United States
Environmental Protection
Agency

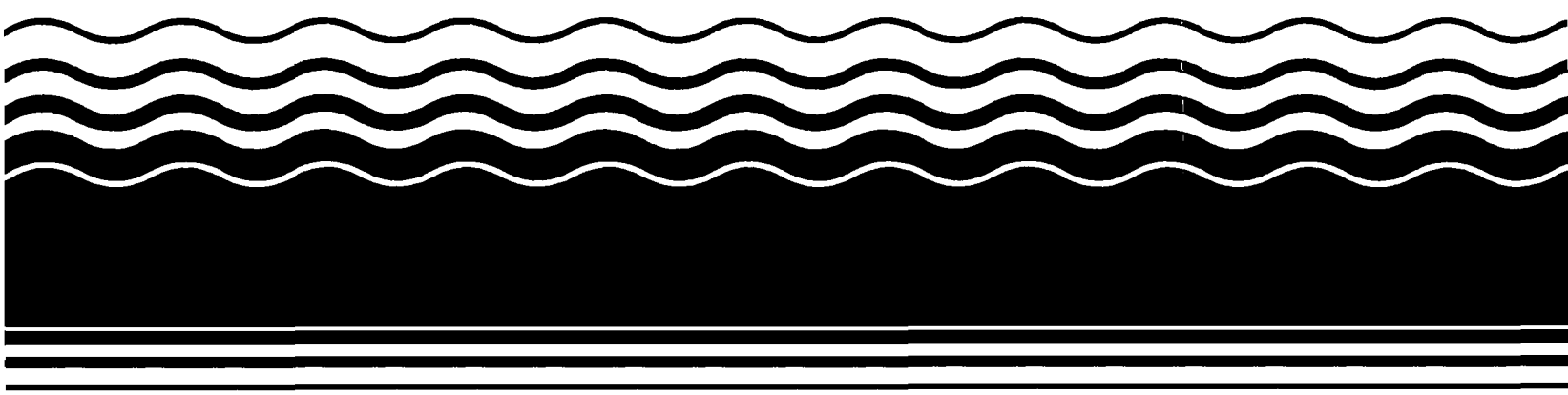
Office of
Emergency and
Remedial Response

EPA/ROD/R04-93/154
September 1993

EPA

Superfund Record of Decision:

Chem-Form, FL



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SUPERFUND RECORD OF DECISION Chem-Form, FL Second Remedial Action - Final	09/16/93
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	14.

15. Supplementary Notes

PB94-964042

16. Abstract (Limit: 200 words)

The 4-acre Chem-Form site is a former manufacturing facility located in Pompano Beach, Broward County, Florida. Land use in the area is predominantly commercial and industrial. Another Superfund site, the Wilson Concepts site is located immediately adjacent to the east of the Chem-Form property. The site is fenced and includes a 50,866 square-foot building. The nearest residence is located approximately one-half mile from the site. The Pompano-Cypress Creek Canal lies approximately 3,000 feet south of the Site and flows east toward the Biscayne Bay. The Site overlies the Biscayne Aquifer, which supplies all potable water for Broward County and has been designated as a sole-source aquifer. Since 1967, various manufacturing activities have been conducted at the site, primarily related to the machining of precision parts for the aerospace industry. While manufacturing activities conducted at the Site have remained relatively similar, ownership of the site changed hands several times between 1967 and 1986. From 1967 to 1976, a division of KMS Industries named "Chem-Form" operated as a certified station for the repair and refurbishment of turbine engine components, and manufactured electrochemical machining equipment and precision machined metal parts. These operations generated waste and spent materials such as cutting oils, organic solvents from metal cleaning, solvents used in fiberglassing and painting

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Chem-Form, FL
Second Remedial Action - Final
Contaminated Medium: None
Key Contaminants: None

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 44
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse*

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

Abstract (Continued)

operations, metal-bearing electrolyte solutions, and process wastewater. Process wastewater was discharged along with sanitary sewage to a septic tank and associated drain field on the south side of the building. Other wastewater was discharged to an open trench in the open field on the west side of the building. In August 1985, EPA conducted an onsite screening investigation and noted 19 drums outside the building, two of which were found to be leaking, as well as 47 other drums and four steel tanks in the shop yard containing various quantities of oil and sludge. A two-phase removal action was conducted by the PRPs in 1990 and 1991 to remove the drums and any contaminated soil that might potentially affect the ground water, respectively. A 1992 ROD addressed potentially contaminated ground water at the site, as OU1. This ROD addresses a final remedy for the onsite contaminated soil, as OU2. Based on the results of the RI and the Risk Assessment that were conducted, EPA has concluded that previous removal and remedial actions have fully addressed site contamination; therefore, there are no contaminants of concern affecting the site.

The selected remedial action for this site includes no further action. Based on the results of the RI and the Risk Assessment, as well as the removal action that was previously been conducted to reduce soil contamination levels, EPA has determined that no further action is necessary to protect human health and the environment. There are no present worth or O&M costs associated with this no action remedy.

PERFORMANCE STANDARDS OR GOALS:

Not applicable.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Operable Unit Two
Chemform, Inc. Site
Pompano Beach, Florida

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Chemform, Inc. Site in Pompano Beach, Florida. The remedy for Operable Unit Two of the site was chosen in accordance with the Comprehensive Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) 42 U.S.C. Section 9601 et.seq., and to the extent practicable, the National Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the administrative record file for this site.

In accordance with 40 CFR 300.430, the State of Florida, as represented by the Florida Department of Environmental Protection (FDEP), has been the support agency during the Remedial Investigation process for the Chemform site. Based upon comments received from FDEP, EPA does not anticipate that concurrence on this Record of Decision will be forthcoming; however, EPA has not yet received a formal letter of nonconcurrence.

DESCRIPTION OF THE SELECTED REMEDY

This remedy applies to Operable Unit Two at the site which pertains to the site-related soil contamination. Due to an extensive cleanup of the site related contaminant sources, and a significant reduction in soil contaminant levels, no further Superfund action is necessary to address Operable Unit Two at the site.

DECLARATION STATEMENT

Based on the results of the Remedial Investigation and Risk Assessment conducted for Operable Unit Two at the Chemform, Inc. site, EPA has determined that no further action is necessary to ensure the protection of human health and the environment, and that the selected remedy is protective of human health and the environment. The five-year review will not apply to this action because this remedy

will not result in hazardous substances remaining on-site above health-based levels. EPA has determined that with the exception of quarterly groundwater monitoring as part of Operable Unit One, its response at this site is complete. Therefore, the site now qualifies for inclusion on the Construction Completion List.

Patrick M Tobin

Patrick M. Tobin, Acting Regional Administrator

9-16-93

Date

Record of Decision

Summary of Remedial Alternative Selection

Operable Unit Two

Chemform, Inc. Site

Pompano Beach, Florida

Prepared by:
U.S. Environmental Protection Agency
Region IV
Atlanta, Georgia

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDIX

DECISION SUMMARY FOR THE RECORD OF DECISION
CHEMFORM, INC. SITE
POMPANO BEACH, FLORIDA

1.0 SITE NAME, LOCATION, AND DESCRIPTION

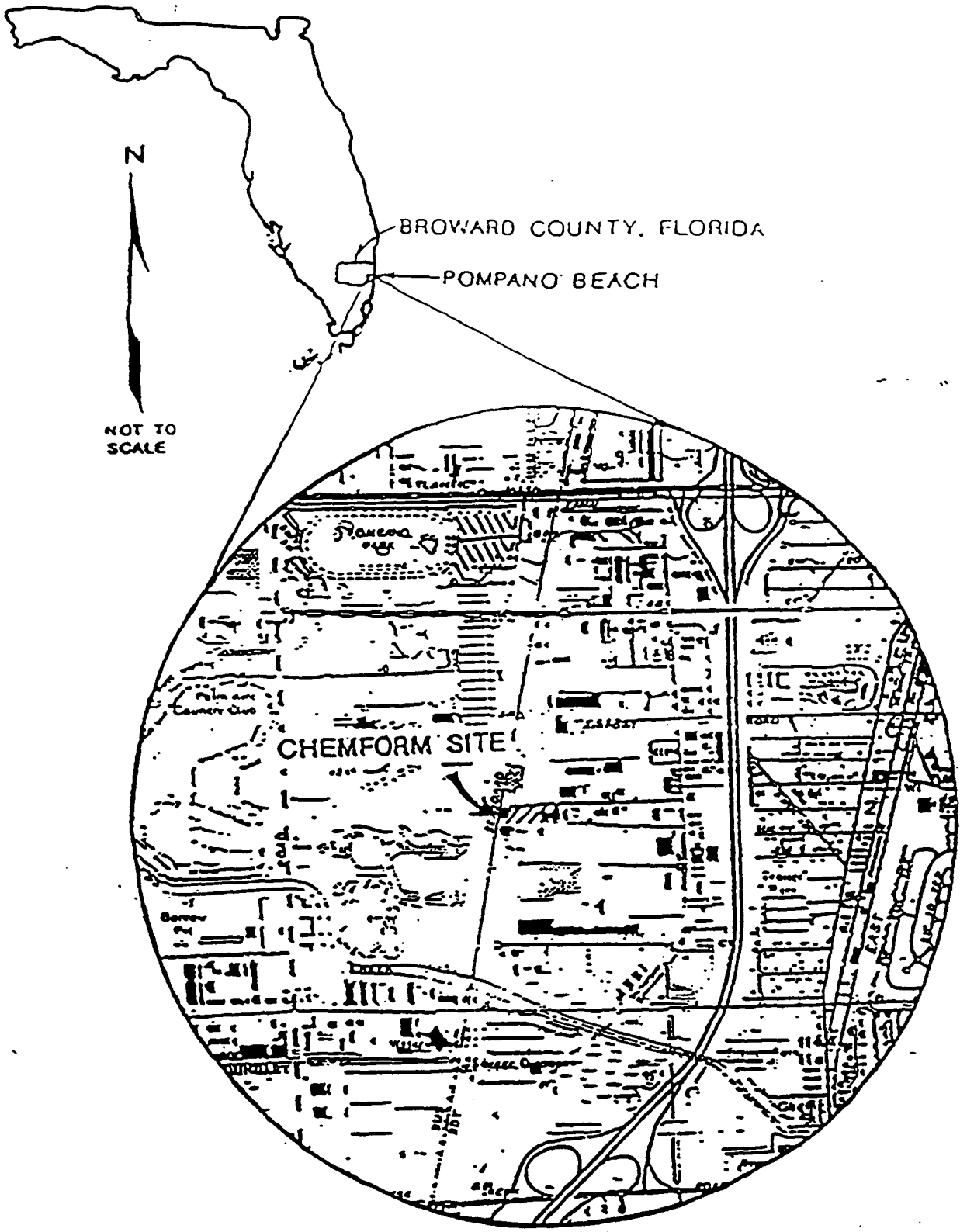
The Chemform, Inc. Site (Chemform) is located in Broward County at 1410 S.W. 8th Street, Pompano Beach, Florida (Figure 1-1). The site is located in a commercial-industrial area at the end of a dead-end street. Immediately adjacent to and east of Chemform is the Wilson Concepts Superfund site currently operated as a machine tool manufacturing facility (Figure 1-2). An alley about 6-10 feet wide on the Chemform property separates the Wilson Concepts and Chemform buildings. The site is bounded on the west by active Seaboard Coastline Railroad tracks, and on the north by S.W. 8th Street and the National Enquirer Property. On the south side of the site is an industrial access road and Carpenter Contractors of America, Inc., a roof truss manufacturing facility.

Chemform occupies approximately four acres in a highly industrialized area less than one half mile west of Interstate 95. The site is fenced and includes a 50,866 square-foot building. The closest residential zoning lies just east of I-95. The site is located within the city limits of Pompano Beach, which has a population of 72,400 (U.S.D.C., 1990).

The Pompano-Cypress Creek Canal lies an estimated 3000 feet south of the site. The Canal, operated by the South Florida Water Management District, flows east toward and connects with Biscayne Bay. Directly underlying the site is the Biscayne Aquifer, which supplies all potable water for Broward County and has been designated as a sole-source aquifer.

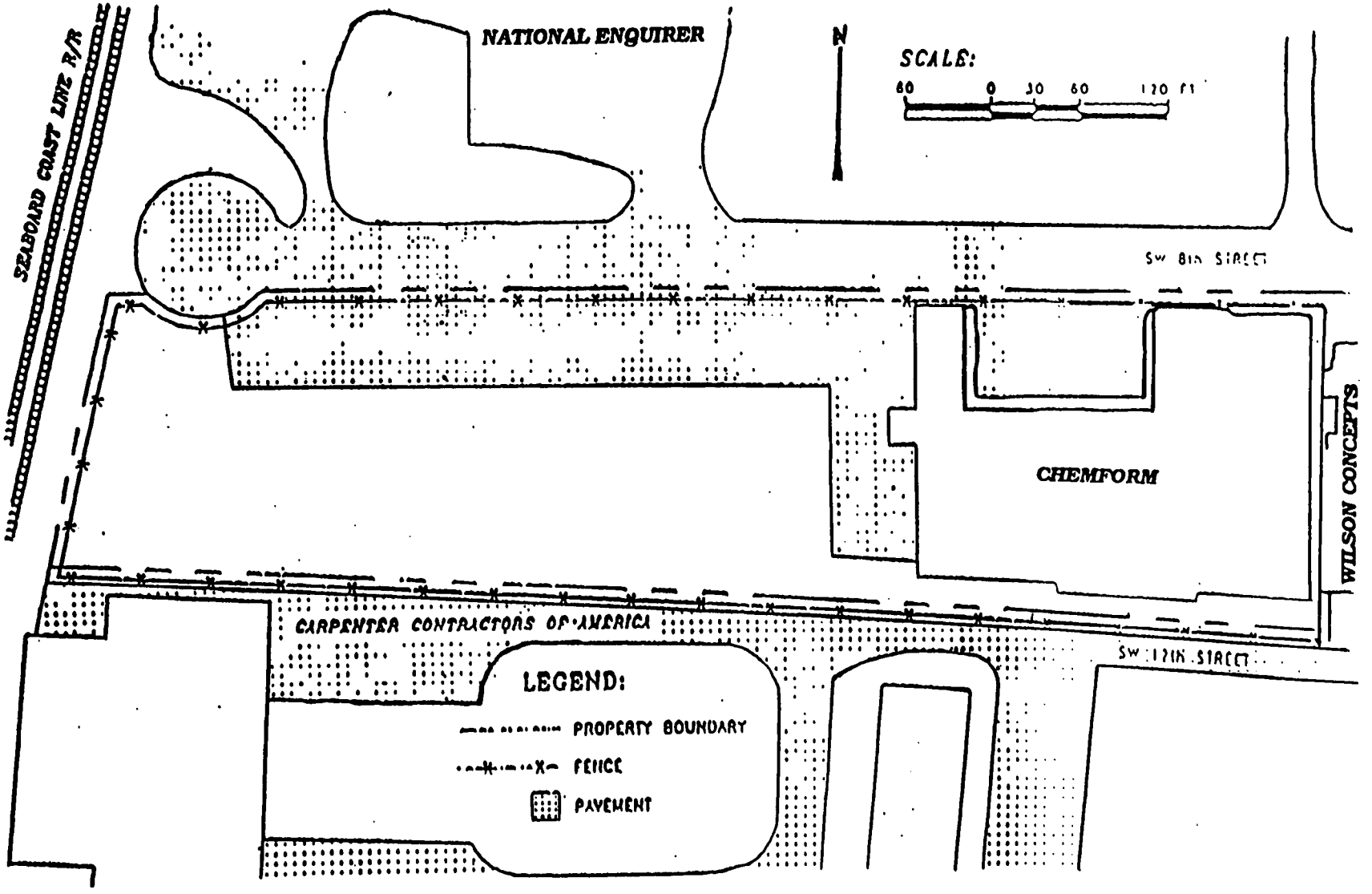
2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Operations began on the site in November 1967 after construction of the original building. Aerial photographs show the Chemform site and the area in general as undeveloped prior to 1967. The first operation at the site was a small precision machine shop under the name KECO, Inc., an acronym for Kismet Engineering Company. During its initial years of operation, KECO was involved in the machining of precision metal parts for the aerospace industry. Later, KECO began operation of its first Electro-Chemical Milling (ECM) machine. After gaining experience with the ECM machine, KECO converted a standard milling machine into an ECM machine. Success with this machine led to the design, building, and marketing of a product line of ECM machines under the name of Chemform.



SITE LOCATION MAP
CHEMFORM SITE
POMPANO BEACH, FLORIDA

Figure 1-1



SITE LAYOUT MAP
CHEMFORM SITE
POMPANO BEACH, FLORIDA

Figure 1-2

On November 29, 1967, the site was sold to KMS Industries, Inc. (KMS) who then sold the site to New England Mutual Life Insurance Company in 1969 in exchange for a long-term lease. New England Mutual Life is the current owner of the site. Chemform, a division of KMS, manufactured electrochemical machining equipment and precision machined metal parts at the site from November 1967 to May 1976. Although operators of the site changed twice more, the above-described manufacturing operation continued until 1985. From September 1985 through October 1986, the site was subleased to a company which operated a small-scale manufacturing business.

Most of Chemform's business was with the aerospace industry as a certified repair station for the repair and refurbishment of turbine engine components. Chemform also provided services to utility companies that used turbine power plants. Chemform's other business operations consisted of the design, manufacture, and marketing of electro-chemical machines for other industries involved in the fabrication of metal parts.

Chemform ceased operations in 1985 and has been maintained in a potential operational status since that time with limited maintenance and upkeep. The property has undergone extensive renovation, however, since late 1991 to prepare it for leasing.

From 1967 to 1985, Chemform and its predecessor operations were engaged in several processes that generated wastes or spent materials. Metal milling and mechanical shaping operations required cutting oils to lubricate and cool the parts and machines during operations. Spent cutting oils were collected in stainless-steel vats and routinely pumped out by local reprocessing contractors. Organic solvents were used for metal cleaning. Finished metal parts which required cleaning were processed through vapor degreasing equipment. Fiberglassing and painting operations also involved the use of solvents for thinning and cleanup. The electro-chemical machining operation involved a wet process which removed metal from the part being worked by using an electric current applied in an electrolyte solution. This process produced metal-bearing electrolyte solutions which were settled in tanks and centrifuged to remove the metal solids. Process wastewater from ECM machine wash down and sanitary sewage was discharged to a septic tank and associated drain field on the south side of the building. Wastewaters were discharged to an open trench in the open field on the west side of the building. According to Chemform's response to an Industrial Wastewater Questionnaire, the company discharged about 50 gallons per day of wastewater (sodium chloride and sodium nitrate) until 1975.

In August 1985, EPA conducted a site screening investigation at the site. This investigation noted an outside drum rack in the paved shop yard west of the building with 19 drums, two of which were leaking. EPA also noted that approximately 47 other drums were stored in the shop yard along with four stainless steel tanks containing various quantities of oil and sludge. In July 1986, an EPA contractor, NUS Corporation, conducted a sampling investigation. After evaluating the sampling results, EPA proposed the site for the National Priorities List (NPL) in July 1988. In March 1989, the

Chemform Site was formally included on the NPL.

On October 19, 1989, EPA and the Potentially Responsible Parties (PRPs) entered into an Administrative Order on Consent (AOC) for conducting the Remedial Investigation/Feasibility Study (RI/FS) at the site.

The PRPs for the site are Chemform, Inc., New England Mutual Life Insurance Company, KMS Industries, and Smith International, Inc.

On April 17, 1990, EPA sent the PRPs a Unilateral Administrative Order to address the removal of drums found on the Site and to investigate the effect of metal concentrations on the groundwater. The PRPs commenced the removal action in October 1990. Based upon the results of this initial action, EPA further ordered the PRPs to remove contaminated soil that may potentially affect the groundwater. This second phase of the removal action commenced in July 1991 and was completed in early 1993.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Chemform site is located in the industrial section of Pompano Beach, Florida. The closest residentially zoned area is east of I-95, about 1/2 mile east of the site.

Community interviews were conducted by EPA in February 1990 to determine public interest in the Chemform site. The conclusion drawn from these interviews is that there is minimal interest in the Chemform Site, probably due to the transient nature of the local population and the industrial setting around the site. EPA held an Availability Session at the Pompano Beach Multipurpose Center on December 4, 1990 to provide information and answer questions on the Remedial Investigation (RI) to be conducted at the site. Seven people attended. Attendees of the session indicated an interest in learning more about the site and asked numerous questions about the Superfund process. Minimal questions were raised regarding site-related health and/or environmental concerns.

The RI, Risk Assessment, and Proposed Plan for Operable Unit Two of Chemform were released to the public on July 22, 1993. These documents were made available in both the administrative record and at the information repository maintained at the EPA Records Center in Region IV, Atlanta, Georgia and at the Broward County Main Library in Fort Lauderdale, Florida. The notice of availability for these two documents was published in the Ft. Lauderdale Sun Sentinel on July 15, 1993. A public comment period was held from July 22, 1993 through August 22, 1993. In addition, a public meeting was held on August 4, 1993. At the public meeting, which was attended by 10 people, representatives from EPA answered questions about the findings of the RI and Risk Assessment and EPA's Proposed Plan for the site. A response to the comments received during this period is included in the Responsiveness Summary, which is Appendix A

of this Record of Decision. The decision for this site is based on the administrative record. These community relations activities fulfill the statutory requirements for public participation contained in CERCLA section 113(k)(2)(B)(i-v).

4.0 SCOPE AND ROLE OF OPERABLE UNIT

On April 7, 1992, EPA and the PRPs entered into the First Amendment to the AOC dated October 19, 1989. This amendment included modifications to the AOC which reflected the division of the Site into two operable units. Operable Unit 1 (OU1) addressed any contamination in the groundwater at the Site that may have posed a risk to the surrounding population. Operable Unit 2 (OU2) addressed the soil at the Site, the principle site-related threat. Dividing the site into two operable units allowed for the groundwater to be addressed while the removal action was ongoing for the soils.

The response action in this ROD is for OU2 at the Site. Extensive cleanup efforts during the removal action and results of the risk assessment suggest that if no further action were taken at this site, present site conditions would be protective of human health and the environment. The response actions are consistent with the NCP (40 CFR Part 300).

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 CLIMATE

Pompano Beach is located in South Florida in an area dominated by tropical air masses. The average maximum annual temperature is 82.6°F; the average minimum annual temperature is 68°F; and the mean annual temperature is 75.6°F. The average annual precipitation for the area Is 57.5 inches. Surface meteorological data obtained from the Miami International Airport indicate a general westerly flow of air in this region.

5.2 SURFACE HYDROLOGY

Figure 5-1 displays potential surface drainage patterns on and near the site. The ground surface on the site slopes gently from north to south, with an average gradient of 1.4 feet across the site. Surficial soils on the site are sandy and highly permeable. The flat topography and permeable soils tend to minimize surface runoff from the site. Should surface runoff occur during heavy rainfalls, the general flow direction would be south, toward the Carpenter Contractors of America truss plant.

The closest surface water body to the site is Cypress Creek, which lies about 0.5 miles south of the site at its closest point, as shown in Figure 5-2. Cypress Creek, or C-14 Canal, is a short 7-8 mile branch of Pompano Canal, a part of the vast system of canals that provide drainage and flood control in south Florida. From its origin at the Pompano Canal, about 1.5 miles northeast of the site, Cypress Creek flows due

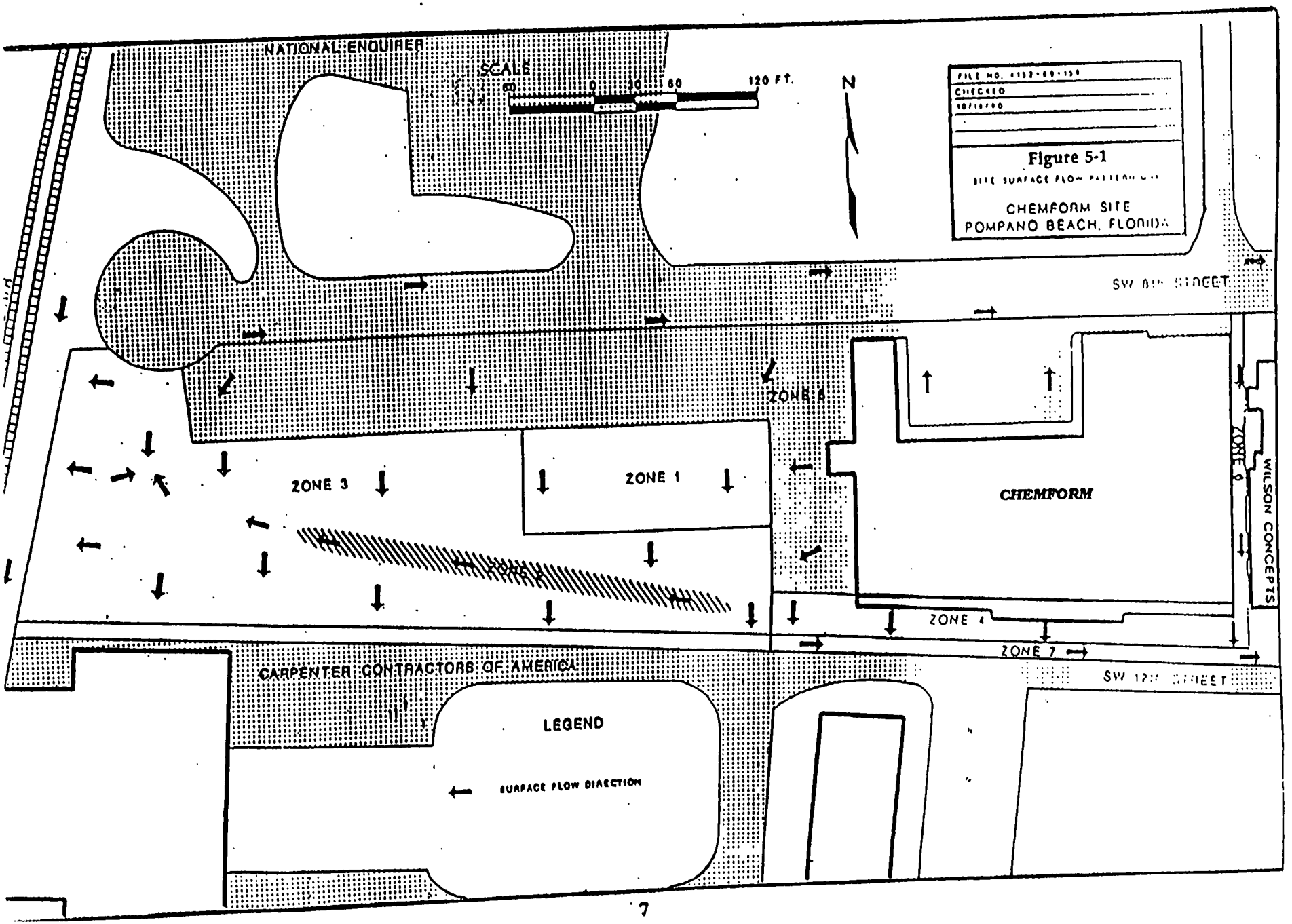

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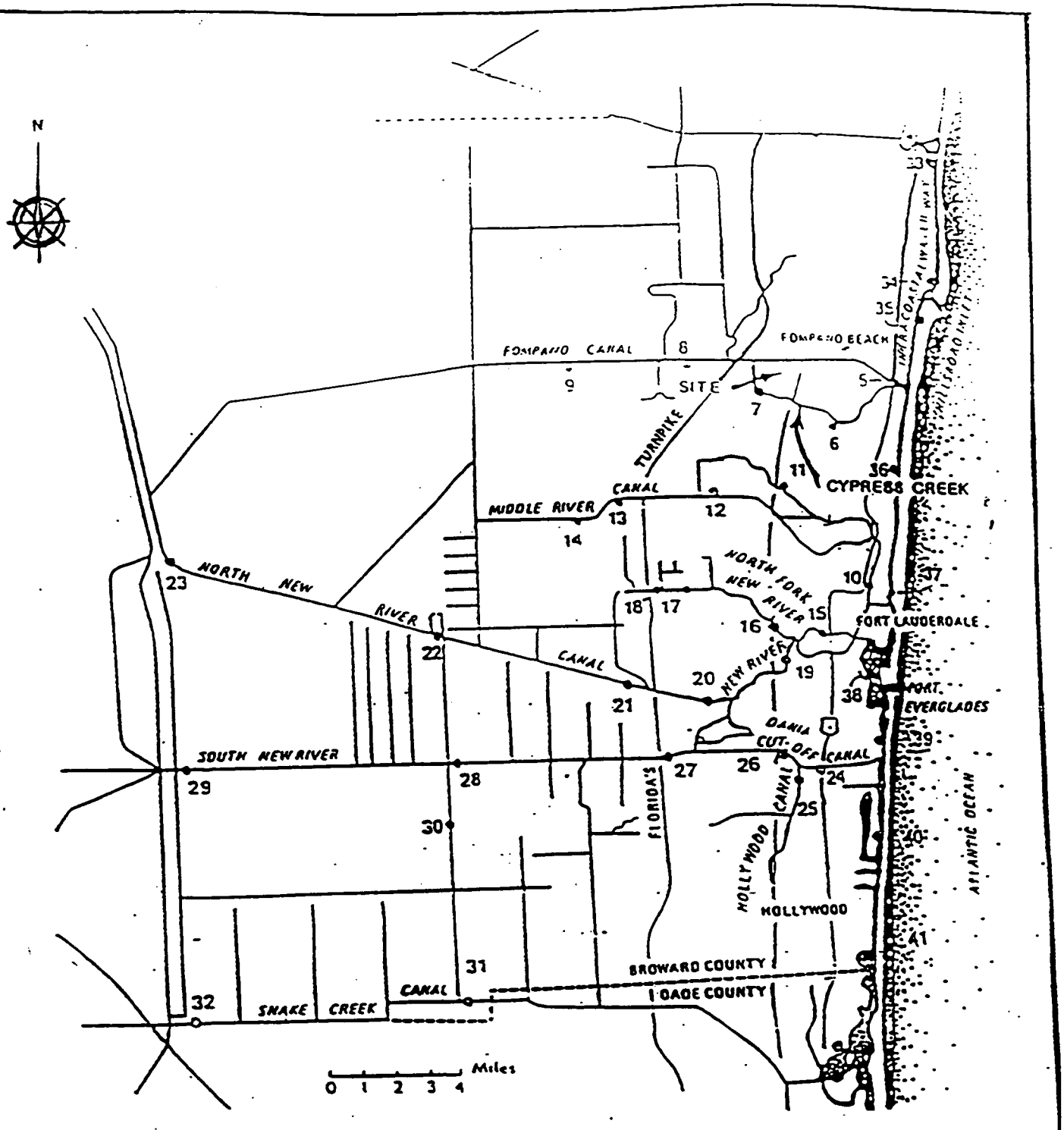
Figure 5-1
SITE SURFACE FLOW PATTERN
CHEMFORM SITE
POMPANO BEACH, FLORIDA
SW 6TH STREET
ZONE 5
ZONE 3
ZONE 1
ZONE 2
CHEMFORM
ZONE 6
WILSON CONCEPTS
ZONE 4
ZONE 7
CARPENTER CONTRACTORS OF AMERICA
SW 12TH STREET
LEGEND
SURFACE FLOW DIRECTION



SOURCE:
BROWARD COUNTY ENVIRONMENTAL
QUALITY CONTROL BOARD

FILE NO.: ORW E159
CHECKED
3-24-92

Westinghouse Environmental and Geotechnical Services, Inc.
ORLANDO • TAMPA • DEERFIELD BEACH
FLORIDA

Figure 5-2
CYPRESS CREEK CANAL
CHEMFORM SITE
POMPANO BEACH, FLORIDA

south for about 1 mile and then in an easterly direction for about 6-7 miles until it empties into the Intercoastal Waterway. Cypress Creek is about 100 feet wide at its nearest point to the Chemform Site. Cypress Creek, as well as the other canals in this part of South Florida, is managed by the South Florida Water Management District (SFWMD) which is responsible for operation, maintenance, and monitoring of the canals. SFWMD maintains two flood control structures/gauging stations on Cypress Creek, one upstream, at about 1.7 miles west of the site, and one downstream, at about 1.2 miles east of the site. The average flow for the period 1985 to 1992 was 120-129 cubic feet per second (cfs).

5.3 GEOLOGY AND HYDROGEOLOGY

The Chemform Site is located on the Southern Atlantic Coastal strip which is a broad ridge that is underlain by Pleistocene-aged sand and shelly sand (Pamlico sand). In the vicinity of the site, the Pamlico sand occurs to a depth of approximately 50 feet, where the Anastasia Formation occurs as a slightly calcareous shelly sandstone. Below the Anastasia Formation (at a depth of approximately 200 feet) the Miocene-aged Hawthorne Formation occurs; a thick unit consisting primarily of semi-consolidated clay and silt. Below the Hawthorne Formation are highly transmissive Eocene-age limestones. Soil borings conducted during the Phase I RI indicated no evidence of a confining unit within 50 feet of the surface.

The sands, sandstone, and limestone beneath the site form part of the Biscayne Aquifer, the primary drinking water source in Broward and Dade Counties. The aquifer is thickest near the coast and it thins and pinches out in the western reaches of Dade and Broward Counties. The aquifer is comprised primarily of unconsolidated quart sands in approximately the upper 50 feet and it becomes more calcareous and consolidated with depth. Below a depth of 75 feet the aquifer is comprised of semiconsolidated sandstone and limestone that are interlayered. The limestone is more transmissive than either the unconsolidated sand or sandstone; it is from the more transmissive zones of the limestone that water supplies are drawn. Transmissivity of the Biscayne Aquifer ranges from 5.4×10^4 ft^2/day where the aquifer is mostly sand to greater than 1.6×10^6 ft^2/day in the limestone-rich areas. Regional flow of ground water is to the southeast; however, the direction of flow may be influenced by drainage canals or well fields. Flow direction in the site area appears to be influenced by the C-102 Canal, as it ranges in direction from east to northeast.

Regionally, the groundwater table is high, from 1.62 to 6.24 feet above mean sea level (USGS, 1988) and typically 6 to 8 feet below ground surface, characteristic of South Florida. Site-specific information obtained by NUS during the 1986 study indicates that ground water is approximately four feet below grade at the site, while later studies indicate that the groundwater is approximately 3.0 to 3.5 feet below grade.

5.4 RESULTS OF THE REMEDIAL INVESTIGATION

The purpose of the Remedial Investigation (RI) is to gather and analyze sufficient data to characterize the site in order to perform the Baseline Risk Assessment, which determines the site's impact on human health and the environment. Both the RI and Risk Assessment are used to determine whether further remedial action is necessary at the site.

The goal of soil and source area sampling at the site was to estimate the lateral and vertical extent of soil contamination as well as for use in the Baseline Risk Assessment to evaluate current and future risks associated with exposure to possible soil contaminants.

Soil characterization has been an ongoing process over several years at the site beginning with Phase I of the RI in June of 1990 and ending when the Removal Action was essentially completed in July of 1992. During this time period, site sampling activities were initially directed at general site characterization. As the Removal Action got underway, sampling became focused on confirming the effectiveness of several rounds of soil excavation and source area remediation to meet EPA generated Soil Cleanup Levels (SCLs) that were developed to be protective of the groundwater beneath the site.

Sampling for inorganic soil parameters consisted of a preliminary screening of 113 soil samples using nickel as an indicator of general inorganics contamination, and analysis of a subset of the 113 samples for Toxic Compound List (TCL) inorganics based on nickel screening results. The results of EPA's site screening studies showed nickel to be ubiquitous in soils at the site and a general indicator of the presence of inorganics in the soils. From this subset mentioned above, a list of the main contaminants of concern for surface soils was generated for the site. In subsurface soils, nickel and chromium were found to be the primary contaminants of concern. Table 5-1 summarizes sample results for inorganics in surface and subsurface soils for these main contaminants of concern prior to and after excavation at the site.

Sampling results for organics in surface soils revealed low concentrations (less than 1mg/kg) of three semi-volatile compounds and one pesticide and subsurface soils revealed similar compounds again in low concentrations.

Contaminant levels were substantially reduced through the implementation of soil and source area cleanup activities conducted by Chemform under EPA's oversight. Over 2,000 tons of contaminated surface and subsurface soils were excavated. Figure 5-3 presents the specific areas of soil remediation and Table 5-2 represents a description of soil and source area excavation. Confirmatory sampling of surface and subsurface soils corroborated that SCLs established for inorganics under the Removal Action were attained at the site. The exceptions to this were two isolated samples

Table 5-1

Inorganics in Surface Soils

Chemical	Frequency of Detection	Range of Detected Concentrations (mg/kg)	Background Levels
Prior to Excavation			
Arsenic	20/27	0.51-38	<0.36
Beryllium	7/27	0.65-51	<0.50
Cadmium	15/27	0.67-240	<0.50
Chromium	27/27	1.8-36,000	18.0
Cobalt	26/27	4.9-62,000	20.0
Lead	27/27	1.7-650	18.0
Nickel	26/27	6.6-92,000	36.0
Post-Excavation			
Arsenic	7/12	<0.33-38	0.18
Beryllium	0/21	<0.30-<0.50	<0.50
Cadmium	7/21	<0.30-12.0	<0.50
Chromium	24/24	2.1-340	18.0
Cobalt	9/9	6.9-290	20.0
Lead	9/9	8.2-120	18.0
Nickel	24/24	3.3-780	36.0

Inorganics in Subsurface Soils

Prior to Excavation			
Chromium	32/32	1.8-1,000	18.0
Nickel	28/32	3.4-1,800	36.0
Post-Excavation			
Chromium	33/38	<1.0-260	18.0
Nickel	20/38	<4.0-200	36.0

EPA Surface Soil Cleanup Levels (SCLs)

Parameter	SCL (mg/kg)
Chromium	400
Nickel	2,000
Lead	500
Arsenic	100

EPA Subsurface Soil Cleanup Levels

Parameter	SCL (mg/kg)
Chromium	200[a]
	250[b]
Nickel	100[a]
	200[b]

a- Wastewater Trench; b- All Other Areas

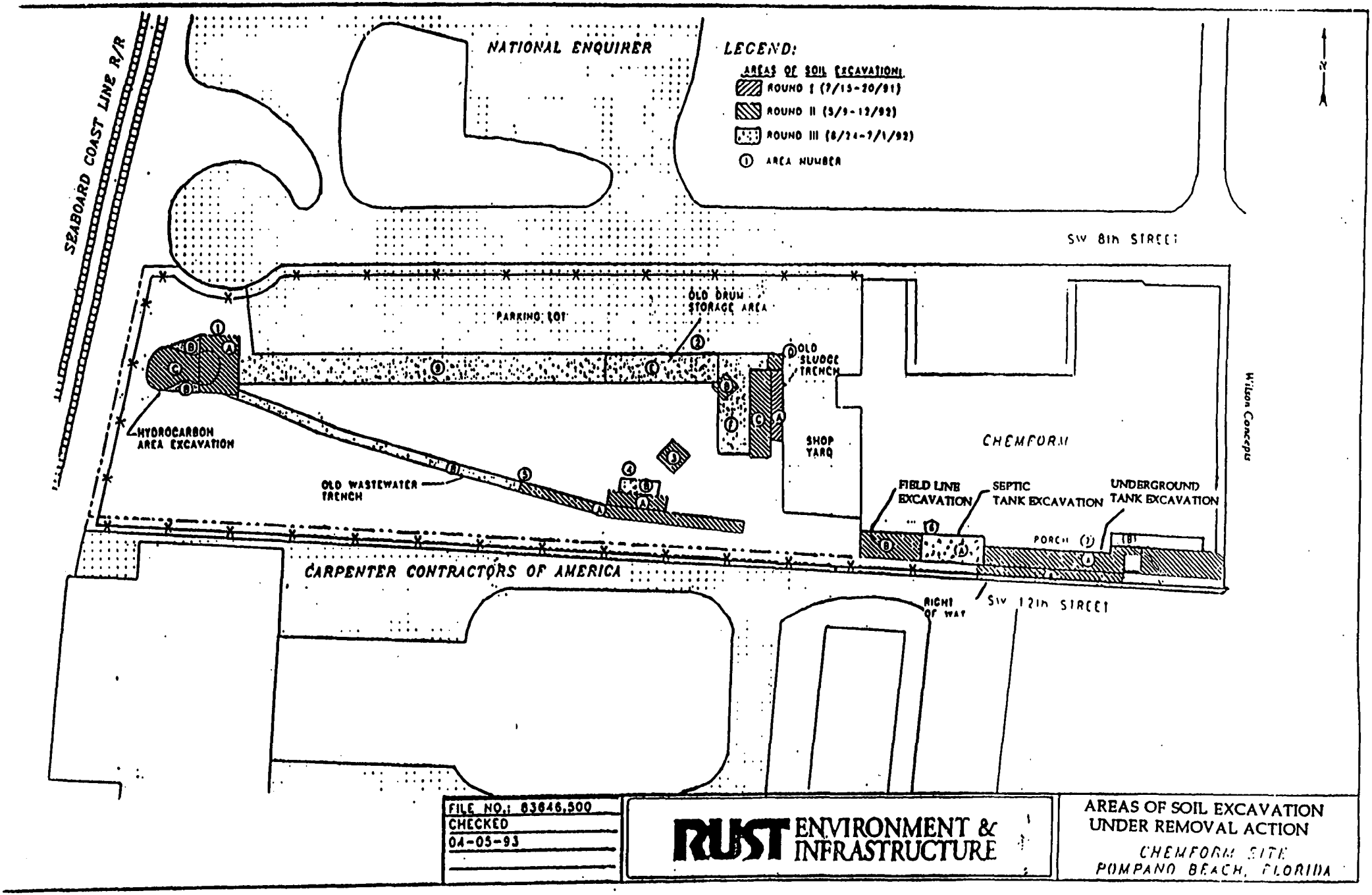

SEABOARD COAST LINE R/R
NATIONAL ENQUIRER
LEGEND:
AREAS OF SOIL EXCAVATION:
ROUND I (7/15-20/91)
ROUND II (3/9-13/92)
ROUND III (8/24-9/1/92)
① AREA NUMBER
SW 8th STREET
PARKING LOT
OLD DRUM STORAGE AREA
OLD SLUDGE TRENCH
HYDROCARBON AREA EXCAVATION
OLD WASTEWATER TRENCH
SHOP YARD
CHEMFORM
FIELD LINE EXCAVATION
SEPTIC TANK EXCAVATION
UNDERGROUND TANK EXCAVATION
PORCH
CARPENTER CONTRACTORS OF AMERICA
RIGHT OF WAY
SW 12th STREET
Wilson Concepts
FILE NO.: 63646.500
CHECKED
04-05-93
RUST ENVIRONMENT & INFRASTRUCTURE
AREAS OF SOIL EXCAVATION UNDER REMOVAL ACTION
CHEMFORM SITE
POMPANO BEACH, FLORIDA

Figure 5-3

Table 5-2
Description of Soil and Source Area
Excavation Under the Removal Action
Chemform Site, Pompano Beach, Florida

Area Number	Description	Approximate Volume Excavated(yd)	Average Depth(ft)[1]	Date Excavation Completed[2]
1A	Western Field	78	1.3	05/12/92
1B	Western Field	12	1.5	07/01/92
1C	Hydrocarbon Area	450	5-7	05/12/92
2A	Old Sludge Trench	22	1.3	07/20/91
2B	Area West of Shopyard	11	1.3	05/12/92
2C	Area West of Shopyard	54	1.3	05/12/92
2D	Area West of Shopyard	11	1.3	05/12/92
2E	Old Drum Storage Area	114	2	07/01/92
2F	Area West of Shopyard	81	1	07/01/92
3	Hot Spot South of Old Drum Storage Area	11	1.3	05/12/92
4A	Hot Spot North of Trench	20	1.3	05/12/92
4B	Hot Spot North of Trench	9	1	07/01/92
5A	Old Wastewater Trench	235	5-7	05/12/92
5B	Old Wastewater Trench	360	5-7	07/01/92
6A	Septic Tank Area	462	10	07/01/92
6B	Field Line Area	100	6	05/12/92
7A	Porch Area	500	3	05/12/92
7B	Porch Area	129	4	07/01/92
8	Right of Way	46	1.3	05/12/92
9	Area South of Parking Lot	113	1	07/01/92

Notes:
1. Depth is Feet below land surface.
2. Some excavation areas were excavated deeper in a subsequent round. Date shown is for final round of excavation complete for the area.

that exceeded the SCLs - one sample from the underground tank excavation (240 mg/kg nickel versus 200 mg/kg SCL) and one sample in the old wastewater trench excavation (260 mg/kg chromium versus 200 mg/kg SCL). Four organic parameters are indicated in surface soils under the current site conditions. These parameters were identified at only two locations in surface soils, at concentrations less that 1.0 mg/kg. Ten organic parameters were detected in subsurface soils and source areas in one or more samples. Organic parameter concentrations were generally below 1.0 mg/kg except for acetone and fluoroanthene, which were below 5.0 mg/kg.

6.0 SUMMARY OF SITE RISKS

A Baseline Risk Assessment was conducted as part of the RI to estimate the health or environmental problems that could result if no further action were taken at the Chemform site. Results are contained in the Final Baseline Risk Assessment Report. A Baseline Risk Assessment represents an evaluation of the risk posed if no remedial action is taken. The assessment considers environmental media and exposure pathways that could result in unacceptable levels of exposure now or in the foreseeable future. Data collected and analyzed during the RI provided the basis for the risk evaluation. The risk assessment process can be divided into four components: contaminant identification, exposure assessment, toxicity assessment, and risk characterization.

6.1 CONTAMINANTS OF CONCERN

The objective of contaminant identification is to screen the information that is available on hazardous substances present at the site and to identify contaminants of concern (COCs) in order to focus subsequent efforts in the risk assessment process. COCs are selected based upon their toxicological properties, concentrations and frequency of occurrence at the site. Contaminants in subsurface soils were not considered to be chemicals of potential concern for the risk assessment. An analysis of the leaching potential of subsurface soils present in the RI Report concluded that contaminant concentrations in subsurface soils were not presenting a likely threat to the underlying groundwater. Based on the data evaluation and screening steps necessary, the following parameters were selected as chemicals of potential concern for quantitative evaluation of risk.

Inorganics - arsenic, barium, cadmium, chromium, copper, manganese, mercury, nickel, silver, vanadium, and zinc

Organics - bis(2-ethylhexyl)phthalate, di-n-butylphthalate, 4,4'-DDT, and benzo(b)fluoranthene

6.2 EXPOSURE ASSESSMENT

An exposure assessment was conducted to estimate the magnitude of exposure to the soil contaminants of concern at the site and the pathways through which these exposures could occur. The results of this exposure assessment is combined with chemical-specific toxicity information to characterize potential risks. Populations on or near the site were characterized under current and potential future land use scenarios.

The exposure pathways evaluated quantitatively for these scenarios were incidental ingestion of soils and inhalation of particulates from the soil. The results of the exposure assessment are presented in Tables 6-1, 6-2, and 6-3.

6.2.1 Current Land Use

Figure 6-1 represents current land use patterns near the site. As depicted in this figure, the area within a one-half mile radius of the site is bisected in a north-south direction by the Seaboard Coastline Railroad tracks. The area east of the tracks, within the one-half mile radius, is zoned "highway light industrial" and represents 52 percent of the total area of the circle. The area west of the tracks is currently zoned (with percent of area percent in parentheses): commercial recreational (19 percent); multiple family residential (18 percent); and planned light industrial/office/warehouse and planned commercial district (7 percent). The remaining 4 percent represents Cypress Creek Canal located at the southern edge of the circle.

6.2.2 Future Land Use

The Future Land Use Plan for the City was evaluated in conjunction with an evaluation of established land use trends. The City's Future Land Use Plan is shown in Figure 6-2. This plan was adopted in 1989 and projects land use through 1998. It is updated every five years; however, the classifications are generally consistent for at least a ten year period. In Figure 6-2, on the western side of the railroad tracks from the Chemform site, exists in an area classified as commercial/recreation (i.e., Pompano Race Track) and one classified as Medium Residential (i.e., 10 to 16 developments per acre, for Cypress Bend Condominium Complex). These are the same as the present land uses in these areas. The only anticipated change for these two areas is the addition of 500 living units to the Cypress Bend Condominium complex to bring the total number of units to 2,000. With the present analysis of occupancy expected to remain the same, this would amount to approximately, 4,000 people at the condominium complex.

Table 6-1
Summary of Results of Exposure Assessment
Trespasser Scenario
Chemform Site, Pompano Beach, Florida

Population	Exposure Pathway	Parameter	Chronic Daily Intake (mg/kg-day)	
			Carcinogenic Effects	Noncarcinogenic Effects
Trespassers	Incidental Ingestion of Soils	Arsenic	7.7E-8	2.3E-7
		Barium	-[1]	1.6E-6
		Cadmium	-	2.3E-7
		Chromium (III)	-	1.1E-5
		Chromium (VI)	-	1.2E-6
		Copper	-	3.6E-5
		Manganese	-	2.6E-6
		Mercury	-	6.4E-8
		Nickel	-	2.6E-5
		Silver	-	1.1E-6
		Vanadium	-	3.6E-7
		Zinc	-	7.3E-5
		Benzo(b)flouranthene[2]	9.9E-10	2.9E-9
		Bis(2-ethylhexyl)phthalate	8.2E-9	2.4E-8
		Di-n-butylphthalate	-	4.5E-8
		4,4'-DDT	1.5E-10	4.5E-10
	Inhalation of Particulates	Arsenic	4.7E-11	1.4E-10
		Barium	-	9.9E-10
		Cadmium	4.7E-11	1.4E-10
		Chromium (III)	-	6.6E-9
		Chromium (VI)	2.4E-10	7.0E-10
		Copper	-	2.2E-8
		Manganese	-	1.5E-9
		Mercury	-	3.8E-11
		Nickel	5.0E-9	1.5E-8
		Silver	-	6.6E-10
		Vanadium	-	2.2E-8
		Zinc	-	4.4E-8
		Benzo(b)flouranthene[2]	6.0E-13	1.7E-12
		Bis(2-ethylhexyl)phthalate	-	1.5E-11
		Di-n-butylphthalate	-	2.7E-11
		4,4'-DDT	8.7E-14	2.5E-13

NOTES:

1. -Intake for carcinogenic effects not calculated for parameters not considered by EPA to be potential human carcinogens (in IRIS as of May 1993).
2. -Benzo(b)flouranthene concentration used in intake calculations was converted to equivalent concentration of benzo(a)pyrene.

Table 6-2
Summary of Results of Exposure Assessment
Future Industrial Scenario
Chemform Site, Pompano Beach, Florida

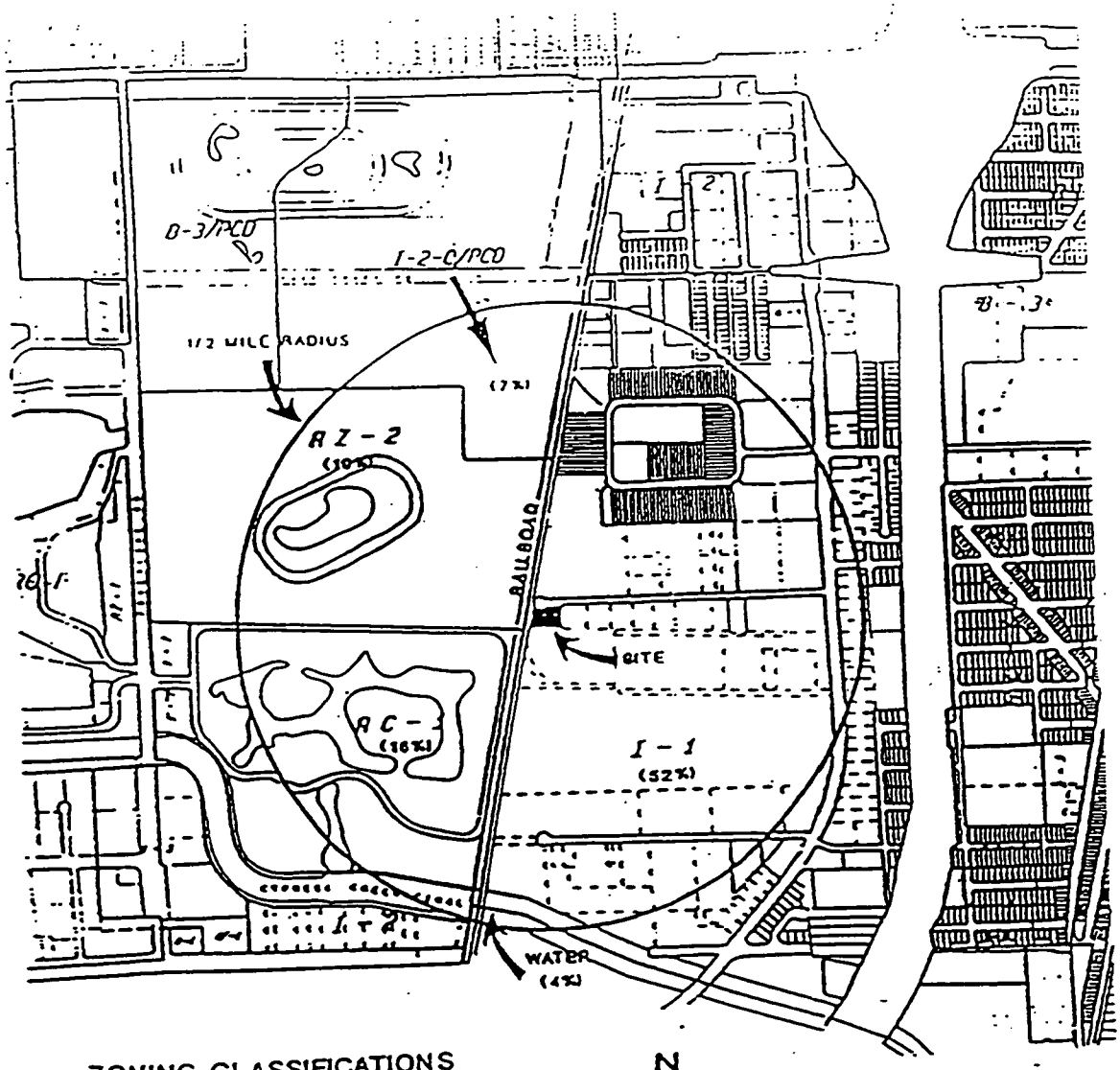
Population	Exposure Pathway	Parameter	Chronic Daily Intake (mg/kg-day)	
			Carcinogenic Effects	Noncarcinogenic Effects
Industrial Workers	Incidental Ingestion of Soils	Arsenic	8.0E-7	2.3E-6
		Barium	-[1]	1.6E-6
		Cadmium	-	2.3E-6
		Chromium (III)	-	1.1E-4
		Chromium (VI)	-	1.2E-5
		Copper	-	3.6E-4
		Manganese	-	2.6E-5
		Mercury	-	6.4E-7
		Nickel	-	2.6E-4
		Silver	-	1.1E-5
		Vanadium	-	3.6E-6
		Zinc	-	7.3E-4
		Benzo(b)flouranthene[2]	1.0E-8	2.9E-8
		Bis(2-ethylhexyl)phthalate	8.6E-8	2.4E-7
		Di-n-butylphthalate	-	4.5E-7
		4,4'-DDT	2.0E-9	4.3E-9
	Inhalation of Particulates	Arsenic	2.0E-9	6.0E-9
		Barium	-	4.1E-8
		Cadmium	2.0E-9	6.0E-9
		Chromium (III)	-	2.7E-7
		Chromium (VI)	1.1E-8	2.9E-8
		Copper	-	9.0E-7
		Manganese	-	6.5E-8
		Mercury	-	2.0E-9
		Nickel	2.2E-7	6.1E-7
		Silver	-	2.7E-8
		Vanadium	-	9.0E-7
		Zinc	-	1.8E-6
		Benzo(b)flouranthene[2]	2.6E-11	7.2E-11
		Bis(2-ethylhexyl)phthalate	-	1.0E-9
		Di-n-butylphthalate	-	1.0E-9
		4,4'-DDT	3.8E-12	1.1E-11

Notes:
1. -Intake for carcinogenic effects not calculated for parameters not considered by EPA to be potential human carcinogens (in IRIS as of May 1993).
2. -Benzo(b)flouranthene concentration used in intake calculations was converted to equivalent concentration of benzo(a)pyrene.

Table 6-3
Summary of Results of Exposure Assessment
Future Residential Scenario
Chemform Site, Pompano Beach, Florida

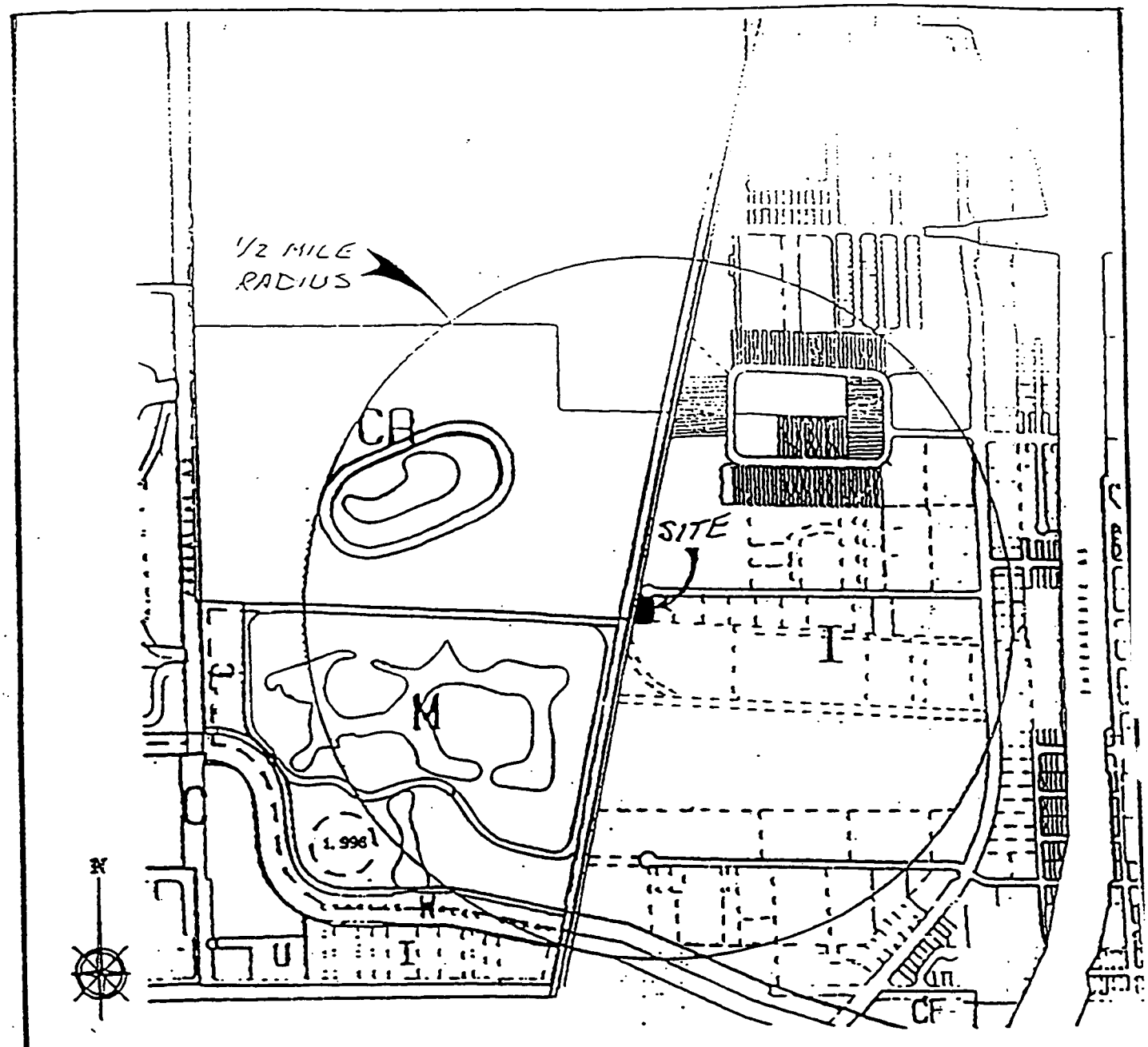
Population	Exposure Pathway	Parameter	Chronic Daily Intake (mg/kg-day)	
			Carcinogenic Effects	Noncarcinogenic Effects
Residents	Incidental Ingestion of Soils	Arsenic	2.7E-6	6.3E-6
		Barium	-[1]	4.5E-5
		Cadmium	-	6.3E-6
		Chromium (III)	-	3.0E-4
		Chromium (VI)	-	3.3E-5
		Copper	-	1.0E-3
		Manganese	-	7.3E-5
		Mercury	-	1.8E-6
		Nickel	-	7.3E-4
		Silver	-	3.0E-5
		Vanadium	-	1.0E-5
		Zinc	-	2.1E-3
		Eg(b)flouranthene[2]	3.5E-8	8.1E-8
		Bis(2-ethylhexyl)phthalate	2.9E-7	6.7E-7
		Di-n-butylphthalate	-	1.3E-6
		4,4'-DDT	5.1E-9	1.2E-8
	Inhalation of Particulates	Arsenic	3.0E-9	8.0E-9
		Barium	-	5.8E-8
		Cadmium	3.0E-9	8.0E-9
		Chromium (III)	-	3.8E-7
		Chromium (VI)	1.8E-8	4.2E-8
		Copper	-	1.3E-6
		Manganese	-	9.0E-8
		Mercury	-	2.0E-9
		Nickel	3.6E-7	8.5E-7
		Silver	-	3.8E-8
		Vanadium	-	1.3E-6
		Zinc	-	2.6E-6
		Eg(b)flouranthene[2]	4.3E-11	1.0E-10
		Bis(2-ethylhexyl)phthalate	-	1.0E-9
		Di-n-butylphthalate	-	2.0E-10
		4,4'-DDT	6.3E-12	1.5E-11

NOTES:
1. -Intake for carcinogenic effects not calculated for parameters not considered by EPA to be potential human carcinogens (in IRIS as of May 1993).
2. -Eg(b)flouranthene concentration used in intake calculations was converted to equivalent concentration of eg(a)pyrene.



NOTE: PERCENTAGES REPRESENT PERCENT LAND USE WITHIN 1/2 MILE RADIUS OF SITE

LAND USE MAP
CHEMFORM SITE
POMPANO BEACH, FLORIDA
Figure 6-1



1200 600 0 1200 FT.

SCALE: 1"= 1200 FT.

SOURCE:
CITY OF POMPANO BEACH, FLORIDA

LEGEND:

I = INDUSTRIAL
CR = COMMERCIAL–RECREATIONAL
M = MEDIUM RESIDENTIAL

FILE NO.: ORW E159
CHECKED
4–13–92 (GOF

Westinghouse Environmental and Geotechnical Services, Inc.
ORLANDO • TAMPA • DEERFIELD BEACH FLORIDA

Figure 6-2
FUTURE LAND USE MAP
CHEMFORM SITE
POMPANO BEACH, FLORIDA

According to the City of Pompano Beach, there are to be no plans for future residential use in the Chemform area, if there are no existing residential land uses in that area. The Chemform Site is in a commercial/industrial zoned area with no existing or past residential land use. Therefore, it appears that the most likely future land use for the Chemform Site is industrial.

6.3 TOXICITY ASSESSMENT

The purpose of a toxicity assessment is to weigh available evidence regarding the potential of the contaminants of concern to cause adverse effects in exposed individuals and to provide an estimate of the relationship between the extent of exposure and the likelihood of adverse effects. The toxicity assessment is based on toxicity values which have been derived from quantitative dose-response information. Toxicity values for cancer are known as slope factors (SFs) and those determined for noncarcinogenic effects are referred to as reference doses (RfDs).

Slope factors (SFs), which are also known as cancer potency factors (CPFs), have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. Sfs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. SFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. SFs for the contaminants of concern at Chemform are listed in Table 6-4 (ingestion) and Table 6-5 (inhalation).

Reference doses (RfDs) 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-day, 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 ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. RfDs for the contaminants of concern at Chemform are found in Table 6-6 (ingestion) and Table 6-7 (inhalation).

Table 6-4
Ingestion (Oral) Toxicity Values
Potential Carcinogenic Effects
Chemform Site, Pompano Beach, Florida

Parameter	Slope Factor (Q)	Weight-of-Evidence Classification[1]	Type of Cancer[2]	Slope Factor Source
Arsenic	1.8E+0[3]	A	Skin (Drinking Water)	IRIS
Benzo(b)flouranthene	7.3E+0[4]	B2		IRIS
Bis(2-ethylhexyl) phthalate	1.4E-2	B2		IRIS
4,4'-DDT	3.4E-1	B2		IRIS

Notes:

1. Weight of evidence classification
   A- Human carcinogens
   B- Probable human carcinogens
   C- Possible human carcinogens
   D- Not classifiable as to human carcinogenicity
   E- Evidence of noncarcinogenicity for humans

2. Type of cancer only identified for Class A carcinogens

3. Slope factor derived from unit risk value of 5.05E-5 as follows:

$$Q\ (mg/kg\text{-}day)^{-1} = \frac{\text{Unit Risk (ug/l)}}{\frac{1}{70\ kg \times 21/day \times 10^{3}\ mg/ug}}$$

4. Slope factor for benzo(a)pyrene used for benzo(b)flouranthene per EPA Region IV guidance dated 2/11/92; guidance applies to oral exposure only.

Table 6-5
Inhalation Toxicity Values
Potential Carcinogenic Effects
Chemform Site, Pompano Beach, Florida

Parameter	Slope Factor (Q)	Weight-of-Evidence Classification[2]	Type of Cancer[3]	Slope Factor Source
Arsenic	5E+1	A	Skin	HEAST
Cadmium	6.1E+0	B1		HEAST
Chromium (VI)	4.1E+1	A	Lung	HEAST
Nickel	8.4E-1[1]	A	Lung	HEAST
4,4'-DDT	3.4E-1	B2		HEAST

Notes:

1. Nickel slope factor for refinery dust

2. Weight of evidence classification
   A- Human carcinogens
   B- Probable human carcinogens
   C- Possible human carcinogens
   D- Not classifiable as to human carcinogenicity
   E- Evidence of noncarcinogenicity for humans

3. Type of cancer only identified for Class A carcinogens

Table 6-6
Ingestion (Oral) Toxicity Values
Potential Noncarcinogenic Effects
Chemform Site, Pompano Beach, Florida

Parameter	Chronic RfD (mg/kg-day)	Confidence Level[1]	Critical Effect	RfD Source	Uncertainty Factor	Modifying Factor
Arsenic	3E-4	Medium	Skin, vascular	IRIS	3	1
Barium	7E-2	Medium	Blood pressure	IRIS	3	1
Cadmium	1E-3[2]	High	No observed effect	IRIS	10	1
Chromium (III)	1E+0	Low	No observed effect	IRIS	100	10
Chromium (VI)	5E-3	Low	No observed effect	IRIS	500	1
Copper	3.7E-2[4]	NA	Local GI irritation	HEAST	NA	NA
Manganese	NA[3]	–	–	–	–	–
Mercury	3E-4	NA	Kidney effects	HEAST	1000	NA
Nickel	2E-2[5]	Medium	Decreased body and organ weight	IRIS	300	1
Silver	5E-3	Low	Argyria	IRIS	3	1
Vanadium	7E-3	NA	No observed effect	HEAST	100	NA
Zinc	3E-1	Medium	Blood cells	IRIS	3	1
Bis(2-ethyl hexylphthalate	2E-2	Medium	Increased liver weight	IRIS	1000	1
Di-n-butylphthalate	1E-1	Low	Mortality	IRIS	1000	1
4,4'-DDT	5E-4	Medium	Liver lesions	IRIS	100	1

Notes:
1. Confidence level from IRIS; either high, medium or low
2. RfD based on food intake
3. NA - not available
4. RfD calculated from drinking water standard - 1.3 mg/l (in HEAST)
5. Nickel RfD is for soluble salts

Table 6-7
Inhalation Toxicity Values
Potential Noncarcinogenic Effects
Chemform Site, Pompano Beach, Florida

Parameter	Chronic RfD (mg/kg-day)[1]	Confidence Level[2]	Critical Effect	RfD Source	Uncertainty Factor	Modifying factor
Barium	1.4E-4	NA	Fetotoxicity	HEAST	1000	NA
Manganese	1.1E-4	Medium	Respiratory System and Psychomotor effects	IRIS	300	3
Mercury	8.6E-5	NA	Central Nervous System	HEAST	30	NA

Notes: 1. RfD calculated from reference concentration (RfC) provided in HEAST of IRIS as follows:

$$\text{RfD (mg/kg-day)} = \text{RfC (mg/m}^3\text{)} \times \frac{20\text{m}^3\text{/day}}{70\text{ kg body weight}}$$

2. Confidence level from IRIS; either high, medium or low.

6.4 RISK CHARACTERIZATION

In this final step of the risk assessment, the results of the exposure and toxicity assessments are combined to provide numerical estimates of the carcinogenic and non-carcinogenic risks for the site. Nearly all of the carcinogenic and noncarcinogenic risk is produced by ingestion of soils under the three assumed scenarios.

Excess lifetime cancer risks are determined by multiplying the intake level with the slope factor. These risks are probabilities that are generally expressed in scientific notation (e.g. $1x10^{-6}$ or 1E-6). An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer, over a 70-year lifetime, as a result of site-related exposure to a carcinogen. The NCP states that sites should be remediated to chemical concentrations that correspond to an upper-bound lifetime cancer risk to an individual not exceeding 10^{-6} to 10^{-4} excess lifetime risk. Carcinogenic risk levels that exceed this range indicate the need for performing remedial action at a site.

The sum of the risks across both exposure pathways was calculated for each exposure scenario as follows:

Total Exposure Cancer Risk = Risk (Ingestion) + Risk (Inhalation)

As shown in Table 6-8, Table 6-9, and Table 6-10, the total cancer risk for all exposure pathways is 1E-7 for the trespasser scenario, 2E-6 for the future industrial scenario, and 6E-6 for the future residential scenario.

In order to characterize potential noncarcinogenic effects, estimated intake levels are compared with toxicity values. 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). A HQ exceeding unity (1.0) indicates a potential for site-related noncarcinogenic health effects. By adding the HQs for all contaminants within a medium or across all media to which a given population may be reasonably 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.

The total Hazard Index, representing the noncarcinogenic risk for the site, is equal to 6E-6 (Table 6-11) for the trespasser scenario, 4E-2 (Table 6-12) for the future industrial scenario, and 1E-1 (Table 6-13) for the future residential scenario. As can be seen, the total exposure hazard index for each scenario is well below unity, a value which, when not exceeded, generally is not cause for concern. Based on the results of the baseline risk assessment, the removal actions conducted at the site were sufficient to be protective of human health.

Table 6-8
Cancer Risk Estimates
Trespasser Scenario
Chemform Site, Pompano Beach, Florida

Parameter	CDI[1] (mg/kg-day)	Slope Factor (mg/kg-day)$^{-1}$	Chemical-Specific Risk	Pathway Risk	Total Exposure Risk
Exposure Pathway: Incidental Ingestion of Contaminated Soil					
Arsenic	7.7E-8	1.8E+0[2]	1E-7		
Benzo(b)Flouranthene	9.9E-10	7.3E+0[3]	7E-9		
Bis(2-ethylhexyl)phthalate	8.2E-9	1.4E-2	1E-10		
4,4'-DDT	1.5E-10	3.4E-1	5E-11		
				1E-7	
Exposure Pathway: Inhalation of Particulates					
Arsenic	4.7E-11	5E+1	2E-9		
Cadmium	4.7E-11	6.1E+0	3E-10		
Chromium(IV)	2.4E-10	4.1E+1	1E-8		
Nickel	5.0E-9	8.4E-1	4E-9		
4,4'-DDT	8.7E-14	3.4E-1	3E-14		
				2E-8	1E-7

Notes:
1. CDI = Chronic Daily Intake
2. Value calculated using proposed unit cancer risk from IRIS. Arsenic does not have a published slope factor verified by EPA's Cancer Assessment Group (see Uncertainties Section for further discussion).
3. Slope factor for benzo(a)pyrene used for benzo(b)flouranthene per EPA guidance dated 2/11/92; guidance applies to oral exposure only.

Table 6-9
Cancer Risk Estimates
Future Industrial Scenario
Chemform Site, Pompano Beach, Florida

Parameter	CDI[1] (mg/kg-day)	Slope Factor $(mg/kg\text{-}day)^{-1}$	Chemical-Specific Risk	Pathway Risk	Total Exposure Risk
Exposure Pathway: Incidental Ingestion of Contaminated Soil					
Arsenic	8.0E-7	1.8E+0[2]	1E-6		
Benzo(b)Flouranthene	1.0E-8	7.3E+0[3]	7.3E-8		
Bis(2-ethylhexyl)phthalate	8.6E-8	1.4E-2	1E-9		
4,4'-DDT	2.0E-9	3.4E-1	7E-10		
				1E-6	
Exposure Pathway: Inhalation of Particulates					
Arsenic	2.0E-9	5E+1	1E-7		
Cadmium	2.0E-9	6.1E+0	1E-8		
Chromium(IV)	1.1E-8	4.1E+1	5E-7		
Nickel	2.2E-7	8.4E-1	2E-7		
4,4'-DDT	3.8E-12	3.4E-1	1E-12		
				8E-7	2E-6

Notes:
1. CDI = Chronic Daily Intake
2. Value calculated using proposed unit cancer risk from IRIS. Arsenic does not have a published slope factor verified by EPA's Cancer Assessment Group (see Uncertainties Section for further discussion).
3. Slope factor for benzo(a)pyrene used for benzo(b)flouranthene per EPA guidance dated 2/11/92; guidance applies to oral exposure only.

Table 6-10
Cancer Risk Estimates
Future Residential Scenario
Chemform Site, Pompano Beach, Florida

Parameter	CDI[1] (mg/kg-day)	Slope Factor $(mg/kg\text{-}day)^{-1}$	Chemical-Specific Risk	Pathway Risk	Total Exposure Risk
Exposure Pathway: Incidental Ingestion of Contaminated Soil					
Arsenic	2.7E-6	1.8E+0[2]	5E-6		
Benzo(b)Flouranthene	3.5E-8	7.3E+0[3]	3E-7		
Bis(2-ethylhexyl)phthalate	2.9E-7	1.4E-2	4E-9		
4,4'-DDT	5.1E-9	3.4E-1	2E-9		
				5E-6	
Exposure Pathway: Inhalation of Particulates					
Arsenic	3.0E-9	5E+1	2E-7		
Cadmium	3.0E-9	6.1E+0	2E-8		
Chromium(IV)	1.8E-8	4.1E+1	7E-7		
Nickel	3.6E-7	8.4E-1	3E-7		
4,4'-DDT	6.3E-12	3.4E-1	2E-12		
				1E-6	6E-6

Notes:
1. CDI = Chronic Daily Intake
2. Value calculated using proposed unit cancer risk from IRIS. Arsenic does not have a published slope factor verified by EPA's Cancer Assessment Group (see Uncertainties Section for further discussion).
3. Slope factor for benzo(a)pyrene used for benzo(b)flouranthene per EPA guidance dated 2/11/92; guidance applies to oral exposure only.given

Table 6-11
Chronic Hazard Index Estimates
Trespasser Scenario
Chemform Site, Pompano Beach, Florida

Parameter	CDI[1] (mg/kg-day)	Rfd[2] (mg/kg-day)	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Exposure Pathway: Incidental Ingestion of Contaminated Soil					
Arsenic	2.3E-7	3E-4	8E-4		
Barium	1.6E-6	7E-2	2E-5		
Cadmium	2.3E-7	1E-3	2E-4		
Chromium (III)	1.1E-5	1E+0	1E-5		
Chromium (IV)	1.2E-6	5E-3	2E-3		
Copper	3.6E-5	3.7E-2	1E-3		
Manganese	2.6E-6	NA[3]	–		
Mercury	6.4E-8	3E-4	2E-4		
Nickel	2.6E-5	2E-2	1E-3		
Silver	1.1E-6	5E-3	2E-4		
Vanadium	3.6E-7	7E-3	5E-5		
Zinc	7.3E-5	3E-1	2E-4		
Bis(2-ethylhexyl)phthalate	2.4E-8	2E-2	1E-6		
Di-n-butylphthalate	4.5E-8	1E-1	5E-7		
4,4'-DDT	4.5E-10	5E-4	9E-7		
				6E-3	
Exposure Pathway: Inhalation of Particulates					
Barium	9.9E-10	1.4E-4	7E-6		
Manganese	1.5E-9	1.1E-4	1E-5		
Mercury	3.8E-11	8.6E-5	4E-7		
				2E-5	6E-3

Notes:
1. CDI = Chronic Daily Intake
2. RfD = Chronic reference Dose
3. NA = Not Available

Table 6-12
Chronic Hazard Index Estimates
Future Industrial Scenario
Chemform Site, Pompano Beach, Florida

Parameter	CDI[1] (mg/kg-day)	Rfd[2] (mg/kg-day)	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Exposure Pathway: Incidental Ingestion of Contaminated Soil					
Arsenic	2.3E-6	3E-4	8E-3		
Barium	1.6E-5	7E-2	2E-4		
Cadmium	2.3E-6	1E-3	2E-3		
Chromium (III)	1.1E-4	1E+0	1E-4		
Chromium (IV)	1.2E-5	5E-3	2E-3		
Copper	3.6E-4	3.7E-2	1E-2		
Manganese	2.6E-5	NA[3]	–		
Mercury	6.4E-7	3E-4	2E-3		
Nickel	2.6E-4	2E-2	1E-2		
Silver	1.1E-5	5E-3	2E-3		
Vanadium	3.6E-6	7E-3	5E-4		
Zinc	7.3E-4	3E-1	2E-3		
Bis(2-ethylhexyl)phthalate	2.4E-7	2E-2	1E-5		
Di-n-butylphthalate	4.5E-7	1E-1	5E-6		
4,4'-DDT	4.3E-9	5E-4	9E-6		
				4E-2	
Exposure Pathway: Inhalation of Particulates					
Barium	4.1E-8	1.4E-4	3E-4		
Manganese	6.5E-8	1.1E-4	6E-4		
Mercury	2.0E-9	8.6E-5	2E-5		
				9E-4	4E-2

Notes:
1. CDI = Chronic Daily Intake
2. RfD = Chronic reference Dose
3. NA = Not Available

Table 6-13
Chronic Hazard Index Estimates
Future Residential Scenario
Chemform Site, Pompano Beach, Florida

Parameter	CDI[1] (mg/kg-day)	Rfd[2] (mg/kg-day)	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Exposure Pathway: Incidental Ingestion of Contaminated Soil					
Arsenic	6.3E-6	3E-4	2E-2		
Barium	4.5E-5	7E-2	6E-4		
Cadmium	6.3E-6	1E-3	6E-3		
Chromium (III)	3.0E-4	1E+0	3E-4		
Chromium (IV)	3.3E-5	5E-3	7E-3		
Copper	1.0E-3	3.7E-2	3E-2		
Manganese	7.3E-5	NA[3]	--		
Mercury	1.8E-6	3E-4	6E-3		
Nickel	7.3E-4	2E-2	4E-2		
Silver	3.0E-5	5E-3	6E-3		
Vanadium	1.0E-5	7E-3	1E-3		
Zinc	2.1E-3	3E-1	7E-3		
Bis(2-ethylhexyl)phthalate	6.7E-7	2E-2	3E-5		
Di-n-butylphthalate	1.3E-6	1E-1	1E-5		
4,4'-DDT	1.2E-8	5E-4	2E-5		
				1E-1	
Exposure Pathway: Inhalation of Particulates					
Barium	5.8E-8	1.4E-4	4E-4		
Manganese	9.0E-8	1.1E-4	8E-4		
Mercury	2.0E-9	8.6E-5	2E-5		
				1E-3	1E-1

Notes:
1. CDI = Chronic Daily Intake
2. RfD = Chronic reference Dose
3. NA = Not Available

6.5 ENVIRONMENTAL ASSESSMENT (EA)

The environmental evaluation (EA), also known as the ecological assessment, is a "qualitative and/or quantitative appraisal of the actual or potential effects of a hazardous waste site on plants and animals other than people and domesticated species". This EA will address the potential environmental risks associated with soil contamination at the Chemform Site.

Chemform and the surrounding area are in an industrial/commercial area with limited opportunities for wildlife to find food and shelter necessary for sustaining a viable habitat. The presence of fences around all the properties in the area would also tend to limit the mobility of any fauna that may exist. Studies indicate that there are no surface waters or wetlands areas within 0.5 miles of the site that could be impacted. Therefore, under the present site conditions, ecological impacts at the site would be very limited.

7.0 DESCRIPTION OF THE "NO FURTHER ACTION" ALTERNATIVE

EPA has determined, based on the results of the RI and Risk Assessment for Operable Unit Two, that no further Superfund action is necessary for the soils at the site. The previous removal actions of the contaminated soils and source areas has successfully mitigated in accordance with 40 CFR 300.430 (e)(2), the threat from the site to human health and the environment. Groundwater monitoring will be conducted at the site for a period of one year as required in the Record of Decision for Operable Unit One.

8.0 DOCUMENTATION OF SIGNIFICANT DIFFERENCES

The selected remedy as presented in this decision document has no difference, significant or otherwise, from the preferred alternative presented in the proposed plan.

APPENDIX A

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY
CHEMFORM, INC. SUPERFUND SITE

PART I - Summary of Major Issues and Concerns

A public information meeting was held on August 4, 1993 at which the Environmental Protection Agency (EPA) presented its Proposed Plan for Operable Unit Two-Soils of the Chemform Inc. Superfund Site. The Proposed Plan called for no further action to address soils at the site.

Ten people attended the public meeting. The major concerns involved explanation of the Superfund process, and minor issues related to the actual site itself. A 30 day public comment period began on July 22, 1993 and concluded on August 23, 1993 and there was no request for an extension to this comment period. EPA received one comment letter from the Florida Department of Environmental Protection (FDEP) during this time period. In addition to responses to the state, oral comments that were received during the public meeting as well as those received during the comment period, are addressed in the Responsiveness Summary.

PART II - Comments and Responses

Comment: FDEP inquired about the possibility of hexavalent chromium in soils leaching to the underlying groundwater and posing a threat.

Response: As a prerequisite to offsite disposal of soils excavated under the Removal Action, representative samples of stockpiled soils were collected and analyzed for both total metals and leachable metals. The laboratory data show that only a very small fraction of the total chromium in the soils was leached in the Toxicity Characteristic Leaching Procedure (TCLP) tests. Because hexavalent chromium salts are infinitely soluble in water, much higher concentrations of chromium would have been observed in the TCLP extracts if hexavalent chromium had been present in significant concentrations.

Comment: The FDEP expressed concern with a small area of the site that had soil arsenic level of 38 Parts Per Million (ppm) that they considered could pose a threat to human health. FDEP proposed a remediation level of 3.2 ppm arsenic for industrial use and 0.59 ppm (or background, whichever is higher) for residential use.

Response: Based on the concentration of arsenic present at this particular portion of the site, the risk numbers generated for both an industrial and residential scenario are well within the acceptable range of risk as defined by EPA 40 CFR 300.430 (e)(2). Since the risk posed by the Chemform site does not exceed EPA's established risk range, further soil cleanup actions under the Superfund program are not necessary.

Although further Superfund action is not necessary to protect human health and the environment since arsenic soil concentrations currently fall within EPA's acceptable risk range, a voluntary private party action to address this area of arsenic in the soil could be implemented. Such an action may be conducted under the authority of the FDEP.

Comment: One commenter at the public meeting inquired about the possibility of removing the fences surrounding the Chemform property.

Response: Since EPA has determined that the site no longer presents an unacceptable health risk, the fences may be removed. However, in discussions with the PRP contractor, it was brought to EPA's attention that the property would remain fenced after all Superfund work had been completed for security reasons.

Comment: One citizen called to discuss the cleanup of the Chemform site and inquired about the location of the contaminants that were transported off site for disposal.

Response: All contaminants that were transported off site during the 1990 removal action were checked for leachability using the TCLP method. The results indicated that the contaminants in the soils were not leachable and would therefore, not pose a threat if disposed of in an approved landfill. Over 2,000 tons of contaminated soils were taken to the Chambers industrial waste landfill in Florida for disposal.

Comment: One commenter at the public meeting asked about the possibility of applying institutional controls such as deed restrictions to the Chemform site. This would allow the property to be used solely for industrial purposes as opposed to residential use.

Response: The risk numbers generated for both the residential and industrial scenarios were protective of human health and the environment. Therefore, EPA believes that institutional controls are not necessary for the Chemform site.

Comment: One commenter at the public meeting asked about possible PCB contamination in the alley way between the Chemform site and the Wilson Concepts Superfund site.

Response: Past records (which include the RI Reports for both sites) indicated no PCB contamination in this area of the site.