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Report
Text, Tables, Figures
60251

Volume 1 of 2

Remedial Investigation Report
Baseline Risk Assessment
ACS NPL Site
Griffith, Indiana

Prepared for:
Steering Committee
ACS PRP Group

Prepared by:
Warzyn Inc.
Madison, Wisconsin

June 1991

WARZYN

June 28, 1991

Robert E. Swale, RPM
Mail Code 5HS-11
U.S. EPA, Region V
230 South Dearborn
Chicago, Illinois 60604

RE: Letter of Transmittal
Final Draft Baseline Risk Assessment
American Chemical Services NPL Site
Warzyn Project No. 60251

Dear Mr. Swale:

In accordance with the project schedule, Warzyn is submitting for your review the final draft Baseline Risk Assessment for the ACS NPL Site. This draft incorporates the Agency's comments, dated April 24, 1991, to the Human Health Evaluation portion of the Baseline Risk Assessment (Section 7) of the Draft Remedial Investigation Report.

In accordance with your request, we are submitting three copies of the Human Health Evaluation portion of Section 7. Based on our conversation of today, June 28, six copies of the Ecological Assessment will be forwarded on Wednesday, July 3, 1991.

Sincerely,

WARZYN INC.

Dennis J. Domack for PJV

Peter J. Vagt, Ph.D., CPG
Project Coordinator

KJD/ccf/DRV
[mad-106b-70]
60251.17

Enclosure

cc: A. Perellis

THE PERFECT BALANCE
BETWEEN TECHNOLOGY
AND CREATIVITY

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Volume 1 of 2

Remedial Investigation Report
Baseline Risk Assessment
ACS NPL Site
Griffith, Indiana

June 1991

TABLE OF CONTENTS

	Page No.
7.0 BASELINE RISK ASSESSMENT	1
7.1 Human Health Evaluation	1
7.1.1 Introduction	1
7.1.1.1 Organization	2
7.1.1.2 Background	3
7.1.2 Identification of Chemicals of Potential Concern	4
7.1.2.1 Chemical Analysis of Site Media	4
7.1.2.2 Development of a Set of Chemical Data and Information for Use in the Risk Assessment	4
7.1.3 Exposure Assessment	6
7.1.3.1 Exposure Setting	6
7.1.3.1.1 Location of Site	6
7.1.3.1.2 Physical Setting	7
7.1.3.1.3 Zoning and Surrounding Land Uses	8
7.1.3.1.4 Distance to Nearest Receptors	9
7.1.3.1.5 Population Information	10
7.1.3.2 Exposure Pathway Analysis	10
7.1.3.3 Contaminant Sources	11
7.1.3.4 Contaminant Migration	11
7.1.3.5 Selection of Exposure Pathways For Risk Assessment	12
7.1.3.5.1 Current Land Use	12

Page No.

7.1.3.5.1.1 Off-Site Residents (Including Trespassers) ... 14

7.1.3.5.1.1.1 Potential Exposure Through Groundwater Use ... 14

7.1.3.5.1.1.1.1 Upper Aquifer ... 15

7.1.3.5.1.1.1.2 Lower Aquifer ... 16

7.1.3.5.1.1.2 Potential Exposure to VOCs in Ambient Air ... 17

7.1.3.5.1.1.3 Potential Exposure to Contaminants Via Fugitive Dust ... 18

7.1.3.5.1.1.4 Potential Exposure Via Direct Contact with Contaminated Soils ... 18

7.1.3.5.1.1.5 Potential Exposure Via Contact with Surface Water and Sediments ... 19

7.1.3.5.1.2 On-Site Workers at the Site ... 20

7.1.3.5.1.2.1 Potential Exposure to Contaminants Via Inhalation of VOCs ... 21

7.1.3.5.1.2.2 Potential Exposure to Contaminants Via Fugitive Dusts ... 21

7.1.3.5.2 Future Land Use ... 21

7.1.3.5.2.1 Hypothetical Resident Living On-Site ... 22

7.1.3.5.2.1.1 Potential Exposures Via Groundwater ... 22

7.1.3.5.2.1.2 Potential Exposures Via Contact with Contaminated Soils ... 24

7.1.3.5.2.1.3 Potential Exposure Via Contact With Contaminated Surface Water and Sediments ... 24

7.1.3.5.2.1.4 Potential Exposure Via Inhalation of Contaminants Released to Air ... 25

7.1.3.6 Quantification of Human Exposure Estimates ... 25

7.1.3.6.1 Groundwater/Surface Water Exposures ... 27

7.1.3.6.1.1 Ingestion ... 28

Page No.

7.1.3.6.1.2 Dermal Absorption 28

7.1.3.6.1.3 Inhalation 28

7.1.3.6.2 Soil/Sediment Contact Exposures 29

7.1.3.6.2.1 Incidental Ingestion 29

7.1.3.6.2.2 Dermal Absorption 29

7.1.3.6.3 Air Exposures 30

7.1.3.6.3.1 Inhalation 30

7.1.3.7 Exposure Point Concentrations 30

7.1.3.7.1 Groundwater 31

7.1.3.7.2 Soils, Surface Water, and Sediment 31

7.1.3.7.3 Air 32

7.1.4 Toxicity Assessment 33

7.1.4.1 Dose-Response Relationship 33

7.1.4.1.1 Noncarcinogenic Effects 33

7.1.4.1.2 Carcinogenic Effects 34

7.1.4.2 Critical Toxicity Values and Toxicity Profiles 35

7.1.5 Risk Characterization 36

7.1.5.1 Procedures Used to Quantify Health Risk 36

7.1.5.1.1 Non-Cancer Effects 36

7.1.5.1.2 Carcinogenic Effects 36

7.1.5.2 Superfund EPA Health Risk Goals 37

7.1.5.3 Public Health Evaluation 37

7.1.5.3.1 Summary of Potential Health Risks Based on Current Land Use 38

7.1.5.3.1.1 Potential Health Risks to Off-Site Residents 39

7.1.5.3.1.2 Summary of Potential Health Risk to Trespassers 41

7.1.5.3.1.3 Summary of Potential Health Risks to On-Site Workers at the Site 42

7.1.5.3.2 Summary of Potential Health Risks Based Based on Future Land Use 43

7.1.5.3.2.1 Potential Health Risks to Hypothetical Residents Living On-Site 43

7.1.5.4 Uncertainties in the Risk Assessment Process 50

Ecological Assessment Text will be submitted July 3, 1991

REFERENCES 63

TABLES

Table 7-1 - Summary of Sample Groupings Used to Estimate Chemical Exposure Point Concentrations

Table 7-2 - Organic and Inorganic Chemical Concentrations - Groundwater Upper Aquifer

Table 7-3 - Organic and Inorganic Chemical Concentrations - Groundwater Lower Aquifer

Table 7-4 - Organic and Inorganic Chemical Concentrations - Soil On-Site Containment Area

Table 7-5 - Organic and Inorganic Chemical Concentrations - Soil Still Bottoms/Treatment Lagoon

Table 7-6 - Organic and Inorganic Chemical Concentrations - Soil Off-Site Containment Area

Table 7-7 - Organic and Inorganic Chemical Concentrations - Soil Kapica/Pazmey Surface Soils

Table 7-8 - Organic and Inorganic Chemical Concentrations - Soil Kapica/Pazmey Subsurface Soils

Table 7-9 - Organic and Inorganic Chemical Concentrations - Surface Water Drainage Area

Table 7-10 - Organic and Inorganic Chemical Concentrations - Sediment Drainage Area

Table 7-11 - Summary of Tentatively Identified Compound (TIC) Groupings

Table 7-12 - Representative Compounds for Tentatively Identified Compound (TIC) Groups

Table 7-13 - Summary of Chemicals of Potential Concern

Table 7-14 - Summary of Physical and Chemical Properties of Chemicals of Potential Concern

Table 7-15 - Exposure Pathway Analysis

Table 7-16 - Summary of Chemical Exposure Point Concentrations

Table 7-17 - Chemical Toxicity Values and Absorption Estimates Used for Risk Quantification

Table 7-18 - Summary of Toxicity Information for Chemicals of Potential Concern

Land Use Scenario	Exposed Population	Exposure Medium	Table Number
Current	Off-Site Resident	Groundwater Lower Aquifer	Table 7-19
Current	Off-Site Resident	Ambient Air VOC Emissions	Table 7-20
Current	Off-Site Resident	Ambient Air Fugitive Dust	Table 7-21
Current	Off-Site Child Resident	Groundwater Upper Aquifer	Table 7-22
Current	Child Trespasser	Surface Soils Kapica Pazmey	Table 7-23
Future	On-Site Child Resident	Surface Water ACS	Table 7-24
Future	On-Site Child Resident	Sediment ACS	Table 7-25
Current	Child Trespasser	Ambient Air VOC Emissions	Table 7-26
Current	Child Trespasser	Ambient Air Fugitive Dust	Table 7-27
Current	ACS Worker	Ambient Air VOC Emissions	Table 7-28
Current	ACS Worker	Ambient Air Fugitive Dust	Table 7-29
Future	Off-Site Resident	Groundwater Lower Aquifer	Table 7-30
Future	On-Site Resident	Groundwater Upper Aquifer	Table 7-31

Land Use Scenario	Exposed Population	Exposure Medium	Table Number
Future	On-Site Resident	Ambient Air VOC Emissions	Table 7-32
Future	On-Site Resident	Soil On-Site Containment Area	Table 7-33
Future	On-Site Resident	Soil Still Bottoms Treatment Lagoon Area	Table 7-34
Future	On-Site Resident	Soil Off-Site Containment Area	Table 7-35
Future	On-Site Resident	Surface Soil Kapica - Pazmey	Table 7-36
Future	On-Site Resident	Sub-Surface Soil Kapica - Pazmey	Table 7-37

Table 7-38 - Summary of Hazard Indices and Cancer Risks for Potentially Exposed Populations

Ecological Assessment Tables will be Submitted July 3, 1991

FIGURES

Figure 7-1 Toxicity Determination Decision Tree for Tentatively Identified Compounds (TIC)

Figure 7-2 Zoning Map

Ecological Assessment Figures will be submitted July 3, 1991

APPENDICES

Appendix S -- Identification of Chemicals of Potential Concern

Appendix T - Equations Used to Estimate Chronic Daily Chemical Intakes

Appendix U - Evaluation of Analytical Data for Calculation of Exposure Point Concentrations

Appendix V - Modeling of Volatile Organic Emissions to Determine Exposure Point Concentrations

Appendix W -Modeling of Fugitive Dust Emission to Determine Exposure Point Concentrations

Appendix X - Chronic Daily Chemical Intakes, Noncancer Hazard and Cancer Risks

Appendix Y - Groundwater Model

Appendix Z - Screening Method for Estimating Inhalation Exposure to Volatile Chemicals from Domestic Water

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SECTION 7.0
BASELINE RISK ASSESSMENT

7.1 HUMAN HEALTH EVALUATION

7.1.1 Introduction

Section 300.430 of the National Oil and Contingency Plan (NCP 1990) states that the purpose of the remedial process for a contaminated site is to implement remedies that reduce, control, or eliminate risks to human health and the environment. The mandate of the Superfund program is to protect human health and the environment from current and potential substance releases, as enforced in the NCP.

Under CERCLA and the Superfund process, a Baseline Risk Assessment is the vehicle or tool used to evaluate the potential threats to public health and the environment from a site in the absence of any remedial action (U.S. EPA, 1988). It identifies and characterizes the toxicological characteristics of the contaminants of concern, the potential exposure pathways, the potential human and environmental receptors, and the potential health impact the site may pose. The information obtained through risk assessment is used to assist in the evaluation of possible remedial measures to reduce risk at a site.

This Baseline Risk assessment addresses the potential risks associated with the American Chemical Services Site (Site) under the "no-action" alternative. The no-action alternative assumes that no corrective actions will take place and no restrictions will be placed on future use of the site.

The Baseline Risk Assessment for the Site was performed consistent with the Risk Assessment Guidance for Superfund (RAGS, U.S. EPA, 1989). In addition, guidance recommended in RAGS for conducting specific parts of the risk assessment were used to the extent practicable.

The Baseline Risk Assessment is based on the following major assumptions:

- No corrective actions will take place and no restrictions will be placed on future use of the Site.
- There are no groundwater use restrictions.
- There is the potential for future development of the Site.
- Contaminant concentrations in various media are assumed not to change over time.

7.1.1.1 Organization

The Baseline Risk Assessment is organized into the following sections:

- Identification of Chemicals of Potential Concern
- Toxicity Assessment
- Exposure Assessment
- Risk Characterization

Identification of Chemicals of Potential Concern - This component consists of a review of the data collected during the remedial investigation at the Site in view of data validity, chemical concentrations, media in which the chemicals have been detected, frequency of chemical detection, the toxic properties of the chemicals, the physical properties of each chemical as they relate to fate and migration potential, and the conditions of potential exposure to identified human receptors.

Toxicity Assessment - The toxicity assessment is a determination of the quantitative and qualitative relationship between the magnitude of exposure to chemicals of potential concern at the Site and the probability of occurrence of adverse health effects from that exposure.

Exposure Assessment - This element of the Baseline Risk Assessment identifies populations potentially exposed to Site contamination and evaluates the potential magnitude and duration of their exposure.

Risk Characterization - This final element integrates the toxicological information for the chemicals of potential concern with potential exposure considerations to arrive at an estimate of public health risk.

7.1.1.2 Background

Previous sections of the Site Remedial Investigation (RI) Report provide descriptions of the Site location, history, physical characteristics (i.e., geology, hydrogeology, etc.), and sampling locations and media. Also included in previous sections is a discussion of the Site chemistry as it relates to sample locations and chemical fate and migration.

Information presented in these previous sections has been used in the Baseline Risk Assessment to assist in assessing public health risk. Reference to appropriate sections of the RI Report should be made for detailed discussions of the background information.

Because of the large area within the Site RI/FS boundary, the numerous media affected by contamination, and several discrete areas where contamination sources exist, the Site was divided into nine operable areas (areas) including the Griffith Municipal Landfill, for evaluation in the risk assessment. These areas are defined as follows:

- Groundwater - Upper Aquifer
- Groundwater - Lower Aquifer
- Surface Water
- Sediments
- On-Site Containment Area - Subsurface Contamination
- Still Bottoms and Treatment Lagoon - Subsurface Contamination
- Off-Site Containment Area - Subsurface Contamination
- Kapica-Pazmey Area - Surface and Subsurface Contamination
- Griffith Municipal Landfill

These nine areas have been evaluated with respect to the contamination present at each location. In defining these areas, potential exposure pathways and Feasibility Study needs were taken into consideration. Table 7-1 provides a summary of samples collected and analyzed for at each of the above areas.

7.1.2 Identification of Chemicals of Potential Concern

The identification of chemicals of potential concern at the Site involved a number of steps. These steps, as outlined in the guidance, have been used to arrive at a list of chemicals of potential concern which were subsequently evaluated in the Baseline Risk Assessment.

7.1.2.1 Chemical Analysis of Site Media

After evaluating the quality/validity of data obtained from the performing Contract Laboratory Program (CLP) laboratories, numerous chemicals were determined to be present in various media at the Site. Twenty-seven Target Compound List (TCL) volatiles were detected in various media as were 51 TCL semivolatiles, 14 TCL pesticides/PCBs, more than 400 tentatively identified compounds (TIC), and the full Target Analyte List (TAL) of metals. Tables 7-2 through 7-10 present the chemicals detected in the designated source areas at the Site along with their respective minimum, maximum, and arithmetic average concentrations, and frequency of detection.

The chemical analyses of samples were performed through the CLP and have been evaluated as to their usability in accordance with U.S. EPA guidance for validation of organic and inorganic analyses of environmental samples (U.S. EPA, 1988a and b). Data used in the present risk assessment include unqualified data and data which represent estimated quantities (qualified J). For a description of the evaluation of data quality, refer to Appendix Q of the RI Report.

7.1.2.2 Development of a Set of Chemical Data and Information for Use in the Risk Assessment

The following describes the rationale for selection or exclusion of identified chemicals in the data set as chemicals of potential concern for further evaluation in the risk assessment. The process of identifying chemicals of potential concern and which samples to include in the evaluation, is an integrated procedure.

As suggested in recent guidance, chemicals that exhibit the following characteristics are to be included in a set of chemical data and information for use in the Baseline Risk Assessment:

- Positively detected in at least one CLP sample in a given medium. Positively detected chemicals include both unqualified results and results qualified as estimated but with known identities (J-qualified Target Compound List data);
- Determined to be present at the Site and not due to contamination introduced during sampling or analysis;
- Determined to be the result of chemical releases from the Site and not natural background levels;
- Tentatively identified compounds associated with the Site; and
- Transformation products of chemicals demonstrated to be present.

The above criteria were applied to each of the areas defined earlier and for all chemicals positively detected at the Site (refer to Appendix S for a detailed discussion of the preceding approach and its application to each of the defined areas).

Because more than 400 tentatively identified compounds were detected at the Site, it was necessary to group these chemicals based on similar chemical structure. Forty-four groups were identified and a specific chemical was selected to represent each individual group. Table 7-11 shows the chemical groups and Table 7-12 indicates the representative chemical selected for each group and a brief description of the rationale for the selection. When possible, the representative chemical was selected such that the group's toxicity might be evaluated on the basis of a similar chemical with an existing toxicity value. This approach was agreed upon by the U.S. EPA, Region V Technical Support Group. The decision logic applied to the TICs is illustrated in the decision tree in Figure 7-1.

The result of the above processes culminated in most chemicals detected at the Site being included in the risk assessment as chemicals of potential concern. The final list of chemicals of potential concern based on the above criteria for each area are presented in Table 7-13.

7.1.3 Exposure Assessment

The exposure assessment is performed to identify actual and potential pathways by which human exposure to contaminated Site media might occur. The assessment considers factors such as the physical location of contaminated areas, the type of contamination, and the populations which may come into contact with these areas. Exposure pathways are identified for two Site land-use scenarios: 1) pathways based on land-use practices as they currently exist, and 2) potential pathways based on land use changes which may occur in the future and result in additional types of exposure.

Both current and future pathways which represent possible exposures were then quantified in order to estimate the magnitude of daily contaminant exposure a population may incur. To accomplish this, assumptions pertaining to the exposed population were made such as, the nature of the individuals (as child vs. adult), the rate of contact with the contaminated medium (e.g., adult consumes 2 liters of water daily), and the length of time the exposure is likely to occur (e.g., years vs. lifetime). These population variables are then integrated with chemical concentration data to calculate a level of exposure (or dose).

7.1.3.1 Exposure Setting

7.1.3.1.1 Location of Site

The Site is located at 420 South Colfax Avenue in Griffith, Indiana. The Site is located in the northeast one-quarter of the southeast one-quarter, Section 2, Township 35 North, Range 9 West, Lake County, Indiana (Figure 1-1). Although the Site name is American Chemical Services (ACS), the U.S. EPA has defined the Site as including the ACS property (19 acres), the Pazmey Corporation property (2 acres; formerly Kapica Drum, Inc.), and the inactive portion of the Griffith Municipal Landfill (about 15 acres).

The Site is bordered on the east and southeast by Colfax (Arbogast) Avenue. The Chesapeake and Ohio railroad right-of-way bisects the Site in a northwest-southeast direction, between the fenced Site compound area and the off-site areas. On the west and southwest, south of the Chesapeake and Ohio railroad right-of-way, the Site is bordered by the abandoned Erie and Lackawanna railroad right-of-way, and the active

portion of the Griffith Municipal Landfill. North of the Chesapeake and Ohio right-of-way, the Site is bordered on the west by wetland areas. The northern boundary of the Site is formed by the Grand Trunk railroad right-of-way.

7.1.3.1.2 Physical Setting

The Site is located in northwestern Indiana in the Calumet Lacustrine Plain, a subdivision of the Northern Moraine and Lake Region of Hartke, et. al (1975). The Calumet Lacustrine Plain represents a portion of the lake bed of glacial Lake Chicago. The landscape is generally low-lying and exhibits little relief. In the immediate Site vicinity, surface elevations range between 650 and 630 ft, MSL. The lower surface elevations are associated with the wetlands located to the west and south of the Site, while the higher elevations represent the relict sand dunes found east of the Site.

The geologic and hydrogeologic setting of the Site is presented in detail in Section 4 of this report. In general, the geologic setting of the Site consists of approximately 130 ft of unconsolidated glacial deposits overlying bedrock. Three geologic units have been identified within the glacial deposits. These units are: an upper sand and gravel unit, an intermediate silty clay unit, and a lower sand and gravel unit. Bedrock was not encountered in any of the borings performed for the RI.

The upper sand and gravel unit forms the uppermost aquifer at the Site. In the Site monitoring wells, the thickness of this unit ranges from 13 to 32 ft, and averages 17 ft. The upper aquifer exists under water table conditions at the Site, and is directly influenced by precipitation patterns. Four dominant hydraulic controls have been recognized for the uppermost aquifer. These controls include: (1) the regional gradient, (2) discharge to drainage ditches, (3) dewatering activities at the active landfill, and (4) recharge to the aquifer, which occurs mainly in the cleared and filled areas. Potentiometric maps illustrating flow within the upper aquifer are presented in Figures 4-17, 4-18, and 4-21.

The intermediate silty clay unit forms a confining layer between the upper aquifer and the lower sand and gravel unit (lower aquifer). The silty clay ranges in thickness from about 2.5 ft to 18 ft. This confining layer was found to be the thinnest in the northwestern portion of the Site.

The full thickness of the lower sand and gravel unit (lower aquifer) was not penetrated in any of the borings performed for the RI. Drillers' logs for water wells in the Site vicinity indicate that the lower aquifer can be in excess of 50 ft thick. Based on monitoring wells installed during the RI, the flow direction in the lower aquifer is to the north.

Approximately 72 private wells were identified in the Site vicinity during the RI. Figure 2-7 illustrates the location of the wells. Complete information on well depth and aquifers screened were not available for all of the wells. The available information has been summarized in Table 2-6 and Figure 2-7.

The majority of the private wells in the immediate Site vicinity which are used for drinking water purposes are located to the east and northeast of the Site. These wells draw water from the lower aquifer. Several wells in the upper aquifer were identified near the Site, these wells are generally not used for drinking water supplies, but were known to be used as drinking water supply wells as recently as five years ago by some area residents located one-half mile north (upgradient) of the Site. Figure 4-13 illustrates the locations of the private wells identified near the Site with respect to the flow direction in the lower aquifer.

7.1.3.1.3 Zoning and Surrounding Land Uses

Zoning in the immediate vicinity of the Site is primarily industrial (Figure 7-2). The areas adjacent to the Site on the north, east, and southeast are zoned either industrial or light industrial. Areas to the west and southwest of the Site are zoned one-family residential. No zoning changes are planned for the Site area.

In keeping with the current zoning, the following land uses are observed in the immediate Site vicinity. In the following discussion, land uses are described in a clockwise fashion around the Site, beginning at the northeast corner.

Northeast of the intersection of Colfax Avenue and the Grand Trunk Railroad right-of-way is a park, Oak Ridge Prairie. Immediately east of the Site fenced compound and north of the Chesapeake and Ohio Railroad right-of-way, the land is undeveloped. On the east side of Colfax Avenue and south of the Chesapeake and Ohio Railroad right-of-way (east of the Off-Site Containment Area) are several small businesses, including an auto repair shop, a welding shop, and a security dog business. East of the Site, along the north side of Reder Road, are several single family residences. Along the south side of Reder Road in this same area are several small businesses, including a trucking firm, an auto repair shop, and an environmental clean-up contracting firm. South of the intersection of Reder Road and Colfax Avenue (Arbogast), on Arbogast, are a private residence and a small industrial building.

To the west and southwest of the Site, west of the abandoned Erie and Lackawanna Railroad right-of-way, are vacant land and a residential development. The residential area is separated from the Site by the active portions of the Griffith Municipal Landfill.

North of the Grand Trunk Railroad right-of-way, along the northern boundary of the Site, the land is primarily vacant. Further to the north, along Main Street, are small businesses and an industrial park.

7.1.3.1.4 Distance to Nearest Receptors

The nearest residence to the Site is located at 1002 Reder Road, approximately 150 ft east of the Off-Site Containment Area. Other residences within about 500 ft of the southeastern property boundary include 1009 Reder Road, 1033 Reder Road, 1043 Reder Road, and 945 South Arbogast. The nearest potential receptors east of the Site are the employees of the businesses located approximately 100 to 200 ft east of the Off-Site Containment Area, along the east side of Colfax Avenue. To the south and west of the Site, the nearest potential receptors are the employees of the Griffith Municipal Landfill, and the occupants of the residential development approximately 800 ft west of the Site boundary. To the north, the nearest potential receptors are occupants of the industrial park and small businesses along Main Street (approximately 1000 to 2000 ft north of the Site boundary).

7.1.3.1.5 Population Information

The most recent census for which data was available on individual census tracts was the 1980 census. Based on 1980 census data (as of this writing, 1990 census data was not available), 17,026 people live in the Town of Griffith. In the census tracts of other communities within a two mile radius of the Site, 15,423 persons were identified in the town of Highland, 18,149 in the town of Merrillville, 1,423 in the town of Schererville, and 8,084 in unincorporated Lake County.

The median age of persons identified in the Griffith census tracts was 27.7 to 32.8 years. The median age in the Highland tracts bordering the Site area was 28 to 30.7 years. The median age in the Merrillville tract and the Schererville tract, respectively, was 34.7 and 24.8 years. In the unincorporated areas of Lake County bordering the Site, the median age was 30.1.

7.1.3.2 Exposure Pathway Analysis

A chemical exposure pathway describes the route taken by a chemical from its source in the environment, to contact with receptors. As such, each exposure pathway must include the following elements:

- A source and mechanism of chemical release to the environment;
- An environmental transport medium (e.g., air, groundwater) for the released chemical;
- A point of potential human contact with the contaminated medium (referred to as the exposure point); and
- Receptor contact (e.g., ingestion of contaminated groundwater).

In general, exposure may occur when contaminants migrate from the Site to an exposure point (i.e., a location where receptors can come into contact with contaminants) or when a receptor comes into direct contact with waste or contaminated media at the Site. An exposure pathway is complete (i.e., exposure occurs) if there is a way for the receptor to take in contaminants through ingestion, inhalation, or dermal absorption of contaminated media or waste.

7.1.3.3 Contaminant Sources

As a result of waste disposal practices at the Site, sources of potential contaminant release were considered to exist as:

- Buried wastes;
- Waste constituents that have sorbed to soil in the saturated and unsaturated zone; and
- Waste constituents occupying soil pore space in the saturated and unsaturated zone.

These sources are characteristic of the nine areas determined to be contaminated (Page 7-3).

7.1.3.4 Contaminant Migration

The distribution of chemicals associated with On-Site waste disposal indicate migration through environmental media is occurring. In general, the migration of Site contaminants will be controlled by physical conditions at the Site and the inherent physical and chemical properties of the migrating compounds.

Because the mechanism of release and transport of a chemical are important elements in an exposure pathway, the physical and chemical properties of each chemical were used to approximate its general behavior in the environment. The physical and chemical properties of the chemicals of potential concern have been obtained from the literature as appropriate, and approximated, if necessary for use in risk assessment. A list of these properties for the chemicals of potential concern is provided in Table 7-14.

Potential mechanisms for contaminant release at the Site include:

- Leaching of contaminants into the groundwater and downgradient migration;
- Volatilization of subsurface and surface contaminants from the Site to the ambient air;
- Generation of fugitive dusts from exposed soil areas;
- Groundwater discharge to nearby wetlands; and
- Surface runoff of contaminants from the Site.

As a result of wastes disposed, it is evident that surface water and sediments, surface and subsurface soils, upper and lower groundwater aquifers, and the ambient air are media impacted by contamination at and near the Site. Sections 5 and 6 of the RI Report contain information regarding contaminant distribution and the fate and migration of chemicals at the Site. Each of these mechanisms for contaminant release at the Site are discussed in Section 6.

7.1.3.5 Selection of Exposure Pathways For Risk Assessment

The potential exposure pathways at the Site were based on the potential contaminant migration pathways and the Site setting. These potential exposure pathways were evaluated to determine whether they are complete or have the potential to be complete in the future. Current use of the Site and adjacent land and potential future land uses were considered in the analysis.

7.1.3.5.1 Current Land Use

Current land use of the Site and surrounding area was based primarily on information gathered during Site visits. Other sources of information that assisted in this evaluation included zoning maps, census information, and aerial photographs. After defining the current land use at the Site, a determination of human activities and behavioral patterns was made. This approach was based on "common sense" and not on any specific data sources, but rather on a general understanding of the types of activities that may be associated with the land use.

Several potential exposure pathways were assumed to exist under the current land use scenario. These exposure pathways are summarized below and in Table 7-15.

Off-Site Residents

- Incidental ingestion of contaminated water from the upper aquifer (children swimming in a pool).
- Dermal absorption of contaminated water from the upper aquifer (children swimming in a pool).
- Ingestion of contaminated water from the lower aquifer.

- Dermal absorption of contaminated water from the lower aquifer while bathing.
- Inhalation of VOCs released from water from the lower aquifer during its household use (e.g., bathing, showering).
- Inhalation of VOC emissions released from subsurface soil contamination.
- Inhalation of contaminants entrained by fugitive dusts emanating from surface contamination at Kapica-Pazmey.

Adolescents Playing On-Site (Trespassing)

- Inhalation of volatiles released from subsurface soils at the Site.
- Inhalation of fugitive dusts released from surface soil contamination at Kapica-Pazmey.
- Incidental ingestion of contaminated surface soils at Kapica-Pazmey.
- Dermal contact with contaminated surface soils at Kapica-Pazmey.
- Incidental ingestion of contaminated surface water from wetlands and drainage ditches.
- Dermal contact with contaminated surface water from wetlands and drainage ditches.
- Incidental ingestion of contaminated sediments from wetlands and drainage ditches.
- Dermal contact with contaminated sediments from wetlands and drainage ditches.

On-Site Workers at the Site

- Inhalation of volatiles released from subsurface soil contamination at the Site.
- Inhalation of fugitive dusts migrating from Kapica-Pazmey.

In addition to the exposures that exist for each population as described above, it is possible that a trespasser may also be an off-Site resident, and on-Site workers may be an off-Site resident. Thus, while pathways have been combined for each individual population, populations could also be combined, as appropriate (e.g., off-Site resident and trespasser) to evaluate the maximum exposure of a population that is reasonably expected to occur at the Site. The following sections discuss the potential for exposure to receptors through specific environmental media, and areas, as appropriate, for current land use conditions.

7.1.3.5.1.1 Off-Site Residents (Including Trespassers)

Residential dwellings exist near the boundaries of the Site. The current land use takes into account that there are residents who have access now and will have access in the future to contaminated areas of the Site. This access may actually increase in future years, because of the possibility that current ownership may change, and land access will be less restrictive. Given that the Baseline Risk Assessment assumes the "no-action" alternative (i.e., the risks to human health which may occur at anytime in the future if U.S. EPA does not require some remediation of the Site), it is plausible that off-Site residents, including trespassers, may be exposed to contaminants at the Site.

7.1.3.5.1.1.1 Potential Exposure Through Groundwater Use

Two groundwater aquifers have been identified at the Site during the remedial investigation; an upper aquifer and a lower aquifer. A continuous clay layer was documented across the Site effectively separating the two systems (see previous sections on geology and hydrogeology of the Site for details). The lower aquifer is used for drinking water purposes, however the upper aquifer is not classified for drinking water use. In fact, a survey of homes adjacent to the Site performed during the RI indicated that private wells exist in both aquifers, however, the upper aquifer is reportedly only used for non-potable purposes (e.g., lawn care, car washing). However, some persons located one-half mile north (upgradient) of the Site reportedly had used the upper aquifer for drinking water purposes as recently as five years ago. No private wells screened in the upper aquifer were sampled during the RI; lower aquifer private wells were sampled (see Figure 4-13 for locations of private wells).

Local officials (City of Griffith - Office of Public Works) indicated that there is no ordinance in place which would restrict the placement of wells for new construction. Most City residents use the City water supply system for drinking water; some residents do use private wells screened in the lower aquifer. There are no municipal wells used locally by the City of Griffith. However, a pump station used to supply water to City residents is located at 45th Street and Glenwood in Griffith. The source of this water is the Gary-Hobart Company. The pump station supplies three overhead storage tanks for distribution.

7.1.3.5.1.1.1.1 Upper Aquifer

The groundwater flow pattern in the upper aquifer has been shown to be confined to within a few hundred feet of the Site boundary. Some homes at greater distances from the Site were found to maintain wells in the upper aquifer and reportedly use the water for lawn care and other non-potable uses. If contaminated groundwater were to migrate to these off-Site wells, exposure might be possible while gardening or if children were to play in the water.

Groundwater flow in the upper aquifer is controlled by several factors as discussed in previous sections of this RI Report. The flow of groundwater in the upper aquifer appears to be diverted towards an excavation near the active landfill used to de-water the landfill, and by the wetlands which surround the Site. The fire pond acts as an injection point creating a groundwater high at the Site which influences flow.

Since the groundwater flow paths are controlled primarily by water injection at the firepond and dewatering at the landfill, changes in either of these activities could result in changed flow paths and therefore, the potential might exist for contaminants in the upper aquifer to migrate to off-Site locations, presenting an exposure potential to residents who use private wells screened in the upper aquifer near the Site. Groundwater modeling was not performed to predict the fate and transport of contaminants in groundwater, therefore, it was assumed that on-Site groundwater chemical concentrations may be equivalent to off-Site concentrations, in time, if not mitigated.

If no action were taken at the Site to mitigate contaminant release to groundwater, and the plume were to reach private wells in the upper aquifer, residents could be exposed to contaminants in the water. For purposes of this risk assessment, a child, age 5-15 years old, using the water for play (using water in a swimming pool), was selected to represent a "worst case" population among off-Site users of the upper aquifer (this is consistent with the intent of the current guidance in defining the maximum exposure that is reasonably expected to occur). Children could be exposed to contaminants in water from the upper aquifer through the following exposure pathways:

- Incidental ingestion of water while swimming in a pool containing contaminated groundwater from the upper aquifer; and
- Dermal exposure while swimming.

The Griffith Municipal Landfill was also evaluated separately for its potential impact on groundwater. There is evidence that the landfill is generating leachate. The leachate is being controlled by a collection system (de-watering excavation). Monitoring wells located in the upper aquifer, and down-gradient of the Landfill appear to indicate the collection system has been effective in limiting release of contaminants (in leachate) to the upper aquifer.

Under current land use conditions, there is no evidence that exposure to contaminants, associated with the Landfill, is occurring, or has occurred in the past. Contaminant release from the Landfill, based on cessation of the collection system, has been modeled to evaluate potential future land use exposures (see Section 7.1.3.5.2.1.1).

7.1.3.5.1.1.1.2 Lower Aquifer

Eight private wells located in the deep aquifer were analyzed during the RI and had no detectable levels of contamination (two additional wells were sampled in January 1991). Both the Site and landfill facilities maintain wells in the lower aquifer; the well at the landfill facility is used for drinking water; the wells at the Site are used for industrial processes and for drinking water.

There appears to be a substantial amount of retardation of contaminants migrating vertically from the upper aquifer to the lower aquifer due to the confining clay layer. While the confining clay layer was found to be only 2.5 ft thick in one limited area, generally it is greater than 6 ft thick across the Site. The clay layer provides an effective separation between the two aquifers because of its high organic carbon content and low permeability. The potential for contaminant exposure via the lower aquifer is considered to be low. Contamination was found in the lower aquifer at monitoring well MW9D, but was not found at any other lower aquifer monitoring wells, indicating that the contamination is limited and has not extended off-Site. For

the purposes of risk assessment, contaminants detected in the lower aquifer were assumed to migrate at their present concentrations to off-Site locations where exposure might occur. Exposure pathways include:

- Ingestion of water;
- Dermal absorption of contaminants from water during bathing; and
- Inhalation of the VOCs released from water during its household use (e.g., showering, bathing, etc.).

7.1.3.5.1.1.2 Potential Exposure to VOCs in Ambient Air

Contaminants can be released to the air through volatilization. Numerous VOCs have been detected in various Site media from which volatilization could occur. The majority of volatiles are located at discrete areas of the Site. These areas include the on-Site containment area, off-Site containment area, Kapica-Pazmey, and the still bottoms and treatment lagoon area. Each of these areas, with the exception of Kapica-Pazmey, have been covered with clean material. Although VOCs are also detected in other media (e.g., groundwater), it is expected that the greatest quantity of release of VOCs to air would come from the subsurface soils from the areas just described.

Several factors may reduce the significance of VOC releases to ambient air. It is believed that most of the VOCs are present at the water table. The soil moisture in this zone may serve to inhibit the release of VOCs. Once released, the VOCs would be diluted with ambient air.

The quantity of VOCs emanating from the contaminated subsurface soils is expected to be low compared to that from the Site. No air samples were taken in the field during the RI because of the difficulty in distinguishing air pollutant sources at the Site from anthropogenic background. However, it should be recognized that volatiles released from Site pollution may pose potential inhalation exposure (proportionately) to on-Site as well as off-Site populations residing near the Site and to children who may play (trespass) on-Site. Predicting the amount of exposure quantitatively for this risk assessment required estimating potential emissions from the subsurface soils and using a dispersion model to obtain on-Site and downwind VOC concentrations.

7.1.3.5.1.1.3 Potential Exposure to Contaminants Via Fugitive Dust

The potential for contaminants to be released to air via fugitive dust is expected to occur only at the Kapica-Pazmey area. In this area, there are unvegetated areas of surface soil contamination where fugitive dust generation from wind erosion is possible. The bare soil is visibly contaminated at this location and based on particle size analysis, soil particles are conducive to such a release. Dust generation was observed in this area during the RI.

There is little or no potential for fugitive dust release from other areas where contamination exists. The on-Site containment area, off-Site containment area, and still bottoms and treatment lagoon area are covered with clean material, effectively eliminating the potential generation of contaminated fugitive dust. The still bottoms and treatment lagoon area is covered by construction and the off-Site containment area is covered by dense vegetation.

The greatest potential for inhalation of contaminated dusts would be by children playing (trespassing) at the Kapica-Pazmey area. However, contaminants entrained on soil particles in air could also migrate to off-Site residences near the Site where they might be inhaled by receptors (residents).

7.1.3.5.1.1.4 Potential Exposure Via Direct Contact with Contaminated Soils

Surface soil contamination is evident at Kapica-Pazmey where potential exposure via direct contact is considered to be plausible for adolescents trespassing on-Site. Subsurface contamination beneath clean cover material exists at other locations on-Site but does not represent a direct contact exposure potential under current conditions.

The source area at Kapica-Pazmey is an open area adjacent to Site buildings. The open area is visually contaminated (see Table 7-7 for analytical results) and is unvegetated. Access to the property is partially restricted by fences and buildings but, the area is not completely restricted.

The potential for exposure to contaminated soils under current conditions is plausible only for soils located at the surface. Contact with soils below ground surface would require excavation (digging) and is not likely to occur on a regular basis. Risks to subsurface soils were considered under the future land use scenario.

The most plausible population which may contact surface soils in these areas is considered to be adolescents who may play (trespass) on the Site. To assess potential health risks associated with contaminated surface soils, contaminant exposure was quantified by assuming adolescents regularly play at the Kapica-Pazmey location. Exposure routes considered included incidental ingestion and dermal absorption.

7.1.3.5.1.1.5 Potential Exposure Via Contact with Surface Water and Sediments

Wetlands are found on all sides of the Site. In addition there are drainage ditches near the Site which transport overland runoff in the area. Surface water and sediment samples (see Tables 7-9 and 7-10 for a summary of analytical results) collected and analyzed from these Site features indicate the presence of contamination.

Portions of the groundwater table discharge from the upper aquifer into the wetlands and surface water surrounding the Site. It is possible that if no action is taken, groundwater with increasing contaminant levels would discharge to the wetlands. If this were to occur, people and wildlife might be exposed to contamination in these media currently and in the future.

To assess the health risks associated with contamination detected in surface water and sediments, adolescents were assumed to play (trespass) on-Site and become exposed to these media on a regular basis. Exposure was assumed to be plausible through incidental ingestion and dermal contact.

It is unknown whether hunting activities take place on-Site. However, it is expected that if hunting does occur, this is a small potential user group. The Site is surrounded by residences, commercial businesses, and industry making hunting an impractical matter.

The surface waters on-Site are not indicative of habitats for major sport fishing populations. Thus, fishing appears to be inherently limited by the physical makeup of the Site.

It is reasonable to conclude that terrestrial and aquatic organisms taken from the Site would not constitute a major source of food for human consumption. Potential exposure to chemical contaminants via ingestion of aquatic species or wildlife was not evaluated due to the lack of a defined user group and the reasonable assumption of limited potential for exposure.

7.1.3.5.1.2 On-Site Workers at the Site

ACS continues to maintain its operations and thus, employees of the Site represent a population potentially exposed to Site contamination under current conditions. The Site has effective access limitations and only authorized personnel are allowed on the property.

There are no apparent direct contact exposures to surface water or soils at the Site. This area of the Site has been covered by clean fill material, effectively eliminating the potential for direct contact with buried materials, particularly in the area of on-Site containment.

There is only one surface water body location on the Site. This location was analyzed and found to contain relatively low levels of contaminants. This lagoon is actively used for Site processes, and workers may encounter the lagoon. However, working activities near the lagoon were considered to be voluntary, and associated with job requirements. Site workers were assumed to be trained in their job functions, and have an understanding of potential worker hazards. The Occupational Safety and Health Act (OSHA) requires compliance with safety and hygiene standards to reduce potential risks to these employees. Site worker exposure to the lagoon was not evaluated in the Baseline Risk Assessment.

The Site maintains four groundwater wells. These wells are used for industrial purposes, as well as for drinking water. All four of these wells are installed in bedrock at a depth greater than 300 ft. The RI has focused on evaluating the upper aquifer

and the lower sand and gravel aquifer, separate from the bedrock. The bedrock aquifer has not been identified as a concern in the RI, nor has it been defined as being Site-related. Analysis of one of the four wells indicated no contamination. The bedrock aquifer was not considered further in the risk assessment.

7.1.3.5.1.2.1 Potential Exposure to Contaminants Via Inhalation of VOCS

The most apparent exposure to workers at the Site would be via inhalation of gases/vapors released from their operations; this is apparent based on observation during Site visits. The VOC releases emanating from buried materials on the Site (on-Site containment area, and still bottoms and treatment lagoon area) are in addition to that of the Site operations. To assess health risks to Site workers due to VOC releases to ambient air, only those releases associated with the buried contamination on and near the Site were considered.

7.1.3.5.1.2.2 Potential Exposure to Contaminants Via Fugitive Dusts

As described previously, the Kapica-Pazmey area has exposed contamination at the surface. Site workers may be exposed via inhalation to downwind concentrations of contaminated dusts emanating from the Kapica-Pazmey area.

7.1.3.5.2 Future Land Use

There are no hard-and-fast rules by which to determine alternate future land use. To the extent the information was available and applicable, City and County projections of future land use, census projections, and information regarding land use trends were used to assist in the determination of future land use for this risk assessment. While these sources may provide useful information, they cannot always be interpreted as providing proof that a certain land use will or will not occur. Thus, much of the interpretation for determination of the future use scenario for this risk assessment was based on professional judgment.

The Zoning District Map (Figure 7-2) for the Town of Griffith indicates the Site is zoned general industrial. However, there is residential zoning adjacent to the Site and some residences exist within the industrial zoned areas. Although future trends regarding development of the area are not known with certainty, it may be possible

that the Site or areas near the Site could be developed for residential use (i.e., the probability that the Site will support residential land use in the future is not so exceedingly small to preclude using this scenario for this assessment). The residential use scenario was selected based on concurrence with the U.S. EPA Region V RPM, and Technical Support Group.

The likelihood of residential development at and near the Site in the future is supported primarily by the presence of residences currently near the Site. In addition, because the Baseline Risk Assessment must evaluate the Site on the basis that no action is taken to mitigate the Site and no restrictions and/or institutional controls are placed on future use of the Site, the residential pathway seemed plausible for risk assessment. An alternate future use is for industrial purposes. The potential exposure pathways associated with future land use of the Site for industrial purposes has been included in this risk assessment under the current land use scenario. An evaluation of exposure pathways based on potential future land use changes is summarized in Table 7-15 and discussed below.

Hypothetical Resident Living On-Site

- Ingestion of contaminated groundwater from the lower or upper aquifer.
- Dermal absorption of contaminated groundwater from the lower or upper aquifer.
- Inhalation of VOCs released from water from the lower or upper aquifer during its household use (e.g., showering, bathing).
- Dermal absorption and incidental ingestion of contaminants adsorbed onto sediments and soils.
- Dermal absorption and incidental ingestion of contaminants detected in surface water.
- Inhalation of volatiles released to ambient air.

7.1.3.5.2.1 Hypothetical Resident Living On-Site

7.1.3.5.2.1.1 Potential Exposures Via Groundwater

As has been previously stated, there are two groundwater aquifers at the Site; upper and lower. For the purpose of this risk assessment, it was assumed that a residential well could be screened in either of the aquifers and used as a drinking water source.

Without remedial action for Site clean-up, nor institutional restrictions or other limitations, as specified by guidance for the Baseline Risk Assessment, risks have been quantified for residential use of either aquifer for drinking water purposes. The routes of contaminant intake evaluated include ingestion and dermal absorption of groundwater, and inhalation of VOCs released from groundwater during its household use.

Contaminant concentrations were assumed to remain at their present levels when performing the calculations to estimate the amount of exposure under future land use conditions. This assumption may over- or under-estimate the exposure. Using steady-state conditions does not account for substantial future releases of unmitigated source materials to groundwater that may occur over time, nor does it account for source depletion and attenuation of materials through environmental fate and transport processes. It is not known with certainty the resultant (future) groundwater concentrations due to these potential (collective) impacts.

In addition to the Site-specific geologic and hydrogeologic conditions, and extraneous groundwater influences (as previously discussed in the RI Report), many chemical and physical properties affect chemical transport and fate in groundwater. Some of the more important mechanisms include leaching from the surface, advection (infiltration, flow through the unsaturated zone and flow with groundwater), dispersion, sorption (adsorption, desorption, and ion exchange), biological degradation, hydrolysis, oxidation, reduction, complexation, dissolution, and precipitation. In accordance with current U.S. EPA guidance documents, current concentrations can be used to represent future concentrations assuming a steady-state condition when groundwater modeling is not used.

For directly assessing the potential impact of the Griffith Municipal Landfill on groundwater, the collection/de-watering system was assumed to be stopped, and a model was used to determine the potential release of contaminants in leachate to groundwater. This evaluation was made to assess the potential risks to a hypothetical future use residence, with a private well, located immediately adjacent to, and downgradient from the landfill.

The model indicates that in the future, all groundwater passing through or under the landfill will discharge to areas where wetlands predominate. That is, areas where a residential dwelling could not be constructed, and a well could not be installed. Thus, it appears reasonable to assume that the landfill will present no risk via groundwater in the upper aquifer under future land use considerations. This pathway, based on the model results was not evaluated further in the risk assessment. For a detailed analysis of the model (with assumptions) used, see Appendix Y.

7.1.3.5.2.1.2 Potential Exposure Via Contact with Contaminated Soils

Little contamination exists at ground surface at the Site. In general, the contaminants have been buried below ground. Therefore, exposure to soils is limited unless the subsurface soils are excavated and brought to the surface where exposure may be possible. Exposures were quantified for subsurface soils being unearthed and brought to the surface consistent with the "no-action" alternative, and future land use for residential development. The contaminated subsurface soils were assumed to be excavated during hypothetical development of residences on-Site, and used as fill material and cover material in yards, gardens, and playgrounds. This exposure pathway is highly subjective, however, using such a pathway may be more important as it relates to the feasibility study in determining which chemicals in subsurface materials may require evaluation in the detailed analysis of alternatives.

The analytical results for subsurface and surface soils have been averaged together to account for mixing of soils, where appropriate, to arrive at exposure point concentrations. It should be recognized that there are degradative processes which would act to reduce contamination over time. However, these processes are complex and their impact has not been predicted for risk assessment; exposure point concentrations assume steady-state conditions.

7.1.3.5.2.1.3 Potential Exposure Via Contact With Contaminated Surface Water and Sediments

For future land use considerations, the wetlands and drainage ways were assumed to be protected, and remain unchanged from current conditions. Contaminants were also assumed to reflect steady-state conditions. This assumption appeared reasonable since the sources, under the no action alternative, may continue to contribute to surface

water and sediment contamination. Therefore, contact with surface water and sediments would be the same as described for the current land use scenario. On-Site residents were assumed to have occasional contact with contaminated surface water and sediments through the dermal absorption route and incidental ingestion.

Predicting exposure by this scenario is highly speculative because the hypothetical future use pathway has low probability. Even though unlikely, current methods and approaches for evaluating potential risks associated with various media at Superfund Sites requires inclusion of this pathway for risk assessment.

7.1.3.5.2.1.4 Potential Exposure Via Inhalation of Contaminants Released to Air

Fugitive dust generation and VOCs emanating from contaminated areas are the two potential release routes to air.

Under future land use considerations, it was assumed that fugitive dust generation would be effectively minimized by conditions evident in an urban setting. That is, unearthed contaminated soils brought to the surface, would be covered by vegetation, building construction, roadways, and other ground cover features. These features, in essence, reduce the potential for wind and/or mechanical erosion forces necessary to generate dusts. VOC release could potentially occur through the soil cover into the ambient air. This pathway is similar to the current land use pathway where VOCs in subsurface soil are released from the source through the ground cover to the ambient air. The mechanism for VOC release would still exist and may be enhanced under these circumstances presenting potential exposure to on-Site residents via inhalation of VOCs.

7.1.3.6 Quantification of Human Exposure Estimates

Exposure is defined as the contact of an organism with a chemical or physical agent. In this assessment, exposure (intake or dose) is normalized for time and body weight and is expressed as mg chemical/kg body weight-day (mg/kg-d). Five factors are used to estimate intake; exposure frequency, exposure duration, contact rate, exposure point

concentrations, and body weight. This section summarizes the exposure factors used in this assessment. The methodology (equations) for calculating estimates of human exposure is provided in Appendix T.

An additional term in the dose estimate equation is "averaging time," which normalizes the dose over a specified period of time. For chemicals which are potential carcinogens, dose estimates are normalized over a 70 year lifetime to allow comparison with toxicology information which is generated from studies in which the test species is exposed to the chemical over the majority of its lifetime. Dose estimates which are used to assess the non-cancer effects of chemicals are normalized over the period of exposure.

Recently published national statistics on the number of years spent by an individual in one residence indicate that the average number of years spent at a single residence is 9 and the 90th percentile figure is 30 years (U.S. EPA, 1989). This assessment uses the 90th percentile figure to represent the period of exposure for many of the exposures assumed to occur at and near the Site. Thus, the averaging time for carcinogens versus noncarcinogens is 70 years and 30 years, respectively. There are instances where the exposure period is less than 30 years (e.g., child swimming - 10 years, adolescent playing on Site - 10 years). In these cases, the averaging time for carcinogens is still 70 years, however, non-cancer effects of chemicals are normalized over 10 years.

Levels of exposure are quantified to allow comparison with exposure levels corresponding to adverse health effects. Estimates of contaminant exposure can be derived using the following general equation:

$$\text{Contaminant Dose Estimate} = \text{Chemical Concentration} \times \text{Contact Rate} \times \text{Exposure Frequency and Duration} \times \frac{1}{\text{Body Weight}} \times \frac{1}{\text{Averaging Time}}$$

The contaminant dose estimate may represent either an "administered" or "absorbed" dose. An administered dose refers to a contaminant exposure which occurs at an exchange boundary of an organism. For example, exposure via ingestion

(drinking groundwater) is based on delivery of the contaminant to the gastrointestinal tract. Equations which estimate doses for some exposures incorporate a variable which accounts for absorption of the contaminant across the exchange boundary into the blood stream. This estimate is referred to as an "absorbed dose estimate." The distinction between administered and absorbed dose estimates is necessary for proper comparison with toxicity information, as is further described in the Toxicity Assessment.

The most recent EPA guidance states that actions at Superfund sites should be based on an estimate of the "reasonable maximum exposure" expected to occur under both current and future land use conditions. The reasonable maximum exposure is defined as the "highest exposure that is reasonably expected to occur at a site" (U.S. EPA, 1989). The intent of the reasonable maximum exposure is to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possibilities. Each exposure factor has a range of possible values. In accordance with the guidance, this assessment has used values for the exposure factors that result in an estimate of the reasonable maximum exposure.

7.1.3.6.1 Groundwater/Surface Water Exposures

Exposure to contaminants through the use of groundwater as a water supply source from either the lower or upper aquifer was estimated for the ingestion, dermal absorption, and inhalation routes of exposure. The exposure assumptions used to describe groundwater use are summarized for individual populations in Appendix T. Intake equations are also presented in this Appendix.

The principles used to calculate groundwater dose estimates were used to evaluate exposure to surface water, however, the parameters used to calculate surface water exposure are different. Assumptions applied to the surface water exposure pathways are contained in Appendix T for each population.

Some of the more important intake assumptions are highlighted below for each exposure route.

7.1.3.6.1.1 Ingestion

This assessment follows the U.S. EPA's standard set of exposure assumptions to describe exposure through ingestion of drinking water (U.S. EPA, 1989). These assumptions include an ingestion rate of 2 liters per day for drinking water.

An ingestion rate of 0.05 L/hr was used for incidental ingestion of water while swimming (2.6 hours/day, 52 days/year), and 0.005 L/hr for incidental ingestion of surface water for children assumed to play near wetlands and drainage ways (3 hours/day, 52 days/year).

7.1.3.6.1.2 Dermal Absorption

Exposure through dermal absorption is a function of more variables than ingestion, and there is no standard set of exposure assumptions. The assumptions used in this assessment are based on recent EPA guidance and professional judgment.

Dermal absorption exposure is a function of permeability of the skin, surface area exposed, and length of exposure. Chemical-specific permeability constants (PC) (which approximate the rate of chemical movement across the skin) are not available for all contaminants. Where they are not available for VOCs, this assessment assumes that contaminants penetrate the skin at the same rate as toluene (U.S. EPA directive) when toluene is present. When toluene is not present, the chemical of concern with the next greatest permeability potential was used. The PC for water was used as a default value for metals, and the PC for 2-butanone was used as a default value for semi-volatiles (U.S. EPA directive). The assessment assumes that dermal absorption of water occurs through the use of groundwater while showering, when children swim in pools filled with contaminated groundwater, and when children play on-Site and become exposed to surface water.

7.1.3.6.1.3 Inhalation

Inhalation of VOCs released from drinking water to household air was approximated using a draft methodology supplied by the U.S. EPA Exposure Assessment Group, Office of Health and Environmental Assessment ("Screening Method for Estimating Inhalation Exposure to Volatile Chemicals from Domestic Water"). The procedure has evolved from research performed by Julian Andelman, University of Pittsburgh. Appendix T contains the formula for deriving concentrations of chemicals released to

air while showering. Appendix Z contains the methods used to arrive at a chemical concentration in air as a result of volatilization. The concentration estimate was then applied to standard methods for calculating daily intake.

Inhalation of volatiles released from contaminated water in a swimming pool or from surface water was considered negligible and not quantified in this risk assessment.

7.1.3.6.2 Soil/Sediment Contact Exposures

Exposure to contaminants in soils and sediments were assumed to occur through dermal absorption and incidental ingestion. Soil and sediment contact impacts populations considered in both current and future land use scenarios (i.e., trespassers, hypothetical on-Site residents). The exposure variables have been adjusted accordingly based on the population exposed. For specific information regarding the exposure variables associated with each population and route of exposure, refer to Appendix T. These tables also contain the equations used to calculate intake. Some of the more important exposure assumptions used to calculate intake are provided below.

7.1.3.6.2.1 Incidental Ingestion

Standard assumptions were used to calculate incidental ingestion of soil/sediment. Contact is assumed to occur 6 months per year because snow cover and/or frozen ground is assumed to prevail 6 months per year. A standard ingestion rate of 100 mg soil/day was used.

7.1.3.6.2.2 Dermal Absorption

As with dermal absorption of water, there is no standard set of exposure assumptions for dermal absorption from soil or sediment. Dermal absorption of soil/sediment is a function of permeability of the skin, surface area exposed, soil/sediment deposition, and length of exposure. Estimates of the rate of absorption of chemicals from soil/sediment are not available for many contaminants so the method stipulated in U.S. EPA guidance was used. Exposure through dermal absorption from soil/sediment was calculated using specific dermal absorption factors when available, otherwise an absorption factor of 30% was used for organic compounds. The organic value was

based on information obtained from ECAO for PAHs. Metals do not readily absorb, thus 1% was assumed to be a reasonable estimate of absorption for these elements.

7.1.3.6.3 Air Exposures

7.1.3.6.3.1 Inhalation

Subsurface contamination at several areas of the Site contain high concentrations of VOCs, potentially providing a continuous source of releases to the air. Climatic conditions were assumed to limit volatilization to 6 months of the year (absent or negligible during the winter). In addition, fugitive dust generation is anticipated at the Kapica-Pazmey area. Both of these mechanisms of contaminant release to the ambient air may pose an inhalation hazard and have been included for risk assessment. On-Site and off-Site exposures have been evaluated for current and future land use populations, as appropriate.

Standard assumptions have been applied to the inhalation pathway when available while professional judgment was utilized for some of the parameters. Exposure assumptions and the equations to calculate intakes for the air pathway for each population are listed in Appendix T.

7.1.3.7 Exposure Point Concentrations

U.S. EPA guidance requires that the concentration of contaminants in a given medium (groundwater, soil, etc.) used to represent the exposure point concentration be derived by calculating the 95% upper confidence limit on the mean (data assumed to be either normally or log-normally distributed) of sample concentrations (95% UCL) (exceptions for groundwater exist - see discussion below in Section 7.1.3.7.1). If the 95% UCL value exceeds the maximum value identified, the maximum value is to be used instead. In the present assessment, a log-normal distribution was assumed, and confirmed through analysis of covariance (Appendix U contains details for determination of exposure point concentrations). Ninety-five percent UCL values (based on a log-normal distribution) were calculated for all contaminants identified in Site media. In most instances, the 95% UCL values were greater than the maximum concentrations identified for these chemicals because of the large degree of variability within the contaminant concentration data. Therefore, maximum contaminant concentrations

were used to represent most exposure concentrations for these data. UCL values were used only when less than the maximum concentration. Calculations of UCLs and comparisons to maximum concentrations is presented in Appendix U. Exposure point concentrations (either UCL or maximum concentrations) selected for each area are contained in Table 7-16.

7.1.3.7.1 Groundwater

For groundwater, there are no data available to directly describe concentrations at exposure points (private wells located off-Site). However, contamination has been detected at monitoring wells located at the periphery of the Site. Contaminants could potentially migrate off-Site in the upper aquifer and, because receptors surround the Site, there is the potential for contamination of private wells screened in the upper aquifer. Because the potential exists for migration off-Site under current land use, the U.S. EPA Region V requires evaluation of off-Site exposure to groundwater.

Monitoring well analytical data were used directly to estimate potential exposures from either the upper or lower aquifers using either the UCL or maximum contaminant concentration, as appropriate. Under current land use conditions, the exposures that may occur are off-Site. Therefore, using the UCL or maximum (lower of the two) concentration was considered to be reasonable to quantitate exposure (based on a teleconference with U.S. EPA). However, for future land use, a hypothetical well is assumed to be placed on-Site, and the maximum concentration was used. This is in accordance with recent U.S. EPA guidance (March 1991). In addition, to calculate future land use exposures, concentrations of contaminants in both aquifers were assumed to remain steady-state.

7.1.3.7.2 Soils, Surface Water, and Sediment

Either the UCL or maximum chemical concentration detected was used to calculate exposure to soil, surface water, and sediment. Similar to groundwater, future exposures were based on steady-state conditions.

7.1.3.7.3 Air

VOC releases to air emanating from subsurface contamination was modeled for this risk assessment. A baseline emission estimate was generated based on either the UCL or maximum concentration, as appropriate. A dispersion model was then applied to obtain a downwind exposure point concentration. The models used were those contained in the Superfund Exposure Assessment Manual (U.S. EPA, 1988). Refer to Appendix V for complete details on the application of these models to arrive at exposure point estimates for VOCs released to air.

A fugitive dust model was also employed to address the potential for dust release from surface contamination at Kapica-Pazmey. The methods of Cowherd, et.al. (1985) were used to arrive at fugitive dust emission rates and exposure point estimates. A description of this method and its application at the Site is contained in Appendix W.

Again, without the use of sophisticated predictive models, chemical concentrations used were assumed to remain at steady-state conditions for future land use exposure calculations.

7.1.4 Toxicity Assessment

This section addresses the nature of the toxic effects which may result from exposure to the chemicals of concern. The risk assessment addresses two general types of toxicities which may result from chemical exposure; cancer and non-cancer effects. Because these two broad types of toxicity are assumed to be expressed through different biological mechanisms, the methods used to quantify these effects are different. Although the chemicals have been divided into carcinogens or noncarcinogens, some chemicals have been evaluated as having the potential to cause both carcinogenic and noncarcinogenic effects.

7.1.4.1 Dose-Response Relationship

The type, severity and frequency of occurrence of a given toxic effect observed within a population (response) is a function of the magnitude of chemical exposure (dose). Different chemicals which produce similar toxicities within a species usually do so at different concentrations (i.e., have different toxic potencies). These relative differences in the dose-response relationships among chemicals are addressed in the risk assessment by considering "critical toxicity values" developed by the U.S. EPA. Critical toxicity values have been derived for potential noncarcinogenic effects and potential carcinogenic effects of the chemicals and are termed reference doses (RFD) and slope factors (SF), respectively.

Two sources of critical toxicity values were used. The primary source was the U.S. EPA's Integrated Risk Information System (IRIS) database. A secondary source of data was the Health Effects Assessment Summary Table (HEAST) published quarterly by the U.S. EPA. Critical toxicity values were not available for many of the chemicals of potential concern. To establish those toxicity values, the Environmental Criteria and Assessment Office (ECAO) and the U.S. EPA Region V Technical Support Group were contacted to provide additional values and guidance, as appropriate.

7.1.4.1.1 Noncarcinogenic Effects

Noncarcinogenic effects of chemicals are assumed to display a threshold phenomenon, i.e., effects are not observed below a given chemical concentration (threshold dose). Therefore, a health risk is thought to exist only if established threshold doses are exceeded.

Noncarcinogenic health effects include a variety of toxic effects on body systems such as renal toxicity (toxicity to the kidney), teratogenicity (damage to the developing fetus), and central nervous system disorders. In many cases, organisms have adaptive mechanisms that must be overcome before a toxic endpoint (effect) is manifested. The toxicity of a chemical is assessed through a review of toxic effects noted in short-term (acute) animal studies, long-term (chronic) animal studies, and epidemiological investigations.

The noncarcinogenic dose-response relationship is addressed in the toxicity assessment by considering RFDs, expressed in mg contaminant/kg body weight-day, which are levels of contaminants not expected to cause adverse health effects in humans, including sensitive subsets of the population. RFDs are generally estimated from No-Observed-Adverse-Effect-Levels (NOAEL), determined from animal studies, which are the highest chemical concentrations which produce no adverse effects. Safety factors related to various assumptions made (e.g., animal to human extrapolation) are incorporated in the derivation of the values to result in a more health-protective estimation.

RFDs for some inorganic compounds are for specific forms (e.g., hexavalent and trivalent chromium). The chemical analyses performed do not, however, report concentrations of specific forms, but rather give results in terms of "total" inorganic chemical. In such situations, it was assumed that unless otherwise known, the most toxic form is present and its RFD used.

7.1.4.1.2 Carcinogenic Effects

Presently in the risk assessment process, all carcinogens are considered to have a dose-response relationship with no threshold. Thus theoretically, any exposure is associated with some degree of risk.

The cancer potentials of carcinogens are known with varying degrees of certainty, depending on the amount and quality of scientific information available. The U.S. EPA has developed a system to review this information and to classify chemicals as to their likelihood of causing cancer. For example, this classification scheme distinguishes between chemicals which are known human carcinogens (Group A) and chemicals which are probable human carcinogens (Group B), based on their cancer causing properties in animal studies. The dose-response relationship for an established or

potential carcinogen is incorporated into the SF; a value expressed in $(mg/kg\text{-}d)^{-1}$, which is directly proportional to the cancer potency of the chemical.

7.1.4.2 Critical Toxicity Values and Toxicity Profiles

The critical toxicity values (RFDs and SFs) used in the present risk assessment are shown in Table 7-17. Toxicity values are generally based on the level of a chemical "administered" to a test animal. This situation does not account for the ability of the animal to absorb the compound into the blood stream. Toxicity values can be adjusted to account for this factor by incorporating an estimate of the level of absorption which is likely to occur. In the present risk assessment it was necessary to adjust toxicity values based on "administered" doses to an "absorbed" dose basis because contaminant dose estimates calculated for the dermal route of exposure provide an "absorbed" dose estimate. Thus, all contaminant dose estimates for all dermal exposure routes were compared to adjusted toxicity values to estimate health risk. Absorption estimates and critical toxicity values were approved by the Environmental Criteria and Assessment Office.

Toxicity values are based on a "critical" toxic effect in an animal. These are generally the most sensitive effects observed (those detected at lowest doses). The critical effects for the chemicals of potential concern are listed in Table 7-18. In addition, the uncertainty factor used to develop the reference dose and the U.S. EPA carcinogen classification for potential carcinogens are also summarized.

7.1.5 Risk Characterization

In this section, estimates of contaminant exposure are compared with toxicity information to arrive at an estimate of potential human health risk. Two general types of toxicity endpoints are evaluated for chemicals of potential concern in this assessment, i.e., cancer and non-cancer effects. Because the assumptions related to how chemicals produce cancer effects and non-cancer toxicities differ, the methods employed to qualify these risks also differ. These are described below.

7.1.5.1 Procedures Used to Quantify Health Risk

7.1.5.1.1 Non-Cancer Effects

Estimating the risk of a non-cancer health effect was accomplished by calculating a hazard quotient. The hazard quotient for a chemical is calculated by dividing the estimated contaminant dose by the Reference Dose for the chemical as shown below:

$$\text{Hazard Quotient} = \frac{\text{Contaminant Dose Estimate (mg/kg-d)}}{\text{Reference Dose (mg/kg-d)}}$$

For a given exposure pathway, the hazard quotients for all chemicals of potential concern are added to arrive at a total. This value is referred to as the hazard index (HI) for the exposure pathway. If the HI (or hazard quotient) exceeds unity (1), there may be a potential health risk associated with exposure via the particular pathway (or chemical) evaluated.

7.1.5.1.2 Carcinogenic Effects

The cancer risk value is an estimate of an individuals' lifetime likelihood of developing cancer over and above the existing background chance of developing cancer. A cancer risk of $1x10^{-6}$, for example, may be interpreted as an increased risk of one in one million of developing cancer over a person's lifetime. This risk may also be interpreted on a population basis, to predict that one additional case of cancer may occur in a population of one million people.

Generally, when the HQs for several contaminants give an additive HI > 1.0, the HQs are regrouped according to target organ effect or mechanism of action. If the HI for all chemicals having the same target organ effect is > 1.0, there is a likelihood of the

effect. However, in this risk assessment, there are some chemicals which tended to exceed an HQ of 1.0. Because these chemicals dominate the HI, regrouping by target organ effect was not considered necessary.

The cancer risk is estimated by multiplying the estimated contaminant dose by the slope factor for the chemical as shown below:

Cancer Risk = Estimated Contaminant Dose (mg/kg-d) x Slope Factor (kg-d/mg)

The cancer risks associated with specific chemicals within an exposure pathway are assumed to be additive. Therefore, cancer risks for individual chemicals are summed to arrive at a total exposure pathway cancer risk.

7.1.5.2 Superfund EPA Health Risk Goals

The U.S. EPA has developed program goals for potential health risks estimated from exposure to contaminants at Superfund Sites. For chemicals which may cause non-cancer health effects, acceptable exposure levels are intended to represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety (i.e., a HI of less than 1). For known or suspected carcinogens, the $1x10^{-6}$ risk level is used by U.S. EPA as a "point of departure" for determining remediation goals. Risks below this level are not considered to be of concern. Cancer risks which are between $1x10^{-6}$ and $1x10^{-4}$ may or may not be acceptable depending on other risk management factors (e.g., ARARs, nature of exposure, efficacy of treatment technologies, cost, and others) applicable to the Site.

7.1.5.3 Public Health Evaluation

Potential health risks were evaluated for contaminant exposures based on two land-use scenarios; current Site conditions and possible future Site conditions. As part of these evaluations, risks to groundwater (upper and lower aquifers), surface and subsurface soils, surface water and sediment, and air (via fugitive dust and volatiles emissions) were assessed. In addition, the Site was segregated into "areas" (on-Site containment, off-Site containment, still bottoms and treatment lagoon, and Kapica-Pazmey areas) to

assess location-specific contamination. Potential risks to groundwater downgradient of the Griffith Landfill were also evaluated. The risks, based on the assumptions and conditions provided in this assessment, are discussed below. Tables 7-19 through 7-37 summarize risks only for chemicals which may contribute substantially to the total exposure pathway risk. Thus, these tables summarize chemicals associated with cancer risk greater than $1x10^{-6}$ and chemicals associated with hazard quotients greater than 0.01. Table 7-38 contains population-based risk totals including a multi-population assessment for the maximally exposed individual. For a detailed summary of risk values associated with all chemicals of potential concern, the reader is referred to Appendix X.

7.1.5.3.1 Summary of Potential Health Risks Based on Current Land Use

Current land use health risks associated with exposure to contaminated Site media were evaluated for off-Site residents, trespassers (children who may occasionally play on-Site), and on-Site workers at the Site. The likelihood of exposure to populations from any of the pathways in this risk assessment is considered to be low and generally results in risk estimates that are conservative.

As has been referred to previously in this risk assessment, risks are based on hypothetical exposure scenarios. The risks quantified are approximations of potential health hazards that should be viewed on a relative risk basis, rather than on actual risk basis.

The risks calculated for groundwater were based on samples that were filtered for metals but not filtered for organics. The unfiltered samples generally result in sediments (suspended solids) being collected. This point deserves emphasis in that, the presence of certain organic chemicals (i.e., those with strong binding affinity to soils; high Koc) in groundwater samples is likely the result of the incorporation of sediments into the sample (i.e., the chemical is adsorbed to sediments and not actually in solution). PCBs for instance, bind (adsorb) strongly to soils and likely have been introduced into the groundwater sample as a suspended sediment. It is also important to note that arsenic, while contributing to groundwater risks, has a maximum detected

concentration on-Site of 43.2 ug/L (Table 7-2) which is lower than the Maximum Contaminant Level (MCL) Standard of 50 ug/L. The MCL value for arsenic assumes that drinking water is the only route of exposure to arsenic, and arsenic is the only chemical of concern.

7.1.5.3.1.1 Potential Health Risks to Off-Site Residents

Off-Site residents were considered to be exposed to contaminants released to groundwater and air under current land use conditions. Exposure to groundwater was considered plausible from both the upper and lower aquifers. Exposure to contaminants in air (fugitive dusts and volatiles emissions) was considered in the risk estimate for off-Site residents. Total pathway/population risks (cancer and non-cancer) are summarized in Table 7-38 while Tables 7-19 through 7-22 contain chemical, route-specific, and total pathway risks for the off-Site populations in consideration of the current land use exposure assumptions.

Potential risk to children from non-cancer health effects were above a level of concern as indicated by an exposure pathway HI greater than unity (1). This potential health threat is primarily the result of dermal exposure to 4-methyl-2-pentanone (54% of the risk). Several other chemicals of potential concern exceeded a hazard quotient of 1, including acetone, 1,2-dichloroethene, 2-butanone, ethylbenzene, dimethyl ethylbenzenes, branched alkanes, and non-cyclic acids. 4-methyl-2-pentanone and acetone combine for a HI which is greater than 80% of the non-cancer hazard. The primary toxicity associated with these chemicals is liver and kidney effects (see Table 7-18).

The total cancer risk to children exposed to contaminated groundwater (upper aquifer only) was calculated to be 3.4×10^{-2}. This exceeds the U.S. EPA 1×10^{-6} point of departure. Dermal absorption of benzene is the primary route and chemical associated with this risk although, vinyl chloride, bis(2-chloroethyl)ether, PCB, and arsenic were also determined to exceed the 1×10^{-6} point of departure (see Table 7-22). Cyclic ketones (tentatively identified compounds) were considered similar in chemical structure to isophorone, and the slope factor for isophorone was used to quantitate a cancer risk value for this TIC group which exceeded 1×10^{-6}. There is substantial

uncertainty in this result since there is no verified slope factor or reference dose for this TIC group. Isophorone was used as an approximation/representation for this TIC group (see Section 7.1.2.2 and Table 7-12).

The total pathway HI value for off-Site residents exposed to contaminants in air and groundwater is 2.3. This value takes into consideration ingestion, dermal absorption and inhalation (VOCs released from groundwater during household use) of groundwater from the lower aquifer, and inhalation of fugitive dusts and VOCs in ambient air (Table 7-38). None of these exposure pathways, when viewed independent of one another, has a HI greater than 1 nor does any specific chemical have a HQ greater than 1.

The HI of 2.3 does not take into consideration each chemical's toxic endpoint. Arsenic, barium, manganese, cyclic alcohols (as represented by benzyl alcohol), and oxygenated alcohols (as represented by ethylene glycol monobutyl ether) contribute to the cumulative HI of 2.3; this assumes each of these chemicals have the same toxic endpoint. However, each of these chemicals actually have toxicities that differ (e.g., arsenic is associated with keratosis and hyperpigmentation via chronic-oral exposure; chronic oral barium exposure results in high blood pressure, and so on, see Table 7-18). The individual HQs for each chemical is less than unity (1), and because each chemical of concern has a different toxic endpoint, a cumulative HI greater than 1 cannot be calculated. Therefore, there does not appear to be a noncancer concern for the off-Site adult residential population when evaluating on the basis of toxicity.

The total cancer risk for off-Site adult residents is 4.5×10^{-4} (Table 7-38). Ingestion of arsenic and bis(2-chloroethyl)ether in groundwater from the lower aquifer contributes a substantial portion of this risk. Inhalation of several volatile compounds (methylene chloride, 1,1-dichloroethene, chloroform, carbon tetrachloride, trichloroethene, and benzene) from ambient air combine for a total cancer risk of 1.6×10^{-4}. Cancer risk estimates for fugitive dust inhalation did not exceed levels of concern.

7.1.5.3.1.2 Summary of Potential Health Risks to Trespassers

Trespassers (children-adolescents playing on-Site) were assumed to be exposed to contaminants in several media including surface soils at Kapica-Pazmey, surface water and sediment in the wetlands and drainage ditches, and fugitive dusts and volatiles in ambient air. Table 7-38 provides a summary of hazard indices and cancer risks for this population. This Table indicates that the total hazard indices for all pathways is greater than 1 ($1.9x10^{+2}$) with most of the concern attributed to ingestion and dermal absorption of surface soils at Kapica-Pazmey. Total cancer risks for all pathways assumed to occur for trespassers is $6.4x10^{-3}$. This multiple pathway assessment indicates a cancer risk exceeding the $1.0x10^{-6}$ point of departure.

In assessing non-cancer risks for the trespasser scenario, none of the chemical-specific HQs for inhalation of fugitive dusts nor the HI for the total pathway exceeded or even approached unity (1) (Table 7-27). Therefore, inhalation of fugitive dusts is not considered to pose a health hazard to trespassers at the Site. Inhalation of volatiles in ambient air by Site trespassers had an inhalation HI of 5.3 (Table 7-26). Non-cyclic acids (TIC group represented by acrylic acid; Table 7-12), and chloroethane both have HQs greater than 1, and together make up approximately 83% of the HI (5.3). The remaining chemicals have individual HQs less than 1 (Table 26).

No individual chemical in surface water or sediment had a chemical-specific HQ greater than 1 (See Tables 7-24 and 7-25). A hazard index of 1.0 was exceeded when adding chemical-specific HQs (this assumes the additive effects of these chemicals affect the same target organ) for the surface water pathway. However, there is no cumulative HI greater than unity when combining chemicals on the basis of similar toxic endpoints.

The non-cancer risk to trespassers exposed to surface soils at Kapica-Pazmey was estimated to be $1.8x10^{+2}$ (Table 7-23). The majority of the hazard index (93%) is due to exposure to lead (HQ of $1.7x10^{+2}$) (Table 7-23). Lead elicits central nervous system toxicity (Table 7-18). Several other chemicals with chemical-specific hazard quotients exceeding 1 contribute to the total pathway risk. They include

tetrachloroethene, toluene, ethylbenzene, and bis(2-ethylhexyl)phthalate. In addition to lead, the metals antimony and cadmium also had chemical-specific hazard quotients greater than 1.

The cancer risk due to trespasser exposure to surface water is 1.61×10^{-4} (Table 7-24). Seventy-one percent of this risk is due to dermal contact with PCBs. The surface water results likely indicate the presence of sediments in the surface water samples as PCBs absorb preferentially to solids, particularly those sediments with high organic content. PCBs are less likely to be in solution based on this tendency and their low water solubility. For exposure to sediments, the cancer risk estimate for trespassers is 2.2×10^{-4} (Table 7-25). 70% of the sediment cancer risk is due to dermal contact and incidental ingestion of carcinogenic PAHs (1.5×10^{-4}) and 28% is attributed to dermal absorption and incidental ingestion of PCBs (6.0×10^{-5}).

There is no cancer risk greater than U.S. EPA's point of departure associated with exposure of trespassers to fugitive dusts (Table 7-27). Inhalation of volatiles by trespassers on-Site, results in a cancer risk estimate of 2.9×10^{-4} (Table 7-26). Greater than 90% of this risk is associated with inhalation of 1,1-dichloroethene (highest exposure point concentration located at the off-Site containment area), chloroform (highest exposure point concentration located at the off-Site containment area), and carbon tetrachloride (highest exposure point concentration located at the still bottoms/treatment lagoon area).

The cancer risk estimate for exposures to Kapica-Pazmey surface soils is 5.7×10^{-3} (Table 7-23). Approximately 85% of this total is attributed to PCB exposures (4.8×10^{-3}), primarily via dermal absorption (4.7×10^{-3}). PAHs account for approximately 13% of the total cancer risk (6.8×10^{-4}).

7.1.5.3.1.3 Summary of Potential Health Risks to On-Site Workers at the Site

Site workers were assumed to be exposed via inhalation to contaminated fugitive dusts generated at the Kapica-Pazmey location and to volatiles released from subsurface (buried) waste from various areas located around the Site. The summary of hazard indices and cancer risks for these pathways is contained in Table 7-38. The hazard index estimated for the Site worker is 9.9, which exceeds unity assuming the same toxic

endpoint for the chemicals contributing to the HI. The cancer risk estimated for this population is $1.6x10^{-3}$ (the cancer risk, like the non-cancer risk is primarily associated with exposure to volatiles emissions and not fugitive dusts).

The fugitive dust hazard index for this population is substantially less than 1 and does not pose a non-cancer health hazard (Table 7-29). The risk to Site workers is primarily from exposure pathways evaluated for volatile emissions emanating from buried wastes. In assessing which chemicals are contributing to the non-cancer risk for inhalation of volatiles emissions, non-cyclic acids (TIC group), and chloroethane have chemical-specific hazard quotients that exceeds 1 (Table 7-28). Thus, based on the assumptions used to evaluate ACS worker exposure to chemicals volatilizing in ambient air, there may be a noncancer hazard associated with exposure to VOCs in ambient air, and in particular, chloroethane, and noncyclic acids.

The cancer risk estimated for fugitive dust exposure is much less than the U.S. EPA's point of departure (Table 7-29). The cancer risk estimate for inhalation of VOCs in ambient air is $1.6x10^{-3}$ (Table 7-28). The majority of this risk is associated with 1,1-dichloroethene (highest exposure point concentration used to model VOC emissions is from the off-Site containment area), chloroform (highest exposure point concentration found at the off-Site containment area), and carbon tetrachloride (highest exposure point concentration located at the still bottoms/treatment lagoon area).

7.1.5.3.2 Summary of Potential Health Risks Based on Future Land-Use

Future land-use health risks associated with exposure to contaminated Site media were evaluated for residents living on-Site. The future land-use scenario assumed hypothetically, that a residential development may be plausible at the Site. This coincides with recent guidance and is required by the U.S. EPA RPM and U.S. EPA Technical Support Group. The likelihood of this type of occurrence in unknown but, is considered to be quite low.

7.1.5.3.2.1 Potential Health Risks to Hypothetical Residents Living On-Site

To address potential health risks due to contamination associated with operable areas of the Site (e.g., on-Site containment area, Kapica-Pazmey area, off-Site containment area, and the still bottoms/treatment lagoon area), a resident was assumed to exist at

each of these locations, and be exposed to the contaminated soils at each location independent from the other areas. For example, a resident is assumed to have their home on the on-Site containment area and is exposed to the soils at this location only. Risks associated with other media (for exposures to contaminants in surface water and sediments, groundwater, and air) for a resident residing at the on-Site containment location are the same as that for a resident assumed to have their home at the other areas. Therefore, the only difference in risks at the Site is associated with exposure to soils from each area. This approach was taken to assess the soils on a localized basis rather than on a Site-wide basis and to facilitate analysis in the Feasibility Study.

Total pathway risks (non-cancer and cancer) are summarized in Table 7-38 for each of the populations residing at the different areas. Tables 7-24, 7-25 and 7-30 through 7-37 contain chemical-specific, route-specific, and total pathway risks for the hypothetical residents.

Exposure to groundwater was assumed to occur from both the upper and lower aquifers, nonconcurrently (i.e., residents had a well in either the lower or upper aquifer - not both at the same time). For purposes of this discussion, only the upper aquifer is addressed because the risks associated with exposure to it were greater than that of the lower aquifer.

The non-cancer health risk for a hypothetical resident (regardless of location on-Site) exposed to contaminated groundwater in the upper aquifer was estimated to be $3.3 \times 10^{+2}$ (Table 7-31). This assumes that each chemical of concern has the same toxic effect.

Approximately 47% of the HI is due to exposure to 2-butanone (HQ of $1.6 \times 10^{+2}$); 23% to 4-methyl-2-pentanone (HQ of $7.6 \times 10^{+1}$), and 14% to non-cyclic acids (HQ of $4.6 \times 10^{+1}$; TIC group represented by acrylic acid). 2-Butanone toxicity via inhalation is manifested by central nervous system effects, and fetotoxic effects based on oral studies on rats (Table 7-18).

Exposure to surface water and sediments for on-Site residents was assumed to be similar to that of Site trespassers under the current land-use scenario that is, on an occasional basis. The total surface water HI was calculated to be 1.3 which assumes similar toxic endpoints for the chemicals of concern contributing to the HI. A HI of 1 is not exceeded when evaluating chemicals based on each chemicals toxic endpoint, therefore, there does not appear to be a noncancer health concern related to surface water exposure. The HI for sediments is less than unity even when assuming conservatively that the chemicals of concern have the same toxic effect, and thus, exposure to sediments is not considered to pose a non-cancer health hazard to future on-Site residents.

The non-cancer HI value for inhalation of VOCs in air is $1.6 \times 10^{+1}$. The majority of this HI value is associated with non-cyclic alkanes (38%). Non-cyclic alkanes (HQ of 7.7) and chloroethane (HQ of 5.9) comprise approximately 83% of this HI value. These are the only chemicals of potential concern associated with inhalation of VOCs in ambient air with HQs greater than 1.

The non-cancer HI values for potential on-Site residents associated with subsurface soils from each of the areas is summarized below and in Tables 7-33 through 7-37.

- On-Site Containment Area

  - The total pathway HI value for exposures to subsurface soils assumed to be unearthed for residential development and brought to the surface is $5.0 \times 10^{+1}$ (Table 7-33) based on similar toxicities. Several chemicals exceed unity by themselves (i.e., HQ > 1), and tend to drive the HI result (see Table 7-18 for toxic endpoints for chemicals of concern).

  - 47% of this value is associated with tetrachloroethene, 32% with toluene, and 11% with ethylbenzene. Only two other chemicals of potential concern had HQ values greater than 1; naphthalene and bis(2-ethylhexyl)phthalate (Table 7-33).

- Still Bottoms/Treatment Lagoon Area

  - The total pathway HI for exposure to subsurface soils at the Still Bottoms/Treatment Lagoon area was estimated to be $5.6 \times 10^{+2}$ (Table 7-34). Because this value exceeds unity, it may be interpreted to mean that there is a potential non-cancer health concern associated with subsurface soil exposure in this area. This is because some chemicals have HQ values that exceed unity.

- 45% of this value is associated with carbon tetrachloride (HQ of $2.4x10^{+2}$), 27% with lead (HQ of $1.5x10^{+2}$), and 7% with nitrogenated benzenes (HQ of $3.9x10^{+1}$) (Table 7-34).

- Other chemicals with HQ values greater than 1 include; 1,2-dichloroethene (cis), chloroform, 1,1,1-trichloroethane,4-methyl-2-pentanone, tetrachloroethene, toluene, ethylbenzene, isophorone, naphthalene, hexachlorobutadiene, bis(2-ethylhexyl)phthalate, endosulfan I, 4,4'DDT, antimony, cadmium, methyl propyl benzenes, dimethyl ethyl benzenes, halogenated alkanes, n-chain alkanes and branched alkanes. Numerous other chemicals of potential concern approach a HQ of 1.

- Off-Site Containment Area

  - Table 7-35 contains a summary of HQs for chemicals of potential concern at the off-Site containment area. A total pathway HI value (based on similar toxic endpoints) of $1.0x10^{+3}$ was calculated.

  - The following chemicals were determined to contribute substantially to the potential hazard: tetrachloroethene - 18% (HQ of $1.8x10^{+2}$), 2-butanone - 15% (HQ of $1.6x10^{+2}$), nitrogenated benzenes (TIC group) - 15% (HQ of $1.6x10^{+2}$), bis(2-ethylhexyl)phthalate - 11% (HQ of $1.1x10^{+2}$), 4-methyl-2-pentanone - 9% (HQ of $9.6x10^{+1}$), 1,1,1-trichloroethane - 7% (HQ of $66x10^{+1}$), cadmium - 3% (HQ of $3.3x10^{+1}$), and naphthalene 3% (HQ of $2.8x10^{+1}$).

  - Besides the chemicals above, 24 additional chemicals of potential concern had a HQ greater than 1.

- Kapica-Pazmey Area (Surface Soils - assuming no excavation for residential development)

  - The total pathway HI value for exposures to surface soils is $4.2x10^{+2}$ (Table 7-36). Because the HI exceeds unity there may be a potential non-cancer health risk associated with exposure to Kapica-Pazmey surface soils. Again, this is possible because several chemicals of concern, in and of themselves, have a HQ value which exceeds unity.

  - 92% of the cumulative HI is attributable to lead exposure which has a chemical-specific HQ value of $3.8x10^{+2}$ (Table 7-36).

  - In addition to lead, the following metals and organic compounds have HI values that exceed 1 (Table 7-36): Metals - antimony, barium, cadmium, and chromium; Organics - tetrachloroethene, toluene, ethylbenzene, naphthalene, and bis(2-ethylhexyl)phthalate.

- Kapica-Pazmey Area (Subsurface Soils and Surface Soils-Mixed)

  - The total pathway HI value for exposures to mixed soils is $4.2x10^{+2}$ (Table 7-37).

- As with Kapica-Pazmey surface soils, the majority of the pathway risk is associated with lead (92% of HI) (Table 7-37). Also, because several chemical-specific HQs exceeded unity, it was not necessary to regroup the chemicals based on toxic endpoints. Refer to Table 7-18 for toxic effects associated with those chemicals determined to provide the greatest potential hazard.

- Along with lead, the metals antimony, barium, cadmium, and chromium had individual HQs greater than 1. Tetrachloroethene, toluene, ethylbenzene, naphthalene, and bis(2-ethylhexyl)phthalate also had HQ values greater than unity.

The highest total pathway, non-cancer risk for a hypothetical resident at the Site is associated with residential development at the off-Site containment area. The Still Bottoms/Treatment Lagoon area has the next highest hazard index followed by Kapica-Pazmey surface soils and Kapica-Pazmey soils - all depths, and finally the on-Site containment area. The difference in the noncancer risk between these areas is no greater than a factor of approximately 3.5.

For purposes of this discussion, cancer risks estimated for hypothetical residents have been evaluated in the same fashion as non-cancer risks. That is, the cancer risks estimated for groundwater, surface water and sediment, and air are the same for a hypothetical resident regardless of the location on-Site. Risks estimated for exposure to soils has been evaluated on a location-specific basis.

Cancer risks estimated for exposure to groundwater are greatest in the upper aquifer. The cancer risk associated with groundwater exposures is approximately 8.7×10^{-2}. This is well in exceedance of the U.S. EPA's 1×10^{-6} point of departure. Chemicals which contribute to this risk are provided in Table 7-31. As is evident in this Table, nearly 61% of the risk is associated with dermal absorption, inhalation and ingestion of benzene in groundwater. Numerous other chemicals of potential concern exceed the 1×10^{-6} point of departure (see Table 7-31).

Cancer risk estimates for occasional exposure to surface water and sediment is contained in Tables 7-24 and 7-25. Cancer risks due to surface water exposure were estimated to be 1.6×10^{-4}. Dermal contact with PCBs (likely absorbed on sediment) accounts for 7.4% of this risk estimate. The permeability constant for PCBs is based

on PCBs not bound to sediments. Thus, this result likely over-estimates the PCB risk. Benzene, bis(2-chloroethyl)ether, and arsenic also exceed the $1x10^{-6}$ point of departure for surface water exposure. Sediment exposures result in a cancer risk estimate of $2.2x10^{-4}$. In this instance, carcinogenic PAHs and PCBs combined, comprise nearly 100% of the risk estimate (Table 7-25).

Inhalation of VOCs in ambient air emanating from buried wastes at the Site results in a cancer risk estimate of $2.7x10^{-3}$. As is evident in Table 7-32, most of this risk is associated with 1,1-dichloroethene, carbon tetrachloride, and chloroform. Other chemicals of potential concern also exceed the U.S. EPA point of departure (see Table 7-32).

The cancer risk estimates for soils at the various locations on-Site are summarized below and in Tables 7-33 through 7-37.

- On-Site Containment Area
  - The cancer risk estimated for exposure to subsurface soils at the on-Site containment area is $6.8x10^{-3}$ (Table 7-33).
  - 76% of this risk is due to tetrachloroethene, 15% to PCBs, and 5% to benzene. Several other chemicals of potential concern exceed the $1x10^{-6}$ point of departure.
- Still Bottoms/Treatment Lagoon Area
  - Cancer risk estimated for the subsurface soils in this area is $3.8x10^{-2}$ (Table 7-34).
  - The majority of this risk is attributable to PCBs (48%), carbon tetrachloride (24%), bis(2-chloroethyl)ether (11%), bis(2-ethylhexyl)phthalate (6%), and tetrachloroethene (4%).
  - Numerous other chemicals of potential concern exceed the U.S. EPA $1x10^{-6}$ point of departure.
- Off-Site Containment Area
  - Table 7-35 indicates a cancer risk estimate for exposure to subsurface soils in the off-Site containment area of $1.5x10^{-1}$.
  - Chemicals of potential concern that contribute substantially to this risk include PCBs, tetrachloroethene, PAHs, bis(2-ethylhexyl)phthalate, 1,4-dichlorobenzene, 1,1-dichloroethene, and trichloroethene. There are several other chemicals of potential concern besides these that have cancer values exceeding the $1x10^{-6}$ point of departure (see Table 7-35).

- Kapica-Pazmey (Surface Soils - assuming no excavation for residential development)

  - A cancer risk value estimated for exposure to surface soils in the Kapica-Pazmey area is 4.5×10^{-2} (Table 7-36).

  - 85% of this risk is estimated to be the result of PCB exposure from these soils. 12% is from PAH exposure. Other chemicals of potential concern in surface soils from this area resulted in cancer risks exceeding the U.S. EPA point of departure (see Table 7-36).

- Kapica-Pazmey (Subsurface Soils and Surface Soils - Mixed))

  - Exposure to subsurface soils from Kapica-Pazmey results in a cancer risk of 1.8×10^{-2} (Table 7-37).

  - PAHs and PCBs combine for 91% of the risk estimate. Several other organics and inorganics in soils at this location also exceed the 1×10^{-6} point of departure (Table 7-37).

The multiple exposure assessment indicates that cancer risk appears to be greatest for a resident residing at the off-Site containment area (2.9×10^{-1}). A factor of approximately 2.4 separates the cancer risks from the five areas evaluated.

Health hazards (cancer and noncancer) were also evaluated based on the maximally exposed individual. For instance, under the current use scenario, risks were combined for the off-Site child assumed to use upper aquifer water to swim and the risks for off-Site residents using the lower aquifer for domestic purposes. Other multi-population assessments were made with the results contained in Table 7-38. Based on the assumptions applied, the maximally exposed population having the greatest noncancer hazard potential is an off-Site resident having exposure as a child who trespassed on-Site, and had additional off-Site exposures as a child (i.e., using upper aquifer groundwater for play). The greatest cancer risk is also associated with this same population. See Table 7-38 for details.

7.1.5.4 Uncertainties in the Risk Assessment Process

The risk assessment process incorporates numerous assumptions and is therefore associated with a great deal of uncertainty. Thus, calculated risk estimates are not to be construed to necessarily represent actual risks. Proper interpretation of health risk values requires consideration of the uncertainties and assumptions involved in the risk calculations.

It is important to note that there are no apparent risks associated with Site contamination currently. The risk assessment uses hypothetical scenarios and conservative assumptions to quantify potential risks for current and future land uses which do not necessarily reflect actual risks. For instance, a trespasser is assumed to come on the Site and be exposed to contaminants in several media. In reality, the behavior patterns of children (and conditions for Site trespass) near the Site are unknown but Site trespass likely occurs to a far lesser extent than what was assumed for this risk assessment (i.e., the exposure assumptions overestimate Site risks). Similarly, groundwater contamination in the lower aquifer was determined to be limited to the Site, based on Phase III on-Site sampling and private well testing. No contamination was evident based on this analysis. Therefore, there are no apparent exposures associated with use of the lower aquifer and no unacceptable risks. In addition, based on the RI data, contamination in the upper aquifer is confined to the Site or marginally off-Site (southeast corner) within flow paths which return to the Site. Thus, private wells at off-Site locations in both the upper and lower aquifers are not currently impacted, and no exposure (risk) is actually occurring. The risks calculated for the groundwater are based on extremely conservative assumptions, the results of which should be viewed on a relative risk basis, rather than on an actual risk basis.

Assumptions are applied in all steps of the process including Site contaminant characterization, exposure assessment, toxicity assessment, and risk characterization. These assumptions may over- or under-estimate risks. Examples of some key uncertainty factors and assumptions applied in the risk assessment are described below, as well as indications of their biases.

- Assume Site is fully characterized. The presence of areas of contamination not identified may result in an under estimation of Site risks.

- Assume identified chemicals are associated with the majority of Site health risks. The presence of highly toxic compounds not analyzed for or identified compounds for which little toxicity information exists (e.g., tentatively identified compounds) may result in an underestimation of Site risks.

- Evaluating potential current and future risks (e.g., private well users and future residents) without consideration of the likelihood with which these scenarios may occur overestimates actual risks.

- Toxicity values may overestimate risk. Reference doses incorporate conservative uncertainty factors and cancer slope factors estimate upper bound 95th percentile values.

- Risks/doses within an exposure route assumed to be additive. This may result in an over- or underestimation of risk because using this approach does not take into account antogonistic or synergistic effects.

- Critical toxicity values derived primarily from animal studies may over- or underestimate risk. There is a fundamental uncertainty in extrapolating animal toxicity data to humans. Several factors may introduce the uncertainty including differences in species, absorption characteristics, pharmacokinetics, target organs, etc.

- Behavioral patterns cannot be predicted with certainty. The Exposure Assessment Section identifies numerous assumptions that are applied to characterizing populations and their potential for exposure to Site contaminants.

- Models used to predict environmental fate and transport of contaminants may over- or underestimate risk. The air pathway models used have inherent uncertainty in their theoretical ability to accurately predict air concentrations of contaminants.

- Identification of tentatively identified compounds. The associated value is an estimated quantity in which there is presumptive evidence of the presence of the material (tentative identification).

- Other major assumptions used in the risk assessment that would tend to overestimate Site risks include:

  - There are no groundwater use restrictions.

  - There is the potential for future development of the Site.

  - Contaminant concentrations in various media are assumed to remain constant over time (As was noted previously for this assumption, this may result in an over- or underestimation of exposure because using steady-state conditions does not account for substantial future releases of unmitigated source materials (e.g., to groundwater) that may occur over time, nor does it account for source depletion and attenuation of materials through environmental fate and transport processes).

Section 7.2 will be submitted on July 3, 1991.

TABLE 7-1

SUMMARY OF SAMPLE GROUPINGS USED TO ESTIMATE CHEMICAL EXPOSURE POINT CONCENTRATIONS
AMERICAN CHEMICAL SERVICES NPL SITE RI/FS
GRIFFITH, INDIANA

SOIL						GROUNDWATER		
ON-SITE CONTAINMENT AREA	STILL BOTTOMS AND TREATMENT LAGOON	OFF-SITE CONTAINMENT AREA	KAPICA-PAZMEY SURFACE	KAPICA-PAZMEY SUBSURFACE	SEDIMENT	UPPER AQUIFER	LOWER AQUIFER	SURFACE WATER
ACS-SB08-06	ACS-SB14-11	ACS-SB03-12	ACS-SA01-03	ACS-SB01-09	ACS-SD01-01	ACS-GWMW01-01	ACS-GWMW07-01	ACS-SW01-01
ACS-SB08-10	ACS-SB15-13	ACS-SB03-17	ACS-SA02-03	ACS-SB02-05.5	ACS-SD02-01	ACS-GWMW02-01	ACS-GWMW07-02	ACS-SW02-01
ACS-SB09-06	ACS-SB16-06	ACS-SB03-20	ACS-SB01-03	ACS-SB02-07	ACS-SD03-01	ACS-GWMW02-02	ACS-GWMW08-01	ACS-SW05-01
ACS-SB09-10	ACS-SB17-06.5	ACS-SB04-05	ACS-SB31-02	ACS-SB02-08.5	ACS-SD04-01	ACS-GWMW03-01	ACS-GWMW08-02	ACS-SW07A-01
ACS-SB10-05	ACS-SB18-07	ACS-SB04A-19	ACS-SB32-02	ACS-SB43-04.5	ACS-SD05-01	ACS-GWMW03-02	ACS-GWMW09-01	ACS-SW08-01
ACS-SB10-10	ACS-SB20-07	ACS-SB05-14	ACS-SB33-02	ACS-SB44-04.5	ACS-SD06-01	ACS-GWMW04-01	ACS-GWMW09-02	
ACS-SB11-05	ACS-SB21-07	ACS-SB05-17	ACS-SB43-01	ACS-SB45-04.5	ACS-SD07A-01	ACS-GWMW04-02	ACS-GWMW10-01	
ACS-SB11-10	ACS-SB21-12	ACS-SB06-11.5	ACS-SB44-01	ACS-SB46-04.5	ACS-SD07B-01	ACS-GWMW05-01	ACS-GWMW10-02	
ACS-SB12-05	ACS-SB22-12	ACS-SB06-15	ACS-SB45-01	ACS-SB47-04.5	ACS-SD07C-01	ACS-GWMW05-02	ACS-GWMW10C-1	
ACS-SB12-10	ACS-SB23-12	ACS-SB07-14	ACS-SB46-01	ACS-SB48-04.5	ACS-SD08-01	ACS-GWMW06-01		
ACS-SB13-05	ACS-SB69-08	ACS-SB07-19	ACS-SB47-01	ACS-SB49-04.5	ACS-SD09-01	ACS-GWMW06-02		
ACS-SB13-10	ACS-SB69-21.5	ACS-SB24-12	ACS-SB48-01	ACS-SB50-04.5	ACS-SD10-01	ACS-GWMW11-01		
ACS-SB55-07	ACS-SB70-08	ACS-SB24-21	ACS-SB50-01	ACS-SB51-04.5	ACS-SD11-01	ACS-GWMW11-02		
ACS-SB55-16	ACS-SB70-20.5	ACS-SB24R-26	ACS-SB52-01	ACS-SB52-04.5	ACS-SD12-01	ACS-GWMW12-01		
ACS-SB56-07	ACS-SB71-08	ACS-SB25-11	ACS-SB53-01	ACS-SB53-04.5	ACS-SD13-01	ACS-GWMW12-02		
ACS-SB56-16	ACS-SB71-20.5	ACS-SB25-21	ACS-TP01-03.5	ACS-SB54-04.5	ACS-SD14-01	ACS-GWMW13-01		
ACS-SB57-07	ACS-SB72-08	ACS-SB25R-29		ACS-TP01-06	ACS-SD15-01	ACS-GWMW13-02		
ACS-SB57-16	ACS-SB72-20.5	ACS-SB26-11			ACS-SD16-01	ACS-GWMW14-01		
ACS-SB58-07	ACS-SB73-05	ACS-SB26-21				ACS-GWMW14-02		
ACS-SB58-16	ACS-SB73-19	ACS-SB26R-26				ACS-GWMW15-01		
ACS-SB59-07	ACS-SB74-05	ACS-SB27-11				ACS-GWMW15-02		
ACS-SB59-16	ACS-SB74-19	ACS-SB27-21				ACS-GWMW16-01		
ACS-SB60-07	ACS-SB75-15	ACS-SB27RR-24				ACS-GWMW16-02		
ACS-SB60-16	ACS-TP03-09	ACS-SB28-08				ACS-GWMW17-01		
ACS-SB61-07	ACS-TP04-08	ACS-SB29-08						
ACS-SB61-16	ACS-TP05-03	ACS-SB30-10						
ACS-SB62-07	ACS-TP06-04	ACS-SB36-10						
ACS-SB62-16	ACS-TP07-03	ACS-SB36-17						
ACS-SB63-07		ACS-SB36-23.5						
ACS-SB63-15.5		ACS-SB37-10						
ACS-SB64-07		ACS-SB37-17						
ACS-SB64-16		ACS-SB37-23.5						
ACS-SB65-07		ACS-SB38-10						
ACS-SB65-16		ACS-SB38-20						
ACS-SB66-07		ACS-SB38-23.5						
ACS-SB66-16		ACS-SB39-10						
ACS-SB67-07		ACS-SB39-17						
ACS-SB67-16		ACS-SB39-23.5						
ACS-SB68-07		ACS-SB40-10						
ACS-SB68-16		ACS-SB41-05.5						
ACS-TP02-03		ACS-SB41-23.5						
ACS-TP02-05		ACS-SB42-05.5						
ACS-SB35-17		ACS-SB42-20						
		ACS-WS01-01						

This table presents sample identifications for all samples included in each of the source areas identified at the ACS Site. Sample identifications describe the site (ACS), the matrix (soil boring-SB, test pit-TP, sediment-SD, groundwater-GW, and surface water-SW), the sample location number, and the depth for non-aqueous samples or sampling round for aqueous samples.

[ACS.2020]ACS-AREAS.W20

TABLE 7-2
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Ground Water
SOURCE AREA: Upper Aquifer

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Volatiles					24	
Chloromethane	ug/l	68.000	68.000	68.00		1
Vinyl Chloride	ug/l	22.000	720.000	374.00		3
Chloroethane	ug/l	3.000	2000.000	442.71		17
Methylene Chloride	ug/l	1.000	7.000	4.00		2
Acetone	ug/l	84000.000	99000.000	91500.00		2
1,1-Dichloroethane	ug/l	6.000	2400.000	981.25		4
Total 1,2-Dichloroethene	ug/l	1.000	400.000	180.67		6
2-Butanone	ug/l	150000.000	220000.000	185000.00		2
Trichloroethene	ug/l	34.000	45.000	39.50		2
Benzene	ug/l	1.000	100000.000	7265.20		15
4-Methyl-2-Pentanone	ug/l	45000.000	54000.000	49500.00		2
2-Hexanone	ug/l	1200.000	1800.000	1500.00		2
Tetrachloroethene	ug/l	160.000	200.000	180.00		2
Toluene	ug/l	21.000	2300.000	725.25		4
Chlorobenzene	ug/l	2.000	96.000	33.60		5
Ethylbenzene	ug/l	52.000	1100.000	476.00		7
Total Xylenes	ug/l	47.000	3000.000	659.57		7
Semi-Volatiles					24	
Phenol	ug/l	3.000	240.000	34.20		10
bis(2-Chloroethyl)ether	ug/l	4.000	250.000	65.67		9
1,3-Dichlorobenzene	ug/l	3.000	3.000	3.00		1
1,4-Dichlorobenzene	ug/l	3.000	10.000	5.50		4
1,2-Dichlorobenzene	ug/l	4.000	33.000	18.50		6
2-Methylphenol	ug/l	2.000	38.000	14.50		4
bis(2-Chloroisopropyl)ether	ug/l	59.000	300.000	143.20		5
4-Methylphenol	ug/l	5.000	2200.000	468.00		5
Isophorone	ug/l	19.000	35.000	26.33		3
2,4-Dimethylphenol	ug/l	6.000	110.000	41.33		3
Benzoic acid	ug/l	2.000	1900.000	323.00		6
Naphthalene	ug/l	2.000	71.000	32.50		6
4-Chloro-3-methylphenol	ug/l	2.000	2.000	2.00		1
2-Methylnaphthalene	ug/l	9.000	27.000	17.00		3
Diethylphthalate	ug/l	3.000	9.000	6.00		2
Pentachlorophenol	ug/l	2.000	3.000	2.50		2
Di-n-butylphthalate	ug/l	2.000	2.000	2.00		1
bis(2-Ethylhexyl)phthalate	ug/l	2.000	50.000	16.33		6
Pesticides/PCBs					24	
AROCLOR-1248	ug/l	2.600	2.600	2.60		1
AROCLOR-1260	ug/l	27.000	27.000	27.00		1

TABLE 7-2
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Ground Water
SOURCE AREA: Upper Aquifer

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Metals					24	
Aluminum	ug/l	250.000	280.000	265.00		2
Arsenic	ug/l	2.100	43.200	13.59		17
Barium	ug/l	230.000	1840.000	608.75		16
Beryllium	ug/l	0.250	0.250	0.25		1
Cadmium	ug/l	0.240	3.100	0.98		4
Calcium	ug/l	32100.000	1040000.000	176233.33		24
Chromium, Total	ug/l	1.100	3.900	2.43		4
Iron	ug/l	170.000	218000.000	25052.77		22
Lead	ug/l	3.200	4.600	3.90		2
Magnesium	ug/l	7270.000	78800.000	33820.56		18
Manganese	ug/l	281.000	4250.000	2099.00		23
Mercury	ug/l	1.700	1.700	1.70		1
Nickel	ug/l	48.000	53.000	49.67		3
Potassium	ug/l	1480.000	95800.000	13938.75		24
Selenium	ug/l	2.100	6.200	3.47		3
Sodium	ug/l	12700.000	444000.000	145423.81		21
Thallium	ug/l	3.100	4.000	3.55		2
Vanadium	ug/l	2.200	25.900	8.25		8
Zinc	ug/l	10.000	886.000	113.15		20
Cyanide, Total	ug/l	10.000	10.000	10.00		1
Tent. Ident. Compound-SVOC					24	
Unknown	ug/l	6.000	2600.000	249.79		86
Unknown Hydrocarbon	ug/l	36.000	1100.000	418.67		3
Ethylmethylbenzene isomer	ug/l	24.000	130.000	64.00		4
Trimethylbenzene isomer	ug/l	50.000	300.000	172.50		4
Ethyldimethylbenzene isomer	ug/l	32.000	160.000	96.00		2
Undecane, 4,7-dimethyl-	ug/l	120.000	120.000	120.00		1
Benzene, 1,1'-oxybis-	ug/l	24.000	24.000	24.00		1
Benzene, propyl-	ug/l	22.000	22.000	22.00		1
Benzene, 1-ethyl-2-methyl-	ug/l	42.000	88.000	65.00		2
Benzene, 2-ethyl-1,4-dimethyl-	ug/l	6.000	400.000	151.00		4
Unknown Substituted Benzene	ug/l	22.000	110.000	51.00		8
Unknown carboxylic acid	ug/l	22.000	22.000	22.00		1
Tetramethylbenzene isomer	ug/l	120.000	130.000	125.00		2
Benzene, 1,3,5-trimethyl-	ug/l	82.000	280.000	181.00		2
Cyclohexanol, 3,3,5-trimethyl-	ug/l	26.000	2000.000	728.57		7
Hexanoic acid, 2-ethyl-	ug/l	360.000	360.000	360.00		1
Benzene, 1-ethenyl-3-ethyl-	ug/l	18.000	18.000	18.00		1
Hexanoic acid (DOT)	ug/l	740.000	740.000	740.00		1
Dimethylphenol	ug/l	54.000	200.000	127.00		2
Cyclopentanol, 2-methyl-CI...	ug/l	52.000	52.000	52.00		1
Benzene, 1-ethyl-4-methoxy-	ug/l	90.000	90.000	90.00		1
Furan, 2,2'-methylenebis-	ug/l	150.000	150.000	150.00		1
Benzenamine, n,n-diethyl-	ug/l	32.000	32.000	32.00		1

TABLE 7-2
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Ground Water
SOURCE AREA: Upper Aquifer

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Furan, 2,2'-[oxybis(methylene)]bis,-	ug/l	32.000	54.000	42.67		3
Hexanoic acid, anhydride	ug/l	60.000	60.000	60.00		1
1,4-Methanonaphthalene, 1,4-...	ug/l	160.000	160.000	160.00		1
2-Propanol, 1-[2-(2-methoxy-1-methylethoxy)-1-2 -propanol	ug/l	110.000	110.000	110.00		1
Hexanoic acid, 2-methyl-	ug/l	720.000	720.000	720.00		1
2,4-Pentanediol, 2-methyl-	ug/l	72.000	1800.000	936.00		2
2-Propanol, 2-(2-methoxy-1-m...	ug/l	90.000	90.000	90.00		1
Benzeneacetic acid, .alpha.-ethyl-	ug/l	58.000	58.000	58.00		1
Pentanoic acid, 4-methyl-	ug/l	1100.000	1100.000	1100.00		1
Disulfide, diethyl-	ug/l	140.000	720.000	430.00		2
3-Octanone	ug/l	86.000	86.000	86.00		1
Benzene, 1-chloro-3-methyl-	ug/l	120.000	120.000	120.00		1
Cyclohexanemethanol, .alpha.-.alpha.-4-trimethyl-	ug/l	220.000	220.000	220.00		1
Unknown substituted phenol	ug/l	28.000	28.000	28.00		1
Phenol, 3-ethyl-5-methyl-	ug/l	50.000	50.000	50.00		1
Benzoic acid, 3-methyl-	ug/l	38.000	38.000	38.00		1
Ethane, 1,2-bis(2-chloroethoxy)-	ug/l	50.000	78.000	64.00		2
Benzene, ethyl-	ug/l	16.000	16.000	16.00		1
Benzene, 1,3-dimethyl-	ug/l	440.000	440.000	440.00		1
Benzene, 1,2-dimethyl-4-(phenylmethyl)-	ug/l	24.000	24.000	24.00		1
Benzene, (1,1-dimethylpropyl...	ug/l	32.000	32.000	32.00		1
Naphthalene, 1,2,3,4-tetrah...	ug/l	52.000	52.000	52.00		1
1(2H)-Naphthalenone, 3,4-dih...	ug/l	12.000	12.000	12.00		1
2-Cyclohepten-1-one	ug/l	92.000	92.000	92.00		1
Benzene, 1-methyl-4-(methyls...	ug/l	14.000	14.000	14.00		1
Glycine, n-(2-methyl-1-oxo-2...	ug/l	12.000	12.000	12.00		1
Phenol, 3,5-dimethyl-	ug/l	12.000	12.000	12.00		1
1,3-Pentanediol, 2,2,4-trimethyl-	ug/l	40.000	40.000	40.00		1
2,4,6(1H,3H,5H)-Pyrimidinetrione-5-(1-methyl)-	ug/l	10.000	130.000	70.00		2
2-Methylcyclopentanol isomer	ug/l	2000.000	2000.000	2000.00		1
Trimethylphenol isomer	ug/l	62.000	62.000	62.00		1
Methylbenzoic acid isomer	ug/l	44.000	420.000	232.00		2
2-Propanol, 1-(2-methoxy-1-methylethoxy)-2-prop anol	ug/l	140.000	2200.000	1170.00		2
Propanoic acid, 2-(3-chlorophenoxy)-propanoic acid	ug/l	98.000	98.000	98.00		1
Unknown substituted sulfonyl	ug/l	44.000	44.000	44.00		1
Trimethyl benzoic acid	ug/l	12.000	12.000	12.00		1
Caprolactam	ug/l	10.000	10.000	10.00		1
Octane, 2,3-dimethyl-	ug/l	320.000	720.000	520.00		2
Decane, 2,6,7-trimethyl-	ug/l	320.000	380.000	350.00		2
Nonane, 3,7-dimethyl-	ug/l	180.000	180.000	180.00		1

TABLE 7-2
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Ground Water
SOURCE AREA: Upper Aquifer

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Dimethyl undecane	ug/l	170.000	170.000	170.00		1
Methylethylphenol	ug/l	54.000	88.000	71.00		2
Unknown diol	ug/l	82.000	82.000	82.00		1
Chloromethylbenzene	ug/l	68.000	68.000	68.00		1
Disilane, hexaethyl-	ug/l	46.000	46.000	46.00		1
Unknown alcohol	ug/l	24.000	24.000	24.00		1
Methylpropenylbenzene	ug/l	6.000	6.000	6.00		1
Tetrahydronaphthalene	ug/l	66.000	66.000	66.00		1
2-Cyclohexen-1-one, 3,5,5-trimethyl-	ug/l	32.000	32.000	32.00		1
Benzoic acid, 2,4-dimethyl-	ug/l	24.000	24.000	24.00		1
Benzoic acid, 2,4,6-trimethyl-	ug/l	36.000	36.000	36.00		1
Benzoic acid, 4-(1,1-dimethylethyl)-	ug/l	34.000	34.000	34.00		1
Phenobarbital (VAN)	ug/l	8.000	22.000	15.00		2
Ethyltrimethylbenzene + unknown	ug/l	54.000	54.000	54.00		1
Methylnaphthalene	ug/l	74.000	74.000	74.00		1
Dimethylnaphthalene	ug/l	38.000	38.000	38.00		1
Tent. Ident. Compound-VOC					24	
Unknown	ug/l	29.000	140.000	73.50		8
Benzene, 1-ethyl-2-methyl-	ug/l	70.000	70.000	70.00		1
Benzene, propyl-	ug/l	60.000	60.000	60.00		1
Benzene, (1-methylethyl)-	ug/l	60.000	60.000	60.00		1
Cyclohexane, methyl-	ug/l	40.000	40.000	40.00		1
Ethylmethylbenzene isomer	ug/l	35.000	100.000	59.60		5
Trimethylbenzene isomer	ug/l	130.000	640.000	437.50		4
Benzene, 1,3,5-trimethyl-	ug/l	170.000	170.000	170.00		1
Unknown alcohol	ug/l	700.000	1100.000	900.00		2
Ethane, 1,1'oxybis-	ug/l	4.000	1500.000	264.29		7
2-Propanol, 2-methyl-	ug/l	8.000	8.000	8.00		1
Unknown oxygenated alkane	ug/l	450.000	450.000	450.00		1
Dimethylcyclohexane	ug/l	76.000	76.000	76.00		1
Ethenylcyclohexene	ug/l	63.000	63.000	63.00		1
Diethylbenzene	ug/l	78.000	78.000	78.00		1
Butanol	ug/l	40.000	40.000	40.00		1
Propane, 1,1'-oxybis-	ug/l	6.000	6.000	6.00		1
Methylpentanol	ug/l	15.000	15.000	15.00		1
Methylhexanone	ug/l	7.000	7.000	7.00		1
Cyclohexane, 1,3-dimethyl-, trans-	ug/l	45.000	45.000	45.00		1
Disopropyl ether (DOT)	ug/l	8.100	8.100	8.10		1

This table includes all compounds identified above detection limits in the Upper Aquifer Source Area (see table 7-1 for samples included in this area), and is provided as the starting point in the development of a Set of Chemical Data for use in the Risk Assessment, as discussed in Section 7.1.2.1. Refer to appropriate appendices to determine the total parameters analyzed and their associated detection limits. Refer to appendix U for values used in risk calulations. The data values presented contain a maximum of three significant digits for the results of metals analyses and two significant digits for organic chemical analyses: additional digits are due to limitations in the computer program used to prepare these tables, and do not infer an increase in accuracy. The number of tentatively identified compounds designated as unknowns may exceed the total number of samples analyzed because more than one unknown compound may be present in a given sample.

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TABLE 7-3
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Ground Water
SOURCE AREA: Lower Aquifer

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Volatiles					9	
Chloroethane	ug/l	3.000	440.000	214.33		3
4-Methyl-2-Pentanone	ug/l	3.000	3.000	3.00		1
Semi-Volatiles					9	
bis(2-Chloroethyl)ether	ug/l	11.000	12.000	11.50		2
Metals					9	
Arsenic	ug/l	2.100	8.600	4.06		5
Barium	ug/l	220.000	310.000	255.00		4
Calcium	ug/l	59000.000	151000.000	113266.67		6
Iron	ug/l	152.000	3160.000	1043.33		6
Magnesium	ug/l	19300.000	53100.000	35766.67		6
Manganese	ug/l	123.000	866.000	337.33		6
Mercury	ug/l	0.470	0.470	0.47		1
Potassium	ug/l	960.000	3420.000	1923.33		6
Sodium	ug/l	10000.000	96200.000	40700.00		6
Vanadium	ug/l	2.000	2.000	2.00		1
Zinc	ug/l	10.000	22.000	16.00		2
Tent. Ident. Compound-SVOC					9	
Unknown	ug/l	10.000	3300.000	340.59		17
Cyclohexanol, 3,3,5-trimethyl-	ug/l	2500.000	2500.000	2500.00		1
2-Propanol, 1-[2-(2-methoxy-1-methylethoxy)-1-2-propanol	ug/l	1000.000	1000.000	1000.00		1
2,4-Pentanediol, 2-methyl-	ug/l	270.000	270.000	270.00		1
2-Propanol, 1-(2-methoxy-1-methylethoxy)-2-propanol	ug/l	530.000	530.000	530.00		1
Dimethylbenzoic acid	ug/l	400.000	400.000	400.00		1
Dimethylethylbenzoic acid	ug/l	400.000	400.000	400.00		1
Propanoic acid, 2-(3-chlorophenoxy)-propanoic acid	ug/l	170.000	170.000	170.00		1
Tent. Ident. Compound-VOC					9	
Unknown	ug/l	1200.000	1200.000	1200.00		1
Methane, dimethoxy-	ug/l	6.000	6.000	6.00		1

TABLE 7-3
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Ground Water
SOURCE AREA: Lower Aquifer

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Ethane, 1,1'oxybis-	ug/l	36.000	36.000	36.00		1
Propane, 2,2'-oxybis-	ug/l	10.000	10.000	10.00		1
Substituted methylborane	ug/l	11.000	11.000	11.00		1

This table includes all compounds identified above detection limits in the lower Aquifer Source Area (see table 7-1 for samples included in this area), and is provided as the starting point in the development of a Set of Chemical Data for use in the Risk Assessment, as discussed in Section 7.1.2.1. Refer to appropriate appendices to determine the total parameters analyzed and their associated detection limits. Refer to appendix U for values used in risk calulations. The data values presented contain a maximum of three significant digits for the results of metals analyses and two significant digits for organic chemical analyses: additional digits are due to limitations in the computer program used to prepare these tables, and do not infer an increase in accuracy. The number of tentatively identified compounds designated as unknowns may exceed the total number of samples analyzed because more than one unknown compound may be present in a given sample.

TABLE 7-4
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: On-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Volatiles					42	
Chloroethane	ug/kg	1.000	2.000	1.50		2
Acetone	ug/kg	88.000	7400.000	2896.00		3
1,1-Dichloroethane	ug/kg	1.000	250.000	34.00		8
Total 1,2-Dichloroethene	ug/kg	2.000	5200.000	606.63		24
Chloroform	ug/kg	1.000	6400.000	970.29		7
1,2-Dichloroethane	ug/kg	1.000	970.000	485.50		2
2-Butanone	ug/kg	4.000	210.000	101.92		12
1,1,1-Trichloroethane	ug/kg	1.000	20000000.000	884990.00		23
1,2-Dichloropropane	ug/kg	1.000	230.000	41.50		6
Trichloroethene	ug/kg	4.000	40000.000	5305.20		10
1,1,2-Trichloroethane	ug/kg	1.000	140.000	34.80		5
Benzene	ug/kg	1.000	7100000.000	205348.34		35
4-Methyl-2-Pentanone	ug/kg	2.000	650.000	119.38		13
Tetrachloroethene	ug/kg	9.000	5900000.000	430941.59		17
1,1,2,2-Tetrachloroethane	ug/kg	2.000	3900.000	779.00		7
Toluene	ug/kg	4.000	200000000.000	5292643.45		38
Chlorobenzene	ug/kg	2.000	300.000	104.14		7
Ethylbenzene	ug/kg	2.000	6700000.000	193832.14		37
Styrene	ug/kg	1.000	6200.000	3100.50		2
Total Xylenes	ug/kg	6.000	25000000.000	790871.54		37
Semi-Volatiles					14	
Phenol	ug/kg	53.000	780.000	345.33		6
1,3-Dichlorobenzene	ug/kg	110.000	350.000	230.00		2
1,4-Dichlorobenzene	ug/kg	570.000	1200.000	850.00		3
1,2-Dichlorobenzene	ug/kg	110.000	9900.000	3557.50		8
2-Methylphenol	ug/kg	42.000	9200.000	1663.50		6
4-Methylphenol	ug/kg	82.000	17000.000	3082.00		6
Isophorone	ug/kg	3900.000	88000.000	45950.00		2
2,4-Dimethylphenol	ug/kg	76.000	12000.000	2311.50		6
Benzoic acid	ug/kg	49.000	49.000	49.00		1
2,4-Dichlorophenol	ug/kg	89.000	280.000	184.50		2
Naphthalene	ug/kg	370.000	90000.000	19517.78		9
Hexachlorobutadiene	ug/kg	3700.000	3700.000	3700.00		1
2-Methylnaphthalene	ug/kg	150.000	55000.000	18580.00		6
2,4,5-Trichlorophenol	ug/kg	270.000	270.000	270.00		1
Dimethylphthalate	ug/kg	42.000	3500.000	1771.00		2
Acenaphthylene	ug/kg	340.000	5500.000	2086.67		3
Acenaphthene	ug/kg	980.000	11000.000	4493.33		3
Dibenzofuran	ug/kg	570.000	4200.000	2385.00		2
Diethylphthalate	ug/kg	46.000	47.000	46.50		2
Fluorene	ug/kg	1200.000	14000.000	5466.67		3
Pentachlorophenol	ug/kg	160.000	160.000	160.00		1
Phenanthrene	ug/kg	1500.000	20000.000	7966.67		3
Anthracene	ug/kg	94.000	94.000	94.00		1
Di-n-butylphthalate	ug/kg	160.000	36000.000	10990.00		4

TABLE 7-4
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: On-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Fluoranthene	ug/kg	54.000	3800.000	1136.00		4
Pyrene	ug/kg	250.000	5900.000	2216.67		3
Butylbenzylphthalate	ug/kg	740.000	15000.000	5713.33		3
Benzo(a)anthracene	ug/kg	170.000	170.000	170.00		1
Chrysene	ug/kg	84.000	84.000	84.00		1
bis(2-Ethylhexyl)phthalate	ug/kg	39.000	140000.000	13545.77		13
Pesticides/PCBs					31	
Endosulfan 1	ug/kg	11.000	12.000	11.50		2
4,4-DDT	ug/kg	50.000	91.000	70.50		2
AROCLOR-1242	ug/kg	130.000	400000.000	91826.00		5
AROCLOR-1248	ug/kg	600.000	990.000	795.00		2
AROCLOR-1254	ug/kg	230.000	100000.000	16871.43		7
Metals					14	
Aluminum	mg/kg	1450.000	5670.000	3187.86		14
Antimony	mg/kg	5.300	5.300	5.30		1
Arsenic	mg/kg	1.000	21.300	3.70		13
Barium	mg/kg	515.000	515.000	515.00		1
Beryllium	mg/kg	0.080	0.440	0.16		14
Cadmium	mg/kg	0.050	6.000	0.72		10
Calcium	mg/kg	183.000	38300.000	8795.71		14
Chromium, Total	mg/kg	4.600	271.000	32.15		11
Cobalt	mg/kg	22.400	22.400	22.40		1
Copper	mg/kg	6.200	115.000	22.29		8
Iron	mg/kg	1730.000	10300.000	5262.14		14
Lead	mg/kg	2.900	1440.000	112.11		14
Magnesium	mg/kg	473.000	17400.000	4368.79		14
Manganese	mg/kg	17.500	614.000	145.49		14
Mercury	mg/kg	12.400	12.400	12.40		1
Nickel	mg/kg	10.000	12.800	11.80		3
Potassium	mg/kg	264.000	764.000	483.21		14
Selenium	mg/kg	0.450	0.450	0.45		1
Vanadium	mg/kg	3.100	20.600	11.01		14
Zinc	mg/kg	9.000	747.000	71.91		14
Cyanide, Total	mg/kg	8.700	8.700	8.70		1
Percent Solids	%	65.800	89.900	84.04		14
Tent. Ident. Compound-SVOC					14	
Unknown	ug/kg	120.000	1900000.000	96398.48		33
Unknown Hydrocarbon	ug/kg	330.000	79000.000	28138.33		12
Ethylmethylbenzene isomer	ug/kg	670.000	45000.000	16323.33		3
Trimethylbenzene isomer	ug/kg	320.000	240000.000	50856.25		8
Ethyldimethylbenzene isomer	ug/kg	1300.000	36000.000	18650.00		2

TABLE 7-4
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: On-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Undecane, 4,7-dimethyl-	ug/kg	8000.000	740000.000	379333.33		3
Benzene, 1,1'-oxybis-	ug/kg	580.000	260000.000	69263.33		6
Benzene, propyl-	ug/kg	330.000	950.000	640.00		2
Benzene, 1-ethyl-2-methyl-	ug/kg	250.000	210000.000	32077.14		7
Benzene, 1,4-diethyl-	ug/kg	28000.000	28000.000	28000.00		1
Benzene, 2-ethyl-1,4-dimethyl-	ug/kg	82.000	200000.000	24136.57		14
Unknown Substituted Benzene	ug/kg	120.000	1300000.000	251016.25		8
Benzene, 1-ethyl-3-methyl-	ug/kg	520.000	38000.000	10705.00		4
Benzene, 1,2,4-trimethyl-	ug/kg	710.000	390000.000	68680.00		6
Benzene, (1,1-dimethylethyl)-	ug/kg	370.000	370.000	370.00		1
Hexadecanoic acid	ug/kg	220000.000	220000.000	220000.00		1
Benzene, 1,3,5-trimethyl-	ug/kg	240.000	2300.000	926.67		6
Nonane, 2,6-dimethyl-	ug/kg	14000.000	470000.000	242000.00		2
Dimethylphenol	ug/kg	1100.000	1100.000	1100.00		1
Unknown fatty acid	ug/kg	9600.000	9600.000	9600.00		1
Sulfur, mol. (S8)	ug/kg	240.000	16000.000	4217.50		8
Ethyl-phenol isomer	ug/kg	1400.000	1400.000	1400.00		1
Propyl-phenol isomer	ug/kg	3400.000	3400.000	3400.00		1
Phenol, 3,5-diethyl-	ug/kg	1100.000	1100.000	1100.00		1
Methyl-methyl-ethylphenol isomer	ug/kg	870.000	870.000	870.00		1
Benzene, 1-ethyl-4-methoxy-	ug/kg	2100.000	2100.000	2100.00		1
Cyclopentene, 1-ethenyl-3-me...	ug/kg	21000.000	190000.000	100333.33		3
Dimethylbenzene isomer	ug/kg	8300.000	12000.000	10433.33		3
Unknown chlorinated biphenyl	ug/kg	240.000	4000.000	1748.75		8
Trichlorobiphenyl isomer	ug/kg	320.000	7500.000	2655.00		4
Nonane, 4,5-dimethyl-	ug/kg	240.000	870.000	555.00		2
Aroclor 1016	ug/kg	550.000	550.000	550.00		1
1,1'-Biphenyl, tetrachloro-	ug/kg	200.000	200.000	200.00		1
Benzo[B]naphtho[2,3-D]furan	ug/kg	200.000	200.000	200.00		1
Furan, 2,2'-methylenebis-	ug/kg	1400.000	1400.000	1400.00		1
Benzenamine, n,n-diethyl-	ug/kg	540.000	170000.000	35836.00		5
Ethanone, 1-(2-chlorophenyl)-	ug/kg	410.000	410.000	410.00		1
Furan, 2,2'-[oxybis(methylene)]bis,-	ug/kg	1100.000	1100.000	1100.00		1
2(1H)-Quinolinone	ug/kg	620.000	620.000	620.00		1
Benzenesulfonamide, n-butyl-	ug/kg	900.000	900.000	900.00		1
Phenol, 2-[1-(4-hydroxypheny...	ug/kg	370.000	2200.000	1285.00		2
Benzene, 1,1'-methylenebis-	ug/kg	950.000	950.000	950.00		1
Hexanoic acid, anhydride	ug/kg	2100.000	2100.000	2100.00		1
4-Carene, (1S,3S,6R)-(-)-	ug/kg	7700.000	7700.000	7700.00		1
Undecane	ug/kg	17000.000	17000.000	17000.00		1
Decane, 3,6-dimethyl-	ug/kg	8800.000	8800.000	8800.00		1
1,4-Methanonaphthalene, 1,4-...	ug/kg	10000.000	10000.000	10000.00		1
Naphthalene, 1,2-dimethyl-	ug/kg	8400.000	8400.000	8400.00		1
Benzene, (1-methylethyl)-	ug/kg	370.000	370.000	370.00		1
Benzene, 1-ethenyl-2-methyl-	ug/kg	1400.000	1400.000	1400.00		1
Benzaldehyde, 4-propyl-	ug/kg	1100.000	1100.000	1100.00		1
Naphthalene, 1-methyl-	ug/kg	240.000	240.000	240.00		1
Benzene, 1-ethyl-2,3-dimethyl-	ug/kg	160000.000	160000.000	160000.00		1

TABLE 7-4
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: On-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
9-Eicosyne	ug/kg	610000.000	610000.000	610000.00		1
3-Carene	ug/kg	160000.000	660000.000	410000.00		2
Tent. Ident. Compound-VOC					42	
Unknown	ug/kg	4.800	42000.000	10218.40		11
Nonane	ug/kg	5.800	70000.000	19371.87		10
Octane, 2,3-dimethyl-	ug/kg	24000.000	52000.000	38000.00		2
Propylbenzene + Unknown	ug/kg	57.000	180.000	118.50		2
Benzene, 1-ethyl-2-methyl-	ug/kg	4.800	110000.000	48204.96		5
Benzene, 1,2,4-trimethyl-	ug/kg	93000.000	93000.000	93000.00		1
Unknown Hydrocarbon	ug/kg	10.000	1400.000	484.63		8
Methylethylbenzene + Unknown	ug/kg	95.000	8300.000	4197.50		2
Benzene, propyl-	ug/kg	15.000	20000.000	8794.80		5
Benzene, (1-methylethyl)-	ug/kg	11.000	49000.000	24505.50		2
Benzene, 1,2,3-trimethyl-	ug/kg	13.000	26000.000	17503.25		4
Cyclohexane, methyl-	ug/kg	34.000	53000.000	19358.50		4
Trimethylbenzene isomer	ug/kg	1100.000	1200.000	1150.00		2
Decane	ug/kg	3300.000	320000.000	87257.14		7
Substituted Benzene	ug/kg	11.000	240000.000	24502.60		20
Trimethylbenzene + Unknown	ug/kg	12.000	12.000	12.00		1
Nonane, 3-methyl-	ug/kg	35000.000	35000.000	35000.00		1
Cyclohexane, propyl-	ug/kg	8.600	94.000	51.30		2
Cyclohexane, ethyl-	ug/kg	42.000	42.000	42.00		1
Nonane, 4-methyl-	ug/kg	180000.000	180000.000	180000.00		1
Benzene, 1,3,5-trimethyl-	ug/kg	3.600	3.600	3.60		1
2-Pentanol, 4-methyl-	ug/kg	2.300	2.300	2.30		1
Octane	ug/kg	41.000	28000.000	14020.50		2
Heptane, 2,5-dimethyl-	ug/kg	24000.000	24000.000	24000.00		1
Heptane, 2,4-dimethyl-	ug/kg	24000.000	24000.000	24000.00		1
Octane, 3-methyl-	ug/kg	27000.000	27000.000	27000.00		1
Benzene, 1-ethyl-4-methyl-	ug/kg	6.000	6.000	6.00		1
Dichlorobenzene	ug/kg	890.000	3400.000	2145.00		2
Bicyclo[3.1.0]hex-2-ene, 2-me...	ug/kg	55000.000	370000.000	212500.00		2
Hexane, 2,4-dimethyl-	ug/kg	25000.000	25000.000	25000.00		1
Unknown cyclic hydrocarbon	ug/kg	27.000	27.000	27.00		1
Ethylmethylbenzene	ug/kg	8.600	3400.000	447.90		14
Trimethylbenzene	ug/kg	4.900	83000.000	9696.70		17
Unknown ketone	ug/kg	12.000	94.000	53.00		2
Decane + unknown	ug/kg	34.000	38000.000	12695.33		3
Ethylmethylheptane	ug/kg	1600.000	1600.000	1600.00		1
Ethylmethyloctane	ug/kg	1900.000	1900.000	1900.00		1
Methyl(methylethyl) benzene	ug/kg	1400.000	1400.000	1400.00		1
Dimethylundecane	ug/kg	1800.000	1800.000	1800.00		1
Cyclohexane	ug/kg	290.000	290.000	290.00		1
Tetramethylbenzene	ug/kg	11.000	11.000	11.00		1
Unknown bicyclic hydrocarbon	ug/kg	24.000	24.000	24.00		1

TABLE 7-4
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: On-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Hydrocarbon + unknown	ug/kg	89.000	160.000	124.50		2
Unknown substituted cyclonex	ug/kg	62.000	62.000	62.00		1
Dichloropentane	ug/kg	1100.000	1100.000	1100.00		1
Dichloromethylbutane	ug/kg	2200.000	2200.000	2200.00		1
Dimethyloctane	ug/kg	18000.000	18000.000	18000.00		1
Dimethyldecane	ug/kg	8900.000	8900.000	8900.00		1

This table includes all compounds identified above detection limits in the On-Site Containment Area (see table 7-1 for samples included in this area), and is provided as the starting point in the development of a Set of Chemical Data for use in the Risk Assessment, as discussed in Section 7.1.2.1. Refer to appropriate appendices to determine the total parameters analyzed and their associated detection limits. Refer to appendix U for values used in risk calulations. The data values presented contain a maximum of three significant digits for the results of metals analyses and two significant digits for organic chemical analyses: additional digits are due to limitations in the computer program used to prepare these tables, and do not infer an increase in accuracy. The number of tentatively identified compounds designated as unknowns may exceed the total number of samples analyzed because more than one unknown compound may be present in a given sample.

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TABLE 7-5
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Still Bottoms/Treatment Lagoon

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Volatiles					28	
Methylene Chloride	ug/kg	12000.000	260000.000	136000.00		2
Acetone	ug/kg	8100.000	12000.000	10050.00		2
1,1-Dichloroethane	ug/kg	12.000	22000.000	5095.33		6
Total 1,2-Dichloroethene	ug/kg	2.000	120000.000	21870.67		12
Chloroform	ug/kg	2.000	2100000.000	286342.21		19
1,2-Dichloroethane	ug/kg	120.000	40000.000	15780.00		4
2-Butanone	ug/kg	15.000	350000.000	59485.77		13
1,1,1-Trichloroethane	ug/kg	6.000	21000000.000	1093134.14		21
Carbon Tetrachloride	ug/kg	530000.000	3600000.000	2065000.00		2
1,2-Dichloropropane	ug/kg	17.000	22000.000	7363.40		5
Trichloroethene	ug/kg	6.000	1700000.000	183544.80		20
1,1,2-Trichloroethane	ug/kg	2.000	8100.000	2710.33		3
Benzene	ug/kg	9.000	170000.000	38794.00		17
4-Methyl-2-Pentanone	ug/kg	65.000	1500000.000	234670.28		18
Tetrachloroethene	ug/kg	23.000	1600000.000	266225.88		26
Toluene	ug/kg	14.000	23000000.000	1704183.48		27
Chlorobenzene	ug/kg	2.000	2.000	2.00		1
Ethylbenzene	ug/kg	2.000	8400000.000	751032.21		28
Styrene	ug/kg	18000.000	90000.000	54000.00		2
Total Xylenes	ug/kg	41.000	9400000.000	1978405.75		28
Semi-Volatiles					28	
Phenol	ug/kg	110.000	170000.000	20293.18		22
bis(2-Chloroethyl)ether	ug/kg	99.000	110000.000	13728.18		17
2-Chlorophenol	ug/kg	130.000	130.000	130.00		1
1,3-Dichlorobenzene	ug/kg	180.000	880.000	543.33		3
1,4-Dichlorobenzene	ug/kg	98.000	5200.000	2032.57		7
Benzyl alcohol	ug/kg	180.000	1600.000	1060.00		3
1,2-Dichlorobenzene	ug/kg	45.000	53000.000	9170.83		18
2-Methylphenol	ug/kg	120.000	15000.000	1875.56		9
4-Methylphenol	ug/kg	46.000	43000.000	4099.71		17
Isophorone	ug/kg	41.000	2600000.000	313641.24		21
2,4-Dimethylphenol	ug/kg	80.000	2600.000	580.00		10
Benzoic acid	ug/kg	130.000	50000.000	10785.00		8
2,4-Dichlorophenol	ug/kg	41.000	4100.000	1480.33		3
1,2,4-Trichlorobenzene	ug/kg	110.000	4300.000	1882.00		5
Naphthalene	ug/kg	260.000	750000.000	97080.74		27
Hexachlorobutadiene	ug/kg	55.000	40000.000	7678.93		14
4-Chloro-3-methylphenol	ug/kg	420.000	420.000	420.00		1
2-Methylnaphthalene	ug/kg	91.000	320000.000	57668.56		27
2,4,6-Trichlorophenol	ug/kg	750.000	750.000	750.00		1
2,4,5-Trichlorophenol	ug/kg	96.000	96.000	96.00		1
2-Chloronaphthalene	ug/kg	1800.000	1800.000	1800.00		1
Dimethylphthalate	ug/kg	65.000	320000.000	62443.24		17
Acenaphthylene	ug/kg	40.000	3900.000	1970.00		2

TABLE 7-5
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Still Bottoms/Treatment Lagoon

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Acenaphthene	ug/kg	60.000	4800.000	1736.10		10
4-Nitrophenol	ug/kg	1600.000	2300.000	1950.00		2
Dibenzofuran	ug/kg	450.000	660.000	555.00		2
Diethylphthalate	ug/kg	44.000	100000.000	13261.29		24
Fluorene	ug/kg	67.000	9800.000	2692.25		12
N-Nitrosodiphenylamine	ug/kg	13000.000	13000.000	13000.00		1
4-Bromophenyl-phenylether	ug/kg	2200.000	2200.000	2200.00		1
Hexachlorobenzene	ug/kg	250.000	2800.000	982.50		4
Pentachlorophenol	ug/kg	160.000	64000.000	14024.00		15
Phenanthrene	ug/kg	79.000	10000.000	3382.13		16
Anthracene	ug/kg	74.000	3300.000	1491.33		3
Di-n-butylphthalate	ug/kg	51.000	690000.000	87654.68		28
Fluoranthene	ug/kg	66.000	1700.000	769.20		5
Pyrene	ug/kg	79.000	4700.000	1565.80		5
Butylbenzylphthalate	ug/kg	47.000	960000.000	106966.33		27
Benzo(a)anthracene	ug/kg	460.000	460.000	460.00		2
Chrysene	ug/kg	260.000	460.000	360.00		2
bis(2-Ethylhexyl)phthalate	ug/kg	140.000	2600000.000	374932.14		28
Di-n-octylphthalate	ug/kg	77.000	24000.000	5474.53		15
Benzo(b)fluoranthene	ug/kg	390.000	460.000	425.00		2
Benzo(k)fluoranthene	ug/kg	390.000	460.000	425.00		2
Benzo(a)pyrene	ug/kg	260.000	260.000	260.00		1
Pesticides/PCBs					23	
Gamma-BHC (Lindane)	ug/kg	1100.000	1100.000	1100.00		1
Endosulfan 1	ug/kg	1200.000	1200.000	1200.00		1
4,4-DDT	ug/kg	4700.000	12000.000	8350.00		2
Endrin Ketone	ug/kg	260.000	260.000	260.00		1
AROCLOR-1248	ug/kg	52000.000	76000.000	64000.00		2
AROCLOR-1254	ug/kg	28000.000	47000.000	37500.00		2
AROCLOR-1260	ug/kg	330.000	35000.000	15726.00		5
Metals					11	
Aluminum	mg/kg	490.000	7890.000	3559.09		11
Antimony	mg/kg	10.900	46.600	28.75		2
Arsenic	mg/kg	0.950	5.700	2.35		10
Barium	mg/kg	81.600	1560.000	466.08		5
Beryllium	mg/kg	0.100	0.890	0.25		10
Cadmium	mg/kg	0.120	118.000	14.73		11
Calcium	mg/kg	181.000	57100.000	11242.55		11
Chromium, Total	mg/kg	8.700	1410.000	195.72		11
Cobalt	mg/kg	41.700	41.700	41.70		1
Copper	mg/kg	6.500	361.000	72.65		11
Iron	mg/kg	482.000	6610.000	3928.36		11
Lead	mg/kg	21.900	6300.000	842.54		11

TABLE 7-5
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Still Bottoms/Treatment Lagoon

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Magnesium	mg/kg	101.000	10300.000	3419.82		11
Manganese	mg/kg	4.300	1030.000	203.30		11
Mercury	mg/kg	0.060	11.000	2.02		10
Nickel	mg/kg	12.200	19.600	16.73		3
Potassium	mg/kg	181.000	767.000	354.55		11
Selenium	mg/kg	0.460	2.830	1.42		4
Sodium	mg/kg	498.000	1260.000	757.67		3
Vanadium	mg/kg	1.200	12.100	7.43		11
Zinc	mg/kg	5.300	2280.000	359.86		11
Cyanide, Total	mg/kg	5.000	70.700	26.90		3
Percent Solids	%	63.200	90.600	80.81		11
Tent. Ident. Compound-SVOC					28	
Unknown	ug/kg	230.000	5500000.000	237468.23		198
Unknown Hydrocarbon	ug/kg	290.000	1300000.000	150781.48		61
Ethylmethylbenzene isomer	ug/kg	17000.000	1600000.000	602428.57		7
Methylbenzene + Unknown	ug/kg	11000.000	11000.000	11000.00		1
Trimethylbenzene + Unknown	ug/kg	29000.000	1800000.000	914500.00		2
Trimethylbenzene isomer	ug/kg	11000.000	1100000.000	553210.53		19
Methylpropylbenzene isomer	ug/kg	19000.000	560000.000	262833.33		6
Ethyldimethylbenzene isomer	ug/kg	9100.000	1100000.000	458131.25		16
Undecane, 4,7-dimethyl-	ug/kg	520.000	520000.000	103613.33		9
Ethyldimethylbenzene + Unknown	ug/kg	6000.000	11000.000	8500.00		2
Ethanol, 2-(2-butoxyethoxy)-...	ug/kg	17000.000	17000.000	17000.00		1
Benzene, 1,1'-oxybis-	ug/kg	280.000	100000.000	25736.00		5
Benzene, propyl-	ug/kg	490.000	280000.000	94622.50		4
Benzene, 1-ethyl-2-methyl-	ug/kg	35000.000	520000.000	258750.00		4
Benzene, 1-methyl-2-propyl-	ug/kg	440000.000	440000.000	440000.00		1
Benzene, 1,4-diethyl-	ug/kg	190000.000	510000.000	350000.00		2
Benzene, 2-ethyl-1,4-dimethyl-	ug/kg	22000.000	1900000.000	410923.08		13
Unknown + Nitrobenzene	ug/kg	900000.000	900000.000	900000.00		1
Unknown + TCL	ug/kg	1100000.000	1100000.000	1100000.00		1
Unknown Substituted Benzene	ug/kg	47000.000	1100000.000	402666.67		6
Benzene, 1-ethyl-3-methyl-	ug/kg	44000.000	1900000.000	426625.00		8
Benzene, 1,2,4-trimethyl-	ug/kg	49000.000	49000.000	49000.00		1
Benzene, (1,1-dimethylethyl)-	ug/kg	46000.000	47000.000	46500.00		2
Benzene, 2-ethyl-1,3-dimethyl-	ug/kg	42000.000	42000.000	42000.00		1
Benzene, methyl(1-methylethyl-)	ug/kg	28000.000	28000.000	28000.00		1
Unknown Alkene	ug/kg	3300000.000	3300000.000	3300000.00		1
3-Octadecene, (E)-	ug/kg	2600000.000	2600000.000	2600000.00		1
Hexadecanoic acid	ug/kg	310000.000	310000.000	310000.00		1
5-Eicosene, (E)-	ug/kg	1400000.000	1400000.000	1400000.00		1
Unknown carboxylic acid	ug/kg	43000.000	480000.000	331000.00		3
Methylpropylbenzene + Unknown	ug/kg	140000.000	1100000.000	620000.00		2
Tetramethylbenzene isomer	ug/kg	290000.000	960000.000	625000.00		2
Tetramethylbenzene + TCL	ug/kg	390000.000	1100000.000	745000.00		2
Decane	ug/kg	450.000	410000.000	216362.50		4

TABLE 7-5
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Still Bottoms/Treatment Lagoon

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Benzene, 1,3,5-trimethyl-	ug/kg	150000.000	150000.000	150000.00		1
Nonane, 2,5-dimethyl-	ug/kg	300000.000	300000.000	300000.00		1
Benzene, 1,2,3,5-tetramethyl-	ug/kg	1400.000	280000.000	140700.00		2
Tetradecane	ug/kg	670.000	140000.000	32115.71		7
Hexadecane	ug/kg	19000.000	85000.000	52000.00		2
Heptadecane, 2,6-dimethyl-	ug/kg	480.000	130000.000	68160.00		3
Dodecanoic acid	ug/kg	30000.000	30000.000	30000.00		1
Tetradecanoic acid	ug/kg	23000.000	23000.000	23000.00		1
Pentacosane	ug/kg	140000.000	140000.000	140000.00		1
Cyclohexanol, 3,3,5-trimethyl-	ug/kg	4800.000	11000.000	8500.00		3
Hexanoic acid, 2-ethyl-	ug/kg	400.000	890.000	645.00		2
Azulene, 1,2,3,3A-tetrahydro-	ug/kg	150000.000	1200000.000	675000.00		2
Diethylbenzeamine + Unknown	ug/kg	12000.000	12000.000	12000.00		1
Hexanoic acid (DOT)	ug/kg	810.000	930.000	870.00		2
Dimethylphenol	ug/kg	570.000	720.000	645.00		2
Benzene, 1,4-dimethyl-2-nitro-	ug/kg	1700.000	1700.000	1700.00		1
Sulfur, mol. (S8)	ug/kg	1600.000	7700.000	4533.33		3
Phthalic anhydride	ug/kg	4400.000	58000.000	31200.00		2
Benzenamine, n,n-diethyl-	ug/kg	890.000	140000.000	20486.25		8
Furan, 2,2'-[oxybis(methylene)]bis,-	ug/kg	440.000	440.000	440.00		1
1H-Idene, 1-ethylidene-	ug/kg	42000.000	42000.000	42000.00		1
Benzene, (1-methylethyl)-	ug/kg	180000.000	180000.000	180000.00		1
Benzene, 1,3-diethyl-4-methy...	ug/kg	870.000	870.000	870.00		1
Hydroxylamine, o-decyl-	ug/kg	590.000	140000.000	47230.00		3
Iron, tricarbonyl[n-(phenyl-...	ug/kg	140000.000	140000.000	140000.00		1
Undecane, 2-methyl-	ug/kg	100000.000	100000.000	100000.00		1
Ethanol, 2-butoxy-*	ug/kg	280000.000	280000.000	280000.00		1
Phosphoric acid, triethyles...	ug/kg	37000.000	150000.000	93500.00		2
Octanoic acid	ug/kg	370.000	4800.000	2585.00		2
2,4-Pentanediol, 2-methyl-	ug/kg	3000.000	3000.000	3000.00		1
Unknown PNA	ug/kg	13000.000	13000.000	13000.00		1
3-Octanone	ug/kg	320.000	770.000	545.00		2
Cyclohexanemethanol, .alpha.-.alpha.-4-trimethyl-	ug/kg	640.000	880.000	760.00		2
Benzene, 1,2-dimethyl-4-(phenylmethyl)-	ug/kg	31000.000	31000.000	31000.00		1
Decane, 2-Cyclohexyl-, 2-cycl...	ug/kg	140000.000	140000.000	140000.00		1
Decane, 2,6,7-trimethyl-	ug/kg	62000.000	62000.000	62000.00		1
Dimethyl undecane	ug/kg	520.000	31000.000	10986.00		5
Cyclohexanone, 3,3,5-trimethyl-	ug/kg	13000.000	65000.000	39000.00		2
Dimethyl heptadecane	ug/kg	310.000	860.000	505.00		4
Dimethyl cyclooctane	ug/kg	110000.000	110000.000	110000.00		1
VOA TCL	ug/kg	13000.000	79000.000	41666.67		3
Ethylmethylbenzene	ug/kg	120.000	360000.000	55188.95		19
Trimethylbenzene	ug/kg	320.000	100000.000	17576.36		22
Trimethylcyclohexanone	ug/kg	23000.000	23000.000	23000.00		1
Trimethylcyclohexanol	ug/kg	15000.000	15000.000	15000.00		1
Methyl(methylethyl)benzene	ug/kg	4100.000	4100.000	4100.00		1

TABLE 7-5
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Still Bottoms/Treatment Lagoon

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Ethyldimethylbenzene	ug/kg	380.000	370000.000	76224.00		10
Tetramethylbenzene	ug/kg	17000.000	47000.000	32000.00		2
Dihydromethylindene	ug/kg	8700.000	8700.000	8700.00		1
Unknown octadecenoic acid	ug/kg	13000.000	13000.000	13000.00		1
Diethylbenzene	ug/kg	91000.000	91000.000	91000.00		1
Ethyltrimethylbenzene + unknown	ug/kg	17000.000	17000.000	17000.00		1
Dimethyldodecane	ug/kg	12000.000	12000.000	12000.00		1
Methylnaphthalene	ug/kg	2000.000	13000.000	7500.00		2
Dimethylnaphthalene + unknown	ug/kg	19000.000	19000.000	19000.00		1
Tetramethylpentadecane	ug/kg	13000.000	13000.000	13000.00		1
Dimethylnaphthalene	ug/kg	1700.000	57000.000	29350.00		2
Benzene, (1,3,3-trimethylnonyl)-	ug/kg	67000.000	67000.000	67000.00		1
Benzene, 1-ethyl-2,4,5-trimethyl-	ug/kg	46000.000	46000.000	46000.00		1
Unknown benzene	ug/kg	6400.000	37000.000	22800.00		3
Unknown aromatic	ug/kg	73000.000	73000.000	73000.00		1
Methylethylbenzene	ug/kg	450.000	1400.000	925.00		2
Isoquinoline	ug/kg	620.000	780.000	700.00		2
Unknown alkyl cyclohexane	ug/kg	150000.000	150000.000	150000.00		1
Tridecane, 4,8-dimethyl-	ug/kg	35000.000	35000.000	35000.00		1
3-Pentanone, 2,2,4,4-tetram..	ug/kg	610.000	610.000	610.00		1
Cyclooctane, 2,4-dimethyl-	ug/kg	2500.000	2500.000	2500.00		1
1-Octanol, 2-butyl-	ug/kg	55000.000	55000.000	55000.00		1
Unknown oxygenated alkane	ug/kg	43000.000	43000.000	43000.00		1
Acetamide, n-ethyl-n-phenyl-	ug/kg	340.000	340.000	340.00		1
Benzenamine, n-ethyl-	ug/kg	280.000	280.000	280.00		1
Tetramethylpentanone + unknown	ug/kg	1600.000	1600.000	1600.00		1
Tetramethylbenzene + unknown	ug/kg	530.000	530.000	530.00		1
Tent. Ident. Compound-VOC					28	
Unknown	ug/kg	2600.000	1900000.000	306390.91		11
Aceticacid, butylester	ug/kg	600.000	600.000	600.00		1
Nonane	ug/kg	7900.000	200000.000	92714.29		7
Benzene, 1-ethyl-3-methyl-	ug/kg	140000.000	140000.000	140000.00		1
Octane, 2,3-dimethyl-	ug/kg	220000.000	220000.000	220000.00		1
Propylbenzene + Unknown	ug/kg	52000.000	59000.000	55500.00		2
Benzene, 1-ethyl-2-methyl-	ug/kg	130000.000	1700000.000	632500.00		4
Benzene, 1,2,4-trimethyl-	ug/kg	150000.000	1200000.000	546666.67		3
Unknown Hydrocarbon	ug/kg	390.000	1100000.000	227439.00		10
Methylethylbenzene + Unknown	ug/kg	27000.000	120000.000	73500.00		4
Heptane, 2,3,6-trimethyl-	ug/kg	230000.000	230000.000	230000.00		1
Benzene, propyl-	ug/kg	65.000	380000.000	88083.13		8
Nonane, 2,6-dimethyl-	ug/kg	250000.000	250000.000	250000.00		1
Benzene, (1-methylethyl)-	ug/kg	24000.000	480000.000	244666.67		3
Benzene, 1,2,3-trimethyl-	ug/kg	470000.000	470000.000	470000.00		1
Decane, 4-methyl-	ug/kg	120000.000	120000.000	120000.00		1
Cyclohexane, methyl-	ug/kg	58000000.000	58000000.000	58000000.000		1
Decane	ug/kg	710000.000	3200000.000	1573333.33		3

TABLE 7-5
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Still Bottoms/Treatment Lagoon

		CHEMICAL CONCENTRATION			NUMBER SAMPLES ANALYZED	
CHEMICAL	UNITS	MINIMUM	MAXIMUM	ARITHMETIC MEAN	TOTAL	DETECTED
Hexane, 3-methyl-	ug/kg	4100000.000	4100000.000	4100000.00		1
Substituted Benzene	ug/kg	790.000	420000.000	91846.25		8
Cyclohexane, ethyl-	ug/kg	100000.000	100000.000	100000.00		1
Benzene, 1,3,5-trimethyl-	ug/kg	14000.000	14000.000	14000.00		1
Octane	ug/kg	130000.000	4100000.000	2115000.00		2
Furan, tetrahydro-	ug/kg	54.000	54.000	54.00		1
Heptane, 3-methyl-	ug/kg	5900000.000	5900000.000	5900000.00		1
Benzene, (nitromethyl)-	ug/kg	250000.000	250000.000	250000.00		1
Hexane, 2-methyl-	ug/kg	3700000.000	3700000.000	3700000.00		1
Heptane	ug/kg	23000000.000	23000000.000	23000000.000		1
Cyclopentane, 1,2,4-trimethyl-	ug/kg	3300000.000	3300000.000	3300000.00		1
Cyclopentane, 1,2,3-trimethyl-	ug/kg	3200000.000	3200000.000	3200000.00		1
Hexane, 2,5-dimethyl-	ug/kg	4600000.000	4600000.000	4600000.00		1
Ethane, 1,1-dichloro-1-nitro-	ug/kg	17000.000	17000.000	17000.00		1
Methane, dichlorofluoro-	ug/kg	4800000.000	4800000.000	4800000.00		1
Nonane, 2-methyl-	ug/kg	130000.000	130000.000	130000.00		1
Methane, trichlorofluoro-	ug/kg	4200000.000	4200000.000	4200000.00		1
2-Hexanone, 5-methyl-	ug/kg	240.000	240.000	240.00		1
Ethylmethylbenzene	ug/kg	75.000	880000.000	238065.36		14
Trimethylbenzene	ug/kg	60.000	1700000.000	390309.33		15
Unknown ketone	ug/kg	7.400	7.400	7.40		1
Decane + unknown	ug/kg	1200.000	1100000.000	350700.00		6
Tetramethylbenzene	ug/kg	220000.000	1300000.000	760000.00		2
Ketone	ug/kg	57.000	230.000	143.50		2
Hydrocarbon + unknown	ug/kg	130000.000	130000.000	130000.00		1
Unknown substituted benzene	ug/kg	690000.000	690000.000	690000.00		2
Tetramethylpentanone	ug/kg	56.000	56.000	56.00		1
Unknown hydrocarbon C10H22	ug/kg	270000.000	270000.000	270000.00		1
Ethylmethylheptane + unknown	ug/kg	330000.000	330000.000	330000.00		1
Methylnonane	ug/kg	7900.000	7900.000	7900.00		1
Undecane + unknown	ug/kg	510000.000	510000.000	510000.00		1
Ethyldimethylbenzene	ug/kg	120000.000	760000.000	440000.00		2
Trimethyloctane	ug/kg	4300.000	4300.000	4300.00		1
Ethane, 1,1,2-trichloro-1,2,2-trichloro-tri fluoroethane	ug/kg	670000.000	670000.000	670000.00		1
Methylphenylethanone	ug/kg	160000.000	160000.000	160000.00		1

This table includes all compounds identified above detection limits in the Stillbottoms/Treatment Lagoon Area (see table 7-1 for samples included in this area), and is provided as the starting point in the development of a Set of Chemical Data for use in the Risk Assessment, as discussed in Section 7.1.2.1. Refer to appropriate appendices to determine the total parameters analyzed and their associated detection limits. Refer to appendix U for values used in risk calulations. The data values presented contain a maximum of three significant digits for the results of metals analyses and two significant digits for organic chemical analyses: additional digits are due to limitations in the computer program used to prepare these tables, and do not infer an increase in accuracy. The number of tentatively identified compounds designated as unknowns may exceed the total number of samples analyzed because more than one unknown compound may be present in a given sample.

TABLE 7-6
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Off-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Volatiles					44	
Vinyl Chloride	ug/kg	2900.000	2900.000	2900.00		1
Chloroethane	ug/kg	8.000	2000.000	949.33		3
Methylene Chloride	ug/kg	120.000	210000.000	31462.22		9
Acetone	ug/kg	18.000	34000000.000	1549406.00		23
1,1-Dichloroethene	ug/kg	3.000	390000.000	117348.25		4
1,1-Dichloroethane	ug/kg	2.000	490000.000	56253.28		18
Total 1,2-Dichloroethene	ug/kg	2.000	34000.000	5551.64		14
Chloroform	ug/kg	2.000	2800000.000	222572.21		19
1,2-Dichloroethane	ug/kg	19.000	440000.000	34581.56		16
2-Butanone	ug/kg	9.000	99000000.000	3760304.09		35
1,1,1-Trichloroethane	ug/kg	6.000	150000000.000	5679486.07		29
1,2-Dichloropropane	ug/kg	1.000	23000.000	3037.36		11
Trichloroethene	ug/kg	3.000	19000000.000	926650.18		33
1,1,2-Trichloroethane	ug/kg	630.000	400000.000	94626.00		5
Benzene	ug/kg	5.000	1500000.000	97320.92		36
4-Methyl-2-Pentanone	ug/kg	1400.000	61000000.000	2535958.62		29
2-Hexanone	ug/kg	11.000	47000.000	12348.71		7
Tetrachloroethene	ug/kg	4.000	46000000.000	2161008.94		35
1,1,2,2-Tetrachloroethane	ug/kg	17.000	17.000	17.00		1
Toluene	ug/kg	5.000	130000000.000	3957498.77		44
Chlorobenzene	ug/kg	3.000	1000000.000	176792.17		6
Ethylbenzene	ug/kg	2.000	23000000.000	942758.29		41
Styrene	ug/kg	30.000	310000.000	86604.29		7
Total Xylenes	ug/kg	2.000	100000000.000	3734752.63		43
Semi-Volatiles					35	
Phenol	ug/kg	85.000	860000.000	84403.00		25
bis(2-Chloroethyl)ether	ug/kg	150.000	200000.000	48040.67		15
1,4-Dichlorobenzene	ug/kg	46.000	11000.000	3146.27		11
Benzyl alcohol	ug/kg	89.000	34000.000	4163.90		10
1,2-Dichlorobenzene	ug/kg	80.000	120000.000	18266.47		19
2-Methylphenol	ug/kg	420.000	90000.000	15494.58		24
4-Methylphenol	ug/kg	150.000	210000.000	33741.07		28
Isophorone	ug/kg	98.000	3600000.000	443152.07		28
2,4-Dimethylphenol	ug/kg	250.000	220000.000	26390.40		25
Benzoic acid	ug/kg	230.000	32000000.000	2293735.33		15
2,4-Dichlorophenol	ug/kg	57.000	200.000	107.33		3
1,2,4-Trichlorobenzene	ug/kg	54.000	79000.000	13469.33		9
Naphthalene	ug/kg	230.000	2400000.000	282228.00		30
Hexachlorobutadiene	ug/kg	190.000	150000.000	33025.00		8
2-Methylnaphthalene	ug/kg	43.000	990000.000	147837.00		29
Dimethylphthalate	ug/kg	120.000	710000.000	68395.65		23
Acenaphthylene	ug/kg	57.000	11000.000	3694.25		4
2,6-Dinitrotoluene	ug/kg	3500.000	3500.000	3500.00		1

TABLE 7-6
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Off-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Acenaphthene	ug/kg	68.000	18000.000	5258.36		14
4-Nitrophenol	ug/kg	10000.000	10000.000	10000.00		1
Dibenzofuran	ug/kg	59.000	11000.000	3241.73		11
Diethylphthalate	ug/kg	60.000	280000.000	24047.17		24
Fluorene	ug/kg	58.000	28000.000	7737.80		15
N-Nitrosodiphenylamine	ug/kg	180.000	53000.000	11060.00		8
Hexachlorobenzene	ug/kg	930.000	11000.000	5965.00		2
Pentachlorophenol	ug/kg	180.000	180000.000	44296.00		10
Phenanthrene	ug/kg	39.000	43000.000	8514.70		20
Anthracene	ug/kg	230.000	1300.000	910.00		3
Di-n-butylphthalate	ug/kg	54.000	3400000.000	327294.50		30
Fluoranthene	ug/kg	220.000	19000.000	4418.33		12
Pyrene	ug/kg	330.000	22000.000	6426.00		10
Butylbenzylphthalate	ug/kg	72.000	1600000.000	185039.24		29
Benzo(a)anthracene	ug/kg	360.000	14000.000	3738.33		6
Chrysene	ug/kg	400.000	20000.000	5316.67		6
bis(2-Ethylhexyl)phthalate	ug/kg	180.000	14000000.000	1525888.93		28
Di-n-octylphthalate	ug/kg	72.000	140000.000	15918.20		15
Benzo(b)fluoranthene	ug/kg	220.000	15000.000	4816.00		5
Benzo(k)fluoranthene	ug/kg	220.000	15000.000	4816.00		5
Benzo(a)pyrene	ug/kg	380.000	9700.000	3245.00		4
Indeno(1,2,3-cd)pyrene	ug/kg	420.000	1400.000	790.00		3
Dibenz(a,h)anthracene	ug/kg	70.000	190.000	130.00		2
Benzo(g,h,i)perylene	ug/kg	230.000	1500.000	766.67		3
Pesticides/PCBs					44	
Alpha-BHC	ug/kg	330.000	330.000	330.00		1
Beta-BHC	ug/kg	800.000	800.000	800.00		1
Aldrin	ug/kg	13.000	7700.000	3856.50		2
Heptachlor Epoxide	ug/kg	13.000	13.000	13.00		1
4,4-DDE	ug/kg	880.000	880.000	880.00		1
4,4-DDD	ug/kg	3300.000	3300.000	3300.00		1
4,4-DDT	ug/kg	1700.000	1700.000	1700.00		1
AROCLOR-1242	ug/kg	96.000	190000.000	66265.33		3
AROCLOR-1248	ug/kg	16000.000	35000.000	23666.67		3
AROCLOR-1254	ug/kg	210.000	650000.000	62715.33		15
AROCLOR-1260	ug/kg	200.000	560000.000	81630.83		12
Metals					19	
Aluminum	mg/kg	137.000	18000.000	4453.00		19
Antimony	mg/kg	3.700	152.000	46.24		5
Arsenic	mg/kg	1.100	9.100	3.33		17
Barium	mg/kg	67.400	6400.000	1461.68		5
Beryllium	mg/kg	0.060	0.800	0.21		16
Cadmium	mg/kg	0.060	1700.000	102.19		18
Calcium	mg/kg	413.000	50500.000	19413.94		17

TABLE 7-6
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Off-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Chromium, Total	mg/kg	6.600	3750.000	253.42		18
Cobalt	mg/kg	14.600	69.100	29.62		5
Copper	mg/kg	5.600	5790.000	415.01		18
Iron	mg/kg	2670.000	27400.000	8202.11		19
Lead	mg/kg	2.300	17200.000	1066.82		19
Magnesium	mg/kg	394.000	18800.000	8300.31		13
Manganese	mg/kg	13.400	441.000	136.50		19
Mercury	mg/kg	0.120	36.000	5.15		8
Nickel	mg/kg	10.900	72.600	34.33		8
Potassium	mg/kg	34.900	8100.000	1081.63		19
Selenium	mg/kg	1.200	157.000	33.56		5
Silver	mg/kg	312.000	312.000	312.00		1
Sodium	mg/kg	232.000	2410.000	704.80		5
Thallium	mg/kg	0.720	1.500	1.07		3
Vanadium	mg/kg	4.500	24.300	11.42		17
Zinc	mg/kg	7.800	4700.000	458.22		19
Cyanide, Total	mg/kg	7.100	31.300	14.28		4
Percent Solids	%	46.400	91.000	78.35		19
Tent. Ident. Compound-SVOC					35	
Unknown	ug/kg	120.000	100000000.000	1118379.22		281
Unknown Hydrocarbon	ug/kg	270.000	1100000.000	88402.88		66
Ethylmethylbenzene isomer	ug/kg	70000.000	84000.000	77000.00		2
Trimethylbenzene + Unknown	ug/kg	220000.000	220000.000	220000.00		1
Trimethylbenzene isomer	ug/kg	86000.000	1900000.000	775750.00		8
Ethyldimethylbenzene isomer	ug/kg	65000.000	1300000.000	749166.67		6
Undecane, 4,7-dimethyl-	ug/kg	1200.000	1100000.000	279890.91		11
Ethyldimethylbenzene + Unknown	ug/kg	830000.000	830000.000	830000.00		1
Ethanol, 2-(2-butoxyethoxy)-...	ug/kg	3800.000	3800.000	3800.00		1
Methanol, dibutoxy-	ug/kg	2400000.000	2400000.000	2400000.00		1
Benzene, 1,1'-oxybis-	ug/kg	2800.000	3500000.000	454366.67		12
Benzene, propyl-	ug/kg	380000.000	520000.000	450000.00		2
Benzene, 1-ethyl-2-methyl-	ug/kg	2800.000	1600000.000	627600.00		3
Benzene, 1,4-diethyl-	ug/kg	750000.000	750000.000	750000.00		1
Benzene, 2-ethyl-1,4-dimethyl-	ug/kg	1700.000	650000.000	233375.00		4
Unknown Substituted Benzene	ug/kg	580.000	780000.000	390290.00		2
Benzene, 1-ethyl-3-methyl-	ug/kg	5700.000	1900000.000	781900.00		3
Benzene, 1,2,4-trimethyl-	ug/kg	1100.000	620000.000	310550.00		2
Benzene, 2-ethyl-1,3-dimethyl-	ug/kg	1700.000	1700.000	1700.00		1
Benzene, methyl(1-methylethyl-)	ug/kg	330000.000	330000.000	330000.00		1
Hexadecanoic acid	ug/kg	2800000.000	2800000.000	2800000.00		1
Unknown carboxylic acid	ug/kg	500.000	1600.000	1050.00		2
Tetramethylbenzene isomer	ug/kg	280000.000	280000.000	280000.00		1
Decane	ug/kg	89000.000	440000.000	224750.00		4
Benzene, 1,3,5-trimethyl-	ug/kg	2900.000	1300000.000	375280.00		5
Nonane, 2,5-dimethyl-	ug/kg	91000.000	1600000.000	672750.00		4

TABLE 7-6
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Off-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Tetradecane	ug/kg	20000.000	78000.000	45333.33		3
Hexadecane	ug/kg	82000.000	82000.000	82000.00		1
Heptadecane, 2,6-dimethyl-	ug/kg	280.000	42000.000	10750.00		4
Heptadecane	ug/kg	16000.000	16000.000	16000.00		1
Docosane	ug/kg	3900.000	3900.000	3900.00		1
Cyclohexanol, 3,3,5-trimethyl-	ug/kg	9500.000	13000.000	10875.00		4
Nonane, 2,6-dimethyl-	ug/kg	82000.000	2300000.000	808000.00		4
Benzene, 1-methyl-3-propyl-	ug/kg	360000.000	700000.000	530000.00		2
Azulene, 1,2,3,3A-tetrahydro-	ug/kg	470000.000	470000.000	470000.00		1
Diethylbenzeamine + Unknown	ug/kg	990000.000	990000.000	990000.00		1
Hexanoic acid (DOT)	ug/kg	1100.000	3700.000	2200.00		3
Dimethylphenol + Unknown	ug/kg	1100.000	1100.000	1100.00		1
Dimethylphenol	ug/kg	280.000	54000.000	9075.71		14
Benzene, 1,4-dimethyl-2-nitro-	ug/kg	5300.000	5300.000	5300.00		1
Unknown chlorinated compound	ug/kg	13000.000	98000.000	55500.00		2
Unknown fatty acid	ug/kg	2600000.000	2600000.000	2600000.00		1
2-Butenedioic acid (E)-dim...	ug/kg	15000000.000	15000000.000	15000000.000		1
Butanedioicacid, dimethyle...	ug/kg	4700000.000	4700000.000	4700000.00		1
Butanedioicacid, monomethyl..	ug/kg	63000000.000	63000000.000	63000000.000		1
1,3-Propanediol, 2,2-dimethyl-	ug/kg	2600000.000	2600000.000	2600000.00		1
Hexanedioic acid, ethylmethlester-	ug/kg	1600000.000	1600000.000	1600000.00		1
Hexanedioic acid, dibutylester	ug/kg	7100000.000	7100000.000	7100000.00		1
Hexanedioic acid, bis(2-methylpropyl) ester-	ug/kg	9600000.000	9600000.000	9600000.00		1
Benzene, 2,4-dimethyl-1-(1-methylethyl)-	ug/kg	2300.000	940000.000	471150.00		2
Cyclopentanol, 2-methyl-CI...	ug/kg	2600.000	2600.000	2600.00		1
Cyclopropanamine, 2-phenyl-,...	ug/kg	9600.000	9600.000	9600.00		1
Phenol, 2,3-dimethyl-	ug/kg	3000.000	11000.000	6475.00		4
Benzene, 1-methyl-4-(1-methylethyl)-	ug/kg	6100.000	6100.000	6100.00		1
Benzene, 1-methyl-3-(1-methylethyl)-	ug/kg	1100.000	1100.000	1100.00		1
Benzene, 1-ethyl-4-methoxy-	ug/kg	1800.000	1800.000	1800.00		1
Cyclopentene, 1-ethenyl-3-me...	ug/kg	180000.000	220000.000	200000.00		2
Dimethylbenzene isomer	ug/kg	120000.000	120000.000	120000.00		1
Butylcitrate + Unknown	ug/kg	430000.000	430000.000	430000.00		1
Benzenamine, n,n-diethyl-	ug/kg	300.000	530000.000	274575.00		4
1,4-Methanonaphthalene, 1,4-...	ug/kg	55000.000	55000.000	55000.00		1
Benzaldehyde, 4-propyl-	ug/kg	78000.000	510000.000	276000.00		3
Naphthalene, 1-methyl-	ug/kg	78000.000	730000.000	397000.00		4
Dispiro[2.0.2.2]octane	ug/kg	40000.000	40000.000	40000.00		1
Benzene, 1,3-diethyl-4-methy...	ug/kg	69000.000	69000.000	69000.00		1
Benzene, 1,2,3-trimethyl-	ug/kg	7600.000	7600.000	7600.00		1
Ethanol, 2-[2-(2-ethoxyethox...	ug/kg	1700.000	1700.000	1700.00		1
Ethanol, 1-(2-butoxyethoxy)-	ug/kg	18000.000	18000.000	18000.00		1
Phenol, 2-ethyl-4-methyl	ug/kg	460.000	2500.000	1586.67		3
Iron, tricarbonyl[n-(phenyl-...	ug/kg	47000.000	47000.000	47000.00		1
Ethanol, 2-butoxy-*	ug/kg	430.000	2900.000	1665.00		2

TABLE 7-6
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Off-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Phosphoric acid, triethyles...	ug/kg	230000.000	230000.000	230000.00		1
Octanoic acid	ug/kg	2000.000	2000.000	2000.00		1
2,4-Pentanediol, 2-methyl-	ug/kg	1100.000	7500.000	3660.00		5
3-Octanone	ug/kg	910.000	910.000	910.00		1
Cyclohexanemethanol, .alpha.-.alpha.-4-trimethyl-	ug/kg	320.000	320.000	320.00		1
Unknown substituted phenol	ug/kg	780.000	780.000	780.00		1
1,2-Benzenedicarboxylic acid butyl-2-methyl	ug/kg	78000.000	78000.000	78000.00		1
Unknown phthalate	ug/kg	1800.000	1200000.000	222300.00		6
Dimethyl undecane	ug/kg	72000.000	91000.000	81500.00		2
Methylethylphenol	ug/kg	330.000	2500.000	1392.50		4
Unknown alcohol	ug/kg	580.000	16000.000	8290.00		2
Cyclohexanone, 3,3,5-trimethyl-	ug/kg	2100.000	17000.000	9550.00		2
Phenol, 3-propyl-	ug/kg	660.000	660.000	660.00		1
Ethylmethylbenzene	ug/kg	630.000	2100000.000	588203.75		8
Trimethylbenzene	ug/kg	550.000	1400000.000	353965.91		22
Trimethylcyclohexanol	ug/kg	5400.000	5400.000	5400.00		1
Ethyldimethylbenzene	ug/kg	35000.000	1700000.000	731500.00		10
Tetramethylbenzene	ug/kg	250.000	290000.000	110750.00		3
Diethylbenzene	ug/kg	1500.000	2200000.000	1100750.00		2
Unknown alkylated benzene	ug/kg	88000.000	280000.000	159666.67		6
Dimethylnonane	ug/kg	140000.000	140000.000	140000.00		1
Methylpropylbenzene	ug/kg	98000.000	140000.000	119000.00		2
Urea, n-methyl-n'-(4-methylphenyl)-	ug/kg	1800.000	1800.000	1800.00		1
Methylethylbenzene + unknown	ug/kg	830.000	830.000	830.00		1
Benzopyrene	ug/kg	270.000	270.000	270.00		1
Methylnaphthalene	ug/kg	230000.000	230000.000	230000.00		1
Unknown benzene	ug/kg	130000.000	480000.000	285000.00		4
Unknown aromatic	ug/kg	37000.000	1400000.000	406500.00		4
7-Hexadecane, (z)-	ug/kg	73000.000	73000.000	73000.00		1
3-Hexadecane, (z)-	ug/kg	1300.000	1300.000	1300.00		1
2-Methylcyclopentanol	ug/kg	510.000	1200.000	855.00		2
9-Octadecene, (E)-	ug/kg	970.000	1200.000	1085.00		2
Unknown substituted hydrocarbon	ug/kg	1100.000	510000.000	195525.00		4
Silanediamine, 1,1-dimethyl-	ug/kg	340000.000	340000.000	340000.00		1
1-Hexen-3-one, 5-methyl-1-phenyl-	ug/kg	80000.000	80000.000	80000.00		1
Azobenzene (ACN)	ug/kg	120000.000	120000.000	120000.00		1
Benzeneacetonitrile, .alpha...	ug/kg	120000.000	120000.000	120000.00		1
Phenol, 2-ethyl-5-methyl-	ug/kg	3400.000	3400.000	3400.00		1
Benzenamine, n-methyl-	ug/kg	930.000	930.000	930.00		1
Methylethylbenzene	ug/kg	1700.000	2300.000	2000.00		2
Diethylbenzene + unknown	ug/kg	400000.000	400000.000	400000.00		1
Diethylundecane	ug/kg	440000.000	440000.000	440000.00		1
Acetic acid, 2-ethylhexyl ester	ug/kg	350000.000	350000.000	350000.00		1
Methylmethylethylbenzene + unknown	ug/kg	290000.000	290000.000	290000.00		1
Unknown ethoxyl alcohol	ug/kg	6500.000	6500.000	6500.00		1
Ethanone, 1-phenyl-	ug/kg	2100.000	2100.000	2100.00		1
1-Decanol, 2-ethyl-	ug/kg	3100.000	3100.000	3100.00		1

TABLE 7-6
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Off-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Isoquinoline	ug/kg	4900.000	4900.000	4900.00		1
Unknown Ketone	ug/kg	2100.000	2100.000	2100.00		1
Unknown butoxyethoxy ethanol	ug/kg	2100.000	2100.000	2100.00		1
Unknown substituted alkane	ug/kg	9600.000	9600.000	9600.00		1
Cyclohexane, 1,2,4,5-tetraethyl-	ug/kg	2500.000	2500.000	2500.00		1
Tent. Ident. Compound-VOC					44	
Unknown	ug/kg	130.000	1500000.000	192115.48		31
Aceticacid, butylester	ug/kg	22.000	140000.000	30555.60		5
Nonane	ug/kg	32.000	160000.000	53340.80		15
Benzene, 1-ethyl-3-methyl-	ug/kg	300000.000	300000.000	300000.00		1
Octane, 2,3-dimethyl-	ug/kg	1700.000	97000.000	52233.33		3
Propylbenzene + Unknown	ug/kg	3100.000	200000.000	64820.00		5
Benzene, 1-ethyl-2-methyl-	ug/kg	65000.000	910000.000	329000.00		5
Benzene, 1,2,4-trimethyl-	ug/kg	150000.000	150000.000	150000.00		1
Unknown Hydrocarbon	ug/kg	11000.000	280000.000	124000.00		10
Methylethylbenzene + Unknown	ug/kg	24.000	640000.000	136990.57		7
Benzene, propyl-	ug/kg	17000.000	160000.000	69857.14		7
Nonane, 2,6-dimethyl-	ug/kg	2000.000	130000.000	41250.00		4
Benzene, (1-methylethyl)-	ug/kg	190000.000	190000.000	190000.00		1
Benzene, 1,2,3-trimethyl-	ug/kg	380000.000	380000.000	380000.00		1
Ethylmethylbenzene isomer	ug/kg	1100.000	370000.000	125775.00		4
Trimethylbenzene isomer	ug/kg	860.000	690000.000	252382.50		8
Decane	ug/kg	2700.000	580000.000	280242.86		7
Cyclopentane, 1-ethyl-3-methyl-, cis-	ug/kg	7500.000	7500.000	7500.00		1
Substituted Benzene	ug/kg	2000.000	15000.000	7240.00		5
3-Pentanone, 2,2,4,4-tetramethyl-	ug/kg	13.000	13.000	13.00		1
Trimethylbenzene + Unknown	ug/kg	2700.000	100000.000	44566.67		3
Nonane, 4-methyl-	ug/kg	5200.000	5200.000	5200.00		1
2-Pentanol, 4-methyl-	ug/kg	390.000	390.000	390.00		1
Undecane	ug/kg	1300000.000	1300000.000	1300000.00		1
Aceticacid, methylester	ug/kg	270000.000	270000.000	270000.00		1
Octane	ug/kg	170.000	27000.000	13585.00		2
Hexane, 4-ethyl-2-methyl-	ug/kg	60000.000	60000.000	60000.00		1
Heptane, 2,3,5-trimethyl-	ug/kg	54000.000	54000.000	54000.00		1
Methane, oxybis-	ug/kg	27000.000	27000.000	27000.00		1
Methane, dimethoxy-	ug/kg	92000.000	92000.000	92000.00		1
3-Buten-2-one, 3-methyl-	ug/kg	100000.000	100000.000	100000.00		1
1-Butanol	ug/kg	2500.000	480000.000	241250.00		2
Pentane	ug/kg	4600.000	120000.000	62300.00		2
2,3-Heptadien-5-yne, 2,4-dimethyl-	ug/kg	140000.000	140000.000	140000.00		1
Benzene, (2-methylpropyl)-	ug/kg	98000.000	98000.000	98000.00		1
Unknown alcohol	ug/kg	380.000	1700.000	1040.00		2
Furan, tetrahydro-	ug/kg	91.000	310.000	188.75		4
3-Heptanone, 5-methyl-	ug/kg	15.000	15.000	15.00		1
1-Propenylbenzene + Unknown	ug/kg	120000.000	120000.000	120000.00		1

TABLE 7-6
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Off-site Containment Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Heptane, 3-methyl-	ug/kg	5300.000	5300.000	5300.00		1
Hexane, 2,2,3,3-tetramethyl-	ug/kg	6000.000	6000.000	6000.00		1
Cyclohexane, butyl-	ug/kg	52000.000	52000.000	52000.00		1
Heptane	ug/kg	180.000	180.000	180.00		1
2-Hexanone, 5-methyl-	ug/kg	20.000	20.000	20.00		1
Ethane, 1,1'oxybis-	ug/kg	22.000	57.000	39.50		2
Propanoicacid, 2-methyl-,butylester-	ug/kg	27000.000	27000.000	27000.00		1
Unknown oxygenated alkane	ug/kg	71.000	71.000	71.00		1
Ethenylcyclohexene	ug/kg	3700.000	3700.000	3700.00		1
Ethylmethylbenzene	ug/kg	9.400	5900000.000	257982.09		39
Trimethylbenzene	ug/kg	4.700	9800000.000	402142.25		41
Unknown ketone	ug/kg	20.000	440.000	136.75		4
Decane + unknown	ug/kg	16.000	1500000.000	263772.57		14
Ethylmethylheptane	ug/kg	58000.000	91000.000	74500.00		2
Methyl(methylethyl) benzene	ug/kg	210000.000	210000.000	210000.00		1
Tetramethylbenzene	ug/kg	11000.000	91000.000	51000.00		2
Unknown substituted benzene	ug/kg	4400.000	96000.000	50200.00		2
Methylheptanone	ug/kg	6.000	6.000	6.00		1
Dimethylnonane + unknown	ug/kg	110000.000	110000.000	110000.00		1
Unknown Hydrocarbon C10H16	ug/kg	130.000	130.000	130.00		1
Bicyclo[3.1.0]hex-2-ene, 2-methyl-	ug/kg	29000.000	29000.000	29000.00		1
Methylnonane	ug/kg	6800.000	20000.000	13400.00		2
Dimethylnonane	ug/kg	87000.000	87000.000	87000.00		1
Decane + Substituted benzene	ug/kg	8800000.000	8800000.000	8800000.00		1
Undecane + Substituted benzene	ug/kg	9800000.000	9800000.000	9800000.00		1
Acetic acid, 1-methylethylester	ug/kg	31.000	640000.000	160801.75		4
Undecane + unknown	ug/kg	210000.000	210000.000	210000.00		1
Acetic acid ester	ug/kg	100000.000	100000.000	100000.00		1
2-Propanol	ug/kg	1900.000	3100.000	2500.00		2
Butanol	ug/kg	51.000	610.000	323.67		3
Unknown oxygenated hydrocarbon	ug/kg	450.000	450.000	450.00		1
Hexanol	ug/kg	14.000	14.000	14.00		1
Methylhexanol	ug/kg	19.000	30.000	24.50		2
Ethyldimethylbenzene	ug/kg	8200.000	8200.000	8200.00		1
Hexane	ug/kg	150.000	150.000	150.00		1
Pentanol	ug/kg	110.000	110.000	110.00		1
Propenylbenzene + unknown	ug/kg	7300.000	7300.000	7300.00		1
Trimethyltricycloheptane	ug/kg	99000.000	99000.000	99000.00		1
Acetic acid, propylester	ug/kg	39.000	39.000	39.00		1
Octane, 2,6-dimethyl-	ug/kg	5300.000	5300.000	5300.00		1
Benzene, 1,1'-oxybis-	ug/kg	7300.000	7300.000	7300.00		1

This table includes all compounds identified above detection limits in the Off-Site Containment Area (see table 7-1 for samples included in this area), and is provided as the starting point in the development of a Set of Chemical Data for use in the Risk Assessment, as discussed in Section 7.1.2.1. Refer to appropriate appendices to determine the total parameters analyzed and their associated detection limits. Refer to appendix U for values used in risk calulations. The data values presented contain a maximum of three significant digits for the results of metals analyses and two significant digits for organic chemical analyses: additional digits are due to limitations in the computer program used to prepare these tables, and do not infer an increase in accuracy. The number of tentatively identified compounds designated as unknowns may exceed the total number of samples analyzed because more than one unknown compound may be present in a given sample.

[ACS]FSB.MAX

TABLE 7-7
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Kapica/Pazmey Surface Soils

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Volatiles					4	
Methylene Chloride	ug/kg	200.000	200.000	200.00		1
Acetone	ug/kg	130.000	970.000	550.00		2
1,1-Dichloroethane	ug/kg	86.000	150.000	118.00		2
Total 1,2-Dichloroethene	ug/kg	21.000	7600.000	3810.50		2
Chloroform	ug/kg	10.000	10.000	10.00		1
1,1,1-Trichloroethane	ug/kg	9.000	9.000	9.00		1
1,2-Dichloropropane	ug/kg	19.000	19.000	19.00		1
Trichloroethene	ug/kg	11.000	170000.000	90003.67		3
Benzene	ug/kg	320.000	3200.000	1760.00		2
4-Methyl-2-Pentanone	ug/kg	270000.000	270000.000	270000.00		1
Tetrachloroethene	ug/kg	130.000	790000.000	260092.50		4
Toluene	ug/kg	29000.000	19000000.000	6556333.33		3
Chlorobenzene	ug/kg	6200.000	6200.000	6200.00		1
Ethylbenzene	ug/kg	7000.000	4300000.000	1482333.33		3
Styrene	ug/kg	23000.000	23000.000	23000.00		1
Total Xylenes	ug/kg	5900.000	23000000.000	5904975.00		4
Semi-Volatiles					4	
Phenol	ug/kg	190.000	28000.000	8822.50		4
1,2-Dichlorobenzene	ug/kg	200.000	590.000	395.00		2
2-Methylphenol	ug/kg	4700.000	4700.000	4700.00		1
4-Methylphenol	ug/kg	230.000	4600.000	2415.00		2
Isophorone	ug/kg	840.000	97000.000	36560.00		4
2,4-Dimethylphenol	ug/kg	1300.000	4900.000	3100.00		2
Naphthalene	ug/kg	680.000	97000.000	33895.00		4
2-Methylnaphthalene	ug/kg	460.000	56000.000	19740.00		4
2,4,5-Trichlorophenol	ug/kg	170.000	170.000	170.00		1
Dimethylphthalate	ug/kg	1400.000	1400.000	1400.00		1
Acenaphthene	ug/kg	360.000	360.000	360.00		1
Dibenzofuran	ug/kg	360.000	430.000	395.00		2
Diethylphthalate	ug/kg	150.000	5000.000	2575.00		2
Fluorene	ug/kg	470.000	620.000	566.67		3
N-Nitrosodiphenylamine	ug/kg	1900.000	4300.000	3100.00		2
Pentachlorophenol	ug/kg	1500.000	1500.000	1500.00		1
Phenanthrene	ug/kg	450.000	4300.000	2150.00		4
Anthracene	ug/kg	660.000	660.000	660.00		1
Di-n-butylphthalate	ug/kg	11000.000	94000.000	36000.00		4
Fluoranthene	ug/kg	760.000	3400.000	2080.00		2
Pyrene	ug/kg	1300.000	2300.000	1800.00		2
Butylbenzylphthalate	ug/kg	3200.000	51000.000	23733.33		3
Benzo(a)anthracene	ug/kg	850.000	2400.000	1625.00		2
Chrysene	ug/kg	1300.000	1300.000	1300.00		2
bis(2-Ethylhexyl)phthalate	ug/kg	110000.000	540000.000	342500.00		4
Di-n-octylphthalate	ug/kg	1300.000	38000.000	15800.00		3
Benzo(b)fluoranthene	ug/kg	430.000	3900.000	2165.00		2

TABLE 7-7
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Kapica/Pazmey Surface Soils

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Benzo(k)fluoranthene	ug/kg	430.000	3900.000	2165.00		2
Benzo(a)pyrene	ug/kg	1400.000	1400.000	1400.00		1
Indeno(1,2,3-cd)pyrene	ug/kg	820.000	820.000	820.00		1
Dibenz(a,h)anthracene	ug/kg	270.000	270.000	270.00		1
Benzo(g,h,i)perylene	ug/kg	1100.000	1100.000	1100.00		1
Pesticides/PCBs					16	
Aldrin	ug/kg	88.000	88.000	88.00		1
Endosulfan 1	ug/kg	42.000	42.000	42.00		1
4,4-DDD	ug/kg	25.000	150.000	77.67		3
AROCLOR-1242	ug/kg	15000.000	280000.000	89750.00		4
AROCLOR-1248	ug/kg	5100.000	27000.000	13333.33		3
AROCLOR-1254	ug/kg	2000.000	22000.000	12360.00		5
Metals					4	
Aluminum	mg/kg	3220.000	13200.000	7667.50		4
Antimony	mg/kg	9.000	84.800	49.63		4
Arsenic	mg/kg	2.100	30.600	10.28		4
Barium	mg/kg	107.000	5730.000	2519.25		4
Beryllium	mg/kg	0.160	1.500	0.53		4
Cadmium	mg/kg	5.000	174.000	114.00		4
Calcium	mg/kg	2910.000	157000.000	50227.50		4
Chromium, Total	mg/kg	70.000	3080.000	1327.25		4
Cobalt	mg/kg	42.300	148.000	82.40		3
Copper	mg/kg	176.000	4470.000	1553.75		4
Iron	mg/kg	8220.000	70100.000	25060.00		4
Lead	mg/kg	401.000	16200.000	8277.75		4
Magnesium	mg/kg	2260.000	36900.000	16326.67		3
Manganese	mg/kg	135.000	1540.000	674.00		4
Mercury	mg/kg	0.240	9.500	7.04		4
Nickel	mg/kg	12.000	197.000	71.28		4
Potassium	mg/kg	333.000	1420.000	713.25		4
Selenium	mg/kg	1.400	17.200	8.35		4
Silver	mg/kg	24.800	24.800	24.80		1
Sodium	mg/kg	215.000	3920.000	1446.75		4
Vanadium	mg/kg	9.900	47.700	23.90		4
Zinc	mg/kg	292.000	15800.000	8720.50		4
Cyanide, Total	mg/kg	4.600	66.200	34.73		4
Percent Solids	%	57.200	93.000	78.25		4
Tent. Ident. Compound-SVOC					4	
Unknown	ug/kg	16000.000	960000.000	97038.46		26
Unknown Hydrocarbon	ug/kg	30000.000	36000.000	33000.00		2

TABLE 7-7
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Kapica/Pazmey Surface Soils

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Ethylmethylbenzene isomer	ug/kg	52000.000	52000.000	52000.00		1
Trimethylbenzene isomer	ug/kg	70000.000	220000.000	145000.00		2
Undecane, 4,7-dimethyl-	ug/kg	14000.000	93000.000	41333.33		6
Benzene, 1-ethyl-2-methyl-	ug/kg	39000.000	76000.000	57500.00		2
Benzene, 2-ethyl-1,4-dimethyl-	ug/kg	21000.000	60000.000	40500.00		2
Unknown Substituted Benzene	ug/kg	28000.000	84000.000	56000.00		2
Benzene, 1-ethyl-3-methyl-	ug/kg	150000.000	150000.000	150000.00		1
Benzene, 1,2,4-trimethyl-	ug/kg	16000.000	68000.000	42000.00		2
Hexadecanoic acid	ug/kg	23000.000	260000.000	141500.00		2
Decane	ug/kg	96000.000	96000.000	96000.00		1
Benzene, 1,3,5-trimethyl-	ug/kg	70000.000	92000.000	81000.00		2
Octane, 2,3,6-trimethyl-	ug/kg	320000.000	320000.000	320000.00		1
Decane, 3-methyl-	ug/kg	56000.000	56000.000	56000.00		1
Nonane, 2,5-dimethyl-	ug/kg	220000.000	220000.000	220000.00		1
Decane, 2,5,6-trimethyl-	ug/kg	48000.000	48000.000	48000.00		1
Benzene, 1,2,3,5-tetramethyl-	ug/kg	21000.000	68000.000	49333.33		3
Tetradecane	ug/kg	21000.000	21000.000	21000.00		1
Hexadecane	ug/kg	35000.000	130000.000	78000.00		3
Heptadecane, 2,6-dimethyl-	ug/kg	14000.000	150000.000	54777.78		9
Dodecanoic acid	ug/kg	190000.000	190000.000	190000.00		2
Phenol, 4-(2,2,3,3-tetramethylbutyl)-	ug/kg	19000.000	240000.000	129500.00		2
Heptadecane	ug/kg	54000.000	260000.000	157000.00		2
Dodecane, 2,6,10-trimethyl-	ug/kg	110000.000	110000.000	110000.00		1
Cycloheptane, 1,3,5-tris(met...	ug/kg	52000.000	52000.000	52000.00		1
Methyl(methylethen) benzene + Unknown	ug/kg	32000.000	32000.000	32000.00		1
1,2-Benzenedicarboxylic acid butyl-2-methyl	ug/kg	19000.000	19000.000	19000.00		1
Tent. Ident. Compound-VOC					4	
Unknown	ug/kg	5900.000	440000.000	70637.50		8
Nonane	ug/kg	39000.000	39000.000	39000.00		1
Benzene, 1-ethyl-3-methyl-	ug/kg	880000.000	880000.000	880000.00		1
Benzene, 1,2,4-trimethyl-	ug/kg	790.000	790.000	790.00		1
Benzene, propyl-	ug/kg	120.000	120.000	120.00		1
Nonane, 2,6-dimethyl-	ug/kg	4800.000	4800.000	4800.00		1
Benzene, (1-methylethyl)-	ug/kg	510.000	370000.000	133170.00		3

TABLE 7-7
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Kapica/Pazmey Surface Soils

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Benzene, 1,2,3-trimethyl-	ug/kg	85.000	85.000	85.00		1
Cyclohexane, methyl-	ug/kg	18000.000	18000.000	18000.00		1
Ethylmethylbenzene isomer	ug/kg	57000.000	180000.000	118500.00		2
Trimethylbenzene isomer	ug/kg	93000.000	210000.000	151500.00		2
Decane	ug/kg	24000.000	290000.000	126666.67		3
Hexane, 3-methyl-	ug/kg	55.000	55.000	55.00		1
Cyclopentane, 1-ethyl-3-methyl-, cis-	ug/kg	150.000	150.000	150.00		1
Cyclohexane, 2-propenyl-	ug/kg	73.000	73.000	73.00		1
Substituted Benzene	ug/kg	98.000	1300.000	699.00		2
3-Pentanone, 2,2,4,4-tetramethyl-	ug/kg	180.000	180.000	180.00		1
Cyclohexane, 1-ethyl-4-methyl-, trans-	ug/kg	5100.000	5100.000	5100.00		1
Trimethylbenzene + Unknown	ug/kg	16000.000	16000.000	16000.00		1

This table includes all compounds identified above detection limits in the Kapica-Pazmey Area soil samples collected at a depth of less than 3 feet(see table 7-1 for samples included in this area), and is provided as the starting point in the development of a Set of Chemical Data for use in the Risk Assessment, as discussed in Section 7.1.2.1. Refer to appropriate appendices to determine the total parameters analyzed and their associated detection limits. Refer to appendix U for values used in risk calulations. The data values presented contain a maximum of three significant digits for the results of metals analyses and two significant digits for organic chemical analyses: additional digits are due to limitations in the computer program used to prepare these tables, and do not infer an increase in accuracy. The number of tentatively identified compounds designated as unknowns may exceed the total number of samples analyzed because more than one unknown compound may be present in a given sample.

[ACS]SSB.MAX

TABLE 7-8
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Kapica/Pazmey Subsurface Soils

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Volatiles					17	
Chloroethane	ug/kg	12.000	12.000	12.00		1
Methylene Chloride	ug/kg	190.000	190.000	190.00		1
Acetone	ug/kg	79.000	8700.000	4126.33		3
Carbon Disulfide	ug/kg	3.000	3.000	3.00		1
1,1-Dichloroethane	ug/kg	5.000	790.000	378.33		3
Total 1,2-Dichloroethene	ug/kg	360.000	26000.000	9553.33		3
Chloroform	ug/kg	1.000	3.000	1.67		3
1,2-Dichloroethane	ug/kg	44.000	44.000	44.00		1
2-Butanone	ug/kg	5.000	90000.000	30012.00		3
1,1,1-Trichloroethane	ug/kg	83.000	560.000	321.50		2
1,2-Dichloropropane	ug/kg	35.000	35.000	35.00		1
Trichloroethene	ug/kg	20.000	250000.000	59444.00		5
Benzene	ug/kg	2.000	23000.000	4970.80		5
4-Methyl-2-Pentanone	ug/kg	2.000	4200.000	1423.67		3
2-Hexanone	ug/kg	4.000	390.000	197.00		2
Tetrachloroethene	ug/kg	2.000	240000.000	43466.63		8
Toluene	ug/kg	1.000	1400000.000	197543.00		13
Chlorobenzene	ug/kg	18.000	27000.000	6787.75		4
Ethylbenzene	ug/kg	2.000	570000.000	60899.93		14
Styrene	ug/kg	58.000	260000.000	87119.33		3
Total Xylenes	ug/kg	11.000	1700000.000	240252.67		15
Semi-Volatiles					4	
Phenol	ug/kg	58.000	9600.000	2974.50		4
1,2-Dichlorobenzene	ug/kg	260.000	260.000	260.00		1
2-Methylphenol	ug/kg	80.000	4100.000	1436.67		3
4-Methylphenol	ug/kg	41.000	2400.000	662.75		4
Isophorone	ug/kg	1600.000	65000.000	33300.00		2
2,4-Dimethylphenol	ug/kg	39.000	2200.000	761.00		3
Benzoic acid	ug/kg	79.000	700.000	323.00		3
Naphthalene	ug/kg	54.000	23000.000	7758.00		3
2-Methylnaphthalene	ug/kg	290.000	16000.000	8145.00		2
Dimethylphthalate	ug/kg	6500.000	6500.000	6500.00		1
Acenaphthene	ug/kg	710.000	710.000	710.00		1
4-Nitrophenol	ug/kg	66.000	66.000	66.00		1
Dibenzofuran	ug/kg	71.000	640.000	355.50		2
2,4-Dinitrotoluene	ug/kg	840.000	840.000	840.00		1
Diethylphthalate	ug/kg	1300.000	1300.000	1300.00		1
Fluorene	ug/kg	92.000	760.000	426.00		2
Pentachlorophenol	ug/kg	45.000	16000.000	8022.50		2
Phenanthrene	ug/kg	220.000	4800.000	2510.00		2
Anthracene	ug/kg	890.000	890.000	890.00		1
Di-n-butylphthalate	ug/kg	39.000	19000.000	4806.50		4
Fluoranthene	ug/kg	40.000	6000.000	3020.00		2
Pyrene	ug/kg	71.000	4200.000	2135.50		2

TABLE 7-8
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Kapica/Pazmey Subsurface Soils

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Butylbenzylphthalate	ug/kg	20000.000	20000.000	20000.00		1
Benzo(a)anthracene	ug/kg	2100.000	2100.000	2100.00		1
Chrysene	ug/kg	1500.000	1500.000	1500.00		1
bis(2-Ethylhexyl)phthalate	ug/kg	110.000	110000.000	28477.50		4
Di-n-octylphthalate	ug/kg	890.000	3300.000	2095.00		2
Benzo(b)fluoranthene	ug/kg	2200.000	2200.000	2200.00		1
Benzo(k)fluoranthene	ug/kg	2200.000	2200.000	2200.00		1
Benzo(a)pyrene	ug/kg	610.000	610.000	610.00		1
Benzo(g,h,i)perylene	ug/kg	260.000	260.000	260.00		1
Pesticides/PCBs					16	
AROCLOR-1242	ug/kg	3200.000	34000.000	18733.33		3
AROCLOR-1248	ug/kg	9600.000	9600.000	9600.00		1
AROCLOR-1254	ug/kg	1000.000	16000.000	9275.00		4
Metals					4	
Aluminum	mg/kg	2380.000	4580.000	3372.50		4
Antimony	mg/kg	10.800	10.800	10.80		1
Arsenic	mg/kg	1.500	2.300	1.98		4
Barium	mg/kg	1490.000	1490.000	1490.00		1
Beryllium	mg/kg	0.110	0.180	0.15		4
Cadmium	mg/kg	0.090	40.400	10.19		4
Calcium	mg/kg	404.000	6650.000	3527.00		2
Chromium, Total	mg/kg	4.800	1010.000	256.95		4
Cobalt	mg/kg	12.000	12.000	12.00		1
Copper	mg/kg	478.000	478.000	478.00		1
Iron	mg/kg	1990.000	8940.000	4325.00		4
Lead	mg/kg	5.000	4060.000	1022.13		4
Magnesium	mg/kg	582.000	5170.000	2876.00		2
Manganese	mg/kg	25.500	105.000	57.63		4
Mercury	mg/kg	0.070	2.300	1.19		2
Nickel	mg/kg	12.700	12.700	12.70		1
Potassium	mg/kg	209.000	425.000	311.00		4
Selenium	mg/kg	1.500	1.500	1.50		1
Silver	mg/kg	64.300	64.300	64.30		1
Sodium	mg/kg	214.000	214.000	214.00		1
Vanadium	mg/kg	3.900	11.300	7.45		4
Zinc	mg/kg	9.400	2200.000	650.20		4
Cyanide, Total	mg/kg	21.300	21.300	21.30		1
Percent Solids	%	85.200	93.400	91.00		4
Tent. Ident. Compound-SVOC					4	
Unknown	ug/kg	180.000	210000.000	18778.80		25
Unknown Hydrocarbon	ug/kg	6800.000	69000.000	37900.00		2

TABLE 7-8
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Kapica/Pazmey Subsurface Soils

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Undecane, 4,7-dimethyl-	ug/kg	1800.000	58000.000	29900.00		2
Benzene, 2-ethyl-1,4-dimethyl-	ug/kg	54000.000	58000.000	56000.00		3
Unknown Substituted Benzene	ug/kg	77000.000	77000.000	77000.00		1
Benzene, 1-ethyl-3-methyl-	ug/kg	52000.000	160000.000	106000.00		2
Benzene, 1,2,4-trimethyl-	ug/kg	52000.000	230000.000	141000.00		2
Benzene, (1,1-dimethylethyl)-	ug/kg	79000.000	79000.000	79000.00		1
Hexadecanoic acid	ug/kg	10000.000	110000.000	60000.00		2
Decane, 2,5,6-trimethyl-	ug/kg	110000.000	110000.000	110000.00		1
Tetradecane	ug/kg	3400.000	3400.000	3400.00		1
Heptadecane, 2,6-dimethyl-	ug/kg	3600.000	14000.000	8366.67		3
Dodecanoic acid	ug/kg	3000.000	3000.000	3000.00		1
Phenol, 4-(2,2,3,3-tetramethylbutyl)-	ug/kg	3300.000	3300.000	3300.00		1
Tridecane, 5-propyl-	ug/kg	3900.000	3900.000	3900.00		1
Hexadecane, 2-methyl-	ug/kg	1600.000	1600.000	1600.00		1
Heptadecane	ug/kg	7900.000	14000.000	10950.00		2
Tetradecanoic acid	ug/kg	3900.000	130000.000	66950.00		2
Docosane	ug/kg	2000.000	2000.000	2000.00		1
Hexatriacontane	ug/kg	3500.000	3500.000	3500.00		1
1-Decene, 2,4-dimethyl-	ug/kg	210.000	210.000	210.00		1
Cyclohexanol, 3,3,5-trimethyl-	ug/kg	210.000	1500.000	855.00		2
Hexanoic acid, 2-ethyl-	ug/kg	470.000	470.000	470.00		1
Eicosane, 10-methyl-	ug/kg	290.000	290.000	290.00		1
Dodecane, 1-iodo-	ug/kg	210.000	210.000	210.00		1
Nonane, 2,6-dimethyl-	ug/kg	42000.000	42000.000	42000.00		1
Benzene, 1-methyl-3-propyl-	ug/kg	98000.000	98000.000	98000.00		1
Benzene, 1-ethenyl-3-ethyl-	ug/kg	44000.000	44000.000	44000.00		1
Tent. Ident. Compound-VOC					17	
Unknown	ug/kg	16.000	87000.000	8301.85		13
Nonane	ug/kg	17.000	42000.000	11907.80		5
Propylbenzene + Unknown	ug/kg	21.000	21.000	21.00		1
Benzene, 1-ethyl-2-methyl-	ug/kg	13.000	44000.000	14707.67		3
Benzene, 1,2,4-trimethyl-	ug/kg	28.000	59.000	43.50		2
Unknown Hydrocarbon	ug/kg	20.000	2700.000	890.25		4
Benzene, propyl-	ug/kg	6.500	130000.000	27422.23		6
Benzene, (1-methylethyl)-	ug/kg	9.700	7500.000	3754.85		2
Benzene, 1,2,3-trimethyl-	ug/kg	14.000	14.000	14.00		1
Cyclohexane, methyl-	ug/kg	16.000	16.000	16.00		1
Decane	ug/kg	88.000	260000.000	115017.60		5
Cyclohexane, 1-ethyl-4-methyl-, trans-	ug/kg	9.700	9.700	9.70		1
Nonane, 3-methyl-	ug/kg	29.000	29.000	29.00		1
Cyclohexane, propyl-	ug/kg	9.000	41.000	28.33		3
Heptane, 4-(1-methylethyl)-	ug/kg	19000.000	19000.000	19000.00		1
Benzene, 1,3,5-trimethyl-	ug/kg	24000.000	24000.000	24000.00		1
2-Pentanol, 4-methyl-	ug/kg	12.000	24.000	18.00		2

TABLE 7-8
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Soil
SOURCE AREA: Kapica/Pazmey Subsurface Soils

		CHEMICAL CONCENTRATION			NUMBER SAMPLES ANALYZED	
CHEMICAL	UNITS	MINIMUM	MAXIMUM	ARITHMETIC MEAN	TOTAL	DETECTED
Octane, 2,3,6-trimethyl-	ug/kg	23.000	23.000	23.00		1
Octane, 6-ethyl-2-methyl-	ug/kg	37.000	37.000	37.00		1
Octane	ug/kg	3800.000	3800.000	3800.00		1
2-Hexanone, 5-methyl-	ug/kg	9.600	9.600	9.60		1
Unknown cyclic hydrocarbon	ug/kg	9.000	9.000	9.00		1
Ethylmethylbenzene	ug/kg	24.000	490000.000	73752.46		13
Trimethylbenzene	ug/kg	14.000	520000.000	76208.38		16
2-Pentanone	ug/kg	54.000	54.000	54.00		1
2-Heptanone	ug/kg	810.000	810.000	810.00		1
Hydrocarbon + unknown	ug/kg	24.000	63000.000	24274.67		3

This table includes all compounds identified above detection limits in the Kapica-Pazmey Area (see table 7-1 for samples included in this area), and is provided as the starting point in the development of a Set of Chemical Data for use in the Risk Assessment, as discussed in Section 7.1.2.1. Refer to appropriate appendices to determine the total parameters analyzed and their associated detection limits. Refer to appendix U for values used in risk calulations. The data values presented contain a maximum of three significant digits for the results of metals analyses and two significant digits for organic chemical analyses: additional digits are due to limitations in the computer program used to prepare these tables, and do not infer an increase in accuracy. The number of tentatively identified compounds designated as unknowns may exceed the total number of samples analyzed because more than one unknown compound may be present in a given sample.

TABLE 7-9
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Surface Water
SOURCE AREA: Drainage Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Volatiles					5	
Chloroethane	ug/l	14.000	30.000	22.00		2
Acetone	ug/l	5.000	380.000	192.50		2
1,1-Dichloroethane	ug/l	1.000	2.000	1.50		2
Total 1,2-Dichloroethene	ug/l	1.000	3.000	2.00		2
2-Butanone	ug/l	33.000	140.000	86.50		2
Benzene	ug/l	460.000	460.000	460.00		1
4-Methyl-2-Pentanone	ug/l	49.000	49.000	49.00		1
Toluene	ug/l	7.000	8.000	7.50		2
Ethylbenzene	ug/l	6.000	6.000	6.00		1
Total Xylenes	ug/l	35.000	35.000	35.00		1
Semi-Volatiles					5	
Phenol	ug/l	23.000	45.000	34.00		2
bis(2-Chloroethyl)ether	ug/l	5.000	77.000	41.00		2
2-Methylphenol	ug/l	5.000	5.000	5.00		1
bis(2-Chloroisopropyl)ether	ug/l	29.000	29.000	29.00		1
4-Methylphenol	ug/l	9.000	590.000	299.50		2
Isophorone	ug/l	5.000	5.000	5.00		1
2,4-Dimethylphenol	ug/l	12.000	12.000	12.00		1
Benzoic acid	ug/l	85.000	85.000	85.00		1
4-Chloro-3-methylphenol	ug/l	2.000	2.000	2.00		1
Pesticides/PCBs					5	
AROCLOR-1248	ug/l	0.500	0.840	0.67		2
Metals					5	
Aluminum	ug/l	470.000	960.000	730.00		3
Arsenic	ug/l	2.300	45.000	23.65		2
Barium	ug/l	330.000	330.000	330.00		1
Beryllium	ug/l	0.280	0.280	0.28		1
Cadmium	ug/l	0.370	0.720	0.55		2
Calcium	ug/l	12500.000	334000.000	113600.00		5
Chromium, Total	ug/l	5.000	28.000	12.28		4
Copper	ug/l	22.000	22.000	22.00		1
Iron	ug/l	265.000	14300.000	4967.20		5
Lead	ug/l	4.200	23.800	11.02		5
Magnesium	ug/l	1080.000	61700.000	25460.00		4
Manganese	ug/l	24.000	1850.000	771.60		5
Nickel	ug/l	55.000	80.000	67.50		2
Potassium	ug/l	650.000	30000.000	13322.50		4
Selenium	ug/l	2.100	2.100	2.10		1

TABLE 7-9
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Surface Water
SOURCE AREA: Drainage Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Sodium	ug/l	4200.000	82300.000	54500.00		3
Zinc	ug/l	53.000	88.000	64.00		4
Tent. Ident. Compound-SVOC					5	
Unknown	ug/l	10.000	620.000	127.20		25
Unknown Hydrocarbon	ug/l	16.000	16.000	16.00		1
Pentacosane	ug/l	72.000	72.000	72.00		1
Cyclohexanol, 3,3,5-trimethyl-	ug/l	420.000	420.000	420.00		1
Hexanoic acid (DOT)	ug/l	200.000	200.000	200.00		1
Phenol, 2,3-dimethyl-	ug/l	90.000	90.000	90.00		1
2-Propanol, 1-[2-(2-methoxy-1-methylethoxy)-1-2 -propanol	ug/l	36.000	36.000	36.00		1
Benzeneacetic acid	ug/l	190.000	190.000	190.00		1
Diphosphoric acid tetraethy..	ug/l	26.000	26.000	26.00		1
2,4-Pentanediol, 2-methyl-	ug/l	14.000	14.000	14.00		1
2-Propanol, 2-(2-methoxy-1-m...	ug/l	14.000	14.000	14.00		1
Benzeneacetic acid, .alpha.-ethyl-	ug/l	34.000	34.000	34.00		1
Unknown PNA	ug/l	8.000	8.000	8.00		1
Eicosane	ug/l	130.000	130.000	130.00		1
Pentanoic acid, 4-methyl-	ug/l	160.000	160.000	160.00		1
Benzeneacetonitrile	ug/l	60.000	60.000	60.00		1
2-Hexadecane, 3,7,11,15-tetr...	ug/l	42.000	42.000	42.00		1
Tent. Ident. Compound-VOC					5	
Furan, tetrahydro-	ug/l	75.000	75.000	75.00		1
3-Heptanone, 5-methyl-	ug/l	6.000	6.000	6.00		1
Ethane, 1,1'oxybis-	ug/l	14.000	14.000	14.00		1

This table includes all compounds identified above detection limits in the Surface Water Samples (see table 7-1 for samples included in this area), and is provided as the starting point in the development of a Set of Chemical Data for use in the Risk Assessment, as discussed in Section 7.1.2.1. Refer to appropriate appendices to determine the total parameters analyzed and their associated detection limits. Refer to appendix U for values used in risk calulations. The data values presented contain a maximum of three significant digits for the results of metals analyses and two significant digits for organic chemical analyses: additional digits are due to limitations in the computer program used to prepare these tables, and do not infer an increase in accuracy. The number of tentatively identified compounds designated as unknowns may exceed the total number of samples analyzed because more than one unknown compound may be present in a given sample.

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TABLE 7-10
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Sediment
SOURCE AREA: Drainage Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Volatiles					18	
Chloroethane	ug/kg	40.000	40.000	40.00		1
Methylene Chloride	ug/kg	44.000	44.000	44.00		1
Total 1,2-Dichloroethene	ug/kg	6.000	6.000	6.00		1
Chloroform	ug/kg	2.000	8.000	3.17		6
2-Butanone	ug/kg	11.000	11.000	11.00		1
1,1,1-Trichloroethane	ug/kg	3.000	3.000	3.00		1
Benzene	ug/kg	23.000	14000.000	7011.50		2
Toluene	ug/kg	3.000	170.000	72.60		5
Ethylbenzene	ug/kg	130.000	130.000	130.00		1
Total Xylenes	ug/kg	200.000	200.000	200.00		1
Semi-Volatiles					18	
Phenol	ug/kg	58.000	190.000	124.00		2
bis(2-Chloroethyl)ether	ug/kg	430.000	560.000	495.00		2
bis(2-Chloroisopropyl)ether	ug/kg	1400.000	1800.000	1600.00		2
4-Methylphenol	ug/kg	100.000	270.000	185.00		2
2,4-Dimethylphenol	ug/kg	610.000	610.000	610.00		1
Benzoic acid	ug/kg	190.000	1200.000	557.14		7
Naphthalene	ug/kg	59.000	420.000	172.00		4
2-Methylnaphthalene	ug/kg	55.000	380.000	178.75		4
Dibenzofuran	ug/kg	230.000	230.000	230.00		1
Fluorene	ug/kg	75.000	75.000	75.00		1
Hexachlorobenzene	ug/kg	140.000	140.000	140.00		1
Pentachlorophenol	ug/kg	47.000	230.000	138.50		2
Phenanthrene	ug/kg	68.000	660.000	264.43		7
Anthracene	ug/kg	83.000	100.000	91.50		2
Di-n-butylphthalate	ug/kg	58.000	170.000	110.50		4
Fluoranthene	ug/kg	62.000	1000.000	423.25		8
Pyrene	ug/kg	71.000	1100.000	394.38		8
Butylbenzylphthalate	ug/kg	160.000	170.000	165.00		2
Benzo(a)anthracene	ug/kg	78.000	710.000	325.14		7
Chrysene	ug/kg	77.000	800.000	330.63		8
bis(2-Ethylhexyl)phthalate	ug/kg	51.000	13000.000	2257.36		11
Benzo(b)fluoranthene	ug/kg	56.000	1500.000	398.36		11
Benzo(k)fluoranthene	ug/kg	56.000	1500.000	408.36		11
Benzo(a)pyrene	ug/kg	63.000	690.000	327.14		7
Indeno(1,2,3-cd)pyrene	ug/kg	160.000	420.000	297.50		4
Dibenz(a,h)anthracene	ug/kg	75.000	200.000	145.00		3
Benzo(g,h,i)perylene	ug/kg	180.000	550.000	372.50		4
Pesticides/PCBs					18	
Heptachlor Epoxide	ug/kg	66.000	66.000	66.00		1
AROCLOR-1248	ug/kg	4600.000	4600.000	4600.00		1

TABLE 7-10
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Sediment
SOURCE AREA: Drainage Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
AROCLOR-1254	ug/kg	460.000	17000.000	5862.50		4
AROCLOR-1260	ug/kg	290.000	290.000	290.00		1
Metals					18	
Aluminum	mg/kg	1850.000	15700.000	6660.56		18
Antimony	mg/kg	2.800	5.100	3.95		2
Arsenic	mg/kg	1.100	22.500	6.98		18
Barium	mg/kg	63.000	107.000	78.51		8
Beryllium	mg/kg	0.080	1.000	0.46		18
Cadmium	mg/kg	0.080	4.700	1.01		16
Calcium	mg/kg	759.000	73000.000	15609.94		18
Chromium, Total	mg/kg	4.300	273.000	30.70		18
Copper	mg/kg	6.300	359.000	47.92		15
Iron	mg/kg	2550.000	34500.000	12395.56		18
Lead	mg/kg	3.600	702.000	100.01		18
Magnesium	mg/kg	443.000	22300.000	5807.31		16
Manganese	mg/kg	23.100	419.000	171.95		18
Mercury	mg/kg	0.130	8.800	2.06		5
Nickel	mg/kg	14.400	40.500	25.15		6
Potassium	mg/kg	202.000	2870.000	720.33		18
Selenium	mg/kg	0.870	1.100	1.02		3
Thallium	mg/kg	1.400	1.400	1.40		1
Vanadium	mg/kg	4.500	47.900	20.50		18
Zinc	mg/kg	6.400	271.000	106.32		18
Percent Solids	%	27.000	81.300	60.31		17
Tent. Ident. Compound-SVOC					18	
Unknown	ug/kg	140.000	17000.000	1679.27		220
Unknown Hydrocarbon	ug/kg	320.000	54000.000	3708.29		41
Hexadecanoic acid	ug/kg	1300.000	1400.000	1350.00		2
Hexatriacontane	ug/kg	1700.000	1700.000	1700.00		1
Cyclohexanol, 3,3,5-trimethyl-	ug/kg	870.000	870.000	870.00		1
Dimethylphenol	ug/kg	2200.000	2200.000	2200.00		1
1,3,5-Triazine-2,4,6(1H,3H,5)-trione, 1,3,5-tri-	ug/kg	690.000	690.000	690.00		1
Sulfur, mol. (S8)	ug/kg	180.000	5400.000	2790.00		2
Bromohexane isomer	ug/kg	790.000	5800.000	2796.67		3
PCB	ug/kg	360.000	4700.000	2253.75		8
Benzopyrene isomer	ug/kg	320.000	320.000	320.00		1
Phthalic anhydride	ug/kg	1300.000	1700.000	1500.00		2
Propanoic acid, 2-methyl-1,...	ug/kg	740.000	740.000	740.00		1
Hexane, 2,3,4-trimethyl-	ug/kg	420.000	420.000	420.00		1
Dimethyl heptadecane	ug/kg	310.000	310.000	310.00		1
Phthalate	ug/kg	2200.000	2200.000	2200.00		1
Methyltetradecane	ug/kg	1000.000	1000.000	1000.00		1
Pentadecanoic acid, 14-methyl-methylester	ug/kg	410.000	410.000	410.00		1

TABLE 7-10
ORGANIC AND INORGANIC CHEMICAL CONCENTRATIONS
AMERICAN CHEMICAL SERVICES RI/FS
GRIFFITH, INDIANA

MATRIX: Sediment
SOURCE AREA: Drainage Area

CHEMICAL	UNITS	CHEMICAL CONCENTRATION MINIMUM	MAXIMUM	ARITHMETIC MEAN	NUMBER SAMPLES ANALYZED TOTAL	DETECTED
Tent. Ident. Compound-VOC					18	
Furan, tetrahydro-	ug/kg	160.000	160.000	160.00		1
3-Pentanone, 2,4-dimethyl-	ug/kg	15.000	15.000	15.00		1
3-Heptanone, 5-methyl-	ug/kg	25.000	25.000	25.00		1

This table includes all compounds identified above detection limits in the sediment samples (see table 7-1 for samples included in this area), and is provided as the starting point in the development of a Set of Chemical Data for use in the Risk Assessment, as discussed in Section 7.1.2.1. Refer to appropriate appendices to determine the total parameters analyzed and their associated detection limits. Refer to appendix U for values used in risk calulations. The data values presented contain a maximum of three significant digits for the results of metals analyses and two significant digits for organic chemical analyses: additional digits are due to limitations in the computer program used to prepare these tables, and do not infer an increase in accuracy. The number of tentatively identified compounds designated as unknowns may exceed the total number of samples analyzed because more than one unknown compound may be present in a given sample.

TABLE 7-11

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUND (TIC) GROUPINGS
AMERICAN CHEMICAL SERVICES NPL SITE
GRIFFITH, INDIANA

TIC GROUP	ANALYSIS TYPE	COMPOUND
SUBSTITUTED BENZENES - Propyl benzenes	VOA	Propylbenzene
	SV	Benzene, propyl-
	VOA	Benzene, propyl-
	VOA	Propylbenzene + Unknown
	SV	Benzene, (1,1-dimethylpropyl...
SUBSTITUTED BENZENES - Propenyl benzenes	SV	Methyl(methylethen) benzene + unknown
	VOA	Propenylbenzene + unknown
	VOA	1-Propenylbenzene + Unknown
	SV	Methylpropenylbenzene
	SV	Benzene, (1,3,3-trimethylnonyl)-
SUBSTITUTED BENZENES - Ethyl methyl benzenes	VOA	Benzene, 1-ethyl-4-methyl-
	SV	Ethylmethylbenzene
	VOA	Ethylmethylbenzene isomer
	SV	Ethylmethylbenzene isomer
	VOA	Ethylmethylbenzene
	VOA	Methylethylbenzene + Unknown
	SV	Methylethylbenzene
	SV	Methylethylbenzene + unknown
	VOA	Ethylmethylbenzene + unknown
	SV	Benzene, 1-ethyl-2-methyl-
	SV	Benzene, (1-methylethyl)-
	VOA	Benzene, 1-ethyl-3-methyl-
	VOA	Methylethylbenzene
	VOA	Benzene, (1-methylethyl)-
	VOA	Ethylmethylbenzene + unknown
	VOA	Benzene, 1-ethyl-3-methyl-
	VOA	Benzene, 1-ethyl-2-methyl-
	SV	Benzene, 1-ethyl-3-methyl-
SUBSTITUTED BENZENES -Diethyl benzenes	SV	Diethylbenzene
	SV	Diethylbenzene + unknown
	VOA	Diethylbenzene
	SV	Benzene, 1,4-diethyl-
SUBSTITUTED BENZENES - Methyl Propyl Benzenes	SV	Benzene, 1-methyl-3-propyl-
	SV	Methylpropylbenzene
	VOA	Benzene, (2-methylpropyl)-
	SV	Methylpropylbenzene + Unknown
	SV	Benzene, 1-methyl-4-(methyls...
	SV	Methylpropylbenzene isomer
	SV	Benzene, 1-methyl-2-propyl-
	SV	Benzene, 1-methyl-3-(1-methylethyl)-
	SV	Benzene, 1-methyl-4-(1-methylethyl)-
	SV	Benzene, methyl(1-methylethyl)
	SV	Methyl(methylethyl)benzene
	VOA	Methyl(methylethyl) benzene
	SV	Benzene, 1-methyl-4-propyl-
	SV	Benzene, 2,4-dimethyl-1-(1-methylethyl)-
SUBSTITUTED BENZENES - Methyl Ethenyl Benzenes	SV	Benzene, 1-ethenyl-2-methyl-
	SV	Benzene, 1-ethenyl-3-ethyl-
SUBSTITUTED BENZENES - Methyl Phenyl Benzenes	SV	Benzene, 1,2-dimethyl-4-(phenylmethyl)-
SUBSTITUTED BENZENES - Trimethyl Benzenes	SV	Trimethylbenzene isomer
	SV	Trimethylbenzene
	SV	Trimethylbenzene + Unknown
	VOA	Trimethylbenzene
	VOA	Trimethylbenzene + Unknown

TABLE 7-11

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUND (TIC) GROUPINGS
AMERICAN CHEMICAL SERVICES NPL SITE
GRIFFITH, INDIANA

TIC GROUP	ANALYSIS TYPE	COMPOUND
	SV	Benzene, 1,2,4-trimethyl-
	SV	Benzene, 1,3,5-trimethyl-
	VOA	Benzene, 1,3,5-trimethyl-
	VOA	Benzene, 1,2,4-trimethyl-
	VOA	Trimethylbenzene isomer
	SV	Benzene, 1,2,3-trimethyl-
	VOA	Benzene, 1,2,3-trimethyl-
SUBSTITUTED BENZENES - Dimethyl ethyl benzenes	SV	Methylmethylethylbenzene + unknown
	SV	Benzene, (1,1-dimethylethyl)-
	SV	Ethyldimethylbenzene + unknown
	SV	Benzene, 2-ethyl-1,4-dimethyl-
	SV	Ethyldimethylbenzene isomer
	SV	Dimethylethylbenzene
	SV	Benzene, 2-ethyl-1,3-dimethyl-
	SV	Ethyldimethylbenzene
	VOA	Ethyldimethylbenzene
	SV	Benzene, 1-ethyl-2,3-dimethyl-
	SV	Ethyldimethylbenzene + Unknown
	SV	Benzene, 1,1'-methylenebis-
	SV	Benzene, 1,3-diethyl-4-methyl...
SUBSTITUTED BENZENES - Tetramethyl benzenes	SV	Tetramethylbenzene
	SV	Tetramethylbenzene + unknown
	SV	Tetramethylbenzene isomer
	SV	Ethyltrimethylbenzene + unknown
	SV	Benzene, 1-ethyl-2,4,5-trimethyl-
	SV	Benzene, 1,2,3,5-tetramethyl-
	VOA	Tetramethylbenzene
	SV	Tetramethylbenzene + TCL
SUBSTITUTED BENZENES - oxygenated benzenes	VOA	Benzene, 1,1'-oxybis-
	SV	Benzene, 1,1'-oxybis-
	SV	Benzene, 1-ethyl-4-methoxy-
	SV	Benzaldehyde, 4-propyl-
SUBSTITUTED BENZENES - halogenated benzenes	SV	Benzene, 1-chloro-3-methyl-
	SV	Chloromethylbenzene
SUBSTITUTED BENZENES - Nitrogen containing benzenes	SV	Azobenzene (ACN)
	SV	Benzeneacetonitrile, .alpha...
	VOA	Benzene, (nitromethyl)-
	SV	Benzene, 1,4-dimethyl-2-nitro-
	SV	Diethylbenzeamine + Unknown
SUBSTITUTED BENZENES - TCL Compounds identified as TICs	VOA	Dichlorobenzene
	SV	Methylbenzene + Unknown
	SV	Benzopyrene isomer
	SV	Benzene, 1,4-dimethyl-
	SV	Benzene, ethyl-
	SV	Benzopyrene
	VOA	Benzene, 1,2-dichloro-
	SV	Benzene, 1,3-dimethyl-
	SV	Dimethylbenzene isomer
SUBSTITUTED BENZENES - Insufficient data	SV	Unknown alkylated benzene
	VOA	Decane + Substituted benzene
	SV	Unknown benzene
	SV	Unknown aromatic
	VOA	Substituted Benzene
	SV	Unknown + Nitrobenzene

TABLE 7-11

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUND (TIC) GROUPINGS
AMERICAN CHEMICAL SERVICES NPL SITE
GRIFFITH, INDIANA

TIC GROUP	ANALYSIS TYPE	COMPOUND
	VOA	Undecane + Substituted benzene
	SV	Unknown Substituted Benzene
	VOA	Unknown substituted benzene
HYDROCARBONS - Cyclic Alkanes	SV	Cycloheptane, 1,3,5-tris(met...
	VOA	Cyclohexane
	SV	Cyclohexane, 1,2,4,5-tetraethyl-
	VOA	Cyclohexane, 1,2,4-trimethyl-, (1.alpha.
	VOA	Cyclohexane, 1,3-dimethyl-, trans-
	VOA	Cyclohexane, 1-ethyl-2,3-dimethyl-
	VOA	Cyclohexane, 1-ethyl-4-methyl-, trans-
	VOA	Cyclohexane, 2-propenyl-
	VOA	Cyclohexane, butyl-
	VOA	Cyclohexane, diethyl-
	VOA	Cyclohexane, ethyl-
	VOA	Cyclohexane, methyl-
	VOA	Cyclohexane, propyl-
	SV	Cyclooctane, 2,4-dimethyl-
	VOA	Cyclopentane, 1,2,3-trimethyl-
	VOA	Cyclopentane, 1,2,4-trimethyl-
	VOA	Cyclopentane, 1-ethyl-3-methyl-, cis-
	SV	Cyclopentane, 1-hexyl-3-methyl-
	SV	Decane, 2-Cyclohexyl-, 2-cycl...
	SV	Dimethyl cyclooctane
	VOA	Dimethylcyclohexane
	VOA	Trimethyltricycloheptane
	SV	Unknown alkyl cyclohexane
	VOA	Unknown bicyclic hydrocarbon
	VOA	Unknown cyclic hydrocarbon
HYDROCARBONS - Cyclic Alkenes	SV	Azulene, 1,2,3,3A-tetrahydro-
	VOA	Bicyclo[3.1.0]hex-2-ene, 2-me...
	VOA	Bicyclo[3.1.0]hex-2-ene, 2-methyl-
	SV	Cyclopentene, 1-ethenyl-3-me...
	VOA	Ethenylcyclohexene
	SV	Tetrahydroazulene
HYDROCARBONS - Halogenated Alkanes	SV	Bromohexane isomer
	VOA	Dichloromethylbutane
	VOA	Dichloropentane
	SV	Dodecane, 1-iodo-
	VOA	Ethane, 1,1,2-trichloro-1,2,2-trichloro-
	VOA	Ethane, 1,1-dichloro-1-nitro-
	SV	Ethane, 1,2-bis(2-chloroethoxy)-
	VOA	Methane, dichlorofluoro-
	VOA	Methane, trichlorofluoro-
HYDROCARBONS - Continuous Chain Alkanes	SV	Decane
	VOA	Decane
	VOA	Decane + unknown
	SV	Docosane
	SV	Eicosane
	SV	Heptadecane
	VOA	Heptane
	SV	Hexadecane
	VOA	Hexane
	VOA	Nonane
	VOA	Nonane
	SV	Octadecane
	VOA	Octane
	VOA	Octane
	SV	Pentacosane
	VOA	Pentane
	SV	Tetradecane

TABLE 7-11

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUND (TIC) GROUPINGS
AMERICAN CHEMICAL SERVICES NPL SITE
GRIFFITH, INDIANA

TIC GROUP	ANALYSIS TYPE	COMPOUND
	SV	Undecane
	VOA	Undecane
	VOA	Undecane + unknown
HYDROCARBONS - Branched Alkanes	SV	Decane, 2,5,6-trimethyl-
	SV	Decane, 2,6,7-trimethyl-
	SV	Decane, 3,6-dimethyl-
	SV	Decane, 3-methyl-
	VOA	Decane, 4-methyl-
	SV	Diethylundecane
	SV	Dimethyl heptadecane
	SV	Dimethyl undecane
	VOA	Dimethyldecane
	SV	Dimethyldodecane
	SV	Dimethylnonane
	VOA	Dimethylnonane
	VOA	Dimethylnonane + unknown
	VOA	Dimethyloctane
	SV	Dimethylundecane
	VOA	Dimethylundecane
	SV	Dodecane, 2,6,10-trimethyl-
	SV	Eicosane, 10-methyl-
	VOA	Ethylmethylheptane
	VOA	Ethylmethylheptane + unknown
	VOA	Ethylmethyloctane
	SV	Heptadecane, 2,6-dimethyl-
	VOA	Heptane, 2,3,5-trimethyl-
	VOA	Heptane, 2,3,6-trimethyl-
	VOA	Heptane, 2,4-dimethyl-
	VOA	Heptane, 2,5-dimethyl-
	VOA	Heptane, 3-ethyl-2-methyl-
	VOA	Heptane, 3-methyl-
	VOA	Heptane, 4-(1-methylethyl)-
	SV	Hexadecane, 2-methyl-
	VOA	Hexane, 2,2,3,3-tetramethyl-
	SV	Hexane, 2,3,4-trimethyl-
	VOA	Hexane, 2,4-dimethyl-
	VOA	Hexane, 2,5-dimethyl-
	VOA	Hexane, 2-methyl-
	VOA	Hexane, 3-ethyl-4-methyl-
	VOA	Hexane, 3-methyl-
	VOA	Hexane, 4-ethyl-2-methyl-
	VOA	Methylnonane
	SV	Methyltetradecane
	SV	Nonane, 2,5-dimethyl-
	VOA	Nonane, 2,6-dimethyl-
	SV	Nonane, 2,6-dimethyl-
	VOA	Nonane, 2-methyl-
	SV	Nonane, 3,7-dimethyl-
	VOA	Nonane, 3-methyl-
	SV	Nonane, 4,5-dimethyl-
	VOA	Nonane, 4-methyl-
	SV	Nonane, 4-methyl-
	SV	Octane, 2,3,6-trimethyl-
	VOA	Octane, 2,3,6-trimethyl-
	VOA	Octane, 2,3-dimethyl-
	SV	Octane, 2,3-dimethyl-
	SV	Octane, 2,5-dimethyl-
	VOA	Octane, 2,6-dimethyl-
	VOA	Octane, 3-methyl-
	VOA	Octane, 6-ethyl-2-methyl-
	SV	Tetramethylpentadecane
	SV	Tridecane, 4,8-dimethyl-
	SV	Tridecane, 5-propyl-
	VOA	Trimethyloctane
	SV	Undecane, 2-methyl-
	SV	Undecane, 4,7-dimethyl-

TABLE 7-11

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUND (TIC) GROUPINGS
AMERICAN CHEMICAL SERVICES NPL SITE
GRIFFITH, INDIANA

TIC GROUP	ANALYSIS TYPE	COMPOUND
HYDROCARBONS - Branched Alkenes/Alkynes	SV	1-Decene, 2,4-dimethyl-
	VOA	2,3-Heptadien-5-yne, 2,4-dimethyl-
	SV	3-Octadecene, (E)-
	SV	9-Octadecene, (E)-
	SV	a-Eicosene, (E)-
	SV	5-Eicosene, (E)-
	SV	1-Hexadecyne
	SV	1H-Idene, 1-ethylidene-
	SV	9-Eicosyne
HYDROCARBONS - Ethers	VOA	Disopropyl ether (DOT)
	VOA	Ethane, 1,1'oxybis-
	VOA	Ethane, 1-1'-oxybis-
	VOA	Methane, dimethoxy-
	VOA	Methane, oxybis-
	VOA	Propane, 1,1'-oxybis-
	VOA	Propane, 2,2'-oxybis-
HYDROCARBONS - Unclassified	SV	Disilane, hexaethyl-
	SV	Disulfide, diethyl-
	SV	2-Hexadecane, 3,7,11,15-tetr...
	SV	3-Carene
	SV	7-Hexadecane, (z)-
	SV	3-Hexadecane, (z)-
	VOA	4-Carene, (1S,3S,6R)-(-)-
	SV	4-Carene, (1S,3S,6R)-(-)-
	SV	Dispiro[2.0.2.2]octane
	SV	Hexatriacontane
	VOA	Hydrocarbon + unknown
	SV	Unknown Alkene
	VOA	Unknown Hydrocarbon
	SV	Unknown Hydrocarbon
	VOA	Unknown Hydrocarbon C10H16
	VOA	Unknown hydrocarbon C10H22
	VOA	Unknown oxygenated alkane
	SV	Unknown oxygenated alkane
	VOA	Unknown oxygenated hydrocarbon
	SV	Unknown substituted alkane
	VOA	Unknown Substituted Heptane
	SV	Unknown substituted hydrocarbon
POLYNUCLEAR AROMATICS - Methylated Naphthalenes	SV	Dimethylnaphthalene
	SV	Dimethylnaphthalene
	SV	Dimethylnaphthalene + unknown
	SV	Methylnaphthalene
	SV	Naphthalene, 1,2-dimethyl-
	SV	Naphthalene, 1-methyl-
POLYNUCLEAR AROMATICS - Unclassified	SV	Tetrahydronaphthalene
	SV	Naphthalene, 1,2,3,4-tetrah...
	SV	Unknown PAH
	SV	1(2H)-Naphthalenone, 3,4-dih...
	SV	1,4-Methanonaphthalene, 1,4-...
	SV	Unknown PNA
PHTHALATES	SV	Phthalic anhydride
	SV	Phthalate
	SV	Unknown phthalate
PHENOLS - Methylated phenols	SV	1,1-Dimethylethyl phenol

TABLE 7-11

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUND (TIC) GROUPINGS
AMERICAN CHEMICAL SERVICES NPL SITE
GRIFFITH, INDIANA

TIC GROUP	ANALYSIS TYPE	COMPOUND
	SV	Dimethylphenol
	SV	Dimethylphenol + Unknown
	SV	Methyl-methyl-ethylphenol isomer
	SV	Methylethylphenol
	SV	Methylphenol isomer
	SV	Phenol, 2,3-dimethyl-
	SV	Phenol, 2-ethyl-4-methyl
	SV	Phenol, 2-ethyl-5-methyl-
	SV	Phenol, 3,5-diethyl-
	SV	Phenol, 3,5-dimethyl-
	SV	Phenol, 3-ethyl-5-methyl-
	SV	Trimethylphenol isomer
PHENOLS - Unclassified	SV	Phenol, 4-(2,2,3,3-tetramethylbutyl)-
	SV	Propyl-phenol isomer
	SV	Phenol, 2-[1-(4-hydroxypheny...
	SV	Phenol, 3-propyl-
	SV	Phenol, 3-propyl-
	SV	Ethyl-phenol isomer
	SV	Unknown substituted phenol
KETONES - Methylated ketones	VOA	2-Hexanone, 5-methyl-
	VOA	3-Buten-2-one, 3-methyl-
	VOA	3-Heptanone, 5-methyl-
	SV	3-Pentanone, 2,2,4,4-tetram..
	VOA	3-Pentanone, 2,2,4,4-tetramethyl-
	VOA	3-Pentanone, 2,4-dimethyl-
	VOA	Methylheptanone
	VOA	Methylhexanone
	SV	Tetramethylpentanone + unknown
KETONES - "simple"	VOA	Tetramethylpentanone
	VOA	2-Heptanone
	VOA	2-Pentanone
	SV	3-Octanone
	VOA	Ketone
KETONES - Cyclic Ketones	SV	2(1H)-Quinolinone
	SV	Cyclohexanone, 3,3,5-trimethyl-
	VOA	Methylphenylethanone
	SV	Trimethylcyclohexanone
	SV	1-Hexen-3-one, 5-methyl-1-phenyl-
	SV	2-Cyclohexen-1-one, 3,5,5-trimethyl-
	SV	2-Cyclohepten-1-one
	SV	2(3H)-Benzothiazolone
	SV	Benzophenone
	SV	Bicyclo[2.2.1]heptan-2-one
	SV	Ethanone, 1-(2-chlorophenyl)-
	SV	Ethanone, 1-phenyl-
KETONES - Unclassified	SV	1,3,5-Triazine- 2,4,6(1H,3H,5)-trione, 1
	SV	2,4,6(1H,3H,5H)-Pyrimidinetrione-5-(1-me
	SV	Camphor (ACN)
	SV	Unknown Ketone
	VOA	Unknown ketone
	VOA	Unknown ketone
ALCOHOLS - Diols	SV	1,3-Pentanediol, 2,2,4-trimethyl-
	SV	1,3-Propanediol, 2,2-dimethyl-
	SV	2,4-Pentanediol, 2-methyl-

TABLE 7-11

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUND (TIC) GROUPINGS
AMERICAN CHEMICAL SERVICES NPL SITE
GRIFFITH, INDIANA

TIC GROUP	ANALYSIS TYPE	COMPOUND
ALCOHOLS - Simple Alcohols	VOA	2-Propanol, 2-methyl-
	VOA	1-Butanol
	SV	1-Decanol, 2-ethyl-
	VOA	1-Heptanol, 2-propyl-
	SV	1-Hexadecanol
	SV	1-Octanol, 2-butyl-
	VOA	1-Octanol, 2-butyl-
	VOA	2-Pentanol, 4-methyl-
	VOA	2-Propanol
	VOA	Butanol
	VOA	Hexanol
	VOA	Methylhexanol
	VOA	Methylpentanol
	VOA	Pentanol
ALCOHOL - Cyclic Alcohols	SV	2-Methylcyclopentanol
	SV	2-Methylcyclopentanol isomer
	SV	Cyclohexanemethanol, .alpha.-.alpha.-4-t
	SV	Cyclohexanol, 3,3,5-trimethyl-
	SV	Cyclopentanol, 2-methyl-CI...
	SV	Methylcyclopentanol
	SV	Trimethylcyclohexanol
ALCOHOLS - Oxygenated Alcohols	SV	2-Propanol, 1-(2-methoxy-1-methylethoxy)
	SV	2-Propanol, 1-[2-(2-methoxy-1-methylethoxy)]
	SV	2-Propanol, 2-(2-methoxy-1-methylethoxy)
	SV	Ethanol, 1-(2-butoxyethoxy)-
	SV	Ethanol, 2-(2-butoxyethoxy)-...
	SV	Ethanol, 2-[2-(2-ethoxyethox...
	SV	Ethanol, 2-butoxy-*
	SV	Methanol, dibutoxy-
	SV	Methanol, dibutoxy-
ALCOHOLS - Unclassified	VOA	Unknown alcohol
	SV	Unknown alcohol
	SV	Unknown butoxyethoxy ethanol
	SV	Unknown diol
	SV	Unknown ethoxyl alcohol
ACIDS - Cyclic acids	SV	1,2-Benzenedicarboxylic acid butyl-2-met
	SV	Benzeneacetic acid
	SV	Benzeneacetic acid, .alpha.-ethyl-
	SV	Benzenepropanoic acid
	SV	Benzoic acid, 2,4,6-trimethyl-
	SV	Benzoic acid, 2,4-dimethyl-
	SV	Benzoic acid, 3-methyl-
	SV	Benzoic acid, 4-(1,1-dimethylethyl)-
	SV	Cyclohexanecarboxylic acid
	SV	Dimethylbenzoic acid
	SV	Dimethylethylbenzoic acid
	SV	Propanoic acid, 2-(3-chlorophenoxy)-prop
	SV	Methylbenzoic acid isomer
	SV	Trimethyl benzoic acid
ACIDS - Non-Cyclic Acids	SV	2-Butenedioic acid (E)-dim...
	SV	Propanoic acid, 2-methyl-1,...
	VOA	Acetic acid ester
	VOA	Acetic acid, 1-methylethylester
	SV	Acetic acid, 2-ethylhexyl ester
	VOA	Acetic acid, propylester
	VOA	Aceticacid, butylester
	VOA	Aceticacid, methylester
	SV	Butanedioicacid, dimethyle...

TABLE 7-11

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUND (TIC) GROUPINGS
AMERICAN CHEMICAL SERVICES NPL SITE
GRIFFITH, INDIANA

TIC GROUP	ANALYSIS TYPE	COMPOUND
	SV	Butanedioicacid, monomethyl..
	SV	Butanoic acid, 2-methyl-
	SV	Butylcitrate + Unknown
	SV	Diphosphoric acid tetraethy..
	SV	Dodecanoic acid
	SV	Glycine, n-(2-methyl-1-oxo-2...
	SV	Heptanoic acid
	SV	Hexadecanoic acid
	SV	Hexanedioic acid, bis(2-methylpropyl) es
	SV	Hexanedioic acid, dibutylester
	SV	Hexanedioic acid, ethylmethlester-
	SV	Hexanoic acid (DOT)
	SV	Hexanoic acid (DOT)
	SV	Hexanoic acid, 2-ethyl-
	SV	Hexanoic acid, 2-methyl-
	SV	Hexanoic acid, anhydride
	SV	Octanoic acid
	SV	Pentadecanoic acid, 14-methyl-methyleste
	SV	Pentanoic acid, 4-methyl-
	SV	Phenobarbital (VAN)
	SV	Phosphoric acid, triethyles...
	VOA	Propanoicacid, 2-methyl-,butylester-
	SV	Tetradecanoic acid
ACIDS - Unclassified	SV	Unknown alkyl acid
	SV	Unknown carboxylic acid
	SV	Unknown carboxylic acid
	SV	Unknown octadecenoic acid
	SV	Unknown substituted benzoic...
AMINES	SV	Acetamide, n-ethyl-n-phenyl-
	SV	Benzamide, n,n-diethyl-3-met...
	SV	Benzenamine, n,n-diethyl-
	SV	Benzenamine, n-ethyl-
	SV	Benzenamine, n-methyl-
	SV	Benzeneacetonitrile
	SV	Benzenesulfonamide, n-butyl-
	SV	Caprolactam
	SV	Cyclopropanamine, 2-phenyl-,...
	SV	Diethylbenzenamine
	SV	Dodecanamide, n,n-bis(2-hydr)-
	SV	Hydroxylamine, o-decyl-
	SV	Silanediamine, 1,1-dimethyl-
	SV	Urea, n-methyl-n'-(4-methylphenyl)-
PCBs	SV	Aroclor 1016
	SV	1,1'-Biphenyl, tetrachloro-
	SV	Trichlorobiphenyl isomer
	SV	PCB
	SV	Unknown chlorinated biphenyl
FURANS	VOA	Tetrahydrofuran
	SV	Furan, 2,2'-[oxybis(methylene)]bis,-
	VOA	Furan, tetrahydro-
	SV	Benzo[B]naphtho[2,3-D]furan
	SV	Furan, 2,2'-methylenebis-
UNCLASSIFIED	SV	Unknown chlorinated compound
	SV	Unknown fatty acid
	VOA	Substituted methylborane
	SV	Unknown substituted sulfonyl
	SV	Unknown + TCL

TABLE 7-11

SUMMARY OF TENTATIVELY IDENTIFIED COMPOUND (TIC) GROUPINGS
AMERICAN CHEMICAL SERVICES NPL SITE
GRIFFITH, INDIANA

TIC GROUP	ANALYSIS TYPE	COMPOUND
	VOA	Unknown
	SV	Unknown
	SV	Iron, tricarbonyl[n-(phenyl-...
	SV	Dihydromethylindene
	SV	Isoquinoline
	VOA	Unknown substituted cyclonex
	SV	Sulfur, mol. (S8)

This table summarizes tentatively identified compounds (TICs) identified in the organic chemical analysis of Site media. TICs were identified from either volatile organic analyses (VOA) or semivolatile organic analyses (SV). TIC groups were selected based on structural similarity of individual compounds.

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TABLE 7-12

Representative Compounds for
Tentatively Identified Compound (TIC) Groups
American Chemical Service RI/FS
Griffith, Indiana

TIC GROUP	REPRESENTATIVE COMPOUND	HEAST PAGE #	COMMENTS
SUBSTITUTED BENZENES			
#1 Propyl benzenes	Cumene(3)	A-25	Cumene (isopropylbenzene) is similar in structure to compounds in this group.
#2 Propenyl benzenes	Methyl styrene(3)	A-61	Methyl styrene (1-ethenyl-2-methylbenzene) is similar in structure to these compounds, the reference dose is based on an industrial mixture.
#3 Ethylmethyl benzenes	Ethyl toluene(4)(2)	A-82	Insufficient data in HEAST or IRIS. Toxicity addressed by Toluene, a represented TCL.
#4 Diethyl benzenes	Ethyl benzene(2)	A-41	Ethyl benzene, a represented TCL, is similar to these TICs.
#5 Methylpropyl benzenes	Cumene(3)	A-25	Cumene (isopropyl benzene) is similar in structure to these compounds.
#6 Methylethenyl benzenes	Methyl styrene(1)	A-61	Methyl styrene (1-ethenyl-2-methylbenzene) has a RDF and is represented in this group.
#7 Methylphenyl benzenes	Naphthalene(2)	A-63	Naphthalene is similar in structure to this group and is a represented TCL.
#8 Trimethyl benzenes	Trimethylbenzene(4)(2)	A-88	Insufficient data in HEAST or IRIS for trimethyl benzenes. Toxicity addressed by Toluene, a represented TCL.
#9 Dimethylethyl benzenes	Ethyl benzene(2)	A-41	Ethyl benzene or toluene, both represented TCLs, are similar in structure to this group.
#10 Tetramethyl benzenes	Trimethylbenzene(4)(2)	A-88	See #8 above.
#11 Oxygenated benzenes	Benzaldehyde(3)	A-10	Benzaldehyde is similar in structure to this group of compound.

TABLE 7-12
(Continued)

TIC GROUP	REPRESENTATIVE COMPOUND	HEAST PAGE #	COMMENTS
#12 Halogenated benzenes	o-Chlorotoluene(3)(4)	A-22	o-Chlorotoluene (2-chloro-1-methylbenzene) is similar in structure to these compounds, m- and p-clorotoluene are represented but have inadequate data (HEAST).
#13 Nitro benzenes	Nitrobenzene(3)	A-64	Nitrobenzene is similar in structure to this group.
"SIMPLE" HYDROCARBONS			
#1 Cyclic alkanes	Methylcyclohexane(4)	A-58	Methylcyclohexane is similar in structure to this group. Insufficient data in HEAST or IRIS.
#2 Cyclic alkenes	Vinyl cyclohexane(4)	A-89	4-Vinyl-1-cyclohexene is similar in structure to this group. Insufficient data in HEAST or IRIS.
#3 Halogenated alkanes	1,1,1-Trichloroethane(1)		This TIC group is similar to the numerous halogenated alkanes represented at the site under the TCL.
#4 Straight chain alkanes	n-Hexane(1)(4)	A-48	n-Hexane is similar in structure to this group. n-Heptane (page A-46), and n-Pentane (page A-68) are also similar in structure, however, there is insufficient data in Heast or IRIS.
#5 Branched alkanes	See comments		Branched alkanes not in HEAST or IRIS. This group represented by n-hexane, see #4 above.
#6 Branched alkenes and alkynes	See comments		Branched alkenes not in HEAST or IRIS. This group represented by vinyl cyclohexene, see #2 above.
#7 Ethers	Ethyl ether(1)	A-43	Ethyl ether is represented in this group.
#8 Straight chain alkenes and alkynes	See comments		Straight chain alkenes not in HEAST or IRIS. This group represented by vinyl cyclohexene, see #2 above.

TABLE 7-12
(Continued)

TIC GROUP	REPRESENTATIVE COMPOUND	HEAST PAGE #	COMMENTS
POLYNUCLEAR AROMATICS			
#1 Methylated naphthalenes	Naphthalene(1)		This group is similar to the TCL PAHs which are represented at the site.
PHTHALATES			
#1 Phthalic anhydride	Phthalic anhydride(1)	A69	Phthalic anhydride has a RFD in HEAST and IRIS.
PHENOLS			
#1 Methylated phenols	Cresol(1)		This group is similar to the TCL methylated phenols, which are represented at the site.
KETONES			
#1 Methylated ketones	Acetone(2)	A-1	Acetone and 4-methyl-2-pentanone are TCLs represented at the site and are similar in structure to this group.
#2 Simple ketones	2-Butanone(2)	A-59	2-Butanone (methyl ethyl ketone) is a TCL represented at the site and is similar in structure to this group.
#3 Cyclic ketones	Isophorone(2)	A-49	Isophorone is a TCL represented at the site and is similar in structure to this group.
ALCOHOLS			
#1 Diols	Ethylene glycol(3)	A-42	Ethylene glycol is similar in structure to this group.
#2 Simple alcohols	1-Butanol(3)	A-14	1-Butanol is similar in structure to this group and is represented at the site.
#3 Cyclic alcohols	Benzyl alcohol(2)	A-10	Benzyl alcohol is a TCL represented at the site and is similar in structure to the cyclic alcohols.
#4 Oxygenated alcohols	Ethyl glycol monobutyl ether(1)	A-42	Ethylene glycol monobutyl ether is represented at the site and is similar in structure to the oxygenated alcohols (ethers).

TABLE 7-12
(Continued)

TIC GROUP	REPRESENTATIVE COMPOUND	HEAST PAGE #	COMMENTS
ACIDS			
#1 Cyclic acids	Benzoic acid(2)	A-10	Benzoic acid is a TCL represented at the site, which is similar in structure to this group of compounds.
#2 Non-cyclic acids	Acrylic acid(3)	A-3	Acrylic acid is a non-cyclic acid similar in structure to this group.
AMINES			
#1 Amines	Caprolactam(1)(4)	A-15	Caprolactam is represented at the site and will be used to assess risk from this group. N-Ethylaniline (n-ethyl-benzeneamine), page A-33, and n,n-diethyl aniline (n,n-diethyl benzeneamine), page A-41) are also represented at the site, however, inadequate data is available for both (HEAST).
PCBs			
#1 PCBs	TCL Aroclors(2)		This group is similar to the TCL Aroclors, which are represented at the site.
FURANS			
#1 Furans	Tetrahydrofuran(1)	ECAO	The Environmental Criteria and Assessment Office (ECAO) has provided a Rfd for Tetrahydrofuran, this compound will be used to assess toxicity of this group.

Notes:

HEAST = Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

(1) TIC has toxicity value.

(2) Group represented by TCL compound on-Site that has toxicity value.

(3) Value obtained from HEAST or IRIS having similar chemical structure.

(4) TIC group - insufficient toxicity data for risk assessment.

Table 7-13

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical of Potential Concern	Soil						Ambient Air				Groundwater		
	Onsite Containment Area	Still Bottoms Treatment Lagoon	Offsite Containment Area	Kapica Pazmey Surface	Kapica Pazmey Sub-Surface	Sediment	Onsite VOC	Offsite VOC	Onsite Dust	Offsite Dust	Upper Aquifer	Lower Aquifer	Surface Water
VOLATILES													
Chloromethane											X		
Vinyl chloride			X				X	X			X		
Chloroethane	X		X		X	X	X	X			X	X	X
Methylene chloride		X	X	X		X	X	X	X	X	X		
Acetone	X	X	X	X	X		X	X	X	X	X		X
Carbon disulfide					X		X	X					
1,1-Dichloroethene			X				X	X					
1,1-Dichloroethane	X	X	X	X	X		X	X	X	X	X		X
1,2-Dichloroethene (cis)	X	X	X	X	X	X	X	X	X	X	X		X
Chloroform	X	X	X	X	X	X	X	X	X	X			
1,2-Dichloroethane	X	X	X		X		X	X					
2-Butanone	X	X	X		X	X	X	X			X		X
1,1,1-Trichloroethane	X	X	X	X	X	X	X	X	X	X			
Carbon tetrachloride		X					X	X					
1,2-Dichloropropane	X	X	X	X	X		X	X	X	X			
Trichloroethene	X	X	X	X	X		X	X	X	X	X		
1,1,2-Trichloroethane	X	X	X				X	X					
Benzene	X	X	X	X	X	X	X	X	X	X	X		X
4-Methyl-2-pentanone	X	X	X	X	X		X	X	X	X	X	X	X
2-Hexanone			X		X		X	X			X		
Tetrachloroethene	X	X	X	X	X		X	X	X	X	X		
1,1,2,2-Tetrachloroethane	X		X				X	X					
Toluene	X	X	X	X	X	X	X	X	X	X	X		X
Chlorobenzene	X	X	X	X	X		X	X	X	X	X		
Ethylbenzene	X	X	X	X	X	X	X	X	X	X	X		X
Styrene	X	X	X	X	X		X	X	X	X			
Xylenes (mixed)	X	X	X	X	X	X	X	X	X	X	X		X
SEMIVOLATILES													
Phenol	X	X	X	X	X	X	X	X	X	X	X		X
bis(2-Chloroethyl) ether		X	X			X	X	X			X	X	X
2-Chlorophenol		X					X	X					
1,3-Dichlorobenzene	X	X					X	X			X		
1,4-Dichlorobenzene	X	X	X				X	X			X		
Benzyl Alcohol		X	X				X	X					
1,2-Dichlorobenzene	X	X	X	X	X		X	X	X	X	X		
2-Methylphenol	X	X	X	X	X		X	X	X	X	X		X
bis(2-Chloroisopropyl)ethe						X					X		X
4-Methylphenol	X	X	X	X	X	X	X	X	X	X	X		X

Table 7-13

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical of Potential Concern	Soil						Ambient Air				Groundwater		
	Onsite Containment Area	Still Bottoms Treatment Lagoon	Offsite Containment Area	Kapica Pazmey Surface	Kapica Pazmey Sub-Surface	Sediment	Onsite VOC	Offsite VOC	Onsite Dust	Offsite Dust	Upper Aquifer	Lower Aquifer	Surface Water
Isophorone		X	X	X	X		X	X	X	X	X		X
2,4-Dimethylphenol	X	X	X	X	X	X	X	X	X	X	X		X
Benzoic Acid	X	X	X		X	X	X	X			X		X
2,4-Dichlorophenol	X	X	X				X	X					
1,2,4-Trichlorobenzene		X	X				X	X					
Naphthalene	X	X	X	X	X	X	X	X	X	X	X		
Hexachlorobutadiene		X	X				X	X					
4-Chloro-3-methylphenol		X					X	X			X		X
2-Methylnaphthalene	X	X	X	X	X	X	X	X	X	X	X		
2,4,6-Trichlorophenol		X					X	X					
2,4,5-Trichlorophenol	X	X		X			X	X	X	X			
2-Chloronaphthalene		X					X	X					
Dimethylphthalate	X	X	X	X	X		X	X	X	X			
Acenaphthylene	X	X	X				X	X					
2,6-Dinitrotoluene			X				X	X					
Acenaphthene	X	X	X	X	X		X	X	X	X			
4-Nitrophenol		X	X		X		X	X					
Dibenzofuran		X	X	X	X	X	X	X	X	X			
2,4-Dinitrotoluene					X		X	X					
Diethylphthalate	X	X	X	X	X		X	X	X	X	X		
Fluorene	X	X	X	X	X	X	X	X	X	X			
N-nitrosodiphenylamine		X	X	X			X	X	X	X			
4-Bromophenyl-phenylether		X					X	X					
Hexachlorobenzene		X	X			X							
Pentachlorophenol	X	X	X	X	X	X	X	X	X	X	X		
Phenanthrene	X	X	X	X	X	X	X	X	X	X			
Anthracene	X	X	X	X	X	X	X	X	X	X			
Di-n-butylphthalate	X	X	X	X	X	X	X	X	X	X	X		
Fluoranthene	X	X	X	X	X	X	X		X	X			
Pyrene	X	X	X	X	X	X	X		X	X			
Butylbenzylphthalate	X	X	X	X	X	X	X	X	X	X			
Benzo(a)anthracene(c)	X	X	X	X	X	X			X	X			
Chrysene(c)	X	X	X	X	X	X			X	X			
bis(2-ethylhexyl)phthalate	X	X	X	X	X	X	X	X	X	X	X		
Di-n-octyl Phthalate		X	X	X	X		X	X	X	X			
Benzo(b)fluoranthene(c)		X	X	X	X	X			X	X			
Benzo(k)fluoranthene(c)		X	X	X	X	X			X	X			
Benzo(a)pyrene(c)		X	X	X	X	X			X	X			
Ideno(1,2,3-cd)pyrene(c)			X	X		X			X	X			
Dibenz(a,h)anthracene(c)			X	X		X			X	X			
Benzo(g,h,i)perylene			X	X	X	X			X	X			
Total-Carcinogenic PAHs	X	X	X	X	X	X			X	X			

Table 7-13

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical of Potential Concern	Soil						Ambient Air				Groundwater		
	Onsite Containment Area	Still Bottoms Treatment Lagoon	Offsite Containment Area	Kapica Pazmey Surface	Kapica Pazmey Sub-Surface	Sediment	Onsite VOC	Offsite VOC	Onsite Dust	Offsite Dust	Upper Aquifer	Lower Aquifer	Surface Water
PESTICIDE/PCB													
alpha-BHC			X										
beta-BHC			X										
gamma-BHC (Lindane)		X					X	X					
Aldrin			X	X					X	X			
Heptachlor epoxide			X			X							
Endosulfan I	X	X		X					X	X			
4,4'-DDE			X										
4,4'-DDD			X	X					X	X			
4,4'-DDT	X	X	X				X						
Endrin ketone		X											
Total - PCBs	X	X	X	X	X	X	X	X	X	X	X		X
METALS													
Aluminum				X					X	X	X		X
Antimony		X	X	X	X				X	X			
Arsenic											X	X	X
Barium	X	X	X	X	X	X			X	X	X	X	X
Beryllium											X		X
Cadmium (water)											X		X
Cadmium (food/soil)		X	X	X	X				X	X			
Calcium	X	X	X	X		X			X	X	X	X	X
Chromium VI	X	X	X	X	X	X			X	X	X		X
Cobalt	X	X	X	X	X				X	X			
Copper		X	X	X	X	X			X	X		X	X
Iron			X	X					X	X	X	X	X
Lead		X		X	X				X	X	X		X
Magnesium	X	X		X	X	X			X	X	X	X	X
Manganese			X	X					X	X	X	X	X
Mercury	X	X	X	X	X	X			X	X	X	X	
Nickel		X	X	X		X			X	X	X		X
Potassium			X								X	X	X
Selenium	X	X	X	X	X	X			X	X	X	X	X
Silver			X	X	X				X	X			
Sodium											X	X	X
Thallium											X		
Vanadium				X		X			X	X	X	X	
Zinc		X	X	X	X				X	X	X	X	X
Cyanide	X	X	X	X	X				X	X	X		

Table 7-13

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical of Potential Concern	Soil						Ambient Air				Groundwater		
	Onsite Containment Area	Still Bottoms Treatment Lagoon	Offsite Containment Area	Kapica Pazmey Surface	Kapica Pazmey Sub-Surface	Sediment	Onsite VOC	Offsite VOC	Onsite Dust	Offsite Dust	Upper Aquifer	Lower Aquifer	Surface Water
TIC Groupings													
Propyl Benzenes	X	X	X	X	X		X	X	X	X	X		
Propenyl Benzenes		X	X	X			X	X	X	X	X		
Ethyl Methyl Benzenes	X	X	X	X	X		X	X	X	X	X		
Diethyl Benzenes	X	X	X				X	X			X		
Methyl Propyl Benzenes	X	X	X		X		X	X			X		
Methyl Ethenyl Benzenes	X				X		X	X			X		
Methyl Phenyl Benzenes		X					X	X			X		
Trimethyl Benzenes	X	X	X	X	X		X	X	X	X	X		
Dimethyl ethyl benzenes	X	X	X	X	X		X	X	X	X	X		
Tetramethyl Benzenes	X	X	X	X			X	X	X	X	X		
Oxygenated Benzenes	X	X	X				X	X			X		
Halogenated Benzenes											X		
Nitrogenated Benzenes		X	X				X	X					
Cyclic alkanes	X	X	X	X	X		X	X	X	X	X		
Cyclic Alkenes	X	X	X				X	X			X		
Halogenated Alkanes	X	X			X	X	X	X			X		
n-chain Alkanes	X	X	X	X	X		X	X	X	X			X
Branched Alkanes	X	X	X	X	X	X	X	X	X	X	X		
Branched Alkenes/Alkynes	X	X	X		X		X	X					
Ethers			X				X	X			X	X	X
Methylated Naphthalenes	X	X	X				X	X			X		
Phthalates		X	X			X	X	X					
Methylated Phenols	X	X	X			X	X	X			X		X
Methylated Ketones		X	X	X	X	X	X	X	X	X	X		X
Simple Ketones		X	X		X		X	X			X		
Cyclic Ketones	X	X	X				X	X			X		
Diols		X	X				X	X			X	X	X
Simple Alcohols	X	X	X		X		X	X			X		
Cyclic Alcohols		X	X		X	X	X	X			X	X	X
Oxygenated Alcohols		X	X				X	X			X	X	X
Cyclic Acids			X	X			X	X	X	X	X	X	X
Non-Cyclic Acids	X	X	X	X	X	X	X	X	X	X	X		X
Amines	X	X	X				X	X			X		X
PCBs	X					X	X	X					
Furans	X	X	X			X	X	X			X		X

Table 7-13

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Notes:
1. "X" indicates Chemicals of Potential Concern for each area and medium, based on the criteria of being positively detected at least once, at a concentration greater than background levels and blank sample levels.

2. (c) indicates a carcinogenic PAH.

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Table 7-14

SUMMARY OF PHYSICAL AND CHEMICAL PROPERTIES OF CHEMICALS OF POTENTIAL CONCERN

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

COMPOUND	MW (g/mole)	Solubility (mg/L)	Koc (ml/g)	VP (mm Hg)	
Chloromethane	5.00e+01	6.50e+03	3.50e+01	4.31e+03	
Vinyl Chloride	6.30e+01	2.67e+03	5.70e+01	2.66e+03	
Chloroethane	5.10e+01	1.00e+06	2.20e+00	3.80e+03	
Methylene Chloride	8.50e+01	2.00e+04	8.80e+00	3.62e+02	
Acetone	5.80e+01	1.00e+06	2.20e+00	2.70e+02	
Carbon disulfide	7.60e+01	2.94e+03	5.40e+01	3.60e+02	
1,1-Dichloroethene	9.70e+01	2.25e+03	6.50e+01	6.00e+02	
1,1-Dichloroethane	9.90e+01	5.50e+03	3.00e+01	1.82e+02	
1,2-Dichloroethane	9.90e+01	8.52e+03	1.40e+01	6.40e+01	
Total 1,2-Dichloroethene	9.70e+01	3.50e+03	4.90e+01	2.08e+02	
Chloroform	1.19e+02	8.20e+03	3.10e+01	1.51e+02	
2-Butanone	7.20e+01	2.68e+05	4.50e+00	7.75e+01	
1,1,1-Trichloroethane	1.33e+02	1.50e+03	1.52e+02	1.23e+02	
Carbon Tetrachloride	1.54e+02	7.57e+02	1.10e+02	9.00e+01	
1,2-Dichloropropane	1.13e+02	2.70e+03	5.10e+01	4.20e+01	
Trichloroethene	1.31e+02	1.10e+03	1.26e+02	5.79e+01	
1,1,2-Trichloroethane	1.33e+02	4.50e+03	5.60e+01	3.00e+01	
Benzene	7.80e+01	1.75e+03	8.30e+01	9.52e+01	
4-Methyl-2-Pentanone	1.00e+02	1.70e+04	2.05e+01	6.00e+00	
2-Hexanone	1.00e+02	3.50e+04	3.90e+00	2.00e+00	
Tetrachloroethene	1.66e+02	1.50e+02	3.64e+02	1.78e+01	
1,1,2,2-Tetrachloroethane	1.68e+02	2.90e+03	1.18e+02	5.00e+00	
Toluene	9.20e+01	5.35e+02	3.00e+02	2.81e+01	
Chlorobenzene	1.13e+02	4.66e+02	3.30e+02	1.17e+01	
Ethylbenzene	1.06e+02	1.52e+02	1.10e+03	7.00e+00	
Styrene	1.04e+02	3.00e+02	1.89e+02	5.00e+00	
Total Xylenes	1.06e+02	4.66e+02	3.30e+02	1.00e+01	
Phenol	9.40e+01	9.30e+04	1.42e+01	3.41e-01	
bis(2-Chloroethyl)ether	1.43e+02	1.02e+04	1.39e+01	7.10e-01	
2-Chlorophenol	1.29e+02	2.85e+04	1.55e+01	5.90e-02	b
1,3-Dichlorobenzene	1.47e+02	1.23e+02	1.70e+03	2.28e+00	
1,4-Dichlorobenzene	1.47e+02	7.90e+01	1.70e+03	1.18e+00	
Benzyl alcohol	1.08e+02	4.00e+04	1.28e+01	9.52e+01	c
1,2-Dichlorobenzene	1.47e+02	1.00e+02	1.70e+03	1.00e+00	
2-Methylphenol	1.08e+02	3.00e+04	5.00e+02	2.40e-01	
bis(2-Chloroisopropyl)ether	1.71e+02	1.70e+03	6.10e+01	8.50e-01	
4-Methylphenol	1.08e+02	3.00e+04	5.00e+02	1.10e-01	
Isophorone	1.38e+02	1.20e+04	2.49e+01	3.80e-01	
2,4-Dimethylphenol	1.22e+02	4.60e+03	b 4.20e+01	5.90e-02	b
Benzoic acid	1.22e+02	2.90e+03	5.44e+01	9.52e+01	c
2,4-Dichlorophenol	1.63e+02	4.60e+03	3.80e+02	5.90e-02	
1,2,4-Trichlorobenzene	1.81e+02	3.00e+01	9.20e+03	2.90e-01	
Naphthalene	1.28e+02	3.20e+01	6.49e+02	2.60e-04	
Hexachlorobutadiene	2.61e+02	1.50e-01	2.90e+04	2.00e+00	
4-Chloro-3-methylphenol	1.43e+02	3.85e+03	4.70e+01	5.90e-02	b
2-Methylnaphthalene	1.42e+02	2.70e+01	7.12e+02	5.90e-02	d
2,4,6-Trichlorophenol	1.97e+02	8.00e+02	2.00e+03	1.20e-02	
2,4,5-Trichlorophenol	1.97e+02	1.19e+03	8.90e+01	1.00e+00	
2-Chloronaphthalene	1.63e+02	2.70e+01	7.12e+02	5.90e-02	d
Dimethylphthalate	1.94e+02	5.00e+03	4.03e+01	1.00e-02	
Acenaphthylene	1.52e+02	3.93e+00	2.50e+03	2.90e-02	
2,6-Dinitrotoluene	1.82e+02	1.32e+03	9.20e+01	1.80e-02	
Acenaphthene	1.54e+02	3.42e+00	4.60e+03	1.55e-03	
4-Nitrophenol	1.39e+02	1.60e+04	2.12e+01	5.90e-02	b
Dibenzofuran	1.70e+02	2.10e+01	8.20e+02	2.00e-02	g
2,4-Dinitrotoluene	1.82e+02	2.40e+02	4.50e+01	5.10e-03	
Diethylphthalate	2.22e+02	8.96e+02	1.42e+02	3.50e-03	
Fluorene	1.16e+02	1.69e+00	7.30e+03	7.10e-04	
N-Nitrosodiphenylamine	1.98e+02	5.80e-01	4.70e+02	3.80e-05	g
4-Bromophenyl-phenylether	2.49e+02	2.10e+01	8.20e+02	2.00e-02	h
Hexachlorobenzene	2.85e+02	6.00e-03	3.90e+03	1.09e-05	
Pentachlorophenol	2.66e+02	1.40e+01	5.30e+04	1.10e-04	
Phenanthrene	1.78e+02	1.00e+00	1.40e+04	6.80e-04	
Anthracene	1.78e+02	4.50e-02	1.40e+04	1.95e-04	
Di-n-butylphthalate	2.78e+02	1.30e+01	1.70e+05	1.00e-05	
Fluoranthene	2.02e+02	2.06e-01	3.80e+04	5.00e-06	
Pyrene	2.02e+02	1.32e-01	3.80e+04	2.50e-06	
Butylbenzylphthalate	3.12e+02	2.90e+00	2.43e+03	8.60e+06	

Table 7-14

SUMMARY OF PHYSICAL AND CHEMICAL PROPERTIES OF CHEMICALS OF POTENTIAL CONCERN

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

COMPOUND	MW (g/mole)	Solubility (mg/L)		Koc (ml/g)	VP (mm Hg)	
Benzo(a)anthracene	2.28e+02	5.70e-03		1.38e+06	2.20e-08	
Chrysene	2.28e+02	1.80e-03		2.00e+05	6.30e-09	
bis(2-Ethylhexyl)phthalate	3.91e+02	2.85e-01	a	6.92e+02	8.60e+06	a
Di-n-octylphthalate	3.91e+02	2.85e-01	a	6.92e+02	8.60e+06	a
Benzo(b)fluoranthene	2.52e+02	1.40e-02		5.50e+05	5.00e-07	
Benzo(k)fluoranthene	2.52e+02	4.30e-03		5.50e+05	5.10e-07	
Benzo(a)pyrene	2.52e+02	1.20e-03		5.50e+06	5.60e-09	
Indeno(1,2,3-cd)pyrene	2.76e+02	5.30e-04		1.60e+06	1.00e-10	
Dibenz(a,h)anthracene	2.78e+02	5.00e-04		3.30e+06	1.00e-10	
Benzo(g,h,i)perylene	2.76e+02	7.00e-04		1.60e+06	1.03e-10	
Alpha-BHC	2.91e+02	1.63e+00		3.80e+03	2.50e-05	
Beta-BHC	2.91e+02	2.40e-01		3.80e+03	2.80e-07	
Gamma-BHC (Lindane)	2.91e+02	7.80e+00		1.08e+03	1.60e+04	
Aldrin	3.65e+02	1.80e+01		9.60e+04	6.00e-06	
Heptachlor Epoxide	3.89e+02	3.50e-01		2.20e+02	3.00e-04	
4,4-DDT	3.55e+02	5.00e-03		2.43e+05	5.50e-06	
4,4-DDE	3.18e+02	4.00e-02		4.40e+06	6.50e-06	
4,4-DDD	3.20e+02	1.00e-01		7.70e+05	1.89e-06	
Endosulfan 1	4.07e+02	5.00e-03		2.43e+06	5.50e-06	e
Endrin Ketone	3.81e+02	1.95e-01		1.70e+03	1.78e-07	f
AROCLOR-1242	3.28e+02	3.10e-02		5.30e+05	7.70e-05	
AROCLOR-1248	3.28e+02	3.10e-02		5.30e+05	7.70e-05	
AROCLOR-1254	3.28e+02	3.10e-02		5.30e+05	7.70e-05	
AROCLOR-1260	3.28e+02	3.10e-02		5.30e+05	7.70e-05	

TIC GROUP	REPRESENTATIVE COMPOUND					
Propyl Benzenes	Cumene	1.20e+02	5.00e+01	5.08e+02	3.20e+00	
Propenyl Benzenes	Cumene	1.20e+02	5.00e+01	5.08e+02	3.20e+00	
Ethyl Methyl Benzenes	Cumene	1.20e+02	5.00e+01	5.08e+02	3.20e+00	
Diethyl Benzenes	Ethyl benzene	1.06e+02	1.52e+02	1.10e+03	7.00e+00	
Methyl Propyl Benzenes	Cumene	1.20e+02	5.00e+01	5.08e+02	3.20e+00	
Methyl Ethenyl Benzenes	Cumene	1.20e+02	5.00e+01	5.08e+02	3.20e+00	
Methyl Phenyl Benzenes	Naphthalene	1.28e+02	3.20e+01	6.49e+02	2.60e-04	
Trimethyl Benzenes	Trimethylbenzene	1.20e+02	2.00e+01	8.40e+02	1.00e+02	
Dimethyl ethyl benzenes	Ethyl benzene	1.06e+02	1.52e+02	1.10e+03	7.00e+00	
Tetramethyl Benzenes	Trimethylbenzene	1.20e+02	2.00e+01	8.40e+02	1.00e+02	
Oxygenated Benzenes	Benzaldehyde	1.06e+02	2.86e+03	5.50e+01	1.00e+02	
Halogenated Benzenes	o-Chlorotoluene	1.27e+02	2.00e+00	3.00e+03	2.70e+00	
Nitrogenated Benzenes	Nitrobenzene	1.23e+02	1.90e+03	6.90e+01	1.50e-01	
Unknown Benzenes	-	-	-	-	-	
TCL Benzenes	-	-	-	-	-	
Cyclic alkanes	Methylcyclohexane	9.80e+01	1.40e+01	1.02e+03	1.44e+02	
Cyclic Alkenes	Methylcyclohexane	9.80e+01	1.40e+01	1.02e+03	1.44e+02	
Halogenated Alkanes	1,1,1-Trichloroethane	1.33e+02	1.50e+03	1.52e+02	1.23e+02	
n-chain Alkanes	n-Hexane	8.60e+01	1.30e+01	1.06e+03	1.20e+02	
Branched Alkanes	n-Hexane	8.60e+01	1.30e+01	1.06e+03	1.20e+02	
Branched Alkenes/Alkynes	n-Hexane	8.60e+01	1.30e+01	1.06e+03	1.20e+02	
Ethers	Ethyl ether	7.40e+01	6.90e+04	9.50e+00	4.42e+02	
Unclassified Hydrocarbons	-	-	-	-	-	
Methylated Naphthalenes	TCL PAHs	1.08e+02	3.00e+04	5.00e+02	2.40e-01	
Unclassified PNAs	-	-	-	-	-	
Phthalates	Phthalic anhydride	1.48e+02	6.17e+03	3.60e+01	2.00e-04	
Methylated Phenols	Methyl phenols	1.08e+02	3.00e+04	5.00e+02	2.40e-01	
Unclassified Phenols	-	-	-	-	-	
Methylated Ketones	Acetone	5.80e+01	1.00e+06	2.20e+00	2.70e+02	
Simple Ketones	2-Butanone	7.20e+01	2.68e+05	4.50e+00	7.75e+01	
Cyclic Ketones	Isophorone	1.38e+02	1.20e+04	2.49e+01	3.80e-01	
Unclassified Ketones	-	-	-	-	-	
Diols	Ethylene glycol	6.20e+01	1.00e+06	2.20e+00	5.00e-02	
Simple Alcohols	1-Butanol	7.40e+01	9.10e+01	3.65e+02	4.40e+00	
Cyclic Alcohols	Benzyl alcohol	1.08e+02	4.00e+04	1.30e+01	1.00e+00	
Oxygenated Alcohols	Ethyl glycol monobutyl ethe	1.18e+02	5.00e+04	1.10e+01	6.00e-01	
Unclassified Alcohols	-	-	-	-	-	
Cyclic Acids	Benzoic acid	1.22e+02	2.90e+03	5.40e+01	9.50e+01	c
Non-Cyclic Acids	Acrylic acid	7.20e+01	1.00e+06	2.20e+00	3.20e+00	
Unclassified Acids	-	-	-	-	-	

Table 7-14

SUMMARY OF PHYSICAL AND CHEMICAL PROPERTIES OF CHEMICALS OF POTENTIAL CONCERN

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

	COMPOUND	MW (g/mole)	Solubility (mg/L)	Koc (ml/g)	VP (mm Hg)
Amines	Caprolactam	1.13e+02	1.00e+06	2.20e+00	1.00e-03
PCBs	TCL Aroclors	3.28e+02	3.10e-02	5.30e+05	7.70e-05
Furans	Tetrahydrofuran	7.20e+01	1.00e+06	2.20e+00	1.31e+02
Unclassified	-	-	-	-	-

TIC FOOTNOTES
a = value unavailable, estimated using butylbenzylphthalate
b = value unavailable, estimated using 2,4-dichlorophenol
c = value unavailable, estimated using benzene
d = value unavailable, estimated using 2-naphthylamine
e = value unavailable, estimated using DDT
f = value unavailable, estimated using dieldrin
g = value unavailable, estimated using diphenylamine
h = value unavailable, estimated using diphenyl ether

Definitions of chemical properties:

Water Solubility is the maximum concentration of a chemical that dissolves in pure water at a specific temperature and pH. Values are given for a neutral pH and a temperature range of 20 degrees C. The rate at which a chemical is leached from a waste by infiltrating precipitation is a function of its solubility in water. The more soluble compounds are expected to be leached much more readily and rapidly than less soluble chemicals. The water solubilities presented in the literature indicate that, in general, the volatile organic chemicals are more water soluble than the many semivolatile organic compounds (e.g., PAHs, PCBs).

Vapor pressure (VP) provides an indication of the rate at which a chemical in its pure state volatilizes. Values are given for a temperature range of 20 to 30 degrees C. VP is of primary significance where environmental interfaces such as surface soil/air and surface water/air occur. Volatilization is not as important when evaluating groundwater and subsurface soils. Chemicals with higher vapor pressures are expected to enter the atmosphere more readily than chemicals with lower vapor pressures. Vapor pressures for monocyclic aromatic (toluene) and chlorinated aliphatics (TCE) are generally many times higher than vapor pressure for phthalate esters (bis(2-ethylhexyl)phthalate), polynuclear aromatic hydrocarbons (PAHs), and pesticides.

Organic Carbon Partition Coefficient (Koc) is a measure of the tendency for organics to be adsorbed by soil and sediment and is expressed as:

$$Koc = \frac{\text{mg chemical adsorbed/kg organic carbon}}{\text{mg chemical dissolved/liter of solution}}$$

The Koc is chemical specific and is largely independent of soil

properties. In general, the Koc is inversely related to its environmental mobility

Values were obtained from the following sources:

U.S. EPA Superfund Public Health Evaluation Manual (SPHEM), 1986

Verschueren, K. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Co., New York, 1983.

Weast, R.C. (ed) Handbook of Chemistry and Physics 54th Edition. CRC Press, Cleveland, 1973.

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TABLE 7-15

Exposure Pathway Analysis
American Chemical Services RI/FS
Griffith, Indiana

Potentially Exposed Population	Exposure Route, Medium and Exposure Point	Pathway Selected for Evaluation?	Reason for Selection or Exclusion
CURRENT LAND USE CONDITIONS			
Off-Site residents adjacent to Site.	Ingestion of groundwater from the upper aquifer.	No	Surveys performed at homes adjacent to the Site indicate those with wells in the shallow aquifer do not use them for drinking water; the municipal system is used.
Off-Site residents adjacent to Site.	Dermal contact and incidental ingestion of groundwater from the upper aquifer.	Yes	Some homes adjacent to the Site maintain wells in the upper aquifer and use the water for lawn care and gardening. If contaminated groundwater were to migrate to the off-Site wells, exposure may be possible for garden produce and subsequent human consumption. In addition, children may play in the water (e.g., in swimming pools) and become exposed dermally or through incidental ingestion. However, no testing was performed for these wells because they are not used for drinking water and because if contamination were found, it would be difficult to determine the source, in a region where there exists many industries. Also, the flow of groundwater in the upper aquifer is diverted towards the excavation near the active landfill and by the wetlands which surround the Site, both serving to control off-Site migration of contaminants. Nonetheless, if contaminants in the shallow aquifer migrate to off-Site locations, residents adjacent to the Site may occasionally be exposed, therefore, this pathway was included in the risk assessment.

Potentially Exposed Population	Exposure Route, Medium and Exposure Point	Pathway Selected for Evaluation?	Reason for Selection or Exclusion
Off-Site residents adjacent to Site.	Ingestion and/or other potential exposures to groundwater from the lower aquifer.	Yes	Eight private wells located in the deep aquifer were analyzed during the RI and had no detectable levels of contamination. The ACS and landfill facilities both maintain wells in the lower aquifer; the landfill facility uses their well for drinking water, the use of the well at ACS is for industrial purposes as well as drinking water. There is retardation of contaminant migration vertically due to the confining layer. The potential for exposure to the groundwater in the lower aquifer is considered to be low. Nonetheless, contaminants detected in the lower aquifer were assumed to migrate to off-Site locations where exposure may occur.
Off-Site residents adjacent to Site.	Inhalation of volatiles emissions released from subsurface contaminants.	Yes	The amount of VOCs eminating from the contaminated soils is expected to be low compared to that from the ACS facility and from the air in this region of heavy industry. No samples were taken in the field because of the difficulty in distinguishing air pollutant sources and anthropogenic background. It should be recognized that volatiles released from the Site may pose an exposure to off-Site residents. Predicting the amount of exposure quantitatively would be difficult given the current conditions. Nonetheless, an emission and dispersion model was used to estimate potential releases to air from subsurface contamination.
Off-Site residents adjacent to Site.	Inhalation of fugitive dusts emanating from surface contamination at Kapica/Pazmey.	Yes	There exist unvegetated areas of surface soil contamination at Kapica/Pazmey. These soils may be disturbed via wind erosion and disperse contaminated particulates to off-Site locations. The greatest impact is likely to be on-Site. A particulate erosion and dispersion model has been used to estimate exposure from this pathway.
Off-Site residents adjacent to Site.	Ingestion of garden vegetables and fruits.	No	This pathway was not considered to present substantial risk.
Off-Site residents adjacent to Site.	Fishing, hunting and trapping; terrestrial and aquatic species for consumption.	No	The wetlands do not support fish populations. Hunting and trapping are considered low potential exposure pathways because of small user groups.
Adolescents playing (trespassing) on-Site.	Inhalation of volatiles released from the Site.	Yes	Similar to off-Site residents, estimating exposure via this pathway under current conditions utilized an emissions and dispersion model.

Potentially Exposed Population	Exposure Route, Medium and Exposure Point	Pathway Selected for Evaluation?	Reason for Selection or Exclusion
Adolescents playing (trespassing) on-Site.	Inhalation of fugitive dusts at Kapica/Pazmey.	Yes	Wind erosion may contribute to the total exposure for a trespasser coming on-Site at Kapica/Pazmey.
Adolescents playing (trespassing) on-Site.	Incidental ingestion of, and dermal contact with, contaminated soils on-Site.	Yes	Surface contamination is evident at Kapica/Pazmey. Children playing (trespassing) on-Site at this location may be exposed occasionally via the pathways indicated. Other areas of the RI/FS Site where contaminated soils exist are covered with clean material and/or have extreme access limitations (i.e., ACS).
Adolescents playing (trespassing) on-Site.	Incidental ingestion of, and dermal contact with, contaminants detected in wetland surface water and sediments and in drainage ditches.	Yes	This pathway is evaluated to assess the risks associated with surface water and sediment. Contamination has been detected in these media.
On-Site workers at the ACS facility.	Direct contact with soils, sediments and lagoon waters.	No	Contaminated soils and sediments have been covered by clean cover material and/or building construction. The surface water in the lagoon has been analyzed and indicates low contamination. The lagoon is the only surface water feature on the Site. In addition, workers on-Site wear health and safety protection, and must comply with OSHA safety requirements.
On-Site workers at the ACS facility.	Inhalation of airborne contaminants emanating from the Site.	Fugitive Dusts - Yes Volatiles - Yes	Contaminated soils are covered by clean cover material effectively minimizing the potential for generation of contaminated fugitive dust. Volatiles released from subsurface soils to the ambient air may occur, however, exposure to volatiles released from operating processes is likely more substantial. Analysis of volatiles released from subsurface soils has not been performed because of the difficulty in obtaining meaningful estimates of exposure point concentrations given the contributions of pollutants to the air from the ACS facility and anthropogenic background. Nonetheless, emissions and dispersion models have been used to estimate release of volatile contaminants from subsurface materials to the air.
On-Site workers at the ACS facility.	Ingestion and/or other potential exposures to groundwater from the lower aquifer.	No	ACS maintains 4 wells in the deep aquifer, more than 300 ft below the ground surface, in bedrock.

TABLE 7-15
(continued)

Potentially Exposed Population	Exposure Route, Medium and Exposure Point	Pathway Selected for Evaluation?	Reason for Selection or Exclusion
POTENTIAL FUTURE LAND USE CONDITIONS			
Hypothetical resident living on-Site.	Ingestion of and dermal contact with groundwater from the upper aquifer. Inhalation of volatiles released while showering.	Yes	Hypothetical.
	Ingestion of and dermal contact with groundwater from the lower aquifer. Inhalation of volatiles released while showering.	Yes	Hypothetical.
	Dermal contact with and incidental ingestion of unearthed subsurface soils.	Yes	Hypothetical - to address risks associated with subsurface soils, it was assumed that contaminated subsurface soils are unearthed and present direct exposure potential to residents living on-Site.
	Direct contact with and incidental ingestion of sediments.	Yes	Similar exposure as current use scenario.
	Direct contact (dermal and incidental ingestion) with surface water.	Yes	Similar exposure as current use scenario.
	Inhalation of volatiles released to air on-Site.	Yes	24-hour/day exposure to volatiles.
	Inhalation of particulate released from unearthed subsurface soils.	No	Assume vegetative cover in residential setting minimizes this pathway; addressed under current use scenario.

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Table 7-16

SUMMARY OF CHEMICAL EXPOSURE POINT CONCENTRATIONS

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical of Potential Concern	Soil: Onsite Containment Area (mg/kg)	Soil: Still Bottoms Treatment Lagoon (mg/kg)	Soil: Offsite Containment Area (mg/kg)	Soil: Kapica Pazmey Surface (mg/kg)	Soil: Kapica Pazmey All Depths (mg/kg)	Soil: Sediment (mg/kg)	Ambient Air: Onsite VOC (mg/m3)	Ambient Air: Offsite VOC (mg/m3)	Ambient Air: Onsite Dust (mg/m3)	Ambient Air: Offsite Dust (mg/m3)	Groundwater: Upper Aquifer (mg/L)	Groundwater: Lower Aquifer (mg/L)	Groundwater: Surface Water (mg/L)
VOLATILES													
Chloromethane											6.80e-02		
Bromomethane													
Vinyl chloride			2.90e+00				6.78e-04	3.83e-05			7.20e-01		
Chloroethane	1.60e+04		2.00e+00		7.06e-03	1.16e-02	4.17e+01	2.36e+00			2.00e+00	4.40e-01	3.00e-02
Methylene chloride		3.80e+02	2.10e+02	2.00e-01	7.17e-02	2.58e-02	5.21e-02	2.94e-03	6.70e-10	1.84e-10	3.80e-01		
Acetone	3.51e+00	1.20e+01	1.71e+04	9.70e-01	8.70e+00		3.89e-01	2.20e-02	3.25e-09	8.92e-10	9.90e+01		3.80e-01
Carbon disulfide					3.00e-03		2.57e-06	1.45e-07					
1,1-Dichloroethene			3.90e+02		7.90e-01		1.75e-02	9.88e-04					
1,1-Dichloroethane	1.19e-02	2.20e+01	4.90e+02	1.50e-01			6.51e-03	3.68e-04	5.02e-10	1.38e-10	2.40e+00		2.00e-03
1,2-Dichloroethene (cis)	5.20e+00	3.20e+02	3.40e+01	7.60e+00	2.60e+01	5.60e-03	2.25e-02	1.27e-03	2.55e-08	6.99e-09	4.00e-01		3.00e-03
1,2-Dichloroethene (trans)													
Chloroform	1.48e+00	2.10e+03	2.80e+03	1.00e-02	1.00e-02	5.93e-03	1.04e-01	5.89e-03	3.35e-11	9.19e-12			
1,2-Dichloroethane	9.70e-01	4.00e+01	4.40e+02		1.70e-02		2.05e-03	1.16e-04					
2-Butanone	2.01e-01	5.30e+02	9.90e+04		9.00e+01	8.86e-03	5.62e-01	3.18e-02			2.20e+02		1.40e-01
1,1,1-Trichloroethane	1.31e+03	2.10e+04	1.50e+05	9.00e-03	5.60e-01	3.00e-03	1.20e+00	6.81e-02	3.01e-11	8.27e-12			
Carbon tetrachloride		3.60e+03					9.57e-02	5.41e-03					
Vinyl acetate													
Bromodichloromethane													
1,2-Dichloropropane	7.51e-01	2.20e+01	6.80e+01	1.90e-02	2.42e-02		2.74e-04	1.55e-05	6.36e-11	1.75e-11			
cis-1,3-Dichloropropene													
Trichloroethene	1.22e+01	1.70e+03	1.90e+04	1.70e+02	2.50e+02		7.31e-02	4.14e-03	5.69e-07	1.56e-07	4.50e-02		
Dibromochloromethane													
1,1,2-Trichloroethane	3.67e-02	8.10e+00	4.00e+02				7.83e-04	4.43e-05					
Benzene	3.61e+02	1.70e+02	1.50e+03	3.20e+00	2.30e+01	4.30e-01	1.74e-02	9.85e-04	1.07e-08	2.94e-09	1.00e+02		4.60e-01
trans-1,3-Dichloropropene													
Bromoform													
4-Methyl-2-pentanone	5.23e-01	1.50e+03	6.10e+04	2.70e+02	2.70e+02		2.19e-02	1.24e-03	9.04e-07	2.48e-07	5.40e+01	3.00e-03	4.90e-02
2-Hexanone			4.70e+01		3.90e-01		5.61e-06	3.17e-07			1.80e+00		
Tetrachloroethene	5.90e+03	1.60e+03	4.60e+04	7.90e+02	7.90e+02		4.97e-02	2.81e-03	2.65e-06	7.26e-07	2.00e-01		
1,1,2,2-Tetrachloroethane	3.90e+00		8.93e-03				8.99e-06	5.08e-07					
Toluene	7.93e+04	2.30e+04	1.30e+05	1.90e+04	1.90e+04	4.89e-02	1.03e+00	5.81e-02	6.36e-05	1.75e-05	2.30e+00		8.00e-03
Chlorobenzene	4.40e-02	2.00e-03	1.00e+03	6.20e+00	2.70e+01		6.89e-04	3.90e-05	2.08e-08	5.70e-09	9.60e-02		
Ethylbenzene	6.70e+03	8.40e+03	2.30e+04	4.30e+03	4.30e+03	1.31e-02	4.93e-02	2.79e-03	1.44e-05	3.95e-06	1.10e+00		5.40e-03
Styrene	6.20e+00	1.60e+02	3.10e+02	2.30e+01	2.60e+02		1.97e-03	1.12e-04	7.70e-08	2.11e-08			
Xylenes (mixed)	2.50e+04	9.40e+03	1.00e+05	2.30e+04	2.30e+04	1.60e-02	3.77e-01	2.13e-02	7.70e-05	2.11e-05	3.00e+00		3.50e-02
Xylenes (m,o)													
Xylenes (p)													
SEMIVOLATILES													
Phenol	4.32e-01	1.09e+02	5.12e+02	2.80e+01	1.43e+01	1.90e-01	1.78e-05	1.01e-06	9.38e-08	2.57e-08	2.40e-01		4.50e-02
bis(2-Chloroethyl) ether		1.10e+02	2.00e+02			3.61e-01	2.05e-05	1.16e-06			2.50e-01	1.20e-02	7.70e-02
2-Chlorophenol		1.30e-01					1.98e-09	1.12e-10					

Table 7-16

SUMMARY OF CHEMICAL EXPOSURE POINT CONCENTRATIONS

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical of Potential Concern	Soil						Ambient Air				Groundwater		
	Onsite Containment Area	Still Bottoms Treatment Lagoon	Offsite Containment Area	Kapica Pazmey Surface	Kapica Pazmey All Depths	Sediment	Onsite VOC	Offsite VOC	Onsite Dust	Offsite Dust	Upper Aquifer	Lower Aquifer	Surface Water
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/L)	(mg/L)	(mg/L)
1,3-Dichlorobenzene	2.30e-01	3.85e-01					2.20e-07	1.25e-08			3.00e-03		
1,4-Dichlorobenzene	5.63e-01	2.39e+00	5.52e+00				6.95e-07	3.93e-08			1.00e-02		
Benzyl Alcohol		6.88e-01	3.40e+01				1.86e-04	1.05e-05					
1,2-Dichlorobenzene	9.90e+00	7.00e+01	1.20e+02	5.90e-01	5.90e-01		1.72e-05	9.74e-07	1.98e-09	5.42e-10	3.30e-02		
2-Methylphenol	1.58e+00	1.50e+01	6.78e+01	4.70e+00	4.70e+00		1.93e-06	1.09e-07	1.57e-08	4.32e-09	3.80e-02		5.00e-03
bis(2-Chloroisopropyl)ethe						5.77e-01					3.00e-01		2.90e-02
4-Methylphenol	2.51e+00	4.30e+01	2.10e+02	4.60e+00	4.60e+00	2.70e-01	1.33e-06	7.52e-08	1.54e-08	4.23e-09	2.20e+00		5.90e-01
N-Nitroso-di-n-dipropylami													
Hexachloroethane													
Nitrobenzene													
Isophorone		2.60e+03	3.60e+03	9.70e+01	9.70e+01		2.24e-04	1.27e-05	3.25e-07	8.92e-08	3.50e-02		5.00e-03
2-Nitrophenol													
2,4-Dimethylphenol	2.39e+00	1.42e+00	1.16e+02	4.90e+00	4.90e+00	3.62e-01	4.59e-07	2.60e-08	1.64e-08	4.50e-09	1.10e-01		1.08e-02
Benzoic Acid	4.90e-02	3.25e+01	1.17e+04		7.00e-01	1.20e+00	6.31e-02	3.57e-03			1.90e+00		8.31e-02
bis(2-Chloroethoxy)methane													
2,4-Dichlorophenol	2.25e-01	1.68e+00	2.00e-01				2.37e-08	1.34e-09					
1,2,4-Trichlorobenzene		1.44e+00	3.44e+01				5.08e-07	2.87e-08					
Naphthalene	9.00e+01	7.50e+02	2.40e+03	9.70e+01	9.70e+01	3.57e-01	4.41e-08	2.50e-09	3.25e-07	8.92e-08	7.10e-02		
4-Chloroaniline													
Hexachlorobutadiene		4.00e+01	1.50e+02				1.71e-05	9.70e-07					
4-Chloro-3-methylphenol		3.01e-01					4.50e-09	2.54e-10			5.00e-03		2.00e-03
2-Methylnaphthalene	5.50e+01	3.20e+02	9.90e+02	5.60e+01	5.60e+01	3.41e-01	4.64e-06	2.62e-07	1.88e-07	5.15e-08	2.70e-02		
Hexachlorocyclopentadiene													
2,4,6-Trichlorophenol		3.47e-01					9.39e-10	5.31e-11					
2,4,5-Trichlorophenol	2.13e-01	9.60e-02		1.70e-01	1.70e-01		2.52e-07	1.42e-08	5.69e-10	1.56e-10			
2-Chloronaphthalene		5.45e-01					6.83e-09	3.86e-10					
2-Nitroaniline													
Dimethylphthalate	3.50e+00	3.20e+02	5.22e+02	1.40e+00	5.84e+00		6.60e-07	3.73e-08	4.69e-09	1.29e-09			
Acenaphthylene	8.98e-01	3.30e+00	1.90e+00				1.98e-08	1.12e-09					
2,6-Dinitrotoluene			7.49e-01				6.92e-10	3.91e-11					
3-Nitroaniline													
Acenaphthene	2.06e+00	2.33e+00	1.80e+01	3.60e-01	7.10e-01		1.35e-09	7.65e-11	1.21e-09	3.31e-10			
2,4-Dinitrophenol													
4-Nitrophenol		1.52e+00	3.11e+00		6.60e+01		4.22e-07	2.39e-08					
Dibenzofuran		3.42e-01	4.16e+00	4.30e-01	6.40e-01	2.30e-01	1.54e-08	8.73e-10	1.44e-09	3.95e-10			
2,4-Dinitrotoluene					8.40e-01		5.97e-09	3.37e-10					
Diethylphthalate	4.70e-02	1.00e+02	2.80e+02	5.00e+00	5.00e+00		6.59e-08	3.72e-09	1.67e-08	4.60e-09	9.00e-03		
4-Chlorophenyl-phenylether													
Fluorene	2.32e+00	5.07e+00	3.10e+01	6.20e-01	7.60e-01	3.95e-01	9.88e-10	5.59e-11	2.08e-09	5.70e-10			
4-Nitroaniline													
4,6-Dinitro-2-methylphenol													
N-nitrosodiphenylamine		1.30e+01	5.30e+01	4.30e+00	4.30e+00		2.09e-10	1.18e-11	1.44e-08	3.95e-09			
4-Bromophenyl-phenylether		9.23e-01					3.38e-09	1.91e-10					
Hexachlorobenzene		7.16e-01	1.92e+00			1.40e-01	1.55e-12	8.74e-14					
Pentachlorophenol	1.60e-01	6.40e+01	1.80e+02	1.50e+00	1.60e+01	2.30e-01	2.15e-09	1.22e-10	5.02e-09	1.38e-09	3.00e-03		

Table 7-16

SUMMARY OF CHEMICAL EXPOSURE POINT CONCENTRATIONS

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical of Potential Concern	Soil						Ambient Air				Groundwater		
	Onsite Containment Area	Still Bottoms Treatment Lagoon	Offsite Containment Area	Kapica Pazmey Surface	Kapica Pazmey All Depths	Sediment	Onsite VOC	Offsite VOC	Onsite Dust	Offsite Dust	Upper Aquifer	Lower Aquifer	Surface Water
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/L)	(mg/L)	(mg/L)
Phenanthrene	4.26e+00	1.00e+01	4.30e+01	4.30e+00	4.80e+00	3.77e-01	3.72e-09	2.10e-10	1.44e-08	3.95e-09			
Anthracene	9.40e-02	9.53e-01	6.87e-01	6.60e-01	6.94e-01	1.00e-01	1.98e-10	1.12e-11	2.21e-09	6.07e-10			
Di-n-butylphthalate	1.16e+01	6.90e+02	3.40e+03	9.40e+01	9.40e+01	1.70e-01	1.22e-09	6.91e-11	3.15e-07	8.64e-08	2.00e-03		
Fluoranthene	7.93e-01	6.10e-01	1.68e+01	3.40e+00	6.00e+00	5.24e-01	3.20e-11	1.81e-12	1.14e-08	3.13e-09			
Pyrene	9.34e-01	1.70e+00	2.20e+01	2.30e+00	4.20e+00	5.00e-01	1.12e-11	6.33e-13	7.70e-09	2.11e-09			
Butylbenzylphthalate	2.27e+00	9.60e+02	1.60e+03	5.10e+01	5.10e+01	1.70e-01	1.25e+03	7.09e+01	1.71e-07	4.69e-08			
3,3'-Dichlorobenzidine													
Benzo(a)anthracene(c)	1.70e-01	3.21e-01	1.60e+01	2.40e+00	2.40e+00	4.57e-01	5.77e-14	3.26e-15	8.04e-09	2.21e-09			
Chrysene(c)	8.40e-02	2.96e-01	1.75e+01	1.30e+00	1.50e+00	4.29e-01	9.44e-15	5.34e-16	4.35e-09	1.20e-09			
bis(2-ethylhexyl)phthalate	1.40e+02	2.60e+03	1.40e+04	5.40e+02	5.40e+02	5.07e+00	4.02e+03	2.27e+02	1.81e-06	4.96e-07	5.00e-02		
Di-n-octyl Phthalate		1.95e+01	1.40e+02	3.80e+01	3.80e+01		2.83e+02	1.60e+01	1.27e-07	3.49e-08			
Benzo(b)fluoranthene(c)		3.20e-01	1.50e+01	3.90e+00	3.90e+00	6.24e-01	2.02e-12	1.14e-13	1.31e-08	3.59e-09			
Benzo(k)fluoranthene(c)		3.20e-01	1.50e+01	3.90e+00	3.90e+00	6.36e-01	2.06e-12	1.17e-13	1.31e-08	3.59e-09			
Benzo(a)pyrene(c)		2.15e-01	2.24e+00	1.40e+00	1.40e+00	4.18e-01	8.13e-15	4.60e-16	4.69e-09	1.29e-09			
Ideno(1,2,3-cd)pyrene(c)			8.17e-01	8.20e-01	8.20e-01	3.24e-01	8.11e-17	4.58e-18	2.75e-09	7.54e-10			
Dibenz(a,h)anthracene(c)			1.90e-01	2.70e-01	2.70e-01	2.00e-01	2.66e-17	1.50e-18	9.04e-10	2.48e-10			
Benzo(g,h,i)perylene			6.23e-01	1.10e+00	1.10e+00	3.59e-01	1.12e-16	6.33e-18	3.68e-09	1.01e-09			
Total-Carcinogenic PAHs	2.54e-01	1.47e+00	6.68e+01	1.40e+01	1.42e+01	3.09e+00	4.16e-12	2.35e-13	4.69e-08	1.29e-08			
PESTICIDE/PCB													
alpha-BHC			1.83e-01				2.68e-13	1.52e-14					
beta-BHC			5.21e-01				8.57e-15	4.85e-16					
delta-BHC													
gamma-BHC (Lindane)		1.10e+00					4.67e-03	2.64e-04					
Heptachlor													
Aldrin			8.98e-01	8.80e-02	2.28e-02		5.56e-13	3.15e-14	2.95e-10	8.09e-11			
Heptachlor epoxide			6.35e-03			2.66e-02	6.94e-14	3.92e-15					
Endosulfan I	5.95e-03	1.20e+00		4.20e-02	2.04e-02		1.09e-12	6.15e-14	1.41e-10	3.86e-11			
Dieldrin													
4,4'-DDE			4.50e-01				1.05e-13	5.95e-15					
Endrin													
Endosulfan II													
4,4'-DDD			1.35e+00	1.50e-01	1.08e-01		2.79e-13	1.58e-14	5.02e-10	1.38e-10			
Endosulfan sulfate													
4,4'-DDT	1.59e-02	2.80e+01	8.91e-01				2.42e-11	1.37e-12					
Methoxychlor													
Endrin ketone		2.60e-01					7.36e-15	4.16e-16					
alpha-Chlordane													
gamma-Chlordane													
Toxaphene													
Total - PCBs	8.80e+00	1.58e+02	4.51e+02	3.29e+02	9.35e+01	4.11e+00	3.15e-08	1.78e-09	1.10e-06	3.02e-07	2.96e-02		8.40e-04
METALS	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)									(mg/L)

Table 7-16

SUMMARY OF CHEMICAL EXPOSURE POINT CONCENTRATIONS

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical of Potential Concern	Soil						Ambient Air				Groundwater		
	Onsite Containment Area	Still Bottoms Treatment Lagoon	Offsite Containment Area	Kapica Pazmey Surface	Kapica Pazmey All Depths	Sediment	Onsite VOC	Offsite VOC	Onsite Dust	Offsite Dust	Upper Aquifer	Lower Aquifer	Surface Water
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/L)	(mg/L)	(mg/L)
Aluminum				1.32e+04	1.04e+04				4.42e-08	1.21e-08	2.80e-01		9.60e-01
Antimony		4.66e+01	1.52e+02	8.48e+01	8.48e+01				2.84e-10	7.80e-11			
Arsenic											4.32e-02	0.0086	4.50e-02
Barium	7.18e+01	8.85e+02	4.90e+02	5.73e+03	5.73e+03	7.12e-02			1.92e-08	5.27e-09	1.84e+00	0.31	3.22e-01
Beryllium											2.50e-04		2.69e-04
Cadmium (water)											3.10e-03		7.20e-04
Cadmium (food/soil)		1.18e+02	1.70e+03	1.74e+02	1.74e+02				5.83e-10	1.60e-10			
Calcium	3.83e+04	5.71e+04	5.05e+04	1.57e+05	1.57e+05	5.62e+01			5.26e-07	1.44e-07	1.04e+03	151	3.34e+02
Chromium III													
Chromium VI	5.09e+01	1.10e+03	5.26e+02	3.08e+03	3.08e+03	4.54e-02			1.03e-08	2.83e-09	3.90e-03		2.80e-02
Cobalt	8.10e+00	2.68e+01	1.65e+01	1.48e+02	1.48e+02				4.96e-10	1.36e-10			
Copper		2.44e+02	1.67e+03	4.47e+03	4.47e+03	9.44e-02			1.50e-08	4.11e-09		0.02	1.90e-02
Iron			6.18e+03	7.01e+04	6.71e+04				2.35e-07	6.44e-08	2.18e+02	3.16	1.43e+01
Lead		6.30e+03		1.62e+04	1.62e+04				5.43e-08	1.49e-08	4.60e-03		2.38e-02
Magnesium	1.33e+04	1.03e+04		3.69e+04	3.69e+04	1.86e+01			1.24e-07	3.39e-08	7.88e+01	53.1	6.17e+01
Manganese			2.66e+02	1.54e+03	1.54e+03				5.16e-09	1.42e-09	4.25e+00	0.866	1.85e+00
Mercury	1.01e+00	1.10e+01	9.17e+00	9.50e+00	9.50e+00	1.22e-03			3.18e-11	8.73e-12	1.70e-03	0.00047	
Nickel		1.33e+01	2.91e+01	1.97e+02	1.97e+02	2.06e-02			6.60e-10	1.81e-10	5.30e-02		8.00e-02
Potassium			2.33e+03								9.58e+01	3.42	3.00e+01
Selenium	2.80e-01	1.15e+00	1.00e+01	1.72e+01	1.72e+01	5.73e-04			5.76e-11	1.58e-11	6.20e-03	0.002	1.83e-03
Silver			9.23e+00	2.48e+01	6.43e+01				8.31e-11	2.28e-11			
Sodium											4.44e+02	96.2	8.23e+01
Thallium											4.00e-03		
Vanadium				4.77e+01	4.05e+01	3.45e-02			1.60e-10	4.39e-11	2.59e-02	0.0024	
Zinc		2.28e+03	1.34e+03	1.58e+04	1.58e+04				5.29e-08	1.45e-08	8.86e-01	0.022	8.80e-02
Cyanide	2.43e+00	1.59e+01	5.99e+00	6.62e+01	6.62e+01				2.22e-10	6.09e-11	1.00e-02		
TIC Groupings													
Propyl Benzenes	2.00e+01	3.80e+02	5.20e+02	1.20e-01	1.30e+02		5.81e-04	3.29e-05	4.02e-10	1.10e-10	6.00e-02		
Propenyl Benzenes		6.70e+01	1.20e+02	3.20e+01	3.20e+01		1.56e-04	8.85e-06	1.07e-07	2.94e-08	6.00e-03		
Ethyl Methyl Benzenes	1.10e+02	1.90e+03	5.90e+03	3.70e+02	8.80e+02		3.94e-03	2.23e-04	1.24e-06	3.40e-07	1.30e-01		
Diethyl Benzenes	2.80e+01	5.10e+02	2.20e+03				8.90e-04	5.03e-05			7.80e-02		
Methyl Propyl Benzenes	1.40e+00	1.10e+03	9.40e+02		9.80e+01		8.19e-04	4.63e-05			1.40e-02		
Methyl Ethenyl Benzenes	1.40e+00				4.40e+01		1.97e-04	1.11e-05			1.80e-02		
Methyl Phenyl Benzenes		3.10e+01					1.82e-09	1.03e-10			2.40e-02		
Trimethyl Benzenes	3.90e+02	1.80e+03	9.80e+03	2.20e+02	5.20e+02		7.27e-02	4.11e-03	7.37e-07	2.02e-07	6.40e-01		
Dimethyl ethyl benzenes	2.00e+02	1.90e+03	1.70e+03	6.00e+01	7.90e+01		3.32e-03	1.88e-04	2.01e-07	5.52e-08	4.00e-01		
Tetramethyl Benzenes	1.10e-02	1.30e+03	2.90e+02	6.80e+01	6.80e+01		3.03e-02	1.71e-03	2.28e-07	6.25e-08	1.30e-01		
Oxygenated Benzenes	2.60e+02	1.00e+02	3.50e+03				2.05e-02	1.16e-03			9.00e-02		
Halogenated Benzenes											1.20e-01		
Nitrogenated Benzenes		2.50e+02	9.90e+02				1.00e-05	5.66e-07					
Cyclic alkanes	5.30e+01	5.80e+03	9.90e+01	5.20e+01	5.20e+01		2.24e-01	1.27e-02	1.74e-07	4.78e-08	7.60e-02		
Cyclic Alkenes	3.70e+02	1.20e+03	4.70e+02				4.63e-02	2.62e-03			6.30e-02		
Halogenated Alkanes	2.20e+00	4.80e+03			2.10e-01	5.80e+00	1.74e-01	9.85e-03			7.80e-02		

Table 7-16

SUMMARY OF CHEMICAL EXPOSURE POINT CONCENTRATIONS

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical of Potential Concern	Soil						Ambient Air				Groundwater		
	Onsite Containment Area	Still Bottoms Treatment Lagoon	Offsite Containment Area	Kapica Pazmey Surface	Kapica Pazmey All Depths	Sediment	Onsite VOC	Offsite VOC	Onsite Dust	Offsite Dust	Upper Aquifer	Lower Aquifer	Surface Water
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/L)	(mg/L)	(mg/L)
n-chain Alkanes	3.20e+02	2.30e+04	1.30e+03	2.90e+02	2.90e+02		8.08e-01	4.57e-02	9.71e-07	2.67e-07			1.30e-01
Branched Alkanes	1.80e+02	5.90e+03	2.30e+03	3.20e+02	3.20e+02	1.00e+00	2.07e-01	1.17e-02	1.07e-06	2.94e-07	7.20e-01		
Branched Alkenes/Alkynes	6.10e+02	2.60e+03	1.40e+02		2.10e-01		9.13e-02	5.16e-03					
Ethers			9.20e+01				2.91e-03	1.65e-04			1.50e+00	3.60e-02	1.40e-02
Methylated Naphthalenes	8.40e+00	5.70e+01	7.30e+02				1.13e-08	6.36e-10			7.40e-02		
Phthalates		5.80e+01	1.20e+03			2.20e+00	1.27e-08	7.16e-10					
Methylated Phenols	1.10e+00	7.20e-01	5.40e+01			2.20e+00	7.46e-07	4.22e-08			2.00e-01		9.00e-02
Methylated Ketones		1.60e+00	1.00e+02	1.80e-01	1.80e-01	2.50e-02	2.28e-03	1.29e-04	6.03e-10	1.65e-10	7.00e-03		6.00e-03
Simple Ketones		7.70e-01	9.10e-01		8.10e-01		1.25e-04	7.06e-06			8.60e-02		
Cyclic Ketones	6.20e-01	1.60e+02	8.00e+01				1.38e-05	7.79e-07			9.20e-02		
Diols		3.00e+00	2.60e+03				1.17e-05	6.59e-07			1.80e+00	2.70e-01	1.40e-02
Simple Alcohols	2.30e-03	5.50e+01	4.80e+02		2.40e-02		1.51e-04	8.56e-06			4.00e-02		
Cyclic Alcohols		1.50e+01	1.30e+01		1.50e+00	8.70e-01	3.91e-06	2.21e-07			2.00e+00	2.50e+00	4.20e-01
Oxygenated Alcohols		2.80e+02	2.40e+03				8.20e-05	4.63e-06			2.20e+00	1.00e+00	3.60e-02
Cyclic Acids			7.80e+01	1.90e+01	1.90e+01		3.03e-03	1.72e-04	6.36e-08	1.75e-08	4.20e-01	4.00e-01	1.90e-01
Non-Cyclic Acids	2.20e+02	3.10e+02	6.30e+04	2.60e+02	2.60e+02	1.40e+00	1.63e-02	9.23e-04	8.71e-07	2.39e-07	1.10e+00		2.00e-01
Amines	1.70e+02	1.40e+02	5.30e+02				7.65e-08	4.32e-09			3.20e-02		6.00e-02
PCBs	7.50e+00					4.70e+00	1.87e-10	1.05e-11					
Furans	1.40e+00	4.40e-01	3.10e-01			1.60e-01	1.04e-04	5.87e-06			1.50e-01		7.50e-02

Exposure Point Concentrations for each chemical are either the 95 % UCLM or
the maximum detected concentration, whichever is smaller, for each area and medium,
based on the criteria of being positively detected at least once,
at a concentration greater than background levels and blank sample levels.
all groundwater values are maximum concentrations per U.S.EPA (This table is a summary
(c) indicates a carcinogenic PAH.

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Table 7-17

CHEMICAL TOXICITY VALUES AND ABSORPTION ESTIMATES
USED FOR RISK QUANTIFICATION

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical	Chronic Reference Dose (mg/kg-d)					Slope Factor $(mg/kg\text{-}d)^{-1}$					Chemical Absorption Estimate (unitless)		Dermal Permeability Constant
	Inhalation		Oral		Dermal	Inhalation		Oral		Dermal	Oral	Dermal	(cm/hr)
VOLATILES													
Chloromethane	ND	D	ND		ND	6.3e-03	H*	1.3e-02	H	2.6e-02	0.50	0.30	1.0e+00
Bromomethane	6.0e-03	H*	1.4e-03	I	7.0e-04	ND		ND		ND	0.50	0.30	1.0e+00
Vinyl chloride	ND		ND		ND	3.0e-01	6	1.9e+00	H*	1.9e+00	1.00	0.30	1.0e+00
Chloroethane	1.0e+00	I*	ND		ND	ND	D	ND		ND	0.50	0.30	8.0e-03
Methylene chloride	3.0e+00	H*	6.0e-02	I	4.8e-02	1.4e-02		7.5e-03	H	9.4e-03	0.80	0.30	1.0e+00
Acetone	ND		1.0e-01	I	9.5e-02	ND		ND		ND	0.95	0.30	1.0e+00
Carbon disulfide	1.0e-02	H*	1.0e-01	H	5.0e-02	ND		ND		ND	0.50	0.30	5.3e-01
1,1-Dichloroethene	ND	2	9.0e-03	I	9.0e-03	1.2e+00	H	6.0e-01	I	6.0e-01	1.00	0.30	1.0e+00
1,1-Dichloroethane	1.0e-01	H	1.0e-01	H	1.0e-01	ND		ND		ND	1.00	0.30	1.0e+00
1,2-Dichloroethene (cis)	ND		1.0e-02	H	9.5e-03	ND		ND		ND	0.95	0.30	1.0e+00
1,2-Dichloroethene (trans)	ND		2.0e-02	H	1.9e-02	ND		ND		ND	0.95	0.30	1.0e+00
Chloroform	ND	2	1.0e-02	I	1.0e-02	8.1e-02	H	6.1e-03	I	6.1e-03	1.00	0.30	1.0e+00
1,2-Dichloroethane	ND		ND		ND	9.1e-02	H	9.1e-02	I	9.1e-02	1.00	0.30	1.0e+00
2-Butanone	9.0e-02	H2	5.0e-02	I	2.5e-02	ND		ND		ND	0.50	0.30	5.0e-03
1,1,1-Trichloroethane	3.0e-01	H2	9.0e-02	I2	9.0e-02	ND		ND		ND	1.00	0.30	1.0e+00
Carbon tetrachloride	ND		7.0e-04	I	6.0e-04	1.3e-01	H	1.3e-01	I	1.5e-01	0.85	0.30	1.0e+00
Vinyl acetate	2.0e-01	I*	1.0e+00	H*	5.0e-01	ND		ND		ND	0.50	0.30	1.0e+00
Bromodichloromethane	ND		2.0e-02	I	1.0e-02	ND		1.3e-01	I	2.6e-01	0.50	0.30	1.0e+00
1,2-Dichloropropane	ND	D	ND		ND	ND		6.8e-02	H	1.4e-01	0.50	0.30	1.0e+00
cis-1,3-Dichloropropene	2.0e-02	H*	3.0e-04	H	1.5e-04	1.3e-01	H	1.8e-01	H	3.6e-01	0.50	0.30	1.0e+00
Trichloroethene	ND		ND		ND	1.7e-02	H	1.1e-02	H	1.1e-02	1.00	0.30	1.0e+00
Dibromochloromethane	ND		2.0e-02	I	1.0e-02	ND		8.4e-02	I	1.7e-01	0.50	0.30	1.0e+00
1,1,2-Trichloroethane	ND		4.0e-03	I	2.0e-03	5.7e-02	H	5.7e-02	I	1.1e-01	0.50	0.30	1.0e+00
Benzene	ND		ND		ND	2.9e-02	H	2.9e-02	I	5.8e-02	0.50	0.30	1.1e-01
trans-1,3-Dichloropropene	2.0e-02	H*	3.0e-04	H	1.5e-04	1.3e-01	H	1.8e-01	H	3.6e-01	0.50	0.30	1.0e+00
Bromoform	ND		2.0e-02	I	1.0e-02	3.9e-03	H	7.9e-03	I	1.6e-02	0.50	0.30	1.0e+00
4-Methyl-2-pentanone	2.0e-02	H2	5.0e-02	H1	2.5e-02	ND		ND		ND	0.50	0.30	1.0e+00
2-Hexanone	ND	D	ND		ND	ND		ND		ND	0.50	0.30	1.0e+00
Tetrachloroethene	ND		1.0e-02	I	1.0e-02	3.3e-03	6	5.1e-02	H	5.1e-02	1.00	0.30	1.0e+00
1,1,2,2-Tetrachloroethane	ND		ND	2	ND	2.0e-01	H	2.0e-01	I	2.1e-01	0.95	0.30	1.0e+00
Toluene	2.0e+00	H*	2.0e-01	I*	2.0e-01	ND		ND		ND	1.00	0.30	1.0e+00
Chlorobenzene	5.0e-03	H2	2.0e-02	I	6.0e-03	ND		ND		ND	0.30	0.30	1.0e+00
Ethylbenzene	1.0e+00	I*	1.0e-01	I	5.0e-02	ND		ND		ND	0.50	0.30	1.4e+00
Styrene	ND		2.0e-01	I2	1.8e-01	2.0e-03	H	3.0e-02	H	3.3e-02	0.90	0.30	6.7e-01
Xylenes (mixed)	3.0e-01	H2*	2.0e+00	I	1.0e+00	ND		ND		ND	0.50	0.30	1.0e+00
Xylenes (m,o)	2.0e-01	H	2.0e+00	H	1.0e+00	ND		ND		ND	0.50	0.30	1.0e+00
Xylenes (p)	3.0e-01	H*	ND		ND	ND		ND		ND	0.50	0.30	1.0e+00

Table 7-17

CHEMICAL TOXICITY VALUES AND ABSORPTION ESTIMATES
USED FOR RISK QUANTIFICATION

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical	Chronic Reference Dose (mg/kg-d)					Slope Factor (mg/kg-d)$^{-1}$			Chemical Absorption Estimate (unitless)		Dermal Permeability Constant
	Inhalation		Oral		Dermal	Inhalation	Oral	Dermal	Oral	Dermal	(cm/hr)
SEMIVOLATILES											
Phenol	ND		6.0e-01	I	5.4e-01	ND	ND	ND	0.90	0.30	8.2e-03
bis(2-Chloroethyl) ether	ND		ND		ND	1.1e+00 I	1.1e+00 I	2.2e+00	0.50	0.30	5.0e-03
2-Chlorophenol	ND		5.0e-03	I	2.5e-03	ND	ND	ND	0.50	0.30	3.3e-02
1,3-Dichlorobenzene	ND	D	ND		ND	ND	ND	ND	0.50	0.30	5.0e-03
1,4-Dichlorobenzene	7.0e-01	H*	ND		ND	ND	2.4e-02 H	2.4e-02	1.00	0.30	5.0e-03
Benzyl Alcohol	ND		3.0e-01	H	1.5e-01	ND	ND	ND	0.50	0.30	5.0e-03
1,2-Dichlorobenzene	4.0e-02	H	9.0e-02	I	4.5e-02	ND	ND	ND	0.50	0.30	5.0e-03
2-Methylphenol	ND		5.1e-02	I	4.1e-02	ND	ND	ND	0.80	0.30	1.6e-02
bis(2-Chloroisopropyl)ether	ND		4.0e-02	H	2.0e-02	ND	ND	ND	0.50	0.30	5.0e-03
4-Methylphenol	ND		5.0e-02	I	4.0e-02	ND	ND	ND	0.80	0.30	1.8e-02
N-Nitroso-di-n-dipropylamine	ND		ND		ND	ND	7.0e+00 I	1.4e+01	0.50	0.30	5.0e-03
Hexachloroethane	ND		1.0e-03	I	5.0e-04	1.4e-02 I	1.4e-02 I	2.8e-02	0.50	0.30	5.0e-03
Nitrobenzene	2.0e-03	H2*	5.0e-04	I	2.5e-04	ND	ND	ND	0.50	0.30	5.0e-03
Isophorone	ND		2.0e-01	I	1.0e-01	ND	4.1e-03 I*	8.2e-03	0.50	0.30	5.0e-03
2-Nitrophenol	ND		ND		ND	ND	ND	ND	0.50	0.30	1.1e-01
2,4-Dimethylphenol	ND		2.0e-02	I	1.0e-02	ND	ND	ND	0.50	0.30	1.1e-01
Benzoic Acid	ND		4.0e+00	I	3.0e+00	ND	ND	ND	0.75	0.30	5.0e-03
bis(2-Chloroethoxy)methane	ND		ND		ND	ND	ND	ND	0.50	0.30	5.0e-03
2,4-Dichlorophenol	ND		3.0e-03	I	1.5e-03	ND	ND	ND	0.50	0.30	6.0e-02
1,2,4-Trichlorobenzene	3.0e-03	H	1.3e-03	H1	6.6e-04	ND	ND	ND	0.50	0.30	5.0e-03
Naphthalene	ND		4.0e-03	H2	3.4e-03	ND	ND	ND	0.84	0.30	5.0e-03
4-Chloroaniline	ND		4.0e-03	I	2.0e-03	ND	ND	ND	0.50	0.30	5.0e-03
Hexachlorobutadiene	ND		2.0e-03	I	1.0e-03	7.8e-02 I	7.8e-02 I	1.6e-01	0.50	0.30	5.0e-03
4-Chloro-3-methylphenol	ND		ND		ND	ND	ND	ND	0.50	0.30	5.5e-02
2-Methylnaphthalene	ND		ND		ND	ND	ND	ND	0.50	0.30	5.0e-03
Hexachlorocyclopentadiene	2.0e-05	H	7.0e-03	I	3.5e-03	ND	ND	ND	0.50	0.30	5.0e-03
2,4,6-Trichlorophenol	ND	2	ND		ND	1.1e-02 I	1.1e-02 I	2.2e-02	0.50	0.30	5.9e-01
2,4,5-Trichlorophenol	ND	2	1.0e-01	I	5.0e-02	ND	ND	ND	0.50	0.30	5.9e-01
2-Chloronaphthalene	ND		8.0e-02	I	4.0e-02	ND	ND	ND	0.50	0.30	5.0e-03
2-Nitroaniline	ND	D	ND		ND	ND	ND	ND	0.50	0.30	5.0e-03
Dimethylphthalate	ND	1	1.0e+00	H	5.0e-01	ND	ND	ND	0.50	0.30	5.0e-03
Acenaphthylene	ND	D	ND	1	ND	ND	ND	ND	0.50	0.30	5.0e-03
2,6-Dinitrotoluene	ND	D	ND		ND	ND	6.8e-01 H	1.4e+00	0.50	0.30	5.0e-03
3-Nitroaniline	ND	D	ND		ND	ND	ND	ND	0.50	0.30	5.0e-03
Acenaphthene	ND		6.0e-02	I	3.0e-02	ND	ND	ND	0.50	0.30	5.0e-03
2,4-Dinitrophenol	ND		2.0e-03	I	1.0e-03	ND	ND	ND	0.50	0.30	3.2e-03
4-Nitrophenol	ND	D	ND		ND	ND	ND	ND	0.50	0.30	5.6e-03
Dibenzofuran	ND	D	ND		ND	ND	ND	ND	0.50	0.30	5.0e-03

Table 7-17

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USED FOR RISK QUANTIFICATION

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical	Chronic Reference Dose (mg/kg-d)						Slope Factor (mg/kg-d)$^{-1}$						Chemical Absorption Estimate (unitless)		Dermal Permeability Constant
	Inhalation		Oral		Dermal		Inhalation		Oral		Dermal		Oral	Dermal	(cm/hr)
2,4-Dinitrotoluene	ND	D1	ND		ND		ND		6.8e-01	H1	1.4e+00		0.50	0.30	5.0e-03
Diethylphthalate	ND		8.0e-01	I	4.0e-01		ND		ND		ND		0.50	0.30	1.1e-05
4-Chlorophenyl-phenylether	ND		ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
Fluorene	ND		4.0e-02	I	2.0e-02		ND		ND		ND		0.50	0.30	5.0e-03
4-Nitroaniline	ND	D	ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
4,6-Dinitro-2-methylphenol	ND	D	ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
N-nitrosodiphenylamine	ND	D	ND		ND		ND		4.9e-03	I	5.0e-03		0.98	0.30	5.0e-03
4-Bromophenyl-phenylether	ND	D	ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
Hexachlorobenzene	ND		8.0e-04	I	4.0e-04		1.6e+00	H	1.6e+00	I	3.2e+00		0.50	0.30	6.4e-04
Pentachlorophenol	ND		3.0e-02	I	2.7e-02		ND		1.2e-01	I*	1.3e-01		0.90	0.30	5.0e-03
Phenanthrene	ND	D	ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
Anthracene	ND		3.0e-01	I	1.5e-01		ND		ND		ND		0.50	0.30	5.0e-03
Di-n-butylphthalate	ND	1	1.0e-01	I	9.0e-02		ND		ND		ND		0.90	0.30	2.3e-06
Fluoranthene	ND		4.0e-02	I	2.0e-02		ND		ND		ND		0.50	0.30	5.0e-03
Pyrene	ND		3.0e-02	I	1.5e-02		ND		ND		ND		0.50	0.30	5.0e-03
Butylbenzylphthalate	ND		2.0e-01	I	1.8e-01		ND		ND		ND		0.90	0.30	5.0e-03
3,3'-Dichlorobenzidine	ND		ND		ND		ND		4.5e-01	I	9.0e-01		0.50	0.30	5.0e-03
Benzo(a)anthracene	ND		ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
Chrysene	ND	D	ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
bis(2-ethylhexyl)phthalate	ND		2.0e-02	I	5.0e-03		ND		1.4e-02	I	5.6e-02		0.25	0.30	5.7e-06
Di-n-octyl Phthalate	ND		2.0e-02	H	1.0e-02		ND		ND		ND		0.50	0.30	5.0e-03
Benzo(b)fluoranthene	ND		ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
Benzo(k)fluoranthene	ND		ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
Benzo(a)pyrene	ND		ND		ND		ND	H	ND	H	ND		0.50	0.30	5.0e-03
Ideno(1,2,3-cd)pyrene	ND		ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
Dibenz(a,h)anthracene	ND		ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
Benzo(g,h,i)perylene	ND		ND		ND		ND		ND		ND		0.50	0.30	5.0e-03
Total Carcinogenic PAHs	ND		ND		ND		6.1e+00	H7	1.2e+01	H7	2.3e+01		0.50	0.30	5.0e-03
PESTICIDE/PCB															
alpha-BHC	ND		ND		ND		6.3e+00	H	6.3e+00	I	1.3e+01		0.50	0.30	1.4e-02
beta-BHC	ND		ND		ND		1.8e+00	H	1.8e+00	I	3.6e+00		0.50	0.30	1.4e-02
delta-BHC	ND	D	ND		ND		ND		ND		ND		0.50	0.30	ND
gamma-BHC (Lindane)	ND		3.0e-04	I	3.0e-04		ND		1.3e+00	H	1.3e+00		1.00	0.30	1.3e-02
Heptachlor	ND		5.0e-04	I	3.5e-04		4.5e+00	H	4.5e+00	I	6.4e+00		0.70	0.30	ND
Aldrin	ND		3.0e-05	I	1.5e-05		1.7e+01	H	1.7e+01	I	3.4e+01		0.50	0.30	1.5e-03
Heptachlor epoxide	ND		1.3e-05	I*	6.5e-06		9.1e+00	H	9.1e+00	I	1.8e+01		0.50	0.30	1.5e-03
Endosulfan I	ND		5.0e-05	H	2.5e-05		ND		ND		ND		0.50	0.30	ND
Dieldrin	ND		5.0e-05	I	2.5e-05		1.6e+01	H	1.6e+01	I	3.2e+01		0.50	0.30	ND

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Remedial Investigation
Griffith, Indiana

Chemical	Chronic Reference Dose (mg/kg-d)			Slope Factor (mg/kg-d)$^{-1}$			Chemical Absorption Estimate (unitless)		Dermal Permeability Constant
	Inhalation	Oral	Dermal	Inhalation	Oral	Dermal	Oral	Dermal	(cm/hr)
4,4'-DDE	ND	ND	ND	ND	3.4e-01 I	3.8e-01	0.90	0.30	1.8e-01
Endrin	ND	3.0e-04 I	1.5e-04	ND	ND	ND	0.50	0.30	ND
Endosulfan II	ND	5.0e-05 H	2.5e-05	ND	ND	ND	0.50	0.30	ND
4,4'-DDD	ND	ND	ND	ND	2.4e-01 H	4.8e-01	0.50	0.30	3.0e-01
Endosulfan sulfate	ND	5.0e-05 H8	2.5e-05	ND	ND	ND	0.50	0.30	ND
4,4'-DDT	ND	5.0e-04 I	2.5e-04	3.4e-01 H	3.4e-01 I	6.8e-01	0.50	0.30	3.0e-01
Methoxychlor	ND	5.0e-03 I*	2.5e-03	ND	ND	ND	0.50	0.30	ND
Endrin ketone	ND	ND	ND	ND	ND	ND	0.50	0.30	ND
alpha-Chlordane	ND	6.0e-05 H	3.0e-05	1.3e+00 H	1.3e+00 H	2.6e+00	0.50	0.30	ND
gamma-Chlordane	ND	6.0e-05 H	3.0e-05	1.3e+00 H	1.3e+00 H	2.6e+00	0.50	0.30	ND
Toxaphene	ND	ND	ND	1.1e+00 H	1.1e+00 I	2.2e+00	0.50	0.30	ND
PCB	ND	ND	ND	ND	7.7e+00 H	2.6e+01	0.30	0.08	5.3e-01
METALS									
Aluminum	ND	ND	ND	ND	ND	ND	0.05	0.01	1.5e-03
Antimony	ND	4.0e-04 I	2.0e-05	ND	ND	ND	0.05	0.01	1.5e-03
Arsenic	ND	1.0e-03 H2	9.5e-04	5.0e+01 H	1.8e+00 6	1.9e+00	0.95	0.01	1.5e-03
Barium	1.0e-04 H	7.0e-02 I*	3.5e-03	ND	ND	ND	0.05	0.01	1.5e-03
Beryllium	ND	5.0e-03 I	5.0e-04	ND I1*	4.3e+00 I	4.3e+01	0.10	0.01	1.5e-03
Cadmium (water)	ND 2	5.0e-04 I	3.5e-05	ND I1*	ND	ND	0.07	0.01	1.5e-03
Cadmium (food/soil)	ND 2	1.0e-03 I	7.0e-05	ND I1*	ND	ND	0.07	0.01	1.5e-03
Calcium	ND	ND	ND	ND	ND	ND	0.05	0.01	1.5e-03
Chromium III	2.0e-06 H	1.0e+00 H	5.0e-01	ND	ND	ND	0.50	0.01	2.1e-03
Chromium VI	2.0e-06 H2*	5.0e-03 I	2.5e-03	ND I1*	ND	ND	0.50	0.01	2.1e-03
Cobalt	ND	ND	ND	ND	ND	ND	0.05	0.01	1.5e-03
Copper	ND	ND	ND	ND	ND	ND	0.05	0.01	1.5e-03
Iron	ND	ND	ND	ND	ND	ND	0.05	0.01	1.5e-03
Lead	ND	1.4e-04 7	7.0e-05	ND	ND	ND	0.50	0.01	1.5e-03
Magnesium	ND	ND	ND	ND	ND	ND	0.05	0.01	1.5e-03
Manganese	4.0e-04 I*	1.0e-01 I*	4.0e-03	ND	ND	ND	0.04	0.01	1.5e-03
Mercury	3.0e-04 H2*	3.0e-04 H2	4.5e-05	ND	ND	ND	0.15	0.01	1.5e-03
Nickel	ND	2.0e-02 I2	2.0e-03	8.4e-01 4	ND	ND	0.10	0.01	1.5e-03
Potassium	ND	ND	ND	ND	ND	ND	0.05	0.01	1.5e-03
Selenium	ND	ND 2	ND	ND	ND	ND	1.00	0.01	1.5e-03
Silver	ND	3.0e-03 I	3.0e-04	ND	ND	ND	0.10	0.01	1.5e-03
Sodium	ND	ND	ND	ND	ND	ND	0.05	0.01	1.5e-03
Thallium	ND	7.0e-05 H	3.5e-06	ND	ND	ND	0.05	0.01	1.5e-03
Vanadium	ND	7.0e-03 H	3.5e-04	ND	ND	ND	0.05	0.01	1.5e-03
Zinc	ND	2.0e-01 H2	6.0e-02	ND	ND	ND	0.30	0.01	1.5e-03

Table 7-17

CHEMICAL TOXICITY VALUES AND ABSORPTION ESTIMATES
USED FOR RISK QUANTIFICATION

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical	Chronic Reference Dose (mg/kg-d)					Slope Factor (mg/kg-d)$^{-1}$			Chemical Absorption Estimate (unitless)		Dermal Permeability Constant
	Inhalation		Oral		Dermal	Inhalation	Oral	Dermal	Oral	Dermal	(cm/hr)
Cyanide	ND		2.0e-02	I	1.4e-02	ND	ND	ND	0.70	0.01	1.5e-03
TIC Groupings											
Propyl Benzenes	9.0e-03	H*	4.0e-02	H	2.0e-02	ND	ND	ND	0.50	0.30	1.0e+00
Propenyl Benzenes	1.0e-02	H	6.0e-03	H	3.0e-03	ND	ND	ND	0.50	0.30	1.0e+00
Ethyl Methyl Benzenes	2.0e+00	H*	2.0e-01	I*	2.0e-01	ND	ND	ND	1.00	0.30	1.0e+00
Diethyl Benzenes	1.0e+00	I*	1.0e-01	I	5.0e-02	ND	ND	ND	0.50	0.30	1.4e+00
Methyl Propyl Benzenes	9.0e-03	H*	4.0e-02	H	2.0e-02	ND	ND	ND	0.50	0.30	1.0e+00
Methyl Ethenyl Benzenes	1.0e-02	H	6.0e-03	H	3.0e-03	ND	ND	ND	0.50	0.30	5.0e-03
Methyl Phenyl Benzenes	ND		4.0e-03	H2	3.4e-03	ND	ND	ND	0.84	0.30	5.0e-03
Trimethyl Benzenes	5.7e-01		4.0e-01		4.0e-01	ND	ND	ND	1.00	0.30	1.0e+00
Dimethyl ethyl benzenes	1.0e+00	I*	1.0e-01	I	5.0e-02	ND	ND	ND	0.50	0.30	1.4e+00
Tetramethyl Benzenes	5.7e-01		4.0e-01		4.0e-01	ND	ND	ND	1.00	0.30	1.0e+00
Oxygenated Benzenes	ND		1.0e-01	H	5.0e-02	ND	ND	ND	0.50	0.30	1.0e+00
Halogenated Benzenes	ND		2.0e-02	H	1.0e-02	ND	ND	ND	0.50	0.30	5.0e-03
Nitrogenated Benzenes	2.0e-03	H2*	5.0e-04	I	2.5e-04	ND	ND	ND	0.50	0.30	1.0e+00
Cyclic alkanes	ND	D	ND		ND	ND	ND	ND	0.50	0.00	1.0e+00
Cyclic Alkenes	ND	D	ND		ND	ND	ND	ND	0.50	0.00	1.0e+00
Halogenated Alkanes	3.0e-01	H2	9.0e-02	I2	9.0e-02	ND	ND	ND	1.00	0.30	1.0e+00
n-chain Alkanes	2.0e-01	H*	6.0e-02	H*	3.0e-02	ND	ND	ND	0.50	0.30	1.0e+00
Branched Alkanes	2.0e-01	H*	6.0e-02	H*	3.0e-02	ND	ND	ND	0.50	0.30	1.0e+00
Branched Alkenes/Alkynes	ND	D	ND		ND	ND	ND	ND	0.50	0.00	1.0e+00
Ethers	ND		5.0e-01	H	2.5e-01	ND	ND	ND	0.50	0.30	1.7e-02
Methylated Naphthalenes	ND		4.0e-03	H2	3.4e-03	ND	ND	ND	0.84	0.30	5.0e-03
Phthalates	ND		2.0e+00	H	1.0e+00	ND	ND	ND	0.50	0.30	5.0e-03
Methylated Phenols	ND		5.1e-02	I	4.1e-02	ND	ND	ND	0.80	0.30	1.8e-02
Methylated Ketones	ND		1.0e-01	I	9.5e-02	ND	ND	ND	0.95	0.30	1.0e+00
Simple Ketones	9.0e-02	H2	5.0e-02	I	2.5e-02	ND	ND	ND	0.50	0.30	1.0e+00
Cyclic Ketones	ND		2.0e-01	I	1.0e-01	ND	4.1e-03 I*	8.2e-03	0.50	0.30	1.0e+00
Diols	ND		2.0e+00	H	1.0e+00	ND	ND	ND	0.50	0.30	5.0e-03
Simple Alcohols	ND		1.0e-01	H	5.0e-02	ND	ND	ND	0.50	0.30	1.0e+00
Cyclic Alcohols	ND		3.0e-01	H	1.5e-01	ND	ND	ND	0.50	0.30	5.0e-03
Oxygenated Alcohols	2.0e-02	H	ND		ND	ND	ND	ND	0.50	0.30	5.0e-03
Cyclic Acids	ND		4.0e+00	I	3.0e+00	ND	ND	ND	0.75	0.30	5.0e-03
Non-Cyclic Acids	3.0e-04	H	8.0e-02	H	4.0e-02	ND	ND	ND	0.50	0.30	1.0e+00
Amines	ND		5.0e-01	H	2.5e-01	ND	ND	ND	0.50	0.30	1.0e+00
PCBs	ND		ND		ND	ND	7.7e+00 H	2.6e+01	0.30	0.00	5.0e-03
Furans	ND		2.0e-03		1.0e-03	ND	ND	ND	0.50	0.30	1.0e+00

Table 7-17

CHEMICAL TOXICITY VALUES AND ABSORPTION ESTIMATES
USED FOR RISK QUANTIFICATION

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Notes:

Toxicity values were obtained from the U.S. EPA's Integrated Risk Information System (IRIS), U.S. EPA's "Health Effects Assessment Summary Tables" (HEAST, Annual FY-1991), and information provided by U.S.EPA Environmental Criteria Assessment Office (ECAO). Toxicity values for the TIC groupings are values for the representative compounds.

Chemical specific information pertaining to the oral and dermal absorption of compounds was provided by ECAO. In the absence of chemical specific values, it was assumed that the oral absorption efficiency for organic compounds and metals was 50 % and 5 %, respectively. The dermal absorption estimates were assumed to be 30% for organic compounds and 1.0 % for metals. The oral and dermal absorption estimates are presented as unitless values where 1.0 represents 100 % (complete) absorption. Chemical-specific dermal permeability constants were obtained from the U.S. EPA "Superfund Exposure Assessment Manual" (SEAM) 1988, or the ECAO. As required by the U.S.EPA, when chemical-specific information is not available, default values were assigned to represent chemical permeability, as footnoted.

Reference Doses and Slope Factors designated for the dermal route of exposure are not provided in the U.S. EPA information sources, but were calculated from corresponding values for the oral route of exposure. These values are used to calculate risks associated with chemical dose estimates based on an absorbed (in contrast to an administered) level of chemical. All chemical dose estimates for the dermal route of exposure are based on absorbed chemical levels. The following relationships were used to derive dermal toxicity values:

Oral Reference Dose (administered) x Oral Absorption Estimate = Dermal Reference Dose (absorbed)
Oral Slope Factor (administered) / Oral Absorption Estimate = Dermal Slope Factor (absorbed)

FOOTNOTES - (listed to the right of the value)

I = Verified in IRIS 5/15/91
H = Values from HEAST FY-1991
D = 'Data inadequate for quantitative risk assessment' (HEAST); applies to all RfDs for this compound.
ND = Value not determined for this compound.
C = Values from Interim Guidance for Dermal Exposure Assessment. (OHEA-E-367, 3/91, Review Draft)
S = Values from the Superfund Environmental Assessment Manual (EPA/540/1-88/001) Table A-4.
* = Value updated 5/91 (Revised from draft risk assessment)
1 = Value withdrawn by IRIS pending further review.
2 = Compound under IRIS review.
3 = Total carcinogenic PAHs; RfDs and SF values from Benzo[a]pyrene used.
4 = Nickel slope factor for nickel refinery dust.
5 = IRIS not queried for this compound
6 = Values from ECAO Technical Support Center.
7 = Baranowska-Dutkiewic, B. 1981. Absorption of Hexavalent Chromium in Man. Arch. Toxicol., 47: 47-50.
8 = Value for endosulfan used for endosulfan sulfate.

Dermal Permeability Constant Default Values:

Volatiles	- Toluene (1.01e+00) as required by U.S.EPA.
Semivolatiles	- 2-Butanone (5.0e-03) as required by U.S.EPA.
Pesticides	- Values from ECAO. Total PCBs use Aroclor 1248.
Inorganics	- water (1.5e-03)

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Table 7-18

SUMMARY OF TOXICITY INFORMATION
FOR CHEMICALS OF POTENTIAL CONCERN

American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Chemical of Potential Concern	Chronic Reference Dose				Slope Factor			
	Inhalation		Oral		Inhalation		Oral	
	Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)	Species/Tumor Site	Weight of Evidence	Species/Tumor Site	Weight of Evidence (2)
TARGET COMPOUND LIST								
VOLATILES								
Chloromethane	--/--	--	--	--	mouse/kidney	C	mouse/kidney	C
Bromomethane	rabbit/neurotoxicity	3000	rat/hyperplasia of forestomach epithelium	1000	--/--	--	--	--
Vinyl chloride	--/--	--	--	--	rat/liver	A	rat/lung	A
Chloroethane	--/--	--	--	--	mouse/kidney	C	mouse/kidney	C
Methylene chloride	rat/--	100	rat/liver toxicity	100	mouse/lung, liver	B2	mouse/liver	B2
Acetone	--/--	--	rat/increased liver & kidney weight, nephro-toxicity	1000	--/--	--	--	--
Carbon disulfide	--	--	rabbit/fetal toxicity; mal-	100	--/--	--	--	--
1,1-Dichloroethene	--/--	--	rat/liver lesions	1000	mouse/kidney	C	rat/adrenal	C
1,1-Dichloroethane	cat/kidney damage	1000	rat/none	1000	--/--	C	rat/hemangiosarcoma	C

Table 7-18
(continued)

Chemical of Potential Concern	Chronic Reference Dose				Slope Factor			
	Inhalation		Oral		Inhalation		Oral	
	Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)	Species/Tumor Site	Weight of Evidence	Species/Tumor Site	Weight of Evidence (2)
1,2-Dichloroethene (cis)	--/--	--	rat/decreased hemoglobin & hematocrit	3000	--/--	--	--/--	--
1,2-Dichloroethene (trans)	--/--	--	mouse/increased serum alkaline phophatase	100	--/--	--	--/--	--
Chloroform	--/--	--	dog/liver lesions	1000	mouse/liver	B2	rat/kidney	B2
1,2-Dichloroethane	--/--	--	--/--	--	rat/circulatory system	B2	rat/circulatory system	B2
2-Butanone (methyl ethyl ketone)	rat/CNS	1000	rat/fetotoxicity	1000	--/--	--	--/--	D
1,1,1-Trichloroethane	guinea pig/ hepatotoxicity	1000	guinea pig/ hepatotoxicity	1000	--/--	--	--/--	--
Carbon Tetrachloride	--/--	--	rat/liver lesions	100	several/liver	B2	several/liver	B2
Vinyl acetate	--/--	--	--/--	--	--/--	--	--/--	--
Bromodichloromethane	--/--	--	mouse/renal cytomegaly	1000	--/--	B2	mouse/liver	B2
1,2-Dichloropropane	(data inadequate for quantitative risk assessments)				--/--	B2	mouse/liver	B2
cis-1,3-Dichloropropene	rat/degenerative changes in nasal mucosa	100	rat/increased organ weights	10,000	mouse/benign lung tumors	B2	rat/forestomach, liver, adrenal, thyroid	B2
Trichloroethene	--/--	--	--/--	--	mouse/lung	B2	mouse/liver	B2
Dibromochloromethane	--/--	--	rat/liver lesions	1000	--/--	C	mouse/hepatocellular adenomas or carcinomas	C
1,1,2-Trichloroethane	--/--	--	mouse/clinical chemistry alterations	1000	mouse/liver	C	mouse/liver	C
Benzene	--/--	--	--/--	--	human/leukemia	A	human/leukemia	A
trans-1,3-Dichloropropene	rat/degeneration changes in nasal mucosa	100	rat/increased organ weight	1000	mouse/benign lung tumors	B2	rat/forestomach, liver, adrenal, thyroid	B2

Table 7-18
(continued)

Chemical of Potential Concern	Chronic Reference Dose				Slope Factor			
	Inhalation		Oral		Inhalation		Oral	
	Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)	Species/Tumor Site	Weight of Evidence	Species/Tumor Site	Weight of Evidence (2)
Bromoform	--/--	--/--	rat/liver effects	1000	--/--	B2	rat/adenomatous polyps or adeno-carcinomas in the large intestine	B2
4-Methyl-2-pentanone	rat/liver & kidney effects	1000	rat/liver & kidney effects	1000	--/--	--	--/--	--
2-Hexanone	Data inadequate							
Tetrachloroethene	--/--	--	mouse/hepato-toxicity	1000	rat, mouse/ leukemia, liver	B2	mouse/liver	B2
1,1,2,2-Tetrachloroethane	--/--	--	--/--	--	mouse/liver	C	mouse/liver	C
Toluene	human/CNS effects eyes eyes, nose irritation	100	rat/CNS effects	1000	--/--	--	--/--	--
Chlorobenzene	rat/liver & kidney effects	10,000	dog/liver & kidney effects	1000	--/--	--	--/--	--
Ethylbenzene	--/--	--	rat/hepatotoxicity, & nephrotoxicity	1000	--/--	--	--/--	--
Styrene	--/--	--	dog/red blood cell & liver effects	1000	rat/leukemia	B2	mouse/lung & bronchi	B2
Xylenes (mixed)	human/CNS effects, nose & throat irritation	100	rat/hyperactivity, decreased body weight & increased mortaility at higher dosage	100	--/--	--	--/--	--
SEMIVOLATILES								
Phenol	--/--	--	rat/reduced fetal body weight	100	--/--	--	--/--	--
bis(2-Chloroethyl) ether	--/--	--	mouse/decrease in hemoglobin & possible erythrocyte destruction	1000	mouse/liver	B2	mouse/liver	B2
2-Chlorophenol	--/--	--	rat/reproductive effects	1000	--/--	--	--/--	--

Table 7-18
(continued)

Chemical of Potential Concern	Chronic Reference Dose				Slope Factor			
	Inhalation		Oral		Inhalation		Oral	
	Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)	Species/Tumor Site	Weight of Evidence	Species/Tumor Site	Weight of Evidence (2)
1,3-Dichlorobenzene	--/--	--	--/--	--	--/--	--	--/--	--
1,4-Dichlorobenzene	rat/liver & kidney effect	1000-	--/--	--	--/--	B2	mouse/liver	B2
Benzyl Alcohol	--/--	--	rat/hyperplasia of the epithelium of the forestomach	1000	--/--	--	--/--	--
1,2-Dichlorobenzene	rat/decreased body weight gain	1000	rat/liver effects	1000	--/--	--	--/--	--
2-Methylphenol	--/--	--	rat/reduced body weight gain, neurotoxicity	1000	--/--	--	--/--	--
bis(2-Chloroisopropyl)ether	--/--	--	mouse/decrease in hemoglobin & possible erythrocyte destruction	1000	--/--	--	--/--	--
4-Methylphenol	--/--	--	rat/reduced body weight gain, neurotoxicity	1000	--/--	--	--/--	--
N-Nitroso-di-n-dipropylamine	--/--	--	--/--	--	--/--	B2	rat/liver	B2
Hexachloroethane	--/--	--	rat/kidney degeneration	100	mouse/liver	C	mouse/liver	C
Nitrobenzene	mouse/hematological, adrenal, renal & hepatic lesions	3000	mouse/hematological, adrenal, renal & hepatic lesions	10,000	--/--	--	--/--	--
Isophorone	--/--	--	dog/kidney lesions	1000	--/--	C	rat/kidney, preputial gland	C
2-Nitrophenol	data inadequate							
2,4-Dimethylphenol	--/--	--	mouse/neurological signs & hematological changes	3000	--/--	--	--/--	--
Benzoic Acid	--/--	--	human/irritation, malaise	1	--/--	--	--/--	--
bis(2-Chloroethoxy)methane	--/--	--	--/--	--	--/--	--	--/--	--

Table 7-18
(continued)

Chemical of Potential Concern	Chronic Reference Dose				Slope Factor			
	Inhalation		Oral		Inhalation		Oral	
	Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)	Species/Tumor Site	Weight of Evidence	Species/Tumor Site	Weight of Evidence (2)
2,4-Dichlorophenol	--/--	--	rat/immune function	100	--/--	--	--/--	--
1,2,4-Trichlorophenol	--/--	--	--/--	--	--/--	--	--/--	--
Naphthalene	--/--	--	rat/ocular & internal lesions	10,000	--/--	--	--/--	--
4-Chloroaniline	--/--	--	rat/proliferative lesions of the spleen	3000	--/--	--	--/--	--
Hexachlorobutadiene	--/--	--	rat/kidney toxicity	100	rat/kidney	C	rat/kidney	C
4-Chloro-3-methylphenol	--/--	--	--/--	--	--/--	--	--/--	--
2-Methylnaphthalene	--/--	--	--/--	--	--/--	--	--/--	--
Hexachlorocyclopentadiene	rat/respiratory tract lesions	1,000	rat/forestomach lesions	1000	--/--	--	--/--	--
2,4,6-Trichlorophenol	--/--	--	--/--	--	mouse/liver	B2	mouse/liver	B2
2,4,5-Trichlorophenol	--/--	--	rat/decreased survival	300	--/--	--	--/--	--
2-Chloronaphthalene	--/--	--	--/--	--	--/--	--	--/--	--
2-Nitroaniline	--/--	--	--/--	--	--/--	--	--/--	--
Dimethylphthalate	--/--	--	--/--	--	--/--	--	--/--	--
Acenaphthylene	--/--	--	--/--	--	--/--	--	--/--	--
2,6-Dinitrotoluene	--/--	--	--/--	--	--/--	B2	--/--	B2
3-Nitroaniline	--/--	--	--/--	--	--/--	--	--/--	--
Acenaphthene	--/--	--	mouse/hepato-toxicity	3000	--/--	--	--/--	--
2,4-Dinitrophenol	--/--	--	human/cataract	1000	--/--	--	--/--	--
4-Nitrophenol	--/--	--	--/--	--	--/--	--	--/--	--
Dibenzofuran	--/--	--	--/--	--	--/--	--	--/--	--
2,4-Dinitrotoluene	--/--	--	--/--	--	--/--	B2	--/--	B2

Table 7-18
(continued)

Chemical of Potential Concern	Chronic Reference Dose				Slope Factor			
	Inhalation		Oral		Inhalation		Oral	
	Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)	Species/Tumor Site	Weight of Evidence	Species/Tumor Site	Weight of Evidence (2)
Diethylphthalate	--/--	--	rat/reduced terminal body weight	1000	--/--	--	--/--	--
4-Chlorophenyl-phenylether	--/--	--	--/--	--	--/--	--	--/--	--
Fluorene	--/--	--	mouse/hematological changes	3000	--/--	--	--/--	--
4-Nitroaniline	--/--	--	--/--	--	--/--	--	--/--	--
4,6-Dinitro-2-methylphenol	--/--	--	--/--	--	--/--	--	--/--	--
N-nitrosodiphenylamine	--/--	--	--/--	--	--/--	--	rat/urinary bladder	B2
4-Bromophenyl-phenylether	--/--	--	--/--	--	--/--	--	--/--	--
Hexachlorobenzene	--/--	--	rat/liver & hematologic effects	100	hamster/liver	B2	hamster/liver	B2
Pentachlorophenol	--/--	--	rat/liver & kidney pathology	100	--/--	--	--/--	--
Phenanthrene	--/--	--	--/--	--	--/--	--	--/--	--
Anthracene	--/--	--	mouse/no effects	3000	--/--	--	--/--	--
Di-n-butylphthalate	--/--	--	rat/mortaility	1000	--/--	--	--/--	--
Fluoranthene	--/--	--	mouse/nephropathy, liver weight changes, hematological changes	3000	--/--	--	--/--	--
Pyrene	--/--	--	mouse/renal effects	3000	--/--	--	--/--	--
Butylbenzylphthalate	--/--	--	rat/effects on body weight gain, testes, liver, kidney	1000	--/--	--	--/--	C
3,3'-Dichlorobenzidine	--/--	--	--/--	--	--/--	--	rat/mammary	B2
Benzo(a)anthracene(c)	--/--	--	--/--	--	--/--	B2	--/--	B2
Chrysene(c)	--/--	--	--/--	--	--/--	B2	--/--	B2

Table 7-18
(continued)

Chemical of Potential Concern	Chronic Reference Dose				Slope Factor			
	Inhalation		Oral		Inhalation		Oral	
	Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)	Species/Tumor Site	Weight of Evidence	Species/Tumor Site	Weight of Evidence (2)
bis(2-ethylhexyl)phthalate	--/--	--	guinea pig/increased relative liver weight	1000	--/--	B2	--/--	B2
Di-n-octyl Phthalate	--/--	--	rat/elevated kidney & liver weights	1000	--/--	--	--/--	--
Benzo(b)fluoranthene(c)	--/--	--	--/--	--	--/--	B2	--/--	B2
Benzo(k)fluoranthene(c)	--/--	--	--/--	--	--/--	B2	--/--	B2
Benzo(a)pyrene(c)	--/--	--	--/--	--	hamster/respiratory tract	B2	mouse/stomach	B2
Ideno(1,2,3-cd)pyrene(c)	--/--	--	--/--	--	--/--	B2	--/--	B2
Dibenz(a,h)anthracene(c)	--/--	--	--/--	--	--/--	B2	--/--	B2
Benzo(g,h,i)perylene	--/--	--	--/--	--	--/--	--	--/--	--
Total-Carcinogenic PAHs(3)	--/--	--	--/--	--	hamster/respiratory tract	B2	mouse/stomach	B2
PESTICIDE/PCB								
alpha-BHC	--/--	--	--/--	--	--/--	--	mouse/liver	B2
beta-BHC	--/--	--	--/--	--	--/--	--	mouse/liver	C
delta-BHC	--/--	--	--/--	--	--/--	--	--/--	--
gamma-BHC (Lindane)	--/--	--	rat/liver & kidney toxicity	1000	--/--	--	mouse/liver	B2
Heptachlor	--/--	--	rat/increased liver weight	300	mouse/liver	B2	mouse/liver	B2
Aldrin	--/--	--	rat/liver lesions	1000	mouse/liver	B2	mouse/liver	B2
Heptachlor epoxide	--/--	--	--/--	--	mouse/liver	B2	mouse/liver	B2
Endosulfan I	--/--	--	rat/mild kidney lesions	3000	--/--	--	--/--	--

Table 7-18
(continued)

Chemical of Potential Concern	Chronic Reference Dose				Slope Factor			
	Inhalation		Oral		Inhalation		Oral	
	Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)	Species/Tumor Site	Weight of Evidence	Species/Tumor Site	Weight of Evidence (2)
Dieldrin	--/--	--	--/--	--	--/--	B2	mouse/liver	B2
4,4'-DDE	--/--	--	--/--	--	--/--	--	mouse, hamster/ liver	B2
Endrin	--/--	--	dog/convulsions & liver lesions	100	--/--	--	--/--	--
Endosulfan II	--/--	--	rat/mild kidney lesions	3000	--/--	--	--/--	--
4,4'-DDD	--/--	--	--/--	--	--/--	--	mouse/liver	B2
Endosulfan sulfate	--/--	--	--/--	--	--/--	--	--/--	--
4,4'-DDT	--/--	--	rat/liver lesions	100	mouse, rat/ liver	B2	mouse, rat/ liver	B2
Methoxychlor	--/--	--	rat/fetotoxicity	100	--/--	--	--/--	--
Enrin ketone	--/--	--	--/--	--	--/--	--	--/--	--
alpha-Chlordane	--/--	--	rat/liver necrosis	1000	mouse/liver	B2	mouse/liver	B2
gamma-Chlordane	--/--	--	rat/liver necrosis	1000	mouse/liver	B2	mouse/liver	B2
Toxaphene	--/--	--	--/--	--	mouse/liver	B2	mouse/liver	B2
Polychlorinated biphenyls (PCBs)	--/--	--	--/--	--	--/--	--	rat/liver	B2
TARGET ANALYTE LIST								
METALS								
Aluminum	Data Inadequate	--	--/--	--	--/--	--	--/--	--
Antimony	--/cancer	--	rat/reduced life span, altered blood chemistries	1000	--/--	--	--/--	--
Arsenic	--/cancer	--	human/keratosis & hyperpigmentation	1	human/respitra- tory tract	A	human/skin	A
Barium	--/fetotoxicity	100	rat/increased blood pressure	100	--/--	--	--/--	--

Table 7-18
(continued)

Chemical of Potential Concern	Chronic Reference Dose				Slope Factor			
	Inhalation		Oral		Inhalation		Oral	
	Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)	Species/Tumor Site	Weight of Evidence	Species/Tumor Site	Weight of Evidence (2)
Beryllium	--/--	--	rat/none observed	100	human/lung	B2	rat/total tumors	B2
Cadmium (water) (4)	--/--	--	human/cancer, renal damage	10	human/respiratory tract	B1	--/--	--
Cadmium (food/soil) (4)	--/--	--	human/cancer, renal damage	10	human/respiratory tract	B1	--/--	--
Calcium	--/--	--	--/--	--	--/--	--	--/--	--
Chromium III	--/--	--	rat/hepatotoxicity	1000	--/--	--	--/--	--
Chromium VI	--/cancer	--	rat/not defined	500	human/lung	A	--/--	--
Cobalt	--/--	--	--/--	--	--/--	--	--/--	--
Copper	--/--	--	human/local GI irritation	--	--/--	--	--/--	--
Iron	Data inadequate	--	--/--	--	--/--	--	--/--	--
Lead	--/CNS effects	--	--/CNS effects	--	--/--	B2	--/--	B2
Magnesium	--/--	--	--/--	--	--/--	--	--/--	--
Manganese	human/CNS	100	rat/reproductive	100	--/--	--	--/--	--
Mercury	human/neurotoxicity	30	rat/kidney effects	1000	--/--	--	--/--	--
Nickel	--/cancer	--	rat/reduced body & organ weight	300	human/respiratory tract	A	--/--	--
Potassium	--/--	--	--/--	--	--/--	--	--/--	--
Selenium	--/--	--	--/--	--	--/--	--	--/--	--
Silver	--/--	--	human/argyria	2	--/--	--	--/--	--
Sodium	--/--	--	--/--	--	--/--	--	--/--	--
Thallium	--/--	--	rat/increased SGOT & serum LDH levels, alopecia	3000	--/--	--	--/--	--
Vanadium	--/--	--	rat/none observed	100	--/--	--	--/--	--

Table 7-18
(continued)

Chemical of Potential Concern	Chronic Reference Dose				Slope Factor			
	Inhalation		Oral		Inhalation		Oral	
	Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)	Species/Tumor Site	Weight of Evidence	Species/Tumor Site	Weight of Evidence (2)
Zinc	--/--	--	rat/weight loss, thyroid effects & myelin degeneration	500	--/--	--	--/--	--
Cyanide	--/--	--	rat/weight loss, thyroid effects & myelin degeneration	500	--/--	--	--/--	--

Table 7-18
(continued)

Chemical Group of Potential Concern	Representative Compound	Chronic Reference Dose			
		Inhalation		Oral	
		Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)
TENTATIVELY IDENTIFIED COMPOUNDS (5)					
Propyl Benzenes	Cumene	rat/CNS involvement, nasal irritation	10,000	rat/renal	3,000
Propenyl Benzenes	Methyl Styrene	mouse/nasal lesions	1000	mouse/nasal lesions	1,000
Ethyl Methyl Benzenes	Ethyl toluene	Data inadequate	--	--/--	--
Diethyl Benzenes	Ethyl benzene	--/--	--	rat/hepatotoxicity, nephrotoxicity	--
Methyl Propyl Benzenes	Cumene	rat/CNS involvement, nasal irritation	10,000	rat/renal	3,000
Methyl Ethenyl Benzenes	Methyl Styrene	mouse/nasal lesions	1,000	mouse/nasal lesions	1,000
Methyl Phenyl Benzenes	Naphthalene	--/--	--	rat/decreased body weight gain	10,000
Trimethyl Benzenes	Trimethyl benzene	Data Inadequate	--	--/--	--
Dimethyl ethyl benzenes	Ethyl benzene	--/--	--	rat/hepatotoxicity, nephrotoxicity	1,000
Tetramethyl Benzenes	Trimethyl benzene	Data Inadequate	--	--/--	--
Oxygenated Benzenes	Benzaldehyde	--/--	--	rat/kidney, forestomach	1,000
Halogenated Benzenes	o-chlorotoluene	--/--	--	rat/decreased body weight gain	1,000

Table 7-18
(continued)

Chemical Group of Potential Concern	Representative Compound	Chronic Reference Dose			
		Inhalation		Oral	
		Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)
Nitrogenated Benzenes	Nitrobenzene	mouse/hematological, adrenal, renal & hepatic lesions	300	mouse/hematological, adrenal, renal & hepatic lesions	1,000
Cyclic alkanes	Methylcyclohexane	--/--	--	--/--	--
Cyclic Alkenes	Vinylcyclohexane	--/--	--	--/--	--
Halogenated Alkanes	1,1,1-Trichloroethane	guinea pig/hepatotoxicity	1,000	guinea pig/ hepatotoxicity	1,000
n-chain Alkanes	n-hexane	human/neurotoxicity	300	rat/neuropathy or testicular atrophy	10,000
Branched Alkanes	n-hexane	human/neurotoxicity	300	rat/neuropathy or testicular atrophy	10,000
Branched Alkenes/Alkynes	Vinyl cyclohexene	Data Inadequate	--	--/--	--
Ethers	Ethylether	--/--	--	rat/liver effects	1,000
Methylated Naphthalenes	Naphthalene	--/--	--	rat/decreased body weight gain	10,000
Phthalates	Phthalic anhydride	--/--	--	mouse/lung & kidney histopathology	1,000
Methylated Phenols	Cresol	--/--	--	rat/reduced body weight gain, neurotoxicity	1,000
Methylated Ketones	Acetone	--/--	--	rat/increased liver & kidney weight, nephrotoxicity	1,000
Simple Ketones	2-butanone	rat/CNS	1,000	rat/fetotoxicity	1,000
Cyclic Ketones	Isophorone	--/--	--	dog/kidney lesions	1,000
Diols	Ethylene glycol	--/--	--	rat/mortality, liver & kidney effects	100
Simple Alcohols	1-butanol	--/--	--	rat/effects on erythrocyte	1,000
Straight chain alkenes/alkynes	Vinyl cyclohexene	Data Inadequate	--	--/--	--

Table 7-18
(continued)

Chemical Group of Potential Concern	Representative Compound	Chronic Reference Dose			
		Inhalation		Oral	
		Species/Effect of Concern	Uncertainty Factor (1)	Species/Effect of Concern	Uncertainty Factor (1)
Cyclic Alcohols	Benzyl alcohol	--/--	--	rat/hyperplasia of the epithelium of the forestomach	1,000
Oxygenated Alcohols	Ethyl glycol monobutyl ether	rat/altered hemotology	1,000	--/--	--
Cyclic Acids	Benzoic acid	--/--	--	human/irritation, malaise	1
Non-Cyclic Acids	Acrylic acid	mouse/lesions of the nasal mucosa	1,000	rat/reduced body weight, altered organ weights	1,000
Amines	Coprolactam	--/--	--	rat/reduced body weight	100
Polychlorindated Biphenyls (PCBs)	PCBs	--/--	--	--/--	--
Furans	Tetrahydrofuran	--/--	--	mouse/hepatic lesions	1000

NOTES:

1) A reference dose (RFD) is derived from a pertinent toxicity study(s), and is an estimate of the "safe" level of chemical intake over a set length of exposure (e.g., chronic) for humans. Many assumptions must be made when predicting this "safe" chemical intake level (i.e., RFD) from a laboratory study. Uncertainty factors (UFs) are applied when estimating the RFD for the following reasons.

- A UF of 10 is used to account for variation in the general population and is intended to protect sensitive subpopulations (e.g., elderly, children).
- A UF of 10 is used when extrapolating from animal data to humans. This factor is intended to account for the interspecies variability between humans and other mammals.
- A UF of 10 is used when a RFD is derived from a subchronic instead of a chronic toxicity study.
- A UF of 10 is used when a lowest adverse effect level (LOAEL) is used instead of a no adverse affect level (NOAEL). to derive a RFD. This factor is intended to account for the uncertainty associated with extrapolating from toxic levels of chemical exposure (i.e., LOAEL) to nontoxic levels of chemical exposure (i.e., NOAEL).

In certain cases, a modifying factor (MF) is used to account for further uncertainty associated with the toxicity study used to develop the RFD. The MF may vary from >0 to 10.

The uncertainty factors presented in this table represent the product of all the uncertainty factors (and modifying factors) used to derive the RFD (e.g., 10x10x10 = 1000).

2) This code represents the U.S. EPA weight-of-evidence classification system for carcinogenicity for chemicals. The following is a description of the classification by group.

Group	Description
A	Known human carcinogen
B1 or B2	Probable human carcinogen
	B1 indicates that limited human data on the carcinogenicity of the chemical are available.
	B2 indicates sufficient evidence of carcinogenicity in animals and inadequate or no evidence of carcinogenicity in humans exists.
C	Possible human carcinogen
D	Not classifiable as to human carcinogenicity
E	Evidence of noncarcinogenicity for humans

3) The slope factor for benzo(a)pyrene was used to represent the carcinogenic potential of the carcinogenic polynuclear aromatic hydrocarbons (PAHs).

4) Toxicity values have been developed separately for ingestion of cadmium in water and cadmium ingestion with solids (i.e., food or soil).

5) Tentatively identified compounds (TICs) were grouped based on similar chemical structure. Compounds of similar chemical structure are assumed to have similar toxicological properties. For each TIC grouping, a representative compound was chosen for which there was a reference dose (RFD). The RFD for the representative compound was used to represent the toxic potential of the particular TIC group.

LEGEND

-- = information not available

data inadequate = presently, toxicity data is inadequate for reference dose or slope factor derivation.

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Table 7-19

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Groundwater
Source Area: Lower Aquifer

Population: Offsite Resident
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS					CANCER RISKS				
	Dermal Absorp.	Ingestion	Inhalation	Total	% of Total	Dermal Absorp.	Ingestion	Inhalation	Total	% of Total
SEMIVOLATILES										
bis(2-Chloroethyl) ether	ND	ND	ND	0.0e+00	0.0	1.1e-06	1.1e-04	2.7e-05	1.4e-04	48.5
METALS										
Arsenic	6.0e-04	1.9e-01	ND	2.0e-01	16.5	4.6e-07	1.5e-04	ND	1.5e-04	51.5
Barium	6.9e-03	1.2e-01	ND	1.2e-01	10.5	ND	ND	ND	0.0e+00	0.0
Manganese	1.5e-02	2.1e-01	ND	2.2e-01	18.8	ND	ND	ND	0.0e+00	0.0
Mercury	6.1e-04	3.2e-02	ND	3.2e-02	2.7	ND	ND	ND	0.0e+00	0.0
TIC Groupings										
Cyclic Alcohols	2.3e-03	2.4e-01	ND	2.4e-01	20.2	ND	ND	ND	0.0e+00	0.0
Oxygenated Alcohols	ND	ND	3.4e-01	3.4e-01	28.9	ND	ND	ND	0.0e+00	0.0
	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
	2.7e-02	8.1e-01	3.5e-01	1.2e+00	100.0	1.6e-06	2.6e-04	2.7e-05	2.9e-04	100.0
	Total Risk All Routes		2.3e+00			Total Risk All Routes		5.9e-04		

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-20

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Ambient Air
Source Area: VOC Emissions
Population: Offsite Resident
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS		CANCER RISKS	
	Inhalation	% of Total	Inhalation	% of Total
VOLATILES				
Chloroethane	3.4e-01	36.1	ND	0.0
Methylene chloride	1.4e-04	0.0	2.5e-06	1.6
1,1-Dichloroethene	ND	0.0	7.2e-05	46.6
Chloroform	ND	0.0	2.9e-05	18.8
2-Butanone	5.0e-02	5.4	ND	0.0
1,1,1-Trichloroethane	3.2e-02	3.5	ND	0.0
Carbon tetrachloride	ND	0.0	4.3e-05	27.7
Trichloroethene	ND	0.0	4.3e-06	2.8
Benzene	ND	0.0	1.7e-06	1.1
Xylenes (mixed)	1.0e-02	1.1	ND	0.0
TIC GROUPINGS				
n-chain Alkanes	3.3e-02	3.5	ND	0.0
Non-Cyclic Acids	4.4e-01	47.1	ND	0.0
	Total	Total	Total	Total
	9.3e-01	100.0%	1.6e-04	100.0%

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-21

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Ambient Air
Source Area: Fugitive Dust

Population: Offsite Resident
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS		CANCER RISKS	
	Inhalation	% of Total	Inhalation	% of Total
Total Hazard risk less than 0.01				
Total cancer risk less than 1e-6				
	Total 3.4e-04	Total 100%	Total 5.2e-09	Total 100%

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-22

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Groundwater
Source Area: Upper Aquifer

Population: Offsite Child Resident
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
VOLATILES								
Chloromethane	ND	ND	0.0e+00	0.0	8.1e-06	1.7e-08	8.1e-06	0.0
Vinyl chloride	ND	ND	0.0e+00	0.0	2.8e-03	1.2e-05	2.9e-03	16.9
Methylene chloride	6.4e-01	2.2e-03	6.4e-01	0.4	4.1e-05	1.4e-07	4.1e-05	0.2
Acetone	4.3e+01	1.7e-01	4.3e+01	27.7	ND	ND	0.0e+00	0.0
1,1-Dichloroethane	8.5e-01	3.6e-03	8.5e-01	0.6	ND	ND	0.0e+00	0.0
1,2-Dichloroethene (cis)	1.2e+00	4.9e-03	1.2e+00	0.8	ND	ND	0.0e+00	0.0
2-Butanone	6.3e+00	2.7e+00	9.0e+00	5.8	ND	ND	0.0e+00	0.0
Trichloroethene	ND	ND	0.0e+00	0.0	1.9e-06	8.1e-09	1.9e-06	0.0
Benzene	ND	ND	0.0e+00	0.0	1.3e-02	2.6e-04	1.3e-02	79.6
4-Methyl-2-pentanone	8.4e+01	1.8e-01	8.4e+01	54.3	ND	ND	0.0e+00	0.0
Tetrachloroethene	3.4e-01	1.5e-03	3.5e-01	0.2	2.5e-05	1.1e-07	2.5e-05	0.1
Toluene	1.5e-01	6.5e-04	1.5e-01	0.1	ND	ND	0.0e+00	0.0
Chlorobenzene	3.5e-01	4.4e-04	3.5e-01	0.2	ND	ND	0.0e+00	0.0
Ethylbenzene	2.8e+00	4.3e-03	2.8e+00	1.8	ND	ND	0.0e+00	0.0
Xylenes (mixed)	1.3e-01	2.8e-04	1.3e-01	0.1	ND	ND	0.0e+00	0.0
SEMIVOLATILES								
bis(2-Chloroethyl) ether	ND	ND	0.0e+00	0.0	8.6e-06	3.7e-06	1.2e-05	0.1
2,4-Dimethylphenol	1.6e-02	3.1e-04	1.6e-02	0.0	ND	ND	0.0e+00	0.0
PESTICIDE/PCB								
PCB	ND	ND	0.0e+00	0.0	4.8e-04	1.2e-06	4.8e-04	2.9
METALS								
Arsenic	5.1e-03	1.4e-02	1.9e-02	0.0	1.3e-06	3.6e-06	4.9e-06	0.0
Barium	3.9e-02	5.6e-03	4.5e-02	0.0	ND	ND	0.0e+00	0.0
Lead	5.6e-03	8.1e-03	1.4e-02	0.0	ND	ND	0.0e+00	0.0
Manganese	2.3e-01	2.6e-02	2.5e-01	0.2	ND	ND	0.0e+00	0.0
Thallium	1.3e-01	1.8e-02	1.5e-01	0.1	ND	ND	0.0e+00	0.0
TIC Groupings								
Propyl Benzenes	4.3e-01	9.3e-04	4.3e-01	0.3	ND	ND	0.0e+00	0.0
Propenyl Benzenes	2.9e-01	6.2e-04	2.9e-01	0.2	ND	ND	0.0e+00	0.0
Ethyl Methyl Benzenes	9.4e-02	4.0e-04	9.4e-02	0.1	ND	ND	0.0e+00	0.0
Diethyl Benzenes	3.1e-01	4.8e-04	3.1e-01	0.2	ND	ND	0.0e+00	0.0
Methyl Propyl Benzenes	1.0e-01	2.2e-04	1.0e-01	0.1	ND	ND	0.0e+00	0.0
Trimethyl Benzenes	2.3e-01	9.9e-04	2.3e-01	0.2	ND	ND	0.0e+00	0.0

Table 7-22

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Groundwater
Source Area: Upper Aquifer

Population: Offsite Child Resident
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
Dimethyl ethyl benzenes	1.6e+00	2.5e-03	1.6e+00	1.0	ND	ND	0.0e+00	0.0
Tetramethyl Benzenes	4.7e-02	2.0e-04	4.7e-02	0.0	ND	ND	0.0e+00	0.0
Oxygenated Benzenes	2.6e-01	5.6e-04	2.6e-01	0.2	ND	ND	0.0e+00	0.0
Halogenated Benzenes	8.6e-03	3.7e-03	1.2e-02	0.0	ND	ND	0.0e+00	0.0
Halogenated Alkanes	1.3e-01	5.4e-04	1.3e-01	0.1	ND	ND	0.0e+00	0.0
Branched Alkanes	3.5e+00	7.4e-03	3.5e+00	2.3	ND	ND	0.0e+00	0.0
Ethers	1.5e-02	1.9e-03	1.6e-02	0.0	ND	ND	0.0e+00	0.0
Methylated Naphthalenes	1.6e-02	1.1e-02	2.7e-02	0.0	ND	ND	0.0e+00	0.0
Methylated Phenols	1.2e-02	2.4e-03	1.5e-02	0.0	ND	ND	0.0e+00	0.0
Methylated Ketones	1.1e-02	4.3e-05	1.1e-02	0.0	ND	ND	0.0e+00	0.0
Simple Ketones	5.0e-01	1.1e-03	5.0e-01	0.3	ND	ND	0.0e+00	0.0
Cyclic Ketones	1.3e-01	2.8e-04	1.3e-01	0.1	1.6e-05	3.3e-08	1.6e-05	0.1
Simple Alcohols	1.2e-01	2.5e-04	1.2e-01	0.1	ND	ND	0.0e+00	0.0
Cyclic Alcohols	9.5e-03	4.1e-03	1.4e-02	0.0	ND	ND	0.0e+00	0.0
Non-Cyclic Acids	4.0e+00	8.5e-03	4.0e+00	2.6	ND	ND	0.0e+00	0.0
Amines	1.9e-02	4.0e-05	1.9e-02	0.0	ND	ND	0.0e+00	0.0
	Total	Total	Total	Total	Total	Total	Total	Total
	1.5e+02	3.2e+00	1.5e+02	100	1.7e-02	2.8e-04	1.7e-02	100

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-23

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Surface Soils
Source Area: Kapica Pazmey

Population: Child Trespasser
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
VOLATILES								
1,2-Dichloroethene (cis)	1.2e-02	3.6e-04	1.2e-02	0.0	ND	ND	0.0e+00	0.0
Trichloroethene	ND	ND	0.0e+00	0.0	3.9e-06	1.3e-07	4.0e-06	0.1
4-Methyl-2-pentanone	1.6e-01	2.6e-03	1.6e-01	0.1	ND	ND	0.0e+00	0.0
Tetrachloroethene	1.2e+00	3.8e-02	1.2e+00	0.7	8.4e-05	2.7e-06	8.7e-05	1.5
Toluene	1.4e+00	4.5e-02	1.4e+00	0.8	ND	ND	0.0e+00	0.0
Chlorobenzene	1.5e-02	1.5e-04	1.5e-02	0.0	ND	ND	0.0e+00	0.0
Ethylbenzene	1.3e+00	2.0e-02	1.3e+00	0.7	ND	ND	0.0e+00	0.0
Styrene	1.9e-03	5.5e-05	1.9e-03	0.0	1.6e-06	4.7e-08	1.7e-06	0.0
Xylenes (mixed)	3.4e-01	5.5e-03	3.4e-01	0.2	ND	ND	0.0e+00	0.0
SEMIVOLATILES								
Isophorone	1.4e-02	2.3e-04	1.4e-02	0.0	1.7e-06	2.7e-08	1.7e-06	0.0
Naphthalene	4.2e-01	1.2e-02	4.3e-01	0.2	ND	ND	0.0e+00	0.0
Di-n-butylphthalate	1.5e-02	4.5e-04	1.6e-02	0.0	ND	ND	0.0e+00	0.0
bis(2-ethylhexyl)phthalate	1.6e+00	1.3e-02	1.6e+00	0.9	6.3e-05	5.1e-07	6.4e-05	1.1
Di-n-octyl Phthalate	5.6e-02	9.0e-04	5.7e-02	0.0	ND	ND	0.0e+00	0.0
Total Carcinogenic PAHs	ND	ND	0.0e+00	0.0	6.7e-04	1.1e-05	6.8e-04	11.9
PESTICIDE/PCB								
Aldrin	8.6e-02	1.4e-03	8.7e-02	0.0	6.3e-06	1.0e-07	6.4e-06	0.1
Endosulfan I	2.5e-02	4.0e-04	2.5e-02	0.0	ND	ND	0.0e+00	0.0
PCB	ND	ND	0.0e+00	0.0	4.7e-03	1.7e-04	4.9e-03	85.2
METALS								
Antimony	2.1e+00	1.0e-01	2.2e+00	1.2	ND	ND	0.0e+00	0.0
Barium	8.0e-01	3.9e-02	8.4e-01	0.5	ND	ND	0.0e+00	0.0
Cadmium (food/soil)	1.2e+00	8.3e-02	1.3e+00	0.7	ND	ND	0.0e+00	0.0
Chromium VI	6.0e-01	2.9e-01	8.9e-01	0.5	ND	ND	0.0e+00	0.0
Lead	1.1e+02	5.5e+01	1.7e+02	92.7	ND	ND	0.0e+00	0.0
Manganese	1.9e-01	7.3e-03	2.0e-01	0.1	ND	ND	0.0e+00	0.0
Mercury	1.0e-01	1.5e-02	1.2e-01	0.1	ND	ND	0.0e+00	0.0
Nickel	4.8e-02	4.7e-03	5.3e-02	0.0	ND	ND	0.0e+00	0.0
Silver	4.0e-02	3.9e-03	4.4e-02	0.0	ND	ND	0.0e+00	0.0
Vanadium	6.7e-02	3.2e-03	7.0e-02	0.0	ND	ND	0.0e+00	0.0
Zinc	1.3e-01	3.8e-02	1.7e-01	0.1	ND	ND	0.0e+00	0.0
TIC Groupings								

Table 7-23

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Surface Soils
Source Area: Kapica Pazmey

Population: Child Trespasser
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
Propenyl Benzenes	1.6e-01	2.5e-03	1.6e-01	0.1	ND	ND	0.0e+00	0.0
Ethyl Methyl Benzenes	2.7e-02	8.8e-04	2.8e-02	0.0	ND	ND	0.0e+00	0.0
Dimethyl ethyl benzenes	1.8e-02	2.8e-04	1.8e-02	0.0	ND	ND	0.0e+00	0.0
n-chain Alkanes	1.4e-01	2.3e-03	1.4e-01	0.1	ND	ND	0.0e+00	0.0
Branched Alkanes	1.6e-01	2.5e-03	1.6e-01	0.1	ND	ND	0.0e+00	0.0
Non-Cyclic Acids	9.5e-02	1.5e-03	9.7e-02	0.1	ND	ND	0.0e+00	0.0
	Total 1.3e+02	Total 5.6e+01	Total 1.8e+02	Total 100.0	Total 5.5e-03	Total 1.9e-04	Total 5.7e-03	Total 100.0

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-24

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Surface Water
Source Area: ACS

Population: Child Trespasser; Onsite Child Resident
Land Use: Current Conditions; Future Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
VOLATILES								
Acetone	2.9e-01	2.7e-04	2.9e-01	21.7	ND	ND	0.0e+00	0.0
1,2-Dichloroethene (cis)	2.3e-02	2.1e-05	2.3e-02	1.7	ND	ND	0.0e+00	0.0
Benzene	ND	ND	0.0e+00	0.0	3.0e-05	1.4e-07	3.0e-05	19.1
4-Methyl-2-pentanone	1.4e-01	7.0e-05	1.4e-01	10.7	ND	ND	0.0e+00	0.0
Ethylbenzene	1.0e-02	3.8e-06	1.0e-02	0.8	ND	ND	0.0e+00	0.0
SEMIVOLATILES								
bis(2-Chloroethyl) ether	ND	ND	0.0e+00	0.0	8.6e-06	8.6e-07	9.4e-06	6.0
4-Methylphenol	1.8e-02	8.4e-04	1.9e-02	1.5	ND	ND	0.0e+00	0.0
PESTICIDE/PCB								
PCB	ND	ND	0.0e+00	0.0	1.2e-04	6.6e-08	1.2e-04	73.4
METALS								
Arsenic	5.0e-03	3.2e-03	8.2e-03	0.6	1.3e-06	8.2e-07	2.1e-06	1.3
Barium	9.8e-03	3.3e-04	1.0e-02	0.8	ND	ND	0.0e+00	0.0
Lead	3.6e-02	1.2e-02	4.8e-02	3.7	ND	ND	0.0e+00	0.0
Manganese	4.9e-02	1.3e-03	5.0e-02	3.8	ND	ND	0.0e+00	0.0
TIC Groupings								
n-chain Alkanes	3.1e-01	1.5e-04	3.1e-01	23.5	ND	ND	0.0e+00	0.0
Non-Cyclic Acids	3.6e-01	1.8e-04	3.6e-01	27.2	ND	ND	0.0e+00	0.0
Amines	1.7e-02	8.5e-06	1.7e-02	1.3	ND	ND	0.0e+00	0.0
	Total	Total	Total	Total	Total	Total	Total	Total
	1.3e+00	2.0e-02	1.3e+00	100.0	1.6e-04	1.9e-06	1.6e-04	100.0

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Table 7-24

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Surface Water
Source Area: ACS

Population: Child Trespasser; Onsite Child Resident
Land Use: Current Conditions; Future Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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[ACS.2020.BRA]H-T.W20

Table 7-25

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Sediment
Source Area: ACS

Population: Child Trespasser; Onsite Child Resident
Land Use: Current Conditions; Future Conditions

CHEMICAL OF POTENTIAL CONCERN			HAZARD QUOTIENTS				CANCER RISKS			
			Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
SEMIVOLATILES										
bis(2-Chloroethyl) ether		P	ND	ND	0.0e+00	0.0	1.7e-06	1.3e-08	1.7e-06	0.8
bis(2-ethylhexyl)phthalate	P		1.5e-02	6.0e-05	1.5e-02	17.0	5.9e-07	2.4e-09	6.0e-07	0.3
Total Carcinogenic PAHs		P	ND	ND	0.0e+00	0.0	1.5e-04	1.2e-06	1.5e-04	69.6
PESTICIDE/PCB										
Heptachlor epoxide	P	P	6.0e-02	4.9e-04	6.0e-02	69.0	1.0e-06	8.2e-09	1.0e-06	0.5
PCB		P	ND	ND	0.0e+00	0.0	5.9e-05	1.1e-06	6.0e-05	27.8
TIC Groupings										
PCBs		P	ND	ND	0.0e+00	0.0	ND	1.2e-06	1.2e-06	0.6
			Total 8.7e-02	Total 6.7e-04	Total 8.7e-02	Total 100.0	Total 2.1e-04	Total 3.5e-06	Total 2.2e-04	Total 100.0

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-26

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Ambient Air
Source Area: VOC Emissions
Population: Child Trespasser
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS		CANCER RISKS	
	Inhalation	% of Total	Inhalation	% of Total
VOLATILES				
Vinyl chloride	ND	0.0	1.3e-06	0.4
Chloroethane	1.9e+00	36.1	ND	0.0
Methylene chloride	7.9e-04	0.0	4.7e-06	1.6
1,1-Dichloroethene	ND	0.0	1.4e-04	46.6
Chloroform	ND	0.0	5.5e-05	18.8
1,2-Dichloroethane	ND	0.0	1.2e-06	0.4
2-Butanone	2.8e-01	5.4	ND	0.0
1,1,1-Trichloroethane	1.8e-01	3.5	ND	0.0
Carbon tetrachloride	ND	0.0	8.1e-05	27.7
Trichloroethene	ND	0.0	8.1e-06	2.8
Benzene	ND	0.0	3.3e-06	1.1
4-Methyl-2-pentanone	5.0e-02	0.9	ND	0.0
Tetrachloroethene	ND	0.0	1.1e-06	0.4
Toluene	2.3e-02	0.4	ND	0.0
Xylenes (mixed)	5.7e-02	1.1	ND	0.0
TIC Groupings				
Halogenated Alkanes	2.6e-02	0.5	ND	0.0
n-chain Alkanes	1.8e-01	3.5	ND	0.0
Branched Alkanes	4.7e-02	0.9	ND	0.0
Non-Cyclic Acids	2.5e+00	47.1	ND	0.0
	Total 5.3e+00	100.0%	Total 2.9e-04	100.0%

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

Table 7-26

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Ambient Air
Source Area: VOC Emissions

Population: Child Trespasser
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS		CANCER RISKS	
	Inhalation	% of Total	Inhalation	% of Total

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Table 7-27

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Ambient Air
Source Area: Fugitive Dust

Population: Child Trespasser
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS		CANCER RISKS	
	Inhalation	% of Total	Inhalation	% of Total
Total hazard risk less than 0.01				
Total Cancer risk less than 1e-6				
	Total 3.9e-04	Total 100%	Total 2.0e-09	Total 100%

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-28

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Ambient Air
Source Area: VOC Emissions
Population: ACS Worker
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS		CANCER RISKS	
	Inhalation	% of Total	Inhalation	% of Total
VOLATILES				
Vinyl chloride	ND	0.0	7.3e-06	0.4
Chloroethane	3.6e+00	36.1	ND	0.0
Methylene chloride	1.5e-03	0.0	2.7e-05	1.6
1,1-Dichloroethene	ND	0.0	7.7e-04	46.6
Chloroform	ND	0.0	3.1e-04	18.8
1,2-Dichloroethane	ND	0.0	6.8e-06	0.4
2-Butanone	5.3e-01	5.4	ND	0.0
1,1,1-Trichloroethane	3.4e-01	3.5	ND	0.0
Carbon tetrachloride	ND	0.0	4.6e-04	27.7
Trichloroethene	ND	0.0	4.6e-05	2.8
1,1,2-Trichloroethane	ND	0.0	1.6e-06	0.1
Benzene	ND	0.0	1.9e-05	1.1
4-Methyl-2-pentanone	9.3e-02	0.9	ND	0.0
Tetrachloroethene	ND	0.0	6.0e-06	0.4
Toluene	4.4e-02	0.4	ND	0.0
Chlorobenzene	1.2e-02	0.1	ND	0.0
Xylenes (mixed)	1.1e-01	1.1	ND	0.0
TIC Groupings				
Trimethyl Benzenes	1.1e-02	0.1	ND	0.0
Halogenated Alkanes	5.0e-02	0.5	ND	0.0
n-chain Alkanes	3.5e-01	3.5	ND	0.0
Branched Alkanes	8.9e-02	0.9	ND	0.0
Non-Cyclic Acids	4.6e+00	47.1	ND	0.0
	Total 9.9e+00	Total 100.0%	Total 1.6e-03	Total 100.0%

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Table 7-28

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Ambient Air
Source Area: VOC Emissions

Population: ACS Worker
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS		CANCER RISKS	
	Inhalation	% of Total	Inhalation	% of Total

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-29

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Ambient Air
Source Area: Fugitive Dust

Population: ACS Worker
Land Use: Current Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS		CANCER RISKS	
	Inhalation	% of Total	Inhalation	% of Total
Total Hazard risk less than 0.01				
Total cancer risk less than 1e-6				
	Total 7.4e-04	Total 100%	Total 1.1e-08	Total 100%

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-30

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Groundwater
Source Area: Lower Aquifer

Population: Offsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS					CANCER RISKS				
	Dermal Absorp.	Ingestion	Inhalation	Total	% of Total	Dermal Absorp.	Ingestion	Inhalation	Total	% of Total
SEMIVOLATILES										
bis(2-Chloroethyl) ether	ND	ND	ND	0.0e+00	0.0	1.6e-06	1.6e-04	3.9e-05	2.0e-04	51.5
METALS										
Arsenic	7.5e-04	2.5e-01	ND	2.5e-01	18.9	5.8e-07	1.9e-04	ND	1.9e-04	48.5
Barium	7.4e-03	1.3e-01	ND	1.3e-01	10.2	ND	ND	ND	0.0e+00	0.0
Manganese	1.8e-02	2.5e-01	ND	2.7e-01	20.3	ND	ND	ND	0.0e+00	0.0
Mercury	8.7e-04	4.5e-02	ND	4.6e-02	3.5	ND	ND	ND	0.0e+00	0.0
Vanadium	5.7e-04	9.8e-03	ND	1.0e-02	0.8	ND	ND	ND	0.0e+00	0.0
TIC Groupings										
Cyclic Alcohols	2.3e-03	2.4e-01	ND	2.4e-01	18.4	ND	ND	ND	0.0e+00	0.0
Oxygenated Alcohols	ND	ND	3.4e-01	3.4e-01	26.2	ND	ND	ND	0.0e+00	0.0
	3.1e-02	9.3e-01	3.5e-01	3.5e-01	100.0	2.1e-06	3.5e-04	3.9e-05	1.3e-05	100.0
	Total Risk All Routes		1.3e+00			Total Risk All Routes		3.9e-04		

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-31

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Groundwater
Source Area: Upper Aquifer

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS					CANCER RISKS				
	Dermal Absorp.	Ingestion	Inhalation	Total	% of Total	Dermal Absorp.	Ingestion	Inhalation	Total	% of Total
VOLATILES										
Chloromethane	ND	ND	ND	0.0e+00	0.0	4.2e-06	1.1e-05	2.3e-06	1.7e-05	0.0
Vinyl chloride	ND	ND	ND	0.0e+00	0.0	3.3e-03	1.7e-02	1.1e-03	2.1e-02	24.4
Chloroethane	ND	ND	2.5e-02	2.5e-02	0.0	ND	ND	ND	0.0e+00	0.0
Methylene chloride	4.4e-02	1.8e-01	1.6e-03	2.3e-01	0.1	8.5e-06	3.5e-05	2.8e-05	7.2e-05	0.1
Acetone	5.8e+00	2.8e+01	ND	3.4e+01	10.3	ND	ND	ND	0.0e+00	0.0
1,1-Dichloroethane	1.3e-01	6.9e-01	3.0e-01	1.1e+00	0.3	ND	ND	ND	0.0e+00	0.0
1,2-Dichloroethene (cis)	2.4e-01	1.1e+00	ND	1.4e+00	0.4	ND	ND	ND	0.0e+00	0.0
2-Butanone	2.4e-01	1.3e+02	3.0e+01	1.6e+02	47.3	ND	ND	ND	0.0e+00	0.0
Trichloroethene	ND	ND	ND	0.0e+00	0.0	1.2e-06	6.1e-06	4.0e-06	1.1e-05	0.0
Benzene	ND	ND	ND	0.0e+00	0.0	1.5e-03	3.6e-02	1.5e-02	5.2e-02	60.5
4-Methyl-2-pentanone	1.2e+01	3.1e+01	3.3e+01	7.6e+01	23.1	ND	ND	ND	0.0e+00	0.0
Tetrachloroethene	1.1e-01	5.7e-01	ND	6.8e-01	0.2	2.4e-05	1.2e-04	3.5e-06	1.5e-04	0.2
Toluene	6.4e-02	3.3e-01	1.4e-02	4.1e-01	0.1	ND	ND	ND	0.0e+00	0.0
Chlorobenzene	9.0e-02	1.4e-01	2.4e-01	4.6e-01	0.1	ND	ND	ND	0.0e+00	0.0
Ethylbenzene	1.7e-01	3.1e-01	1.4e-02	4.9e-01	0.2	ND	ND	ND	0.0e+00	0.0
Xylenes (mixed)	1.7e-02	4.3e-02	1.2e-01	1.8e-01	0.1	ND	ND	ND	0.0e+00	0.0
SEMIVOLATILES										
Phenol	1.0e-04	1.1e-02	ND	1.2e-02	0.0	ND	ND	ND	0.0e+00	0.0
bis(2-Chloroethyl) ether	ND	ND	ND	0.0e+00	0.0	3.3e-05	3.4e-03	8.1e-04	4.2e-03	4.9
1,4-Dichlorobenzene	ND	ND	9.8e-05	9.8e-05	0.0	1.4e-08	2.9e-06	ND	3.0e-06	0.0
1,2-Dichlorobenzene	1.0e-04	1.0e-02	5.7e-03	1.6e-02	0.0	ND	ND	ND	0.0e+00	0.0
2-Methylphenol	4.1e-04	2.1e-02	ND	2.2e-02	0.0	ND	ND	ND	0.0e+00	0.0
bis(2-Chloroisopropyl)ether	2.1e-03	2.1e-01	ND	2.2e-01	0.1	ND	ND	ND	0.0e+00	0.0
4-Methylphenol	2.7e-02	1.3e+00	ND	1.3e+00	0.4	ND	ND	ND	0.0e+00	0.0
Isophorone	4.9e-05	5.0e-03	ND	5.0e-03	0.0	1.7e-08	1.8e-06	ND	1.8e-06	0.0
2,4-Dimethylphenol	3.4e-02	1.6e-01	ND	1.9e-01	0.1	ND	ND	ND	0.0e+00	0.0
Benzoic Acid	8.8e-05	1.4e-02	ND	1.4e-02	0.0	ND	ND	ND	0.0e+00	0.0
Naphthalene	2.9e-03	5.1e-01	ND	5.1e-01	0.2	ND	ND	ND	0.0e+00	0.0
Pentachlorophenol	1.5e-05	2.9e-03	ND	2.9e-03	0.0	2.4e-08	4.4e-06	ND	4.4e-06	0.0
bis(2-ethylhexyl)phthalate	1.6e-06	7.1e-02	ND	7.1e-02	0.0	1.9e-10	8.6e-06	ND	8.6e-06	0.0
PESTICIDE/PCB										
PCB	ND	ND	ND	0.0e+00	0.0	4.8e-03	2.8e-03	ND	7.6e-03	8.7
METALS										
Arsenic	3.8e-03	1.2e+00	ND	1.2e+00	0.4	2.9e-06	9.5e-04	ND	9.6e-04	1.1
Barium	4.4e-02	7.5e-01	ND	7.9e-01	0.2	ND	ND	ND	0.0e+00	0.0

Table 7-31

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Groundwater
Source Area: Upper Aquifer

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS					CANCER RISKS				
	Dermal Absorp.	Ingestion	Inhalation	Total	% of Total	Dermal Absorp.	Ingestion	Inhalation	Total	% of Total
Beryllium	4.2e-05	1.4e-03	ND	1.5e-03	0.0	3.8e-07	1.3e-05	ND	1.4e-05	0.0
Cadmium (water)	7.4e-03	1.8e-01	ND	1.8e-01	0.1	ND	ND	ND	0.0e+00	0.0
Chromium VI	1.8e-04	2.2e-02	ND	2.2e-02	0.0	ND	ND	ND	0.0e+00	0.0
Lead	5.5e-03	9.4e-01	ND	9.4e-01	0.3	ND	ND	ND	0.0e+00	0.0
Manganese	8.8e-02	1.2e+00	ND	1.3e+00	0.4	ND	ND	ND	0.0e+00	0.0
Mercury	3.1e-03	1.6e-01	ND	1.7e-01	0.1	ND	ND	ND	0.0e+00	0.0
Nickel	2.2e-03	7.6e-02	ND	7.8e-02	0.0	ND	ND	ND	0.0e+00	0.0
Thallium	9.5e-02	1.6e+00	ND	1.7e+00	0.5	ND	ND	ND	0.0e+00	0.0
Vanadium	6.2e-03	1.1e-01	ND	1.1e-01	0.0	ND	ND	ND	0.0e+00	0.0
Zinc	1.2e-03	1.3e-01	ND	1.3e-01	0.0	ND	ND	ND	0.0e+00	0.0
Cyanide	5.9e-05	1.4e-02	ND	1.4e-02	0.0	ND	ND	ND	0.0e+00	0.0
TIC Groupings										
Propyl Benzenes	1.7e-02	4.3e-02	8.2e-02	1.4e-01	0.0	ND	ND	ND	0.0e+00	0.0
Propenyl Benzenes	1.1e-02	2.9e-02	7.4e-03	4.7e-02	0.0	ND	ND	ND	0.0e+00	0.0
Ethyl Methyl Benzenes	3.6e-03	1.9e-02	8.0e-04	2.3e-02	0.0	ND	ND	ND	0.0e+00	0.0
Diethyl Benzenes	1.2e-02	2.2e-02	9.6e-04	3.5e-02	0.0	ND	ND	ND	0.0e+00	0.0
Methyl Propyl Benzenes	3.9e-03	1.0e-02	1.9e-02	3.3e-02	0.0	ND	ND	ND	0.0e+00	0.0
Methyl Ethenyl Benzenes	8.3e-04	8.6e-02	1.2e-02	9.9e-02	0.0	ND	ND	ND	0.0e+00	0.0
Methyl Phenyl Benzenes	9.9e-04	1.7e-01	ND	1.7e-01	0.1	ND	ND	ND	0.0e+00	0.0
Trimethyl Benzenes	9.0e-03	4.6e-02	1.4e-02	6.9e-02	0.0	ND	ND	ND	0.0e+00	0.0
Dimethyl ethyl benzenes	6.1e-02	1.1e-01	4.9e-03	1.8e-01	0.1	ND	ND	ND	0.0e+00	0.0
Tetramethyl Benzenes	1.8e-03	9.3e-03	2.8e-03	1.4e-02	0.0	ND	ND	ND	0.0e+00	0.0
Oxygenated Benzenes	1.0e-02	2.6e-02	ND	3.6e-02	0.0	ND	ND	ND	0.0e+00	0.0
Halogenated Benzenes	1.7e-03	1.7e-01	ND	1.7e-01	0.1	ND	ND	ND	0.0e+00	0.0
Halogenated Alkanes	4.9e-03	2.5e-02	3.2e-03	3.3e-02	0.0	ND	ND	ND	0.0e+00	0.0
Branched Alkanes	1.3e-01	3.4e-01	4.4e-02	5.2e-01	0.2	ND	ND	ND	0.0e+00	0.0
Ethers	5.7e-04	8.6e-02	ND	8.6e-02	0.0	ND	ND	ND	0.0e+00	0.0
Methylated Naphthalenes	3.1e-03	5.3e-01	ND	5.3e-01	0.2	ND	ND	ND	0.0e+00	0.0
Methylated Phenols	2.4e-03	1.1e-01	ND	1.1e-01	0.0	ND	ND	ND	0.0e+00	0.0
Simple Ketones	1.9e-02	4.9e-02	1.2e-02	8.0e-02	0.0	ND	ND	ND	0.0e+00	0.0
Cyclic Ketones	5.2e-03	1.3e-02	ND	1.8e-02	0.0	1.8e-06	4.6e-06	ND	6.4e-06	0.0
Diols	2.5e-04	2.6e-02	ND	2.6e-02	0.0	ND	ND	ND	0.0e+00	0.0
Simple Alcohols	4.5e-03	1.1e-02	ND	1.6e-02	0.0	ND	ND	ND	0.0e+00	0.0
Cyclic Alcohols	1.8e-03	1.9e-01	ND	1.9e-01	0.1	ND	ND	ND	0.0e+00	0.0
Oxygenated Alcohols	ND	ND	7.5e-01	7.5e-01	0.2	ND	ND	ND	0.0e+00	0.0
Non-Cyclic Acids	1.5e-01	3.9e-01	4.5e+01	4.6e+01	13.9	ND	ND	ND	0.0e+00	0.0
	Total 2.0e+01	Total 2.0e+02	Total 1.1e+02	Total 3.3e+02	Total 100.0	Total 9.7e-03	Total 6.0e-02	Total 1.7e-02	Total 8.7e-02	Total 100.0

Table 7-31

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Groundwater
Source Area: Upper Aquifer

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS					CANCER RISKS				
	Dermal Absorp.	Ingestion	Inhalation	Total	% of Total	Dermal Absorp.	Ingestion	Inhalation	Total	% of Total

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-32

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Ambient Air
Source Area: VOC Emissions

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS		CANCER RISKS	
	Inhalation	% of Total	Inhalation	% of Total
VOLATILES				
Vinyl chloride	ND	0.0	1.2e-05	0.4
Chloroethane	5.9e+00	36.1	ND	0.0
Methylene chloride	2.5e-03	0.0	4.4e-05	1.6
1,1-Dichloroethene	ND	0.0	1.3e-03	46.6
Chloroform	ND	0.0	5.2e-04	18.8
1,2-Dichloroethane	ND	0.0	1.1e-05	0.4
2-Butanone	8.9e-01	5.4	ND	0.0
1,1,1-Trichloroethane	5.7e-01	3.5	ND	0.0
Carbon tetrachloride	ND	0.0	7.6e-04	27.7
Trichloroethene	ND	0.0	7.6e-05	2.8
1,1,2-Trichloroethane	ND	0.0	2.7e-06	0.1
Benzene	ND	0.0	3.1e-05	1.1
4-Methyl-2-pentanone	1.6e-01	0.9	ND	0.0
Tetrachloroethene	ND	0.0	1.0e-05	0.4
Toluene	7.3e-02	0.4	ND	0.0
Chlorobenzene	2.0e-02	0.1	ND	0.0
Xylenes (mixed)	1.8e-01	1.1	ND	0.0
SEMIVOLATILES				
bis(2-Chloroethyl) ether	ND	0.0	1.4e-06	0.1
TIC Groupings				
Methyl Propyl Benzenes	1.3e-02	0.1	ND	0.0
Trimethyl Benzenes	1.8e-02	0.1	ND	0.0
Halogenated Alkanes	8.3e-02	0.5	ND	0.0
n-chain Alkanes	5.8e-01	3.5	ND	0.0
Branched Alkanes	1.5e-01	0.9	ND	0.0
Non-Cyclic Acids	7.7e+00	47.1	ND	0.0
	Total	Total	Total	Total
	1.6e+01	1.0	2.7e-03	1.0

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Table 7-32

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Ambient Air
Source Area: VOC Emissions

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS		CANCER RISKS	
	Inhalation	% of Total	Inhalation	% of Total

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each c

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-33

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Soil
Source Area: Onsite Containment Area

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
VOLATILES								
1,2-Dichloroethene (cis)	2.1e-02	3.7e-04	2.2e-02	0.0	ND	ND	0.0e+00	0.0
1,2-Dichloroethane	ND	ND	0.0e+00	0.0	1.5e-06	2.7e-08	1.5e-06	0.0
1,1,1-Trichloroethane	5.7e-01	1.0e-02	5.8e-01	1.2	ND	ND	0.0e+00	0.0
1,2-Dichloropropane	ND	ND	0.0e+00	0.0	1.7e-06	1.6e-08	1.7e-06	0.0
Trichloroethene	ND	ND	0.0e+00	0.0	2.2e-06	4.1e-08	2.3e-06	0.0
Benzene	ND	ND	0.0e+00	0.0	3.5e-04	3.2e-06	3.5e-04	5.2
Tetrachloroethene	2.3e+01	4.2e-01	2.3e+01	47.0	5.0e-03	9.2e-05	5.1e-03	75.6
1,1,2,2-Tetrachloroethane	ND	ND	0.0e+00	0.0	1.4e-05	2.4e-07	1.4e-05	0.2
Toluene	1.5e+01	2.8e-01	1.6e+01	31.6	ND	ND	0.0e+00	0.0
Ethylbenzene	5.2e+00	4.8e-02	5.3e+00	10.6	ND	ND	0.0e+00	0.0
Styrene	1.3e-03	2.2e-05	1.4e-03	0.0	3.4e-06	5.7e-08	3.5e-06	0.1
Xylenes (mixed)	9.7e-01	8.9e-03	9.8e-01	2.0	ND	ND	0.0e+00	0.0
SEMIVOLATILES								
Naphthalene	1.0e+00	1.6e-02	1.1e+00	2.1	ND	ND	0.0e+00	0.0
bis(2-ethylhexyl)phthalate	1.1e+00	5.0e-03	1.1e+00	2.2	1.3e-04	6.0e-07	1.3e-04	1.9
Total Carcinogenic PAHs	ND	ND	0.0e+00	0.0	9.7e-05	8.9e-07	9.8e-05	1.5
PESTICIDE/PCB								
PCB	ND	ND	0.0e+00	0.0	1.0e-03	2.1e-05	1.0e-03	15.2
METALS								
Barium	2.7e-02	7.3e-04	2.7e-02	0.1	ND	ND	0.0e+00	0.0
Chromium VI	2.6e-02	7.2e-03	3.4e-02	0.1	ND	ND	0.0e+00	0.0
Mercury	2.9e-02	2.4e-03	3.1e-02	0.1	ND	ND	0.0e+00	0.0
TIC Groupings								
Propyl Benzenes	3.9e-02	3.6e-04	3.9e-02	0.1	ND	ND	0.0e+00	0.0
Ethyl Methyl Benzenes	2.1e-02	3.9e-04	2.2e-02	0.0	ND	ND	0.0e+00	0.0
Diethyl Benzenes	2.2e-02	2.0e-04	2.2e-02	0.0	ND	ND	0.0e+00	0.0
Methyl Ethenyl Benzenes	1.8e-02	1.7e-04	1.8e-02	0.0	ND	ND	0.0e+00	0.0
Trimethyl Benzenes	3.8e-02	6.9e-04	3.9e-02	0.1	ND	ND	0.0e+00	0.0
Dimethyl ethyl benzenes	1.6e-01	1.4e-03	1.6e-01	0.3	ND	ND	0.0e+00	0.0
Oxygenated Benzenes	2.0e-01	1.9e-03	2.0e-01	0.4	ND	ND	0.0e+00	0.0
n-chain Alkanes	4.1e-01	3.8e-03	4.2e-01	0.8	ND	ND	0.0e+00	0.0
Branched Alkanes	2.3e-01	2.1e-03	2.4e-01	0.5	ND	ND	0.0e+00	0.0
Methylated Naphthalenes	9.7e-02	1.5e-03	9.9e-02	0.2	ND	ND	0.0e+00	0.0

Table 7-33

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Soil
Source Area: Onsite Containment Area

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
Non-Cyclic Acids	2.1e-01	2.0e-03	2.2e-01	0.4	ND	ND	0.0e+00	0.0
Amines	2.6e-02	2.4e-04	2.7e-02	0.1	ND	ND	0.0e+00	0.0
PCBs	ND	ND	0.0e+00	0.0	ND	1.8e-05	1.8e-05	0.3
	Total	Total	Total	Total	Total	Total	Total	Total
	4.9e+01	8.2e-01	5.0e+01	100.0	6.6e-03	1.4e-04	6.8e-03	100.0

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-34

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Soil
Source Area: Still Bottoms Treatment Lagoon Area

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
VOLATILES								
Methylene chloride	3.1e-01	4.5e-03	3.1e-01	0.1	5.9e-05	8.7e-07	6.0e-05	0.2
1,2-Dichloroethene (cis)	1.3e+00	2.3e-02	1.3e+00	0.2	ND	ND	0.0e+00	0.0
Chloroform	8.2e+00	1.5e-01	8.3e+00	1.5	2.1e-04	3.9e-06	2.2e-04	0.6
1,2-Dichloroethane	ND	ND	0.0e+00	0.0	6.1e-05	1.1e-06	6.2e-05	0.2
2-Butanone	8.2e-01	7.6e-03	8.3e-01	0.1	ND	ND	0.0e+00	0.0
1,1,1-Trichloroethane	9.1e+00	1.7e-01	9.2e+00	1.6	ND	ND	0.0e+00	0.0
Carbon tetrachloride	2.4e+02	3.7e+00	2.4e+02	42.6	9.2e-03	1.4e-04	9.3e-03	24.4
1,2-Dichloropropane	ND	ND	0.0e+00	0.0	5.0e-05	4.6e-07	5.0e-05	0.1
Trichloroethene	ND	ND	0.0e+00	0.0	3.1e-04	5.7e-06	3.2e-04	0.8
1,1,2-Trichloroethane	1.6e-01	1.4e-03	1.6e-01	0.0	1.5e-05	1.4e-07	1.6e-05	0.0
Benzene	ND	ND	0.0e+00	0.0	1.6e-04	1.5e-06	1.7e-04	0.4
4-Methyl-2-pentanone	2.3e+00	2.1e-02	2.4e+00	0.4	ND	ND	0.0e+00	0.0
Tetrachloroethene	6.2e+00	1.1e-01	6.3e+00	1.1	1.4e-03	2.5e-05	1.4e-03	3.6
Toluene	4.5e+00	8.2e-02	4.6e+00	0.8	ND	ND	0.0e+00	0.0
Ethylbenzene	6.5e+00	6.0e-02	6.6e+00	1.2	ND	ND	0.0e+00	0.0
Styrene	3.5e-02	5.7e-04	3.5e-02	0.0	8.9e-05	1.5e-06	9.0e-05	0.2
Xylenes (mixed)	3.7e-01	3.3e-03	3.7e-01	0.1	ND	ND	0.0e+00	0.0
SEMIVOLATILES								
bis(2-Chloroethyl) ether	ND	ND	0.0e+00	0.0	4.0e-03	3.7e-05	4.1e-03	10.7
1,2-Dichlorobenzene	6.0e-02	5.5e-04	6.1e-02	0.0	ND	ND	0.0e+00	0.0
2-Methylphenol	1.4e-02	2.1e-04	1.4e-02	0.0	ND	ND	0.0e+00	0.0
4-Methylphenol	4.2e-02	6.1e-04	4.2e-02	0.0	ND	ND	0.0e+00	0.0
Isophorone	1.0e+00	9.3e-03	1.0e+00	0.2	3.6e-04	3.3e-06	3.6e-04	0.9
2,4-Dichlorophenol	4.3e-02	4.0e-04	4.4e-02	0.0	ND	ND	0.0e+00	0.0
1,2,4-Trichlorophenol	8.5e-02	7.8e-04	8.6e-02	0.0	ND	ND	0.0e+00	0.0
Naphthalene	8.7e+00	1.3e-01	8.8e+00	1.6	ND	ND	0.0e+00	0.0
Hexachlorobutadiene	1.6e+00	1.4e-02	1.6e+00	0.3	1.0e-04	9.5e-07	1.0e-04	0.3
Dimethylphthalate	2.5e-02	2.3e-04	2.5e-02	0.0	ND	ND	0.0e+00	0.0
N-nitrosodiphenylamine	ND	ND	0.0e+00	0.0	1.1e-06	1.9e-08	1.1e-06	0.0
Hexachlorobenzene	7.0e-02	6.4e-04	7.0e-02	0.0	3.8e-05	3.5e-07	3.9e-05	0.1
Pentachlorophenol	9.2e-02	1.5e-03	9.4e-02	0.0	1.4e-04	2.3e-06	1.4e-04	0.4
Di-n-butylphthalate	3.0e-01	4.9e-03	3.0e-01	0.1	ND	ND	0.0e+00	0.0
Butylbenzylphthalate	2.1e-01	3.4e-03	2.1e-01	0.0	ND	ND	0.0e+00	0.0
bis(2-ethylhexyl)phthalate	2.0e+01	9.3e-02	2.0e+01	3.6	2.4e-03	1.1e-05	2.4e-03	6.4
Di-n-octyl Phthalate	7.6e-02	6.9e-04	7.6e-02	0.0	ND	ND	0.0e+00	0.0
Total Carcinogenic PAHs	ND	ND	0.0e+00	0.0	5.6e-04	5.2e-06	5.7e-04	1.5
PESTICIDE/PCB								

Table 7-34

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Soil
Source Area: Still Bottoms Treatment Lagoon Area

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
gamma-BHC (Lindane)	1.4e-01	2.6e-03	1.5e-01	0.0	2.4e-05	4.4e-07	2.4e-05	0.1
Endosulfan I	1.9e+00	1.7e-02	1.9e+00	0.3	ND	ND	0.0e+00	0.0
4,4'-DDT	4.4e+00	4.0e-02	4.4e+00	0.8	3.2e-04	2.9e-06	3.2e-04	0.8
PCB	ND	ND	0.0e+00	0.0	1.8e-02	3.7e-04	1.8e-02	48.2
METALS								
Antimony	3.0e+00	8.3e-02	3.1e+00	0.6	ND	ND	0.0e+00	0.0
Barium	3.3e-01	9.0e-03	3.4e-01	0.1	ND	ND	0.0e+00	0.0
Cadmium (food/soil)	2.2e+00	8.4e-02	2.3e+00	0.4	ND	ND	0.0e+00	0.0
Chromium VI	5.7e-01	1.6e-01	7.2e-01	0.1	ND	ND	0.0e+00	0.0
Lead	1.2e+02	3.2e+01	1.5e+02	26.5	ND	ND	0.0e+00	0.0
Mercury	3.2e-01	2.6e-02	3.4e-01	0.1	ND	ND	0.0e+00	0.0
Zinc	4.9e-02	8.1e-03	5.7e-02	0.0	ND	ND	0.0e+00	0.0
TIC Groupings								
Propyl Benzenes	7.4e-01	6.8e-03	7.5e-01	0.1	ND	ND	0.0e+00	0.0
Propenyl Benzenes	8.7e-01	8.0e-03	8.8e-01	0.2	ND	ND	0.0e+00	0.0
Ethyl Methyl Benzenes	3.7e-01	6.8e-03	3.8e-01	0.1	ND	ND	0.0e+00	0.0
Diethyl Benzenes	4.0e-01	3.6e-03	4.0e-01	0.1	ND	ND	0.0e+00	0.0
Methyl Propyl Benzenes	2.1e+00	2.0e-02	2.2e+00	0.4	ND	ND	0.0e+00	0.0
Methyl Phenyl Benzenes	3.6e-01	5.5e-03	3.6e-01	0.1	ND	ND	0.0e+00	0.0
Trimethyl Benzenes	1.7e-01	3.2e-03	1.8e-01	0.0	ND	ND	0.0e+00	0.0
Dimethyl ethyl benzenes	1.5e+00	1.4e-02	1.5e+00	0.3	ND	ND	0.0e+00	0.0
Tetramethyl Benzenes	1.3e-01	2.3e-03	1.3e-01	0.0	ND	ND	0.0e+00	0.0
Oxygenated Benzenes	7.8e-02	7.1e-04	7.8e-02	0.0	ND	ND	0.0e+00	0.0
Nitrogenated Benzenes	3.9e+01	3.6e-01	3.9e+01	7.0	ND	ND	0.0e+00	0.0
Halogenated Alkanes	2.1e+00	3.8e-02	2.1e+00	0.4	ND	ND	0.0e+00	0.0
n-chain Alkanes	3.0e+01	2.7e-01	3.0e+01	5.4	ND	ND	0.0e+00	0.0
Branched Alkanes	7.6e+00	7.0e-02	7.7e+00	1.4	ND	ND	0.0e+00	0.0
Methylated Naphthalenes	6.6e-01	1.0e-02	6.7e-01	0.1	ND	ND	0.0e+00	0.0
Cyclic Ketones	6.2e-02	5.7e-04	6.3e-02	0.0	2.2e-05	2.0e-07	2.2e-05	0.1
Simple Alcohols	4.3e-02	3.9e-04	4.3e-02	0.0	ND	ND	0.0e+00	0.0
Non-Cyclic Acids	3.0e-01	2.8e-03	3.0e-01	0.1	ND	ND	0.0e+00	0.0
Amines	2.2e-02	2.0e-04	2.2e-02	0.0	ND	ND	0.0e+00	0.0
	Total 5.2e+02	Total 3.8e+01	Total 5.6e+02	Total 100.0	Total 3.8e-02	Total 6.2e-04	Total 3.8e-02	Total 100.0

This table presents risk values for chemicals of potential concern which are associated with hazard quotients

Table 7-34

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Soil
Source Area: Still Bottoms Treatment Lagoon Area

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total

greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-35

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Soil
Source Area: Offsite Containment Area

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
VOLATILES								
Vinyl chloride	ND	ND	0.0e+00	0.0	9.2e-05	1.7e-06	9.3e-05	0.1
Methylene chloride	1.7e-01	2.5e-03	1.7e-01	0.0	3.3e-05	4.8e-07	3.3e-05	0.0
Acetone	7.0e+00	1.2e-01	7.1e+00	0.7	ND	ND	0.0e+00	0.0
1,1-Dichloroethene	1.7e+00	3.1e-02	1.7e+00	0.2	3.9e-03	7.1e-05	4.0e-03	2.6
1,1-Dichloroethane	1.9e-01	3.5e-03	1.9e-01	0.0	ND	ND	0.0e+00	0.0
1,2-Dichloroethene (cis)	1.4e-01	2.4e-03	1.4e-01	0.0	ND	ND	0.0e+00	0.0
Chloroform	1.1e+01	2.0e-01	1.1e+01	1.1	2.8e-04	5.2e-06	2.9e-04	0.2
1,2-Dichloroethane	ND	ND	0.0e+00	0.0	6.7e-04	1.2e-05	6.8e-04	0.4
2-Butanone	1.5e+02	1.4e+00	1.6e+02	15.2	ND	ND	0.0e+00	0.0
1,1,1-Trichloroethane	6.5e+01	1.2e+00	6.6e+01	6.5	ND	ND	0.0e+00	0.0
1,2-Dichloropropane	ND	ND	0.0e+00	0.0	1.5e-04	1.4e-06	1.6e-04	0.1
Trichloroethene	ND	ND	0.0e+00	0.0	3.5e-03	6.4e-05	3.5e-03	2.3
1,1,2-Trichloroethane	7.8e+00	7.1e-02	7.8e+00	0.8	7.6e-04	7.0e-06	7.7e-04	0.5
Benzene	ND	ND	0.0e+00	0.0	1.4e-03	1.3e-05	1.5e-03	1.0
4-Methyl-2-pentanone	9.5e+01	8.7e-01	9.6e+01	9.4	ND	ND	0.0e+00	0.0
Tetrachloroethene	1.8e+02	3.3e+00	1.8e+02	17.8	3.9e-02	7.2e-04	4.0e-02	26.2
Toluene	2.5e+01	4.6e-01	2.6e+01	2.5	ND	ND	0.0e+00	0.0
Chlorobenzene	6.5e+00	3.6e-02	6.5e+00	0.6	ND	ND	0.0e+00	0.0
Ethylbenzene	1.8e+01	1.6e-01	1.8e+01	1.8	ND	ND	0.0e+00	0.0
Styrene	6.7e-02	1.1e-03	6.8e-02	0.0	1.7e-04	2.8e-06	1.7e-04	0.1
Xylenes (mixed)	3.9e+00	3.6e-02	3.9e+00	0.4	ND	ND	0.0e+00	0.0
SEMIVOLATILES								
Phenol	3.7e-02	6.1e-04	3.7e-02	0.0	ND	ND	0.0e+00	0.0
bis(2-Chloroethyl) ether	ND	ND	0.0e+00	0.0	7.3e-03	6.7e-05	7.4e-03	4.9
1,4-Dichlorobenzene	ND	ND	0.0e+00	0.0	2.2e-06	4.0e-08	2.2e-06	0.0
1,2-Dichlorobenzene	1.0e-01	9.5e-04	1.0e-01	0.0	ND	ND	0.0e+00	0.0
2-Methylphenol	6.5e-02	9.5e-04	6.6e-02	0.0	ND	ND	0.0e+00	0.0
4-Methylphenol	2.0e-01	3.0e-03	2.1e-01	0.0	ND	ND	0.0e+00	0.0
Isophorone	1.4e+00	1.3e-02	1.4e+00	0.1	4.9e-04	4.5e-06	5.0e-04	0.3
2,4-Dimethylphenol	4.5e-01	4.1e-03	4.6e-01	0.0	ND	ND	0.0e+00	0.0
Benzoic Acid	1.5e-01	2.1e-03	1.5e-01	0.0	ND	ND	0.0e+00	0.0
1,2,4-Trichlorophenol	2.0e+00	1.9e-02	2.1e+00	0.2	ND	ND	0.0e+00	0.0
Naphthalene	2.8e+01	4.3e-01	2.8e+01	2.8	ND	ND	0.0e+00	0.0
Hexachlorobutadiene	5.8e+00	5.3e-02	5.9e+00	0.6	3.9e-04	3.6e-06	3.9e-04	0.3
Dimethylphthalate	4.1e-02	3.7e-04	4.1e-02	0.0	ND	ND	0.0e+00	0.0
2,6-Dinitrotoluene	ND	ND	0.0e+00	0.0	1.7e-05	1.6e-07	1.7e-05	0.0
Acenaphthene	2.3e-02	2.1e-04	2.4e-02	0.0	ND	ND	0.0e+00	0.0
Diethylphthalate	2.7e-02	2.5e-04	2.7e-02	0.0	ND	ND	0.0e+00	0.0
Fluorene	6.0e-02	5.5e-04	6.1e-02	0.0	ND	ND	0.0e+00	0.0

Table 7-35

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Soil
Source Area: Offsite Containment Area

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
N-nitrosodiphenylamine	ND	ND	0.0e+00	0.0	4.4e-06	7.9e-08	4.5e-06	0.0
Hexachlorobenzene	1.9e-01	1.7e-03	1.9e-01	0.0	1.0e-04	9.4e-07	1.0e-04	0.1
Pentachlorophenol	2.6e-01	4.3e-03	2.6e-01	0.0	4.0e-04	6.6e-06	4.1e-04	0.3
Di-n-butylphthalate	1.5e+00	2.4e-02	1.5e+00	0.1	ND	ND	0.0e+00	0.0
Fluoranthene	3.3e-02	3.0e-04	3.3e-02	0.0	ND	ND	0.0e+00	0.0
Pyrene	5.7e-02	5.2e-04	5.8e-02	0.0	ND	ND	0.0e+00	0.0
Butylbenzylphthalate	3.5e-01	5.7e-03	3.5e-01	0.0	ND	ND	0.0e+00	0.0
bis(2-ethylhexyl)phthalate	1.1e+02	5.0e-01	1.1e+02	10.7	1.3e-02	6.0e-05	1.3e-02	8.6
Di-n-octyl Phthalate	5.4e-01	5.0e-03	5.5e-01	0.1	ND	ND	0.0e+00	0.0
Total Carcinogenic PAHs	ND	ND	0.0e+00	0.0	2.6e-02	2.3e-04	2.6e-02	17.0
PESTICIDE/PCB								
alpha-BHC	ND	ND	0.0e+00	0.0	3.8e-05	3.5e-07	3.9e-05	0.0
beta-BHC	ND	ND	0.0e+00	0.0	3.1e-05	2.9e-07	3.2e-05	0.0
Aldrin	2.3e+00	2.1e-02	2.3e+00	0.2	5.1e-04	4.7e-06	5.1e-04	0.3
Heptachlor epoxide	3.8e-02	3.5e-04	3.8e-02	0.0	1.9e-06	1.8e-08	1.9e-06	0.0
4,4'-DDE	ND	ND	0.0e+00	0.0	2.8e-06	4.7e-08	2.9e-06	0.0
4,4'-DDD	ND	ND	0.0e+00	0.0	1.1e-05	9.9e-08	1.1e-05	0.0
4,4'-DDT	1.4e-01	1.3e-03	1.4e-01	0.0	1.0e-05	9.3e-08	1.0e-05	0.0
PCB	ND	ND	0.0e+00	0.0	5.1e-02	1.1e-03	5.2e-02	34.6
METALS								
Antimony	9.8e+00	2.7e-01	1.0e+01	1.0	ND	ND	0.0e+00	0.0
Barium	1.8e-01	5.0e-03	1.9e-01	0.0	ND	ND	0.0e+00	0.0
Cadmium (food/soil)	3.1e+01	1.2e+00	3.3e+01	3.2	ND	ND	0.0e+00	0.0
Chromium VI	2.7e-01	7.5e-02	3.5e-01	0.0	ND	ND	0.0e+00	0.0
Manganese	8.6e-02	1.9e-03	8.8e-02	0.0	ND	ND	0.0e+00	0.0
Mercury	2.6e-01	2.2e-02	2.9e-01	0.0	ND	ND	0.0e+00	0.0
Nickel	1.9e-02	1.0e-03	2.0e-02	0.0	ND	ND	0.0e+00	0.0
Silver	4.0e-02	2.2e-03	4.2e-02	0.0	ND	ND	0.0e+00	0.0
Zinc	2.9e-02	4.8e-03	3.4e-02	0.0	ND	ND	0.0e+00	0.0
TIC Groupings								
Propyl Benzenes	1.0e+00	9.3e-03	1.0e+00	0.1	ND	ND	0.0e+00	0.0
Propenyl Benzenes	1.6e+00	1.4e-02	1.6e+00	0.2	ND	ND	0.0e+00	0.0
Ethyl Methyl Benzenes	1.1e+00	2.1e-02	1.2e+00	0.1	ND	ND	0.0e+00	0.0
Diethyl Benzenes	1.7e+00	1.6e-02	1.7e+00	0.2	ND	ND	0.0e+00	0.0
Methyl Propyl Benzenes	1.8e+00	1.7e-02	1.8e+00	0.2	ND	ND	0.0e+00	0.0
Trimethyl Benzenes	9.5e-01	1.7e-02	9.7e-01	0.1	ND	ND	0.0e+00	0.0
Dimethyl ethyl benzenes	1.3e+00	1.2e-02	1.3e+00	0.1	ND	ND	0.0e+00	0.0

Table 7-35

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Soil
Source Area: Offsite Containment Area

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
Tetramethyl Benzenes	2.8e-02	5.2e-04	2.9e-02	0.0	ND	ND	0.0e+00	0.0
Oxygenated Benzenes	2.7e+00	2.5e-02	2.7e+00	0.3	ND	ND	0.0e+00	0.0
Nitrogenated Benzenes	1.5e+02	1.4e+00	1.6e+02	15.2	ND	ND	0.0e+00	0.0
n-chain Alkanes	1.7e+00	1.5e-02	1.7e+00	0.2	ND	ND	0.0e+00	0.0
Branched Alkanes	3.0e+00	2.7e-02	3.0e+00	0.3	ND	ND	0.0e+00	0.0
Ethers	1.4e-02	1.3e-04	1.4e-02	0.0	ND	ND	0.0e+00	0.0
Methylated Naphthalenes	8.4e+00	1.3e-01	8.6e+00	0.8	ND	ND	0.0e+00	0.0
Phthalates	4.7e-02	4.3e-04	4.7e-02	0.0	ND	ND	0.0e+00	0.0
Methylated Phenols	5.1e-02	7.5e-04	5.2e-02	0.0	ND	ND	0.0e+00	0.0
Methylated Ketones	4.1e-02	7.1e-04	4.2e-02	0.0	ND	ND	0.0e+00	0.0
Cyclic Ketones	3.1e-02	2.8e-04	3.1e-02	0.0	1.1e-05	1.0e-07	1.1e-05	0.0
Diols	1.0e-01	9.3e-04	1.0e-01	0.0	ND	ND	0.0e+00	0.0
Simple Alcohols	3.7e-01	3.4e-03	3.8e-01	0.0	ND	ND	0.0e+00	0.0
Non-Cyclic Acids	6.1e+01	5.6e-01	6.2e+01	6.0	ND	ND	0.0e+00	0.0
Amines	8.2e-02	7.6e-04	8.3e-02	0.0	ND	ND	0.0e+00	0.0
	Total	Total	Total	Total	Total	Total	Total	Total
	1.0e+03	1.3e+01	1.0e+03	100.0	1.5e-01	2.3e-03	1.5e-01	100.0

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-36

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Surface Soil
Source Area: Kapica - Pazmey

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
VOLATILES								
1,2-Dichloroethene (cis)	3.1e-02	5.4e-04	3.2e-02	0.0	ND	ND	0.0e+00	0.0
Trichloroethene	ND	ND	0.0e+00	0.0	3.1e-05	5.7e-07	3.2e-05	0.1
Benzene	ND	ND	0.0e+00	0.0	3.1e-06	2.8e-08	3.1e-06	0.0
4-Methyl-2-pentanone	4.2e-01	3.8e-03	4.2e-01	0.1	ND	ND	0.0e+00	0.0
Tetrachloroethene	3.1e+00	5.6e-02	3.1e+00	0.8	6.7e-04	1.2e-05	6.8e-04	1.5
Toluene	3.7e+00	6.8e-02	3.8e+00	0.9	ND	ND	0.0e+00	0.0
Chlorobenzene	4.0e-02	2.2e-04	4.0e-02	0.0	ND	ND	0.0e+00	0.0
Ethylbenzene	3.3e+00	3.1e-02	3.4e+00	0.8	ND	ND	0.0e+00	0.0
Styrene	5.0e-03	8.2e-05	5.0e-03	0.0	1.3e-05	2.1e-07	1.3e-05	0.0
Xylenes (mixed)	8.9e-01	8.2e-03	9.0e-01	0.2	ND	ND	0.0e+00	0.0
SEMIVOLATILES								
Isophorone	3.8e-02	3.5e-04	3.8e-02	0.0	1.3e-05	1.2e-07	1.3e-05	0.0
2,4-Dimethylphenol	1.9e-02	1.7e-04	1.9e-02	0.0	ND	ND	0.0e+00	0.0
Naphthalene	1.1e+00	1.7e-02	1.1e+00	0.3	ND	ND	0.0e+00	0.0
Pentachlorophenol	2.2e-03	3.6e-05	2.2e-03	0.0	3.3e-06	5.5e-08	3.4e-06	0.0
Di-n-butylphthalate	4.1e-02	6.7e-04	4.1e-02	0.0	ND	ND	0.0e+00	0.0
Butylbenzylphthalate	1.1e-02	1.8e-04	1.1e-02	0.0	ND	ND	0.0e+00	0.0
bis(2-ethylhexyl)phthalate	4.2e+00	1.9e-02	4.2e+00	1.0	5.0e-04	2.3e-06	5.1e-04	1.1
Di-n-octyl Phthalate	1.5e-01	1.4e-03	1.5e-01	0.0	ND	ND	0.0e+00	0.0
Total Carcinogenic PAHs	ND	ND	0.0e+00	0.0	5.4e-03	4.9e-05	5.4e-03	12.0
PESTICIDE/PCB								
Aldrin	2.3e-01	2.1e-03	2.3e-01	0.1	5.0e-05	4.6e-07	5.0e-05	0.1
Endosulfan I	6.5e-02	6.0e-04	6.6e-02	0.0	ND	ND	0.0e+00	0.0
4,4'-DDD	ND	ND	0.0e+00	0.0	1.2e-06	1.1e-08	1.2e-06	0.0
PCB	ND	ND	0.0e+00	0.0	3.8e-02	7.7e-04	3.8e-02	85.1
METALS								
Antimony	5.5e+00	1.5e-01	5.6e+00	1.4	ND	ND	0.0e+00	0.0
Barium	2.1e+00	5.8e-02	2.2e+00	0.5	ND	ND	0.0e+00	0.0
Cadmium (food/soil)	3.2e+00	1.2e-01	3.3e+00	0.8	ND	ND	0.0e+00	0.0
Chromium VI	1.6e+00	4.4e-01	2.0e+00	0.5	ND	ND	0.0e+00	0.0
Lead	3.0e+02	8.2e+01	3.8e+02	91.8	ND	ND	0.0e+00	0.0
Manganese	5.0e-01	1.1e-02	5.1e-01	0.1	ND	ND	0.0e+00	0.0
Mercury	2.7e-01	2.3e-02	3.0e-01	0.1	ND	ND	0.0e+00	0.0
Nickel	1.3e-01	7.0e-03	1.3e-01	0.0	ND	ND	0.0e+00	0.0
Silver	1.1e-01	5.9e-03	1.1e-01	0.0	ND	ND	0.0e+00	0.0

Table 7-36

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Surface Soil
Source Area: Kapica - Pazmey

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
Vanadium	1.8e-01	4.9e-03	1.8e-01	0.0	ND	ND	0.0e+00	0.0
Zinc	3.4e-01	5.6e-02	4.0e-01	0.1	ND	ND	0.0e+00	0.0
TIC Groupings								
Propenyl Benzenes	4.1e-01	3.8e-03	4.2e-01	0.1	ND	ND	0.0e+00	0.0
Ethyl Methyl Benzenes	7.2e-02	1.3e-03	7.3e-02	0.0	ND	ND	0.0e+00	0.0
Trimethyl Benzenes	2.1e-02	3.9e-04	2.2e-02	0.0	ND	ND	0.0e+00	0.0
Dimethyl ethyl benzenes	4.7e-02	4.3e-04	4.7e-02	0.0	ND	ND	0.0e+00	0.0
n-chain Alkanes	3.8e-01	3.4e-03	3.8e-01	0.1	ND	ND	0.0e+00	0.0
Branched Alkanes	4.1e-01	3.8e-03	4.2e-01	0.1	ND	ND	0.0e+00	0.0
Non-Cyclic Acids	2.5e-01	2.3e-03	2.5e-01	0.1	ND	ND	0.0e+00	0.0
	Total 3.3e+02	Total 8.4e+01	Total 4.2e+02	Total 100.0	Total 4.4e-02	Total 8.4e-04	Total 4.5e-02	Total 100.0

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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Table 7-37

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Sub-Surface Soil
Source Area: Kapica - Pazmey

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
VOLATILES								
1,1-Dichloroethene	3.4e-03	6.3e-05	3.5e-03	0.0	7.9e-06	1.4e-07	8.0e-06	0.0
1,2-Dichloroethene (cis)	1.1e-01	1.9e-03	1.1e-01	0.0	ND	ND	0.0e+00	0.0
2-Butanone	1.4e-01	1.3e-03	1.4e-01	0.0	ND	ND	0.0e+00	0.0
Trichloroethene	ND	ND	0.0e+00	0.0	4.6e-05	8.4e-07	4.7e-05	0.3
Benzene	ND	ND	0.0e+00	0.0	2.2e-05	2.0e-07	2.2e-05	0.1
4-Methyl-2-pentanone	4.2e-01	3.8e-03	4.2e-01	0.1	ND	ND	0.0e+00	0.0
Tetrachloroethene	3.1e+00	5.6e-02	3.1e+00	0.7	6.7e-04	1.2e-05	6.8e-04	3.8
Toluene	3.7e+00	6.8e-02	3.8e+00	0.9	ND	ND	0.0e+00	0.0
Chlorobenzene	1.7e-01	9.6e-04	1.8e-01	0.0	ND	ND	0.0e+00	0.0
Ethylbenzene	3.3e+00	3.1e-02	3.4e+00	0.8	ND	ND	0.0e+00	0.0
Styrene	5.6e-02	9.3e-04	5.7e-02	0.0	1.4e-04	2.4e-06	1.5e-04	0.8
Xylenes (mixed)	8.9e-01	8.2e-03	9.0e-01	0.2	ND	ND	0.0e+00	0.0
SEMIVOLATILES								
Isophorone	3.8e-02	3.5e-04	3.8e-02	0.0	1.3e-05	1.2e-07	1.3e-05	0.1
2,4-Dimethylphenol	1.9e-02	1.7e-04	1.9e-02	0.0	ND	ND	0.0e+00	0.0
Naphthalene	1.1e+00	1.7e-02	1.1e+00	0.3	ND	ND	0.0e+00	0.0
2,4-Dinitrotoluene	ND	ND	0.0e+00	0.0	1.9e-05	1.7e-07	1.9e-05	0.1
Pentachlorophenol	2.3e-02	3.8e-04	2.3e-02	0.0	3.6e-05	5.9e-07	3.6e-05	0.2
Di-n-butylphthalate	4.1e-02	6.7e-04	4.1e-02	0.0	ND	ND	0.0e+00	0.0
Fluoranthene	1.2e-02	1.1e-04	1.2e-02	0.0	ND	ND	0.0e+00	0.0
Pyrene	1.1e-02	1.0e-04	1.1e-02	0.0	ND	ND	0.0e+00	0.0
Butylbenzylphthalate	1.1e-02	1.8e-04	1.1e-02	0.0	ND	ND	0.0e+00	0.0
bis(2-ethylhexyl)phthalate	4.2e+00	1.9e-02	4.2e+00	1.0	5.0e-04	2.3e-06	5.1e-04	2.8
Di-n-octyl Phthalate	1.5e-01	1.4e-03	1.5e-01	0.0	ND	ND	0.0e+00	0.0
Total Carcinogenic PAHs	ND	ND	0.0e+00	0.0	5.4e-03	5.0e-05	5.5e-03	30.7
PESTICIDE/PCB								
Aldrin	5.9e-02	5.4e-04	6.0e-02	0.0	1.3e-05	1.2e-07	1.3e-05	0.1
Endosulfan I	3.2e-02	2.9e-04	3.2e-02	0.0	ND	ND	0.0e+00	0.0
PCB	ND	ND	0.0e+00	0.0	1.1e-02	2.2e-04	1.1e-02	60.9
METALS								
Antimony	5.5e+00	1.5e-01	5.6e+00	1.4	ND	ND	0.0e+00	0.0
Barium	2.1e+00	5.8e-02	2.2e+00	0.5	ND	ND	0.0e+00	0.0
Cadmium (food/soil)	3.2e+00	1.2e-01	3.3e+00	0.8	ND	ND	0.0e+00	0.0
Chromium VI	1.6e+00	4.4e-01	2.0e+00	0.5	ND	ND	0.0e+00	0.0
Lead	3.0e+02	8.2e+01	3.8e+02	91.5	ND	ND	0.0e+00	0.0

Table 7-37

SUMMARY OF NONCANCER HAZARDS GREATER THAN 0.01 AND CANCER RISKS GREATER THAN 1.0E-06

American Chemical Services Remedial Investigation
Griffith, Indiana

Medium: Sub-Surface Soil
Source Area: Kapica - Pazmey

Population: Onsite Resident
Land Use: Future Site Conditions

CHEMICAL OF POTENTIAL CONCERN	HAZARD QUOTIENTS				CANCER RISKS			
	Dermal Absorp.	Ingestion	Total	% of Total	Dermal Absorp.	Ingestion	Total	% of Total
Manganese	5.0e-01	1.1e-02	5.1e-01	0.1	ND	ND	0.0e+00	0.0
Mercury	2.7e-01	2.3e-02	3.0e-01	0.1	ND	ND	0.0e+00	0.0
Nickel	1.3e-01	7.0e-03	1.3e-01	0.0	ND	ND	0.0e+00	0.0
Silver	2.8e-01	1.5e-02	2.9e-01	0.1	ND	ND	0.0e+00	0.0
Vanadium	1.5e-01	4.1e-03	1.5e-01	0.0	ND	ND	0.0e+00	0.0
Zinc	3.4e-01	5.6e-02	4.0e-01	0.1	ND	ND	0.0e+00	0.0
TIC Groupings								
Propyl Benzenes	2.5e-01	2.3e-03	2.5e-01	0.1	ND	ND	0.0e+00	0.0
Propenyl Benzenes	4.1e-01	3.8e-03	4.2e-01	0.1	ND	ND	0.0e+00	0.0
Ethyl Methyl Benzenes	1.7e-01	3.1e-03	1.7e-01	0.0	ND	ND	0.0e+00	0.0
Methyl Propyl Benzenes	1.9e-01	1.7e-03	1.9e-01	0.0	ND	ND	0.0e+00	0.0
Methyl Ethenyl Benzenes	5.7e-01	5.2e-03	5.8e-01	0.1	ND	ND	0.0e+00	0.0
Trimethyl Benzenes	5.1e-02	9.3e-04	5.1e-02	0.0	ND	ND	0.0e+00	0.0
Dimethyl ethyl benzenes	6.1e-02	5.6e-04	6.2e-02	0.0	ND	ND	0.0e+00	0.0
n-chain Alkanes	3.8e-01	3.4e-03	3.8e-01	0.1	ND	ND	0.0e+00	0.0
Branched Alkanes	4.1e-01	3.8e-03	4.2e-01	0.1	ND	ND	0.0e+00	0.0
Non-Cyclic Acids	2.5e-01	2.3e-03	2.5e-01	0.1	ND	ND	0.0e+00	0.0
	Total 3.3e+02	Total 8.4e+01	Total 4.2e+02	Total 100.0	Total 1.8e-02	Total 2.9e-04	Total 1.8e-02	Total 100.0

This table presents risk values for chemicals of potential concern which are associated with hazard quotients greater than 0.01 or cancer risks greater than 1.0e-06. Chemicals of potential concern with risk values less than both of these levels are not shown.

Hazard quotients and cancer risks are unitless values which represent the probability of incurring an adverse health effect. These risk values are calculated using the following relationships:

Hazard Quotient = Chronic Daily Intake / Reference Dose
Cancer Risk = Chronic Daily Intake x Slope Factor

Hazard quotients and cancer risks are summarized for applicable routes of exposure. Values for each route are summed to arrive at an exposure pathway total risk value. The percentage of total risk is also shown for each compound.

In some cases risks were not determined (ND) because reference doses or slope factors were not available.

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VERSION 6/19/91
[ACS.2020.BRA]R-T.W20

Table 7-38

SUMMARY OF HAZARD INDICES AND CANCER RISKS FOR POTENTIALLY EXPOSED POPULATIONS
American Chemical Services NPL Site
Remedial Investigation
Griffith, Indiana

Population/Exposure Pathway	Table Number	Hazard Indices			Cancer Risks		
		Ingestion	Dermal Absorption	Inhalation	Ingestion	Dermal Absorption	Inhalation
CURRENT LAND USE CONDITIONS							
Off-Site Resident-Adult							
Groundwater, Lower Aquifer	7-19	8.1e-01	2.7e-02	3.5e-01	2.6e-04	1.6e-06	2.7e-05
Ambient Air, VOC	7-20	-	-	9.3e-01	-	-	1.6e-04
Ambient Air, Dust	7-21	-	-	3.4e-04	-	-	5.2e-09
Population Total			2.1e+00			4.5e-04	
Off-Site Resident-Child							
Groundwater, Upper Aquifer	7-22	3.2e+00	1.5e+02	-	2.8e-04	1.7e-02	-
Population Total			1.5e+02			1.7e-02	
Trespasser-Child							
Surface Soils, Kapica-Pazmey	7-23	5.6e+01	1.3e+02	-	1.9e-04	5.5e-03	-
Surface Water	7-24	2.0e-02	1.3e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-26	-	-	5.3e+00	-	-	2.9e-04
Ambient Air, Dust	7-27	-	-	3.9e-04	-	-	2.0e-09
Population Total			1.9e+02			6.4e-03	
ACS Worker							
Ambient Air, VOC	7-28	-	-	9.9e+00	-	-	1.6e-03
Ambient Air, Dust	7-29	-	-	7.4e-04	-		1.1e-08
Population Total			9.9e+00			1.6e-03	

Table 7-38
(Continued)

Population/Exposure Pathway	Table Number	Hazard Indices: Ingestion	Hazard Indices: Dermal Absorption	Hazard Indices: Inhalation	Cancer Risks: Ingestion	Cancer Risks: Dermal Absorption	Cancer Risks: Inhalation
FUTURE LAND USE CONDITIONS							
On-Site Resident - On-Site Containment Area							
Groundwater, Lower Aquifer	7-30	9.3e-01	3.1e-02	3.5e-01	3.5e-04	2.1e-06	3.9e-05
Groundwater, Upper Aquifer	7-31	2.0e+02	2.0e+01	1.1e+02	6.0e-02	9.7e-03	1.7e-02
Surface Water	7-24	2.0e-02	1.3e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-32	-	-	1.6e+01	-	-	2.7e-03
Soils	7-33	8.2e-01	4.9e+01	-	1.4e-04	6.6e-03	-
Population Total*			4.0e+02			9.7e-02	
On-Site Resident - Still Bottoms and Treatment Lagoons							
Groundwater, Lower Aquifer	7-30	9.3e-01	3.1e-02	3.5e-01	3.5e-04	2.1e-06	3.9e-05
Groundwater, Upper Aquifer	7-31	2.0e+02	2.0e+01	1.1e+02	6.0e-02	9.7e-03	1.7e-02
Surface Water	7-24	2.0e-02	1.3e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-32	-	-	1.6e+01	-	-	2.7e-03
Soils	7-34	3.8e+01	5.2e+02	-	6.2e-04	3.8e-02	-
Population Total*			9.1e+02			1.3e-01	
On-Site Resident - Off-Site Containment Area							
Groundwater, Lower Aquifer	7-30	9.3e-01	3.1e-02	3.5e-01	3.5e-04	2.1e-06	3.9e-05
Groundwater, Upper Aquifer	7-31	2.0e+02	2.0e+01	1.1e+02	6.0e-02	9.7e-03	1.7e-02
Surface Water	7-24	2.0e-02	1.3e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-32	-	-	1.6e+01	-	-	2.7e-03
Soils	7-35	1.3e+01	1.0e+03	-	2.3e-03	1.5e-01	-
Population Total*			1.4e+03			2.4e-01	

Table 7-38
(Continued)

Population/Exposure Pathway	Table Number	Hazard Indices: Ingestion	Hazard Indices: Dermal Absorption	Hazard Indices: Inhalation	Cancer Risks: Ingestion	Cancer Risks: Dermal Absorption	Cancer Risks: Inhalation
On-Site Resident - Surface Soils, Kapica-Pazmey							
Groundwater, Lower Aquifer	7-30	9.3e-01	3.1e-02	3.5e-01	3.5e-04	2.1e-06	3.9e-05
Groundwater, Upper Aquifer	7-31	2.0e+02	2.0e+01	1.1e+02	6.0e-02	9.7e-03	1.7e-02
Surface Water	7-24	2.0e-02	1.3e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-32	-	-	1.6e+01	-	-	2.7e-03
Soils	7-36	8.4e+01	3.3e+02	-	8.4e-04	4.4e-02	-
Population Total*			7.6e+02			1.3e-01	
On-Site Resident- Soils All depths Kapica-Pazmey							
Groundwater, Lower Aquifer	7-30	9.3e-01	3.1e-02	3.5e-01	3.5e-04	2.1e-06	3.9e-05
Groundwater, Upper Aquifer	7-31	2.0e+02	2.0e+01	1.1e+02	6.0e-02	9.7e-03	1.7e-02
Surface Water	7-24	2.0e-02	1.3e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.2e-04	
Ambient Air, VOC	7-32	-	-	1.6e+01	-	-	2.7e-03
Soils	7-37	8.4e+01	3.3e+02	-	2.9e-04	1.8e-02	-
Population Total*			7.6e+02			1.1e-01	

Table 7-38
(Continued)

Population/Exposure Pathway	Table Number	Hazard Indices: Ingestion	Hazard Indices: Dermal Absorption	Hazard Indices: Inhalation	Cancer Risks: Ingestion	Cancer Risks: Dermal Absorption	Cancer Risks: Inhalation
Multi-Population Assessment (1)							
Off-Site Resident - Adult & Off-Site Resident - Child							
Off-Site Resident Adult							
Groundwater, Lower Aquifer	7-19	8.1e-01	2.7e-02	3.5e-01	2.6e-04	1.6e-06	2.7e-05
Ambient Air, VOC	7-20	-	-	9.3e-01	-	-	1.6e-04
Ambient Air, Dust	7-21	-	-	3.4e-04	-	-	5.2e-09
Off-Site Resident-Child							
Groundwater, Upper Aquifer	7-22	3.2e+00	1.5e+02	-	2.8e-04	1.7e-02	
Population Total			1.6e+02			1.7e-02	
Off-site Resident - Adult & Trespasser - Child (2)							
Off-Site Resident-Adult							
Groundwater, Lower Aquifer	7-19	8.1e-01	2.7e-02	3.5e-01	2.6e-04	1.6e-06	2.7e-05
Ambient Air, VOC	7-20	-	-	9.3e-01	-	-	1.6e-04
Ambient Air, Dust	7-21	-	-	3.4e-04	-	-	5.2e-09
Trespasser-Child							
Surface Soils, Kapica - Pazmey	7-23	5.6e+01	1.3e+02	-	1.9e-04	5.5e-03	-
Surface Water	7-24	2.0e-02	1.3e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-26	-	-	5.3e+00	-	-	2.9e-04
Ambient Air, Dust	7-27	-	-	3.9e-04	-	-	2.0e-09
Population Total			1.9e+02			6.8e-03	

Table 7-38
(Continued)

Population/Exposure Pathway	Table Number	Hazard Indices: Ingestion	Hazard Indices: Dermal Absorption	Hazard Indices: Inhalation	Cancer Risks: Ingestion	Cancer Risks: Dermal Absorption	Cancer Risks: Inhalation
Off -Site Resident - Adult & Off-Site Resident - Child & Trespasser - Child (2)							
Off-Site Resident Adult							
Groundwater, Lower Aquifer	7-19	8.1e-01	2.7e-02	3.5e-01	2.6e-04	1.6e-06	2.7e-05
Ambient Air, VOC	7-20	-	-	9.3e-01	-	-	1.6e-04
Ambient Air, Dust	7-21	-	-	3.4e-04	-	-	5.2e-09
Off-Site Resident-Child							
Groundwater, Upper Aquifer	7-22	3.2e+00	1.5e+02	-	2.8e-04	1.7e-02	-
Trespasser-Child							
Surface Soils, Kapica - Pazmey	7-23	5.6e+01	1.3e+02	-	1.9e-04	5.5e-03	-
Surface Water	7-24	2.0e-02	1.3e+00	-	1.9e-06	1.6e-04	-
Sediment	7-25	6.7e-04	8.7e-02	-	3.5e-06	2.1e-04	
Ambient Air, VOC	7-26	-	-	5.3e+00	-	-	2.9e-04
Ambient Air, Dust	7-27	-	-	3.9e-04	-	-	2.0e-09
Population Total			3.4e+02			2.3e-02	
Off-Site Resident - Adult & ACS Worker (3)							
Off-Site Resident Adult							
Groundwater, Lower Aquifer	7-19	8.1e-01	2.7e-02	3.5e-01	2.6e-04	1.6e-06	2.7e-05
Ambient Air, VOC	7-20	-	-	9.3e-01	-	-	1.6e-04
Ambient Air, Dust	7-21	-	-	3.4e-04	-	-	5.2e-09
ACS Worker							
Ambient Air, VOC	7-28	-	-	9.9e+00	-	-	1.6e-03
Ambient Air, Dust	7-29	-	-	7.4e-04	-		1.1e-08
Population Total			1.2e+01			2.1e-03	

Table 7-38
(Continued)

(*) Total population hazard indices and cancer risks for future site residents were calculated by incorporating values for groundwater in the upper aquifer.

(1) In addition to the current use exposures that exist for each population as described above, it is possible that a trespasser may also be an off-Site resident, and On-Site workers may be an off-Site resident. Thus, while pathways have been combined for each individual population, populations have also been combined, as appropriate (e.g., off-Site resident and trespasser) to evaluate the maximum exposure of a population through current land use conditions that is reasonably expected to occur at the Site.

(2) The amount of exposure time to contaminants in air as a trespasser (3 hours/day, 52 days/year, 10 years) is 1.2% of the off-Site resident (24 hours/day, 182 days/year, 30 years). Because making this adjustment does not significantly alter the total multi-population risk, individual population risks were directly added in order to evaluate maximally exposed population risks.

(3) Similarly, ACS exposure to contaminants in air while working on-Site (8 hours/day, 130 days/year, 30 years) is 23.8% of the exposure conditions assumed for the off-Site resident (24 hours/day, 182 days/year, 30 years). This difference does not have a substantial impact on the total multi-population risk. Individual population risks were directly added in order to evaluate maximally exposed population risks.

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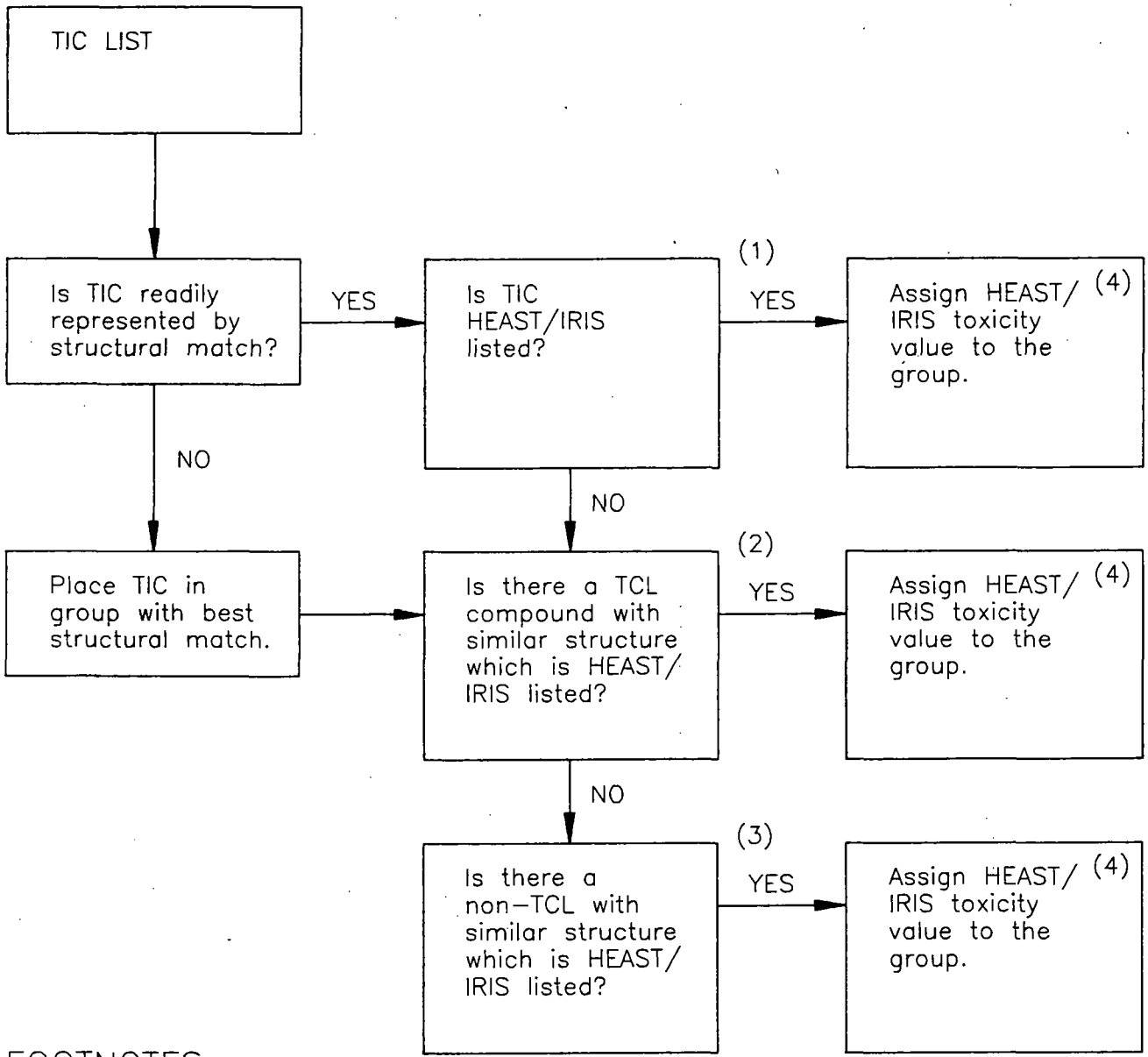


FOOTNOTES

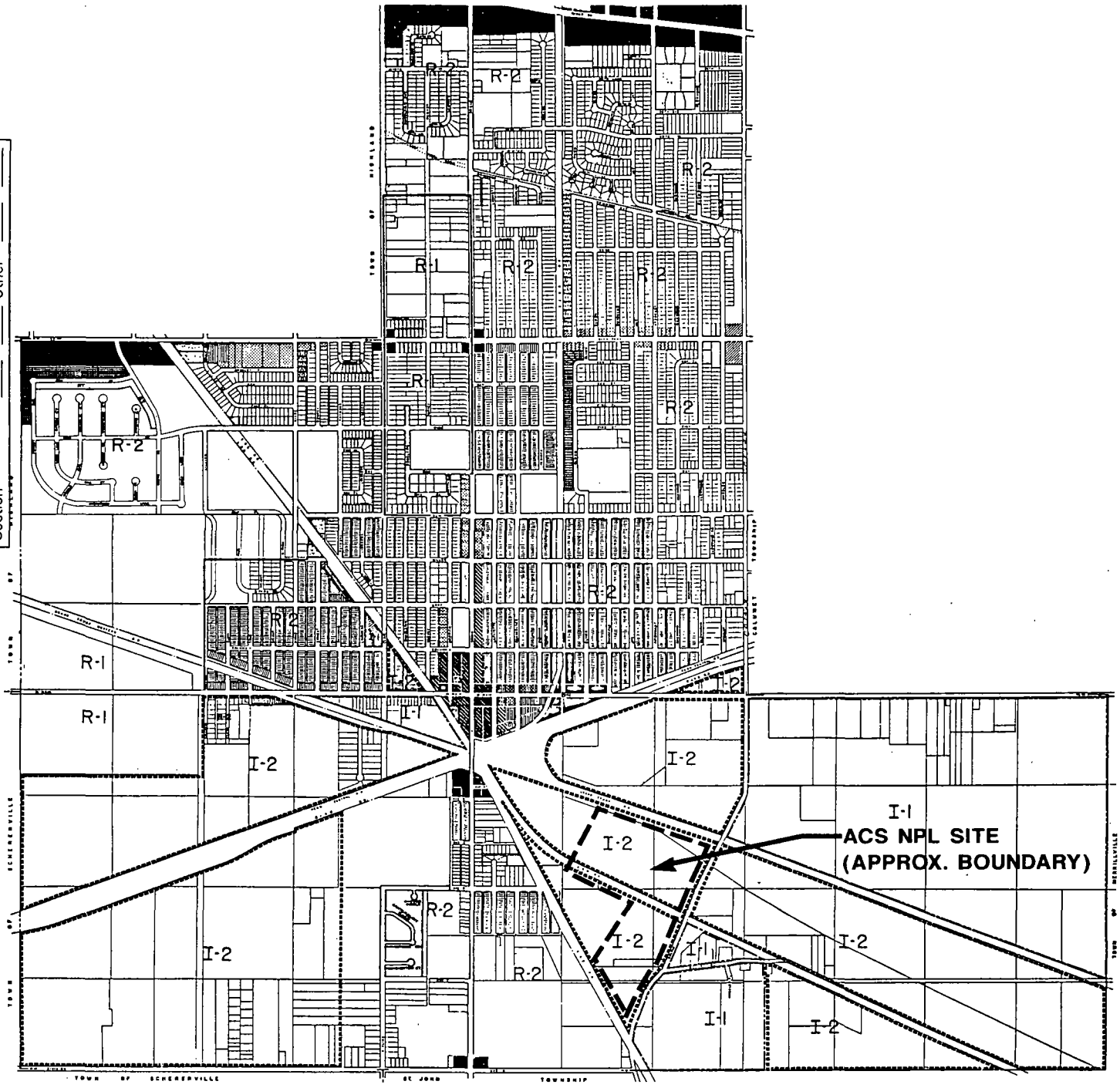
(1) TIC has toxicity value.
(2) Group represented by TCL compound on-site, that has toxicity value.
(3) Value obtained from HEAST or IRIS having similar chemical structure.
(4) If insufficient toxicological data is available according to HEAST or IRIS; no toxicity value is assigned to the group.

HEAST = Health Effects Assessment Summary Tables
IRIS = Integrated Risk Information Systems
TIC = Tentatively Identified Compound
TCL = Target Compound List

FIGURE 7-1

WARZYN	TOXICITY DETERMINATION DECISION TREE FOR TENTATIVELY IDENTIFIED COMPOUNDS (TIC)	Drawn LCL	Checked JDD	App'd. [signature]
	REMEDIAL INVESTIGATION AMERICAN CHEMICAL SERVICES NPL SITE GRIFFITH, INDIANA	Revisions		Date 6/28/91
				60251 A21

QUALITY CONTROL
Drafting Standards INITIALS DLE DATE 01.15.91 PM INITIALS KJD DATE 01.17.91
Lead Professional JDD 01.17.91 Division
Section Other



RESIDENTIAL DISTRICTS

- R-1 R-1 ONE-FAMILY
- R-2 R-2 ONE-FAMILY
- RT TWO-FAMILY
- RM-1 MULTIPLE-FAMILY
- RM-2 MEDIUM DENSITY MULTI-FAMILY

NON-RESIDENTIAL DISTRICTS

- OS-1 OFFICE SERVICE
- B-1 LOCAL BUSINESS
- B-2 CENTRAL BUSINESS
- B-3 GENERAL BUSINESS
- RO RESEARCH OFFICE
- I-1 LIGHT INDUSTRIAL
- I-2 GENERAL INDUSTRIAL
- P-1 VEHICULAR PARKING
- B-4 COMMERCIAL DISTRICT

north

0 2000 4000

SCALE IN FEET

NOTES

1. BASE MAP DEVELOPED FROM ZONING DISTRICT MAP PROVIDED BY THE TOWN OF GRIFFITH, INDIANA, DATED APRIL, 1978. REVISED FEBRUARY 5, 1986 & JUNE 27, 1989 BY TORRENGA ENGINEERING, INC.

FIGURE 7-2

WARZYN	ZONING MAP	Drawn DLF	Checked KJD	App'd.
	REMEDIAL INVESTIGATION AMERICAN CHEMICAL SERVICES NPL SITE GRIFFITH, INDIANA	Revisions		Date 6/28/91
				60251 A22

TELEDYNE POST N40683

QUALITY CONTROL INITIALS DATE
Drafting Standards DLF 1-17-91 PM INITIALS KJD DATE 1-17-91
Lead Professional ____ Division ____
Section ____ Other ____