usually light and heavy pine oils, pitch, and a composite of several light solvent oils. Further fractional distillation of the solvent oils yielded turpentine, dipentene, pine oil, and small amounts of other hydrocarbons. The crude oils and pitch mixtures were stored for refining, with one retort charge producing about 1,100 gal of crude wood oil. A summary of the primary constituents of pine oil and turpentine mixtures is presented in Table 1.2-1. The available literature indicates that pine oil, pine tar, and turpentine are not pure compounds but contain a mixture of chemical constituents. It should be noted that the list of constituents on Table 1.2-1 is not necessarily exclusive to the pine tar industry.

Minor products of the process, such as tar and tar oils, pyroligneous acid (acid water), and charcoal, were also obtained. The wood tars were of two types: soluble tars and settled tars. The soluble tars are those in the pyroligneous acid solutions, and they are separated as tars in the refining process. The settled tars are insoluble in, and heavier than, the aqueous pyroligneous acid and, thus, can be mechanically separated. The settled tars can be fractioned into: (1) light

Table 1.2-1. Constituents of Pine Oil and Turpentine Mixtures

Constituent	Specific Gravity
Alpha-terpineol	0.9337
Beta-terpineol	NA
Gamma-terpineol	0.9411
Isoborneol	NA
Borneol	1.011
Alpha-fenchol	0.935
Camphor	0.9353
Terpinen-1-ol	0.9171
Terpinen-4-ol	0.9259
Dihydroterpineol	NA
Methyl chavicol	NA
Anethole	0.9682
1,4-Cineole	0.8997
1,8-Cineole	0.9267
Champhene	0.8446
Dipentene	0.8402
Limonene	0.8402
Terpinolene	0.8623
Alpha-pinene	0.8582
Beta-pinene	0.8694
Rho-cymene	0.8573
Fenchyl alcohol	NA
Paramenthane	NA

Note: NA = not available.

Source: Hunter/ESE, 1989.

oils (specific gravities less than 1.0) with boiling points up to 200 degrees Celsius ( $^{\circ}\text{C}$ ), containing aldehydes, ketone, acids, and esters; (2) heavy oils (specific gravities greater than 1.0) with boiling points over  $200^{\circ}\text{C}$ , containing many phenolic components; and (3) pitch. The heavy oil fraction contains phenols, especially cresols, and is known as wood tar and wood creosote. Pyroligneous acid is the dilute aqueous solution obtained by cooling the vapors from the retort or oven. This acid contains acetic acid, methanol, acetone, and minor quantities of numerous other organic compounds. During the site operations, wastewater containing residual pyroligneous constituents and pine tar was discharged to a concrete-lined, acid water pond, where pine tar was allowed to settle for product recovery. This settling pond, which was located within the northern portion of the plant area (see Figure 1.2-3), was approximately 27 feet (ft) by 90-ft in plan dimension and consisted of a series of shallow concrete basins separated by partitions with connecting spillways. The spillways were constructed with baffles designed to confine the floating pine-oil fractions. The settled pine tars were periodically recovered as product and pumped to adjacent storage facilities. The pond overflowed intermittently to an onsite drainage ditch that discharged to a second ditch paralleling North Main Street (the North Main Street ditch) and ultimately discharged to Hogtown Creek. During later years of operation, the three previously referenced, unlined earthen impoundments were constructed to the north and downstream of the concrete-lined pond to increase set line capacity. The general location and configuration of these ponds is shown on Figure 1.2-3.

In 1967, the site area was sold to Raymond Tassinari, a local private investor, and in October of that year the impoundment walls were breached, and the contents discharged to a surface ditch and eventually to Hogtown Creek. Approximately 10 years later, the property was sold to Harry S. Hamilton, who proceeded in developing the property into the existing shopping center. Cleanup operations were performed in 1979 to remove some contaminated sediments from the ditch; however, there is no documented evidence of the extent of source remediation activities.

### 3.2 Koppers Operations

The facility on the Koppers site has been an active plant since 1916 and has been used primarily to preserve wood utility poles and timbers. The plant initially was operated by the American Lumber and Treating Company, which used a creosote impregnation process. Koppers purchased the plant operations in 1954 while leasing the property from the Seaboard Coastline Railroad. In 1984, Koppers purchased the property.

As of June 30, 1988, BNS Acquisitions, Inc., a Delaware Corporation and a wholly-owned subsidiary of Beazer PLC, indirectly acquired more than 90 percent of the outstanding common stock of Koppers. On November 14, 1988, BNS Acquisitions acquired indirectly the balance of common shares. On January 20, 1989, the name of Koppers was changed to Beazer Materials and Services, Inc. On December 28, 1988, Koppers (now BMS) sold the assets of its Tar and Treated Wood Sector, including its Gainesville, Florida facility, to a management buy out group known as Koppers Industries, Inc. As agreed between the parties, BMS has retained responsibility to satisfy the obligations under the Administrative Order on Consent Docket No. 89-06-C, dated October 26, 1988 in conjunction with the Cabot Carbon Company.

In later years, the Koppers facility operations were modified to include two additional processes, one using CCA salts and the other using PCP. Wolman salts were mixed at the site beginning in 1936. The current CCA plant was constructed in the late 1960s. It is reported that PCP was used at the site beginning in 1969. A brief discussion of the type of compounds associated with these wood preserving processes is presented next.

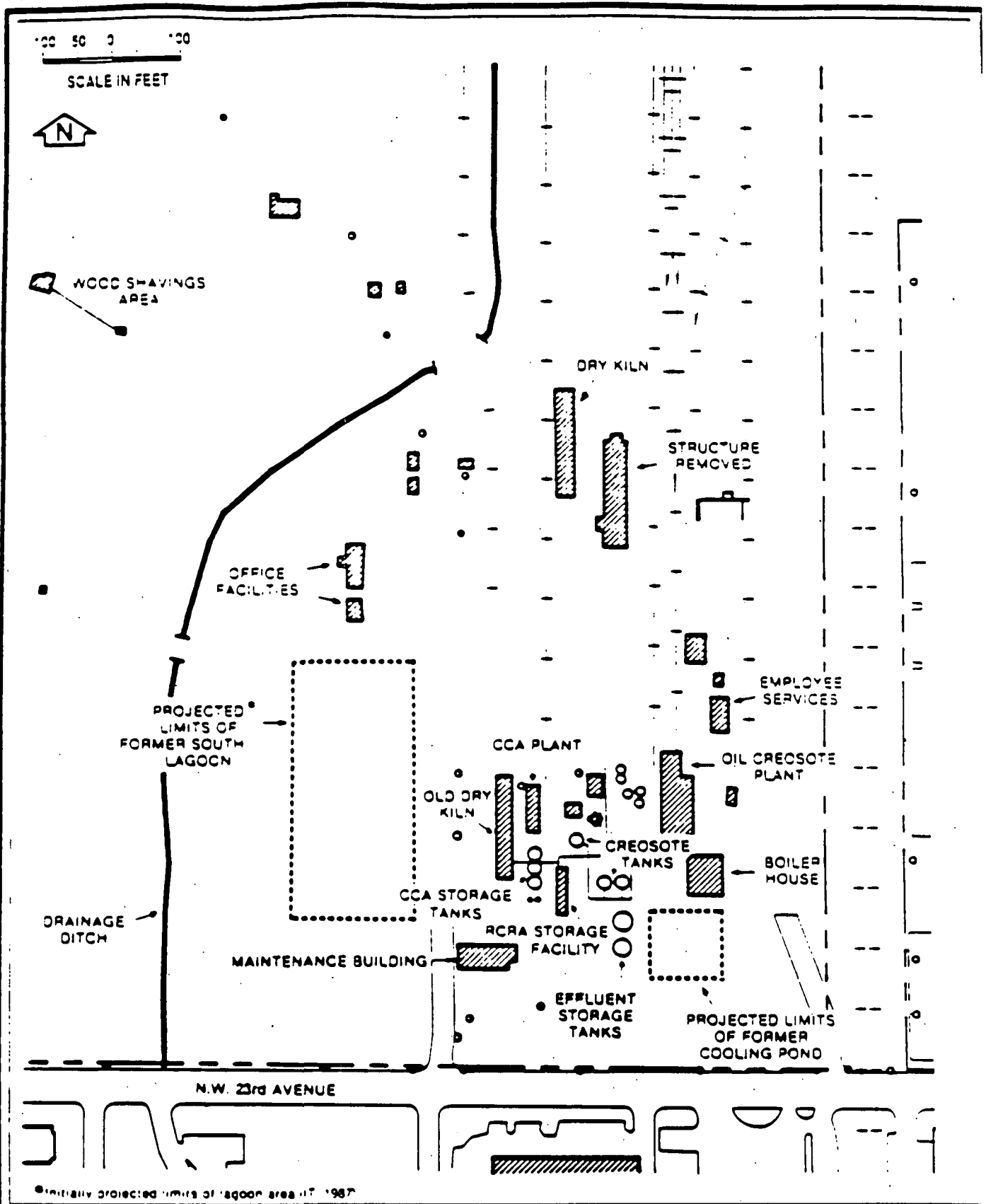
- Creosote is not a pure compound, but a mixture of compounds that are distilled from coal tar at 200 to 400°C. Some of the more common chemical compounds associated with creosote are listed in Table 1.2-2.
- PCP is prepared by the chlorination of phenol in the presence of a catalyst and containing a mixture of chemical constituents. Several of the compounds associated with the PCP wood-preserving process are listed in Table 1.2-3.
- The CCA wood-preserving process is normally prepared by mixing portions of arsenic acid, sodium dichromate, and copper sulfate.

It should be noted that the lists of constituents on Tables 1.2-2 and 1.2-3 are not necessarily exclusive to the wood-preserving industry.

At the present time, only the creosote and CCA treatment processes are in use at the site.

The main processing facilities are located within the southeast corner of the property. This area includes the tank farm, a former cooling water pond, the cylinder drip tracks, the treating cylinders' wastewater system, and the drying kilns. The general layout of the main plant area is presented in Figure





**Figure 1.2-4  
MAIN KII FACILITIES**

SOURCE: HUNTER/ESI, 1988.

**CABOT CARBON/KOPPERS**

**Remedial Investigation**

Table 1 2-2 Constituents of Creosote

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Major constituents reported present in whole creosote

Naphthalene  
2-Methylnaphthalene  
1-Methylnaphthalene  
Biphenyl  
Dimethylnaphthalenes  
Acenaphthene  
Dibenzofuran  
Fluorene  
9,10-Dihydroanthracene  
Methylfluorene  
Phenanthrene  
Anthracene  
Acridine  
Carbazol  
Methylphenanthrenes  
2-Phenylnaphthalene  
Methylantracenes  
Pyrene  
Benzofluorenes  
Chrysene  
9,10-Benzophenanthrene

Hazardous constituents present in small quantities less than 1 percent  
in creosote:

Benzo(a)pyrene  
Benz(a)anthracene  
Benzo(b)fluoranthene  
Dibenz(a,h)anthracene  
Ideno(1,2,3-cd)pyrene

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Source: IT, 1987.

Table 1.2-3. Composition of Commercial PCP Formerly Available  
(Prior to 1986)

Compound	Dowicide EC-7	Dowicide 7	Monsanto
Pentachlorophenol	90.4 $\pm$ 1.0%	85-90%	84-86%
Tetrachlorophenol	10.4 $\pm$ 0.2%	4-8%	3%
Trichlorophenol	<0.1%	<0.1%	
Higher chlorophenols		2-6%	
Caustic insolubles (max)		1	
2,3,7,8-Tetrachlorodibenzo- p-dioxins	<0.5 ppm	--	<0.1ppm
Pentachlorodibenzo-p-dioxins			<0.1ppm
Hexachlorodibenzo-p-dioxins	1.0 $\pm$ 0.1 ppm	9.27 ppm	8-10
Heptachlorodibenzo-p-dioxins ppm	6.5 $\pm$ 1.0 ppm	--	500
Octachlorodibenzo-p-dioxins	15.0 $\pm$ 3.0 ppm	575- 2,510 ppm	<180ppm
Tetrachlorodibenzofurans			-- ppm
Pentachlorodibenzofurans			40 ppm
Hexachlorodibenzofurans	3.4 $\pm$ 0.4 ppm	Detected	90 ppm
Heptachlorodibenzofurans	1.8 $\pm$ 0.3 ppm	Detected	400 ppm
Octachlorodibenzofurans	<1 ppm	Detected	260 ppm

Note: -- = not detected.  
ppm = parts per million.

Source: IT, 1987.

1.2-4. The central and northern portions of the site area have been cleared and graded and are used primarily as storage areas. This area contains a network of railroad sidings and dirt access roads. The main plant access is from the south off of NW 23rd Avenue. The unpaved main access road bisects the site area in a north-south direction. A drainage channel crosses the entire site from the southwest to the northeast corners and discharges into Springstead Creek.

In the past, two lagoon areas were used to manage wastewaters generated by the treating process. The south lagoon was located to the west of the plant access road immediately south of the current office building. The north lagoon was located approximately 1,500 ft to the north. The north lagoon was operated from 1956 until the 1970s. The operating period on the south lagoon is not known. Both lagoon areas have been closed and graded and are currently utilized for pole storage. The exact year of closure for either lagoon is not known. Detailed information pertaining to the method of closure (i.e., drainage, sludge removal, backfill, etc.) is not available.

#### 4.0 COMMUNITY RELATIONS

##### 4.1 Community Profile

The site is located in an urban neighborhood in the Northwest section of Gainesville, Florida, a growing inland city, seventy miles southwest of Jacksonville, Florida. Residential areas border the site to the west and northwest, with commercial properties to the south. There are several schools within a one-mile radius of the site, as well as three parks and one community center.

Gainesville's 1987 population was 85,469, and is projected to reach 92,400 by the year 2,000. Gainesville has a young population, due mostly to the presence of the University of Florida and the Santa Fe Community College, which have a combined full-time and part-time enrollment of approximately 43,000 students.

The University of Florida contributes significantly to community life in Gainesville. With 10,000 employees, it is by far the largest single employer in Gainesville and Alachua County, which has an unemployment rate of 3.3 percent. Approximately 37 percent of Alachua County's work force is employed by the government, 23 percent by the service industry, and 22 percent by the trade industry. The remainder work in manufacturing; construction; finance, insurance and real estate; and transportation, communications and utilities. The University contributes also to the health care available to area

residents. Shands Hospital, a private, non-profit teaching hospital associated with the University's J. Hills Miller Health Center, is one of four major hospitals in the city. City and county officials and citizens readily acknowledge the University's other contributions to the cultural and intellectual life of the community, through fine and performing arts and the athletics program. The variety of residents and officials who were interviewed for this report spoke proudly of the city's resources and accomplishments, and for the most part expressed a desire to continue its growth.

The City of Gainesville is governed by a five-member commission. The commissioners are elected for three-year staggered terms, and each year select one of their own to serve as Mayor-Commissioner. Alachua County also has a Board of Commissioners, whose five members are elected to four-year terms, with one member serving as the chairperson. These two commissions work together on various issues, most notably on the Metropolitan Transportation Planning Organization (MTPO), which schedules regular monthly meetings. The MTPO comprises the members of both the City and County Commissions, and is the primary local government entity holding jurisdiction over the N. Main Street widening proposal. Non-transportation planning and zoning actions for the city are accomplished by the Gainesville Planning Board, and for the county by the Alachua County Planning and Development Commission. The city and county governments demonstrate good organization, as evidenced by their ready information referrals.

Gainesville Regional Utilities (GRU), owned by the City of Gainesville, owns and operates the electric, water, and wastewater systems. Most of the electricity is provided by GRU's Kelly and Deerhaven Stations, with the remainder supplied by a nuclear power unit owned by the Florida Power Corporation. GRU's Murphree Treatment Plant provides the county's commercial and residential customers with water, utilizing a distribution capacity of 64 million gallons per day (mgd). The Murphree plant draws most of its water from eight deep wells, which tap into the Floridan aquifer. GRU plans to sink more wells into Murphree's well field within the next two years. Other water sources include three reservoirs, and officials and citizens report that there are a number of private wells in the site vicinity. Wastewater is treated at two major facilities. One of these, the Kanapaha Treatment Plant, has a current capacity of 10 mgd, which city officials expect to expand to 14 mgd in 1991.

Gainesville's citizens participate actively in community affairs, as evidenced by the number of attendees at city and county commission meetings, and has a wide variety of informational resources at its disposal. Several civic and environmental groups are active in the community. In addition,

a number of citizen advisory boards and committees, appointed by the city and county commissions, provide recommendations on policies and directions and solicit citizen input on important issues.

#### 4.2 History of Community Concern

The site has sparked the community's interest for many years. Although previous studies conducted by the University of Florida in 1961 and 1962 concluded that the operating wood treatment facilities were having a detrimental effect on Hogtown Creek, the community as a whole reportedly did not become active until a discharge incident in 1967. At that time, the new owner of the Cabot Carbon property broke the lagoon impoundment walls and allowed the contents to drain into Hogtown Creek; local citizens began to complain about the site. The City of Gainesville fined the owner \$100 for causing the pollution, and assessed another charge to cover the City's cost for performing part of the corrective action. The corrective action consisted of: removing material two feet west and one foot deep from west bank of North Main Street Ditch (starting at discharge pipe for overflow pond and going 55 feet north); and disposal of this soil in Southwest Landfill in Archer, Florida.

Reports indicate that problems and interest in the site remained dormant until 1977, when a new owner began developing the site into the shopping center that now exists there. During construction, the owner allowed lagoon wastes to drain into Hogtown Creek. The County, as well as FDER, received several complaints from citizens about the look and smell of the creek. In October 1977, FDER conducted a biological survey of the upper 2.8 miles of Hogtown Creek, showing the creek to be devoid of life (except for bacteria) from the point of drainage discharge to 1.1 miles downstream. The owner agreed to implement measures to prevent further contamination from the development.

Local and state agencies continued, however, to receive complaints about the site, and local newspaper published articles and editorials about it. This community attention continued during the next few years, as EPA and FDER conducted preliminary studies and investigations of the site in 1979 through 1981. Citizens, media, and environmental groups reportedly began calling and writing to both EPA and FDER during this time to find out about study results and express their concerns about the site.

Community interest increased dramatically in 1983 through 1985. During this time, the site was placed on the NPL, FDER and EPA entered into a Cooperative Agreement giving FDER management lead at the site, and the Florida Department of Transportation (DOT) proposed to widen N. Main Street between 23rd and 39th Avenues,

a section of the road that traverses the site. Some interviewees reported that the site had not concerned them until this time. Although part of the community's concern arose because the NPL listing heightened the public's awareness of the site, part of the concern also resulted from the road-widening proposal. A number of citizens and civic and environmental groups contacted FDER, EPA, and city and county officials with questions and concerns about the pollution coming from the site and the environmental impact of widening the road.

Gainesville citizens called for a public meeting that was held on June 28, 1984, to discuss the history of the site, the industrial processes used there, possible air problems at the site, Superfund and RCRA procedures and regulations, and FDER's proposed interim measure for the site (Project Jumpstart). The meeting was moderated by the Chairperson of the Board of County Commissioners, and panelists included personnel from the County and FDER.

Community attention to the site continued as plans were developed to widen N. Main Street. FDER and DOT had agreed in late 1985 that construction should wait until FDER completed its RI/FS, but citizens and civic and environmental groups perceived a change in that policy by FDER and DOT in 1986, and protested the project's resumption. Those protesting asserted that FDER's RI data were not conclusive enough to allow DOT to proceed with road construction and the possible movement of contaminated material.

A number of articles and editorials appeared in the Gainesville Sun and the Independent Florida Alligator in 1985, protesting the road construction and assailing FDER for what many citizens perceived to be a lack of caution based on incomplete test results.

Citizens called for another public meeting to be held on May 1, 1986, and several civic and environmental organizations wrote letters to EPA officials requesting their input and advice prior to the meeting. It was reported that in the May 1986 meeting, attendees were angry and upset about site proceedings. Many felt that their environmental concerns were being ignored, and they were afraid that widening the road would supercede cleaning up pollution at the site. Some apparently thought remediation will proceed without taking the road into consideration. Although DOT has de-obligated funds for the road-widening project, it is still a high priority of Gainesville's MTPO, according to local officials, and is a subject of great debate within the community.

The community has two opposing views regarding road construction through the site. Some citizens do not believe the site poses a great threat to the community or the environment, and feel that the road construction should proceed without further delay.

Some of these believe that no cleanup action should be taken, and cite the fact that Hogtown Creek seems to have cleansed itself five miles downstream of the site as proof that the contamination is not serious. Several also believe that even if the site warrants a permanent cleanup, it will take so many years that the traffic on N. Main Street will have become a bigger hazard than the site itself. The current two lanes become quite congested, and interviewees noted that a lack of traffic signals compounds the problem.

Other citizens and officials voiced the opposing view, maintaining that previous studies have not demonstrated the extent of contamination at the site. They stated that if people are unaware of any dangers there, it is because the studies conducted so far have neglected to test the site properly and thoroughly. They cite maps showing retorts, pine tar pits, and other process facilities in the vicinity of the existing shopping center and the North Main Street Ditch, as well as incidents such as a floor tile buckling problem at the Winn-Dixie on the site, as arguments for further testing in these specific areas, which they feel have not been addressed so far.

The Winn-Dixie incident is a frequent topic of discussion in the community, and members of the community disagree about whether the tile problem was site-related. A consultant hired by the store to study the problem concluded that site contamination under the foundation was causing the tiles to buckle. Reportedly, Winn-Dixie representatives and FDER disagreed with that conclusion, attributing the trouble to a faulty foundation and bad glue. Many citizens expressed dismay at that, and some believe that there was a deliberate attempt by FDER and Winn-Dixie to downplay the incident to avoid adverse publicity. They are concerned that contaminants at the site may affect other business there, and have given FDER and EPA specific recommendations about where they believe further testing is needed.

Some felt that road construction could probably begin after a thorough RI/FS is completed, but others said that the road project should be postponed until the site is completely cleaned up. Many of the citizens who want road construction to proceed, as well as a few who do not, expressed the belief that some citizens are using the Cabot Carbon/Koppers site merely as a means to prevent commercial growth in the area. At this time, questions of Superfund liability for the City, County, and businesses on or adjacent to the site have brought the road project to a standstill. The decision about whether or not to ask DOT to release funds for and begin the project rests with city and county officials.



Currently, many citizens and environmental groups were most concerned that the supplemental RI/FS address the concerns that they have brought to the attention of EPA and FDER officials. EPA and DOT agreed that road construction should wait until the RI/FS is completed. Meanwhile, those interviewed said that they will continue to press their concerns about the site, to ensure that contamination is thoroughly quantified.

As a part of its community relations process, EPA has held a number of informal meetings with concerned local citizens during the 1989/90 to discuss various issues and listen to their concerns. EPA plans to continue this pattern. Also, the formal public comment period for the RI/FS was held from August 6 to September 7, 1990; with the public meeting held on August 14, 1990. The results are discuss in detail in the Responsiveness Summary, an appendix to this ROD.

#### 4.3 Key Issues and Community Concerns

##### 4.3.1 Proposed Widening of North Main Street

Probably the most volatile issue is the proposed widening of North Main Street. There appear to be two major schools of thought concerning the proposed project. The first is composed of citizens and environmental groups who are concerned that there is an unknown major source of contamination where the suspected "lagoon" under North Main Street was located. They are worried that the construction activities associated with road widening would disturb this source and cause them to migrate in unexpected ways. The second is concerned that there has already been a long delay in the road project and that EPA's remedial process may cause additional delay and a continual worsening of the traffic congestion along North Main Street. They want EPA to make a decision on the appropriate remedial action so that FDOT can make a decision on its project.

##### 4.3.2 Ground, Drinking and Surface Water Quality

Citizens and local officials are concerned that the contaminated ground water in the surficial aquifer will reach the Floridan Aquifer, which is the main water supply for Gainesville and much of Florida. Some people believe there is a link between the two aquifers because of the numerous sinkholes in the area. Gainesville's Murphree well fields, which tap into the Floridan aquifer, are 2.3 miles northeast of the site. The city plans to add new wells during the next two years to expand its services, and there are no other well fields identified at this time. City officials noted that it is important for them, as well as for others who draw from the Floridan, to know the possibilities of contamination before they expand their current water system.

Citizens and officials also expressed concern about the possible contamination of private drinking wells in the area. There was concern that the supplemental RI/FS containing a survey of all private wells within a one-half mile radius of the site is not complete. Some interviewees asked that every private well in the near vicinity be tested, as well.

Many residents expressed concern about damage to Hogtown Creek. Early studies have noted detrimental effects to the creek up to five miles downstream of the site, and many residents living near the creek reportedly believe frustrated that damage is still evident.

#### 4.3.3 North Main Street Ditch

Many people are concerned about the leachate discharging into the North Main Street Ditch. They are concerned that it appears to be a public health threat and request that access to it be limited.

#### 4.3.4 Schedules

Most interested citizens wanted to know the schedule EPA has set for the site. Most stated that site officials have not met past schedules, and expressed the hope that EPA, as lead for the site, will be more accurate in estimating the remediation schedule, and adhere to announced dates.

#### 4.3.5 Proposed Development

Many business persons in the site vicinity are reportedly concerned about having their property values drop. Some are concerned that the value will drop specifically because their property is part of a Superfund site, but most are concerned that property value will drop as a result of delaying the road-widening project. City officials report only one formal request to develop a parcel of the land during the last two years, but could not say whether the low interest in developing the area was a direct result of the Superfund site, or whether it was indirectly related to the site because of the traffic problems on N. Main Street. Many interviewees, business and non-business, are allowed to conduct business in the area, but the road construction has been effectively halted.

#### 4.3.6 Health Effects

Several individuals expressed concerns about health problems that they believe could be related to site contamination. This concern was raised at the June 1984 public meeting, where the panel suggested that citizens, local doctors, and state and county health officials contact the Centers for Disease Control (CDC) in Atlanta to request a health study. A local official stated that the CDC had not been contacted.

#### 4.3.7 Airborne Toxins

A few citizens and local officials expressed concern about the possible release of toxins into the air during site cleanup activities. They want EPA to take proper precautions during cleanup so that nearby residents and others doing business in the area will not be affected by any airborne toxins.

#### 4.3.8 EPA Communication

Some key local officials and citizens were concerned that EPA officials have been slow to respond to their questions about the site. They expressed the desire to help EPA facilitate site remediation activities, but said that they need faster and more direct responses from EPA. They cited letters requesting meetings and/or advice related to site status, and reported that they had yet to receive any direct answers to their queries.

### 5.0 SUMMARY OF SITE CHARACTERISTICS

#### 5.1 Investigative History

##### 5.1.1 Explanation

There have been a number of investigations of this site conducted in the past ten years. The majority of this section of the ROD will focus on the findings of the 1989 Supplemental RI as the most complete and thorough investigation. The rest of the investigations are summarized in a brief fashion.

##### 5.1.2 EPA 1980

There were two investigations conducted by EPA in 1980. The results are summarized below:

The groundwater quality within the shallow aquifer at the site initially was evaluated during the EPA investigation conducted in 1980. This initial study consisted of the installation and sampling of 24 temporary shallow wells in and around the

periphery of the old Cabot Carbon Site. Five of the wells were located within the vicinity of the former wastewater lagoons. A maximum total phenol concentration of 50 micrograms per liter (ug/L) was detected in this area. The results of this study indicated that there were little shallow groundwater quality effects within the undeveloped areas to the east of the North Main Street ditch. Of the 19 monitoring wells in that area, only one indicated a total phenol level equal to, or greater than, the analytical detection limit.

The water quality of the Floridan aquifer downgradient of the site area was evaluated during the 1980 EPA investigation through the analysis of a composite sample from the City of Gainesville's north well field. The only organic compound identified during the analysis was acetone, which was discounted due to its use as a field cleaning agent.

Soil quality at the Cabot Carbon site was initially evaluated during the 1980 EPA investigation. This investigation consisted of the collection of two composite soil samples from two locations near the existing stormwater retention basin. The sample taken from CC-036 was a composite of soil collected from the perimeter of the basin, and the sample taken from CC-037 was a composite of soil taken from an area immediately to the north. Location CC-036 had 38 organic compounds identified; 2 were volatile organics, and 36 were extractable organics including naphthalene, phenanthrene, anthracene, and pyrene. A total of 26 organic compounds were identified in CC-037, nine of which were pesticides unassociated with the Cabot Carbon operations. The surface water quality of Hogtown Creek and the North Main Street ditch was evaluated during the EPA investigation. This investigation included the sampling for phenol analysis from six stations along Hogtown Creek and its tributaries.

The results of the investigation indicated that concentrations in the surface waters were less than the detection limit (5 ug/L) at control station CC-001 (North Main Street ditch upstream of Cabot Carbon operations) and at CC-003 (downstream tributary to the ditch). However, phenol concentrations in the ditch adjacent to and immediately downstream of the Cabot Carbon site were elevated, measuring up to 1,500 ug/L and 1,015 ug/L at CC-002 and CC-004, respectively. The results also indicated that phenol concentrations within the ditch decreased with increasing distance downstream of the Cabot Carbon site (i.e., at downstream station CC-006, the phenol concentrations had decreased to 70 ug/L).

Macroinvertebrate studies conducted during the other EPA investigation revealed a change in fauna between the sampling stations located downstream of the former Cabot Carbon site.

Stream recovery, regarding a diversified macroinvertebrate community, did not occur until approximately 5 miles downstream of the site, where Hogtown Creek flows through two wetland areas. Static toxicity tests were performed on the stream water from station CC-004. The test results indicated a lethal concentration for 50 percent of the exposed group (LC<sub>50</sub>) of 44 percent for the fathead minnow.

During November 1980, a second surface water investigation was performed for the North Main Street ditch. The investigation included obtaining surface water samples from four of the EPA stations established during the previous investigation (CC-001, CC-002, CC-003, and CC-004). The samples were analyzed for total phenols concentrations.

The results indicate that total phenols concentrations for the upgradient station, CC-001, and the station on the downstream tributary were below the detection limits of 20 ug/L. However, the station adjacent to the Cabot Carbon site, CC-002, and the downstream station, CC-004, showed elevated phenols concentrations of 4,100 ug/L and 3,450 ug/L. These concentrations were higher than those documented during the previous EPA investigation of December 1979. This difference is attributed to the significantly higher rainfall amounts recorded immediately prior to the 1979 sampling event.

The sediments in the Hogtown Creek/North Main Street drainage system were evaluated. This investigation included the analysis of three sediment samples obtained from the North Main Street ditch at locations both adjacent to and downstream of the former Cabot Carbon operations. Organic compounds were identified in all three samples, with the highest concentrations associated with the sampling station adjacent to the former plant site. The organic compounds encountered included C<sub>2</sub> alkyl phenanthrene, acenaphthene, fluorene, and anthracene.

#### 5.1.3 EPA 1983

During this second EPA investigation, shallow groundwater was obtained from three wells on the then-Koppers property, from three wells located around the former Cabot Carbon facilities, and from a background well located to the south of NW 23rd Avenue. The results of the analysis indicated that of the three wells sampled on the Koppers property, only one contained constituents associated with the creosote and/or PCP wood-preserving process (naphthalene at 3,500 ug/L). This well, M-1, was located immediately downgradient of the former north lagoon.

The results of the investigation also indicated that all three wells around the former Cabot Carbon property contained organic chemical constituents. Well A-1, which was located on the border between the then-Koppers site and the former Cabot Carbon plant site, contained constituents ranging in concentration from 1 ug/L (fluorene, a coal tar derivative) to 370 ug/L [bis-(2-ethylhexyl) phthalate, a plasticizer]. The constituents encountered in Well A-3, which was located at the corner of North Main Street and 28th Place, included 2,4-dimethylphenol (3,000 ug/L), toluene (1,500 ug/L), total xylene (600 ug/L), and copper (7,300 ug/L). In addition, two unidentified terpenes (associated with the destructive distillation process) were detected at an estimated combined concentration of 1,000 ug/L. Well A-4, which was located within the northern portion of the site adjacent to Hogtown Creek, contained organic compounds derived from coal tar. The compounds identified include naphthalene (estimated at 7 ug/L), acenaphthene (estimated at 5 ug/L), and fluorene (estimated at 5 ug/L).

A subsurface soil sample was obtained from a proposed well location in the vicinity of the former Cabot Carbon wastewater lagoons. Odors emanating from the hole were so strong that the well was not installed; however, a subsurface soil sample was obtained from a depth of 9 to 45 inches. The sample consisted of a black "tar" granular material that contained extremely high concentrations of the coal tar derivatives naphthalene and phenanthrene [both estimated at 100.0 milligrams per kilogram (mg/kg)]. In addition, PCP was detected at an estimated concentration of 300.0 mg/kg. Other compounds detected at extremely high concentrations were phenol (estimated at 800.0 mg/kg); 2,4-dimethylphenol (930.0 mg/kg); benzene (estimated at 11.0 mg/kg); toluene (estimated at 400.0 mg/kg); ethylbenzene (estimated at 100.0 mg/kg); total xylene (estimated at 270.0 mg/kg); and copper (2,800 mg/kg). Also, two isomers of an unidentified terpene (estimated at 600.0 mg/kg) were found.

This investigation also included surface water and macroinvertebrate sampling from two stations along the North Main Street ditch. One station, CC-001, was located adjacent to the Cabot Carbon facilities, and the second, CC-004, was located downstream just before the confluence with the KII drainage ditch.

The analytical results indicated that the sample from CC-001 contained various organic compounds including the insecticides alpha-benzene hexachloride (0.017 ug/L), beta-benzene hexachloride (0.026 ug/L), and delta-benzene hexachloride (0.045 ug/L), di-n-octylphthalate (11.0 ug/L) (both plasticizers), toluene (9.1 ug/L), and two unidentified compounds (estimated concentrations of 40 ug/L) were detected. The downstream sample from CC-004 also contained chemical compounds associated with

the destructive distillation process, including terpene at 70 ug/L, and from the creosote wood preserving process, including naphthalene at 30 ug/L and acenaphthalene at 4 ug/L. Other compounds detected included phenol (120 ug/L); 2,4-dimethylphenol (180 ug/L); benzene (3 ug/L); toluene (17 ug/L); xylene (7.8 ug/L); ethyl benzene (5 ug/L); and tetrachloroethane (3 ug/L).

The findings of the macroinvertebrate sampling were in general agreement with the 1979 EPA investigation, which confirmed toxicological impact to the stream biota almost 5 miles downstream. Static toxicity test performed on the stream water indicated LC<sub>50</sub>s of 18.5 percent for the fathead minnow and 34 percent for the water flea.

The initial surface water investigation was performed on the KII drainage ditch by EPA. This investigation consisted of the analysis of one surface water sample obtained from the ditch at the northern (downstream) perimeter of the then-Koppers property. The analysis indicated presumptive evidence of compounds associated with coal tar (i.e., dimethylpyridine, trimethylpyridine, dihydroindole, methylquenoline, carbazole, and methylquinolinol). All of these compounds were detected at estimated concentrations of 10 ug/L.

The macroinvertebrate study performed in conjunction with this investigation indicated three species of midges (Diptera) were present at the sampling station. Results of 24-hour static toxicity test indicated no mortality for either the fathead minnow or the water flea.

The sediments in the Hogtown Creek/North Main Street drainage system were evaluated. The upstream sample (CC-001S) was collected from the North Main Street ditch immediately east of the former Cabot Carbon plant site. The sample contained various detectable constituents, with estimated concentration values ranging from 500 ug/kg of phenanthrene to 800 ug/kg fluoranthene. In addition, polychlorinated biphenyl (PCB) was found at a concentration of 170 ug/kg. The downstream sample was taken from Springstead Creek just before the confluence with the KII drainage ditch. There was presumptive evidence of various detectable constituents in the sediment, ranging in concentration from an estimated value of 5,000 ug/kg of methylnaphthalene to 10,000 ug/kg of C<sub>4</sub> alkyl phenanthrene. In addition, gamma-chlordane (2.9 ug/kg) and alphachlordane (3.2 ug/kg) were also detected in the sample.

The sediments in the KII drainage ditch were initially evaluated during investigation. This investigation analyzed samples from two locations along the ditch. The upstream sample, K-1, contained several of the extractable organic compounds associated with the creosote wood-preserving process. The

estimated concentrations ranged from 600 ug/kg of anthracene to 7,500 ug/kg of fluoranthene. The other constituents identified were PCB (960 ug/kg), gamma-chlordane, and alpha-chlordane. The downstream sediment sample, K-2, generally showed an increase in extractable organic compound concentrations, with 1,000 ug/kg anthracene and 42,000 ug/kg fluoranthene. In addition, PCP was detected at a concentration of 10,000 ug/kg. The metals analysis at K-2 also showed elevated concentrations of arsenic (26 mg/kg), chromium (32 mg/kg), and copper (28 mg/kg).

#### 5.1.4 University of Florida

The Cabot Carbon site was evaluated further during the 1982 University of Florida investigation performed under the direction of Dr. John Zoltek. This investigation consisted of the installation and sampling of 11 monitoring wells in and around the former plant area.

The results of this investigation confirmed that the groundwater flow in the site area is to the east-northeast. The three major classes of compounds were phenols, terpenes and condensed aromatics. The highest concentration of phenols were encountered in the wells either in or downgradient of the former lagoon area. The phenolic compounds detected included sigma-cresol (5,238 ug/L), rho-cresol (11,120 ug/L), dimethyl phenol (9,428 ug/L), methoxy phenol (3,277 ug/L), and alkyl phenol (562 ug/L). Compounds such as limonen, alpha-terpineol, borneol, and D-camphor, which are associated with destructive distillation processes, also were encountered at maximum concentrations in the downgradient wells. Naphthalene compounds were detected at highest concentrations in the wells upgradient of the former lagoon area, indicating potential offsite influences.

#### 5.1.5 Koppers 1984

The groundwater within the then-Koppers site initially was evaluated by Koppers in an investigation summarized in their 1984 report. The investigation included the installation of ten monitoring wells within the northern portion of the property. Nine of the wells monitored the upper 8 ft of the aquifer, and 1 well monitored a deeper interval immediately above the clay layer (Hawthorn Formation). Three rounds of sampling were conducted during 1983 (July 28, September 6, and October 12), with analyses including total phenols, TOC, COD, naphthalene, and polynuclear aromatic hydrocarbons (PAHs).

The results consistently indicate detectable concentrations of phenols [approximately 4.0 milligrams per liter (mg/L)] in M-1, immediately downgradient of the former north lagoon area. The



wells downgradient of M-1 displayed phenols concentrations generally at or near the detection limit, with the exception of M-9 (0.23 mg/L) in the first sampling round. The analytical results also show that TOC, COD, and naphthalene values follow the same general pattern as the total phenols concentrations, with the highest concentrations (77.0 mg/L for TOC, 200.0 mg/L for naphthalene) found immediately downgradient of the former north lagoon. However, the concentrations of total PAHs (less naphthalene) are elevated in the wells along the KII drainage ditch, indicating that the ditch may serve as a source area.

Koppers performed an invstone and Ocala Group (both of Eocene Age), the Miocene-Age Hawthorn Formation, and Plio-Pleistocene terrace deposits.

The principal geologic structure in central peninsular Florida is the Ocala Uplift, an anticlinal fold or arch whose crest traverses southwest of Alachua County. The up warping of this structural feature brought the Ocala Group, an extensive sequence of limestones and dolomites, to the surface approximately 5 miles southwest of the Cabot Carbon/Koppers site. From this area of limestone exposures, the ground surface rises to the northeast as the Ocala Group is overlain by the Hawthorn Formation and Plio-Pleistocene terrace deposits in the vicinity of the Cabot Carbon/Koppers site.

There are three aquifer systems in Alachua County: (1) the water-table aquifer, (2) the secondary artesian aquifer, and (3) the Floridan aquifer. The water-table aquifer is composed of Plio-Pleistocene sands and clayey sands. The secondary artesian aquifer is limited vertically and laterally in extent. The results of the analysis for phenols were similar to those of the previous investigation. Relatively low concentrations were recorded at the upstream and downstream stations, S-1 and S-2, respectively. The most elevated phenols concentrations occurred at intermediate sampling points along the ditch (0.043 mg/L at S-4 and 0.041 mg/L at S-5). PCP exhibited a similar trend to phenols. Concentrations of PCP in the ditch as it enters and leaves the site were 0.004 mg/L at S-1 and less than 0.003 mg/L at S-2. The highest concentration (0.38 mg/L) was recorded at station S-4. Total chromium was not detected at S-1, S-2, or S-3 (North Main Street ditch). An elevated total chromium concentration (0.890 mg/L) was recorded at the intermediate station S-4. The arsenic concentrations showed an overall increase from 0.0028 mg/L at the upstream station, S-1, to 0.078 mg/L at the downstream station, S-2. Sampling station S-4 displayed an elevated arsenic concentration of 0.73 mg/L. Arsenic was not detected in the North Main Street ditch.

#### 5.1.6 Koppers 1985

The groundwater quality at the then-Koppers site was further evaluated in the 1985 Koppers investigation. This investigation included the installation of wells to monitor the upper portion of the aquifer, with the remaining 14 screened in an interval immediately above the Hawthorne (clay) Formation. The monitoring wells were sampled in the three rounds (August 6, August 27, and September 12, 1984). The analyses performed on the samples included TOC; COD; phenols; PCP; and copper, chromium, and arsenic.

The results of the investigation indicate that phenols concentrations in the shallow wells are slightly above the background levels and at or just above analytical detection limits. The most elevated phenols concentrations (8.5 to 12.0 mg/L) occurred in the tank farm area adjacent to the former cooling pond. The majority of the samples from the deeper wells exhibited elevated phenol levels. The highest concentration (17.0 to 19.0 mg/L) from these deeper wells was encountered in M-25B, located immediately downgradient of the main process facilities. Well M-3B (downgradient of the former north lagoon displayed the second highest phenol levels (3.1 to 3.4 mg/L)).

The analytical results also indicate that the trends in the concentration of PCP are similar to the phenols trend. Elevated PCP levels were found in the shallow wells located in and near the potential source areas; the deep monitoring wells indicate more widespread presence of PCP immediately above the Hawthorne Formation. The most elevated levels at the site were detected in the treatment area and the former south lagoon. Elevated levels were also detected downgradient of the former north lagoon.

The majority of the wells on the site displayed detectable arsenic concentrations. In general, wells downgradient of the CCA treatment and drip track areas exhibited arsenic levels in excess of drinking water standards (0.05 mg/L). The highest arsenic concentrations at the site were found in M-21A and M-32A (maximum 3.9 and 1.6 mg/L, respectively). Wells M-19, M-21B, and M-32B, which are also downgradient of the CCA treatment area, also displayed arsenic concentrations in excess of the drinking water standards. Elevated arsenic concentrations (0.12 mg/L) also were detected in the former cooling pond area in Well M-30A. Arsenic was undetected (<0.001 mg/L) in the upgradient Wells 27A and 27B.

The distribution of total chromium concentrations essentially paralleled the distribution of arsenic concentrations. However, total chromium did not exceed the drinking water standards (0.05 mg/L) in the deep wells at the site. Total chromium concentrations in excess of the drinking water standards were detected in shallow wells in and downgradient of the CCA treatment area, with maximum levels on the order of 0.13, 0.12, and 0.13 mg/L recorded in M-19, M-22, and M-32A, respectively.

Well M-30A, located near the cooling pond, also showed an elevated concentration of total chromium (0.11 mg/L). Total chromium was undetected (<0.007 mg/L) in the two upgradient wells.

The PAH distribution at the site was similar to the phenols distribution. Elevated PAH concentrations were found in and downgradient of the CCA treatment area and downgradient of the former north lagoon area. PAH concentrations were also generally higher in the deep wells at the site. The highest PAH concentration was noted in M-24 (17.0 mg/L), located in the tank farm area. Well M-21B, downgradient of the former south lagoon area, also displayed an elevated PAH concentration (10.5 mg/L). PAH compounds were undetected in the upgradient Well 27A and detected at 0.0003 mg/L in the upgradient Well 27B.

The investigation noted elevated naphthalene concentrations throughout the site. The most elevated concentrations were found in and downgradient of the treatment area and the former south and north lagoon areas, with the highest concentrations generally occurring in the deeper wells. Well M-25B, along the eastern boundary of the site, had the highest concentration (15.0 mg/L), followed by M-24 in the tank farm area (13.0 mg/L). Naphthalene was undetected (<0.006 mg/L) in the two upgradient wells.

During this investigation, a total of 20 soil borings were drilled and sampled to evaluate soil conditions within potential source areas. A total of 14 samples were analyzed for PCP and total extractable oils analysis, plus copper, chromium, and arsenic where appropriate.

The three borings drilled in the former north lagoon area all displayed visible oil. The analytical results indicated PCP concentrations of 8.6 mg/kg and 1,040 mg/kg total oils. The five borings drilled within the former south lagoon area also displayed visible oil. The analytical results indicated PCP concentrations of 20.0 mg/kg and 62,400 mg/kg total oils content.

The two borings drilled within the former cooling pond area displayed visible oil to depths of 5 ft. Analytical results indicated a PCP concentration of 4.2 mg/kg and 1,500 mg/kg total oils. The boring drilled within the nearby tank farm area showed visible evidence of oil to 12 ft with 1,590 mg/kg total oils, but no detectable PCP.

In the drip track areas, borings were drilled within the CCA, creosote, and PCP areas. The analysis in the CCA area indicated low concentrations of PCP (below detection limit) and total oils (33.4 mg/kg). Arsenic concentrations ranged from 1.8 to 5.6 mg/kg, chromium ranged from 1.5 to 6.4 mg/kg, and copper ranged

from less than 0.008 to 2 mg/kg. In the creosote/PCP area, concentrations of PCP were undetected with total oils showing a maximum concentration of 33.4 mg/kg.

A second Koppers surface water investigation of the ditch was conducted in 1985. This investigation consisted of 5 sampling stations S-1 through S-5, with analysis for phenols, PCP, copper, and total chromium. Four of the sampling stations were located along the ditch within the property limits, with the fifth located just upstream of the confluence.

#### 5.1.7 FDER 1986

The 1986 FDER study addressed the potential environmental issues associated with the widening of North Main Street in the vicinity of the site. A total of seven sediment samples were obtained from the ditch area. Six of the samples were obtained upstream and one downstream of Project Jumpstart. The samples were analyzed for the 129 priority pollutants. The analytical results indicated the presence of three classes of compounds: acid extractables organics (2,4-dimethylphenol), base neutral organics (PAHs), and heavy metals.

Samples from the three upstream stations (S-1, S-2, and S-3), which were taken from the vicinity of the intersection of North Main Street and NE 28th Avenue, had higher concentration of 2,4-dimethylphenol [830 mg/kg (maximum)] and the PAHs than the downgradient stations. The primary base neutral organics contributing to the total were naphthalene (225 mg/kg), phenanthrene (63 mg/kg), acenaphthene (30 mg/kg), and acenaphthylene (35 mg/kg). There was no similar pattern discernible for metals. The maximum concentrations of arsenic, chromium, and copper were noted at 29.9 mg/kg, 5.0 mg/kg, and 22.4 mg/kg, respectively.

#### 5.1.7 IT - First Remedial Investigation - 1987

The groundwater quality within the surficial aquifer was evaluated further, for both the combined Cabot Carbon/Koppers site areas, in the summary IT Corporation report presented in 1987. This investigation included the installation of 24 additional wells that were selectively screened in either the upper or lower portion of the shallow aquifer.

Groundwater elevation data indicated that groundwater flow in the surficial aquifer is northeast with an easterly trend near North Main Street. Analyses were performed for metals (CCA), total phenols and acid-extractable phenol and phenolic compounds, and volatile and semivolatile organics. The

analytical results from this study, along with the data from the 1984/85 Koppers investigations, are summarized in the following paragraphs.

The elevated arsenic concentrations appear to be centered in the area of the former south lagoon and CCA drip track area, with little indication of extensive lateral migration. The maximum detected concentration was 3.9 mg/L at M-21A. The chromium concentration plots are much less distinct than those for arsenic, with the highest values (0.47 mg/L at ITW-20) located to the north of the site and Springstead Creek. Two other areas of elevated concentrations were observed approximately 400 to 500 ft east of the CCA retort (0.28 mg/L at ITW-7) and along the northeast boundary of the then-Koppers property (0.14 mg/L at ITW-24). The copper concentration plots resemble those for chromium, except that there were no elevated copper concentrations along the northeast corner of the Koppers property. The highest copper concentrations were found in the vicinity of the former Cabot Carbon lagoon system (0.318 mg/L at ITW-8 and 0.334 mg/L at ITW-9).

The concentrations of phenols in the upper zone show elevated concentrations to the northeast (downgradient) of the former Cabot Carbon lagoon adjacent to North Main Street. The highest concentration in this area was 90.0 mg/L in ITW-14. In the lower zone, the maximum concentrations were encountered in the immediate vicinity of the lagoons, with a maximum of 144.0 mg/L recorded in ITW-10.

PCP concentrations in both the upper and lower zones indicate elevated concentrations on the then-Koppers property near the PCP drip tracks and the former south lagoon. The maximum concentration in the upper zone was 23.0 mg/L at M-24 and 12.0 mg/L in the lower zone at M-25B.

The highest total volatile concentrations were found downgradient of the former Cabot Carbon lagoon system with peak concentrations of 1.3 mg/L at ITW-15 and 1.26 mg/L at ITW-10.

The main contributors to the total volatile concentrations were benzene, ethylene benzene, methylene chloride, and toluene.

The highest concentrations of total semivolatiles at the site were located:

1. Along the southern portion of the boundary between the former Cabot Carbon and the then-Koppers properties (2.668 mg/L at ITW-5),
2. In an area downgradient of the drip pads on the then-Koppers property (3.763 mg/L at ITW-21), and

3. In an area upgradient of the former Cabot Carbon wastewater lagoons (2.202 mg/L at ITW-6).

The main contributors to the total semivolatiles concentrations were acenaphthene, acenaphthalene, anthracene, bis-(2-ethylhexyl) phthalate, fluorene, naphthalene, phenanthrene, and pyrene.

The 1987 RI also evaluated the water quality within the intermediate aquifer. This investigation consisted of the installation of three monitoring wells (ITF-1, ITF-2, ITF-3) and one round of sampling and analysis. The location of the three wells is presented in Figure 1.3-2.

The analytical results from the three wells indicated very low levels of phenols (0.01 and 0.02 mg/L), arsenic (<0.001 to 0.009 mg/L), and copper (0.021 to 0.042 mg/L). No volatile or semivolatile organics were detected.

Soil samples were collected from a number of soil borings as well, as during monitor well installation, to depths up to ten feet. Metals were detected at relatively low levels within the Cabot Carbon site area, with the exception of copper. The highest concentrations of copper were recorded in the vicinity of the former lagoon areas (72 mg/kg at ITB-6). The arsenic concentrations in the soils were all generally less than 10.0 mg/kg, with the maximum concentration of 16 mg/kg recorded to the northeast of the lagoon area at ITB-9.

Phenolic compounds were detected in the soils within a number of the borings in and around the former lagoon area. In this area, 2,4-dimethylphenol was detected at concentrations of 20.0 mg/kg (ITB-6) and 8.9 mg/kg (ITW-10). Acid extractable phenols were detected at concentrations of 9.5 mg/kg (ITB-6) and 8.98 mg/kg (ITW-10). PCP was not detected in any of the soil samples analyzed from the Cabot Carbon property.

Low concentrations of volatile organics were encountered in most of the borings on the site. The volatiles most commonly detected were benzene, ethylene benzene, methylene chloride, and toluene. The highest collective volatile concentrations were within the former lagoon area (12.18 mg/kg at ITB-6, 2 to 6 ft in ITW-13 (4.17 mg/kg).

The semivolatile organic compounds were detected in a number of the borings drilled within and downgradient of the former Cabot Carbon facilities. One of the highest collective semivolatile concentrations (105 mg/kg) was recorded in ITB-9, located to the northeast of the lagoon area. The primary contributors at this location were phenanthrene (36 mg/kg), chrysene (26 mg/kg), benzo(a)anthracene (11 mg/kg), and 3,4-benzofluoranthene (10 mg/kg). The soils encountered in ITW-13, the well installation north of the automobile dealership along North Main Street, also

exhibited an elevated concentration of total semivolatile organics (53.6 mg/kg). The main contributors were phenanthrene (17 mg/kg), naphthalene (11 mg/kg), acenaphthylene (8.2 mg/kg), and acenaphthene (5.4 mg/kg).

During the IT Corporation investigation, selected soils samples from the groundwater monitoring wells were submitted for chemical analysis. In addition, four exploration borings were drilled and sampled in and around the then-Koppers primary plant facilities within the southern portion of the property. The samples were analyzed for selected metals, phenolic compounds, volatiles, and semivolatile organics.

The results of the analysis indicated the highest arsenic concentrations occur within the former south lagoon area (ITB-15 at 79.0 mg/kg) and in the northeast corner of the property (ITW-24 at 62.0 mg/kg). The former south lagoon area also appears to represent the highest concentrations of chromium (115 mg/kg) and copper (11 mg/kg) on the site.

PCP was detected only in the borings located along the eastern boundary of the site (ITW-21 at 9.2 mg/kg and ITW-24 at 2.1 mg/kg). Other phenolic compounds were not detected.

Low concentrations of volatile organics were encountered in most of the borings on the site. The volatiles most commonly detected were benzene, ethylene benzene, methylene chloride, and toluene.

Semivolatile organic compounds were detected primarily along the northeastern boundary of the Koppers property and within the former south lagoon area. One of the highest concentrations of total semivolatile organics was detected at ITW-21 (119 mg/kg) located to the north of the main plant facilities along the eastern Koppers boundary. The main semivolatile contributors to the total were fluoranthene (23.1 mg/kg); 3,4-benzofluoranthene (18.4 mg/kg); pyrene (15.2 mg/kg); chrysene (13.6 mg/kg); and benzo(a) anthracene (12.0 mg/kg). Elevated concentrations (43 mg/kg) of semivolatiles were also detected in the northeast corner of the Koppers property in ITW-24. In the former south lagoon area (ITB-15), total semivolatile organics were detected at a concentration of 18.7 mg/kg.

During the IT investigation, six additional surface water samples were taken for laboratory analysis. Sample locations ITS-1 and ITS-2 were located in the North Main Street ditch adjacent to the former Cabot Carbon site area. ITS-3 was located in Springstead Creek north of Project Jumpstart. ITS-4 and ITS-5 were located along the westerly flowing portion of the ditch to the north of the site. ITS-9 was taken in a feeder ditch near the intersection of North Main Terrace and Northeast 35th Avenue, approximately two blocks downstream of the site area. Analyses were performed for copper, chromium,

and arsenic; total phenols and acid-extractable phenol and phenolic compounds; and volatile and semivolatile constituents.

All samples indicated low concentrations of copper, chromium, and arsenic ( $<0.016$  mg/L). All samples along the North Main Street ditch showed comparable ( $1.0$  mg/L) levels of phenolic compounds. Volatiles were relatively low (generally less than  $0.10$  mg/L) along the ditch, with the highest recorded at ITS-2 ( $<0.125$  mg/L). The primary volatile organic constituents to the total were benzene, ethyl benzene, and toluene. Semivolatile organics were not detected in the upstream sample from ITS-1. The highest concentration of semivolatile organics was encountered at ITS-4 ( $<1.14$  mg/L) along the northern boundary of the site. The primary semivolatile contributor at ITS-4 was napthalene ( $1.1$  mg/L). Phenolic compounds, volatiles, and semivolatile organics were not detected in either of the feeder ditches, ITS-3 and ITS-9.

During the IT investigation, two additional surface water samples, ITS-6 and ITS-7, from the drainage ditch flowing into Springstead Creek from the Koppers facility were taken. The analyses performed included copper, chromium, and arsenic; total phenols and acid-extractable phenol and phenolic compounds; and volatile and semivolatile constituents.

The results of the analysis essentially substantiated the previous investigations. Very low metals ( $<0.166$  mg/L) and phenols concentrations ( $<0.01$  mg/L) were measured. In addition, volatile and semivolatile organics were not detected in either of the samples. Field data obtained during the time of the sampling did show a dissolved oxygen decrease from  $4.65$  mg/L at the upstream station (ITS-6) to  $2.09$  mg/L at the downstream station (ITS-7). Temperature and pH did not appear to change appreciably.

During the IT investigation, sediment samples were taken at the five surface water sampling locations described previously. The samples were analyzed for chromium, copper and arsenic, phenolic compounds; and volatile and semivolatile constituents.

The results of the analysis indicated that concentrations of metals along the North Main Street ditch were relatively low, with the highest recorded in the tributary stream at ITS-3 ( $0.62$  mg/kg arsenic,  $7.5$  mg/kg chromium, and  $4.0$  mg/kg copper). Phenolic compounds were undetected at all sampling locations, with the exception of low levels ( $3.5$  mg/kg) encountered at ITS-4. The highest concentration of total volatile organics along the ditch was encountered at ITS-2 ( $<1.59$  mg/kg), which included ethyl benzene at  $0.92$  mg/kg and toluene at  $0.57$  mg/kg. The analysis for semivolatile organics indicated the highest



values at ITS-2 (24.1 mg/kg total). The concentration at ITS-1 was the next highest (5.9 mg/kg total), and the total values at ITS-3, ITS-4, and ITS-5 were approximately 1.0 mg/kg. The main semivolatiles contributing to the total were acenaphthene, acenaphthylene, naphthalene, phenanthrene, and pyrene.

During the IT investigation, sediment samples were taken from two locations along the drainage ditch from the Koppers property. The samples were analyzed for selected metals, phenolic compounds, volatiles, and semivolatile organics.

The results of the analyses indicated metals concentrations ranging from 3.8 to 8.4 mg/kg for arsenic, 4.2 to 6.7 mg/kg for chromium, and 4.0 to 34.0 mg/kg for copper. Phenolic compounds were not detected in either of the two samples. Total volatiles, consisting primarily of methylene chloride, were also detected at low concentrations in the samples (0.03 mg/kg at ITS-6 and 0.07 mg/kg at ITS-7). Semivolatile organics were detected at relatively high levels, with total concentrations of 56.9 mg/kg at ITS-6 and 46.8 mg/kg at ITS-7. The primary semivolatiles contributing to the total were chrysene (4.7 and 4.9 mg/kg); fluoranthene (6.5 and 5.1 mg/kg); 3,4-benzofluoranthene (9.9 and 9.2 mg/kg); and pyrene (13.0 and 9.3 mg/kg).

## 5.2 Supplemental RI - 1989

### 5.2.1 Explanation

The purpose of the Supplement RI was to fill in the data gaps identified in the 1987 RI. The 1989 RI investigations can be divided into the following groups:

- groundwater investigation
- surface and subsurface soil investigation
- surface water and sediment investigation
- air investigation

This section of the ROD is broken down into the same subgroups.

### 5.2.2 Indicator Chemical Selection

Indicator chemicals were selected for this investigation based on constituents detected during previous investigations. They are as follows:

#### 1. Air Analysis

Arsenic  
Chromium

Copper  
Base-Neutral/acid extractable organics

## 2. Water Analysis

TOC/oil and grease  
Carbon  
Chromium  
Base-neutral/acid extractable organics  
Purgeable organics  
Volatile organics (VOCs)

## 3. Soil/Sediment Analysis

Moisture  
TOC/oil and grease  
Arsenic  
Copper  
Chromium  
Base-neutral/acid extractable organics

Because of the difficulty of distinguishing between naturally occurring pine tar constituents versus industrial contaminants found in coal tars (phenols, creosotes, volatile organics), non-HSL indicator chemicals were also investigated in an attempt to distinguish between potential industrial sources. Preliminary candidate chemicals included pinene and other turpentine derivatives, terpeneol, and phenolate. In order to identify these compounds, an automated unknown library search for ten, or less, of the highest peaks in the semivolatile analyses was conducted for each sample.

## 5.3 Groundwater

### 5.3.1 Aquifer Characterization

The groundwater flow directions observed during this investigation correspond closely to those of previous investigations. The monitoring data indicate that the sitewide groundwater flow direction within the unconfined shallow aquifer is to the northeast with a northerly flow component in the northern portion of the site. The average hydraulic gradient is approximately 0.010 foot/foot (ft/ft). However, the hydraulic gradient varied across the site area. In the northwest portion of the site the groundwater flow direction was northeast under a relatively steep gradient of 0.020 ft/ft, whereas the groundwater flow direction in the southern portion of the site was to the northeast under a more gentle gradient of 0.007 ft/ft. Influence from the North Main Street ditch and the low-lying area in the northern portion of the Cabot Carbon site is evident. This groundwater flow direction is consistent with

the geologic orientation of the underlying confining Hawthorn Formation, which also dips to the northeast.

Groundwater elevations were compared to surface water elevations and found to be equal to or above surface water elevations for all but the northern portion of the drainage ditch located on the KII property. This indicates that shallow groundwater is discharging into the area's surface water/drainage systems.

Additional groundwater elevation data recorded from the three intermediate aquifer monitoring wells indicate that the flow direction follows the regional north-northeast flow direction of this aquifer. The average groundwater velocity in the intermediate aquifer is 0.45 ft/day.

A comparison of the potentiometric conditions of the unconfined and intermediate aquifers indicates that water levels in wells screened in the intermediate aquifer are approximately 25 ft lower than those of the unconfined aquifer. This suggests that a potential downward component of groundwater flow is present at the site. However, the permeability of the clay in the top of the Hawthorn Formation ranges from an order of  $10^{-6}$  to  $10^{-8}$  cm/sec. Since there is 30 to 35 ft of dense clay between the two aquifers, as reported in the initial RI (1987), it is projected that there is little, if any, interconnection between the unconfined and intermediate aquifer zones.

### 5.3.2 Groundwater Quality Assessment

The groundwater quality assessment included the analyses of samples from the shallow, unconfined aquifer and the underlying intermediate aquifer. Of the 25 wells sampled during the assessment, 22 wells were screened within the shallow aquifer and 3 within the intermediate aquifer. The locations of the wells sampled are presented on Figure 3.4-1. A summary table of constituents found in the shallow aquifer can be found in Table 4.2-1. Maximum concentrations can be found in Table 4.2-4.

A number of constituents were detected in the groundwater at the site, including PAH compounds, phenols, volatile organics, chromium, and various pine oil derivatives. A summary of the analytical results of this groundwater quality assessment is presented in Table 4.2-4. This summary includes a comparison of the background concentrations of the maximum contaminant concentrations detected in both the shallow and intermediate aquifers.

Carcinogenic and noncarcinogenic PAH compounds were detected in the shallow groundwater at elevated concentrations within and downgradient of the site area. The compounds include

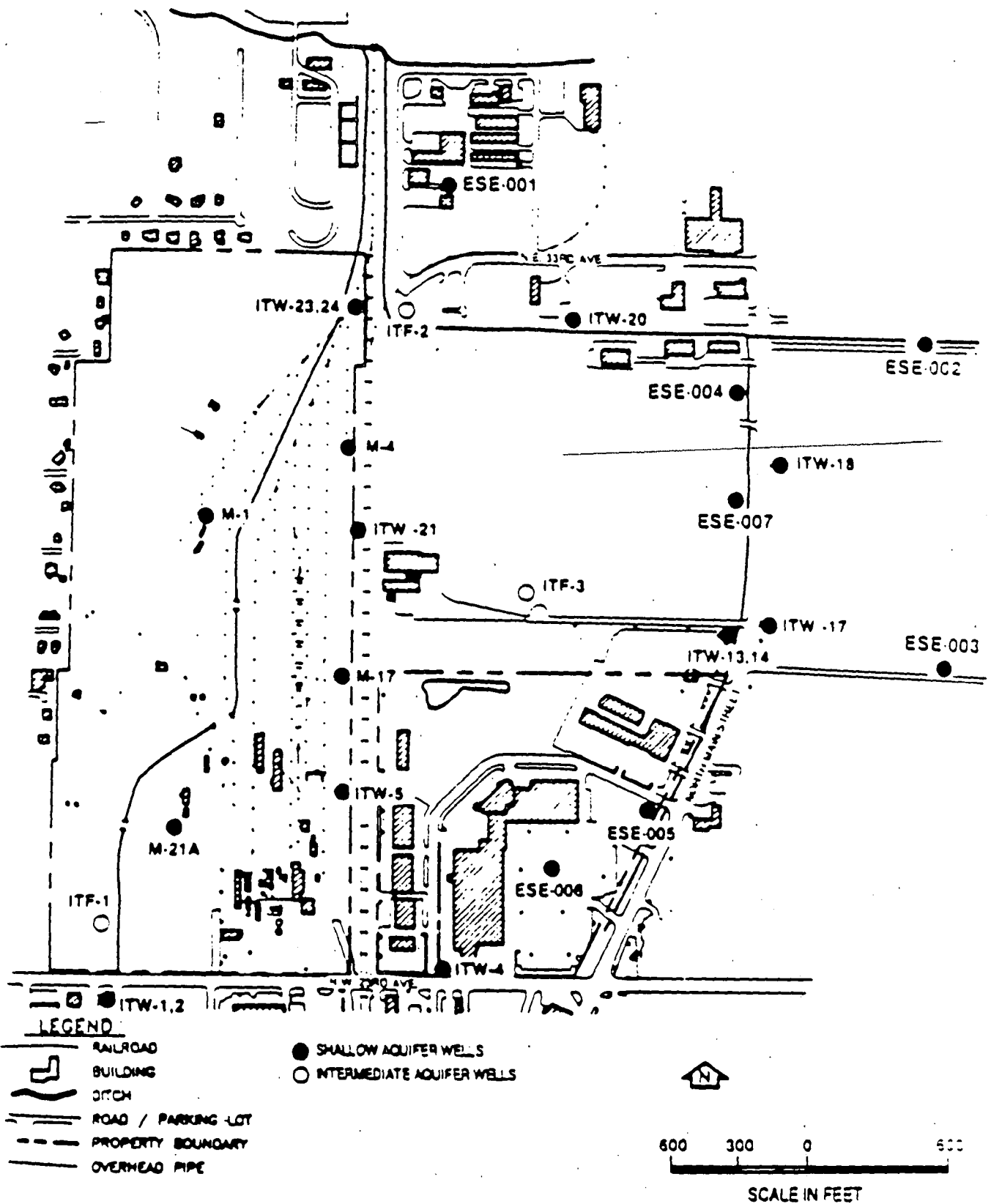


Figure 3.4-1  
GROUNDWATER SAMPLING STATIONS

SOURCE: HUNTER/ESE, 1999.

CABOT CARBON/KOPPERS

Remedial Investigation

Table 4.2.1 Groundwater Quality Summary, Shallow Aquifers

Constituent	Well Nodes																											
	ITW 1	ITW 2	M 1	M 4	M 17	M 21A	ITW 4	ITW 5	ITW 13	ITW 17	ITW 18	ITW 30	ITW 31	ITW 32	ITW 33	ITW 34	ITW 35	ITW 36	ITW 37	ITW 38	ITW 39	ITW 40	ITW 41	ITW 42	ITW 43	ITW 44	ITW 45	ITW 46
Oil and grease, mg/l.	1	3	0.7	0.9	0.1	0.5	0.5	1	19	15	0.1	0.1	0.6	0.2	0.1	0.3	0.5	0.1	0.5	6	8	16						
Carbon (BIC), mg/l.	9.4	10.8	6	11.6	6	22.2	10.1	26.9	62.1	52.9	110	16.2	17.4	2.9	11.6	61.1	22	15.8	65.7	66.1	62.1	66.1						
Chromium (total), mg/l.	0.0046	0.024	0.017	0.022		0.0118	0.0051	0.0071	0.0026	0.0161	0.026	0.048	0.0022	0.0238	0.0022	0.0026	0.0026	0.0111	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Mn (total), mg/l.			164	4.5	69.1	161	220	106	1,500	2,800	12	120	685	81.6	22.6	96.8	109	2.1	22.1									1,080
Arsenobenzene, mg/l.			5.1	58	22	51	220						0.81	81	35	1.1	9.1			6.8								
Arsenobenzene, mg/l.				5.8	2.2	9		12																				
Arsenite, mg/l.					1.1	10		12																				
Bis (2 ethylhexyl) phthalate, mg/l.	60	80	1.4	4.2	4.9		5.6	16			5.5	16	6.9	16	9.1	6	11	5.6	6.1	8.9								
Fluorene, mg/l.			4.2	16	12	12		210					100	19	68		6.6			81								
Fluoranthene, mg/l.								6.6		1.6																		
Naphthalene, mg/l.			20	100	75	1,200	15	1,000	59	140			2,000	940	12	5.2	22			1,000	940							
Benzo(b)fluoranthene, mg/l.					26			120																				
Fluoranthene, mg/l.			16		2.6	180		280						6.9	13	11												6.1
Pyrene, mg/l.										1.1																		
Acenaphthene, mg/l.								65	6,000	6,200										60	68	81	11,000					
2,4 Dimethylphenol, mg/l.			51			51		26	1,100	2,100	51		100	8.6	16	11	68		110	120	1,600	2,000						
Benzo(b)fluoranthene, mg/l.										2.1																		
Benzo(k)fluoranthene, mg/l.										2.9																		
Benzo(a)fluoranthene, mg/l.										1.8																		
Benzo(a)anthracene, mg/l.																												

Note: - not detected  
mg/l. - milligrams per liter  
µg/l. - micrograms per liter

Sampling was performed from November 11 to 21, 1988

Source: Water/ASE, 1989

Table 4.2-4: Maximum Concentrations of Groundwater Constituents

Constituent	Shallow Aquifer			Intermediate Aquifer		
	Background Concentration <sup>a</sup>	Maximum Concentration	Well Number	Background Concentration <sup>a</sup>	Maximum Concentration	Well Number
Oil and Grease, mg/L.	1, 3, 0.5	19	ITW-13	0.1	1.0	ITF-3
Carbon, TOC, mg/L.	9.4, 18.8, 10.1	63	ITW-13	1.2	2.8	ITF-3
Chromium, Total, mg/L.	0.06, 0.12, 0.0451	0.240	ESE-006		0.019	ITF-3
VC, Total, µg/L.	--, --, 560	3,620	ESE-006	6.1	168	ITF-3
Acenaphthene, µg/L.	--	540	ITW-5	--	--	--
Acenaphthylene, µg/L.	--	12	ITW-5	--	--	--
Anthracene, µg/L.	--	17	ITW-5	--	--	--
Fluorene, µg/L.	--	210	ITW-5	--	--	--
Naphthalene, µg/L.	--, --, 35	2,700	ITW-21	6.6	6.6**	ITF-1
Pentachlorophenol, µg/L.	--	120	ITW-5	--	--	--
Fluoranthene, µg/L.	--	280	ITW-5	--	--	--
Fluoranthene, µg/L.	--	4.6	ITW-5	--	--	--
Pyrene, µg/L.	--	1.1	ITW-17	--	--	--
Benzo(b)fluoranthene, µg/L.	--	2.1	ITW-17	--	--	--
Benzo(k)fluoranthene, µg/L.	--	2.9	ITW-17	--	--	--
Benzo(a)fluoranthene, µg/L.	--	1.8	ITW-17	--	--	--
Benzo(a)anthracene, µg/L.	--	1.1	ITW-23	--	--	--
Hexol, µg/L.	--	11,000	ESE-007	--	--	--
2,4-Dimethylphenol, µg/L.	--	3,100	ITW-13	--	11	ITF-3
Bis-(2-ethylhexyl) phthalate, µg/L.	60, 300, 5.6	300	ITW-2	62	74	ITF-3

Table 4.2-4. Maximum Concentrations of Groundwater Constituents (Continued, Page 2 of 2)

Constituent	Shallow Aquifer			Intermediate Aquifer		
	Background Concentrations*	Maximum Concentration	Well Number	Background Concentration <sup>1</sup>	Maximum Concentration	Well Number
<u>Unknown Search</u>						
Cyclopentanone, µg/L	--	8,400	ITW-13	4.0	4.0**	ITF-1
Camphor, µg/L	--	6,200	ITW-13	--	--	--
III-Isobutene, µg/L	--, --, 4	160	ITW-21	3.0	3.0**	ITF-1
9H-Carbazole, µg/L	--	46	ITW-23	--	--	--
Alpha terphenol, µg/L	--	170	ITW-17	--	--	--
Terphenes, alpha and gamma	--	92	ITW-17	--	--	--
Dimethyl-phenol, µg/L	--	1,400	ESE-006	--	4.0	ITF-3
Ethylmethyl phenol, µg/L	--	940	ITW-17	--	3.0	ITF-3
Alkyl phenol, µg/L	--	4,000	ITW-17	--	--	--
Ethyl benzene, µg/L	--, --, 47	610	ESE-006	--	--	--
Dimethyl benzene, µg/L	--, --, 65	730	ESE-006	--	--	--
Dibenzofuran, µg/L	--	22	H-21A	--	--	--
1-Methylnaphthalene, µg/L	--	72	ESE-005	--	--	--
Ethanol, 2-(2-Butoxy-ethoxy), µg/L	--	16	ITW-1	15	17	ITF-3

Note: -- = not detected.

\*ITW-1, ITW-2, and ITW-4 were used for background in shallow aquifer.

<sup>1</sup>ITF-1 was used for background in intermediate aquifer.

\*\*Detected only in background well.

Source: Hunter/ESE, 1989

naphthalene, phenanthrene, fluorene, acenaphthene, and anthracene. The compounds were generally detected at their highest concentrations in the wells along the KII eastern boundary, ITW-5 and ITW-21. PAH compounds were not detected in the upgradient shallow wells, ITW-1 and ITW-2, or in any of the deeper wells within the intermediate aquifer.

Phenolic compounds were also detected in the shallow groundwater at elevated concentrations within and downgradient of the site. The highest concentrations of phenol and 2,4-dimethylphenol were detected along the eastern boundary of the site, on both sides of the Ditch. 2,4-Dimethylphenol was also detected in relatively low concentrations within the western portion of the site in the wells downgradient of the former Koppers lagoons and the main KII process area. PCP was detected in only two of the wells sampled (ITW-5 and M-17), which were located downgradient of the KII process area. The more mobile 2,4-dimethylphenol was the only phenolic compound detected in wells ESE-001 and ESE-002. 2,4-Dimethylphenol was also the only phenolic compound detected in the underlying intermediate aquifer.

Concentrations of total VOCs were detected in the majority of the wells sampled during this investigation. Maximum concentrations were detected in the wells on the former Cabot Carbon facility. Elevated levels were also detected in other areas of the site, which include the northern and southern site boundaries and along the eastern boundary of the KII property. Total VOCs were also detected in the intermediate aquifer (ITF-3) at a concentration of 168 ug/L.

Chromium was detected in relatively high concentrations in the shallow upgradient wells, ITW-1 and ITW-2. These high concentrations are consistent with the results of the initial 1987 RI indicating an elevated background condition within the shallow groundwater. The upgradient concentrations were generally higher than the levels detected in the majority of the onsite and downgradient wells. Chromium was also detected in the intermediate aquifer (ITF-3) at a concentration of 0.019 mg/L. Bis-(2-ethylhexyl) phthalate was also detected at relatively high concentrations (60 and 300 ug/L) in the shallow background wells. The highest concentration detected in the onsite or downgradient shallow wells was 31 ug/L recorded in ESE-002. In the underlying intermediate aquifer, bis-(2-ethylhexyl) phthalate was detected at similar concentrations in each of the three deep wells.

Tentatively identified compounds detected in the unknown search included a number of pine oil derivatives, which include camphor, alpha-terpineol, and alpha- and gamma-terpinenes. These compounds were found almost exclusively in and downgradient of the former Cabot Carbon lagoons area. These compounds were not detected in the wells within the underlying intermediate aquifer.



### 5.3.3 Soil/Source Characterization

A number of potential source areas at the Cabot Carbon/Koppers site were designated during the previous investigations, including:

1. Former north and south lagoons,
2. Former cooling pond,
3. Wood-shaving area,
4. CCA drip track area,
5. Creosote and PCP drip track area,
6. Former Cabot Carbon wastewater lagoons, and
7. Eastern site boundary along the North Main Street ditch.

Each of these areas was individually evaluated during this current supplemental investigation to more accurately define the soil quality at each location. The investigation program included the drilling, logging, and sampling of 64 soil borings. The soil samples were screened in the field both visually and with a PID. A total of 192 selected samples were transmitted to the laboratory for analysis.

A summary of the analytical results of this soils investigation showing, within each source area, the maximum concentration of indicator parameters are presented in Table 4.3-1.

Elevated concentrations of arsenic, copper, and chromium were detected in soils on the Koppers property at the former south lagoon area, the CCA drip track area, and the main plant area. Arsenic, copper, and chromium were detected, at much lower levels, in the area of the former Cabot Carbon wastewater lagoons and along the North Main Street ditch and generally reflect the site's background conditions.

During this investigation, phenolic compounds were detected in soil samples from both the former Cabot Carbon and KII properties. PCP was detected only at the former north and south lagoons, the PCP drip track area, and the former cooling pond area. Phenol was detected in low concentrations only at the former cooling pond area and the former Cabot Carbon wastewater lagoons. 2,4-dimethylphenol was detected only in the soils at the former Cabot Carbon wastewater lagoons.

The highest concentrations of PAH compounds were detected on the KII property at the former north and south lagoons, the former cooling pond/plant area, and the PCP drip track areas. Relatively low concentration of PAH compounds (naphthalene and phenanthrene) were also detected in the soils at the former Cabot Carbon wastewater lagoon area.

Table 4.3-1. Maximum Concentrations of Soil Constituents (ug/kg)

Constituent	North Lagoon	South Lagoon	Cooling Pond	OTA Drip Truck	RTP Drip Truck	Wood Shavings	Cdot Lagoon	North Main Street
Arsenic	23.1	704	75.6	125	9.68	9.34	1.21	0.626
Copper	10.3	200	65.6	83.6	41.7	3.26	577	156
Chromium	12.9	576	116	298	20.5	5.75	13	17.1
Oil and Grease	7,350	8,540	1,620	4,480	6,600	703	15,200	19,000
Acenaphthene	3,900	540	540	2.4	600	0.26	6.3	--
Acenaphthylene	65	75	40	--	13	--	--	--
Anthracene	4,900	780	880	1,800	540	0.26	--	--
Benzo(A)anthracene	730	160	220	7	140	0.32	1.7	--
Benzo(B)fluoranthene	620	86	120	16	98	0.80	2.6	--
Benzo(K)fluoranthene	600	170	150	13	85	0.63	3.8	--
Benzo(A)pyrene	540	52	120	7.4	46	0.33	2.8	--
Chrysene	1,100	160	240	11	110	0.37	4.1	--
Fluoranthene	3,500	810	1,400	29	800	0.93	--	--
Fluorene	4,500	540	510	--	540	0.28	7.3	--
Naphthalene	6,200	1,000	4,600	--	410	0.05	73	26
Phenanthrene	9,500	1,300	2,000	8.2	50	1.10	42	12
Pyrene	4,300	870	780	26	82	1.20	7.0	--
Benzo(G,H,I)perylene	250	12	51	7.4	9.5	0.35	--	--
Bis-(2,ethylhexyl) phthalate	0.88	0.92	1.2	1.4	46	1.1	--	3.7
Dibenz(A,H)anthracene	160	2.1	28	--	--	--	--	--
Indeno(1,2,3-CD)pyrene	350	12	59	5.2	11	--	--	--
Pentachlorophenol	45	2.0	160	--	21	--	--	--
2,4 Dinitrotoluene	--	82	--	--	--	--	--	--
2-Chloronaphthalene	--	21	--	--	--	--	--	--
Di-n-octylphthalate	--	--	--	0.45	--	--	--	--
Phenol	--	--	0.81	--	--	--	1.0	--
2,4-Dimethyl phenol	--	--	--	--	--	--	89	--

Note: -- not detected

Source: Hunter/TSE, 1989.

## 5.4 Surface Water and Sediment Assessment

### 5.4.1 Surface Water

Surface water samples were taken from six designated locations. The sample locations are shown on Figure 3.6.1 and the sample results are shown in Table 4.4-1.

### 5.4.2 Sediment Investigation

Sediment samples were taken from designated locations along the North Main Street ditch, the KII drainage ditch, and the marshy area forming the northeast quadrant of the site, as shown on Figure 3.6-2. The sample results are shown in Tables 4.5-1.2 and 3.

### 5.4.3 Air Investigation

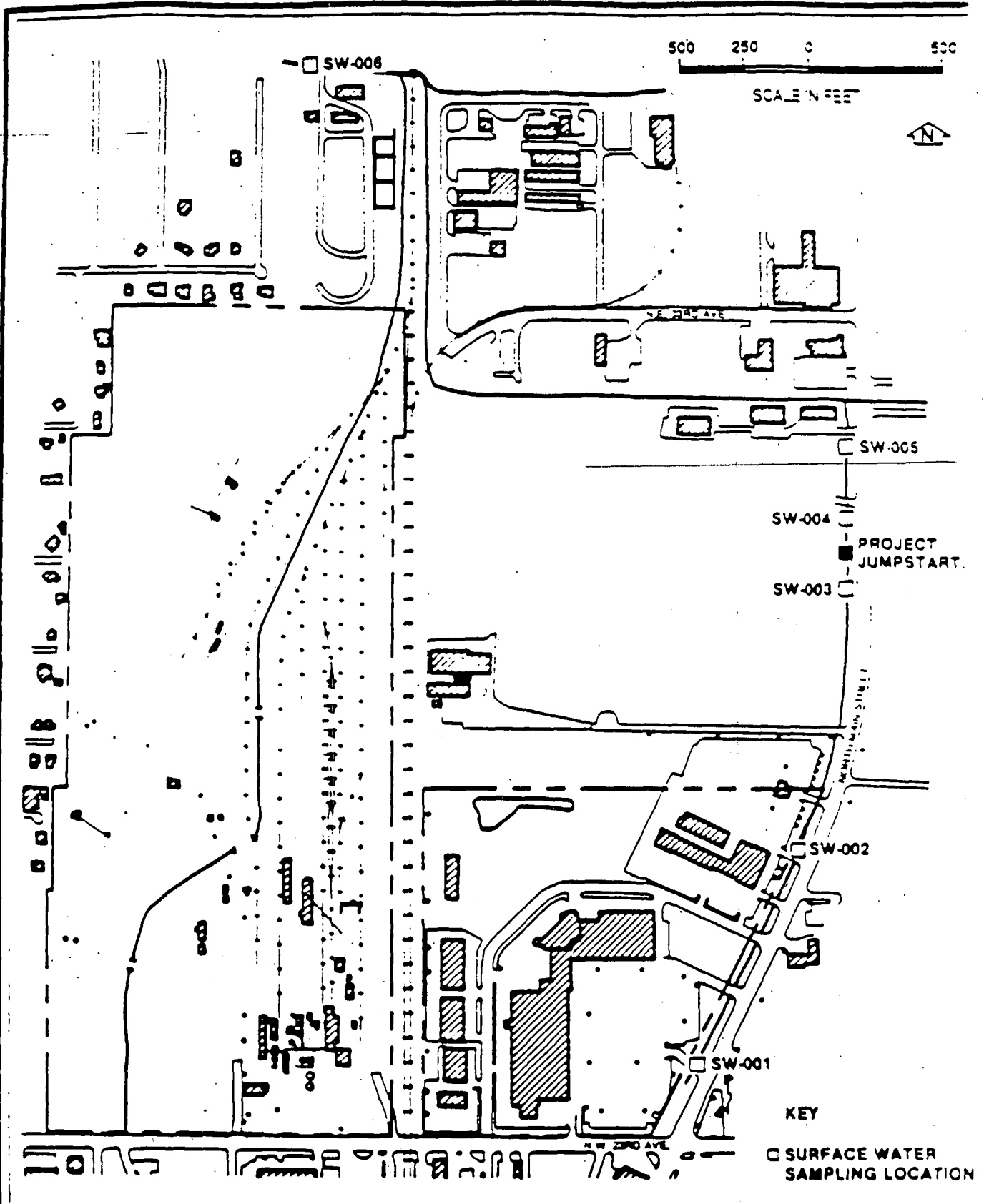
The investigation involved the collection of respirable-sized airborne particulate matter and vapor at three stations. Each station was equipped with two high-volume samplers to obtain analytical samples for metals and semivolatile organics in accordance with the appropriate methodology. Twenty-four hour integrated samples were collected on a daily basis for 7 consecutive days (extending from noon on November 30, 1988 to noon on December 7, 1988). Due to mechanical problems, the samplers at Station 2 were not functioning on the first and fourth day of the program and, thus, analytical results are not available. The constituents found in the air are detailed in Table 4.6.3.

## 6.0 RISK ASSESSMENT

### 6.1 Introduction

A formal Risk Assessment (RA) Report was performed as part of the 1989/90 RI/FS. The RA evaluated and selected appropriate indicator chemicals, evaluated potential exposure pathways and contaminant concentrations that were selected as the most sensitive to exposed populations, and, based on those factors, calculated risks posed by contamination at the site.

Because of the complexity of current and future land use at the site, there were a number of different exposure scenarios developed in the RA. Additional scenarios were evaluated in the FS and will be explained further in Section 7 of this ROD.



**Figure 3.6-1  
SURFACE WATER SAMPLING LOCATIONS**

SOURCE: MURTER/ESI, 1999.

**CABOT CARBON/KOPPERS**

**Remedial Investigation**

Table - 4-1 Maximum Concentrations of Surface Water Constituents  
North Main Street Ditch

Constituent	Concentration	Station
Oil and Grease	2 mg/L	SW-001
Carbon, TSS	42.2 mg/L	SW-003
Chromium, Total	0.0134 mg/L	SW-001
VOC Total	675 µg/L	SW-003
Acenaphthene	7.2 µg/L	SW-002
Bis-(2-ethylhexyl) phthalate	2.1 µg/L	SW-001
Naphthalene	33 µg/L	SW-001
Phenol	250 µg/L	SW-003, SW-001
2,4-dimethylphenol	430 µg/L	SW-001
Fluorene	2.0 µg/L	SW-003
<u>Unknown Search</u>		
H-Indene	47 µg/L	SW-001
Cyclopentanone	100 µg/L	SW-002, SW-003, SW-001
Cyclopentanone, alkyl	100 µg/L	SW-003
Ethanone	85 µg/L	SW-003
Phenol, methyl	640 µg/L	SW-001
Phenol, dimethyl	130 µg/L	SW-001
Phenol, phenyl ethyl	35 µg/L	SW-001
Phenol, ethyl methyl	74 µg/L	SW-002
Phenol, alkyl	690 µg/L	SW-001
Benzene, dimethyl	140 µg/L	SW-001
Camphor	1,800 µg/L	SW-001
1,8-Cineole	93 µg/L	SW-005
2-Pentanone, 4-hydroxy-4 methyl	150 µg/L	SW-006
O-Fenchyl alcohol	330 µg/L	SW-004
Alpha terpinol	170 µg/L	SW-004
Endo-borneol	64 µg/L	SW-005

Note: mg/L = milligrams per liter  
µg/L = micrograms per liter.

Source: Hunter/ES2, 1989.

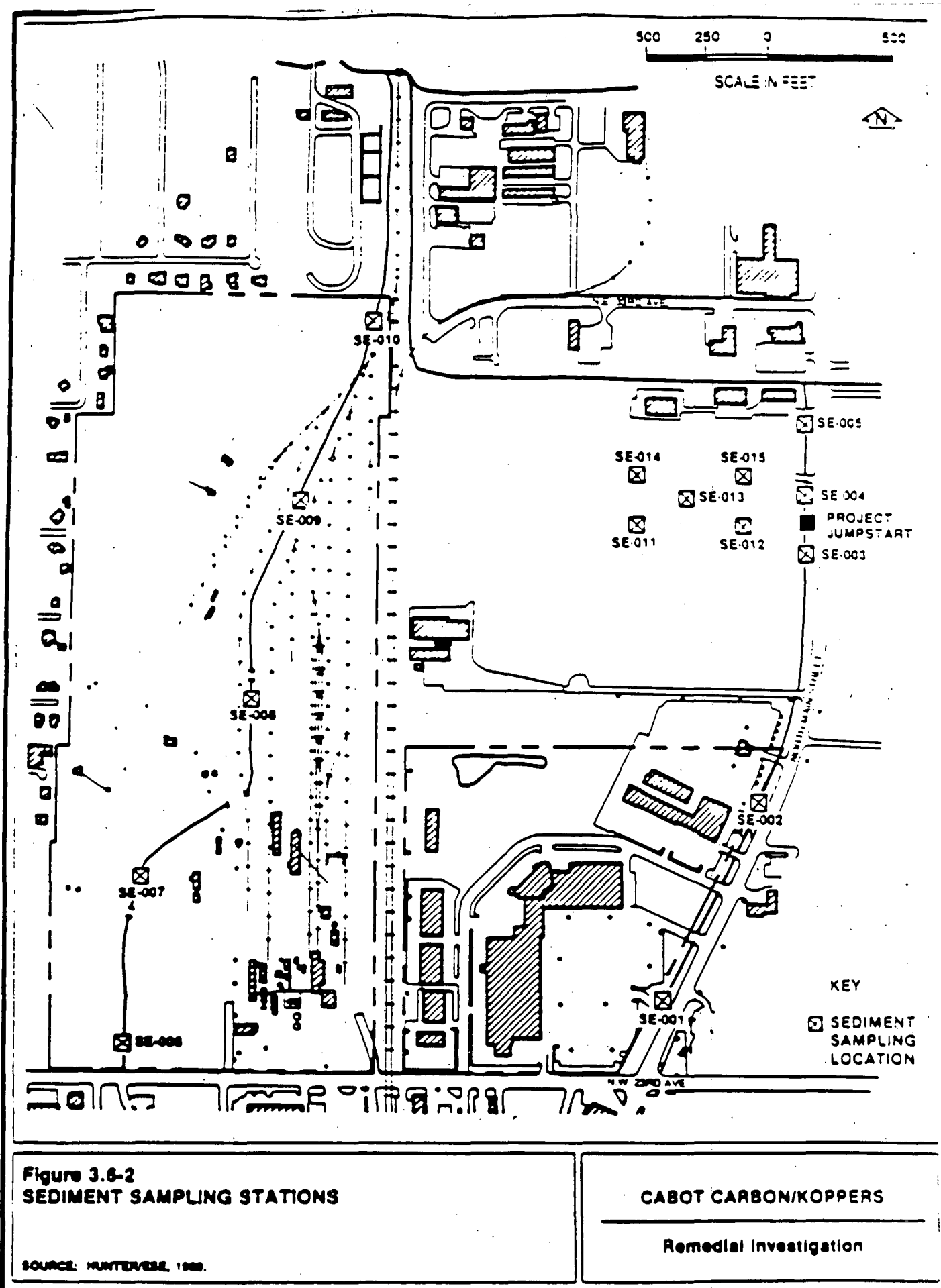


Table 4.3-1 Sediment Constituents, North Main Street Ditch  
in mg/kg

Constituent	SE-001	SE-002	SE-003	SE-004	SE-005
Oil and Grease	4.3	1,000	1,740	639	134
Copper	1.37	5.03	15.7	1.27	1.1
Chromium	3.43	2.63	1.41	8.49	3.17
<u>Tentatively Identified Compounds</u>					
Propanoic acid-1-methyl isomer	0.79	..	..	..	..
Hexadecyne	25	9.5	..	6.3	13
Amide isomer	1.9	..	..	0.77	..
Hexanedioic acid, dioctyl ester	6.5	..	..	0.57	1.16
Phenanthrene-carboxaldehyde isomer	..	12.88	27.320	0.9, 0.63	0.85 1.5
Phenanthrene, dimethyl isomer	..	9.8	..	..	..
Phenanthrene, trimethyl isomer	..	7.9	15	..	..
Phenanthrene, tetra-methyl isomer	..	59	134	1.9	3.1
Phenanthrene, octa-hydromethyl isomer	..	..	5	0.37	0.26
Anthracene methyl isomer	..	..	6.1	..	..

Table 4.5-1 Sediment Constituents, North Main Street Ditch  
(in mg/kg) (Continued, Page 2 of 2)

Constituent	SE-001	SE-002	SE-003	SE-004	SE-005
<u>Unknown Search</u>					
Ethanone (hydroxy, methoxy, dimethyl isomer)	--	--	16	--	--
1,2-Benzenedicarboxylic acid ester	--	--	6.5	--	--
Heptadecane isomer	--	--	--	--	0.11

Note: -- = Not detected.

Source: Hunter/ESE, 1989



3-20001 1-4  
10-11-81

Table 4 5-2 Sediment Constituents, KII Drainage Ditch in mg/kg

Constituent	SE-006	SE-007	SE-008	SE-009	SE-011
Oil and Grease	17590.0	576.0	893.0	769.0	471
Arsenic	1.35	21.3	50.3	14.7	11.1
Copper	76.0	14.3	88.6	29.3	11.1
Chromium	7.13	34.2	172.0	43.0	14.1
Benzo a anthracene	..	..	..	..	11
Benzo b fluoranthene	..	..	4.7	4.1	3
Benzo k fluoranthene	..	..	4.9	4.1	11
Pyrene	..	..	3.9	6.6	23
Chrysene	..	..	5.3	3.4	11
Fluoranthene	..	3.6	4.8	5.4	17
<u>Tentatively Identified Compounds</u>					
3-Hexadecyne	1.1	..	..	..	..
Sulfur	5.2	..	..	..	11
Benzene isomer	25.0	..	..	..	..
Decanedioic acid ester	0.63	..	..	..	..
Naphtho furan isomer	..	0.46	..	..	..
Phenanthrenecarbox-aldehyde isomer	..	0.66	..	..	..
9H-Fluorene, 9 methylene	..	0.83	3.3	..	11
Decene, dimethyl isomer	..	1.4	..	..	..

Table 4.5-2 Sediment Constituents, KII Drainage Ditch (in mg/kg)  
(Continued, Page 2 of 2)

Constituent	SE-006	SE-007	SE-008	SE-009	SE-010
<u>Unknown Search</u>					
2-Cyclopropen-1-one, 2,3-diphenyl	--	1.6	7.3	3.7	3.3
Benzo fluoranthene isomer	--	--	3.3	2.4	3.7
Benzo fluorene isomer	--	--	--	--	1.6
1,3-Benzenedicar- boxylic acid ester	--	--	1.5	--	--
Hexanedioic acid ester	--	--	1.5	0.79	--
Methyl diol isomer	--	--	--	0.53	--
Methyl pyrene isomer	--	--	--	--	4.3
Cyclopentaphenanthrene isomer	--	--	--	--	3.2

Note: -- = Not detected.

Source: Hunter/ESE, 1989.

Table - 3-3. Sediment Constituents, Northeast Marsh Area

Constituent (µg/kg)	SE-011	SE-012A	SE-012B	SE-013	SE-014A	SE-014B	SE-015A	SE-015B
Oil and Grease	6,880	251	123	311	531	170	455	242
Arsenic (total)	2.70	--	--	--	--	0.357	--	--
Copper (total)	7.91	--	--	--	--	--	0.967	--
Chromium (total)	9.53	--	1.06	--	--	8.83	1.66	--
Bis-(2-ethylhexyl) phthalate	--	1.2	1.6	1.3	1.2	1.5	--	--
Bis-(2-chloropropyl) ether	--	--	--	--	--	--	0.81	--
<u>Tentatively Identified Compounds</u>								
Phenanthrene	64	--	--	--	--	--	--	--
carboxaldehyde isomer	--	--	--	--	--	--	--	--
Unknown benzene isomer	67	--	--	--	--	--	--	--
Phenanthrene tetramethyl isomer	160	--	--	--	--	--	--	--
Phenanthrenecarboxylic acid isomer	33	--	--	--	--	--	--	--
Phenanthrenol	110	--	--	--	--	--	--	--
octahydro trimethyl isomer	--	--	--	--	--	--	--	--
Hexanedioic acid ester	120	0.70	--	--	--	--	--	--
Cyclopropane, octyl	--	0.29	--	--	--	--	--	--
Tetradecyne	--	0.16	--	--	--	--	--	--
Hexadecyne	--	1.0	1.9	0.45	--	2.3	4.9	1.9
Cyclopropane isomer	--	--	0.78	--	--	--	--	--
Dodecanediol	--	--	1.1	--	--	--	0.93	--
Octadecene	--	--	--	0.95	--	0.24	--	--
Eicosyne	--	--	--	0.52	--	0.49	--	--
Heptadecanol	--	--	--	--	0.78	--	1.4	0.35
Unknown decyne	--	--	--	--	0.43	--	--	1.0
Hexanedioic acid, dioctyl ester	--	--	--	--	0.64	0.95	4.3	--
Docosane	--	--	--	--	0.56	--	--	--
Methyl cyclopentane isomer	--	--	--	--	--	0.26	--	--
Unknown decanol	--	--	--	--	--	--	0.84	--
Octacosane isomer	--	--	--	--	1.9	--	--	0.19
Octacosane	--	--	--	--	--	--	--	0.13

Table 4.5-3. Sediment Constituents, Northeast Marsh Area (Continued, Page 2 of 2)

Constituent ( $\mu\text{g/kg}$ )	SE-011	SE-012A	SE-012B	SE-013	SE-014A	SE-014B	SE-015A	SE-015B
Decanol isomer	--	--	--	--	--	--	--	0.07
Heptadecanoic acid	--	--	--	1.3	1.4	--	2.2	--
Methylcyclohexane isomer	--	--	--	--	--	--	0.86	--
Phenanthrenecarboxylic acid ester	--	--	--	1.1	--	--	--	--
Hexadecanoic acid	--	--	0.68	--	--	--	--	--

Note:  $\mu\text{g/kg}$  = micrograms.  
-- = below detectable limits.

Source: Hunter/ESE, 1989.

## 6.2 Indicator Chemical Selection

The media of concern at this site are the soil, groundwater, surface water, sediment and air. Due to the number of constituents detected in these media, it was necessary to select a limited number of "indicator chemicals" on which to base the risk assessment. Compounds selected are the focus of the toxicity assessment exposure analysis, risk characterization and development of health based action levels.

All of the historical data was used to select the indicator chemicals; however, the risk calculations were based primarily on the analytical data collected for the supplemental RI. The selection process followed the one outlined in the Superfund Public Health Evaluation Manual, (1986).

It can be divided into the following four steps:

1. Determination of chemical concentrations and frequency of detection;
2. Identification of toxicity characteristics of detected chemicals;
3. Calculation of chemical toxicity (CT) and indicator score (IS) values; and
4. Selection of final indicator chemical.

Using this process, the following indicator chemicals were selected for the CC/K site:

- Arsenic
- Benzene
- Chromium (VI)
- Napthalene
- Potentially Carcinogenic  
Polynuclear Aromatic  
Hydrocarbons (PAHs)
- Noncarcinogenic PAHs
- Pentachlorophenol (PCP)
- Phenol

## 6.3 Exposure Assessment

### 6.3.1 Definition

Table 4.6.3 Air Constituent Concentration ( $\mu\text{g}/\text{m}^3$ )

Constituent ( $\mu\text{g}/\text{m}^3$ )	Station A (01)							Station A (02)							Station A (03)						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Acetophenone								0.10					0.24		0.024						
Acetylphenol								2.24					0.01		0.004						
Bis (2 ethyl- hexyl) phthalate	0.14	1.20		0.21	2.54	1.40	0.20	2.14	0.14	1.4	0.35	0.86			0.05	1.20	1.40	0.52			
Phenanthrene			0.014					0.06	0.06					0.004		0.05			0.12		
Naphthalene								0.074								0.414	0.29		0.11		
Hexanthrene	0.04				0.05		0.294					0.10	1.40	0.02	0.05			0.11	0.14	0.29	0.06
Diethylphthalate				0.014																0.074	
Fluorene					0.06	0.02	0.004						0.25	0.05	0.54						
BP								1.24													
Pyrene								0.124													
Arsenic	0.006	0.002	0.005	0.001	0.005	0.024	0.016	0.002	0.004	0.001								0.002	0.004		0.002
Chromium	0.007	0.001	0.006	0.001	0.001	0.0214	0.012	0.0074	0.001				0.002	0.001	0.001	0.002	0.0074	0.002	0.001	0.001	0.001
Copper	0.064	0.005	0.194	0.079	0.004	0.095	0.062	0.014	0.002				0.011	0.011	0.011	0.022	0.014	0.012	0.015	0.024	0.021

Note: - below detectable limits

Highest concentration day/station

Source: Baxter/ESE, 1989

An exposure pathway is the course a chemical agent takes from a source to an exposed population or individual (receptor). For the exposure pathway to be complete, the following four components must be present:

1. A source or release from a source
2. A likely environmental migration pathway
3. An exposure point where receptors may come into contact with the chemical agent
4. A route by which potential receptors would result in an intake of the chemical agent.

A screening of current potential exposure pathways was conducted; the RA focused only on the significant completed exposure pathways.

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### 6.3.2 Onsite Exposure Pathways to Workers

#### 6.3.2.1 Direct Contact

An important potential exposure pathway is direct contact of contaminated soil to uncovered skin surfaces. On the Koppers facility, potential worker exposure exists in two areas: the drip track areas; and the former lagoon and cooling pond areas. The majority of the contamination in the former lagoon and cooling pond areas is in the subsurface soils. Workers in the drip track areas are protected from direct contact by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) labeling which requires them to wear long pants, long-sleeved shirts and gloves as well as additional protective equipment. FIFRA contains a number of other requirements concerning worker safety and training that effectively prevents direct contact. OSHA regulations also provide protection to workers in both the drip track and former lagoon and cooling pond areas.

#### 6.3.2.2 Incidental Ingestion

The same FIFRA and OSHA regulations that effectively prevent the completion of the exposure pathway for direct contact also prevent the completion of the exposure pathway for incidental ingestion.

#### 6.3.2.3 Inhalation

As part of the supplemental RI, air samples were taken from three different areas on the Koppers site. All of sample results were well below the OSHA limits for worker exposure. Therefore, this pathway was not carried any further in the RA.

### 6.3.3 Potential Onsite Exposure Pathways to the General Public

#### 6.3.3.1 Direct Contact

Because a portion of the Koppers facility is fenced and has a locked gate, direct contact of the general public to source areas on the Koppers facility under the current land use scenario is expected to be infrequent. This pathway was not carried any further in the RA. However, public access to the soils in the former Carbon lagoons is unrestricted, this pathway was carried through the RA. The exposure concentrations selected were the highest observed surface soil concentrations observed in either the IT RI or the Hunter/ESE RI.

The direct contact scenario was based on a child visiting the site to play 36 days per year for six years. In addition, it was assumed that 50 percent of the time onsite would be in the contaminated area. The dermal absorption rates were 10 percent for semivolatile organic compounds, 25 percent for volatile organic compounds, 15 percent for chromium and 1 percent for other metals. The exposed skin surface area and body weight was assumed to be 2350 cm<sup>2</sup> and 35 kg, respectively. A soil ingestion rate of 100 mg per day was used for the ingestion pathway.

#### 6.3.3.2 Inhalation

Because site access is restricted for the Koppers site, this was not considered a completed pathway. The former Cabot Carbon lagoons are covered with moderate vegetation, a concrete foundation and a stormwater retention pond. For these reasons, the generation of dust is greatly inhibited. Therefore, this was also not considered a completed pathway.



#### 6.3.4 Potential Offsite Exposure Pathways to the General Public

##### 6.3.4.1 Direct Contact

There are two significant offsite exposure points for the general public: the North Main Street Ditch and the KII drainage ditch. Because both of these areas have unrestricted access, they were both retained as complete pathways for exposure to contaminated surface water and sediment. In addition to dermal contact, it was determined that children playing in the ditches could also incidentally ingest small quantities of contaminated sediment or surface water.

The exposure concentrations for surface water used for the North Main Street Ditch were the maximum observed values downgradient of the source areas and were taken from either the Hunter/ESE RI or IT RI. For sediment concentrations, the highest concentration from ESE location SE-004 and ITS-2 was used. These levels appeared to most closely represent the levels as observed during several sampling events. For the KII ditch, the highest observed concentration from the Hunter/ESE and the Koppers 1985 investigations were chosen. Due to the small number of detections, no surface water concentrations were calculated.

The direct contact exposure scenario assumes that a child (age 7 to 13 years) plays in or near Springstead Creek 2 times per week, averaging 30 minutes per event, for the 39 weeks that school is in session and 4 times per week averaging 1.5 hours per event for 13 weeks during the summer. It was also assumed that a child would spend 50 percent of this time playing in the area along the creek banks. The exposure frequency for the North Main Street Ditch were assumed to be 10 times per year for 2 hours per day. The skin surface area, body weight and absorption rates for dermal contact with sediments are the same as for the onsite direct contact with soil scenario.

The surface water absorption rate was based on the dermal permeability constant ( $K_p$ ) for each constituent. The sediment ingestion rate was assumed to be 100mg per day and the surface water ingestion rate was assumed to be 10 milliliters per event.

##### 6.3.4.2 Direct Ingestion of Aquatic Organisms

The intermittent flow and small size of the North Main Street Ditch, the KII drainage ditch and Springstead Creek, combined with their location in an industrial/high traffic area, make it highly unlikely that edible size fish would be caught near the site. This was not considered a complete exposure pathway.

#### 6.3.4.3 Inhalation

Due to the presence of moderately volatile constituents in the surface water and sediments of the two drainage ditches, this was retained as a completed exposure pathway.

The exposure frequency is the same as for the direct contact scenario for a child playing at the North Main Street Ditch, except it is assumed that the exposure is occurring 100 percent of the time that the child is in the area. The breathing rate is assumed to be  $2.1 \text{ m}^3/\text{hr}$ .

#### 6.3.4.4 Groundwater

There are currently no users of the shallow aquifer. In order to assess the potential risk of any future use, two hypothetical groundwater wells were selected. Because the indicator chemicals on the northern boundary of the site are different from the indicator chemicals on the eastern boundary of the site, a hypothetical well was located at both these points. The general procedure for estimating the potential current and future groundwater exposure concentrations was as follows:

- o Determination of plume characteristics;
- o Determination of equilibrium conditions between groundwater and soil at source areas;
- o Calculation of expected time of travel from source to receptor; and
- o Calculation of anticipated future exposure concentrations from dilution of source concentrations.

The groundwater exposure assumptions were for the daily consumption of 2 liters of water by a 70 kg person.

#### 6.3.5 Environmental Receptors Exposure Pathways

##### 6.3.5.1 Terrestrial Exposure

Organisms that live in, on, or above the land may be exposed to surficial soils (both dermally and by ingestion) and surface water (primarily as drinking water). Some terrestrial organisms also may consume affected plants or animals from either terrestrial or aquatic habitats; resulting in bioaccumulation of contaminants. A qualitative evaluation of these pathways was performed for various types of organisms found at the site.

#### 6.3.5.2 Aquatic Exposure

Aquatic biota may be exposed to constituents via water, sediment, or food. Organisms may be exposed via transfer from water across thin body membranes such as gills. This is the process of bioconcentration. This exposure pathway is limited by the chemicals' solubilities. Chemicals with low solubilities may adsorb preferentially to sediment particles. These may be ingested by organisms, and some portion of the chemical may be transferred to the organism via the gut. The assimilation efficiency depends on numerous variables such as bioavailability, lipid (fat) content of the organism, gut clearance time, etc. Finally, organisms may ingest affected prey. Bioaccumulation from food is dependent upon numerous factors, including the degree to which the chemical transfers to and remains in living tissue, the physiological rate constants governing uptake and depuration in the various organisms, the encounter rate of and concentration in affected prey, temperature, and other factors.

#### 6.3.6 Summary

As a result of the exposure pathway screening, the preliminary list has been reduced to the following five potentially complete exposure pathways:

1. Exposure by direct contact to onsite surface soils in old Cabot Carbon lagoons area,
2. Incidental ingestion of onsite surface soils in old Cabot Carbon lagoons area,
3. Inhalation of vapors in offsite ambient air,
4. Ingestion of groundwater, and
5. Exposure of receptors, both human and environmental, to affected surface water and sediments.

The RA addresses these five potential exposure pathways associated with the inactive onsite potential reception areas and the potential offsite.

The exposure point concentrations for these completed exposure pathways were then compiled.

#### 6.4 Toxicity Assessment

##### 6.4.1 Reference Doses

Reference doses (RfDs), also referred to as the acceptable daily intakes (ADIs), have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals

exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-days, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help insure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. The RfDs for the site contaminants of concern are contained in Table 8.3.1.

#### 6.4.2 Chronic Hazard Index (HI)

The chronic HI is a ratio of the lifetime average daily exposure of a noncarcinogenic chemical to the acceptable intake exposure level. If this ratio is greater than unity ( $>1$ ), then the lifetime average daily exposure has exceeded the acceptable intake exposure level, indicating that potential health hazardous exist (EPA, 1986a).

#### 6.4.3 Weight-of-Evidence Categories

The weight-of-evidence categories for potential carcinogens qualify the level of evidence that supports designating a chemical as a human carcinogen. Table Three contains a more detailed explanation of the categories.

#### 6.4.4 Carcinogenic Potency Factor

The carcinogenic potency factor (CPF) is used for estimating the lifetime (70 years) probability of a human contracting cancer caused by exposure to known or suspected human carcinogens. This factor is the slope of the cancer risk dose-response curve and is generally reported in  $(\text{mg/kg/day})^{-1}$ . This slope is determined through an assumed low-dosage linear relationship and extrapolation from high to low dose responses determined from human epidemiological studies or animal bioassays. The value used in reporting the slope factor is an upper 95-percent confidence limit on the probability of response per unit intake of a chemical over a lifetime, converting estimated intakes directly to incremental risk (EPA, 1986a). Use of this approach makes underestimation of the actual cancer risk highly unlikely. The CPFs for the site contaminants of concern can be found in Table 8.3.1

#### 6.5. Risk Characterization

TABLE THREE

EPA Weight of Evidence Categories

A Human Carcinogen

B1 or B2 Probable Human Carcinogen

B1 indicates human data available, B2 indicates  
sufficient animal and inadequate or no evidence  
in humans

C Possible Human Carcinogen

D Not Classifiable as to Human Carcinogenicity

E Evidence of Noncarcinogenicity in Humans

Table 8.3-1. Quantitative Evaluation of Indicator Chemicals at the Cabot Carbon/Koppers Site.

Constituent	EPA Weight-of- Evidence Category	Potential Carcinogens (mg/kg/day) <sup>1</sup>		Noncarcinogens (mg/kg/day)	
		CPF		ADI	
		Oral	Inhalation	Oral	Inhalation
Arsenic	A	1.75	50	--	--
Chromium (VI)*	A	--	41	0.005	--
Chromium (III)	D	--	--	1.0	0.0051
Potentially Carcinogenic PAHs	B2	11.5	6.11	--	--
Noncarcinogenic PAHs	D	--	--	0.006	0.006
Phenol	D	--	--	0.6	0.02
PCP	B2	1.00	--	--	--
Naphthalene	--	--	--	0.41	0.41

Note: ADI = acceptable daily intake.  
CPF = cancer potency factor.  
mg/kg/day = milligrams per kilogram per day.  
-- = does not apply to specific contaminant.

\*Of the total chromium detected at the site, the more potentially toxic hexavalent form [Cr(VI)] was used in this RA for conservative purposes (to protect human health), even though Cr(III) is the more stable and less toxic form of chromium in the environment.

Sources: Hunter/ESE, 1989.

### 6.5.1 Introduction

Excess lifetime cancer risks are determined by multiplying the intake level with the CPF. These risks are probabilities that are generally expressed in scientific notation (e.g.  $1 \times 10^{-6}$ ). An excess lifetime cancer risk of  $1 \times 10^{-6}$  indicates that, as a plausible upper bound, an individual has a one in a million chance of developing cancer as a result of a site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the site. The Agency considers individual excess cancer risks in the range of  $10^{-4}$  to  $10^{-6}$  as protective; however, the  $10^{-6}$  risk level is generally used as the point of departure for the setting of cleanup criteria at Superfund sites.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

This risk characterization was performed in a two stage process. The first stage was performed using the highest concentration to calculate the risk. If this risk exceeded the  $10^{-6}$  risk range, then a second calculation was made using representative concentrations. Because the target organ for arsenic (a carcinogen) is different from the target organs of the other carcinogens, the risk for arsenic was calculated separately. The risks to human health are discussed independently for potentially carcinogenic and noncarcinogenic constituents.

### 6.5.2 Risk Results

The results of the risk characterization indicate that unacceptable cancer risk levels are associated with the ingestion of shallow groundwater from the northern and eastern hypothetical wells for both the current and future use scenarios. In addition, the representative concentration HIs exceed unity for the northern well (current and future scenarios) and for the future scenario for the eastern well. The risk characterization information is summarized in Tables 9.2.6 through 9.2.9.

The cumulative risk for the northern hypothetical well resulting from the representative exposure point concentrations was  $9.9 \times 10^{-3}$  for the current scenario and  $1.8 \times 10^{-2}$  for the

Table 9.2-6. Risk Characterization Associated with Potential Shallow Groundwater Uses at the Northern Hypothetical Well (Current Scenario)

Constituent	Upper Bound			Representative		
	Dose (mg/kg/day)	Cancer Risk	HI	Dose (mg/kg/day)	Cancer Risk	HI
Arsenic	$8.57 \times 10^4$	$1.50 \times 10^3$		$5.23 \times 10^4$	$9.15 \times 10^4$	
Background arsenic	$5.71 \times 10^5$	$1.00 \times 10^4$		$5.71 \times 10^5$	$1.00 \times 10^4$	
Chromium (VI)	$4.00 \times 10^3$		$8.00 \times 10^1$	$1.62 \times 10^3$		$3.24 \times 10^1$
Background chromium (VI)	$3.54 \times 10^3$		$7.08 \times 10^1$	$3.54 \times 10^3$		$7.08 \times 10^1$
Total potentially carcinogenic PAHs	$2.57 \times 10^4$	$2.96 \times 10^3$		$2.10 \times 10^4$	$2.41 \times 10^3$	
Total noncarcinogenic PAHs	$7.97 \times 10^3$		$1.32 \times 10^0$	$6.69 \times 10^3$		$1.11 \times 10^0$
Naphthalene	$1.83 \times 10^2$		$4.46 \times 10^2$	$8.06 \times 10^3$		$1.97 \times 10^2$
PCP	$1.49 \times 10^2$	$1.49 \times 10^2$		$7.51 \times 10^3$	$7.51 \times 10^3$	
Phenol	$8.66 \times 10^3$		$1.44 \times 10^2$	$8.66 \times 10^3$		$1.44 \times 10^2$
Benzene	$2.86 \times 10^4$	$8.29 \times 10^6$		$2.86 \times 10^4$	$8.29 \times 10^6$	
Background benzene	$4.00 \times 10^3$	$1.16 \times 10^4$		$4.00 \times 10^3$	$1.16 \times 10^4$	
TOTAL CANCER RISK FROM ARSENIC (Without Background)		$1.40 \times 10^3$			$8.15 \times 10^4$	
TOTAL CANCER RISK FROM POTENTIALLY CARCINOGENIC PAHs AND PCP		$1.79 \times 10^2$			$9.93 \times 10^3$	
TOTAL HI (Without Background Chromium)			$1.47 \times 10^0$			$1.14 \times 10^0$

Note: HI - hazard index.  
mg/kg/day - milligrams per kilogram per day.  
( ) - number of years for future concentration to arrive at hypothetical well.

Source: Hunter/ESE, 1989



Table 9.2-7. Risk Characterization Associated with Shallow Groundwater Uses at the Northern Hypothetical Well (Future Scenario)

Constituent	Representative Future		
	Dose (mg/kg/day)	Cancer Risk	HI
Arsenic	$8.29 \times 10^{-3}$	$1.45 \times 10^{-2}$	
Background arsenic	$5.71 \times 10^{-5}$	$1.00 \times 10^{-4}$	
Chromium (VI)	$4.00 \times 10^{-3}$		$8.00 \times 10^{-3}$
Background chromium (VI)	$3.54 \times 10^{-3}$		$7.08 \times 10^{-3}$
Total potentially carcinogenic PAHs	$2.57 \times 10^{-4}$	$2.96 \times 10^{-3}$	
Total noncarcinogenic PAHs	$6.91 \times 10^{-3}$		$1.15 \times 10^0$ (99)
Naphthalene	$9.37 \times 10^{-2}$		$2.28 \times 10^0$ (37)
PCP	$1.49 \times 10^{-2}$	$1.49 \times 10^{-2}$	
Phenol	$1.43 \times 10^{-2}$		$2.33 \times 10^{-2}$ (26)
Benzene	$2.86 \times 10^{-4}$	$8.29 \times 10^{-6}$	
Background benzene	$4.00 \times 10^{-3}$	$1.16 \times 10^{-5}$	
TOTAL CANCER RISK FROM ARSENIC (Without Background)		$1.45 \times 10^{-2}$	
TOTAL CANCER RISK FROM POTENTIALLY CARCINOGENIC PAHs AND PCP		$1.79 \times 10^{-2}$	
TOTAL HI (Without Background Chromium)			$1.49 \times 10^0$

Note: HI = hazard index.  
mg/kg/day = milligrams per kilogram per day.  
( ) = number of years for future concentration to arrive at  
hypothetical well.

\*HI in 70 years (includes the worst-case assumption that total  
noncarcinogenic PAHs will be observed in 70 years).

Source: Hunter/ESE, 1989.

Table 9.2-8. Risk Characterization Associated with Potential Shallow Groundwater Uses at the Eastern Hypothetical Well (Current Scenario)

Constituent	Upper Bound			Representative		
	Dose (mg/kg/day)	Cancer Risk	HI	Dose (mg/kg/day)	Cancer Risk	HI
Arsenic	$2.85 \times 10^{-4}$	$4.99 \times 10^{-4}$		$1.48 \times 10^{-4}$	$2.59 \times 10^{-4}$	
Background arsenic	$5.71 \times 10^{-5}$	$1.00 \times 10^{-4}$		$5.71 \times 10^{-5}$	$1.00 \times 10^{-4}$	
Chromium (VI)	$5.71 \times 10^{-3}$		$1.14 \times 10^0$	$2.76 \times 10^{-3}$		$5.52 \times 10^{-1}$
Background chromium (VI)	$3.54 \times 10^{-3}$		$7.08 \times 10^{-1}$	$3.54 \times 10^{-3}$		$7.08 \times 10^{-1}$
Total noncarcinogenic PAHs	$1.14 \times 10^{-3}$		$1.90 \times 10^{-1}$	$1.14 \times 10^{-3}$		$1.90 \times 10^{-1}$
Naphthalene	$4.00 \times 10^{-3}$		$9.76 \times 10^{-3}$	$1.66 \times 10^{-3}$		$4.05 \times 10^{-3}$
Phenol	$3.14 \times 10^{-1}$		$5.23 \times 10^{-1}$	$1.43 \times 10^{-1}$		$2.38 \times 10^{-1}$
PCP	$2.77 \times 10^{-3}$	$2.77 \times 10^{-3}$		$2.77 \times 10^{-3}$	$2.77 \times 10^{-3}$	
Benzene	$3.71 \times 10^{-3}$	$1.08 \times 10^{-4}$		$1.55 \times 10^{-3}$	$4.50 \times 10^{-5}$	
Background benzene	$4.00 \times 10^{-3}$	$1.16 \times 10^{-4}$		$4.00 \times 10^{-3}$	$1.16 \times 10^{-4}$	
TOTAL CANCER RISK FROM ARSENIC (Without Background)		$3.99 \times 10^{-4}$			$1.59 \times 10^{-4}$	
TOTAL CANCER RISK FROM PCP		$2.77 \times 10^{-3}$			$2.77 \times 10^{-3}$	
TOTAL HI (Without Background Chromium)			$1.15 \times 10^0$			$4.32 \times 10^{-1}$

Note: HI - hazard index.  
mg/kg/day - milligrams per kilogram per day.

Source: Hunter/ESE, 1989.

Table 9.2-9. Risk Characterization Associated with Potential Shallow Groundwater Uses at the Eastern Hypothetical Well (Future Scenario)

Constituent	Representative		
	Dose (mg/kg/day)	Cancer Risk	HI
Arsenic	$2.85 \times 10^{-4}$	$4.99 \times 10^{-6}$	
Background arsenic	$5.71 \times 10^{-3}$	$1.00 \times 10^{-6}$	
Chromium (VI)	$5.71 \times 10^{-3}$		$1.14 \times 10^{-3}$
Background chromium (VI)	$3.54 \times 10^{-3}$		$7.08 \times 10^{-3}$
Total noncarcinogenic PAHs	$1.14 \times 10^{-3}$		$1.90 \times 10^{-3}$
Naphthalene	$3.89 \times 10^{-2}$		$9.49 \times 10^{-2}$ (100)
Phenol	$3.14 \times 10^{-3}$		$5.23 \times 10^{-3}$
PCP	$2.77 \times 10^{-3}$	$2.77 \times 10^{-3}$	
Benzene	$3.71 \times 10^{-3}$	$1.08 \times 10^{-6}$	
Background benzene	$4.00 \times 10^{-3}$	$1.15 \times 10^{-6}$	
TOTAL CANCER RISK FROM ARSENIC (Without Background)		$3.99 \times 10^{-6}$	
TOTAL CANCER RISK FROM PCP		$2.77 \times 10^{-3}$	
TOTAL HI (Without Background Chromium)			$1.24 \times 10^{-3}$

Note: HI = hazard index.  
mg/kg/day = milligrams per kilogram per day.  
( ) = number of years for future concentration to arrive at hypothetical well.

\*HI in 70 years (includes the worst-case assumption that naphthalene will be observed in 70 years).

Source: Hunter/ESE, 1989.

future scenario. The main contributors to the cancer risk levels are arsenic, carcinogenic PAHs and PCP. In addition, the cumulative HI exceeds unity for the representative concentrations, for the northern hypothetical well for both current and future scenarios. The HIs for the current and future scenarios are 1.1 and 1.5 respectively. Chromium and noncarcinogenic PAHs are the main contributors to the HI.

The cancer risk levels for the eastern hypothetical well exceed the  $10^{-4}$  risk level for arsenic and PCP for both the current and future scenarios. The highest risk levels are associated with the future scenario, with a risk level of  $4 \times 10^{-4}$  for arsenic and  $2 \times 10^{-3}$  for PCP. The main contributors to the HI are chromium, noncarcinogenic PAHs and phenols.

The risk characterization for the exposure scenarios for direct contact with soils at the Cabot lagoons area and the surface water and sediments in the North Main Street Ditch indicate that the cancer risk levels and the noncarcinogenic PAHs are below acceptable levels.

The risk levels associated with direct contact with surface water in Springstead Creek are in the  $10^{-6}$  range due to arsenic ( $1.3 \times 10^{-6}$ ) and carcinogenic PAHs and PCP ( $5.01 \times 10^{-6}$ ). The risk levels associated with sediment contact in this creek are also fall within the risk range due to arsenic ( $2.0 \times 10^{-6}$ ) and carcinogenic PAHs ( $2.6 \times 10^{-5}$ ). The HIs for contact with the surface water and sediments in Springstead Creek are all below unity. The risk levels for these scenarios are summarized in Tables 9.2.2-3.

### 6.5.3 Environmental Risks

The environmental exposure pathway of the most potential significance is the exposure of aquatic life in the Springstead Creek and the North Main Street Ditch to contaminants in the surface water and sediments. The ecological assessment concluded that in general, although acute responses are unlikely based on ecotoxicity benchmark concentrations and the upper bound exposures point concentrations, the potential exists for adverse chronic effects to individuals inhabiting these locations.

An estimate of the environmental risk to aquatic organisms was obtained by comparing the estimated environmental concentrations (EEC) with the toxicity of the chemicals using selected ecotoxicity benchmarks. The resulting toxicity quotients can be used to evaluate the potential for an adverse effect. The toxicity quotients indicate that aquatic organisms may be adversely impacted due to arsenic in Springstead Creek, chromium in the North Main Street Ditch and PCP and PAHs in both Ditch and creek.

Table 9.2-2. Risk Characterization of Potential Human Exposure to Surface Water in Springstead Creek

Constituent	Exposure Pathway	Upper Bound		HI
		Dose (mg/kg/day)	Cancer Risk	
Arsenic	Dermal Absorption	$5.75 \times 10^{-6}$	$1.01 \times 10^{-7}$	
	Incidental Ingestion	$6.79 \times 10^{-7}$	$1.19 \times 10^{-6}$	
	SUBTOTAL		$1.29 \times 10^{-6}$	
Total Potentially Carcinogenic PAHs	Dermal Absorption	$3.68 \times 10^{-6}$	$4.23 \times 10^{-6}$	
	Incidental Ingestion	$4.36 \times 10^{-6}$	$5.01 \times 10^{-7}$	
	SUBTOTAL		$5.43 \times 10^{-7}$	
Total Noncarcinogenic PAHs	Dermal Absorption	$6.50 \times 10^{-6}$		$1.08 \times 10^{-3}$
	Incidental Ingestion	$7.75 \times 10^{-7}$		$1.29 \times 10^{-3}$
	SUBTOTAL			$1.40 \times 10^{-3}$
Naphthalene	Dermal Absorption	$1.30 \times 10^{-7}$		$2.93 \times 10^{-3}$
	Incidental Ingestion	$1.43 \times 10^{-6}$		$3.49 \times 10^{-3}$
	SUBTOTAL			$3.78 \times 10^{-3}$
Phenol	Dermal Absorption	$3.09 \times 10^{-6}$		$5.15 \times 10^{-3}$
	Incidental Ingestion	$3.58 \times 10^{-6}$		$5.97 \times 10^{-3}$
	SUBTOTAL			$5.75 \times 10^{-3}$
PCP	Dermal Absorption	$4.01 \times 10^{-6}$	$4.01 \times 10^{-6}$	
	Incidental Ingestion	$4.62 \times 10^{-7}$	$4.52 \times 10^{-7}$	
	SUBTOTAL		$4.47 \times 10^{-6}$	
	TOTAL CANCER RISK FROM ARSENIC		$1.29 \times 10^{-6}$	
	TOTAL CANCER RISK FROM POTENTIALLY CARCINOGENIC PAHs AND PCPs		$5.01 \times 10^{-6}$	
	TOTAL HI			$7.19 \times 10^{-3}$

Note: HI = Hazard Index.  
mg/kg/day = milligrams per kilogram per day.

Source: Hunter/ESE, 1989.

Table 9.2-3. Risk Characterization of Potential Human Exposure to Sediments in Springstead Creek

Constituent	Exposure Pathway	Upper Bound			Representative		
		Dose (mg/kg/day)	Cancer Risk	HI	Dose (mg/kg/day)	Cancer Risk	HI
Arsenic	Dermal Absorption	$5.14 \times 10^7$	$9.00 \times 10^7$		$2.13 \times 10^7$	$3.73 \times 10^7$	
	Incidental Ingestion	$2.20 \times 10^6$	$3.86 \times 10^6$		$9.11 \times 10^7$	$1.59 \times 10^6$	
	SUBTOTAL		$4.76 \times 10^6$			$1.96 \times 10^6$	
Chromium (VI)	Dermal Absorption	$3.06 \times 10^4$		$6.12 \times 10^2$	$8.03 \times 10^5$		$1.61 \times 10^4$
	Incidental Ingestion	$8.74 \times 10^6$		$1.75 \times 10^2$	$2.28 \times 10^6$		$4.56 \times 10^4$
	SUBTOTAL			$7.87 \times 10^2$			$2.07 \times 10^2$
Total Potentially Carcinogenic PAHs	Dermal Absorption	$4.39 \times 10^6$	$5.05 \times 10^5$		$1.61 \times 10^6$	$1.85 \times 10^6$	
	Incidental Ingestion	$1.87 \times 10^6$	$2.15 \times 10^5$		$6.89 \times 10^7$	$7.92 \times 10^6$	
	SUBTOTAL		$7.20 \times 10^5$			$2.64 \times 10^6$	
Total Noncar- cinogenic PAHs	Dermal Absorption	$8.17 \times 10^5$		$1.36 \times 10^2$	$1.94 \times 10^5$		$3.23 \times 10^4$
	Incidental Ingestion	$3.50 \times 10^5$		$5.81 \times 10^3$	$8.28 \times 10^6$		$1.38 \times 10^3$
	SUBTOTAL			$1.94 \times 10^2$			$4.61 \times 10^3$
	TOTAL CANCER RISK FROM ARSENIC		$4.76 \times 10^6$			$1.96 \times 10^6$	
	TOTAL CANCER RISK FROM POTENTIALLY CARCINOGENIC PAHs		$7.20 \times 10^5$			$2.64 \times 10^6$	
	TOTAL HI			$9.81 \times 10^2$			$2.53 \times 10^2$

Note: HI = Hazard Index.

mg/kg/day = milligrams per kilogram per day.

Source: Hunter/ESE, 1989.

The environmental assessment predicts that, while temporal changes may occur in the aquatic system, future impacts that may occur at the site will not be observable for the following reasons:

- o The aquatic areas consist of man-made ditches that do not always contain sufficient amounts of water needed to support aquatic organisms during all developmental stages:
- o These areas are small relative to the contiguous aquatic habitat in areas further from the site, which suggests that for populations inhabiting these areas, only a small number of individuals within the population would be potentially exposed to any of the site contaminants.

Therefore, although the risk of potential adverse effects to individuals inhabiting these locations exists, it is unlikely to subsequently produce a potential measurable effect on the population as a whole. This is especially true because the potentially effected areas are not major sites for reproduction.

## 6.6 Feasibility Study Risk Results

### 6.6.1 Explanation

Another evaluation of risk was performed in the FS. This additional work focused on the risk concerning the subsurface soils in the general area of the North Main Street Ditch. The reason that this was done was because the Florida Department of Transportation may, at some future date, do some excavation work in the widening of North Main Street.

### 6.6.2 Risk Analysis for FDOT Workers During Soil Excavation

For this scenario, both maximum and representative soil concentrations were used. Exposure assumptions were based on FDOT's estimation of on how long the road widening would take. Based on these assumptions, the HI and potential risks associated with short term worst case worker exposure are within EPA acceptable limits. The results can be found in Table A-2.

### 6.6.3 Risk Analysis for Offsite Disposal of Soils from North Main Street Ditch

The risk posed by offsite disposal of soils excavated during the widening of North Main Street was assessed. A worst case scenario was developed where the soils would be deposited in a residential area and potential exposure to children would result. Risk ranges and HI again indicated that the risks were within acceptable EPA limits. The results can be found in Table A-3.

TABLE A-3. RESIDENTIAL DERMAL AND ORAL EXPOSURE TO NORTH MAIN STREET EXCAVATED SOILS: MAXIMUM SOIL CONCENTRATIONS

Constituent	Soil Concentration(a)	Exposure Level(c)		RID(d)	CPI(e)	Hazard Index		Potential Carcinogenic Risk		Total HI	Total Potential Carcinogenic Risk
		Dermal	Oral			Dermal	Oral	Dermal	Oral		
Potential Carcinogens											
Arsenic	6.26E-01	4.06E-08	8.63E-08	--	1.75E+00	--	--	7.10E-08	1.51E-07	--	2.22E-07
Benzene	4.20E-02	6.80E-08	5.79E-09	--	2.90E-02	--	--	1.97E-09	1.68E-10	--	2.14E-09
Carcinogenic PAHs	9.40E+00 (b)	6.09E-06	1.30E-06	--	1.15E+01	--	--	7.01E-05	1.50E-05	--	8.50E-05
Pentachlorophenol	5.00E-01	3.24E-07	6.89E-08	--	1.00E+00	--	--	3.24E-07	6.89E-08	--	3.93E-07
Noncarcinogens											
Acenaphthene	5.40E+00	2.72E-05	5.79E-06	6.00E-02	--	4.54E-04	9.65E-05	--	--	5.50E-04	--
Acenaphthylene	8.20E+00	4.13E-05	8.79E-06	3.00E-02	--	1.38E-03	2.93E-04	--	--	1.67E-03	--
Anthracene	5.00E-01	2.52E-06	5.36E-07	3.00E-01	--	8.40E-06	1.79E-06	--	--	1.02E-05	--
Benzo(ghi)perylene	5.00E-01	2.52E-06	5.36E-07	3.00E-02	--	8.40E-05	1.79E-05	--	--	1.02E-04	--
Chromium	1.71E+01	1.29E-04	1.83E-05	5.00E-03	--	2.59E-02	3.67E-03	--	--	2.95E-02	--
Fluoranthene	1.30E+00	6.55E-06	1.39E-06	4.00E-02	--	1.64E-04	3.49E-05	--	--	1.99E-04	--
Fluorene	1.10E+00	5.54E-06	1.18E-06	4.00E-02	--	1.39E-04	2.95E-05	--	--	1.68E-04	--
Naphthalene	2.60E+01	1.31E-04	2.79E-05	4.00E-03	--	3.28E-02	6.97E-03	--	--	3.97E-02	--
Phenanthrene	1.70E+01	8.57E-05	1.82E-05	4.00E-02	--	2.14E-03	4.56E-04	--	--	2.60E-03	--
Phenol	5.00E-01	2.52E-06	5.36E-07	6.00E-01	--	4.20E-06	8.94E-07	--	--	5.09E-06	--
Pyrene	3.10E+00	1.56E-05	3.32E-06	3.00E-02	--	5.21E-04	1.11E-04	--	--	6.32E-04	--
TOTAL:						6.35E-02	1.17E-02	7.05E-05	1.51E-05	7.52E-02	8.56E-05 (f)

- Note:
- a - all soil concentrations, except potentially carcinogenic PAHs, are the maximum detected concentration or 1/2 the reported detection limit if the chemical was not detected (mg/kg)
  - b - the soil concentration for potentially carcinogenic PAHs is a total of the maximum detected concentration and 1/2 the reported detection limit for those of the seven potentially carcinogenic PAHs not detected (mg/kg)
  - c - exposure levels are derived using the formulas presented in Table A-1 (mg/kg/day)
  - d - risk reference dose (mg/kg/day)
  - e - carcinogenic potency factor ((mg/kg/day)<sup>-1</sup>)
  - f - the potential carcinogenic risk posed by arsenic is not included in the total potential carcinogenic risk since arsenic has a different target organ.



## 7.0 CLEANUP CRITERIA

### 7.1 Introduction

There are 3 sets of cleanup criteria for this site: soil, surface water and groundwater. The remainder of this chapter further explains the development and selection of the cleanup criteria.

### 7.2 Groundwater Cleanup Criteria

Separate health based groundwater cleanup criteria were initially developed for the surficial aquifer at the north and east hypothetical well locations based on the assumptions developed during the risk assessment. The more stringent criteria for each indicator chemical was then selected to comprise the list of cleanup criteria to be applied at the site. In determining the individual cleanup criteria, the additive risk posed by the simultaneous exposure to multiple contaminants was incorporated. The cleanup goals for PAHs are based on health based levels. Because carcinogenic PAHs are evaluated as a separate class, the cleanup goals did not change from the preliminary to the final evaluation.

Potential exposure to the noncarcinogens naphthalene, phenol, and noncarcinogenic PAHs may occur at the northern site boundary. The noncarcinogenic PAHs are the source of virtually all the potential endangerment at this boundary. Reduction of all eight noncarcinogenic constituents (excluding chromium) to the preliminary remedial action objectives presented in Table 1.1-4 will result in a total HI of 1.0, based on the assumption that each noncarcinogen (excluding chromium) contributes one-eighth of the overall HI of 1.

Simultaneous hypothetical exposure to noncarcinogens at the eastern site boundary is based on the upper bound worst-case exposure scenario, which assumes that the highest observed concentration of phenol. The majority of the potential future risk, excluding chromium, is contributed by phenol and naphthalene. Noncarcinogenic PAHs were not detected above quantification limits at the eastern site boundary in either of the previously conducted RIs. Additionally, the environmental fate-and-transport analyses conducted in the RA indicate that noncarcinogenic PAHs observed elsewhere onsite are expected to remain the same or decrease in concentration with time. Reduction of all six noncarcinogenic constituents (excluding chromium) to the preliminary remedial action objectives presented in Table 1.1-4 will result in a total HI of 1.0, based on the assumption that each noncarcinogen (excluding chromium) contributes one sixth of the overall HI of 1. Therefore, the

values presented in Table 1.1-4 are selected as the preliminary remedial action objectives for phenol and noncarcinogenic PAHs at the eastern site boundary.

If chromium is included along with the noncarcinogenic constituents in the simultaneous hypothetical exposure scenarios, the overall HIs become 1.28. This value slightly exceeds unity due to the conservative assumption (to protect public health) that all the chromium present in groundwater is in the more potentially toxic hexavalent form. However, this approach is very conservative because in the natural environment both hexavalent and trivalent are present, with trivalent being the most stable form. Therefore, the actual overall HI is most likely to be closer to unity for both hypothetical exposure scenarios, as the more stable trivalent form of chromium is less toxic and is expected to be present at the site.

In addition to the indicator chemicals mentioned previously, one additional chemical was added: benzene. Although no specific onsite source of benzene was found during previous investigations, the pattern of groundwater contamination indicates that there is a source of benzene on the site. The cleanup criteria of 1 ug/l is based on the state ARAR.

A conservative approach was utilized in this study to ensure that the target risk will not be exceeded if the remedial action objectives are attained. As the relative proportion of the constituents will change throughout remediation, the concentrations of certain constituents may become negligible by default. Because of this change, a reassessment of the remedial action objectives may be warranted in the future. The final cleanup criteria can be found in Table One.

### 7.3 Soils Cleanup Criteria

The initial soils cleanup criteria were developed based on protection to groundwater. They were back calculated from the groundwater cleanup criteria such that the presence of site constituent concentrations at or below the soil cleanup criteria would not result in groundwater concentrations higher than the cleanup criteria. These calculations take into account both retardation ( $K_d$ ) and dilution factors and is described in more detail in Appendix B of the FS.

The soil cleanup criteria determined to be protective of groundwater were then subjected to the human health risk assessment process. The risk calculations were based on ingestion as the worst case exposure. The assumption was that the site could be used as a residential area in the future so appropriate cleanup criteria should be protective of that potential use. The site is bordered to the immediate west by single and multi-family use housing, which is zoned

Table 1.1-4. Groundwater Remedial Action Objectives ( $\mu\text{g/L}$ ) for the Cabot Carbon/Koppers Site

Site Constituent	Northern* Boundary	Eastern Boundary
Total Potentially Carcinogenic PAHs	0.003	0.003
<u>Non-Carcinogenic PAHs</u>		
Anthracene	1,310	1,750
Phenanthrene	130	175
Acenaphthylene	130	175
Acenaphthene	260	350
Fluorene	180	+
Pyrene	130	+
Naphthalene	18	23
<u>Phenols</u>		
Phenol**	2,630	3,500
Pentachlorophenol	0.1	0.1
<u>Metals</u>		
Chromium	50↔	50↔
Arsenic	50	50

\* The remedial action objectives for the northern boundary are selected as the site-wide groundwater remedial action objectives.

+ Not present at the east boundary.

\*\*Based on apportioning an equal fraction of the target HI(1) to each noncarcinogen identified at the eastern and northern boundary (excluding chromium).

↔The proposed MCL of 120  $\mu\text{g/L}$ , when finalized, will replace 50  $\mu\text{g/L}$  as the remedial action objective.

Source: ESE, 1990.

TABLE ONE  
Groundwater Cleanup Criteria

<u>Site Contaminant</u> <u>(ug/l)</u>	<u>Cleanup Criteria</u>
Anthracene	1310
Phenanthrene	130
Acenaphthylene	130
Acenaphthene	260
Fluorene	323
Pyrene	130
Napthalene	18
Potentially Carcinogenic PAHs	0.003
Phenol	2,630
Pentachlorophenol	0.1
Arsenic	50
Chromium	50
Benzene	1

residential. It is possible that the plant could relocate and that land use may change.

Based on the results of this future land use scenerio, cleanup goals for three of the indicator chemicals, naphthalene, pyrene, and flourine, were lowered in order for the risk to be within acceptable EPA risk ranges. Final cleanup criteria are identified in Table Two.

#### 7.4 Surface Water Cleanup Criteria

Surface water cleanup criteria of 1 ug/L was selected for phenols in Springstead Creek. This criteria is based on Florida's Ambient Water Quality Criteria for the protection of aquatic life. The selected compliance point for the surface water standard to be met can be seen in Figure 4.1-1. The Agency is to meet the phenol criteria at this compliance point without the continued use of Project Jumpstart. Because the surface water contamination is a result of leachate from the groundwater, surface water criteria cannot be met without the continued operation of a groundwater remediation system.

### 8.0 SUMMARY OF ALTERNATIVES

#### 8.1 Areas to Be Remediated

The source areas selected for remediation are selected based on comparison of levels of contamination in the soils to the soils cleanup criteria and include the North Lagoon, the South Lagoon, the Cooling Pond and the drip track areas. These areas are located on the Koppers facility. The levels of contamination in the other source areas investigated; the Wood Shavings area, the old Cabot Carbon Lagoons, and the wetlands/lagoon area near North Main Street, were also compared to the soils cleanup criteria. While downgradient groundwater quality data near the old Cabot lagoons and the wetlands/lagoon area near North Main Street suggest that these areas may be acting as a source, recent RI soil data indicated that soils in these lagoon areas were below soil cleanup criteria. Likewise, contamination above the groundwater cleanup criteria attributable to the onsite source areas was found in the shallow aquifer both onsite and immediately downgradient of the site east of North Main Street. Volatile organic contamination, along with phenols (below cleanup criteria), was observed in one intermediate aquifer well centrally located onsite. Contamination in this aquifer may not be related to the site and appears to be limited in extent. Phenol contamination was found in the surface water in the North Main Street Ditch; which drains into Springstead Creek, (legally a waters of the State). An initial screening of technologies was done.

TABLE TWO  
Soil Cleanup Criteria

<u>Site Contaminant</u> <u>(mg/kg)</u>	<u>Cleanup Criteria</u>
Anthracene	7,700
Phenanthrene	770
Acenaphthylene	72.3
Acenaphthene	389
Fluorene	323
Pyrene	673
Napthalene	211
Potentially Carcinogenic PAHs	0.59
Phenol	4.28
Pentachlorophenol	2.92
Arsenic	27
Chromium	92.7

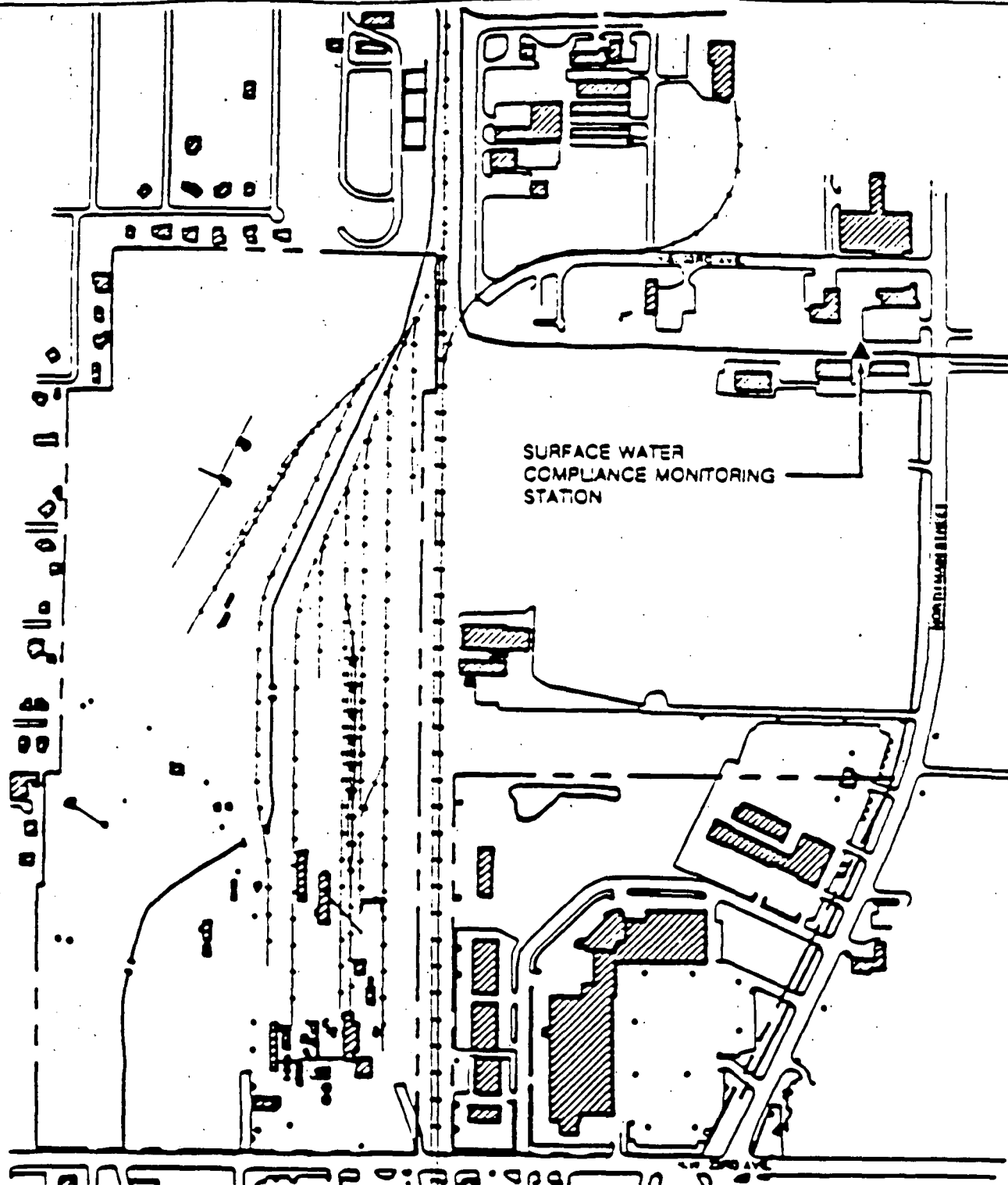


FIGURE 4.1-1  
SURFACE WATER COMPLIANCE  
MONITORING STATION

SOURCE: ERM, 1997; EPA, 1998

CABOT CARBON/KOPPERS

Feasibility Study

## 8.2 Summary of Remedial Alternatives

The alternatives evaluated in this chapter can be divided into two main groups: the source control alternatives; and the management of migration alternatives. The results can be loosely lumped into six categories: no-action; institutional controls; containment; removal; treatment or disposal. Table 2.3-5 contains the technologies that passed the initial technology screening.

From this list, a number of remedial alternatives were developed. That list can be found in Table 3.2-1. A table containing a summary of the remedial alternative costs can be found in ~~Table 3.2-2.~~ Following is a summary of the developed remedial alternatives.

### 8.2.1 No Action--Monitoring (Alternative 1A)

The no action alternative involves only the long-term monitoring of five monitoring wells on the site. No action is taken with regard to the source areas. Sampling frequency is quarterly for the first year and semiannually thereafter.

### 8.2.2 Limited Action--Water Use Restrictions (Alternative 1B)

Water use restrictions will be implemented for the shallow and intermediate aquifers on both the site and properties that may be potentially affected downgradient of the Cabot Carbon/Koppers site. The water use restrictions will prohibit the use of any residential or other shallow aquifer well identified in the affected area (i.e., one-half mile downgradient) as a potable water source. Additional restrictions may be imposed on future well construction in the affected area.

This limited action alternative also involves the long-term monitoring of five monitoring wells on the site. Sampling frequency is assumed to be quarterly for the first year and semi-annually thereafter.

### 8.2.3 Groundwater Extraction and Treatment (Alternative 2)

This alternative consists of groundwater extraction, and treatment at the publically owned treatment works (POTW) operated by the Gainesville Regional Utility (GRU). A groundwater extraction system will recover affected groundwater. System design will initially consider the use of various extraction systems, such as extraction wells or linear drainage technologies. The design phase will also consider



Table 2.3-5. Summary of Process Options Retained for Further Analysis

Response Action	Technology Type	Process Options	Process Option Retained as Representative Technology
<u>Groundwater Migration Management</u>			
No Action	None	Monitoring	Monitoring
Limited Action	Institutional	Long-Term Monitoring Water Use Restriction	Long-Term Monitoring Water Use Restriction
Collection	Groundwater Extraction	Extraction Wells Linear Drains	Extraction Wells Linear Drains
Containment	Slurry Wall	Soil-Bentonite Cutoff Wall	Soil-Bentonite Cutoff Wall
Treatment	Physical/Chemical Biological Treatment	Air Stripping Activated Carbon Steam Stripping POTW	POTW
<u>Source Control</u>			
No Action	None	Monitoring	Monitoring
Containment	Capping	Non-RCRA Caps	Asphalt Cap
	Onsite Landfill	RCRA-type Landfill	RCRA-type Landfill
Removal	Excavation	Excavation Dredging	Excavation Dredging
Treatment	Physical Treatment	Solidification/ Stabilization Soil Washing	Solidification/ Stabilization Soil Washing
	<u>In Situ Treatment</u>	<u>In Situ</u> Vitrification <u>In Situ</u> Solidification/ Stabilization Biodegradation	<u>In Situ</u> Solidification/ Stabilization Biodegradation
	Incineration	Fluidized Bed Rotary Kiln Infrared	Rotary Kiln
Disposal	Offsite Landfill	RCRA Landfill	RCRA Landfill

Note: POTW = publicly owned treatment works;  
RCRA = Resource Conservation and Recovery Act.

Source: ESE, 1990.

Table 3.2-1. Summary of Remedial Alternatives (Page 1 of 2)

Alternative Number	Description	Process Options
1A.	No Action	Long-Term Monitoring
<u>Migration Management</u>		
1B	Limited Action	Long-Term Monitoring, Water Use Restrictions
2	Groundwater Extraction and Treatment	Extraction Wells, Air Stripping, Treatment at POTW, Water Use Restrictions
3	Groundwater Containment, Extraction, and Treatment	Slurry Wall (Site), Extraction Wells, Air Stripping, Treatment at POTW, Water Use Restrictions
<u>Source Control</u>		
4	Onsite Landfill	Excavation, RCRA Landfill, Backfill
5	Asphalt Capping	Asphalt Cap
6	Source Removal and Offsite Disposal	Excavation, RCRA Landfill, Backfill
7	Solidification/Stabilization	Excavation, Solidification/Stabilization, Backfill
8	<u>In Situ</u> Solidification/Stabilization	<u>In Situ</u> Solidification/Stabilization
9	Source Containment	Asphalt Cap, Slurry Wall
10	Source Treatment and Containment	Asphalt Cap, <u>In Situ</u> Solidification/Stabilization, Slurry Wall (source areas)
11	<u>In Situ</u> Biodegradation	<u>In Situ</u> Biodegradation

Table 3.2-1. Summary of Remedial Alternatives (Page 2 of 2)

Alternative Number	Description	Process Options
12	Soil Washing	Excavation, Soil Washing, Backfill
13	Incineration	Excavation, Incineration, Backfill

Note: Inclusion of monitoring in both the no action and limited action alternatives is consistent with current guidance (EPA, 1988a; see p. 4-21).

Source: ESE, 1990.

Table 3.2-2. Summary of Alternative Costs

Alternative	Description	Capital Cost (\$)	Annual O&M Cost (\$)	Present Worth (\$)
1A	No Action	0	33,000	507,000
<u>Management of Migration</u>				
1B	Limited Action	17,000	33,000	559,000
2	Groundwater Extraction and Treatment	243,000	105,000	1,885,000
3	Groundwater Containment, Extraction, and Treatment	5,775,000	53,000	6,349,000
<u>Source Control</u>				
4	Onsite Landfill	1,090,000	25,300	2,567,000
5	Asphalt Capping	140,000	46,000	881,000
6	Source Removal and Onsite/Offsite Disposal	6,751,000	41,000	7,269,000
7	Solidification/Stabilization	1,838,000	33,000	2,469,000
8	In Situ Solidification/Stabilization	1,546,000	41,000	2,205,000
9	Source Containment	1,392,000	48,000	2,168,000
10	Source Treatment and Containment	2,916,000	53,000	3,764,000
11	In Situ Biodegradation	533,000	130,000	1,130,000
12	Soil Washing	1,578,000	120,000	2,128,000
13	Incineration	4,408,735	45,156	4,453,891

Source: ESE, 1990.

multiple extraction system configurations, and evaluate the relative effectiveness of the various configurations. The function of the North Main Street Ditch and existing lift station will also be considered in the design of the groundwater recovery system.

It may be necessary to pretreat extracted groundwater prior to discharge to the lift station directing water to the POTW. Discharge criteria will be developed during design with GRU and treatability studies will be performed as necessary to design any needed pretreatment system.

#### 8.2.4 Groundwater Containment, Extraction, Treatment, and Disposal (Alternative 3)

This alternative consists of construction of a circumferential slurry wall; construction of an upgradient subsurface drainage trench, groundwater extraction, and treatment at a POTW operated by GRU. The 31-ft deep slurry wall will encompass an area of approximately 130 acres. The extraction rate is based on an estimate of the annual recharge of groundwater by infiltration of 5.1 inches per year and an infiltration factor of 0.8 into the area within the confines of the slurry wall. The purpose of the upgradient subsurface drain is to divert groundwater flow to reduce hydraulic loading on the slurry wall. Aquifer testing and groundwater modeling would be necessary to more accurately estimate the extraction rate. Within the slurry wall, at the estimated extraction rate of 27 gpm, approximately 39,000 gpd will be extracted to offset recharge and to maintain the groundwater level within the confines of the slurry wall. Extraction rate and recharge/infiltration calculations are included in Appendix C.

The concentrations of contaminants in the extracted groundwater are estimated in the same manner as described in Section 8.2.3. Again, pretreatment may be required to reduce contaminants to concentrations below GRU pretreatment standards. Due to the finite mass of contaminants within the confines of the slurry wall, operation of the pretreatment system may not be necessary over the total 30 year life of the alternative. Treated wastewater will be discharged to a lift station to be constructed onsite. Groundwater monitoring will be conducted quarterly for 1 year and semi-annually thereafter as described in Alternative 1A.

#### 8.2.5 Onsite Landfill (Alternative 4)

The alternative consists of excavation of the source areas and placement of the soil (12,000 yd<sup>3</sup>) in an onsite landfill.

#### 8.2.6 Asphalt Capping (Alternative 5)

This alternative includes construction of a 4-inch thick asphalt cap over the source areas. Regular maintenance and sealing of the asphalt pavement is necessary to ensure the integrity of the cap.

#### 8.2.7 Removal and Offsite Disposal (Alternative 6)

It is assumed that approximately 12,000 yd<sup>3</sup> of soil would be excavated and transported to a RCRA-permitted disposal facility under this alternative. Excavation, loading, and hauling will be conducted in a manner that minimizes generation of dust from the soil and particulates. An out-of-state disposal facility was selected for costing purposes.

#### 8.2.8 Excavation and Onsite Treatment (Alternative 7)

This alternative involves the excavation and solidification/stabilization of soil in the source areas to an assumed 4 foot depth. The soil would be treated by a silicate-based process. Treated soil would be used as backfill onsite.

#### 8.2.9 In Situ Solidification/Stabilization (Alternative 8)

This alternative involves the in situ solidification/stabilization of soil by a silicate-based process in the source areas to an assumed 4 foot depth.

#### 8.2.10 Source Containment (Alternative 9)

This alternative includes construction of circumferential slurry walls to provide containment of source area soils. A 4-inch-thick asphalt cap will then be constructed over the source areas. Regular maintenance and sealing of the asphalt pavement is necessary to ensure the integrity of the cap.

#### 8.2.11 Source Treatment and Containment (Alternative 10)

The source areas will be treated by in situ stabilization/solidification. The source areas will then be surrounded with circumferential slurry walls and capped with a 4-inch-thick asphalt cap. Regular maintenance and sealing of the asphalt pavement is necessary to ensure the integrity of the cap.

#### 8.2.12 In Situ Biodegradation (Alternative 11)

This alternative involves the in situ biological treatment of soil and groundwater in the source areas and the active wood-preserving area. The in situ biodegradation process uses indigenous microorganisms to degrade organics. Affected groundwater is extracted and treated, nutrients are added as required, and the water is percolated onto the source areas.

#### 8.2.13 Soil Washing (Alternative 12)

This alternative involves soil excavation in the source areas to an assumed 4-ft depth, physical/chemical removal of constituents by soil washing, treatment of wash solution at the POTW, and dewatering of washed soils that will be used as backfill.

#### 8.2.14 Incineration (Alternative 13)

This alternative involves soil excavation in the source areas to an assumed 4-ft depth. Soil is incinerated onsite in a transportable incinerator achieving the substantive requirements of RCRA for incineration of hazardous waste. Soil is loaded into the incinerator feed hopper and fed to the incinerator at a rate of between 1 and 5 tons per hour (tons/hr). The ash formed during incineration is sampled before being used as backfill in excavated areas.

### 8.3 Screening of Remedial Alternatives

#### 8.3.1 SCREENING CRITERIA

##### 8.3.1.1 Effectiveness

Alternatives were evaluated for their effectiveness in protecting human health and the environment. Protectiveness was evaluated over the short-term (construction and implementation period) and long-term (after the remedial action is complete). The effectiveness evaluation also considered the degree to which mobility, toxicity, or volume (MTV) would be reduced.

##### 8.3.1.2 Implementability

This criterion includes both technical and administrative feasibility of implementing the combination of process options at the site. Technical feasibility is the relative ability to construct, operate, and maintain an alternative as well as any replacement necessary over the life of an alternative. Administration feasibility is the ability to obtain approvals from appropriate agencies as well as the availability of

specific equipment, technical expertise, and management expertise to implement or meet specific requirements of the alternative.

#### 8.3.1.3 Cost

Capital and operation and maintenance (O&M) costs were developed for alternatives that pass effectiveness and implementability screening criteria. Cost estimates were based on cost curves, generic unit costs, vendor information, and prior similar estimates. The cost estimate accuracy is dependent on the level of detail or uncertainty of an alternative. Present worth costs in January 1989 dollars were evaluated on a 30-year basis for each alternative.

#### 8.3.2 Alternatives Screened Out

Alternative 3 was screened out because the cost was significantly more than alternative 2 without providing a significantly higher level of protectiveness. The same reasoning applies to alternative 4 as compared to alternative 2.

Alternative 6 was not retained because the effectiveness of landfill containment to immobilize contaminants at this site is questionable. Alternative 13 was not retained because it did not provide significantly more protectiveness than the other treatment alternatives but it had a significantly higher cost.

The remainder of the alternatives were retained for detailed analysis.

### 9.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

#### 9.1 Glossary of Evaluation Criteria

This section provides the basis for determining which alternative provides the best balance of the evaluation criteria. EPA has nine criteria for judging the best alternative for providing for protection of human health and the environment. These criteria are as follows:

Overall Protection of Human Health and the Environment - addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.



Compliance with ARARs - addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes and/or provides grounds for invoking a waiver.

Long-Term Effectiveness - refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

Reduction of Toxicity, Mobility, or Volume - is the anticipated performance of the treatment technologies that may be employed in a remedy.

Short-Term Effectiveness - refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

Implementability - is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

Cost - includes capital and operation and maintenance costs.

State Acceptance - indicates whether the State concurs with, opposes, or has no comment on the preferred alternative.

Community Acceptance - will be assessed in the Responsiveness Summary in the Appendix A of the Record of Decision after reviewing the public comments received on the Feasibility Study and the Proposed Plan.

## 9.2 Overall Protection of Human Health and the Environment

All of the alternatives, with the exception of the "no action" alternative, would be protective of human health and the environment by eliminating, reducing or controlling exposure to the contaminants on the site. Because the "no-action" alternative does not meet this criteria, it will not be considered further in this section.

Alternatives 1B, 5, 9 will be protective by minimizing direct contact with the contaminants of concern. Alternatives 2, 7, 8, 10, 11 and 12 would be protective because contaminants would be treated and removed from the environment.

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

Alternative 1B would not comply with ARARs because it would leave groundwater contamination above standards in place. Alternatives 7 and 12 would require a Treatability Variance in order to meet ARARs because the contamination in the source areas is the result of the deposition of K001 wastes and by excavating it, the Land Ban requirements would be triggered. The treatments contemplated in Alternatives 7 and 12 are not the BDAT for K001 wastes; thus are not in compliance with the Land Disposal Restrictions. Alternatives 2, 5, 8, 9, 10 and 11 meet all potential Federal and State ARARs.

#### 9.4 Long-Term Effectiveness

Alternatives 2, 7 and 12 provide the best long-term effectiveness because they involve the treatment and removal of contaminants from the site. Alternatives 8, 9, 10 and 11 provide proportionately less long-term effectiveness because there have been few in situ technologies implemented in the field for the purpose of cleaning up both organic and metal contaminated soil; thus, there is little data to support their effectiveness. Alternative 5 and 1B have the least long-term effectiveness because they potentially allow continuing contamination to the groundwater.

#### 9.5 Reduction of Toxicity, Mobility or Volume

All of the alternatives, with the exception of alternative 1B, should meet this criteria. Alternative 1B, by providing only for maintaining and institutional controls, does not reduce the toxicity, mobility, or volume of the contamination.

#### 9.6 Short-Term Effectiveness

Alternatives 1B, 5, 9 and 10 provide the best short-term effectiveness because they can be implemented in a short period of time and essentially prevent exposure to contaminants. Alternative 2, 7, 8, 11 and 12 all involve long-term treatment technologies that would require a number of years to implement.

#### 9.7 Implementability

Alternatives 1B, 2, 5 and 9 are readily implementable because they involve well known technologies. Alternatives 7, 8, 10, 11 and 12 should also be readily implementable; however, they will require bench and/or pilot scale studies to be performed before full scale implementation. Alternative 2 will require the cooperation of GRU for implementation.

## 9.8 Cost

Cost effectiveness is determined by comparing the costs of all the alternatives being considered with their overall effectiveness to determining whether the costs are proportional to the effectiveness achieved. Using this criteria, alternatives 2 and 12 are the most cost effective because they provide the most permanent and effective long-term protection to human health and the environment.

## 9.9 State Acceptance

The State of Florida, as represented by the Florida Department of Environmental Regulation, concurs with alternatives chosen in Section 10 of this ROD.

## 9.10 Community Acceptance

As stated at the public meeting held on August 14, 1990, the public indicated that they concurred with the active remedial alternatives that EPA was proposing. However, it was strongly felt that EPA had not thoroughly investigated all of the source areas; especially the potential wetlands/lagoon area. They indicated that EPA should more thoroughly investigate and, if necessary, remediate these other potential source areas.

## 10.0 SELECTED REMEDY

All of the alternatives carried through to the detailed analysis stage were evaluated using these nine criteria. Based on this evaluation, EPA selected Alternative 2 as the preferred alternative to address contamination in the groundwater and a combination of Alternatives 7, 11 and 12 as the preferred alternative for addressing contamination in source areas. These alternatives will require extensive treatability studies during design before implementation of the remedy.

Alternative 2 would result in the extraction of contaminated groundwater from the ground and disposal into the POTW. Treatability studies will have to be done during the design in order to insure that levels of contaminants in the discharged water are acceptable to GRU; if not, then it will have to be pretreated before being discharged. The groundwater recovery system will be designed to insure collection of all contaminated groundwater as well as to prevent continued discharge of leachate to the North Main Street ditch and Springstead Creek. The system will include the installation of recovery systems both immediately west and east of North Main Street. Tentative compliance points are identified in Figure 4.1-2. Specific groundwater monitoring locations will be selected in the RD.

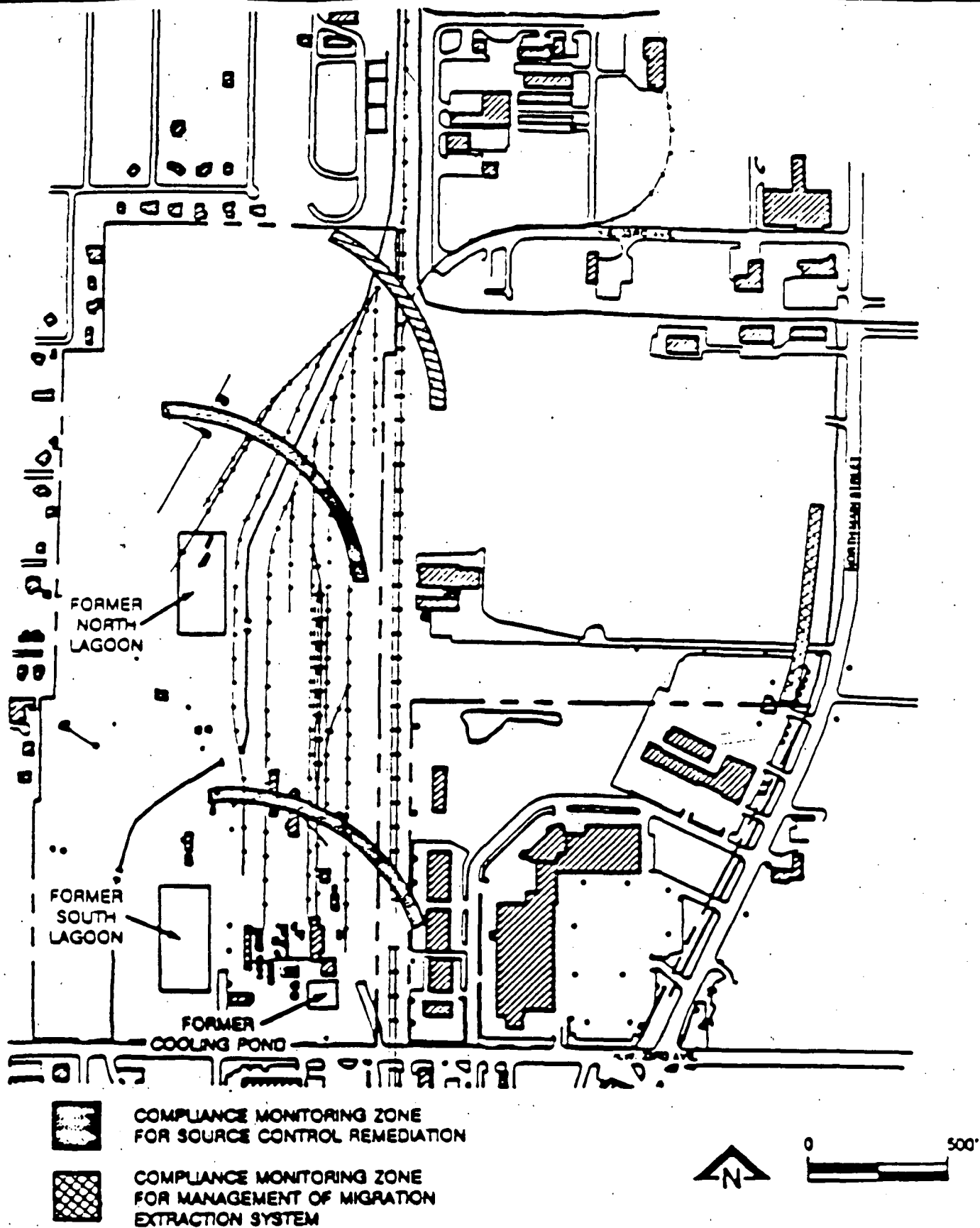


FIGURE 4.1-2  
GROUND WATER COMPLIANCE  
MONITORING AREAS

SOURCE: ERI, 1989; EPA, 1988.

CABOT CARBON/KOPPERS

Feasibility Study

EPA and FDOT will work closely to integrate any road widening activity with the groundwater extraction system. If the final decision on the North Main Street widening project involves leaving the North Main Street ditch intact, then the ditch will be lined to insure no further contamination will leach into the ditch.

EPA selects Alternative 12 as one of a combination of alternatives to address the contamination of two of the source areas. For the North Lagoon and South Lagoon, the combination of soil washing with the solidification/stabilization and bioremediation of residual soils containing unacceptable levels of metals and/or organics would provide the best combination of effectiveness, implementability, and cost for the majority of the source areas. The combination of alternatives would treat both the organic and inorganic chemicals in the soils. The ready accessibility of the source areas and the large amount of empty land available make excavation and treatment implementable. Based on an assumption of excavation to the shallow groundwater table (4 feet below surface), the total amount of soil to be treated from the 2 lagoons is approximately 6,400 cubic yards. Comparisons of soil concentrations and soil remedial action objectives indicate that soils will have to be excavated to levels deeper than the groundwater table in the North and South Lagoons in order to address all soils exceeding cleanup criteria.

This combination of alternatives will comply with Land Disposal Restrictions (LDRs) through a Treatability Variance under 40 CFR 268.44. This Variance will result in the use of soils washing, combined with solidification/stabilization and bioremediation of residuals, to attain the Agency's "treatment goals" for the contaminated soil to be excavated at the site.

EPA proposes Alternative 11 for addressing source contamination in the cooling pond area and the drip track areas. In situ bioremediation is selected because low hanging pipes and buildings required for plant operation make excavation of contaminated soils technically infeasible. The soils in these areas are contaminated with both metals and organics. While in situ bioremediation is feasible for treating organic contaminants, its effectiveness for reducing metals concentrations to the cleanup criteria has not been demonstrated. Long term institutional controls will be implemented to assure that unacceptable exposure to metals does not occur in the future due to changing land use.

Comparison of the remedial action objectives for soils with existing soils data suggests that the Wood Shavings area, the Cabot Carbon lagoon area and the wetland/lagoon area near North Main Street may not require remedial action. Additional sampling will be performed during design to confirm that this is the case. Remediation of these areas will be performed as part of the site cleanup, if necessary.

Because of the shopping center that currently exists on the property that the Cabot Carbon facility used to occupy, it is impossible from both a technical and a cost-effective standpoint to directly remediate this source area. Long term institutional controls will be implemented to assure that unacceptable exposure to contaminants does not occur in the future due to changing land use.

In addition to the preferred alternatives, EPA also proposes that the following tasks be undertaken as part of the Remedial Design phase:

- o Perform additional groundwater sampling to determine if intermediate aquifer requires remediation.
- o Sample sediment in Springstead Creek. If contaminants are found, the same risk assessment assumptions applied in the North Main Street risk assessment will be used to determine if sediments require remediation.
- o Locate the Old Cabot Carbon production well and properly plug and abandon the well.
- o Determine existence of underground storage tanks under paved area of former Cabot Carbon property onsite and properly abandon any existing tanks no longer in use.
- o Perform additional subsurface soil sampling on both sides of North Main Street to delineate the extent of any subsurface soil contamination around old wetland/lagoon area at the intersection of North Main Street and NE 28th Avenue and east of North Main Street.
- o Perform additional soil sampling in the Cabot Carbon old lagoons area.

Each of these additional activities is being proposed as a means of further delineating contamination at the site prior to implementation of the remedial action. This information is needed for the completion of the remedial design.

## **11.0 STATUTORY DETERMINATIONS**

### **11.1 Introduction**

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when

complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy must also be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

#### 11.2 Protection of Human Health and the Environment

The selected remedy protects human health and the environment through groundwater extraction and pretreatment, if necessary, and disposal at the POTW for the management of migration of contaminants, along with combination of soils washing, in situ bioremediation, solidification/stabilization of residuals (if necessary) and land use restrictions provides protection for the source control remedy. This remedy provides for the permanent treatment of contamination in areas where it is technically feasible and land use restrictions to prevent potential future exposure for those areas where treatment or containment technologies are not feasible.

#### 11.3 Attainment of the Applicable or Relevant and Appropriate Requirements (ARARs)

Remedial actions performed under CERCLA, as amended by SARA, must comply with applicable or relevant and appropriate requirements unless a statutory waiver is justified. The proposed alternative for the CC/K site was evaluated on the basis of the degree of compliance with those requirements. The proposed alternative was found to meet those requirements.

The proposed alternative will comply with the Land Disposal Restrictions (LDRs) through a treatability variance, under 40 CFR 268.44. This variance will result in the use of soils washing with appropriate treatment of residuals, to attain the Agency's interim "treatment levels ranges" for the contaminated soils at the sites.

The remainder of the ARARs are detailed in Table Four.

TABLE FOUR

Applicable or Relevant and Appropriate Requirements  
To Be Considered Requirements

Law, Regulation, policy Standard	Application
Federal	
<u>Chemical Specific</u>	
RCRA, 40CFR 261 Definition and Identification	Definition and identification of waste material as hazardous
RCRA, 40CFR 264 Groundwater Protection Standards	Standards developed for protection of groundwater from RCRA regulated units
Safe Drinking Water Act	Maximum Contaminant Levels (MCLs) established for protection of public drinking water supplies
40CFR 403, Effluent Guidelines and Standards: Pretreatment Standards	Discharge of extracted groundwater will be subject to pretreatment requirements if discharged to POTW
National Ambient Air Quality Standards	NAAQS for PM10 applied to fugitive dust
<u>Action Specific</u>	
RCRA, 40CFR 268 Land Disposal Restrictions	Excavated waste disposed onsite may be subject to land disposal restrictions if placement occurs
RCRA, 40CFR 264	Disposal or decontamination of equipment, structures, and soils



TABLE FOUR  
(continued)

Applicable or Relevant and Appropriate Requirements  
To Be Considered Requirements

RCRA, Subtitle C	Regulates the treatment, storage and disposal aspects of hazardous wastes.
OSHA, 29CFR 1910 General standards for worker protection	Worker safety for construction and operation of remedial action
OSHA, 29CFR 1090 Regulations for workers involved in hazardous waste operations	Worker safety for construction and operation of remedial action
40 CFR 403.5	Discharge requirements
40CFR 122.44(a), (d), and (e)	Use of BAT and BCT to control pollutants; treatment of system effluent to comply with Federal and state water quality standards; set discharge limitations
<u>Location Specific</u>	
Fish and Wildlife Coordination Act	Protection of fish and wildlife when federal action result in the control or modification of a natural stream or body of water
40CFR 29, Executive Order 12372, Intergovernmental Review	State and local coordination and review of proposed EPA assisted projects
Executive Order 11990	Protection of wetlands affected by remedial action
Executive Order 11980	Protection of flood plains affected by remedial action

TABLE FOUR  
(continued)

Applicable or Relevant and Appropriate Requirements  
To Be Considered Requirements

STATE

Chemical Specific

Section 17-30-180  
F.A.C.

Adopts 40CFR 264.91-100

Action Specific

Section 17-30

Adopts 40CFR Parts 260-270

GTU's Pretreatment  
Standards

Standards for discharge into GTU's  
system

Location Specific

Section 17-3.402

Groundwater classification system

To Be Considered

52FR 3748  
Proposed Rulemaking

Proposed standard for the control  
of volatile organics emissions  
that may address air stripping  
activities

#### 11.4 Cost Effectiveness

The preferred remedy for this site is a combination of several of the remedial alternative developed in the FS. For the management of migration remedy, the present worth cost is \$1,885,000. For soils washing at all four source areas, the present worth cost is \$2,128,000; for in-situ biodegradation, the present worth cost is \$1,130,000. Given this situation, the present worth costs of the combined remedy can be roughly calculated by halving the costs of these two alternatives, then summing them for a figure of 1,629,000. It should also be pointed out that, in estimating these costs, the FS did not include any fees paid to GRU for disposal into their system. An estimate of these fees (provided by FDER) are \$300,000 for the initial hookup and \$120,000/year for the yearly fees. Using these assumptions, the estimated present worth cost of the preferred remedy is \$3,514,000. The GRU fees are not included in this figure. This remedy provides the best balance of costs and overall effectiveness of all the alternatives.

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

The USEPA believes this remedy is the appropriate remediation plan for the CC/K site.

For the management of migration, the contaminated groundwater would be removed from the shallow aquifer and discharged into the GRU system. Any needed pretreatment would be done, prior to discharge. The GRU's treatment plant will provide final treatment for the contaminants in the water.

For the source areas where it is technically feasible to excavate, the alternative of soils washing followed by bioremediation and solidification of the residuals, will treat the contaminated soil down to levels that are protective.

For the source areas on the Koppers facility where it is technically infeasible to excavate, in situ bioremediation should effectively reduce the organics contamination to levels that are protective. In situ bioremediation will probably not be as effective for metals contamination; however, there is no current unacceptable risk by direct contact and the management of migration (MOM) alternative will capture contaminants that leach into the groundwater. Long term land use restrictions, as written into Koppers RCRA permit, should mitigate the potential threat of future direct contact.

Because the former Cabot Carbon facility is now occupied by a shopping center, it is technically infeasible to attempt to excavate source areas on this part of the site. However, for the same reason, there is no current risk by direct contact with contaminants and land use restrictions should prevent any future direct contact threat. The MOM alternative will effectively mitigate the current potential threat from contaminants leaching into the groundwater.

#### 11.6 Preference for Treatment as a Principle Element

The statutory preference for treatment was met to the greatest extent possible given site conditions. In the source areas where treatment was not feasible, the chosen remedy will prevent current and future exposures and will mitigate groundwater contamination.

**APPENDIX A**  
**RESPONSIVENESS SUMMARY**

## RESPONSIVENESS SUMMARY

### CABOT CARBON/KOPPERS SUPERFUND SITE GAINESVILLE, FLORIDA

#### Community Profile

The site is located in an urban neighborhood in the Northwest section of Gainesville, Florida, a growing inland city, seventy miles southwest of Jacksonville, Florida. Residential areas border the site to the west and northwest, with commercial properties to the south. There are several schools within a one-mile radius of the site, as well as three parks and one community center.

Gainesville's 1987 population was 85,469 and is projected to reach 92,400 by the year 2,000. Gainesville has a young population, due mostly to the presence of the University of Florida and the Santa Fe Community College, which have a combined full-time and part-time enrollment of approximately 43,000 students.

The University of Florida contributes significantly to community life in Gainesville. With 10,000 employees, it is by far the largest single employer in Gainesville and Alachua County, which has an unemployment rate of 3.3 percent. Approximately 37 percent of Alachua County's work force is employed by the government, 23 percent by the service industry, and 22 percent by the trade industry. The remainder work in manufacturing; construction; finance, insurance and real estate; and transportation, communications and utilities. The University contributes also to the health care available to area residents. Shands Hospital, a private, non-profit teaching hospital associated with the University's J. Hills Miller Health Center, is one of four major hospitals in the city. City and county officials and citizens readily acknowledge the University's other contributions to the cultural and intellectual life of the community, through fine and performing arts and the athletics program. The variety of residents and officials who were interviewed for this report spoke proudly of the city's resources and accomplishments, and for the most part expressed a desire to continue its growth.

The City of Gainesville is governed by a five-member commission. The commissioners are elected for three-year staggered terms, and each year select one of their own to serve as Mayor-Commissioner. Alachua County also has a Board of Commissioners, whose five members are elected to four-year terms, with one member serving as the chairperson. These two commissions work together on various issues, most notably on

the Metropolitan Transportation Planning Organization (MTPO), which schedules regular monthly meetings. The MTPO comprises the members of both the City and County Commissions, and is the primary local government entity holding jurisdiction over the N. Main Street widening proposal. Non-transportation planning and zoning actions for the city are accomplished by the Gainesville Planning Board, and for the county by the Alachua County Planning and Development Commission. The city and county governments demonstrate good organization, as evidenced by their ready information referrals.

Gainesville Regional Utilities (GRU), owned by the City of Gainesville, owns and operates the electric, water, and wastewater systems. Most of the electricity is provided by GRU's Kelly and Deerhaven Stations, with the remainder supplied by a nuclear power unit owned by the Florida Power Corporation. GRU's Murphree Treatment Plant provides the county's commercial and residential customers with water, utilizing a distribution capacity of 64 million gallons per day (mgd). The Murphree plant draws most of its water from eight deep wells, which tap into the Floridan aquifer. GRU plans to sink more wells into Murphree's well field within the next two years. Other water sources include three reservoirs, and officials and citizens report that there are a number of private wells in the site vicinity. Wastewater is treated at two major facilities. One of these, the Kanapaha Treatment Plant, has a current capacity of 10 mgd, which city officials expect to expand to 14 mgd in 1991.

Gainesville's citizens participate actively in community affairs, as evidenced by the number of attendees at city and county commission meetings, and has a wide variety of informational resources at its disposal. Several civic and environmental groups are active in the community. In addition, a number of citizen advisory boards and committees, appointed by the city and county commissions, provide recommendations on policies and directions and solicit citizen input on important issues.

#### History of Community Concern

The site has sparked the community's interest for many years. Although previous studies conducted by the University of Florida in 1961 and 1962 concluded that the operating wood treatment facilities were having a detrimental effect on Hogtown Creek, the community as a whole reportedly did not become active until a discharge incident in 1967. At that time, the new owner of the Cabot Carbon property broke the lagoon impoundment walls and allowed the contents to drain into Hogtown Creek; local citizens began to complain about the site. The City of Gainesville fined the owner \$100 for causing the pollution, and assessed another

charge to cover the City's cost for performing part of the corrective action.

Reports indicate that problems and interest in the site remained dormant until 1977, when a new owner began developing the site into the shopping center that now exists there. During construction, the owner allowed lagoon wastes to drain into Hogtown Creek. The County, as well as FDER, received several complaints from citizens about the look and smell of the creek. In October 1977, FDER conducted a biological survey of the upper 2.8 miles of Hogtown Creek, showing the creek to be devoid of life (except for bacteria) from the point of drainage discharge to 1.1 miles downstream. The owner agreed to implement measures to prevent further contamination from the development.

Local and state agencies continued, however, to receive complaints about the site, and local newspaper published articles and editorials about it. This community attention continued during the next few years, as EPA and FDER conducted preliminary studies and investigations of the site in 1979 through 1981. Citizens, media, and environmental groups reportedly began calling and writing to both EPA and FDER during this time to find out about study results and express their concerns about the site.

Community interest increased dramatically in 1983 through 1985. During this time, the site was placed on the NPL, FDER and EPA entered into a Cooperative Agreement giving FDER management lead at the site, and the Florida Department of Transportation (DOT) proposed to widen N. Main Street between 23rd and 39th Avenues, a section of the road that traverses the site. Some citizens reported that the site had not concerned them until this time. Although part of the community's concern arose because the NPL listing heightened the public's awareness of the site, part of the concern also resulted from the road-widening proposal. A number of citizens and civic and environmental groups contacted FDER, EPA, and city and county officials with questions and concerns about the pollution coming from the site and the environmental impact of widening the road.

Gainesville citizens called for a public meeting that was held on June 28, 1984, to discuss the history of the site, the industrial processes used there, possible air problems at the site, Superfund and RCRA procedures and regulations, and FDER's proposed interim measure for the site (Project Jumpstart). The meeting was moderated by the Chairperson of the Board of County Commissioners, and panelists included personnel from the County and FDER. Reports from the FDER representative indicate that this meeting was attended by citizens that were upset about the lack of progress at the site and the meeting apparently did not resolve their concerns.



Community attention to the site continued as plans were developed to widen N. Main Street. FDER and DOT had agreed in late 1985 that construction should wait until FDER completed its RI/FS. However, but citizens and civic and environmental groups perceived a change in that policy by FDER and DOT in 1986, and protested the project's resumption. Those protesting asserted that FDER's RI data were not conclusive enough to allow DOT to proceed with road construction and the possible movement of contaminated material.

A number of articles and editorials appeared in the Gainesville Sun and the Independent Florida Alligator in 1985, protesting the road construction and assailing FDER for what many citizens perceived to be a lack of caution based on incomplete test results.

Citizens called for another public meeting to be held on May 1, 1986, and several civic and environmental organizations wrote letters to EPA officials requesting their input and advice prior to the meeting. At this meeting, attendees were angry and upset about site proceedings. Many felt that their environmental concerns were being ignored, and they were afraid that widening the road would supercede cleaning up pollution at the site. Some citizens still think remediation will proceed without taking the road into consideration. Although DOT has de-obligated funds for the road-widening project, it is still a high priority of Gainesville's MTPD, according to local officials, and is a subject of great debate within the community.

The community has two opposing views regarding road construction through the site. Some citizens do not believe the site poses a great threat to the community or the environment, and feel that the road construction should proceed without further delay. Some of these believe that no cleanup action should be taken, and cite the fact that Hogtown Creek seems to have cleansed itself five miles downstream of the site as proof that the contamination is not serious. Several also believe that even if the site warrants a permanent cleanup, it will take so many years that the traffic on N. Main Street will have become a bigger hazard than the site itself. The current two lanes become quite congested, and citizens noted that a lack of traffic signals compounds the problem.

Other citizens and officials voiced the opposing view, maintaining that previous studies have not demonstrated the extent of contamination at the site. They stated that if people are unaware of any dangers there, it is because the studies conducted so far have neglected to test the site properly and thoroughly. They cite maps showing retorts, pine tar pits, and other process facilities in the vicinity of the existing

shopping center, as well as incidents such as a floor tile buckling problem at the Winn-Dixie on the site, as arguments for further testing in these specific areas, which they feel have not been addressed so far.

The Winn-Dixie incident is a frequent topic of discussion in the community, and members of the community disagree about whether the tile problem was site-related. A consultant hired by the store to study the problem concluded that site contamination under the foundation was causing the tiles to buckle. Reportedly, Winn-Dixie representatives and FDER disagreed with that conclusion, attributing the trouble to a faulty foundation and bad glue. Many citizens expressed dismay at that, and some believe that there was a deliberate attempt by FDER and Winn-Dixie to downplay the incident to avoid adverse publicity. They are concerned that contaminants at the site may affect other business there, and have given FDER and EPA specific recommendations about where they believe further testing is needed.

Some citizens felt that road construction could probably begin after a thorough RI/FS is completed, but others said that the road project should be postponed until the site is completely cleaned up. Many of the citizens who want road construction to proceed, as well as a few who do not, expressed the belief that some citizens are using the Cabot Carbon/Koppers site merely as a means to prevent commercial growth in the area. At this time, questions of Superfund liability for the City, County, and businesses on or adjacent to the site have brought the road project to a standstill, and the decision about whether or not to ask DOT to release funds for and begin the project rests with city and county officials.

Currently, many citizens and environmental groups are most concerned that the supplemental RI/FS address the concerns that they have brought to the attention of EPA and FDER officials. EPA and DOT agreed at the time that road construction should wait until the RI/FS was completed. Meanwhile, those interviewed said that they will continue to press their concerns about the site, to ensure that contamination is thoroughly quantified.

### Key Issues and Community Concerns

#### 1. Proposed Widening of North Main Street

Probably the most volatile issue is the proposed widening of North Main Street. There appear to be two major schools of thought concerning the proposed project. The first is composed of citizens and environmental groups who are concerned that there is an unknown major source of contamination where the suspected "lagoon" under North Main Street was located. They

are worried that the construction activities associated with road widening would disturb this source and caused them to migrate in unexpected ways. The second is concerned that there has already been a long delay in the road project and that EPA's remedial process may cause additional day and a continual worsening of the traffic congestion along North Main Street. They want EPA to make a decision on the appropriate remedial action so that FDOT can make a decision on its project.

## 2. Ground, Drinking and Surface Water Quality

Citizens and local officials are concerned that the contaminated ground water in the surficial aquifer will reach the Floridan Aquifer, which is the main water supply for Gainesville and much of Florida. Some people believe there is a link between the two aquifer because of the numerous sinkholes in the area. Gainesville's Murphree well fields, which tap into the Floridan aquifer, are 2.3 miles northeast of the site. The city plans to add new wells during the next two years to expand its services, and there are no other well fields identified at this time. City officials noted that it is important for them, as well as for others who draw from the Floridan, to know the possibilities of contamination before they expand their current water system.

Citizens and officials also expressed concern about the possible contamination of private drinking wells in the area. A current, accurate inventory of private wells is unavailable at present. Some citizens asked that every private well in the near vicinity be tested, as well.

Many residents expressed concern about damage to Hogtown Creek. Studies have noted detrimental effects to the creek up to five miles downstream of the site, and many residents living near the creek reportedly are frustrated that the damage is still evident.

## 3. North Main Street Ditch

Many people are concerned about the leachate discharge into the North Main Street Ditch. They are concerned that it appears to be a public health threat and access to it should be limited.

## 4. Schedules

Most interested citizens wanted to know the schedule EPA has set for the site. Most stated that site officials have not met past schedules, and expressed the hope that EPA, as lead for the

site, will be more accurate in estimating the remediation schedule, and adhere to announced dates.

#### 5. Proposed Development

Many business persons in the site vicinity are reportedly concerned about having their property values drop. Some are concerned that the value will drop specifically because their property is part of a Superfund site, but most are concerned that property value will drop as a result of delaying the road-widening project. City officials report only one formal request to develop a parcel of the land during the last two years, but could not say whether the low interest in developing the area was a direct result of the Superfund site, or whether it was indirectly related to the site because of the traffic problems on N. Main Street. Many citizens, business and non-business, are allowed in the area without problem, but the road construction has been effectively halted.

#### 6. Health Effects

Several individuals expressed concerns about health problems that they believe could be related to site contamination. This concern was raised at the June 1984 public meeting, where the panel suggested that citizens, local doctors, and state and county health officials contact the Centers for Disease Control (CDC) Atlanta to request a health study.

#### 7. Airborne Toxins

A few citizens and local officials expressed concern about the possible release of toxins into the air during site cleanup activities. They want EPA to take proper precautions during cleanup so that nearby residents and others doing business in the area will not be affected by any airborne toxins.

#### 8. EPA Communication

Some key local officials and citizens were concerned that EPA officials have been slow to respond to their questions about the site. They expressed the desire to help EPA facilitate site remediation activities, but said that they need faster and more direct responses from EPA. They cited letters requesting meetings and/or advice related to site status, and reported that they had yet to receive any direct answers to their queries.

Questions Concerning Cabot Carbon/Koppers Site Generated During Public Comment Period

1. Organization of Responsiveness Summary

There were a number of different areas that the public questioned or commented on concerning this site. In general, these questions and comments can be loosely organized into separate categories. This question-and-answer section of this Responsiveness Summary is organized into those general categories; which approximate the categories listed under the Key Issues and Community Concerns section.

1. Proposed Widening of North Main Street

Has the Agency found evidence of the lagoon that is currently under North Main Street?

The Agency is aware of a number of different items concerning the lagoon/wetlands area that formerly existed on what was the northeast corner of the Cabot Carbon facility. The Agency has in its possession aerial photographs from the 30s and 40s that show a body of water in this area. In these photos, this body appears to be a manmade structure. The Agency also has photos of the Site taken from an oblique angle where this body does not seem to have well defined boundaries and appears to contain trees; in other words, it looks like a naturally occurring wetland. It would also appear that, whatever it was, the majority of it existed under what is now an auto dealership. Based on the photographic evidence, the Agency cannot conclude whether or not this body of water was a manmade lagoon or a naturally occurring wetland.

The Agency is aware of a number of different sampling expeditions in this area. Although earlier studies not supervised by EPA show high levels of some contaminants in the soils of this area, later studies have not been able to duplicate these levels. Sample data from the RI show levels of soil contamination far below the Agency's soil cleanup criteria. This data would appear to support the theory that the body of water was a naturally occurring wetland that became somewhat contaminated when the other Cabot Carbon settling ponds were bulldozed and their contents allowed to drain into the wetlands area.

As a part of the Remedial Design, EPA intends to resample this area to make one last effort to determine whether there are any contaminated remains of this wetland/lagoon area.

Has the Agency seen the aerials documenting the existence of the old lagoon under North Main Street?

The Agency has copies of the aerials from the University of Florida's library. The Agency also has photographs taken from an oblique angle that were provided by the Cabot Carbon Company.

Why does the Agency continue to insist, after seeing these aerial photos, that there was no lagoon under North Main Street

The Agency does not continue to insist that there was no lagoon at this location. EPA is well aware that a body of water existed here and that, in some photographs, it looks to be a manmade structure. However, in other photographs, it appears to be a naturally occurring wetland. No records exist of the plant operation that would indicate the use of that wetland as a containment lagoon.

For these reasons, EPA cannot state, for the record, that the wetland area was a manmade structure. EPA is not, however, disputing the strong possibility that it is. In an effort to solve this problem, EPA is planning on commissioning EPA's Environmental Photographic Interpretation Center (EPIC) to develop a photoperiodical site analysis for CC/K. As part of this analysis, EPIC will study the existing aerial photographs to attempt to determine the use of this area.

If this suspected lagoon did not, in fact, exist, how does EPA explain the sharp rise in the levels of contaminants in the groundwater in this area?

There are several potential explanations for the sharp rise in VOC levels in the shallow aquifer in this area. The first is that there was a containment lagoon in this area and the VOC levels are the result of contaminants leaching from its remains. The second is that the levels are the result of an as yet undetermined source area on the former Cabot Carbon property. The third is that the levels are elevated because of a leaking underground storage tank connected with the auto dealership. The fourth is that the elevated levels are somehow connected with being next to a busy road. The fifth is that the levels are resulting from a source pellagragenic to the site itself. At this time, EPA does not have enough data to determine the source of these levels; EPA plans to do additional sampling in the RD to try to determine the source.

Earlier investigations (primarily by the University of Florida) show levels of contaminants above your soil cleanup criteria in the North Main Street Ditch area. Is the Agency going to consider any source cleanup over there?

As stated earlier, EPA has not been able to replicate those levels in its investigations. It is likely that these levels were random "hot spots" that do not require any remediation efforts. To confirm this, EPA is going to do some additional sampling in this area. If the additional sampling indicates that there is a potential soils problem, EPA will revisit this issue.

People in the area are concerned that, if FDOT widens the road based on the current data base, FDOT may cause a release of contaminants from this old lagoon area. What does the Agency intend to do about this?

As part of the FS, EPA did a risk assessment for these soils using two scenarios: short term exposure to FDOT workers building the road; and long term residential use exposure to children (if soil was used as fill for housing development). In both cases, the risk fell within EPA's acceptable risk range of  $10^{-4}$  to  $10^{-6}$ . Thus, a release of soil from the area should not cause a problem. What will be problematic will be the disposal of contaminated groundwater pumped from the shallow aquifer during excavation activities. There have been preliminary discussions with FDOT concerning the best way to do this, but no final plan can be developed until it is decided how to build the road. FDOT has made the commitment to keep EPA involved with its plans.

What is going to happen with the soil FDOT would excavate while building this road?

The final disposition of the soil would be FDOT's decision. As stated earlier, the RA done as part of the FS indicates that no special disposition of the soil is necessary. Final plans on disposing of this soil will have to wait until finalization of the construction plans.

Did FDOT cause a release from this old lagoon when they built the original North Main Street? Specifically, did they cause contamination to be spread on the property to the east of North Main Street?

To EPA's knowledge, there are no detailed records of the original construction of North Main Street. EPA's investigation, done in May 1990, does not show significant contamination in the soils east of North Main Street.

Did not EPA, in the past, tell FDOT that FDOT could not widen the road without EPA's permission?

EPA never prevented, or sought to prevent, the widening of North Main Street. EPA advised FDOT that, if the widened road interfered with the implementation of EPA's selected remedial alternative, part of the rebuilt road may have to be demolished and FDOT may be liable for that. EPA also advised FDOT to wait until EPA had selected its remedy before proceeding with the road. However, the final decision was FDOT's.

Did not EPA require FDOT to ask for indemnification from property owners adjacent to North Main Street in order to widen the road?

EPA did not and has never had anything to do with the question of third party indemnification.

Can EPA indemnify FDOT from any federal liability if, in the course of widening the road, FDOT causes a release?

EPA does not want to discuss site specific legal issues in this Responsiveness Summary because this is not the proper forum for these issues to be discussed. However EPA, in general, will not indemnify any person or organization from liability for causing a release. EPA will not even give a release to the PRPs that are doing the work.

If, in the course of widening the road, FDOT incurs any additional expense due to the Superfund site, will the Superfund make up the difference?

No. Under Superfund, EPA is only authorized to spend funds investigating and remediating Superfund sites and, even then, only in cases where there are no viable responsible parties identified that can fund the work. There are no provisions to reimburse other government agencies for expenses incurred because of proximity to a Superfund Site.

Property owners with property to the east of North Main Street contend that their property was contaminated by FDOT's actions when originally building North Main Street. Will EPA indemnify them against any Superfund liability?

No. Again, EPA does not, in general, indemnify anyone.

Given that it is the Federal and State Government that is determining the appropriate health based cleanup criteria, will either entity assume liability in case these cleanup criteria turn out to be nonprotective to human health and the environment?

There are no provisions for the State or Federal government to assume liability for decisions on cleanup criteria or standards. This would be a matter of law and cannot be properly addressed in this Responsiveness Summary.



Will the road widening have any impact on the flow of the shallow aquifer in the immediate area?

It is not anticipated that the road widening will have a significant impact on the direction of flow in the shallow aquifer. As part of its proposed remedy, EPA will have a number of monitor and extraction wells in the immediate vicinity. This will allow long term monitoring of the situation.

Does EPA think that its OK for FDOT to proceed with its road widening plans?

At this time, EPA does not oppose FDOT's road widening plan. EPA does not expect the road widening to have a significant impact on its remediation plan. Again, it is not EPA's decision to make.

Can EPA accelerate its process so that the part of the remedy concerning North Main Street is finished first?

EPA has committed to working with FDOT so that its remediation plan and the North Main Street widening plans are compatible. EPA is always interested in minimizing the amount of time needed to complete an action; not, however, at the expense of implementing the action correctly. EPA will study this request during the Remedial Design phase in order to attempt to find ways to accelerate this portion of the remedy in technically feasible ways.

Will EPA make any effort to coordinate its remediation design with the FDOT's road widening design?

Yes, EPA will coordinate its Remedial Design with FDOT's road widening design and construction.

What, if any, problems does EPA foresee in the road widening project?

There are any number of generic problems that can come up with different construction projects happening at the same time. EPA will not be in the position to define specific problems until it is well into the Remedial Design phase.

## 2. Ground, Drinking and Surface Water Quality

Has the contamination reached the Floridan aquifer?

There is no evidence that contamination from the site has reached the Floridan Aquifer.

Is the plume from the site going to impact Gainesville's Murphree well field?

Data from the RI indicates that the plume of contamination is no more than a couple of hundred yards offsite. The implementation of the groundwater extraction system will effectively prevent any chance of this plume ever reaching the Murphree well field.

How far off the site has the contamination spread?

The flow of the shallow aquifer is to the north east. Data indicates that the plume is no more than 200 yards downgradient from the site's eastern boundary (North Main Street).

Does the Agency have a complete listing of private wells in the area? If not, will EPA consider doing a door to door search in the area to identify those wells?

The Agency does not have a complete list of private wells in the area. It is EPA's understanding that the Florida Department of Health and Rehabilitative Services (FHRS) has committed to assembling such a list.

Has the Agency tested any of the private wells in the area?

The Agency has not tested any private wells in the area.

If the Agency has not tested all of the wells in the area, how can it be confident that none are contaminated?

EPA is confident that the direction of shallow groundwater flow and the extent of the plume of contamination have been well defined in the RI. EPA knows that there are no private wells in the general vicinity of this plume.

Was the Agency aware that there was an operating Floridan well on the site?

The Agency was not aware of an operating Floridan well on the site.

Given that there are several pellagrigenic sources of benzene, and no sources of benzene were identified onsite, what is the Agency's justification for adding benzene as a cleanup criteria for groundwater?

It is true that there are several sources of benzene that are pellagrigenic of the site. However, the Agency does have justification for adding benzene as a cleanup criteria for groundwater. Based on the results of the supplemental

RI (Hunter/ESB), the VOC contamination in the shallow monitor wells downgradient of the Cabot Carbon lagoon areas. Benzene is a significant component of these VOCs. In addition, earlier investigations showed indications of benzene contamination in the soils onsite. The Agency is also aware that there were a number of storage tanks that existed on the Cabot Carbon facility; with no record that they were ever removed. For these reasons, EPA has justification for believing that there is a yet unidentified source area for benzene onsite. For that reason, EPA is justified in adding benzene to the site cleanup criteria for the groundwater.

How thick and contiguous is the confining layer between the shallow and intermediate aquifer?

Data from the IT RI indicates that there is thirty to thirty five feet of dense clay between the two aquifers and that the layer is contiguous under the site.

Is the site currently impacting Hogtown Creek?

The site is not currently having a significant impact on Hogtown Creek. The lift station appears to be intercepting the majority of the surface water contamination; and sampling of surface water in Springstead Creek did not show significant levels of phenol contamination.

Is it safe for children to play in Hogtown or Springstead Creek?

EPA is not in a position to comment in general about the safety of playing in either one of those creeks. EPA does feel confident that these creeks are not being currently impacted by the site. The area of highest surface water/sediment contamination is the North Main Street Ditch and the risk assessment performed for exposure to children shows that the risk is well within EPA's acceptable risk range.

### 3. North Main Street Ditch

How contaminated is the water in the ditch?

The only significant contaminants in the water in the ditch are the hyphenless. The phenols are at levels that pose a threat to aquatic life, but not at levels that pose a problem for human health.

Is it safe to come into contact with the ditch?

EPA is not in the position to say that it is absolutely safe to come into contact with the ditch. EPA can only make a judgement on the relative risk that the contaminants cause based on the current state of knowledge concerning these contaminants. The RA done for the ditch shows that the levels of contaminants in the ditch are within EPA's acceptable risk range. Each individual will have to judge for him- or herself whether he or she is comfortable with that judgement.

What about the odors from the ditch?

Phenolics are well known for being very odoriferous. It takes only a very low level of phenol to cause an odor that humans can detect. The air pathway was analyzed in the RA and the levels fell well within EPA's acceptable risk range.

Why isn't access to the ditch restricted in some way?

In order to justify restricting access to the Ditch, EPA would have to make a determination that exposure to the contaminants posed some potential or actual short or long term risk. Based on the known levels of contaminants, there is no justification for making such a determination.

Does Project Jumpstart prevent phenol contamination from reaching Springstead Creek?

Project Jumpstart was designed to handle the normal flow of surface water in the North Main Street Ditch. As long as the flow is normal, Project Jumpstart does an effective job of preventing significant contamination from reaching Springstead Creek. However, during storm events, the capacity of the lift station is overwhelmed by the greatly increased amount of water in the Ditch. Some of the phenol contamination undoubtedly is carried into Springstead Creek during these times.

How much longer is Project Jumpstart going to be in operation?

It is anticipated that Project Jumpstart remain in operation at least until the implementation of the groundwater extraction system. The groundwater extraction system should eliminate the need for Project Jumpstart.

Is Project Jumpstart expected to be in operation concurrently with the groundwater extraction system? If so, does EPA know how much additional flow into GRU's system that would create?

The logistics of Project Jumpstart's shutdown and the amount of additional flow this would cause cannot be determined at this time. The answer to these questions will be determined as part of the remedial design.

Will the ditch be in existence after the road is widened?

According to FDOT's current road design, the ditch will be filled as part of the road widening project. In its place will be a sealed storm drain system designed to handle excess surface water flow.

#### 4. Schedules

Why is it, after eight years worth of studies, EPA still does not have all of the source areas as well identified as the source areas on the Koppers facility?

This site is an extremely complex site containing a number of different potential source areas. Records that could be used to more accurately locate any of these areas are few and incomplete. Complicating the situation further are the number of site alterations that have occurred; due both to expansion of facility's plant operations and to the evolution of the site's use in the last twenty five years. These factors have made it almost impossible to pinpoint all of the source areas that may have existed on the site at one time.

After the decision on the remedial alternative is made, how much longer will it be before cleanup actually starts?

There are a number of mandatory processes that will have to be undertaken before the remedial alternative can be implemented. After the Record of Decision (ROD) is signed, EPA must offer the PRPs the opportunity to perform the RD/RA. This process will take approximately six months. After this process is complete, then the Remedial Design will have to be performed. The RD determines, in detail, how the remedy is to be implemented. At this site, the complexity of the chosen remedy dictates extensive bench and pilot studies be done and this is estimated to take a minimum of eighteen months. A more detailed schedule for the RD will be developed at the beginning of the RD process. Altogether, it will be a minimum of two years after the remedy is chosen before the remedy will be implemented.

How long will the cleanup take?

It will take approximately five years for the source control remedy to be completed. The groundwater remedy is estimated to take thirty years.

#### 5. Proposed Development

Is there a formal process by which property owners around a Superfund site submit their development plans to EPA for approval?

For property owners that signatories to the Consent Decree, there is a provision for notifying EPA about about changes in ownership or land use. For local property owners that are not parties to the Consent Decree, EPA does not yet have a strategy for allowing EPA to formally review development plans. EPA will address this issue in the future.

Several property owners around the site have stated that their property values have dropped significantly because of proximity to a Superfund site. Shouldn't the Agency be held responsible for that?

There are no provisions in the Superfund law for reimbursing nearby property owners for loss of property values due to proximately to a Superfund site. Other than advising these property owners to seek advise from their counsel, EPA cannot further address the issue.

Is there a mechanism in place for the private corporations that benefitted from the pollution at the site to reimburse the property owners and/or the surrounding community for the lost business opportunities because of the site?

There are no mechanisms in the Superfund law to allow for this kind of settlement as a part of the RD/RA Consent Decree. Again, all the EPA can do is to advise all parties concerned to seek advise from counsel.

Will EPA give "no action" letters to these property owners in the area so that their property can be sold without liability?

EPA can give letters stating its findings from the RI/PS and what actions it is taking as a result of these investigations. These findings may include "no current action" on particular pieces of property. However, EPA cannot give property owners a release of future liability for any future proposed remedial or removal actions.

## 6. Health Effects

The Agency received no comments directly asking about whether an individual's health problems were related to the Site. Rather, the majority of questions regarding health were concerned with potential health problems caused by the Site and are addressed in other parts of the Responsiveness Summary.

## 7. Airborne Toxics

Citizens who live near the Koppers facility are fed up with the odors coming from the facility. Can't EPA do anything about it?

The regulation of emissions from the Koppers plant is a State function; EPA has no regulatory authority to address the problem.

Are the odors from the Koppers facility a health hazard?

Questions concerning the emissions should be addressed to the Florida Department of Environmental Regulation. EPA can only address issues concerning the activities conducted under Superfund authority in this Responsiveness Summary.

Is there a mechanism for the government to buy out communities that are adversely affected by a point source air pollution problem?

The only buyout mechanism EPA has at its disposal is the mechanism in the Superfund law that allows EPA to relocate people if that is the only way to prevent exposure to hazardous levels of contaminants. There is no mechanism for relocating communities because of air pollution problems.

#### 8. EPA Communication

Some feel that EPA's studies could have been better if EPA had more local input into the design of those studies. Will EPA consider doing that in the future?

EPA realizes that past community relation activities have not always been as complete as they should have been. Although EPA is not in a position to commit to any specific activities at this time, EPA will commit to doing more to involve the community in upcoming activities. EPA will review its community relations plan prior to the implementation of the RD and revise it as appropriate to insure that the public is provided sufficient opportunities for involvement.

Will EPA keep local organizations such as FDOT and GRU informed of ongoing progress?

EPA intends to keep GRU and FDOT fully involved in upcoming activities.

#### 9. Miscellaneous

How were the Agency's cleanup criteria developed?

A detailed description of the development of the cleanup criteria can be found in the FS and the ROD. In general, the cleanup criteria were developed to be protective of both human health and the groundwater.

Do the cleanup criteria consider exposure to multiple chemicals?

Yes, the cleanup criteria are developed to be protective against exposure to all of the indicator chemicals.

Some feel that the Agency's soil cleanup criteria for several of the noncarcinogenic PAHs are too high and should be lowered to the 50-100 ppm range. Will EPA consider doing this?

The methodologies EPA used to develop its criteria are standard methodologies that have been used at a number of different Superfund sites. EPA stands by those criteria as being protective, based on the current state of knowledge.

Because residual levels of contamination will be left onsite, EPA is mandated to perform a Five Year Review. This review must be done within five years after the start of the RA and is intended to assess the effectiveness of the chosen alternative and the protectiveness of the chosen cleanup criteria.

One commentator stated that having one set of cleanup criteria for the site was not technically defensible; given that the site consisted of two separate facilities with two different operations. What is the Agency's justification for having only one set of criteria?

The Agency is cognizant of the fact that the varied source areas do not all contain the same indicator chemicals. However, as emphasized in the RI/FS, one of the major potential exposure pathways is the shallow aquifer. Once the contaminants have intermingled in the aquifer, there is no practicable way to set and enforce different cleanup criteria. As to trying to develop different cleanup criteria for the source areas; operationally, this is very difficult to implement and the numbers would not necessarily be protective of human health. The cleanup criteria as chosen by EPA is protective of human health and the groundwater and EPA believes this approach is defensible.

In one part of the Proposed Plan, EPA stated that one of the sources of groundwater contamination was the Cabot lagoons on the northwest corner of the former Cabot facility; in another part, EPA states that the level of soil contamination in this area does not require remediation? Can the Agency explain this seeming contradiction?

These statements do initially appear contradictory. The former Cabot Carbon lagoons functioned as source areas when they contained liquid sludges during the plant's operation. However, after the ponds were bulldozed, their contents were



scattered over the northern portion of the Cabot Carbon property and have, in effect, become too diluted to currently act as a significant source area.

What, specifically, are the potentially carcinogenic PAHs?

The site contaminants that are potentially carcinogenic PAHs are benzo(a)anthracene, benzo(a)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-C,d)pyrene and indeno(1,2,3-c,d)perylene.

In your presentation at the public meeting on August 14, you indicated that extraction wells for the contaminated groundwater would be placed to the east of North Main Street, but the Proposed Plan does not specify this. Could you clarify whether or not this is true?

Extraction wells will be placed to intercept the plume east of North Main Street.

It is believed by some commenters that Alternative 11, in situ bioremediation, will alleviate the source areas on the Koppers site. Why does the Agency not select this alternative for the source control?

EPA has contacted a number of different sources regarding the effectiveness of in situ bioremediation in remediating both organic and inorganic contamination. These sources were questioned concerning the bioremediation in cleaning up the organics and the concurrent soils washing effect on removing the soluble metals from the soil particles. The sources include RPMs in other EPA Regions, and technical experts in labs in Cincinnati, Ohio, ADA, Oklahoma and the SITES program. None of these sources gave any encouragement that this technology would be effective in remediating metals contamination.

In the Proposed Plan, EPA states that the "large amount of empty land available make excavation and treatment implementable." This statement has been disputed.

In making this statement, EPA is referring to what appears to be unused space in the southwest corner of the Koppers facility. However, EPA is not implying that the soils washing equipment should be set up in this area. The location of the equipment would be designated as part of the remedial design.

There is concern that any excavation activities will greatly increase the odor problem at the site. How does the Agency propose to deal with that?

The problem will be addressed specifically in the Remedial Design.

How does EPA justify having soil cleanup criteria for some chemicals that are lower than levels present in some foods?

As stated earlier, EPA developed its cleanup criteria based on standard methodologies used for Superfund remediation in Region IV. EPA has no real expertise regarding food products and is not in a position to comment on the comparison.

Considering the large number of studies already done on this site, how does EPA justify asking for additional investigation ~~work as part of the Remedial Design?~~

Despite the large number of studies, there are still significant questions about several of the source areas; especially the Cabot lagoons and the wetland/lagoon area. Levels of contaminants higher than the cleanup criteria appear in several locations in earlier studies and EPA needs to confirm that these areas do not require remediation.

Is EPA aware that Koppers is planning to install a new containment area for their creosote tanks and associated equipment?

Yes, EPA is now aware of this fact.

## 6.2 Indicator Chemical Selection

The media of concern at this site are the soil, groundwater, surface water, sediment and air. Due to the number of constituents detected in these media, it was necessary to select a limited number of "indicator chemicals" on which to base the risk assessment. Compounds selected are the focus of the toxicity assessment exposure analysis, risk characterization and development of health based action levels.

All of the historical data was used to select the indicator chemicals; however, the risk calculations were based primarily on the analytical data collected for the supplemental RI. The selection process followed the one outlined in the Superfund Public Health Evaluation Manual, (1986).

It can be divided into the following four steps:

1. Determination of chemical concentrations and frequency of detection;
2. Identification of toxicity characteristics of detected chemicals;
3. Calculation of chemical toxicity (CT) and indicator score (IS) values; and
4. Selection of final indicator chemical.

Using this process, the following indicator chemicals were selected for the CC/R site:

- o Arsenic
- o Benzene
- o Chromium (VI)
- o Napthalene
- o Potentially Carcinogenic  
Polynuclear Aromatic  
Hydrocarbons (PAHs)
- o Noncarcinogenic PAHs
- o Pentachlorophenol (PCP)
- o Phenol

## 6.3 Exposure Assessment

### 6.3.1 Definition

Table 4.6.3. Air Constituent Concentrations ( $\mu\text{g}/\text{m}^3$ )

Constituent ( $\mu\text{g}/\text{m}^3$ )	Station A (01) (Day)							Station A (02) (Day)							Station A (03) (Day)							
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	
Acenaphthylene	...	...	...	...	...	...	...	...	...	...	...	...	0.10	...	0.54*	...	0.02*	...	...	...	...	
Acenaphthylene	...	...	...	...	...	...	...	...	...	...	...	...	2.20*	...	0.01	...	0.08*	...	...	...	...	
Bis (2 ethyl- hexyl) phthalate	0.14	1.20	...	0.23	2.50*	1.40	0.20	...	...	...	...	...	2.14*	0.14	1.4	0.15	0.06	0.07	1.50	1.50*	0.57	
Fluorenone	...	...	0.03*	...	...	...	...	0.07	0.07	...	...	...	...	...	0.08*	...	0.05	...	0.07	...	...	
Naphthalene	...	...	...	...	...	...	...	0.07*	...	...	...	...	...	...	...	0.51*	0.29	...	0.11	...	...	
Phenanthrene	0.04	...	...	...	0.05	...	0.29*	...	...	...	...	...	0.10	1.20*	0.02	0.05	...	0.11	0.16	0.29*	0.07	
Diethylphthalate	...	...	...	0.03*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.07*	...	
Fluorene	...	...	...	...	0.07	0.07	0.08*	...	...	...	...	...	0.25	0.05	0.54	...	...	0.06*	...	...	...	
BP	...	...	...	...	...	...	...	...	...	...	...	...	1.40*	...	...	...	...	...	...	...	...	
Pyrene	...	...	...	...	...	...	...	...	...	...	...	...	0.17*	...	...	...	...	...	...	...	...	
Arsenic	0.006	0.002	0.005	0.001	0.005	0.008*	0.016	...	...	...	...	...	0.002	0.003*	0.003	...	...	0.002	0.003*	...	0.002	
Chromium	0.007	0.003	0.006	0.003	0.003	0.021*	0.017	0.005*	0.003	...	...	...	0.002	0.003	0.003	0.002	0.005*	0.002	0.003	0.003	0.003	
Copper	0.064	0.065	0.190*	0.079	0.064	0.095	0.062	0.016*	0.002	...	...	...	0.003	0.003	0.003	0.002	0.004	0.002	0.005	0.026*	0.022	0.021

Note: - = below detectable limits

\*Highest concentration dry/station

Source: Hunter/FSE, 1989

An exposure pathway is the course a chemical agent takes from a source to an exposed population or individual (receptor). For the exposure pathway to be complete, the following four components must be present:

1. A source or release from a source
2. A likely environmental migration pathway
3. An exposure point where receptors may come into contact with the chemical agent
4. A route by which potential receptors would result in an intake of the chemical agent.

A screening of current potential exposure pathways was conducted; the RA focused only on the significant completed exposure pathways.

### 6.3.2 Onsite Exposure Pathways to Workers

#### 6.3.2.1 Direct Contact

An important potential exposure pathway is direct contact of contaminated soil to uncovered skin surfaces. On the Koppers facility, potential worker exposure exists in two areas: the drip track areas; and the former lagoon and cooling pond areas. The majority of the contamination in the former lagoon and cooling pond areas is in the subsurface soils. Workers in the drip track areas are protected from direct contact by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) labeling which requires them to wear long pants, long-sleeved shirts and gloves as well as additional protective equipment. FIFRA contains a number of other requirements concerning worker safety and training that effectively prevents direct contact. OSHA regulations also provide protection to workers in both the drip track and former lagoon and cooling pond areas.

#### 6.3.2.2 Incidental Ingestion

The same FIFRA and OSHA regulations that effectively prevent the completion of the exposure pathway for direct contact also prevent the completion of the exposure pathway for incidental ingestion.

#### 6.3.2.3 Inhalation

As part of the supplemental RI, air samples were taken from three different areas on the Koppers site. All of sample results were well below the OSHA limits for worker exposure. Therefore, this pathway was not carried any further in the RA.

### 6.3.3 Potential Onsite Exposure Pathways to the General Public

#### 6.3.3.1 Direct Contact

Because a portion of the Koppers facility is fenced and has a locked gate, direct contact of the general public to source areas on the Koppers facility under the current land use scenario is expected to be infrequent. This pathway was not carried any further in the RA. However, public access to the soils in the former Carbon lagoons is unrestricted, this pathway was carried through the RA. The exposure concentrations selected were the highest observed surface soil concentrations observed in either the IT RI or the Hunter/ESE RI.

The direct contact scenario was based on a child visiting the site to play 36 days per year for six years. In addition, it was assumed that 50 percent of the time onsite would be in the contaminated area. The dermal absorption rates were 10 percent for semivolatile organic compounds, 25 percent for volatile organic compounds, 15 percent for chromium and 1 percent for other metals. The exposed skin surface area and body weight was assumed to be 2350 cm<sup>2</sup> and 35 kg, respectively. A soil ingestion rate of 100 mg per day was used for the ingestion pathway.

#### 6.3.3.2 Inhalation

Because site access is restricted for the Koppers site, this was not considered a completed pathway. The former Cabot Carbon lagoons are covered with moderate vegetation, a concrete foundation and a stormwater retention pond. For these reasons, the generation of dust is greatly inhibited. Therefore, this was also not considered a completed pathway.

#### 6.3.4 Potential Offsite Exposure Pathways to the General Public

##### 6.3.4.1 Direct Contact

There are two significant offsite exposure points for the general public: the North Main Street Ditch and the KII drainage ditch. Because both of these areas have unrestricted access, they were both retained as complete pathways for exposure to contaminated surface water and sediment. In addition to dermal contact, it was determined that children playing in the ditches could also incidentally ingest small quantities of contaminated sediment or surface water.

The exposure concentrations for surface water used for the North Main Street Ditch were the maximum observed values downgradient of the source areas and were taken from either the Hunter/ESE RI or IT RI. For sediment concentrations, the highest concentration from ESE location SE-004 and ITS-2 was used. These levels appeared to most closely represent the levels as observed during several sampling events. For the KII ditch, the highest observed concentration from the Hunter/ESE and the Koppers 1985 investigations were chosen. Due to the small number of detections, no surface water concentrations were calculated.

The direct contact exposure scenario assumes that a child (age 7 to 13 years) plays in or near Springstead Creek 2 times per week, averaging 30 minutes per event, for the 39 weeks that school is in session and 4 times per week averaging 1.5 hours per event for 13 weeks during the summer. It was also assumed that a child would spend 50 percent of this time playing in the area along the creek banks. The exposure frequency for the North Main Street Ditch were assumed to be 10 times per year for 2 hours per day. The skin surface area, body weight and absorption rates for dermal contact with sediments are the same as for the onsite direct contact with soil scenario.

The surface water absorption rate was based on the dermal permeability constant ( $K_p$ ) for each constituent. The sediment ingestion rate was assumed to be 100mg per day and the surface water ingestion rate was assumed to be 10 milliliters per event.

##### 6.3.4.2 Direct Ingestion of Aquatic Organisms

The intermittent flow and small size of the North Main Street Ditch, the KII drainage ditch and Springstead Creek, combined with their location in an industrial/high traffic area, make it highly unlikely that edible size fish would be caught near the site. This was not considered a complete exposure pathway.

#### 6.3.4.3 Inhalation

Due to the presence of moderately volatile constituents in the surface water and sediments of the two drainage ditches, this was retained as a completed exposure pathway.

The exposure frequency is the same as for the direct contact scenario for a child playing at the North Main Street Ditch, except it is assumed that the exposure is occurring 100 percent of the time that the child is in the area. The breathing rate is assumed to be  $2.1 \text{ m}^3/\text{hr}$ .

#### 6.3.4.4 Groundwater

There are currently no users of the shallow aquifer. In order to assess the potential risk of any future use, two hypothetical groundwater wells were selected. Because the indicator chemicals on the northern boundary of the site are different from the indicator chemicals on the eastern boundary of the site, a hypothetical well was located at both these points. The general procedure for estimating the potential current and future groundwater exposure concentrations was as follows:

- o Determination of plume characteristics;
- o Determination of equilibrium conditions between groundwater and soil at source areas;
- o Calculation of expected time of travel from source to receptor; and
- o Calculation of anticipated future exposure concentrations from dilution of source concentrations.

The groundwater exposure assumptions were for the daily consumption of 2 liters of water by a 70 kg person.

#### 6.3.5 Environmental Receptors Exposure Pathways

##### 6.3.5.1 Terrestrial Exposure

Organisms that live in, on, or above the land may be exposed to surficial soils (both dermally and by ingestion) and surface water (primarily as drinking water). Some terrestrial organisms also may consume affected plants or animals from either terrestrial or aquatic habitats; resulting in bioaccumulation of contaminants. A qualitative evaluation of these pathways was performed for various types of organisms found at the site.



#### 6.3.5.2 Aquatic Exposure

Aquatic biota may be exposed to constituents via water, sediment, or food. Organisms may be exposed via transfer from water across thin body membranes such as gills. This is the process of bioconcentration. This exposure pathway is limited by the chemicals' solubilities. Chemicals with low solubilities may adsorb preferentially to sediment particles. These may be ingested by organisms, and some portion of the chemical may be transferred to the organism via the gut. The assimilation efficiency depends on numerous variables such as bioavailability, lipid (fat) content of the organism, gut clearance time, etc. Finally, organisms may ingest affected prey. Bioaccumulation from food is dependent upon numerous factors, including the degree to which the chemical transfers to and remains in living tissue, the physiological rate constants governing uptake and depuration in the various organisms, the encounter rate of and concentration in affected prey, temperature, and other factors.

#### 6.3.6 Summary

As a result of the exposure pathway screening, the preliminary list has been reduced to the following five potentially complete exposure pathways:

1. Exposure by direct contact to onsite surface soils in old Cabot Carbon lagoons area,
2. Incidental ingestion of onsite surface soils in old Cabot Carbon lagoons area,
3. Inhalation of vapors in offsite ambient air,
4. Ingestion of groundwater, and
5. Exposure of receptors, both human and environmental, to affected surface water and sediments.

The RA addresses these five potential exposure pathways associated with the inactive onsite potential reception areas and the potential offsite.

The exposure point concentrations for these completed exposure pathways were then compiled.

### 6.4 Toxicity Assessment

#### 6.4.1 Reference Doses

Reference doses (RfDs), also referred to as the acceptable daily intakes (ADIs), have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals

exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-days, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help insure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. The RfDs for the site contaminants of concern are contained in Table 8.3.1.

#### 6.4.2 Chronic Hazard Index (HI)

The chronic HI is a ratio of the lifetime average daily exposure of a noncarcinogenic chemical to the acceptable intake exposure level. If this ratio is greater than unity ( $>1$ ), then the lifetime average daily exposure has exceeded the acceptable intake exposure level, indicating that potential health hazards exist (EPA, 1986a).

#### 6.4.3 Weight-of-Evidence Categories

The weight-of-evidence categories for potential carcinogens qualify the level of evidence that supports designating a chemical as a human carcinogen. Table Three contains a more detailed explanation of the categories.

#### 6.4.4 Carcinogenic Potency Factor

The carcinogenic potency factor (CPF) is used for estimating the lifetime (70 years) probability of a human contracting cancer caused by exposure to known or suspected human carcinogens. This factor is the slope of the cancer risk dose-response curve and is generally reported in  $(\text{mg/kg/day})^{-1}$ . This slope is determined through an assumed low-dosage linear relationship and extrapolation from high to low dose responses determined from human epidemiological studies or animal bioassays. The value used in reporting the slope factor is an upper 95-percent confidence limit on the probability of response per unit intake of a chemical over a lifetime, converting estimated intakes directly to incremental risk (EPA, 1986a). Use of this approach makes underestimation of the actual cancer risk highly unlikely. The CPFs for the site contaminants of concern can be found in Table 8.3.1

#### 6.5. Risk Characterization

TABLE THREE

EPA Weight of Evidence Categories

A Human Carcinogen

B1 or B2 Probable Human Carcinogen

B1 indicates human data available, B2 indicates  
sufficient animal and inadequate or no evidence  
in humans

C Possible Human Carcinogen

D Not Classifiable as to Human Carcinogenicity

E Evidence of Noncarcinogenicity in Humans

The problem will be addressed specifically in the Remedial Design.

How does EPA justify having soil cleanup criteria for some chemicals that are lower than levels present in some foods?

As stated earlier, EPA developed its cleanup criteria based on standard methodologies used for Superfund remediation in Region IV. EPA has no real expertise regarding food products and is not in a position to comment on the comparison.

Considering the large number of studies already done on this site, how does EPA justify asking for additional investigation ~~work as part of the Remedial Design?~~

Despite the large number of studies, there are still significant questions about several of the source areas; especially the Cabot lagoons and the wetland/lagoon area. Levels of contaminants higher than the cleanup criteria appear in several locations in earlier studies and EPA needs to confirm that these areas do not require remediation.

Is EPA aware that Koppers is planning to install a new containment area for their creosote tanks and associated equipment?

Yes, EPA is now aware of this fact.