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ENGINEERING EVALUATION AND COST ANALYSIS (EE/CA) REPORT

Textile Road Site
Ypsilanti Township
Washtenaw County, Michigan

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CONESTOGA-ROVERS & ASSOCIATES

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EXECUTIVE SUMMARY

1. Introduction

This document presents the Engineering Evaluation and Cost Analysis (EE/CA) for the Textile Road Site (Site) located in Ypsilanti Township, Washtenaw County, Michigan. This EE/CA has been prepared pursuant to the requirements of an Administrative Order by Consent (Consent Order) entered into by General Motors Corporation (GM), Holtzman-Silverman Realty Company (HS), and the U.S. EPA. This EE/CA was developed in accordance with the National Contingency Plan (NCP), U.S. EPA's Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA (August 6, 1993, EPA/540-R-93-057), and provisions outlined in the Consent Order.

2. Site Characterization

The Site is an inactive industrial property (formerly used for gravel mining) located to the southeast of the corner of Textile Road and Bunton Road in Ypsilanti Township, Washtenaw County, Michigan. The Site is bounded to the north by Textile Road, the west by Bunton Road, to the east by a Ford Motor Company facility and to the south by an agricultural property.

Attention was drawn to the Site in March 1983 when a local resident informed the MDNR of the presence of 55-gallon drums. The drums were subsequently removed and a number of environmental investigations were completed.

- Land Use

The current local land use consists of industrial, gravel mining, agricultural and mixed rural residential land uses. The Site has been utilized for industrial purposes since the 1940s. The current "Master Plan for Future Land Use" contemplates that the property will be utilized for "Light Industrial" purposes.

- Geology

The geology at the Site is divided into the overburden and bedrock. These are in turn sub-divided to classify five stratigraphic units:

1. Overburden
   - upper sand/fill - comprised of: topsoil, fill, sand, gravel, clay
   - glacial clay

- lower sands - comprised of: sand, gravel, silt

2. Bedrock
   - Antrim shale
   - limestone

- Hydrogeology

The hydrogeology of the Site corresponds with the geology of the Site. In general, the hydrostratigraphic units encountered at the Site are summarized as follows:

1. upper water table zone;
2. clay aquitard;
3. lower sands aquifer; and
4. bedrock shale aquitard.

- Chemical Distribution

The chemical distribution at the Site was characterized during the Extent of Contamination (EOC) study for the Site. The chemical distribution at the Site is summarized as follows:

- Soil

  - VOCs, BNAs and inorganic chemicals were identified at low concentrations in the upper sands.
  - PCBs were identified at the north end of the Site at levels up to 310 ppm (generally detected in the 5 to 100 ppm range).
  - There were no exceedances of the Michigan Type B soil cleanup levels in the clay aquitard or lower sands aquifer.

- Groundwater

  - VOCs, BNAs and inorganic chemicals were identified at low concentrations.
  - PCBs were identified at 8.4J/12 µg/L (R1/R2) in monitoring well MW-1U-93 at the north end of the Site.

- Pond Sediment

  - Michigan Type B soil cleanup levels were not exceeded for any compound.
  - PCBs were not detected.

3. Streamlined Risk Assessment

The Streamlined Risk Assessment (SRA) utilizes data developed during Site investigations to estimate potential health risks and hazards related to human exposure to residual chemicals identified as related to the activities at the Site. The SRA was conducted in accordance with applicable U.S. EPA guidance.

The SRA includes the following four steps:

1. Identification of chemicals of concern (COC).
2. Exposure Assessment.
3. Toxicity Assessment.
4. Risk Characterizations.

- Identification of Chemicals of Concern

The identification of COCs for the SRA may use several objective approaches which evaluate the concentrations, frequency of occurrence and toxicity of the reported chemicals with respect to identified soil or groundwater criteria. The identified COCs are a subset of the total list of chemicals detected at the Site and represent those Site-related chemicals most likely to contribute a majority of the overall potential estimated human health risk at the Site.

Based upon the specific screening methodology, the following are COCs for the soil and/or groundwater on Site:

	Soil	*Groundwater*
PCB		
Aroclor 1254	X	X
Aroclor 1260	X	--
VOC		
Acetone	--	X
BNA		
benzo(a)pyrene	X	--
benzo(a)anthracene	X	--
hexachlorobenzene	X	--
bis(2-ethylhexyl)phthalate	--	X

	Soil	*Groundwater*
Metals (unfiltered)		
Arsenic	X	X
Beryllium	–	X
Chromium	X	–
Cobalt	X	–
Lead	–	X
Manganese	–	X
Nickel	–	X
Metals (filtered)		
Beryllium	–	X
Chromium	–	X
Manganese	–	X

X - denotes COC

There were no COCs identified for the pond sediment.

- Exposure Assessment

Potential exposure pathways were assessed to determine how and in what media the chemicals of concern could reach potential public receptors. The exposure assessment considered the following criteria to determine potential exposure scenarios and exposure point concentrations for use in the Risk Characterization:

Media

surface soil;
sub-surface soil; and
groundwater.

Exposure Pathway

Dermal contact;
Incidental Ingestion; and
Ingestion as drinking water.

Receptor Populations

Trespassers (present/future);
Workers on-Site (present);

Construction Workers (present); and
Workers on-Site (future).

Land Use

Present; and
Future.

- Toxicity Assessment

The toxicity assessment provides a summary of the occurrence, hazards and toxicity of the COCs identified at the Site.

- Risk Characterization

The Risk Characterization estimates potential carcinogenic and non-carcinogenic risks for each potential exposure pathway based on the exposure and toxicity assessments.

The potential carcinogenic risks were not within the screening level limits identified by U.S. EPA for use in this EE/CA for the trespasser and maintenance worker scenarios (i.e., less than 10^{-6} for cancer risk). Also, the potential carcinogenic and non-carcinogenic risk were not within screening level limits for the scenario which considered the use of on-Site groundwater from within the upper water table zone as a drinking water supply. The potential development of a potable water supply from the upper water table zone was considered under a future land use scenario (e.g., future industrial development) as this groundwater is not currently utilized.

4. Identification of Removal Action Objectives

The removal action objectives (RAOs) were developed in order to evaluate the removal alternatives developed and assessed in this EE/CA. The RAOs were developed considering the following Site specific information:

1. media of potential concern;
2. chemicals of concern; and
3. probable future land use.

The RAOs developed for this EE/CA were developed in accordance with the NCP, Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA, Guidance on Remedial Actions for Superfund Sites with PCB contamination, levels of residual risk as

determined in the SRA, and consideration of potential applicable or relevant and appropriate requirements (ARARs).

The selection of COCs for the development of RAOs is based upon the SRA scenarios which were determined to exceed a risk of 10^{-6} or HI of 1. In this instance, the following COCs were selected for the development of RAOs:

1. Aroclor 1254;
2. Arsenic;
3. Beryllium; and
4. Manganese.

Cleanup level for PCBs will be established by U.S. EPA. According to some guidance, cleanup levels at industrially zoned properties are typically established in the range of 10 to 25 mg/kg.

Cleanup levels for other COCs were not developed due to the low risk posed when compared with the risk posed from PCBs, and the assumption that the residual risk due to non-PCB chemicals will be reduced during the removal action addressing the PCB risk. This approach is considered appropriate because the inorganic compounds constitute only a minor proportion of the risks and the majority of the inorganics co-exist with the materials containing PCBs greater than 10 mg/kg. Therefore, it is likely, depending upon the removal action alternative selected, that the concentrations of these inorganic compounds, and thus their associated health effects, will be reduced as a by-product of the RAO for PCBs in soil.

5. Identification, Description and Prescreening of Removal Action Technologies and Process Options

The following process options and technologies were evaluated for potential implementation at the Site:

No Action

Limited Action

Institutional controls and property access restrictions.

Physical Containment

- Capping:
  - normal Portland cement cover;
  - asphaltic concrete cover;

- clay;
- sprayed on covers; and
- synthetic covers.

- Groundwater Cutoff Wall:

  - slurry walls;
  - grout curtains; and
  - sheet piles.

In Situ Treatment

- Biological;
- Soil Vapor Extraction;
- Soil Flushing/Solvent Washing;
- Vitrification; and
- Stabilization/Solidification.

Waste Removal

- various options.

Ex Situ Treatment

- Bioremediation;
- Incineration;
- Low Temperature Thermal Desorption;
- Advanced Electric Reactor;
- Stabilization/Solidification;
- Solvent Extraction; and
- Gas-Phase Chemical Reduction.

Disposal

- On-Site Disposal; and
- Off-Site Disposal.

Process options and technologies that were determined to be implementable at the Site were retained for further consideration in the detailed evaluation.

6. Evaluation of Removal Action Technologies

Following the general pre-screening of removal technologies and process options, the remaining options were further evaluated in terms of effectiveness, implementability and cost. The purpose

of this evaluation was to identify potential concerns which may exist with each response action, technology or process option which may limit its applicability to the Site.

The following specific criteria were applied to each technology, response action and process option:

- Effectiveness

The evaluation of effectiveness focused on:

- potential for successful treatment of the estimated volume or area of media to levels which meet RAOs;
- potential impacts to human health and the environment; and
- proven effectiveness and reliability of each process.

- Implementability

In the evaluation stage, implementability concerns administrative aspects including:

- ability to obtain necessary permits;
- availability of treatment, storage and disposal services; and
- availability of necessary equipment and skilled labor to implement each technology.

- Cost

The cost criteria considers the relative capital, and operation and maintenance (O&M) costs. At the evaluation stage costing was generally conducted on a comparative scale based on engineering judgment.

The technology types considered in the evaluation stage included:

- No Action
- Limited Action
- Physical Containment
  - Capping
  - Soil Bentonite Slurry Wall
- Soil Treatment
  - In Situ Stabilization/Solidification
  - Ex Situ Stabilization/Solidification
  - On-Site Incineration
  - Off-Site Incineration
  - Low Temperature Thermal Desorption

- Solvent Extraction
- Gas-Phase Chemical Reduction

- Disposal
  - On-Site Disposal
  - Off-Site Disposal

7. Development of Removal Action Alternatives

Based on the evaluation of screened removal actions, technologies and process options presented in the EE/CA, the following removal action alternatives were developed for further review and analysis:

Alternative 1	No Action
Alternative 2	Limited Action
Alternative 3	Physical Site Containment
Alternative 3A	Capping
Alternative 3B	Capping and Groundwater Cutoff Wall
Alternative 4	Source Removal/Treatment
Alternative 4A	Solidification/Stabilization and Capping
Alternative 4B	Solidification/Stabilization, Capping and Groundwater Cutoff Wall
Alternative 4C	Solvent Extraction, Solidification/Stabilization and Capping
Alternative 4D	Gas-Phase Chemical Reduction, Solidification/Stabilization and Capping
Alternative 4E	Low Temperature Thermal Desorption, Solidification/Stabilization and Capping
Alternative 4F	On-Site Incineration, Solidification/Stabilization and Capping
Alternative 5	Disposal
Alternative 5A	On-Site Disposal
Alternative 5B	Off-Site Disposal

These alternatives are described in detail in Section 7.0 of this EE/CA.

8. Comparative Analysis of Removal Action Alternatives

The detailed analysis of removal alternatives consists of the refinement and further development of each proposed alternative against the following seven criteria:

1. overall protection of human health and the environment;
2. consideration of applicable or appropriate and relevant requirements (ARARs);
3. short-term impacts and effectiveness;

4. long-term effectiveness and permanence;
5. reduction of toxicity, mobility and volume;
6. implementability; and
7. cost.

The following provides a summary of the evaluation of removal alternatives based on the separate evaluations presented in Section 8.0 of this EE/CA.

- Overall Protection of Human Health and the Environment

All of the alternatives with the exception of the No Action alternative (Alternative 1) would result in a reduction of risks from chemicals in contaminated media. Major Site usage restrictions (i.e., deed restrictions or other institutional controls) would be required for Alternatives 2 through 4F. Additional minor restrictions to Site usage would be required for Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, and 5A (in order to protect the Site cap from disturbance).

The use of thermal treatment in Alternatives 4C, 4D, 4E, 4F, and 5B may pose additional health-based concerns regarding the emission of inorganics in the off-gas and the potential for the release of incomplete combustion products (i.e., dioxins and furans) which are of more concern than the PCBs from which they were derived.

- Consideration with ARARs

Alternatives 1 and 2 do not meet all chemical, action and location-specific ARARs as they do not provide treatment. Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, 5A, and 5B may be performed in a manner which meets or exceeds relevant ARARs.

- Long-Term Effectiveness and Permanence

Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, and 5A would reduce the potential risk from contact with chemicals in the soils (via direct contact/ingestion) through placement of a cap over near-surface soils with concentrations exceeding the potential cleanup levels (in addition to institutional controls). The potential risks would be reduced moderately in Alternative 2 through institutional controls and restricted Site access. Alternative 5B would further reduce this risk on Site through removal of the chemical source. However, potential risks would be created in the communities to which the materials are disposed under Alternatives 5B. Alternative 5B will have additional concerns regarding increased truck traffic. Alternative 1 provides negligible long-term risk reductions, as no containment or treatment actions are taken.

Alternatives 3A, 3B. 4A, 4B, 4C, 4D, 4E, 4F, and 5A are considered to be reliable provided that the caps are maintained. Alternative 5B is considered reliable as the chemical source is removed. However, long term operation and maintenance would be required for alternatives involving capping or groundwater containment/treatment (alternatives 3B, 4B and 5A). Institutional controls, which are included as components of Alternatives 2 through 5A, are considered reliable due to the location of the Site in an industrial area.

- Reduction of Toxicity, Mobility or Volume Through Treatment

Alternatives 1 and 2 provide no reductions in toxicity, mobility or volume as they do not involve containment or treatment.

Alternatives 3A, 3B, 4A, 4B, and 5A provide reductions in the mobility of both organic and inorganic contaminants at the Site. These reductions in mobility are achieved through capping (Alternatives 3A, 3B, 4A, 4B, and 5A), installation of a groundwater cutoff wall (Alternatives 3B and 4B), and/or stabilization/solidification (Alternatives 4A and 4B).

Alternatives 4C, 4D, 4E, 4F, and 5B provide reductions in the toxicity, mobility and volume of organic contaminants at the Site through destruction by thermal treatment. In Alternatives 4C and 4D thermal treatment (incineration) is preceded by LTTD and solvent extraction, respectively. Alternatives 4C, 4D, 4E, and 4F provide reductions in the mobility of inorganic contaminants at the Site through the use of stabilization/solidification and capping. Alternative 5B provides a reduction in the mobility of inorganic contaminants through off-Site land disposal to an appropriate landfill. Alternatives 3B and 4B would provide additional reductions in toxicity through the treatment of collected leachate.

- Short-Term Effectiveness

Alternatives 1 and 2 would not have any significant short-term effects on the community, workers or the environment. Alternatives 3A and 3B involve minimal disturbance of chemicals in the soils, however, it could result in a temporary increase in dust generation. Alternatives 4C, 4D, 4E, 4F, 5A, and 5B all involve soil excavation. These alternatives also have the highest potentials for significant dust and chemical emissions to the atmosphere during the treatment process. In addition, Alternatives 4C, 4D, 4E and 4F include thermal destruction of PCBs. Concerns of possible exposure of workers, community and the environment to inorganics or incomplete combustion products exist.

Alternatives 4C, 4D, 4E, and 4F have additional concerns regarding the siting of treatment facilities on Site. These concerns include:

- inorganic constituent emissions from various treatment components (i.e., incinerator stack); and
- public acceptance.

Alternative 4F would require U.S. EPA to conduct a Site-specific incineration risk assessment prior to its selection.

Alternative 5B has significant concerns regarding the trucking of the waste materials over significant distances (i.e., transportation over a minimum of 1,000 miles round trip). This alternative may result in greater actual short-term risks in comparison to the potential long-term risks identified in the SRA. In addition, Alternative 5B requires landfilling to other off-Site facilities thereby creating other potential long-term risks.

- Implementability

Alternatives 1 and 2 require little or no construction. Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, 5A, and 5B would involve common construction procedures to excavate contaminated media, install a groundwater cutoff wall (Alternatives 3B and 4B) and cap the Site (Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, and 5A). Alternatives 4C, 4D, 4E, and 4F may be more difficult to implement due to the addition of one or more treatment steps.

Excavation of the soils to the depths required (approximately 10 feet) would not require specialized equipment.

All of the alternatives could be effectively monitored through implementation of a Site monitoring plan. Services and materials are readily available for each of the alternatives identified.

Compliance with the substantive requirements of applicable permits may be required for Alternatives 4C, 4D, 4E, 4F, and 5B. NPDES permits may be required for Alternatives 3B, 4B, 4C, 4D, and 4E for the discharge of water from treatment processes. Air and water permits may be difficult to obtain.

- Costs

The capital costs for Alternatives 2 through 5B range from $120,000 (Alternative 2), to $31,228,000 (Alternative 4F). The No Action alternative would not involve any capital expenditures. The operation and maintenance costs for Alternatives 1 through 3B and 4B range from $41,200

(Alternative 1) to $66,400 (Alternatives 3B and 4B). The present worth costs for Alternatives 1 through 4F range from $388,000 (Alternative 1) to $31,741,000 (Alternative 4F).

9. Removal Action Schedule

A removal action schedule has not been determined. The removal action schedule will be determined after a removal action alternative has been selected by U.S. EPA.

10. Public Involvement Process

The U.S. EPA will coordinate the public involvement process for the Site. The Textile Road Respondents will support the U.S. EPA public involvement process during the removal action selection, as required.

1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) was retained by the Respondents for the Textile Road Site (Site) to complete an Extent of Contamination (EOC) and Engineering Evaluation/Cost Analysis (EE/CA) for the Site. The Site is located in Ypsilanti Township, Washtenaw County, Michigan.

This EE/CA has been prepared pursuant to the requirements of an Administrative Order by Consent (Consent Order) entered into by General Motors Corporation (GM), Holtzman-Silverman Realty Company (HS) (collectively GM and HS are referred to as the Respondents) and the United States Environmental Protection Agency (U.S. EPA). The Consent Order was executed by the U.S. EPA and became effective on March 10, 1993.

The specific activities to be completed in fulfillment of the requirements of the Consent Order were defined in the document entitled: "Work Plan for Extent of Contamination Study/Engineering Evaluation and Cost Analysis (EOC/EE/CA) (Work Plan) (November 4, 1992)."

The Work Plan was incorporated into the Consent Order to define project activities. An EOC Study Report for the Site has been completed and is presented under separate cover.

This document presents the EE/CA Report (Report) prepared for the Site in accordance with Task 9 of the Work Plan.

1.1 STATEMENT OF PURPOSE

The goals of this EE/CA are to identify the objectives of the removal action and analyze the effectiveness, implementability and cost of various removal action alternatives that may satisfy the identified objectives. Generalized goals for an EE/CA are presented in the guidance document entitled "Guidance on Conducting Non-Time-Critical Removal

Actions Under CERCLA (Removal Action Guidance)" (EPA/540-R-93-057, August 1993).

The purpose of this Report is to present the EE/CA which includes:

- presenting relevant information generated during the EOC Study;
- conducting a Site-specific Streamlined Risk Assessment (SRA);
- presenting potentially applicable or relevant and appropriate requirements (ARARs);
- developing removal action scope, goals and objectives;
- identifying potentially applicable removal action technologies;
- screening and evaluating removal action technologies;
- assembling removal action alternatives applicable to the Textile Road Site; and
- conducting a detailed evaluation of assembled alternatives.

1.2 BASIS

The primary regulation that governs removal actions is the National Contingency Plan (NCP 40 CFR 300). The NCP provides the regulatory framework to address the requirements of CERCLA. The NCP states the following factors shall be considered in determining the appropriateness of removal actions [40 CFR 300.415 (b) (2) (i-vii)]:

(i) actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;

(ii) actual or potential contamination of drinking water supplies or sensitive ecosystems;

(iii) hazardous substances or pollutants or contaminants in drums, barrels, tanks or other bulk storage containers, that may pose a threat of release;

(iv) high levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;

(v) weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;

(vi) threat of fire or explosion;

(vii) the availability of other appropriate federal or state response mechanisms to respond to the release; and

(viii) other situations or factors that may pose threats to public health or welfare of the environment.

In addition, 40 CFR 300.415 (c) states that:

(c) Removal actions shall, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action with respect to the release concerned.

This EE/CA utilizes the regulatory requirements and guidance designed to evaluate alternative removal actions. In addition, the concepts involved in evaluating remedial actions are utilized to insure a long-term solution is effectively selected.

The regulatory requirements for PCB contaminated Superfund Sites are defined in the NCP and summarized in a guidance document entitled "Guidance on Remedial Actions for Superfund Sites with PCB Contamination (PCB Guidance)" (OSWER Directive No. 9355.4-01, August 1990). Together, the NCP, Removal Action Guidance and PCB Guidance documents provide the basis for the evaluation of the removal action alternatives presented in this EE/CA.

In addition to the above identified removal action guidance, the following criteria were utilized in the removal action alternative evaluation to ensure a long-term solution:

- be protective of human health and the environment;

- applicable or relevant and appropriate requirements (ARARs) of Federal and State laws are followed to a practicable extent;

- be cost effective, taking into consideration short- and long-term costs;

- utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and

- satisfy the preference for remedies that employ treatment which permanently and significantly reduces the mobility, toxicity, or volume (MTV) of hazardous substances as a principal element.

The PCB Guidance document provides a *"recommended approach for evaluating and remediating Superfund Sites with PCB contamination"* (page 1, August 1990). Although the PCB Guidance Document is designed for remedial actions, it has been utilized in this Report to insure a long-term solution is effectively selected.

In determining whether a removal action is warranted, based on risk assessment, the following factors should be considered (Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, OSWER Directive 9355.0-30, U.S. EPA, April 22, 1991):

- whether there is a release or threat of a release of a hazardous substance into the environment, or whether there is a release or threat of a release into the environment of a pollutant or contaminant *"which may present an imminent and substantial danger to public health or welfare;"*

- *"Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts. "*

- whether chemical-specific standards that define acceptable risk are violated;

- whether there are non-carcinogenic effects or adverse environmental impacts that warrant action;

- whether there are uncertainties in risk assessment results;

- whether there are possible potential future releases (based on quantities of material and environmental setting and reasonably foreseeable future land use); and

- whether other Site-specific conditions warrant action.

The Risk Assessment Guidance for Superfund (RAGS) states that:

- *"When the cumulative current or future baseline cancer risk for a medium is within the range of 10^{-6} to 10^{-4}, a decision about whether or not to take action is a site-specific determination."* (RAGS, VI, Part B)

In summary, U.S. EPA guidance generally requires that removal or remedial actions be completed at sites where current or future human health carcinogenic risks are identified to exceed 10^{-4}. In addition, U.S. EPA has expressed a preference for cleanups that achieve a residual carcinogenic risk level of 10^{-6} (~~cleanups to residual risk levels in the 10^{-4} to 10^{-6} range are determined on a site-specific basis~~). If the Baseline Risk Assessment does not identify unacceptable human health risks, it is necessary to assess the requirements for removal or remedial actions to be undertaken based upon the determination of unacceptable environmental risks or the exceedence of chemical-specific standards.

The EE/CA Report presented herein has been developed consistent with the NCP and has utilized a number of approaches as outlined in the Removal Action and PCB Guidance documents.

1.3 REPORT ORGANIZATION

This EE/CA Report is presented in the following sections:

1.0 Introduction
2.0 Site Characterization
3.0 Streamlined Risk Assessment
4.0 Identification of Removal Action Objectives
5.0 Identification, Description And Prescreening Of Removal Action Technologies and Process Options
6.0 Evaluation Of Removal Action Technologies
7.0 Development Of Removal Action Alternatives
8.0 Comparative Analysis Of Removal Action Alternatives
9.0 Removal Action Schedule
10.0 Public Involvement Process
11.0 References

Section 2.0 presents a summary of the Site conditions as developed during the EOC Study and presented in detail in the EOC Study Report.

Section 3.0 presents a Site-specific Streamlined Risk Assessment (SRA) prepared in support of the EE/CA.

Section 4.0 presents the removal action scope, cleanup levels and potential ARARs based upon the results of the EOC Study Report and the Site-specific Streamlined Risk Assessment presented in Section 3.0.

Section 5.0 lists, describes and screens potential removal action technologies and Site institutional controls.

Section 6.0 provides a preliminary evaluation of the screened removal technologies of Section 5.0 in terms of their effectiveness, implementability and cost.

Section 7.0 presents the development of potential removal action alternatives utilizing the general response actions, technologies, and process options retained from the screening and evaluation of Sections 5.0 and 6.0.

Section 8.0 presents a detailed analysis of the removal action alternatives developed in Section 8.0. The removal actions alternatives are evaluated in terms of the following:

1) the overall protection of human health and the environment;
2) short-term effectiveness;
3) long-term effectiveness;
4) reduction of toxicity, mobility and volume of contaminants;
5) compliance with potential ARARs;
6) implementability; and
7) cost.

Sections 9.0 and 10.0 summarize procedures for developing a removal action schedule and implementing a public involvement process.

Finally, Section 11.0 presents references utilized in the development of the EE/CA Report.

2.0 SITE CHARACTERIZATION

The purpose of this section is to present an overview of the current situation at the Site. The overview is based on information developed and presented in the EOC Study Report. This section is organized as follows:

2.1 Site Description
2.2 Site Background
2.3 Land Use
2.4 Previous Removal Actions
2.5 Site Geology
2.6 Site Hydrogeology
2.7 Site Hydrology
2.8 Site Chemical Distribution Summary

2.1 SITE DESCRIPTION

The Site is an inactive 62-acre industrial property located to the southeast of the corner of Textile Road and Bunton Road in Ypsilanti Township, Washtenaw County, Michigan. The location of the Site is presented on Figure 2.1. The Site is bounded to the north by Textile Road, to the west by Bunton Road, to the east by a Ford Motor Company facility and to the south by an agricultural property. A Site plan is presented on Figure 2.2. A Site topographic plan is presented as Plan 1. An aerial photograph is presented as Plan 2.

The Site is generally flat with occasional fill mounds (also referred to as hummocks) located across the Site. Three man-made ponds are located on the Site as shown on Figure 2.2. The ponds were formed after sand and gravel was removed from beneath the groundwater table.

The surface materials at the Site consist of various amounts of earth fill, building rubble and native soils. The majority of the

surface soils are covered with relatively heavy vegetation, including trees, shrubs and grass.

A gravel road traverses the Site from the entrance point off of Textile Road, southward to the area of the ponds. The gravel road forks at several locations to permit access to various parts of the Site. A cinder block building exists near the entrance point off of Textile Road.

Access to the Site is restricted by the presence of a security fence which completely encloses the Site. Entry to the Site is controlled at two locked truck gates located on each of the northern and southern fence lines. The Site fence is regularly inspected and maintained by the Respondents.

2.2 SITE BACKGROUND

The Site was originally used for agricultural purposes. Ford Motor Company (Ford) sold the property to Elma and Lenor Schultz in the 1940s. The Schultz's subsequently sold the property to Lamar Thumm in 1947. Lamar Thumm initiated gravel extraction operations in approximately 1947. Filling activities at the Site were ceased in May 1973. Gravel sales from existing stockpiles continued until September 1973.

Attention was drawn to the Site in March 1983 when a local resident informed the MDNR of the presence of 55-gallon drums. The drums were subsequently removed and a number of environmental investigations were completed.

The Site background is presented in further detail in the report entitled "Summary of Prior Site Investigations and Identification of Data Gaps Report" (November 24, 1992) which is presented under separate cover.

2.3 LAND USE

The current local land use consists of industrial, gravel mining, agricultural and mixed rural residential land uses.

The current "Master Plan for Future Land Use" contemplates that the property will be utilized for "Light Industrial" purposes (Charter Township of Ypsilanti, Michigan Planning Commission, Adopted August 25, 1992). A copy of the "Master Plan for Future Land Use" is reproduced as Figure 2.3.

The property surrounding the Site consists of industrial, gravel mining, agricultural, and mixed rural residential land uses. To the north across Textile Road, there is some commercial development (e.g., gas station). Immediately east of the Site is a large manufacturing plant. Farther east the land is unused. South of the Site there is rural land use with some agricultural development. A residential trailer park and several houses exist on land reclaimed from a separate gravel mining operation to the west of the Site (west of Bunton Road). In addition, there are several houses west of Bunton Road and to the south of the trailer park.

2.4 PREVIOUS REMOVAL ACTIONS

The purpose of this section is to provide a summary of previous environmental investigations and removal actions which have been completed at the Site.

Since 1983, when the Site was identified to the MDNR, the Site has been visited on several occasions for the purpose of obtaining samples for chemical analysis. The samples obtained for analysis included; oil from drums, refuse, stained soil, wood, groundwater, surface water, lake sediments and fish tissues.

Sampling and analysis has been conducted by/for the MDNR, U.S. EPA and Freedman, Levy, Kroll and Simonds.

2.4.1 Sampling and Analysis by/for MDNR

The MDNR visited the Site on three occasions in 1983 and once in 1986.

The Site was first visited by the MDNR on April 12, 1983, following a complaint by a local resident, of 55-gallon drums at the Site. Forty drums containing oil substances were discovered by the MDNR, some of which were reported to be leaking. Based on their condition, the drums were postulated by the MDNR to have been on Site for many years. Samples collected from the drums contained up to 210 ppm of PCB Aroclor 1254. At the same time, two surface soil samples were obtained near the drums. The samples were oil stained and were found to contain 160 and 550 ppm of PCB Aroclors 1242 and 1254. The MDNR also observed oil-soaked rags, creosote treated wood blocks, fly ash and metal shavings on the Site. Surface water samples obtained on April 12, 1983 were found to contain concentrations of copper (25 µg/L), phenol (14 µg/L) and zinc (350 µg/L).

The Site was visited for the second time by MDNR on June 10, 1983. During this visit, bottom sediments and fish tissue samples were obtained. PCBs were detected in the bottom sediment samples only, at concentrations ranging from 1.1 to 8.3 ppm.

On June 29, 1983, an inspection of the Site was conducted by the MDNR, the Washtenaw County Health Department, Washtenaw County Sheriff Department, representatives of Holtzman/Silverman, (a potential purchaser), and Lamar Thumm. During this visit 10 samples were obtained for chemical analysis. These included samples collected from the following media; soil, pond sediment and water, fill and wood blocks. All samples were collected at the north end of Pond 1 near the 55-gallon drums. The concentrations of PCB in the soil samples ranged from 1.3 to 360 ppm. PCBs were not detected in the surface water. Pond sediments contained PCBs

at a concentration of 100 ppm. The other samples collected contained PCBs at levels ranging between 4.5 and 28 ppm of PCB.

In response to an MDNR order, 55 drums were removed from the Site in February 1986. A March 29, 1986 inspection by the MDNR revealed an additional 24 rusty drums containing oily substances. Samples collected on March 20, 1986 from the drums revealed PCBs at concentrations of 17 to 43 ppm. A soil sample collected near the drums detected a PCB concentration of 230 ppm. These drums were removed from the Site in 1988 and 1991.

2.4.2 Sampling and Analysis by/for U.S. EPA

This section presents a summary of information and data developed by the U.S. EPA during a number of investigations completed at the Site.

2.4.2.1 E&E FIT Sampling and Analysis

A Site inspection, including sampling and analysis of environmental samples and a magnetometer survey were conducted by an Ecology and Environment, Inc. (E&E) Field Investigation Team (FIT) for the U.S. EPA. E&E visited the Site on October 27, 1987, and reported 13 drums in the vicinity of the structure at the Site entrance. Oil and a tar like substance were found to be leaking from the drums which were reported to be in poor condition.

A magnetometer survey was subsequently conducted by the FIT Team on November 17, 1987. The survey reported high magnetometer reading along the north end of the Pond 1 (northeast corner) and near the northwest corner of the Site. Later investigations indicated that the anomalies were due to metal slag and debris.

Samples collected from the stained soil area north of Pond 1 were found to contain Aroclor 1254 at a concentration of 116 ppm.

On December 11, 1990, E&E returned to the Site to conduct additional investigations. The results of the December 11, 1990 assessment are presented in the Screening Site Inspection Report dated October 15, 1991. During the 1990 assessment the following samples were obtained.

1) 16 soil samples,
2) 4 sediment samples,
3) 2 surface water samples,
4) 8 groundwater samples, and
5) 4 residential and municipal well samples.

2.4.2.2 Weston-MP TAT Sampling and Analysis

An extent of contamination study (EOC) was conducted by Maecorp for the U.S. EPA in March 1989. The investigation was monitored by Weston-MP Technical Assistance Team (TAT), who reported the findings in a Removal Action Plan (RAP, dated November 1989) prepared for the U.S. EPA.

The investigation consisted of sampling soil materials within 19 test pits and two test trenches excavated in the area north of Pond 1.

The test pits were placed in the area where PCB contaminated oil stained soils had previously been identified by the U.S. EPA and MDNR. The pits were excavated using a trackhoe, and samples were collected.

2.4.2.3 Sampling and Analysis by Others

A Site investigation was conducted by Versar (an Engineering Consulting Firm) on behalf of Freedman, Levy, Kroll and Simonds in March 1989.

The samples included three drum samples, two cloth/filter cake samples, two wood samples, three filter cake samples, three soil/sediment samples and one buried (3-foot depth) conder sample.

2.5 SITE GEOLOGY

The Site geology presented in this section is based upon regional geologic information and stratigraphic information obtained from fifty (50) boreholes and nine (9) monitoring wells installed at the Site as part of the EOC Study.

The geology at the Site is divided into the overburden and bedrock. These are in turn sub-divided to classify five stratigraphic units:

1. Overburden
   - upper sand/fill - comprised of: topsoil, fill, sand, gravel, clay
   - glacial clay
   - lower sands - comprised of: sand, gravel, silt

2. Bedrock
   - Antrim shale
   - limestone

2.5.1 Overburden

The overburden is divided into three stratigraphic layers. The upper most layer consists of mixed sands, gravels, clays and fill. This layer extends to a depth of 15 feet below ground surface (BGS) at the north end and approximately 22 feet BGS at the south end of the Site.

A glacial clay deposit exists immediately below the fill material in the area. This clay unit is continuous across the Site. Borehole stratigraphic logs indicate this clay layer extends to a depth of approximately

28 feet BGS at the north end of the Site and 40 feet BGS at the south end of the Site. The thickness of this clay unit ranges from approximately 14 to 18 feet. No evidence of glacial till was identified at the Site.

The lower sands unit is comprised of glacially derived sand, gravel and silt, located below the clay layer. This unit is areally extensive. It extends from a depth of approximately 30 to 40 feet BGS and was observed to be approximately 90 feet thick.

2.5.2 Bedrock

The Antrim shale was the first bedrock unit encountered below the Site (at a depth of 130 feet BGS). Limestone bedrock is expected to underlie this shale.

2.6 SITE HYDROGEOLOGY

The Site hydrogeology was characterized in the EOC Study through the installation of six (6) shallow and three (3) deep monitoring wells, static water level measurements (in the monitoring wells and the ponds), single well response tests, and laboratory geotechnical tests. In general, the hydrostratigraphic units encountered at the Site are summarized as follows:

1. upper water table zone;
2. clay aquitard;
3. lower sands aquifer; and
4. bedrock shale aquitard.

The upper water table zone exists in the permeable unconsolidated upper sand/fill unit which has been identified to exist from ground surface to a depth of approximately 15 to 22 feet BGS. The water flow direction is generally northwest with a maximum potential velocity of 29 feet/year. The groundwater velocity in most areas of the Site is expected to be significantly lower than 29 feet/year. In addition, the main chemical of

concern, PCBs, are relatively insoluble in water and as a result their migration rate is expected to be much slower than the average groundwater velocity on Site (i.e., on the order of 0.009 feet/year).

A clay stratum exists at a depth of approximately 15 to 22 feet BGS and ranges from 14 to 18 feet thick. This clay stratum, lacustrine clay, exists across the entire Site and has been identified throughout Wayne and Washtenaw Counties. Samples collected from the clay stratum were determined to have a hydraulic conductivity on the order of 10^{-8} cm/sec. The thickness and low hydraulic conductivity of this clay stratum effectively serves to limit the downward migration of groundwater from the upper water table zone to the lower sands aquifer.

The lower sands aquifer exists beneath the clay aquitard in the lower sands unit. The thickness of the unsaturated lower sands zone ranges from approximately 14 to 31 feet. The saturated lower sands aquifer zone was observed to be approximately 77 feet thick.

Underlying the lower sands aquifer is the bedrock shale aquitard formed by the Antrim shale. The Antrim shale was identified at a depth of approximately 130 feet BGS.

2.7 HYDROLOGY

Precipitation and runoff remains on Site, draining into the existing low areas (such as ditches or depressions) and ponds. As a result, surface drainage waters do not flow directly off Site but become part of the ponds or upper water table zone flow regime.

2.8 SITE CHEMICAL DISTRIBUTION SUMMARY

The chemical distribution at the Textile Road Site was characterized by the collection and analysis of over 100 soil samples, 18 groundwater samples from 9 monitoring wells during 2 sampling rounds,

and 17 pond sediment samples. The chemical distribution at the Site is summarized as follows:

Soil

- VOCs, BNAs and inorganic chemicals were identified at relatively low concentrations in the upper sands.
- PCBs were identified at the north end of the Site at levels below 310 ppm (generally detected in the 5 to 100 ppm range). PCB distribution is presented in Figures 2.4 and 2.5 at 2 to 4 feet BGS and 6 to 8 feet BGS, respectively.
- There were no exceedances of the Michigan Type B soil cleanup levels in the clay aquitard or lower sands aquifer.
- Analytical results for the collected soil samples are presented in Appendix A. Data Validation Memoranda are presented in Appendix D.

Groundwater

- VOCs, BNAs and inorganic chemicals were identified at relatively low concentrations.
- PCBs were identified at 8.4J/12 µg/L (R1/R2) in monitoring well MW-1U-93 at the north end of the Site. PCBs are considered to have limited mobility in groundwater. The velocity of the PCBs in groundwater is expected to be on the order of 0.009 feet/year.
- Analytical results for the collected groundwater samples are presented in Appendix B. Data Validation Memoranda are presented in Appendix D.

Pond Sediment

- Michigan Type B soil cleanup levels were not exceeded for any compound.
- PCBs were not detected.
- Analytical results for the collected sediment samples are presented in Appendix C. Data Validation Memoranda are presented in Appendix D.

In general, the shallow fill/sand to the north and west of Pond 1 was identified to contain PCBs (and associated constituents) at

concentrations above the Michigan Type B/C cleanup levels. Groundwater in the affected soil/fill zone (i.e., upper water table zone) to the north and west of Pond 1 was also identified to contain constituents at concentrations above the Michigan Type B/C cleanup levels. The clay aquitard soils, lower sands soil and pond sediments were identified to be unimpacted by Site-related constituents.

The EOC indicated that there were exceedances of acetone, chloroform, chromium, and lead above Michigan Type B groundwater cleanup criteria in the lower sands aquifer. It is unknown if these compounds are related to previous Site activities, off-Site sources or potential laboratory contamination. As a result, further investigation may be necessary. It should be noted that none of the compounds identified above were detected in the lower sands aquifer, above Michigan Type B cleanup levels, in both sampling rounds 1 and 2, and none of these compounds were identified above Michigan Type B cleanup levels in the groundwater samples from the upper water table zone. Also, although acetone and chloroform are common laboratory contaminants, the data validation memoranda presented in Appendix I of the EOC do not qualify the presence of acetone and chloroform in the lower sands aquifer as being a result of laboratory contamination.

A more detailed chemical distribution is presented in the EOC Study Report.

2.9 DEMOGRAPHY

The populations of Ypsilanti and Washtenaw County in 1970, 1980 and 1990 are summarized below:

Location	*Population*				
	1970	1980	1990	*% Change* (1970-1980)	*% Change* (1980-1990)
City of Ypsilanti	29,538	24,031	24,846	- 18.6	+3.4
Washtenaw County	234,103	264,748	282,937	+ 13.1	+6.9

2.10 METEOROLOGY

The meteorological conditions of Washtenaw County are monitored by three nearby U.S. Weather Bureau Offices. These are:

	Station	*Proximity to Landfills*
1.	Detroit - Willow Run	2 miles northeast
2.	Detroit Metropolitan Airport	10 miles east
3.	Willis	6 miles south

The Site is located approximately 20 miles inland (northwest) of Lake Erie and 140 miles east of Lake Michigan. The Great Lakes have a moderating effect on the area in that they cause more cloud cover over the area during the winter, thus moderating temperatures. The average annual precipitation is 32 inches per year and winds are generally from the southwest at an average velocity of 10 mph.

3.0 STREAMLINED RISK ASSESSMENT

3.1 INTRODUCTION

This Streamlined Risk Assessment (SRA) utilizes data developed during previous Site investigations to estimate potential health risks and hazards related to human exposure to residual chemicals identified as related to the activities at the Site.

Reported chemical concentrations in the environmental media will change over time due to various degradation processes (*i.e., dilution, sorption, dispersion,* volatilization, biodegradation, chemical degradation and photodegradation). These processes and their resultant decrease in concentrations have not been assessed in the SRA. In addition, various exposure scenarios have been developed in accordance with applicable U.S. EPA guidance. This guidance is admittedly conservative and, as such, may overstate risks.

The scope of the SRA is comprised of the following:

1. Identification of primary chemicals of concern (COC) - the presence, *distribution, concentration and toxicity* of chemicals detected and identified as Site related were evaluated to identify those chemicals which are most likely to pose the majority of the potential health risks;

2. Exposure Assessment - potential exposure pathways were assessed to determine how and in what media the chemicals of concern could reach potential public receptors and estimation of the exposure point concentrations;

3. Toxicity Assessment - potential hazards associated with the chemicals of concern were identified; and

4. Risk Characterization - estimates of potential carcinogenic and non-carcinogenic risks were calculated for each potential exposure pathway based on the exposure and toxicity assessments.

3.2 IDENTIFICATION OF CHEMICALS OF CONCERN

Information on Site characteristics and data from analysis of soil, groundwater and pond sediment samples obtained during Site investigations were examined to evaluate the chemicals present, their distributions and concentrations at the Site. All validated data were evaluated in the identification of chemicals of concern (COCs) and are summarized and discussed in Section 3.2.3 of this report.

In the procedure to identify COCs, maximum concentrations reported in non-background samples were evaluated against the criteria described herein.

For the identification of COCs, duplicate samples were considered as one sample.

3.2.1 Identification of Background Sample Locations

3.2.1.1 Soil Background

Soil samples from BH-46, BH-47, BH-48, and BH-49 were collected from locations near the southern or southeastern boundary of the Site. These sampling locations are upgradient from contaminant releases and are considered not to be impacted by the Site. Therefore, the samples from these locations were believed to represent natural soil and/or areas not contaminated by Site activities (e.g., background).

The surface and subsurface soil data were combined to represent the background soil for the area around the Site.

3.2.1.2 Groundwater Background

Groundwater monitoring well locations, MW-3U-93 and MW-6U-93, are located near the southern or southeastern boundary of the Site. These monitoring wells draw water from the upper water table zone and are upgradient from contaminant releases. These monitoring wells were considered to be unimpacted by Site activities and therefore, were identified as background monitoring wells for the upper water table zone.

Groundwater monitoring well location, MW-3D-93, is located near the southern boundary of the Site. This monitoring well draws water from the lower sands aquifer and is located upgradient from contaminant releases. This well location was considered to be unimpacted by Site activities and therefore, was identified as a background monitoring well for the lower sand aquifer.

3.2.2 Identification of COCs

The identification of COCs may use several objective approaches which evaluate the concentrations, frequency of occurrence and toxicity of the reported chemicals and, by applying selected criteria, identify the primary chemicals in a specific media. This is consistent with U.S. EPA guidance document Risk Assessment Guidance for Superfund (RAGS), Volume I, "Human Health Evaluation Manual (Part A)", Section 5.0.

To be identified as a COC, a chemical had to be reported as present in at least one sample of the media being evaluated at a concentration greater than the mean concentration reported in the Site-related background samples for the same media. The Site-specific mean background concentrations for each media were calculated consistent with MERA Operation Memorandum #15: "Default Type A Cleanup Criteria (September 30, 1993)".

The COCs were established on the basis of their concentration in relation to background and Michigan Type B Cleanup

Criteria published in MERA Operation Memorandum #8: Type B Criteria (updated June 21, 1994). The selection of COCs is an attempt to identify those Site-related compounds which are most likely to be the cause of a potential adverse impact on public health.

The results of the evaluation process are summarized in Tables 3.1, 3.2, 3.3, and 3.4. The chemicals identified by this selection process for each media evaluated are summarized in Table 3.5.

3.2.2.1 COCs in Soils

Soil data collected from surface and subsurface were used to identify COCs in soils. The detection frequency and range of reported concentrations for detected parameters are summarized in Table 3.1. The maximum reported concentration for each detected chemical was compared to MDNR Type B criterion and the Site-specific mean background concentration. If the maximum reported concentration for the chemical exceeded both the MDNR Type B criterion and the Site-specific background concentration, then the chemical is identified as a COC.

Table 3.1 summarizes this evaluation and identifies COCs in soil.

Note that the maximum concentrations for some polycyclic aromatic hydrocarbons (PAHs), namely, benzo(a)anthracene and benzo(a)pyrene, exceeded both the MDNR Type B and the Site-specific mean background concentrations. The concentrations reported on Site are typical of levels found in agricultural, urban and residential areas. Typical background PAH levels are summarized in Table 3.2.

Hexachlorobenzene is reported in only two of fourteen samples, with the maximum concentration slightly exceeding the MDNR Type B criterion. The maximum reported concentration of 0.85 mg/kg was reported at depths of 6 to 8 feet BGS. Although exposure to this low

concentration at depth is expected to be minimal, hexachlorobenzene is identified as a COC in the SRA to maintain a conservative approach.

Maximum concentrations for inorganics were compared to MDNR Type B and Site-specific mean background concentrations. If maximum concentrations exceeded both MDNR Type B and Site-specific mean background concentrations, then, the individual inorganic compound is identified as a COC.

3.2.2.2 COCs in Groundwater

Two rounds of groundwater data from both the upper water table zone and lower aquifer were combined in the identification of COCs. The detection frequency and range of reported concentrations are summarized in Table 3.3. To be identified as a COC, the maximum reported concentration of a chemical must exceed the MDNR Type B or Federal MCL, and the Site-specific mean background concentration.

Table 3.3 summarizes this evaluation and identifies COCs in groundwater.

3.2.2.3 COCs in Pond Sediments

Pond sediment data from nine locations were used in the identification of COCs. The detection frequency and range of reported concentrations are summarized in Table 3.4. To be identified as a COC, the maximum reported concentration of a chemical must exceed the Low Effects Range (ER-L), defined as the concentration at which adverse effects are considered possible, the MDNR Type B GSI value and the Site-specific mean background concentrations[1].

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(1) Reference: National Oceanic and Atmospheric Administration (NOAA). "The Potential for Biological Effects of Sediment Sorbed Contaminants Tested in the National Status and Trends Program". NOAA Technical Memorandum NOS OMA 52. August 1991

No COCs were identified for pond sediments based upon the evaluation summarized in Table 3.4.

3.2.2.4 Summary of Identification of COCs

The evaluation of the database and comparison with background concentrations identified chemicals of concern (COCs) in soils, groundwater and pond sediments. The COCs for all media are summarized in Table 3.5. The identified list of chemicals does not include all the chemicals reported in each media but the COCs that are believed to account for the vast majority (>95 percent) of the potential adverse effects on human health and the environment from any probable exposure.

3.3 EXPOSURE ASSESSMENT

3.3.1 Characterization of Exposure Setting

3.3.1.1 Physical Setting

The physical setting of the Site is discussed in Section 1.0 and Section 2.0 of this Report.

The primary Site-related facts applied to this evaluation are summarized as follows:

i) the Site is an inactive industrial property which consists of approximately 62 acres, two-thirds of which is currently covered with three ponds;

ii) the three ponds were created as a result of historical sand and gravel mining operations. The ponds have been used for fishing by local citizens;

iii) the Site is bounded to the north by Textile Road, to the west by Bunton Road, to the east by a Ford Motor Company facility and to the south by an agricultural property;

iv) access to the Site is restricted by the presence of a 6-foot high security fence which completely encloses the Site;

v) entry to the Site is controlled at two locked truck gates located along each of the northern and southern fence lines;

vi) the Master Plan for future land use states that the Site is presently zoned "Light Industrial" and there is no anticipated change in the future land use;

vii) the area in the vicinity of the Site is serviced by municipal water; and

viii) residential dwellings exist to the west and south-west of the Site (see Section 2.3).

3.3.2 Potentially Exposed Populations

Because the Site is presently an inactive industrial Site, and the area is zoned light industrial, there is no reason to believe that this land use will change. Therefore, for the purposes of this SRA, the exposure scenarios developed and evaluated for the Site property were limited to worker-type exposure scenarios (construction, maintenance, etc.) or trespassers. Potentially exposed populations evaluated for each media of concern are identified below.

Soils

As stated, the Site is presently an inactive industrial Site. Therefore, current exposure to affected surface soils within the Site is limited to persons who gain unauthorized access (e.g., trespassers) for recreational activities such as hiking, fishing or bike riding. The trespass scenario is

evaluated under both the present and future land use scenarios because it is likely that the property use could remain inactive in the future.

The only potential future direct-contact exposure to subsurface soils would occur if construction activities require excavation of the subsurface soils. During the excavation, construction workers would be exposed to surface and subsurface soils within the Site. A construction worker exposure scenario was developed with the assumption that the construction worker will work on one construction project at the Site.

Sediments in On-Site Ponds

Potential exposure to pond sediments by trespassers or on-Site workers is limited. Sediment data from the EOC showed no reported levels of PCBs and low levels of other organics. In addition, detected levels of inorganics were comparable to background concentrations. As a result, no pond sediment COCs were identified and pond sediments will not be evaluated further in this SRA.

Groundwater

Groundwater in both the upper water table zone and lower aquifer is not currently used on Site as a drinking water supply. Municipal water is available in the vicinity of the Site, and as a result, it is not expected that local groundwater would be used as a potable supply. Accordingly, this exposure pathway is currently incomplete. However, to maintain a conservative approach, this pathway is evaluated in this SRA under the future industrial land use condition.

3.3.3 Identification of Exposure Pathways

The potential exposures under present and future land use are summarized as follows:

Media	*Exposure Pathway*	*Receptor Population(s)*	*Land Use*
Surface Soil	Dermal Contact Incidental Ingestion	Trespassers On-Site Workers	Present/Future Future
General Soil (Surface & Subsurface Soils)	Dermal Contact Incidental Ingestion	Construction Workers	Future
Groundwater (Upper Water Table Zone and Lower Sand Aquifer)	Ingestion as Drinking	On-Site Workers	Future

3.3.4 Exposure Point Concentrations

Tables 3.6 and 3.7 present the arithmetic mean of the concentrations in all samples, the maximum detected concentration and the 95th percent upper confidence limit (95% UCL) of the mean for each COC, in each media evaluated. (RAGS, Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER 9285.7 - 081, May 1992).

For this evaluation, a most likely exposure scenario (e.g., Level 1) and a reasonable maximum exposure (RME) scenario (e.g., Level 2) were evaluated to provide a range of potential impacts. U.S. EPA has defined the mean or average concentration as appropriate for the exposure concentration for the most likely exposure scenario (Level 1). For this evaluation, the average concentration was calculated by averaging results for all samples using the detected concentrations and counting all non-detects (NDs) as half the detection limit for constituents which were reported as both positive and non-detect in different samples from a single study area. In the event that duplicate samples were analyzed, the higher concentration value was used based upon the direction of U.S. EPA (to maintain a conservative approach).

U.S. EPA has defined the RME concentration as the upper 95th percentile of the mean of concentrations reported in the media/area being evaluated. The RME exposure scenario (Level 2) should be considered as conservative.

3.3.5 Quantification of Exposure

For each exposure scenario, two levels of assumptions are presented. "Level 1" assumptions present the average or mean value for the assumption approximating the average expected exposure conditions. "Level 2" presents assumptions which are more conservative, approximating the reasonable maximum exposure. The Level 2 assumptions are based on the 90th or 95th percentile confidence level for factors such as exposure duration, ingestion rates and total exposed skin surface areas.

To quantify exposures, potential exposure scenarios were developed using exposure assumptions presented in the U.S. EPA documents entitled, "Risk Assessment Guidance for Superfund (RAGS)", Part I: Human Health Evaluation Manual, EPA/540/1-89/002, December 1989; "RAGS Supplemental Guidance Standard Default Exposure Factors", OSWER Directive 9285.6-03, March 25, 1991; "Exposure Factors Handbook", EPA/600/8-89/043, March 1990; "Dermal Exposure Assessment: Principles and Applications", EPA/600/8-91/011B, January 1992; and "Superfund Exposure Assessment Manual", EPA/540/1-88/001, April 1988. In some instances, where the U.S. EPA documents did not present necessary assumptions, and where specific appropriate exposure information were not available, professional judgment was applied to develop conservative assumptions which are protective of human health.

3.4 TOXICITY ASSESSMENT

3.4.1 Toxicity Summaries

The following subsections provide a brief summary of the occurrence and toxicity of the COCs evaluated at the Site. The COCs included:

1. PCBs
2. acetone
3. PAHS: benzo(a)anthracene and benzo(a)pyrene
4. bis (2-ethylhexyl) phthalate
5. hexachlorobenzene
6. arsenic
7. beryllium
8. chromium
9. cobalt
10. lead
11. manganese
12. nickel

3.4.2 Polychlorinated Biphenyls (PCBs)

PCBs are a group of 209 stable, fat-soluble chemicals. In the past, PCBs have been used in capacitors, transformers, carbonless copying paper, paints and hydraulic fluid.

Aroclor is the commercial name for U.S. manufactured PCB product mixtures. Different product mixtures are further identified by codes, such as 1248, 1254, and 1260. These codes designate the percent of chlorination of the product mixture. Since the time necessary for different components of PCB mixtures to break down in the environment varies, PCB mixtures usually found in soils, sediments and biota have different compositions in comparison to the commercial formulations. Most PCBs in the environment are similar, but not identical to, Aroclor 1254.

Environmental Fate

Due to the hydrophobic nature of PCBs, their solubility in water is limited. Therefore, the majority of the PCBs are readily adsorbed to sediment/soil material. Increasing organic carbon content in the soil increases the adsorption tendency and capacity.

As reflected by the k_{OC} values, PCBs are immobile compounds. The k_{OC} reflects the tendency of the specific compound to be adsorbed by soil and sediment. The k_{OC} is directly related to the organic carbon content and the amount of fines in the geologic materials, and is inversely related to the solubility of the specific compound in water. Therefore, when the k_{OC} is large, the compounds migrate slowly. The high k_{OCS} for PCBs indicate that PCBs are readily adsorbed by organic carbon and fines in sediment/soils. Additionally, PCBs are not readily soluble in water. Therefore, PCBs are relatively immobile in the environment. At this Site, the velocity of PCBs in groundwater is expected to be on the order of 0.009 feet/year.

Toxicity

PCBs are classified as a probable human carcinogen (designated as a B2 carcinogen by U.S. EPA) with sufficient evidence of carcinogenicity in animal studies. Evaluating the health effects of PCBs is difficult since they are mixtures and each mixture behaves differently kinetically, and therefore exerts different health effects quantitatively.

The U.S. EPA Cancer Slope Factor (CSF) for PCBs used to estimate additional lifetime cancer risks is 7.7 $(mg/kg/day)^{-1}$. This CSF value is taken from the Integrated Risk Information System (IRIS) database, (January 1994).

U.S. EPA has not yet developed a final Reference Dose (RfD) which can be used to quantify noncarcinogenic effects for PCBs due to the complexity of the mixtures. U.S. EPA has developed an RfD for Aroclor 1016 of 7.0E-5 mg/kg/day (IRIS, 1994).

3.4.3 Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic Aromatic Hydrocarbons (PAHs) are a group of chemicals formed during the incomplete combustion of virtually all forms of organic materials. The combustion of fuels in cars and in furnaces produces PAHs. Waste incinerators produce PAHs. Natural sources include volcanoes, forest fires, crude oil and shale oil. PAHs can also be found in substances such as crude oil, coal tar pitch, creosote, road and roofing tar. A major source of exposure for humans is cigarette smoking, both active and passive. Therefore, PAHs are ubiquitous in the environment and the increasing levels found in the environment parallel industrial and urban development.

Chemical Identity

Benzo(a)anthracene [B(a)A] and benzo(c)pyrene [B(a)P] are considered as a group in this review of the chemical and physical properties of PAHs.

Table 3.8 summarize the physical and chemical properties of the above mentioned chemicals.

As pure chemicals, PAHs generally exist as colorless, white or pale yellow-green solids. Most PAHs do not occur alone in the *environment, rather they are found as mixtures of two or more* PAHs. B(a)A and B(a)P are not commercially produced in the U.S. nor are there any known uses for them except as research chemical.

Environmental Fate

Some of the transport and partitioning characteristics of the PAHs are roughly correlated to their molecular weights. The Site-related PAHs are considered high molecular weight compounds ranging from 228 g/mol to 278 g/mol.

In air, PAHs are present in the gaseous phase or sorbed to particulates. The atmospheric residence time and transport distance depend on the size of the particles to which PAHs are adsorbed. That is, the larger the particulate size, the shorter the residence time and transport distance. PAHs can undergo photochemical oxidation with the formation of nitrated PAHs, Phenols, and other compounds. Atmospheric half lives are generally less than 30 days.

PAH compounds tend to be removed from the water column by volatilization to the atmosphere, adsorption to particulates or sediments, biodegradation or bioaccumulation into aquatic organisms. The high molecular weight PAHs have Henry's Law Constants in the range of 10^{-5} to 10^{-8} (refer to Table 3.8) which indicates very limited volatilization from water. Half-lives for volatilization of benzo(a)anthracene and bezno(a)pyrene (high molecular weight PAHs) from water have been estimated to be greater than 100 hours.

High molecular weight PAHs have K_{OC} values that range from 10^5 to 10^6 which indicates strong tendencies to adsorb to organic carbon. Due to their low water solubilities, PAHs are primarily found adsorbed to sediments or soils. Adsorption of PAHs is a function of organic carbon content and particle size. The environmental fate of PAHs is described by U.S. EPA in the document "Ambient Water Quality Criteria for Polynuclear Aromatic Hydrocarbons" which states:

> "PAH will adsorb strongly onto suspended particulates and biota and their (PAH) transport will be determined largely by the hydrogeologic condition of the aquatic system. PAH dissolved in the water column will probably undergo direct photolysis at a rapid rate. The ultimate fate of those which accumulate in the sediment is believed to be biodegradation and biotransformation by benthic organisms." (U.S. EPA, 1979).

This is restated in the U.S. EPA document "Health Effects Assessment for Polycyclic Aromatic Hydrocarbons (PAHs)" which states:

"The predominant mechanism that is likely to dictate the fate of most PAHs in aquatic media is sorption to particulate matter and subsequent sedimentation and microbial degradation".

Since PAHs are most likely to stay in the sediment or soil, microbial degradation is the most likely ultimate environmental fate in contrast to photolysis and volatilization. Compounds with four cyclic rings or less are most amenable to microbial degradation. Benzo(a)pyrene (five cyclic rings) has a half life in soil inoculated with bacteria of less than 8 days. The half-life reported for benzo(a)pyrene in soil reported in Superfund Public Health Evaluation Manual (SPHEM, 1986) in 420 to 480 days but there is no reference to the microbial content in the soil.

Toxicity

Investigative studies reviewing PAHs carcinogenicity have conclusively demonstrated that PAHs may induce tumors on the skin, lung, kidney, stomach, etc. of test animals.

PAHs occur in mixtures. Different mixtures of PAHs are released into the environment and different mixtures of PAHs can demonstrate varying health effects. Evaluating which specific PAH causes the observed toxic health effects from a specific human exposure to a mixture of PAHs is difficult if not impossible. There are several questions that one must consider in estimating the carcinogenic risk of complex mixtures of PAHs. Is the effect observed due to one particular carcinogenic PAH or is it due to the combined effect of the mixture of PAHs.

B(a)P, a known human carcinogen, has consistently been demonstrated to be one of the most potent carcinogenic PAHs to which humans might be expected to be exposed environmentally. B(a)P has been studied extensively and is the basis for the toxicity studies of other PAHs. To estimate carcinogenic risk of complex mixtures of PAHs, one approach assumes that all carcinogenic PAHs are equivalent in potency to B(a)P. This has little scientific support and results in an overestimation of carcinogenic

potency of most mixtures of PAHs. Thus, a relative potency approach for estimation of cancer risk of complex mixtures of PAHs was developed as an alternative to using a B(a)P one-to-one equivalency approach. This alternate approach takes into account differing potencies of carcinogenic PAHS and results in a more realistic estimate for risk from mixtures.

Summary of Relative Potency Estimates Derived for PAHs

Benzo(a)pyrene	1
Benzo(a)anthracene	0.1

To calculate the Cancer Slope Factor (CSF) for the aforementioned carcinogenic PAHs, the relative potency estimates for the individual PAH is multiplied times the CSF for B(a)P (7.3 mg/kg-day). The resultant value is used to calculate the lifetime upper bound excess cancer risk associated with the exposure to the individual PAH.

3.4.4 Acetone

Acetone is a natural component of the metabolic process in tissues of mammals, plants and insects. Acetone is also an emission from combustion of organic materials, is miscible with water and is commonly present in the leachate from sanitary landfills. It is an energy source in mammalian cell metabolism. The photolysis of acetone in the atmosphere has an average half-life of 22 days (Howard 1990, Devlin 1982).

Environmental Fate

The chemical fate and transport mechanisms for acetone is characterized by a high vapor pressure of 270 mm Hg and a high Henry's Law Constant of 2.06×10^{-5} atm•m^3/mol. As indicated by these values, acetone will volatilize rapidly from soil, surface water and groundwater.

In the atmosphere, acetone will be lost by photolysis and reaction with photochemically produced hydroxyl radicals. Half-life estimates

from these combined processes is 22 days. Being miscible in water, wash out by rain should be an important removal process.

Soil adsorption is relatively low for acetone as indicated by a low k_{OC} value of 2.2. Thus, groundwater leaching is a major transport process for acetone. Sediment adsorption and aquatic bioconcentration is negligible for acetone.

Toxicity

Acetone is a reported inhalant abuse problem (glue sniffers) and has been studied in laboratory animals. Mice and rats exposed to 19,000 ppm acetone in air, 3 hours daily, 5 days a week for 8 weeks showed no effects on blood chemistry, histopathology, lung fluid content or organ weight (Bruckner, 1978). The oral LD_{50} for rats was reported to be 8.5 to 10.7 mL/kg. There is no evidence of teratogenicity or mutagenicity (Clayton, 1982). The oral reference dose (RfD) for acetone is 0.1 mg/kg/day and it is classified as a non-carcinogen (IRIS, 1994).

3.4.5 Bis(2-ethylhexyl) Phthalate

Bis(2-ethylhexyl) phthalate (BEHP) is used in large quantities as a plasticizer for polyvinyl chloride (PVC) and other plastics. Disposal of PVC and other plastic materials by incineration or landfilling will result in release of BEHP into the environment. Because of its wide use and distribution, it is essentially ubiquitous in the urban and suburban environments.

Environmental Fate

BEHP released to water systems will biodegrade rapidly (half-life 2-3 weeks) following a period of acclimation. It will also strongly adsorb to sediments (log k_{OC} of 4 to 5) and bioconcentrate in aquatic organisms (log BCF of 2 to 4 in fish and invertebrates). Evaporation and hydrolysis are not significant aquatic processes (Howard, 1990).

BEHP released to soil will neither evaporate nor leach into groundwater. It will have a strong tendency to sorb and will not be mobile. BEHP is rapidly biodegraded in soil under aerobic conditions following acclimation (Howard, 1990).

Toxicity

Studies in animals suggest that rodents absorb BEHP better than other animal species. Based on urinary excretion of metabolites, rats can absorb at least 55 percent of a 2,000 mg/kg oral dose of BEHP (ATSDR, 1992). The liver, kidney, testes and blood have been identified as sites of BEHP metabolism or utilization in several animal studies (ATSDR, 1992). Excretion occurs in the urine and feces (ATSDR, 1992).

The low levels of BEHP to which humans are exposed in the environment have not been shown to cause adverse health effects. High dose levels administered to test animals have caused liver damage, reproductive effects and cancer (ATSDR, 1989).

BEHP is classified as a B2 carcinogen (insufficient evidence in humans but adequate evidence in animals) and has an oral CSF of 0.014 $(mg/kg/day)^{-1}$. The oral RfD value is 0.02 mg/kg/day (IRIS, 1994).

3.4.6 Hexachlorobenzene

There are no known natural sources of hexachlorobenzene. It is a by-product in the production of several chlorinated hydrocarbons, namely, tetrachloroethene, trichloroethene, carbon tetrachloride, chlorine, dimethyl tetrachloroterephthalate, vinyl chloride, atrazine, propazine, simazine, pentachloronitrobenzene and mirex. It is also a contaminant in some pesticides.

Environmental Fate

As indicated by its high Koc value of $1.2 \times 10^{+6}$ mg/g (see Table 3.8), hexachlorobenzene released to soil is likely to remain there for extended period of time due to its strong adsorption to soil. Little biodegradation will occur and transport to groundwater is expected to be slow, depending upon the organic carbon content of the soil.

Hexachlorobenzene released to water will adsorb to sediments and evaporate readily as indicated by its relatively high Henry's Law Constant of 6.8×10^{-4} atm•m^3/mol.

Hexachlorobenzene released to the atmosphere can exist in both the vapor phase and adsorbed phase. Degradation of hexachlorobenzene in the atmosphere appears to be extremely slow.

Toxicity

Mortality data of exposed humans and the results of animal studies suggest that, with the exception of infants, humans are not at significant risk of death from hexachlorobenzene exposure. Nursing infants of exposed mothers may be particularly susceptible to high concentrations of hexachlorobenzene present in milk. An estimated 3,000 to 4,000 persons consumed bread prepared from grain treated with hexachlorobenzene at 2 kg/1,000 kg wheat. There was an extremely high rate of mortality in children (under 1 year of age) of lactating mothers known to have consumed this bread. An estimate of hexachlorobenzene exposure through consumption of bread during those years was 0.05 to 0.2 g/day; however, the basis of this estimate was not provided.

The liver appears to be the primary target organ. Hexachlorobenzene has been associated with liver toxicity in humans. An outbreak of porphyria in Turkey is attributed to the consumption of bread prepared from hexachlorobenzene-treated grain from 1955 to 1959. Animal studies showed that hexachlorobenzene causes liver effects indicated by induction of microsomal adverse enzymes, alteration of serum enzymes, and

changes in liver morphology. Changes were evident as early as 24 to 48 hours after treatment and the effects were dose dependent.

No studies were found regarding the renal effects of hexachlorobenzene in humans by any route of exposure or in animals by inhalation or the dermal route. Rats exposed to hexachlorobenzene (40 ppm, highest dose tested) for 130 weeks exhibited chronic nephrosis in males.

Studies in humans in Turkey demonstrated skin lesions following oral exposure to hexachlorobenzene. Reliable exposure data (dose and duration) were not reported. Cutaneous lesions were not reported in epidemiological studies evaluating vegetable sprayers and workers in a chlorinated solvent plant for whom hexachlorobenzene blood levels were known.

No studies were located regarding the immunologic effects of hexachlorobenzene in humans. Immune function tests in animals evaluating humoral and cell-mediated immunity as well as host resistance following exposure suggest that hexachlorobenzene is immunotoxic. Histopathologic findings provide supportive evidence that doses as low as 1 mg/kg/day caused hyperplasia of the lymphoid tissue in the stomach. At higher doses, changes in the lymphoid tissue were noted in the lungs and spleen.

In epidemiological studies of orally exposed humans (estimated at 0.05 to 0.2 g hexachlorobenzene/day through consumption of contaminated bread), muscle weakness, cogwheel rigidity, and sensory shading were observed.

No malignant tumors have been reported in humans following exposure to hexachlorobenzene by any route. Animal studies demonstrated that hexachlorobenzene is carcinogenic, producing liver and thyroid tumors in hamsters, rats, and mice.

U.S. EPA classifies hexachlorobenzene as a probable human carcinogen (Group B2) with sufficient evidence in animals studies.

The chronic oral Reference Dose (RfD) is 8×10^{-4} mg/kg-day. The oral and inhalation Cancer Slope Factors (CSF) are 1.6 $(mg/kg\text{-}day)^{-1}$. These toxicity values were taken from the Integrated Risk Information System (IRIS) database, April 1994.

3.4.7 Arsenic

Arsenic is a naturally occurring element, occurs in the general earth's crust at 2 mg/kg and occurs in surface soil at generally less than 40 mg/kg. In certain areas, concentrations in soil may be elevated because of naturally high levels in mineral deposits in the area. Arsenic is present in many foods and the daily intake from a typical diet is 0.19 mg/person/day (Friberg, Nordberg and Vouk, 1986).

Higher exposures to inorganic arsenic related to arsenical poisoning or industrial exposures can cause characteristic skin lesions, dark and light patches, and small corns on heavily cornified skin such as palms and soles of feet (ATSDR, 1989).

There is some evidence that low levels of arsenic exposure in the normal diet of 10 to 50 ppb may be beneficial to good health (ATSDR, 1989).

Arsenic is recognized as a known human carcinogen and the U.S. EPA has published an oral CSF of 1.75 $(mg/kg/day)^{-1}$, and an oral RfD of 0.0003 mg/kg/day (IRIS, 1994).

3.4.8 Beryllium

Beryllium is one of the less common metals in our environment. It is found in ordinary agricultural soils in µg/kg concentrations. Because of its unique qualities (light weight, stable, high melting point) and its ability to impart special qualities to alloys, beryllium has found many uses in modern, high technology equipment. Twenty (20)

percent of the beryllium produced is used as the free metal in missile and nuclear reactor components, rocket nozzles, aircraft brakes, electrical relays, space vehicle re-entry cones, x-ray windows, inertial guidance parts, and classified weapons parts. Seventy-two (72) percent of the beryllium produced is used in special metal alloys and the remaining 8 percent, as the oxide, is used in special ceramics. At pH values 5 to 8, the element tends to form insoluble hydroxides or hydrated compounds. In some alkaline conditions, berylliates tend to form (Friberg, Nordberg, and Vouk, 1986).

Beryllium is more hazardous by inhalation than by ingestion. It is not easily absorbed from the digestive tract and tends to form insoluble precipitates at the physiological pH. Beryllium has caused an allergic type dermatitis as well as acute and chronic pulmonary reactions. Beryllium apparently causes neoplasia only after inhalation exposures. Beryllium protein complexes cause immune responses which are apparently related to the pulmonary reactions noted in exposed individuals (Friberg, Nordberg, and Vouk, 1986).

Beryllium has a U.S. EPA B2 carcinogenic classification, an oral CSF of 4.3 $(mg/kg/day)^{-1}$, and an oral RfD of 0.005 mg/kg/day (IRIS, 1993).

3.4.9 Chromium

Chromium is a naturally occurring element found in continental crust, volcanic dust and gases. Chromium metal is a steel-gray solid and is primarily used in the steel and metallurgical industries. Chromium is also used in the following industries:

- refractory brick;
- metal finishing;
- manufacture of pigments;
- leather tanning;
- wood treatment; and
- water treatment.

Chromium oxidation states range from chromium(-II) to chromium(+VI). The divalent state (II) is relatively unstable and readily oxidizes to the trivalent state (III). Chromium compounds are stable in the trivalent state and occur naturally in the environment. Chromium VI is the second most stable oxidation state but it rarely occurs naturally, and is generally a product of an industrial process. The hexavalent chromium compounds are readily converted to the trivalent form in the presence of oxidizable organic matter.

Chromium occurs naturally in the Earth's crust but the majority of chromium which exists in the environment is a direct result of human activity. Sixty-one percent of chromium III is released to the environment from coal/oil combustion and steel production, while 32 percent of chromium VI is due to chemical manufacture, plating and metal production.

Environmental Fate

Chromium is removed from the atmosphere by fallout and precipitation. There are no known chromium compounds that can volatilize from water and thus, transport of chromium from water to the atmosphere is minimal.

Most of the Cr (III) is expected to precipitate in sediments. Limited amounts of Cr (III) remains in solution as soluble complexes. Cr (VI) may be transported over a significant distance but will eventually be reduced to Cr (III) by the organic matter in the water. The residence time of chromium in lakewater is estimated to be between 4.6 and 18 years.

Chromium in soil is present mainly as the insoluble chromium trioxide ($Cr_2O_3 \cdot nH_2O$). Therefore, it is not very mobile in soil. Flooding of soils and the subsequent anaerobic decomposition of plant detritus matters may increase the mobilization of chromium (III) in soils due to the formation of soluble complexes (ATSDR, 1992). This complexation may be facilitated by a lower soil pH. The fate of chromium in soil is partly dependent on the redox potential and the pH of the soil. For example, the

leachability of chromium (VI) in the soil increases as the pH of the soil increases.

3.4.10 Cobalt

Pure cobalt is a steel-gray, shiny, hard metal. The sources of cobalt in the environment are both natural and man-made (anthropogenic). Cobalt occurs naturally in small amounts in most rocks, soil, surface and underground water, plants and animals. Primary anthropogenic sources include fossil fuel burning, vehicular and aircraft exhausts, processing of cobalt and cobalt-containing alloys, copper and nickel smelting and refining, the manufacture and use of cobalt chemicals, sewage sludge, and fertilizers derived from phosphate rocks.

Industrial use of cobalt includes manufacture of alloys/superalloys (alloys that maintain their strength at high temperatures); drier in paint and similar uses; cutting and wear-resistant alloys; ground coat or frit for porcelain enameling of steel bathroom fixtures, large appliances, and kitchenwares; colored pigments; feed and nutritional additives; and glass decolorizer. Small amounts of cobalt are added to or naturally occurring in foods. In fact, Vitamin B12 is a cobalt-containing compound that is essential for good health. Cobalt alloys are used to make artificial parts, such as hip and knee joints, that are placed in human bodies by surgery.

Environmental Fate

The transport of atmospheric cobalt levels depends on its state (e.g., gas, vapor or particle) and on meteorological conditions such as wind, precipitation, topography and vegetation. The transport of particulate cobalt in air depends on the particle size, density and meteorological conditions; with coarser particles (diameter greater than 2 um) being deposited within 10 km from the point of emission and finer particles traveling longer distances. Removal of atmospheric cobalt can be from dry and wet deposition.

The transport of cobalt in soil depends on its adsorption/desorption. The mobility of cobalt in soil increases as the pH decreases. Its mobility decreases as the availability of the oxides, crystalline materials, and other adsorbents in soil decreases. Cobalt is retained by oxides such as iron and manganese oxide, crystalline materials such as aluminosilicate and geothite, and natural organic substances in soil. In clay soil, the adsorption may be due to ion exchange at the cationic sites on clay with either simple ionic cobalt or hydrolyzed ionic species. At higher soil pH, the mobility of cobalt decreases, probably due to formation of hydroxide or carbonate. The distribution coefficient of cobalt in variety of soils ranges from 0.2 to 3,800. Therefore, in most soils, cobalt is more mobile than lead, chromium (+2), zinc and nickel, but less mobile than cadmium (ATSDR, 1991).

Toxicity

Stable cobalt has been found to produce adverse effects by the inhalation, oral and dermal routes. Effects in humans following inhalation exposure to cobalt included lung effects (respiratory irritation, fibrosis, asthma, pneumonia, wheezing), cardiovascular effects (cardiomyopathy), liver and kidney congestion, ocular effects (congestion of the conjunctiva), and weight loss. Effects in humans observed following ingestion of cobalt, as cobalt sulfate in beer or as cobalt chloride as a treatment for anemia, included cardiomyopathy, gastrointestinal effects, visual disturbances, and thyroid effects. Cobalt dermatitis and sensitization were well documented as a result of dermal exposure to cobalt (ATSDR, 1991).

Cobalt has not been shown to cause cancer in humans by any exposure route.

3.4.11 Lead

A major use of lead is the production of alkyl lead for leaded gas. This use has made lead essentially ubiquitous in areas of highways and streets. It was also a common pigment in paints which resulted

in significant exposures in homes. These uses are being limited by regulations to decrease potential environmental lead exposures. Lead in soils is adsorbed on soil particles and organic carbon and is comparatively immobile (Friberg et al., 1986).

Chronic exposure to elevated lead intake can cause anemia, renal effects and encephalopathy (Friberg et al., 1986). The dose levels necessary to cause these effects have not been well defined and biological monitoring (blood level) is recommended to determine if safe levels of exposure have been exceeded. Blood levels of 10 to 20 µg/dL have been suggested as levels of concern by U.S. EPA and World Health Organization (WHO) (ATSDR, 1986). Attempts have been made to correlate the oral intake with blood levels which indicate approximate blood levels of 4 to 18 µg/mL from a continuous daily lead oral intake of 100 µg/day. Because the relationship between intake and blood level is not linear, safe oral doses have not been designated.

U.S. EPA IRIS has not established an oral RfD for lead exposure. The previous RfD (0.0014 mg/kg/day) is included in this report so that lead is included in a comparable evaluation with the other chemicals evaluated at the Site.

3.4.12 Manganese

Manganese is widely distributed and found naturally as oxides, carbonates, and silicates. It is used in metallurgy, chemical manufacture, tanning, textile bleaching and welding rods. It is added as a trace element in fertilizers for certain crops. Manganese is an essential trace element in the diet, but deficiencies have not been reported (Friberg et al., 1986). The estimated required daily intake is 2 to 3 mg/day.

Manganese is neurotoxic at adequate dose levels. However, neurological disorders are well-documented via inhalation route by workers. The general public is primarily exposed to manganese by ingestion of foods and water or inadvertent ingestion of soil. Very little

information is available concerning manganese poisoning by the oral route. Dermal exposure has not been noted as a concern except in the case of potassium permanganate which may cause severe irritation or is corrosive when it contacts skin or mucous membrane (ATSDR, 1991).

Health Effects - Animals

Even under an acute exposure scenario, manganese is considered comparatively non-toxic. Daily oral doses in food of 930 to 2,300 mg/kg/day for a number of months did not cause mortality in rats. By gavage, the LD_{50} values range from 223 to 820 mg/kg/day.

Chronic studies on rats and mice at doses of 930 to 810 mg manganese/kg/day showed no respiratory, cardiovascular, haematological, musculoskeletal, hepatic, renal, or dermal effects. A mild epidermal hypertrophy was noted in the stomach of the mice. This was possibly due to irritation of the gastrointestinal epithelium. Dose levels of 10 to 600 mg manganese/kg/day are reported to cause neurological (primarily hypo- or hyperactivity) in controlled animal studies (ATSDR, 1991).

Rats fed diets containing 3,500 mg/kg manganese showed minimal effects on reproduction. Repeated oral doses at 14 µg manganese/kg/day for 80 days did not cause any chromosomal changes in sperm or bone marrow. Studies on the carcinogenic potential of manganese in rats and mice are equivocal and under review (ATSDR, 1991).

Health Effects - Humans

Health impacts of manganese generally involve effects on the lungs or the Central Nervous System (CNS) (i.e., neurological effects) from prolonged inhalation exposure to large amounts of manganese oxide (Friberg et al., 1986). No studies were reported regarding systemic effects on humans following oral exposure other than the possible neurological effects related to oral ingestion (ATSDR, 1991).

Several toxicokinetic factors which could explain the apparent lower toxicity from ingestion exposure compared to inhalation are:

1. altered absorption rate;
2. liver storage;
3. excretion in bile; and
4. metaboiic valence change.

These factors would act equally well for manganese in water or in food.

The absorption of manganese from the digestive tract is inversely related to the dose. In other words, the percent of the dose absorbed decreases as the amount administered orally increases (Friberg et al., 1986). This would appear to decrease the toxic effect of high doses of manganese.

The liver is a major depository of manganese in the body for all ages (Friberg et al., 1986). With oral ingestion and absorption from the intestinal tract, the portal circulation would carry the manganese directly to the liver. Since the liver can store large amounts, it can function as a reservoir for excess manganese while it is being metabolized and/or excreted. In this manner, the absorbed manganese from high oral intake would not enter the general circulation directly.

A similar condition exists where manganese absorbed from the intestinal tract and in the portal blood can be shunted directly to the bile and excreted without entering the general circulation where toxic effects could be induced (Friberg et al., 1986).

If the conversion of Mn^{+2} and Mn^{+4} to Mn^{+3} results in a less toxic, more easily excreted form of manganese, shunting the manganese from the intestinal tract directly to the liver would allow this metabolic alteration to occur before the manganese enters the general circulation.

Since inhaled manganese can be absorbed from the lungs directly into the general circulation (ATSDR, 1991) there is an opportunity for

this manganese to be distributed throughout the body before it is subjected to the moderating effects of the liver.

Three studies are reported that suggest that oral exposure to manganese may cause neurological effects. The first study is related to the observation of neurological symptoms typical of manganism in an aboriginal population in an island near Australia Excess manganese intake is likely an etiological factor, other factors such as genetics, diet and alcoholism are also involved. Inhalation exposure as well as oral exposure may also be involved (ATSDR, 1991).

A second study of six families which reported excessive manganese intake from a contaminated well, is also questionable due to the abnormal very early appearance of symptoms, the very rapid course of the disease from early symptom to death, and the fact that the symptoms subsided in the survivors even before the source of excess manganese was removed (ATSDR, 1991).

A third report, Kondakis et al. (Kondakis et al., 1989), covers an epidemiological study of communities in Greece. Three populations were defined that had low (3.6-14.6 µg/L), medium (8.68-252.6 µg/L) and high (1,800-2,300 µg/L) concentrations of manganese in their drinking water. The populations were evaluated as to manganese levels in blood and hair. The differences in blood levels were not significant, but the differences in manganese content in hair was significant. The populations were also evaluated regarding social information and considered to be uniform. The individuals in the populations were examined for a select group of neurological symptoms which had specific scores weighted for importance. The average scores for the populations were significantly different, with the population on the high manganese water showing the highest average score. The authors concluded that increased intake of manganese in drinking water was associated with an increased prevalence of neurological signs and an increased concentration of manganese in the hair (Kondakis et al., 1989).

The Kondakis et al. study was critically reviewed by the Agency for Toxic Substances and Disease Registry (ATSDR, 1991) and the U.S. EPA work groups preparing the Integrated Risk Information System (IRIS, 1991) reference dose reviewed and finalized September 1, 1990. Questions related to the study and its conclusions are summarized below.

- No details were presented to allow an evaluation of which neurological signs were increased, so an evaluation of the importance of the differences (were the effects observed due to manganism or nonspecific) was not possible (ATSDR, IRIS).

- The weighting factors assigned to the symptoms were largely arbitrary and could have affected the ultimate results (ATSDR).

- Many of the parameters included in the scoring were subjective and could have lead to bias. Little effort was indicated to avoid bias (ATSDR, IRIS).

- There is no evidence that individuals that experienced neurological signs actually ingested more manganese than the individuals in the other populations (ATSDR, IRIS).

- There is a lack of information provided on social and other dietary and drinking water factors (IRIS).

- The populations studied were very small (ATSDR, IRIS).

Although the authors suggested that the increased concentration of manganese in hair indicate higher manganese intake (Kondakis et al., 1989), there was no effort to control for potential exogenous contamination of the hair from soil or washing the hair and allowing water to dry on the hair. Use of hair as a biomarker is not recommended. "Exogenous contamination may yield values that do not reflect absorbed dose" (ATSDR, 1991). Although blood levels in the three groups were discounted as being too sensitive to recent intake (Kondakis et al., 1989), this does not agree with the homeostatic regulation via changes in absorption

and/or excretion or with the comparatively long half-life reported for manganese in blood (Friberg et al., 1986).

Manganese is not known to be a carcinogen, mutagen, or teratogen. For this SRA, the current RfD for manganese in water of 0.005 mg/kg/day will be used to evaluate the manganese drinking water intake.

3.4.13 Nickel

Agricultural soils, world wide, contain from 3 to 1,000 mg nickel per kg. Nickel is found in many foods and the average daily intake in the U.S. is reported to be from 300 to 500 µg. In a U.S. drinking water survey, 3 percent of the samples contained 20 µg/L and more than 20 percent of the samples contained 10 µg/L or more (Friberg, Nordberg, and Vouk, 1986).

Less than 10 percent of the ingested inorganic nickel is absorbed from the digestive tract. Nickel has been shown to be an essential element in the diet of some animal species but this has not been proven for the human species. Large oral doses are tolerated by animals and systemic effects from oral ingestion are unlikely. Nickel can cause pulmonary inflammation and dermal contact has caused dermatitis in nickel workers (Friberg, Nordberg, and Vouk, 1986).

Nickel is classified by U.S. EPA as a known human carcinogen (Class A) via inhalation. The oral RfD for soluble salts is 0.02 mg/kg/day (IRIS, 1994).

3.5 RISK CHARACTERIZATION

The results of the quantitative risk assessments are summarized in Tables 3.8 to 3.11. The detailed calculations are presented in Appendix E, Tables 1 through 20.

The quantitative health risk assessment was performed for the most likely exposure scenario (Level 1) based on mean exposure point concentrations and average exposure conditions as well as the reasonable maximum exposure (RME) scenario (Level 2) based on the 95% UCL concentration and reasonable maximum conditions.

The risk assessment provides a theoretical relative evaluation of the additional risk of contracting cancer due to estimated exposure to specific contaminants. The procedure yielded a negative exponential number that represents the estimated additional cancer risk; for instance, 1E-06 (or 1×10^{-6}) implies one additional case of cancer will result for every 1,000,000 individuals exposed to the specific exposure scenario. As the negative exponent increases, the associated risk decreases. U.S. EPA has identified that a screening level of 10^{-6} should be utilized for this EE/CA.

The estimated additional lifetime carcinogenic risks (R) were calculated according to the following general equation:

$$R = CDI * CSF$$

where:

R = Upper Bound Additional Lifetime Cancer Risks
CDI = Chronic Daily Intake (mg/kg-day)
CSF = Cancer Slope Factor [1/(mg/kg-day)].

The cancer slope factor represents the carcinogenic potency of a chemical (see Table 3.8). The dose, or intake, represents the amount of contaminant to which a receptor is exposed. When evaluating carcinogenic risks, the dose in all exposure scenarios is the estimated daily intake of each chemical, received during the specified period of exposure, and averaged over a 70-year lifetime.

Incremental cancer risk was calculated for each chemical of concern having a designated slope factor and all applicable exposure pathways (ingestion and dermal contact with soil). Risk values for all

contaminants assessed were summed by exposure pathway to provide total pathway-specific risks.

U.S. EPA has not identified a single value that represents a significant incremental cancer risk. However, the NCP acceptable risk range for Superfund sites has been set at 1×10^{-6} to 1×10^{-4} per environmental medium (NCP, 1990). In other words, the goal of the NCP is to reduce the cancer risk associated with site contaminants in a given medium to within or below a range of 1 in 10,000 to 1 in 1,000,000.

Potential non-carcinogen effects were evaluated based on a comparison of chemical-specific chronic exposure doses (depending on the scenario-specific exposure duration) with corresponding reference doses derived from health criteria (see Table 3.8). The result of this comparison is expressed as the Hazard Quotient (HQ):

$$HQ = \frac{\text{Exposure Dose}}{\text{Protective Dose}} = \frac{CDI}{RfD}$$

where :

HQ = Hazard Quotient
CDI = Chronic Daily Intake (mg/kg-day)
RfD = Reference Dose (mg/kg-day).

A Hazard Quotient (HQ) that exceeds unity (1.0) suggests a greater likelihood of developing an adverse chronic effect. However, the uncertainty factors built into the reference doses result in conservative protective dose values. Therefore, the reference dose is likely well below that for which adverse effects will be seen.

Hazard Quotients were calculated for each contaminant for which health criteria are currently available. The HQs for each contaminant were summed to produce a rough estimate of the exposure pathway-specific risk, the Hazard Index (HI). In estimating total non-carcinogen risk, potential responses were conservatively assumed to be additive. However, all chemicals of concern do not have the same or similar toxic endpoints and responses may not be additive. Therefore, in those cases where the HI exceeded one, further analyses were undertaken to evaluate

which specific chemicals might exhibit toxic effects and whether the potential health effects estimated for each chemical were potentially additive.

Estimated risk numbers calculated as part of the risk assessment are compared to U.S. EPA value ranges (U.S. EPA range and hazard index).

3.5.1 Surface Soils

3.5.1.1 Trespasser Exposure

Trespasser exposure to surface soils within the Site were evaluated for both the present and future. The following conservative and health-protective assumptions were used to calculate exposures, as appropriate:

- Exposure point concentrations are the mean concentration of surficial soils for the Level 1 or average most likely exposure scenario and the 95% UCL for the Level 2 or RME exposure scenario.
  Note: Surface soil results (0 to 4 feet BGS) from sampling locations were used to calculate the mean (Level 1) and 95% UCL (Level 2) concentrations.

- Only older children (6-18 years in age)/adults will gain unauthorized access to the Site.

- Inadvertent soil ingestion rate assumed for an older child/adult is 100 milligrams (mg) of soil per event for both Levels 1 and 2.

- Surface area of the body contacted by soil during outdoor activities includes the head, arms, hands, and legs (5,230 cm^2) for Levels 1 and 2.

- Soil-to-skin adherence factor is 0.5 mg/cm^2 for Level 1 and 1.0 mg/cm^2 for Level 2 (U.S. EPA, 1992).

- Matrix factor on skin contact equals 0.15 (e.g., 15 percent of chemical is available for absorption) (Hawley, 1985) for both Levels 1 and 2, respectively.

- When chemical-specific information is not available, the absorption efficiency applicable to ingestion is assumed to be 100 percent for volatile organic compounds and 50 percent for other organic chemicals, PCBs, pesticides, or inorganics (MDNR, 1991).

- When chemical-specific information is not available, the absorption efficiency applicable to dermal contact is assumed to be 10 percent for volatile organic compounds and 1 percent for other organic chemicals, PCBs, pesticides, or inorganics (MDNR, 1991).

- The trespasser scenario developed for the SRA evaluates an individual who continues to gain unauthorized entry into the Site property for a total exposure duration of 32 years (Level 1) and 52 years (Level 2). For 12 of these years, the individual is an older child who frequents the Site for 32 events (Level 1) and 64 events (Level 2) per year. For the remaining 20 years (Level 1) and 40 years (Level 2), the individual is an adult who frequents the Site for 15 events (Level 1) and 20 events (Level 2) per year.

- For the non-carcinogen assessment, a shorter time exposure of 1 year is evaluated for both Levels 1 and 2 To maintain a conservative approach, it is assumed that the individual or trespasser an older child who frequents the Site for 32 events (Level 1) and 64 events (Level 2) per year.

- The percent time factor is assumed to be 0.2 for both Levels 1 and 2.

- Body weight of older child is assumed to be 48 kg.

- Body weight of adult is assumed to be 70 kg.

- Averaging time is 25,550 days or 70 years (Levels 1 and 2) for carcinogens and 365 days (Levels 1 and 2) for non-carcinogens.

- Percentage time factor (PTF) is assumed to be 0.2. This factor is based upon the premise that surficial contamination is limited to less than 20 percent of the existing land area on the Site (excluding ponds).

The estimated cancer risks and hazards are summarized in Table 3.9 while the scenario details, assumptions and calculation tables are presented in Appendix E, Tables 1 through 4, inclusive. The estimated additional risks of cancer exceeded U.S. EPA's screening level of 10^{-6} for this EE/CA, while the non-carcinogenic hazard was below. The additional lifetime upper limit of cancer risks were estimated to be 6.1E-07 and 2.8E-06 for Levels 1 and 2, respectively. Note that 79 percent to 77 percent of the total cancer risks is attributable to PCBs while the remaining 20 percent to 23 percent is due to arsenic exposure. The hazard indices for Levels 1 and 2 were three to two orders of magnitude below 1.0, the level of concern.

3.5.1.2 Maintenance Worker Exposure

Worker exposure, under a future land use scenario, is limited to surface soils within the Site. The following conservative and health-protective assumptions were used to calculate exposures:

- Exposure point concentrations are the mean concentration of surficial soils for the Level 1 or average most likely exposure scenario and the 95% UCL concentration for the Level 2 or RME exposure scenario.
  Note: Surface soil results (0 to 4 feet BGS) from sampling locations were used to calculate the mean (Level 1) and 95% UCL (Level 2) concentrations.

- Inadvertent soil ingestion rate for adult workers is assumed to be 50 mg of soil per day for Levels 1 and 2.
  Note: U.S. EPA guidance document entitled "RAGS Supplemental Guidance, Standard Default Exposure Factors" (U.S. EPA, 1991) states that *"50 mg of soil per day was chosen as the standard default value for adult soil ingestion in the workplace".*

- Surface area of the body contacted by soil during outdoor activities includes the head and hands (2,000 cm^2) for Levels 1 and 2.
  Note: U.S. EPA guidance states that *"clothing is expected to limit the extent of the exposed surface area in cases of soil contact (U.S. EPA, 1992)"*. It is reasonable to assume that workers will be required to wear hard hats, safety glasses, gloves and steel-toe boots, thus, the exposed skin surface is limited.

- Soil-to-skin adherence factor is 0.5 mg/cm^2 for Level 1 and 1.0 mg/cm^2 for Level 2 (U.S. EPA, 1992).

- Matrix factor on skin contact equals 0.15 (e.g., 15 percent of chemical is available for absorption) (Hawley, 1985) for both Levels 1 and 2.

- When chemical-specific information is not available, the absorption efficiency applicable to ingestion is assumed to be 100 percent for volatile organic compounds and 50 percent for other organic chemicals, PCBs, pesticides, or inorganics (MDNR, 1991).

- When chemical-specific information is not available, the absorption efficiency applicable to dermal contact is assumed to be 10 percent for volatile organic compounds and 1 percent for other organic chemicals, PCBs, pesticides, or inorganics (MDNR, 1991).

- Exposure frequency equals 250 days per year for Levels 1 and 2. Reasonably, maximum surficial soil exposure will only occur during the summer months since factors such as precipitation, snow cover and vegetation will limit activity patterns and exposure.

- Exposure duration:
  10 years (Level 1) and 25 years (Level 2) for carcinogens;
  1 year (Level 1 and 2) for non-carcinogens.

- The percent time factor is 0.2 and 1.0 for Levels 1 and 2, respectively.

- Adult body weight is assumed to be 70 kg.

- Averaging time is 25,550 days or 70 years (Levels 1 and 2) for carcinogens and 365 days (Levels 1 and 2) for non-carcinogens.

The estimated cancer risks and hazards are summarized in Table 3.9 while the scenario details, assumptions and calculation tables are presented in Appendix E, Tables 5 through 8, inclusive. The estimated additional risks of cancer exceeded the U.S. EPA screening level of 10^{-6} for this EE/CA, while the non-carcinogenic hazard was below. The additional lifetime upper limit of cancer risks were estimated to be 8.8E-07 and 2.2E-05 for Levels 1 and 2, respectively. Note that 79 percent to 77 percent of the total cancer risks is attributable to PCB exposure while the remaining 20 percent to 23 percent is due to arsenic. The hazard indices for Levels 1 and 2 were two to one order of magnitude below 1.0, the level of concern.

3.5.2 General Soils

3.5.2.1 Construction Worker Exposure

Risks associated with potential exposure by construction workers to contaminated surface and subsurface soils within the Site were assessed under a future land use scenario. The following conservative and health-protective assumptions were used to calculate exposures:

- Subsurface soils and surficial soils on the Site are disturbed/excavated.

- Exposure point concentrations for Levels 1 and 2 are the mean and 95% UCL concentration of surface and subsurface soil data collected from the Site.

  Note: Soil data taken from 0 to 10 feet BGS were used in the evaluation based on the assumption that excavation activities on the Site will result in the mixing of soils at depth with the subsoils being exposed at surface.

- The construction worker inadvertently ingests 50 mg of soil per event for both Levels 1 and 2.

  Note: U.S. EPA guidance document entitled: "RAGS Supplemental Guidance, Standard Default Exposure Factors (U.S. EPA, 1991)" states that *"50 mg of soil per day was chosen as the standard default value for adult soil ingestion in the workplace."*

- The surface area of the body contacted by soil during construction activities includes the head and hands (2,000 $cm^{2)}$ for Levels 1 and 2.

  Note: U.S. EPA guidance states that *"clothing is expected to limit the extent of the exposed surface area in cases of soil contact (U.S. EPA, 1992)"*. Workers are required to wear hard hats, safety glasses, gloves and steel-toe boots, thus, the exposed skin surface is limited.

- Soil-to-skin adherence factor is 0.5 mg/cm^2 and 1.0 mg/cm^2 (U.S. EPA, 1992) for Levels 1 and 2, respectively.

- Matrix factor on skin equals 0.15 (e.g., 15 percent of chemical is available for absorption) (Hawley, 1985) for both Levels 1 and 2.

- When chemical-specific information is not available, the absorption efficiency applicable to ingestion is assumed to be 100 percent for volatile organic compounds and 50 percent for other organic chemicals, PCBs, pesticide, or an inorganic parameter (MDNR, 1991).

- When chemical-specific information is not available, the absorption efficiency applicable to dermal contact is assumed to be 10 percent for volatile organic chemical and 1 percent for other organic chemicals, PCBs, a pesticide, or an inorganic parameter (MDNR, 1991)".

- The exposure time for Levels 1 and 2 is 8 hours/day which represents an average work day.

- The exposure frequency is 250 days/year for Levels 1 and 2.

- The exposure duration for a given construction program including excavation is one year for Levels 1 and 2.

- Adult body weight is assumed to be 70 kg.

- Averaging time is 25,550 days or 70 years (Level 1 and 2) for carcinogen and 365 days (Levels 1 and 2) for non-carcinogens.

- Percentage time factor (PTF) is 0.2 and 1.0 for Levels 1 and 2, respectively.

The estimated cancer risks and hazards are summarized in Table 3.10 while the scenario details, assumptions and calculation tables are presented in Appendix E, Tables 9 through 12, inclusive. The estimated additional risks of cancer and non-carcinogenic hazard are below the U.S. EPA screening levels. The additional lifetime upper limit of cancer risks were estimated to be 9.2E-08 and 8.4E-07 for Levels 1 and 2, respectively. The hazard indices for Levels 1 and 2 were two orders of magnitude below 1.0, the level of concern.

3.5.3 Groundwater

3.5.3.1 Drinking Water Use of Groundwater On Site

As discussed in Section 3.3.1, there are no current groundwater users of the upper water table zone and lower sands aquifer on Site. In addition, these water bearing units will likely not be used under the future Site conditions due to the availability of a municipal water supply. Although unlikely, groundwater use on Site by industrial plant employees was evaluated on Site under a future land use condition.

The scenario for the drinking water use of groundwater on-Site includes the following conservative and health-protective assumptions:

- Exposure point concentrations are the mean (Level 1) and the 95% UCL concentrations (Level 2).

- Ingestion rate for adult workers is 1 L/day for both Levels 1 and 2.

- The individual drinks the groundwater 250 days per year, for Levels 1 and 2.

- Exposure duration is 10 years for Level 1 and 25 years for Level 2.

- The averaging time for the non-carcinogen assessment is 365 days per year for Levels 1 and 2.

- The averaging time for the carcinogen assessment is 25,550 days or 70 years for both Levels 1 and 2.

- Adults weigh 70 kg.

The estimated cancer risk and hazards are summarized in Table 3.11 and presented in Appendix E, Tables 13 through 20, inclusive.

Using the filtered metals data, the lifetime cancer risks associated with the consumption of groundwater from the upper water table zone range from 1.4E-03 to 8.7E-03 for Levels 1 and 2, respectively. Ninety-nine (99) percent of the total cancer risks from this exposure scenario is attributable to Aroclor 1254. It should be noted that Aroclor 1254 was only detected in 1 of 6 groundwater samples for both sampling rounds, at concentrations ranging from 8.4 ppb to 12 ppb. The remaining 1 percent of the total cancer risks is due to beryllium. Even though the calculated mean and 95% UCL concentrations for beryllium are below or equivalent to federal or Michigan drinking water MCLs, and are comparable to the Site-specific mean background levels, the cancer risks associated with beryllium range from 1.9E-05 to 8.1E-05. Using the unfiltered metals data, the lifetime cancer risks associated with the consumption of groundwater from the upper water table zone range from 1.4E-03 to 8.8E-03 for Levels 1 and 2, respectively. Ninety-six (96) percent of the total cancer risks from this expense scenario is

attributable to Aroclor 1254. The remaining 4 percent of the total cancer risks is due to arsenic. Even though the calculated mean and 95% UCL concentrations for arsenic are below or equivalent to federal or Michigan Drinking Water MCLs, and are comparable to the Site-specific mean background levels, the cancer risks associated with arsenic range from 4.9E-05 to 1.5E-04.

The hazard indices associated with consumption of groundwater from the upper water table zone are above 1.0, the level of concern. A major portion of the total hazard (>89 percent) from this scenario is due to Aroclor 1254, while the remainder (≤11 percent) of the total hazard is attributable to manganese.

Using the filtered metals data, the lifetime cancer risks associated with the consumption of groundwater from the lower sands aquifer range from 4.3E-06 to 2.3E-05 for Levels 1 and 2, respectively. This is due predominantly to bis(2-ethylhexene)phthalate.

Using the unfiltered metals data, the lifetime cancer risks associated with the consumption of groundwater from the lower sands aquifer range from 8.3E-05 to 5.4E-04 for Levels 1 and 2, respectively. Approximately 72 percent of the total cancer risks is attributable to arsenic, while the remaining 22 percent is due to beryllium.

Using the filtered metals data, the hazard indices associated with consumption of groundwater from the lower sands aquifer are below 1.0, the level of concern. The major portion of the total hazard from this scenario, however, is attributable to manganese which is present at levels consistent with background.

3.6 REFERENCES

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4.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

The purpose of establishing removal action objectives (RAOs) is to provide a benchmark against which to evaluate the selection of removal alternatives.

The development of RAOs requires the following Site-specific information:

1. media of potential concern;
2. chemicals of potential concern; and
3. probable future land use.

Each of these subjects is further discussed below.

a) Media of Concern

The potential Media of Concern at the Site, as evaluated in the SRA, consist of the surface soils, subsurface soils, the groundwater of the upper water table zone, and the groundwater of the lower sands aquifer.

As a guide to determining the media and chemicals of potential concern, U.S. EPA has indicated *"that action is generally warranted at a site when the cumulative carcinogenic risk is greater than 10^{-4} or the cumulative noncarcinogenic HI exceeds 1 based on RME assumptions." "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions" (EPA 1991)*

As summarized in Section 3.0 of this EE/CA, unacceptable carcinogenic and/or non-carcinogenic risks were identified for potential future land use scenarios evaluated in the SRA for the groundwaters of the upper water table zone (greater than 10^{-4} risk) and present land use of trespassers and maintenance workers (based upon the U.S. EPA screening level of 10^{-6} for use in this EE/CA). Consistent with the guidance identified above, a removal action would be warranted for these areas.

Carcinogenic and non-carcinogenic risks identified for the groundwater in the lower sands aquifer are summarized in Table 3.11. This risk is mostly due to arsenic which is present in the unfiltered groundwater of the lower sands aquifer at mean concentrations below the Federal MCL (arsenic was not detected in the filtered samples from the lower sands aquifer). The arsenic in the lower sands aquifer is not related to Site activities. This was demonstrated in the EOC Study Report as the mean and RME concentrations of arsenic are at or below the Federal MCL and arsenic was not detected in the filtered groundwater samples. Therefore, the groundwater of the lower sands aquifer is not considered a media of concern at this Site.

The cancer risks for surface and subsurface soils were determined to be greater than the U.S. EPA screening level of 10^{-6} for use in this EE/CA for current land uses. As a result, the surface and subsurface soils are considered media of concern based upon the defined risk and U.S. EPA's screening level of 10^{-6} for use in this EE/CA.

The RME cancer risks for all other current and potential future land uses summarized in Tables 3.9 through 3.11, indicate that the cancer risks are less than 10^{-4} and the non-cancer HIs are less than 1, with the exception of the upper water table zone drinking water scenario. The upper water table zone risks are summarized as follows:

- drinking water from the upper water table zone
  - 8.68E-03 cancer risk, RME
  - 4.62E+01 non-cancer risk, RME

In summary, the SRA defined unacceptable risks associated with the maintenance worker and trespasser scenario under current land use and with the upper water table zone under a future land use condition (e.g., future industrial development using groundwater as a potable supply).

b) Chemicals of Concern

"Following the baseline risk assessment, any chemical that has an associated cancer risk (current or future) within a medium of greater than 10^{-6} or an HI of greater than 1 should remain on the list of chemicals of potential concern for that medium. Likewise, chemicals that present cancer risks of less than 10^{-6} generally should not be retained on the list unless there are significant concerns about multiple contaminants and pathways." (RAGS, VI, Part B).

Based upon the guidance identified above, potential chemicals of concern within each media requiring a removal action are defined by having a cumulative carcinogenic risk greater than 10^{-6} or cumulative HI greater than 1. The potential chemicals of concern on a media and exposure specific basis are as follows:

I. CARCINOGENS (>1 x 10^{-6} risks)

Surface and Subsurface Soils

Aroclor 1254
Arsenic

Upper Water Table Zone Groundwater

Aroclor 1254
Arsenic
Beryllium

II. NON-CARCINOGENS (HI>1.0)

Upper Water Table Zone Groundwater

Aroclor 1254
Manganese

These are the chemicals of primary concern which were identified for the maintenance worker and trespasser scenarios and for the future upper water table zone groundwater use scenario evaluated in the SRA. For the purposes of this EE/CA, these are the chemicals of concern (on a media-specific basis) for which RAOs will be developed. It should be noted at this stage that these COCs represent only a subset of those COCs which were evaluated for various media in the SRA.

The results of the SRA indicates that Aroclor 1254 accounts for 95 percent of the cancer risk associated with the groundwater of the upper water table zone. Arsenic and beryllium were determined to account for the remaining 5 percent of risk. Aroclor 1254 also accounts for 90 percent of the non-cancer risk associated with the groundwater of the upper water table zone. Manganese was determined to account for the remaining non-cancer risk.

The results of the SRA indicate that Aroclor 1254 accounts for 77 to 79 percent of the total cancer risk associated with the soils and subsurface soils under the trespasser and maintenance worker scenarios. Arsenic was determined to account for 20 to 23 percent of the remaining risk.

The cancer risk associated with the soil and subsurface soil was calculated assuming ingestion and dermal contact with the soil and subsurface soil under a present and future land use scenario involving trespassers and maintenance workers.

The cancer and non-cancer risk associated with the upper water table zone was calculated assuming the consumption of groundwater under a future land use scenario. The groundwater in the upper water table zone is not used as a drinking water source and no potable wells are located on Site, or known off Site. The risk due to Aroclor 1254 and arsenic in the upper water table zone is considered to be conservatively estimated for the following reasons:

- the groundwater is not currently utilized as a potable supply;
- municipal water is available to the north of the Site;

- it is highly unlikely tha: the shallow groundwater would be developed as a potable supply; and
- Michigan Department of Public Health regulations generally prohibit the development of groundwater supplies in instances where the depth to groundwater is less than 25 feet.

In addition, PCBs are considered to have limited mobility in groundwater due to their low solubility and high affinity for adsorption to geologic media, and as a result, would not be expected to migrate a significant distance in the shallow water table zone off Site.

However, it is acknowledged that since the Site surface drainage becomes part of the upper water table zone flow regime (Section 2.7), the Site contaminants in the upper water table zone would flow generally in the northwesterly direction (Section 2.6), and would most likely discharge into the surface waters in the area.

The following provides a summary of the carcinogenic and non-carcinogenic constituents which are evaluated as chemicals of concern in the development of RAOs.

Chemicals of Concern Summary

Surface and Subsurface Soils

1. Aroclor 1254
2. Arsenic

Groundwater - Upper Water Table Zone

1. Aroclor 1254
2. Arsenic
3. Beryllium
4. Manganese

c) Probable Future Land Use

The Textile Road Site is currently zoned and utilized for industrial purposes. In addition, the Ypsilanti Township future land use plan calls for the continued light industrial classification of the property.

The property surrounding the Site consists of industrial, gravel mining, agricultural, and mixed rural residential land uses. To the north across Textile Road there is some commercial development (e.g., gas station). Immediately east of the Site is a large manufacturing plant. Farther east the land is unused. South of the Site there is rural land use with some agricultural development. A residential trailer park and several houses exist on land reclaimed from a separate gravel mining operation to the west of the Site (west of Bunton Road).

4.1 REMOVAL ACTION OBJECTIVES

This section presents general and Site-specific removal objectives for the Textile Road removal action. General removal objectives are defined by the NCP and CERCLA (as amended by SARA) and are applicable to all Superfund sites. These objectives relate to the statutory requirements for development of any removal action. Site-specific objectives relate to specific media, such as surface soil and ground water, and potential exposure routes. Site-specific objectives also identify target removal areas and concentrations. Site-specific objectives require an understanding of the contaminants in their respective media. The Site-specific objectives are developed based on the risk to the public health and the environment, and in this EE/CA ARARs are also considered. These objectives should be made as specific as possible without limiting the range of alternatives that can be developed for detailed analysis.

4.1.1 General Removal Objectives

The NCP states *"The national goal of the remedy selection process is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste" (40 CFR 300.430).*

This section of the NCP pertains to remedial actions, not removal actions, but is considered in this EE/CA report to ensure that a long-term solution is selected. The removal action will meet the following general removal objectives.

The statutory scope of CERCLA was amended by SARA to include the following requirements for remedial actions:

- Obtain a degree of cleanup of hazardous substances, pollutants and contaminants released into the environment and of control of further releases at a minimum which assures protection of human health and the environment.

- Preference for treatment that permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants and contaminants as a principal element.

- Consideration of standards, requirements, criteria or limitations under any Federal environmental law or any promulgated standard, requirement, criteria or limitation under a State environmental or facility siting law that is more stringent than any Federal standard, requirement criteria or limitation.

4.1.2 Levels of Residual Risk

Increased risk of cancer is expressed by terms such as 1×10^{-6}. This is a hypothetical estimate of the upper limit of risk based on conservative or health protective assumptions and calculations. The

statement that a chemical exposure causes a "1 x 10^{-6} added upper limit risk of cancer" means that if 1,000,000 people are exposed to a carcinogenic contaminant over the course of their lives, a single additional incident of cancer is expected to occur. The calculation and assumptions predict that no more than one case is expected and, in fact, there may be no additional cases of cancer.

In 52 Federal Register (FR Vol. 52, No. 130, page 25700) U.S. EPA published Maximum Contaminant Levels for certain volatile organic compounds. This guidance states that the target reference risk range for carcinogens is between 10^{-6} and 10^{-4} and that the maximum contaminant levels for VOCs generally fall within this range (which U.S. EPA considers to be safe and protective of public health). This guidance provides examples of the calculations which identify that a 10^{-5} risk level is a conservative benchmark.

The 1990 national census indicated a population of 45,307 for Ypsilanti Township. The 1990 population of Washtenaw County was estimated at 282,937.

4.1.3 Site-Specific Removal Action Objectives

The following Site-specific removal action objectives (RAO) have been developed for the Textile Road Site based on the general removal objectives:

- minimize the potential for direct contact with the contaminated soil;
- minimize the potential for consumption of the groundwater of the upper water table zone;
- control leaching of PCBs and inorganics from the soil into the groundwater of the upper water table zone;
- reduce the toxicity, mobility or volume of chemicals of concern through treatment and/or containment of contaminated soil and/or groundwater; and
- reduce long-term Site management and maintenance requirements.

The development of chemical-specific RAOs for the upper water table zone COCs is discussed in the following paragraphs.

A. PCBs (Aroclor 1254)

"Guidance on Remedial Action for Superfund Sites with PCB Contamination" (or The PCB Guidance Document, OSWER DIRECTIVE No. 9355.4.-01, August 1990) describes the recommended approach for Superfund remediations involving PCB contamination. As presented in Table 3.1 of OSWER DIRECTIVE No. 9355.4.-01, the recommended soil action level for remedial actions is 1 ppm for residential land use and 10 to 25 ppm for industrial use.

The Michigan Type B and C cleanup standards, generally based on land use, are summarized as follows (MDNR Operational Memorandum #8 and #14, June 21, 1994):

Standard	*Land Use*	*Soil Cleanup Value*
Type B	Residential	1 mg/kg
Type C	Industrial	7.5 mg/kg
Type C	Commercial (III)	10.0 mg/kg
Type C	Commercial (IV)	25.0 mg/kg

Aroclor 1254 was identified in the SRA as a COC in the soil, subsurface soil, and the groundwater of the upper water table zone. The PCB Guidance Document states, *"Generally, PCB soil cleanup levels based on direct contact assumptions will provide sufficient protection of groundwater."* The PCB Guidance Document also states, *"If PCBs have contaminated potentially drinkable groundwater, groundwater response actions should be considered."* As identified in the EOC Study Report, the groundwater of the upper water table zone is not a potable water source, due to its shallow depth, thin cross-sectional thickness and low yield.

Because the soil RAO cleanup levels established previously should be protective of groundwater, and the groundwater of the

upper water table zone is not a potentially potable source, no RAO has been specified for Aroclor 1254 in the groundwater of the upper water table zone. The RAOs specified for soil will effectively eliminate the majority of all contamination within the fill/soil, thereby eliminating contaminant flux (including PCBs) to groundwater.

B. Arsenic, Beryllium and Manganese

Arsenic and beryllium account for approximately 5 percent of the total health risk, while manganese accounts for approximately 8 percent of the non-cancer health risk associated with the consumption of groundwater from the upper water table zone. Arsenic also accounts for 20 to 23 percent of the total health risk associated with the ingestion and dermal contact with the soil and subsurface soil at the Site.

These inorganic compounds constitute relatively minor proportion of the cancer and/or non-cancer health risks identified at the Site. In addition, most of the arsenic, beryllium and manganese detected in Site soil co-existed with soils containing PCBs at concentrations greater than 10 ppm. Therefore, it is likely, depending upon the removal action alternative selected, that the concentrations of these inorganic compounds, and thus their associated health effects, will be reduced as a by-product of the RAO for PCBs in soil.

The corresponding reductions in risk associated with inorganics will be effected by reducing the mass flux rate of inorganics into the groundwater. The mass flux rate associated with inorganics will be reduced by implementation of a removal action. It should be noted that the inorganics represent only a small percentage of Site risks, and as a result, this approach should be effective.

Therefore, no specific RAOs have been specified for arsenic, beryllium, or manganese for the groundwater of the upper water table zone.

C. Summary

The following provides a summary of the RAOs:

Soil		*Cleanup Level*
1.	PCBs (total)	7.5-25 ppm
Groundwater		
1.	PCBs (total)	none, achieved through RAO for PCBs in soil
2.	Arsenic	none, achieved through RAO for PCBs in soil
3.	Beryllium	none, achieved through RAO for PCBs in soil
4.	Manganese	none, achieved through RAO for PCBs in soil

4.2 IDENTIFICATION OF POTENTIAL ARARs

Removal actions under the NCP are not required to comply with applicable or relevant and appropriate requirements (ARARs). ARARs are presented and utilized in this EE/CA to ensure the selection of a long-term solution for the Site.

Guidance for the determination of ARARs is presented in the U.S. EPA guidance document entitled "Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements", August 27, 1987 (OSWER Directive Number: 9234.0-05).

ARARs are used to develop removal action objectives and to scope and formulate removal action technologies and alternatives. ARARs are cleanup standards, control standards or other substantive environmental limitations promulgated under federal or state law. The consideration of ARARs is made in order to ensure a long-term solution.

ARARs are defined below, pursuant to SARA.

Applicable Requirements

Applicable requirements are federal and state requirements such as cleanup standards, standards of control, and other environmental protection criteria or limitations that specifically address a hazardous substance, pollutant, contaminant, removal action, location, or other circumstance at a site.

Relevant and Appropriate Requirements

Relevant and appropriate requirements are those federal and state requirements that, while not applicable as defined above to the circumstances at a site, address problems or situations sufficiently similar to those encountered at a site that their use is well suited. Relevant and appropriate requirements are accorded the same weight and consideration as applicable requirements.

Other Requirements To Be Considered

The To Be Considered (TBC) category includes federal and state non-regulatory requirements, such as guidance documents, advisories, or criteria. Non-promulgated advisories or guidance documents do not have the status of ARARs.

ARARs are categorized as follows:

1. chemical-specific requirements that define acceptable exposure limits and can therefore, be used in establishing preliminary remediation goals;

2. action-specific requirements which may establish controls or restrictions for specific treatment and disposal activities; and

3. location-specific requirements that may restrict activities within specific locations such as floodplains or wetlands.

Each of these ARAR types is further discussed below.

1) Ambient or chemical specific:

These requirements consider specific concentration limits of hazardous constituents detected in the various environmental media. For this group of requirements the more stringent ARARs would be considered for determination of an acceptable cleanup level of the specific hazardous constituent. Examples of ARARs which fall under this category include: Maximum Contaminant Levels (MCLs) and Primary Drinking Water Standards.

2) Performance, design or other action specific:

This group of requirements considers ARARs which are action specific for the management of hazardous substances such as: Resource Conservation and Recovery Act (RCRA) regulations for facility closures; RCRA incineration standards; Clean Water Act pretreatment standards for discharges to Publicly Owned Treatment Works (POTWs).

3) Location specific:

These requirements should be considered at the time of the final removal action where restrictions on the site characteristics or the surrounding environment exist. Examples include: Federal and State siting laws for hazardous waste facilities and sites on the National Register of Historical Places.

The review of ARARs will occur at various stages including the time of the final Site removal alternative. These stages include:

i) during the Site characterization phase (i.e., public health evaluation);
ii) during the development of removal action alternatives;
iii) during the detailed analysis of the removal alternatives; and
iv) when the final removal alternative is selected.

The consideration of ARARs is essential through each of these stages to ensure that the final Site removal alternative ensures a long-term solution.

4.2.1 Site-Specific ARARs

On the basis of existing information, the present regulatory environment, and the completed EOC Study and Streamlined Risk Assessment, Table 4.1 presents a listing of potential ARARs that may be of relevance to the Textile Road Site.

4.2.2 Michigan Public Act 307

The Michigan Environmental Response Act (MERA) (Michigan Public Act 307 (P.A. 307, 1982, as amended) is the State of Michigan equivalent to the federal CERCLA statute. As such, it provides the rules necessary to develop removal programs and cleanup standards for environmental contamination sites located within the State of Michigan.

The Michigan Act 307 Rules provide for three types of cleanup standards (Type A, Type B, and Type C). The selection of a cleanup standard for a particular site is based on site-specific characteristics, the nature of the contamination which exists and the anticipated future land uses of the property. Under Rule 299.5705(2)(3), the cleanup approach may be Type A, B, C, or a combination of types for individual chemicals within each media of concern.

A Type A cleanup is achieved when the concentration of a hazardous substance in any environmental media does not exceed background or the relevant method detection limit.

Type B cleanup criteria are health-based, employing conservative, standardized exposure assumptions that assume there will be unrestricted direct contact with contaminated media in a residential setting.

A Type C cleanup is a health-based approach which allows site-specific characteristics to be factored into a risk assessment. It must be demonstrated that the assumptions used in the risk assessment are appropriate to the site and consistent with reasonably foreseeable current and future land uses. Less conservative exposure assumptions (than Type B) may

be made by assuming less direct contact with the contaminated media or restricting current and future use of the site through the application of institutional controls and deed restrictions. Cleanup levels will vary according to the exposure assumptions used in a site-specific risk assessment.

A generic approach to developing Type C Remedial Action Plans for industrial and commercial sites was recently identified by MDNR in MERA Operational Memorandum #14 (June 21, 1994). The Type C approach was determined to be generally appropriate for industrial and commercial sites with the following characteristics:

- the primary activity at the site is industrial/commercial; and
- the current zoning of the site is industrial/commercial.

The generic Type C approach includes soil and groundwater cleanup standards for industrial and commercial sites.

4.2.2.1 Compliance With Michigan Act 307

As identified in the EOC Study Report and the Streamlined Risk Assessment, the Textile Road Site is situated on land which is currently zoned and utilized for light industrial purposes. In addition, Ypsilanti Township's future land use plans contemplate that the land on and in the vicinity of the Textile Road Site will continue to be designated for light industrial use well into the future.

Act 307 requires Type A, B, or C (or combinations thereof) cleanups at all environmental contamination sites. The selection of any type of cleanup level is available at all sites. This selection is primarily based upon probable land use projections, the size of the site and the amount of information regarding site conditions which has been assembled and evaluated.

The removal action selected for this Site will be developed in a manner which complies with an Act 307 Type A, B, or C cleanup.

5.0 IDENTIFICATION, DESCRIPTION AND PRESCREENING OF REMOVAL ACTION TECHNOLOGIES AND PROCESS OPTIONS

Prior to the development of a list of potential removal alternatives, all available potentially applicable removal technologies which could be implemented to fulfill the objectives at the Textile Road Site are identified and prescreened.

Technologies are engineering or procedural components that may be grouped together or used individually to form a removal alternative. For example, the technologies of soil removal and incineration, and groundwater containment, extraction and pre-treatment, when grouped together, form removal action alternatives.

The removal technologies considered in this EE/CA were derived for the soil, which was identified in the Removal Action Objective. Table 5.1 presents a listing of the potentially applicable response actions and associated removal technologies/process options.

Table 5.2 presents an initial screening of potential removal response actions and technologies/process options considered applicable to the Site. Each of the response actions and technologies/process options listed is evaluated as to its general technical applicability for implementation at the Site.

The following sections provide a description and technical feasibility evaluation of the response actions and removal technologies/process options considered potentially applicable. The various technologies evaluated in this section were selected for initial evaluation as discussed in Section 4.0 of the PCB Guidance document.

5.1 NO ACTION

The "No Action" alternative allows the Site to exist as it is without the implementation of any removal technologies. The no action

alternative would incorporate long-term environmental monitoring at the Site to confirm that future conditions do not deteriorate significantly from present existing conditions. The long-term monitoring program at the Textile Road Site would involve the monitoring of the surface waters of Ponds 1 and 2 for Site-related constituents as well as the monitoring of the upper water table zone groundwater to ensure that Site-specific contamination is not impacting areas adjacent to the Site.

Contaminated soil with contaminant concentrations in excess of clean-up goals would remain at the Site under the no action response and no measure would be invoked to remove or physically contain contaminant source areas. A contingency plan would be developed and implemented dependent upon the results of the groundwater monitoring. The contingency plan would include the monitoring of off-Site groundwater, implementation of off-Site institutional controls, and implementation of groundwater containment, as necessary.

5.2 LIMITED ACTION

The limited action response involves the implementation of institutional controls and property access restrictions to reduce potential human exposure to Site-related constituents.

5.2.1 Institutional Controls

This action would involve the placement of a restriction within the deed (or other institutional controls such as zoning or building code changes) to the property obligating the property owner to not conduct specific activities (e.g., excavation, residential use) and warn prospective future purchasers of the past history and condition of the property. Deed restrictions can be made enforceable and permanent through various legal mechanisms (e.g., Consent Decree). The use of a deed restriction does not imply that other removal action technologies are unnecessary. To ensure that the Site does not pose a threat to the environment or to public health

may require the implementation of other removal action technologies in addition to a deed restriction.

5.2.2 Access Restriction

Access to the Site may be further restricted by upgrading the existing security fence, constructing additional security fencing or instituting other controls to minimize entry to the Site by wildlife or unauthorized personnel.

Although the soil with contaminant concentrations exceeding potential cleanup goals are not addressed by this option, the implementation of institutional controls and access restrictions would reduce potential future human contact with Site-related constituents. As a result limited action is considered applicable and is recommended for inclusion in all removal alternatives.

5.3 PHYSICAL CONTAINMENT OPTIONS

The physical containment option involves the use of physical barriers to contain or otherwise restrict the mobility and migration of Site constituents associated with the soil. Potential containment options applicable to the Textile Road Site include one or a combination of the following:

1. capping; and
2. groundwater cutoff wall.

5.3.1 Capping

Capping would involve the construction of a low permeability cover over the contaminated soil at the Site. The purpose of the cover is to prevent direct contact and reduce infiltration of precipitation

through the soil and subsequent percolation of potentially contaminated leachate into the groundwater. In addition, capping provides long-term protection against erosion and subsequent transport of contaminants.

In general, the capping technology provides very good isolation of the contaminated soil but may extend the length of time that other possible remedy components, such as monitoring, are required.

Materials which may be used in the construction of low permeability caps may include:

1) Normal Portland Concrete Cover;
2) Asphaltic Concrete Cover;
3) Clay;
4) Sprayed-on Covers; and
5) Synthetic Covers.

A brief description and Site-specific screening of each cap technology is presented below.

Normal Portland Cement Cover

This technology would involve the placement of a concrete slab over a compacted granular base which would overlie the contaminated soil. The thickness of the concrete cap and granular base are dependent on the amount of anticipated settlement and the local weather conditions.

The concrete slab would provide a durable surface which would permit selective future surface use of the Site for storage or parking. The concrete slab has excellent weathering characteristics and low permeability.

Due to the reduced infiltration rate, increased precipitation runoff would occur. This could result in stormwater

management concerns, however, due to the relatively small surface area of the cap, minimal stormwater runoff management would be expected.

Although concrete is susceptible to cracking from settlement, shrinkage and frost heave, proper design of expansion joints and reinforcing, would control cracking and minimize future maintenance.

Although the concrete cover would provide an effective means of eliminating direct contact and erosion, a vegetative cover helps to reduce infiltration and therefore, is a desired characteristic of the cap surface. Therefore, the normal Portland cement cap will not be retained for further evaluation.

Asphaltic Concrete Cover

This technology would involve the construction of an asphaltic concrete surface over a compacted granular base. The granular base would overlie the foundation layer. The required thicknesses of the asphaltic concrete cap and granular drainage base are functions of the degree of anticipated settlement and local climatic conditions.

Asphaltic concrete mixes designed to reduce infiltration are similar to highway paving asphaltic concretes except that the percentages of mineral filler and asphalt cement are increased. These increased percentages serve to increase water repellency and decrease the photo sensitive weathering characteristics as compared to normal asphaltic pavements.

Asphaltic concrete is designed to retain enough flexibility to mold to slight deformations of the subgrade, and is more resistant to surface cracking than normal Portland concrete.

The increased precipitation runoff resulting from the reduced infiltration capacity of the asphaltic concrete pavement may cause stormwater management concerns. However, due to the relatively small

surface area of the cap and location of the three on-Site ponds, minimal stormwater runoff management would be expected.

Although the asphaltic concrete cover would provide an effective means of reducing infiltration to the waste cell, a vegetative cover is a desired characteristic of the cap surface. Therefore, the asphaltic concrete cap will not be retained for further evaluation.

Clay Cover

This technology would require; the pre-grading of a foundation layer to provide two percent minimum slopes; placement of compacted low permeability clay; placement, compaction, and grading of a sand drainage layer, and placement, compaction, and grading of compacted fill. The clay soil must be placed and compacted to achieve a hydraulic conductivity of less than 10^{-7} cm/sec. The finished surface would be covered with topsoil and would be seeded to provide a vegetative cover. Figure 5.1 presents a typical detail of a Michigan Act 64 compliant clay cap. This cap would also be considered TSCA compliant.

The implementation of this cap option would provide protection of human health and the environment by preventing direct contact with, or incidental ingestion of, Site-related constituents.

The drainage layer provides protection against surface water infiltration. Infiltrated water would drain along the surface of the sloped clay layer surface and would be discharged into ditches located adjacent to the cap and eventually into the on-Site ponds. Frost protection of the clay layer by the cover materials prevents degradation of the clay liner due to freeze-thaw cycles.

The vegetative cover, topsoil and low hydraulic conductivity clay will help to reduce infiltration into the contaminated soil. The clay capping option is, therefore, retained for further evaluation.

Sprayed-On Covers

This technology utilizes a surface cap of sprayed on bituminous tar. The purpose of the tar cap is to provide a barrier to reduce infiltration, while facilitating drainage off of the capped area.

The tar would be sprayed directly onto a compacted granular layer. The granular layer would overlie the foundation layer. The tar adheres to and seals the surface of the granular layer, thus reducing infiltration.

This type of cover is not, however, resistant to freeze thaw cycles and as such would deteriorate significantly over time (i.e., develop cracks). This deterioration would impair the caps ability to prevent infiltration.

Due to the lack of freeze thaw durability of sprayed-on covers and the preference for vegetative cover, the sprayed-on cover will not be retained for further evaluation.

Synthetic Cover

In general, this technology would involve installation of the following layers:

- topsoil;
- common fill;
- geotextile fabric;
- sand drainage layer;
- synthetic membrane liner;
- sand layer; and
- grading layer.

The topsoil layer would be seeded to promote vegetative growth.

There are six types of synthetic liners available; High Density Polyethylene (HDPE), Chlorosulfonated Polyethylene (Hypalon), Chlorinated Polyethylene (CPE), Low Density Polyethylene (LDPE), butyl rubber, and Polyvinyl Chloride (PVC). The thickness of the synthetic liner is determined based upon the projected physical and climatic stresses anticipated during installation and the projected service life of the cap.

Synthetic membranes may provide hydraulic conductivities on the order of 10^{-13} cm/sec. The flexibility of the liner makes this technology less susceptible to leakage due to settlement or frost heave than other capping technologies. Long-term maintenance of the vegetative cover would be required. The long-term durability of synthetic liners has not been conclusively demonstrated in the field.

In addition, the low permeability layer could be provided through the utilization of a geosynthetic clay layer (GCL). GCL layers are comprised of a bentonite mat composite which is capable of providing low hydraulic conductivity and a general resistance to freeze-thaw deterioration.

Due to the inconclusive long-term durability of synthetic liners, this option is eliminated from further consideration. The use of synthetic layers of GCLs may be re-evaluated for use in the future.

5.3.2 Groundwater Cutoff Wall

Groundwater cutoff wall technology involves containment of groundwater through construction of a barrier wall which isolates the waste from the surrounding groundwater flow field. Construction of a groundwater cutoff wall reduces the potential for the off-Site migration of any potentially contaminated groundwater.

In order to effectively control contaminant migration, the barrier cutoff wall must be keyed into a confining layer of low permeability at its base and extend upwards to an elevation above the groundwater level. A dewatering system consisting of either a gravity drainage tile system

connected to a sump, or an extraction well system, would be required to control groundwater flow. At the Textile Road Site, the clay aquitard (at a depth of 20 feet BGS) would serve as an effective lower barrier into which the groundwater cutoff wall would be keyed.

Materials which could be utilized for the construction of a groundwater cutoff wall at the Site are listed below:

1) slurry walls;
2) grout curtains; and
3) sheet piles.

A general description of each of these alternative cutoff wall materials is presented in the following sections.

5.3.2.1 Slurry Cutoff Walls

Slurry walls are the most common form of groundwater cutoff wall implemented at hazardous waste sites. The term slurry wall is applied to a variety of cutoff walls, constructed in a vertical trench excavated under a slurry. The bentonite-water (BW) slurry acts to shore the trench, preventing collapse, and also forms a filter cake on the trench walls which acts to prevent fluid losses. The BW filter cake also reduces the native soils effective hydraulic conductivity, as the filter cake permeability is generally on the order of 10^{-7} to 10^{-9} cm/sec.

In brief, the trench is excavated, immediately filled with BW slurry and subsequently backfilled with a soil-bentonite (SB backfill), soil-attapulgite (SA backfill) or some other suitable backfill. In some instances the trench is excavated under a slurry of cement, bentonite and water. In this case, the cement-bentonite (CB) mixture is left in the trench to set. A typical slurry wall construction schematic is presented as Figure 5.2. Figure 5.3 presents various slurry wall construction methods and placement options.

Each of the following types of slurry walls are discussed below:

- soil-bentonite (SB);
- cement-bentonite (CB); and
- soil-attapulgite (SA).

Soil-Bentonite Cutoff Walls

SB slurry walls are the most common form of groundwater cutoff walls constructed for contaminated groundwater containment. SB slurry walls offer advantages over other slurry wall materials which include low costs, low permeability and the widest range of chemical compatibilities.

Cement Bentonite (CB) Cutoff Walls

The principal difference between SB and CB walls is that of the backfill. CB walls are generally excavated using slurries composed of cement, bentonite and water. The difference is that the slurry is left to set to form the completed cutoff wall. CB walls are generally more expensive than SB walls and are not capable of providing hydraulic conductivities as low as SB cutoffs. In general, the hydraulic conductivity of CB walls is in the range of 10^{-6} cm/sec. CB walls are also more susceptible to degradation by contaminants in the groundwater. As with cementious materials in general, CB cutoff walls are susceptible to attack by sulphates, strong acids and bases (pH <4, pH >7) among other chemical substances.

As CB walls are more expensive than SB walls they are generally not used at hazardous waste sites unless one or more of the following conditions applies:

- there is no room to mix SB;
- increased physical strength is required; or
- extreme topography makes it impractical to grade the Site for a SB cutoff wall installation.

As the three conditions mentioned above are not expected to exist at the Textile Road Site, the CB cutoff wall is eliminated from further consideration. The SB cutoff was retained for further evaluation.

Soil-Attapulgite (SA) Cutoff Walls

A relatively new method of backfilling a slurry wall to provide low hydraulic conductivity at hazardous waste sites involves the placement of SA backfill. SA backfill may be chosen as an appropriate backfill when traditional bentonite backfills are found to be adversely affected by site contamination. SA has had only limited field use and is, therefore classified as an emerging technology.

Attapulgite clay consists of "needle-like" silicate clay minerals as opposed to the "plate-like" structure of bentonite. This physical characteristic gives attapulgite clay a lower ion exchange capacity and thus it is more resistant to chemical degradation. However, attapulgite does not have the swelling characteristics of bentonite and thus larger percentages of attapulgite are required in the backfill to provide hydraulic conductivity equivalent to bentonite based backfills.

Although SA cutoff walls are more resistant to chemical degradation, than SB walls, SA is an emerging technology. In addition, the constituents at the Site would not be expected to have an adverse effect on traditional soil bentonite backfills. This option is thus eliminated from further evaluation.

5.3.2.2 Grout Curtains

Grout curtains are formed by injection of grout into unconsolidated overburden under pressure. Several different grout mixtures are used depending on the purpose of the grout. In general, grout mixtures are typically formulated from cement (most common), clay alkali silicates, organic polymers, and various mixtures of these compounds. A typical grout

curtain construction detail is presented on Figure 5.4. Although grout curtains may be used in soil, they have proved to be most cost effective for applications in rock. Grout curtains are generally several times more expensive than slurry walls and recent studies have indicated that it is difficult to form a complete grout curtain (U.S. EPA, 1985).

Problems with grout setting and grout durability have been encountered at hazardous waste sites due to the presence of contaminated groundwater.

Another problem with curtain grouting is the presence of gaps which may be left in the curtain. This may significantly increase the permeability of the grout curtain and prevent it from meeting its design goals.

Grout curtains, which are typically more cost effective for applications in rock, are on the order of two magnitudes higher in cost than SB cutoff walls, and have had only limited applications at hazardous waste sites. Grout curtains are therefore eliminated from further evaluation in the EE/CA.

5.3.2.3 Sheet Pile Cutoffs

Sheet pile cutoffs are used to produce a physical groundwater barrier. A recently developed sheet pile cutoff is the Waterloo Barrier Wall (Waterloo Wall, John Cherry, October 1992).

The Waterloo Wall is a low permeability containment wall constructed from metal sheet piles with sealable joints. A typical Waterloo Wall Barrier assembly is depicted on Figure 5.5.

The Waterloo Wall is a readily available design which consists of conventional metal sheet piles with the addition of sealable wall joints to reduce the leakage of groundwater. A variety of sealant materials may be used including bentonite, vermiculitic grout or cementicious grout and organic polymers. Sealant mixtures are selected to optimize chemical

resistance and provide the lowest attainable hydraulic permeability with respect to Site-specific conditions. The Site conditions which affect sealant selection include general groundwater chemistry and the types of contaminants encountered.

Based on the Site geology and contaminants present at the Site, the Waterloo barrier wall would be effective in preventing the escape of leachate from the contaminated soil. This wall option will be retained for further evaluation. It should be noted, however, that the Waterloo Wall is somewhat more expensive than the SB wall.

5.4 IN SITU TREATMENT

The in situ treatment technologies/process options would involve in situ treatment of approximately 18,600 cubic yards (cy) of contaminated soil. The contaminated soil would include all Site soils with a PCB concentration of 10 mg/kg or greater and would be consolidated prior to in situ treatment (selected for purposes of evaluation only). The in situ treatment process options considered for the treatment of the constituents identified in the contaminated soil at the Textile Road Site include:

1. Biological;
2. Soil Vapor Extraction;
3. Soil Flushing;
4. Vitrification; and
5. Stabilization/Solidification.

A process description and preliminary evaluation of the in situ process options are presented below:

5.4.1 Biological Treatment

In situ biological treatment is a process where oxygen and nutrients are added to soils in situ. These nutrients enhance and expedite the

biological degradation of organic contaminants by either indigenous or introduced micro-organisms.

Water is used as a carrier to transfer the oxygen/nutrients/micro-organisms mixture to the subsurface. This is accomplished through infiltration basins at the ground surface or through a series of injection/extraction wells. A typical injection/extraction well system is presented on Figure 5.6. The injection/extraction wells circulate nutrients, oxygen and micro-organisms through the contaminated media. Under these conditions the circulating water may also desorb and dissolve contaminants as a soil flushing system. The extracted water may be treated on Site, if required, to remove dissolved contaminants before disposal or reinjection.

Many factors influence the effectiveness of an in situ biological treatment process. These factors include:

- concentration of available oxygen;
- appropriate levels of macronutrients and micronutrients;
- redox potential;
- soil pH;
- degree of water saturation;
- soil temperature;
- presence of toxins;
- biodegradability of contaminants;
- by-products of degradation; and
- hydraulic conductivity of soils.

Some work has been done on the use of micro-organisms to degrade PCBs either through enhancing conditions for indigenous micro-organisms or mixing the contaminated material with engineered micro-organisms. A lab scale study has shown that Aroclors 1248 and 1260 demonstrate significant resistance to microbial metabolism. A more chlorinated PCB has a generally higher resistance to biodegradation.

Based on the above-noted difficulties in biological treatment of the Aroclor species present at the Site, as well as the presence of

heavy metals, oil and grease which tend to retard biodegradation, this treatment option will not be evaluated further in the EE/CA.

5.4.2 Soil Vapor Extraction

Soil vapor extraction (or soil vacuum extraction) (SVE) is a technique used to remove VOCs and SVOCs from the vadose (or unsaturated) zone. SVE utilizes vapor extraction wells or trenches installed in the contaminated areas of the vadose zone to strip VOCs and SVOCs from the contaminated media. The extraction wells/trenches can be used alone or in conjunction with air injection wells. Air injection wells may use atmospheric air (passive) or forced air injection (active). An example of the SVE equipment layout is presented on Figure 5.7.

Several factors impact the effectiveness of in situ vacuum extraction at any particular site. These factors include:

- chemicals to be treated and their concentrations;
- soil temperature;
- air conductivity of the soil;
- moisture content;
- geological conditions; and
- soil sorption capacity.

SVE is not effective in removing PCB and inorganic contaminants from soil media. As the primary contaminants of concern at the Site were identified as PCBs and inorganics (e.g., arsenic) this technology is deemed ineffective and will not be considered for further evaluation.

5.4.3 Soil Flushing

Soil flushing is an in situ process using a groundwater extraction/reinjection system similar to the one presented on Figure 5.7. The soil flushing process consists of injecting a solvent or surfactant solution into

the affected soil, to enhance the contaminant solubility. The addition of a solvent/surfactant results in increased recovery of contaminants in the extracted groundwater.

The degree to which soil flushing is effective is primarily dependent upon the following factors:

- soil hydraulic conductivity;
- soil carbon content; and
- chemical-specific properties such as water solubility, adsorption characteristics, vapor pressure, liquid viscosity and liquid density.

The effectiveness of soil flushing is controlled by the solubility of the chemical compound, the tendency of a compound to adsorb to soil, the porosity of soil and the contact time between soil and water.

The probability of successful treatment by soil flushing is categorized as follows:

- high probability of successful treatment (H) for a solubility greater than 1,000 mg/L;
- moderate probability of successful treatment (M) for a solubility from 1 to 999 mg/L; and
- low probability of successful treatment (L) for a solubility less than 1 mg/L.

The solubilities of the PCBs at the Site are low and therefore, do not lend themselves to extraction by soil flushing. Soil flushing is therefore, eliminated from further evaluation.

5.4.4 Vitrification

Soil vitrification is an in situ batch (setting) treatment technology which destroys organic compounds through pyrolysis, and immobilizes inorganics within the resultant solidified mass. Vitrification involves the use of high electrical current transmitted into the soil by large

electrodes which transform the treated material into a pyrolyzed mass. The contaminants are either thermally destroyed or contained in a resultant glass-like matrix. This technology produces an off-gas waste stream which is captured by a fume hood, and treated to meet air emission regulations, if required. The durability of the resultant solidified mass may be measured on the order of thousands to millions of years. Therefore, long-term management controls would not be required. Figure 5.8 provides a schematic of the process.

Although pilot-scale tests have been performed on PCB wastes with satisfactory results, this technology is still relatively unproven for field applications. Therefore, this technology will not be evaluated further in this EE/CA.

5.4.5 In Situ Stabilization/Solidification

In situ stabilization/solidification primarily, but not exclusively, obtains results through the production of a monolithic block of waste with high structural integrity and low hydraulic conductivity (10^{-6} to 10^{-8} cm/sec). Contaminants (both organics and inorganics) are mechanically locked within the solidified matrix. Contaminant loss (through leachability) and mobility are minimized through reduction of surface area in contact with the environment. Utilization of cement as a solidifying agent would serve to increase the pH of infiltrating water to a level at which metals are not significantly soluble in water. Stabilization/solidification is an effective method of reducing the mobility of contaminants but may not reduce the toxicity or volume.

There are two processes available for the in situ stabilization/solidification of waste. They are mass mixing and column mixing.

Mass mixing is accomplished using either a hydraulic backhoe bucket or an injection rake mounted to the stick of a backhoe. Where a backhoe with a standard bucket is used, reagents are placed on top of

the waste and then thoroughly mixed into the sludge by the backhoe. Injection raking introduces the reagents through the tip of the rake fingers as the sludge is being mixed. These methods may be effective where the depth of treatment required is small.

Column mixing employs a crane mounted auger mixing head that is advanced into the waste matrix through a bottom-open cylinder. The reagents are introduced into the waste as the blades rotate and travel through the entire depth of the cylinder. Chemical reagents are added pneumatically. The column mixing process allows containment and collection of vapors and dust emanating from the waste. Containment of volatilized organics could be accomplished through the use of a hood over the mixing column. Head space is kept under negative pressure to draw the vapor and dust into a vapor treatment system.

Following the completion of a cylinder, the mixing blades are retracted and the cylinder assembly is withdrawn. The cylinder is then advanced through the waste at a position located adjacent to the previous cylinder. The process is repeated until the entire waste matrix has been treated. Figure 5.9 presents a typical column mixing method for applicable to a waste sludge. Possible overlapping patterns to provide complete treatment are presented on Figure 5.10. A typical process flow schematic for the column method is presented on Figure 5.11.

Three types of stabilization/solidification reagents, discussed below, may be applicable to the contaminated soil at the Textile Road Site. The applicability of reagents must be determined on a Site-specific basis by performing a treatability study on a characteristic sample of the waste.

Portland Cement

The introduction of Portland cement into a waste stream is accomplished with the addition of water, unless sufficient water is already present in the waste, to ensure that proper hydration is achieved for the successful bonding of the matrix. During this process the waste is physically trapped and some of the inorganics may also be chemically stabilized as

hydroxides of metals may be formed. The basic properties of the cement also serve to increase the pH environment rendering the inorganics less soluble in the presence of leaching agents. Depending on the characteristics of the waste stream, quantities of fly ash, sodium silicate, bentonite or proprietary additives may be added in conjunction with the cement. Resultant waste state of this process ranges from granular material to a monolithic structure of high strength and integrity. The volume increase expected with use of this reagent is approximately 10 to 15 percent. The treatment mix design may provide an unconfined compressive strength (UCS) of 50 psi which meets U.S. EPA guidelines for foundation materials in the construction of a cap.

Portland cement reagents have been used extensively in solidification projects. Portland cement has been applied to wastes containing metals such as cadmium, chromium, lead and zinc. It has also been used to successfully solidify waste streams containing PCBs, oils and oil sludges.

Cement Kiln Dust

Cement kiln dust (CKD), a pozzolan, is a by-product of cement manufacturing which is high in siliceous and aluminosilicate minerals. Pozzolans tend not to have bonding properties unless they are mixed in appropriate quantities with water and lime or cement. Pozzolanic reactions are generally much slower than cement reactions. The result of this process can range from a granular material to a monolithic structure.

CKD has been used in numerous solidification projects. It has been applied to wastes consisting of oil sludges and has been used with wastes containing metals such as lead and chromium. At the Trammel Crow Company in Dallas, Texas, CKD was used to solidify lagoons of oil refinery sludges containing heavy metals.

ASTM Class F Fly Ash

Fly ash is a by-product of coal burning and is a pozzolan like CKD and therefore lacks self-hydrating properties. Fly ash must be

combined with water and lime or cement to create a matrix which will set properly.

Stabilization/solidification of the soil is a viable treatment technology which may be effectively utilized to reduce the mobility of Site-related constituents. The stabilization/solidification technology may be implemented utilizing a variety of stabilization/solidification agents and materials.

Solidification/stabilization is considered a proven and effective treatment technology and, therefore, is retained for further evaluation.

5.5 WASTE REMOVAL

Waste removal would involve the excavation of contaminated soil for treatment or disposal through the use of one of the technologies in Section 5.6. Figure 5.12 identifies the limits of the excavation that would be necessary to remove all of the contaminated soil, as developed in Section 4.0. The following paragraphs discuss waste removal activities.

The potential ex situ treatment technologies identified in Section 5.6 require the excavation of the on-Site contaminated soil. The volume of contaminated soil is estimated to be 18,600 cubic yards.

Although this technology may create problems, it will be carried through for evaluation as an integral part of the ex situ treatment technologies and process options.

5.6 EX SITU TREATMENT

The volume of source material to be excavated and treated is estimated at approximately 18,600 cubic yards (28,000 tons). The treatment

process options considered applicable to the treatment of the waste material at the Textile Road Site may include:

1. bioremediation;
2. low temperature thermal desorption;
3. advanced electric reactor;
4. incineration;
5. stabilization/solidification;
6. solvent extraction; and
7. gas-phase chemical reduction.

A description and screening evaluation for each treatment process is presented below.

5.6.1 Bioremediation

The basis of bioremediation is to provide a favorable environment in which microorganisms may degrade the Site-related contaminants to non-hazardous constituents.

The applicability of bioremediation is limited to wastes which are biologically degradable. Recent studies have identified the potential to sequentially dechlorinate halogenated organic compounds, including PCBs. The applicability, however, to PCBs seems to be most amenable to PCB mixtures with lower percentages of chlorine (e.g., Aroclors 1221 and 1232). As a result, bioremediation is not typically effective in removing PCBs with higher percentages of chlorine (such as those identified at the Site).

Lab scale studies on the biodegradation of PCBs has shown that Aroclors 1248, 1254, and 1260 are relatively resistant to biological metabolism in concentrations greater than 5 ppm. The conclusion made was that highly chlorinated PCBs, like those identified at the Textile Road Site, are generally resistant to biological degradation.

Although this technology may be effective for the degradation of the majority of the oil in the matrix, the actual effectiveness of this technology would be limited by the levels of non-degradable chemicals such as metals and highly chlorinated PCBs . The inability to remove arsenic and PCBs form the basis for elimination of this technology from further review in the development of remedial response actions.

5.6.2 Incineration

Incineration is a treatment technology applicable to organic compounds. Incineration uses high temperature oxidation under controlled conditions to degrade a substance into carbon dioxide, water vapor, sulfur dioxide, nitrogen oxides, hydrogen chloride gases and ash. The hazardous products of incineration, such as particulates, sulfur dioxide, nitrogen oxides and hydrogen chloride may require air emission control equipment (U.S. EPA, October 1988). Incineration may be conducted either on Site or off Site.

One form of on-Site incinerator is the circulating bed combustor (CBC), illustrated on Figure 5.13. The CBC incinerator uses lower temperatures (below 1500°F) than off-Site rotary kiln incinerators, and high combustion air velocities in order to achieve contaminant removal.

A rotary kiln is commonly used for off-Site incineration. Rotary kiln incinerators are cylindrical, refractory-lined shells. They are generally fueled by natural gas, oil or pulverized coal. Most of the heating of the waste is due to heat transfer with the combustion product gases and the walls of the kiln. The basic type of rotary kiln incinerator, illustrated on Figure 5.14, consists of the kiln and an afterburner.

Wastes are fed into the kiln at the higher end and are passed through the combustion zone as the kiln rotates. The rotation creates turbulence which improves combustion. Rotary kilns often utilize afterburners to ensure complete combustion. Most rotary kilns are equipped with wet scrubber emission controls.

The residence time and operational temperature of rotary kiln incinerators depend upon the combustion characteristics and chemical properties of the waste. Residence times can range from a few seconds for liquid with a high BTU value to an hour or more for bulk solids. Combustion temperature ranges from 1500°F to 3000°F (U.S. EPA, October 1988).

Both the CBC and rotary kiln methods of incineration have a demonstrated removal efficiency greater than 99.99 percent.

When soil is incinerated, there is only a small volume reduction. Decontaminated soil/ash may be backfilled on Site following additional treatment to reduce leachability, as necessary.

Inorganic contaminants are not affected by incineration and remain in the waste material. As incineration will not remove the inorganics, incineration ash from the Textile Road Site may contain levels of arsenic, beryllium and manganese which may result in adverse human health risks (based upon the SRA exposure scenarios). Therefore, the residuals may require additional treatment and/or containment.

Several additional concerns exist with respect to incineration. These concerns include the potential generation of incineration byproducts which may be produced through incomplete combustion and the release of inorganic particulates. Incomplete combustion may result in combustion products which are more toxic than the materials originally being incinerated.

Off-Site incineration would require the transportation of soil to a TSCA permitted facility. Available TSCA incinerators are located in Texas and Utah. One way distances to the available TSCA incinerators are in excess of 1,200 miles.

Finally, on- or off-Site incineration may not be feasible due to the following reasons:

- the water content of the soil may make this technology unfeasible,
- the potential for unacceptable inorganics emissions associated with the high concentrations of metals in the waste feed,
- the lack of public acceptance of the technology,
- a general opposition to incineration by U.S. EPA, and
- the cost prohibitive nature of the technology.

Notwithstanding the significant concerns identified for this technology, incineration will be retained for further evaluation.

5.6.3 Low Temperature Thermal Desorption (LTTD)

Low temperature thermal desorption (LTTD) is an emerging technology which has been developed as an ex situ method of treating wastes containing organic contaminants. The technology is generally ineffective in removal of inorganic contaminants.

LTTD systems separate organics from waste materials resulting in a significant reduction in waste volume. LTTD is generally applicable to the remediation of volatile organic compounds (VOCs) but it has also been applied to wastes containing semi-volatile organic compounds (SVOCs), polyaromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs).

LTTD is an ex situ technology which reduces the volume and mobility of contaminants through the separation and collection of organic contaminants. A general process flow for a thermal desorption system is presented on Figure 5.15. Wastes are pre-screened to remove materials greater than two inches in size. This improves heat transfer, reduces clogging of the equipment and allows for stable operating conditions. Dewatering of the wastes may be needed to allow efficient loading of the LTTD unit and increased processing efficiency. The waste material is then fed directly to the desorber (heater) by a gravity conveyor system or screw augers.

The heating of the waste materials (generally 200°F to 1100°F) causes volatilization of the water and organic contaminants into a carrier gas stream. Chemical reactions and combustion are inhibited by controlling the temperatures and oxygen content in the desorber. Oxygen levels of less than one percent can be achieved with the use of an inert carrier gas (e.g., nitrogen) to continuously purge the desorber.

Following desorption, the carrier gas may be treated by incineration in an afterburner, or cooled to condense the volatilized water and organics into liquids. The cooled carrier gas may require treatment to meet air quality requirements before venting to the atmosphere. Typical treatment methods include baghouses, cyclone separators, carbon adsorption or liquid scrubber systems. Carrier gases can also be recycled to the desorber for reuse in oxygen purging.

The condensed water/organic mixture is collected and the water is separated from the organics, usually by gravity. The water is recycled for reuse in processing or treated for release to the ground or a surface water body. The condensed and separated liquid organics are collected for further treatment. Treatment of desorbed liquids may include incineration, land disposal or equivalent treatment.

Residual streams of solid materials include oversized rejects, off-gas particulates, spent carbon and treated solids. The oversized rejects are usually disposed of in an approved manner off Site or size reduced to allow feeding to the desorber. Particulate matter collected from the gas treatment is usually recycled to the desorber. The spent carbon can be regenerated for reuse. The treated media is sprayed with recycled water to control dusting and can generally be backfilled on Site if applicable hazardous waste disposal regulations are met. The process is generally not effective in the treatment of inorganic wastes because inorganics (e.g., metals) have low volatilities. Therefore, if metals are present in the waste stream it may be necessary to stabilize/solidify the treated waste to meet leachability criteria prior to backfilling. In addition, high water content may make LTTD unfeasible.

The LTTD technologies which would be applicable for the Textile Road Site include rotary kilns, beds, and screw auger desorbers. These technologies are discussed below.

Rotary Kiln Desorber

The rotary kiln desorber (RKD) is based on the rotary kiln incinerator (RKI) described in the incineration technology review (Section 5.6.2). The design, construction and processing equipment used in a RKD is very similar to that used in a RKI. The essential difference in the two types of equipment is the operating temperature. RKDs operate at lower temperatures, generally achieved through indirect heating of the kiln, to allow volatization and prevent combustion. Off-gas treatment and residual solid handling in a RKD are similar to that used in a RKI.

RKDs have extensive heat exchangers which are used to cool the flue gas from the desorber and provide contaminant condensation. The condensate is collected and non-aqueous phase liquids (NAPLs) separated from water in oil-water separators. The separated NAPLs are collected and stored for further treatment. If an afterburner is used, the NAPLs are usually not condensed and are incinerated as a vapor.

The RKD may be used with solid, liquid or mixed waste feed streams. The residual waste streams from a RKD include treated solids, particulates collected from the vapors and wastewater from the air scrubbers.

A RKD requires common energy sources such as propane or natural gas as fuels.

Fluidized Bed Desorber

A fluidized bed desorber (FBD) consists of a heating chamber which fluidizes the waste by directing an inert gas (usually nitrogen) through a bed of heated waste. The waste is typically heated using fuel to heat the desorption chamber and/or the gas used for fluidization. FBDs are designed and operated in a similar fashion to fluidized bed incinerators

(FBIs). Liquids, sludges or solids are introduced in the bottom of the bed which may consist of waste material mixed with sand or another suitable material. Wastes are fed to the FBD via pumps, screw augers or pneumatic injection and the ash is typically removed by gravity or screw augers.

An FBD can be adapted to provide LTTD of a wide range of materials. The residual streams from the FBD are typically bed material (treated solids) and flue gases from the desorber. The treated solids are typically collected and backfilled on site. Gases are cooled to condense the organic contaminants and water. Particulates in the flue gas are usually collected by cyclones and recycled to the FBD. Condensed liquids are separated by an oil-water separator in order to remove NAPLs for further treatment and water which may require treatment prior to release to surface water or sewers.

Screw Auger Desorber

The screw auger desorber (SAD) consists of a chamber containing one or more indirectly heated hollow screw augers. The waste is fed into the chamber and the screw augers provide mixing and heating. The chamber is usually jacketed to allow for the circulation of a heat transfer agent to provide further heating of the waste.

Solids from the SAD are discharged and collected. The vapors generated from SADs are cooled by a heat exchanger to condense the organic contaminants and water. The oil and water phases of the condensed liquids are separated in an oil-water separator. The NAPLs collected require further treatment as an afterburner is not available with the SAD.

Off-gases are typically treated by particulate collectors (e.g., baghouses), by scrubbers, or carbon absorption equipment prior to release to the atmosphere.

In many cases, the treated soil may be backfilled on site, thereby eliminating transportation, disposal and backfill costs, while the condensed organics are disposed of off site. This will not be possible without further treatment to remove the inorganic constituents at the Textile Road

Site. LTTD is most suitable for high solid content wastes that have low to medium levels of organic contamination. As with incineration, the residual material produced from LTTD will contain inorganics which may pose an unacceptable risk based upon the SRA. Therefore, the residuals may require additional treatment and/or containment to ensure protection of human health and the environment. The LTTD process is best suited to sandy soils. LTTD may be unsuitable for a variety of reasons as discussed for incineration in Section 5.6.2, however, LTTD will be retained for further evaluation.

5.6.4 Advanced Electric Reactor (AER)

The advanced electric reactor (AER) rapidly heats materials to temperatures in the range of 4000°F using intense thermal radiation in the near-infrared region. The contaminants which can be in gaseous, liquid or solid form, are isolated from the reactor core walls by means of a gaseous blanket formed by flowing nitrogen radially inward through the porous core walls. Carbon electrodes are heated, and in turn, heat the reactor core to incandescence. Energy transfer under these conditions is accomplished through thermal radiative coupling from the core to the feed materials. The feed streams to the reactor are solid, liquid or gaseous wastes and the blanket gas, nitrogen. Destruction is accomplished by pyrolysis rather than oxidation. It is important to note that the typical products produced by incineration such as carbon monoxide, carbon dioxide and oxides of nitrogen, are not formed in significant concentrations by the AER method.

The effectiveness of this technology to treat Site-related materials could be ascertained through the completion of a Site-specific treatability study. However, it should be noted that this is a relatively unproven technology and its ultimate success is questionable. As a result, the AER treatment process will not be considered further in this EE/CA.

5.6.5 Stabilization/Solidification

The chemical processes involved in the ex situ stabilization/solidification process are identical to those presented for in situ stabilization/solidification (Section 5.4.5). Ex situ stabilization/solidification involves the excavation of the waste material and subsequent batch mixing of the waste with the reagents in a pug mill prior to backfilling. A process flow diagram for ex situ stabilization/solidification is presented on Figure 5.16.

The stabilization/solidification reagents presented in Section 5.4.5 are also applicable to ex situ stabilization/solidification, however, their individual feasibility in treating the contaminated waste at the Site would be determined based on the results of a Site-specific treatability study.

Stabilization/solidification of the soil is a viable treatment technology which may be effectively used to reduce the mobility and environmental exposure of Site-related constituents. The stabilization/solidification technology may be implemented utilizing a variety of stabilization/solidification agents and materials. This technology will be retained for further evaluation.

5.6.6 Solvent Extraction

Solvent extraction involves the removal of PCBs from excavated soil and concentration of the PCB residual wastestream. The Basic Extraction Sludge Treatment (B.E.S.T.) process has been SITE demonstrated and shown to effectively remove PCBs from waste media. B.E.S.T. utilizes the properties of inverse miscibility in water of the solvent triethylamine (TEA) to segregate oil-contaminated soil/sludge into its oil, water, and solid fractions. Organic contaminants such as PCBs, are physically separated from the waste media and concentrated in the oil product stream. The process involves multiple extraction cycles followed by solvent recovery, oil polishing (i.e., residual solvent removal from oil), solid residual drying and water stripping. The actual number of extraction cycles required to achieve

clean-up levels is dependent on the level of contamination present and the volume of waste processed.

Triethylamine exhibits several characteristics that enhance its use as a solvent, which include:

- TEA possesses high vapor pressure which allows for easy solvent recovery from the extract (oil, water, and solvent) using steam stripping;
- the formation of low boiling azeotrope with water, which allows solvent recovery from water to very low residual levels; and
- TEA is alkaline (pH = 10), which may cause some heavy metals to form metal hydroxides which precipitate out of solution and exit process.

Typically, a total area of 1 acre is required to house the system and store treated and untreated material. The B.E.S.T. System itself occupies an area of approximately 0.23 acres and requires, according to the National Fire Prevention Association, a perimeter fence.

The required feed preparation includes the collection of samples for analytical analysis, transportation of waste feed (soil or sludge) to the pretreatment area, and screening of the waste material to less than or equal to 1/2 inch particle size. Once the feed material has been screened it is introduced into the system. A process flow diagram for the system is presented in Figure 5.17 and outlined below.

The sludge feed enters the premix tank where chilled solvent and a predetermined quantity of caustic is added. The mixture is agitated and allowed to settle. The agitation time and settling times are determined based upon the specific composition of the waste feed being processed. The liquid portion of the mixture (solvent, water and oil) is decanted via premix tank decant ports and transferred to the centrifuge where fine solids are separated from the liquid phase by centrifugation, fines are routed to the extractor/dryer for further processing, while the remaining liquid is transported to the centrate tank.

Solution from the centrate tank is routed to the oil decanter where it is separated into its aqueous and organic phases. The aqueous phase liquids are transferred to the water receiving tank. The organic phase liquids are routed to the solvent evaporator. The solvent evaporator initially heats the organic phase liquids to a temperature of 170°F causing the azeotrope of water and triethylamine to vaporize. The liquid is heated further to 193°F causing pure triethylamine to vaporize. Water is injected into the Solvent Evaporator as a final stage to form an azeotrope with the treithylamine solvent. The azeotrope serves to dislodge the triethylamine residual from the oil. The oil stream is discharged from the solvent evaporator and stored for alternate treatment.

The triethylamine/water vapor produced in the solvent evaporator is condensed utilizing heat exchangers. The resulting product is treithylamine/water liquid at 110°F. At this temperature, water is only partially miscible with the solvent and separation is achieved through a continuous flow decanter which separates solvent from water. The solvent is recycled to the solvent storage tank. The water is drained by gravity to the water receiving tank.

Once a significant volume of sludge has been processed in the premix tank the material product is transferred to the extractor/dryer where warm and hot extractions are performed.

In the extractor/dryer warm treithylamine is added to the waste and the components are mixed, heated, agitated, settled and decanted. The solids are heated by steam contained within the steam jacket of the extractor/dryer. The steam provides sufficient heat to achieve the heat of vaporization of the water and triethylamine azeotrope. The vapor is condensed and routed to the continuous flow solvent decanter where the miscible fluid is segregated into water and triethylamine which is routed to the water receiving tank and solvent storage tank, respectively.

The next step in the process is solids drying. Prior to drying a small amount of caustic is added for pH control. Steam is introduced into the extractor/dryer to heat the solids to approximately 170°F and promote

the removal of residual triethylamine. The solvent and steam form an azeotrope which is directed to the dryer condensor. Following removal of the residual solvent, the temperature in the extractor dryer is raised to the boiling point of water to complete the drying process. The processed dry solids are discharged from the extractor/dryer through the discharge port at the bottom of the extractor/dryer. Processed solids may be disposed of on Site or transported to an off-Site disposal facility.

The product water produced may be pretreated, if required, prior to discharge to a surface water body or a POTW.

The effectiveness of this technology has been SITE demonstrated, with favorable results and could be considered a viable treatment option for the contaminated soil at Textile Road Site. The ability of this technology to meet the required cleanup levels would be determined by a Site-specific treatability study. This technology is retained for further analyses.

5.6.7 Gas-Phase Chemical Reduction

Gas-phase chemical reduction (GPCR) is an emerging destruction technology. Figure 5.18 presents a schematic of the GPCR process. For solid waste streams (including most sludges) the process first involves thermal desorption of the solid waste stream (including soil, sludge or sediment) to remove organic contaminants. Desorption is followed by treatment of the desorbed contaminants in the gas-phase utilizing a hydrogen reactor.

Prior to entering the reactor, hydrogen is introduced to the desorbed waste stream. In the hydrogen reactor, the organic contaminants undergo a series of thermochemical reactions at temperatures of 850°C (1562°F) or higher which cause hydrogen to react with organic constituents such as PCBs, producing smaller lighter hydrocarbons.

Benzene and hydrogen chloride are typical products of a PCB undergoing gas-phase chemical reduction. A secondary reaction serves to reduce benzene and hydrogen to methane gas. Following the reduction of PCBs into methane and hydrogen chloride, the hydrogen chloride (acid gas) and water are removed using a scrubber. A portion of the methane gas product is used as an energy source in the boiler, while the excess methane gas undergoes a water shift reaction which serves to provide a hydrogen source for the reactor.

GPCR has been demonstrated at two sites at the Pilot scale with positive results. It should be noted, however, that full scale treatment of PCB containing sludges has not been completed, and although promising, this technology is still unproven.

GPCR has been demonstrated to achieve PCB DREs in excess of 99.9999 percent. The technology is well suited to the treatment of PCB contaminated soil and should be retained for further evaluation. It should be noted that the GPCR process is ineffective in the treatment of inorganics. The solid waste streams at some sites would, therefore, require tertiary treatment. In addition, the water content of the soil may make this technology unfeasible.

The decision to apply the gas phase chemical reduction treatment process to a particular PCB contaminated soil would be decided based upon the results of a Site-specific treatability study. Notwithstanding the concerns identified for this technology, GPCR has been retained for further evaluation.

5.7 DISPOSAL

Land disposal involves the placement of contaminated soil or treated soil into a secure disposal landfill. The disposal option could consist of either on- or off-Site disposal. Brief descriptions of on- and off-Site disposal, as they apply to the treated and/or untreated contaminated soil from the Site, are presented in the following sections.

5.7.1 On-Site Disposal

This technology would involve the disposal of contaminated soil on Site, in accordance with applicable state and/or federal regulations. The contaminated soil would be disposed of in an on-Site containment vault. The vault would be constructed of a Act 64 liner/cap (which is TSCA compliant) system with leachate collection/leak detection. This option would allow contaminated soil to be excavated and placed within a constructed landfill cell on Site.

This technology is considered to be effective and, therefore, is retained for further evaluation.

5.7.2 Off-Site Disposal

Excavated soils contaminated with PCBs with concentrations greater than 50 ppm would be transported to a Resource Conservation and Recovery Act (RCRA) or Toxic Substance Control Act (TSCA) permitted chemical waste landfill. Land disposal does not involve treatment of soil, but rather relies on the technologies incorporated in the construction of the landfill to contain the waste and prevent a future release to the environment.

Limitations of this technology include availability of approved space, transportation distance and cost. This technology has significant concerns associated with trucking of materials over long distances. However, it will be retained for further evaluation.

In addition, it should be noted, that off-Site disposal may be utilized as a sub-component for various waste streams and alternatives.

5.8 SUMMARY OF PRESCREENING OF REMOVAL TECHNOLOGIES AND PROCESS OPTIONS

The following process options and technologies were evaluated for potential implementation at the Site:

No Action

Limited Action

- Institutional controls and property access restrictions.

Physical Containment

- Capping:
  - normal Portland cement cover,
  - asphaltic concrete cover,
  - clay,
  - sprayed on covers, and
  - synthetic covers.

- Groundwater Cutoff Wall:
  - slurry walls,
  - grout curtains, and
  - sheet piles.

In Situ Treatment

- Biological;
- Soil Vapor Extraction;
- Soil Flushing/Solvent Washing;
- Vitrification; and
- Stabilization/Solidification.

Waste Removal

- Various options

Ex Situ Treatment

- Bioremediation;
- Incineration;
- Low Temperature Thermal Desorption;
- Advanced Electric Reactor;
- *Stabilization/Solidification;*
- Solvent Extraction; and
- Gas-Phase Chemical Reduction.

Disposal

- On-Site Disposal; and
- Off-Site Disposal.

The advanced electric reactor technology is relatively unproven and as such was eliminated from further evaluation.

Bioremediation was eliminated due to its inability to effectively degrade the PCB and inorganic constituents of the waste.

In situ biological treatment was eliminated from further consideration due to the nature of the contaminated soil (i.e., contains oils and grease which impair the effectiveness of biological treatment), the difficulty in maintaining an ideal controlled environment for microbial growth and activity, and the inability of this technology to degrade the PCB and inorganic Site-related constituents.

In situ soil vapor extraction was eliminated from further evaluation, as it is typically not effective in removing PCB and inorganic chemical constituents.

In situ vitrification is still relatively unproven and ineffective on high water content wastes and, therefore, was eliminated from further consideration.

In situ soil flushing is generally ineffective in reducing contaminants levels of low solubility contaminants including metals and PCBs and, therefore, was eliminated from further evaluation.

The remaining remedial technologies are retained for further evaluation:

No Action

Limited Action

- Institutional controls and property access restrictions

Physical Containment

- Capping
  - clay;
- Groundwater Cutoff Wall
  - slurry walls; and
  - sheet piles.

In Situ

- Stabilization/Solidification

Waste Removal

- Various options

Ex Situ

- Incineration;

- Low Temperature Thermal Desorption;
- Solvent Extraction;
- Gas-Phase Chemical Reduction; and
- Stabilization/Solidification.

Disposal

- On-Site Disposal; and
- Off-Site Disposal

6.0 EVALUATION OF REMOVAL ACTION TECHNOLOGIES

This section presents an evaluation of removal actions, technologies or process options applicable to the Textile Road Site soils, in terms of their effectiveness, implementability and cost.

Effectiveness

This criteria includes further evaluation of the effectiveness of specific technologies or process options, retained from Section 5.0, relative to other processes grouped within the same technology type. The evaluation focuses on:

1. the potential of each process option to successfully treat the estimated area or volume of media and meeting the remediation goals identified in the removal action objectives;

2. the potential impacts to human health and the environment during the construction and implementation phase; and

3. the proven effectiveness and reliability of process with respect to the types of contaminants and conditions present at the Site.

Implementability

The implementability criteria as applied in the screening phase of Section 5.0 was used as an initial screening mechanism to eliminate technologies or process options which were clearly ineffective or unworkable at the Site. In the evaluation stage implementability concerns administrative aspects of implementability including:

1. the ability to obtain permits for off-Site actions;
2. the availability of treatment, storage and disposal services; and
3. the availability of necessary equipment and skilled workers to implement the technology.

Cost

The cost criteria considers the relative capital and operation and maintenance costs associated with the implementation of a technology. At the evaluation stage costing is conducted on a comparative level (i.e., low, medium, high) and is generally conducted on the basis of engineering judgment.

The following sections provide an evaluation of the technology process options in terms of the criteria defined above. The evaluation is conducted in a comparative fashion ranking individual process options within a technology type. Table 6.1 presents an evaluation of the remedial technologies which remain following screening in Section 5.0.

The technology types considered include the following:

- No Action;
- Limited Action;
- Physical Containment;
- Removal and Soil Treatment; and
- Disposal.

6.1 NO ACTION

The No Action Response consists of soil and groundwater sampling with no other remedial action taken. A contingency plan may be developed.

Effectiveness

No measures are taken in the No Action alternative to reduce toxicity, mobility, or volume of Site-related constituents. The No Action alternative does not minimize the potential for direct contact with the contaminated soil or consumption of the groundwater of the upper water table zone.

In general the No Action alternative is not effective in accomplishing the Site-specific removal action objectives.

Implementability

Not Applicable.

Cost

The costs of the semi-annual monitoring of the sediments, surface water and groundwater, are the only costs associated with the No Action alternative. These costs are considered to be very low in comparison to other options and are expected to be in the range of $30,000 to $35,000 per year.

6.2 LIMITED ACTION

Limited Action consists of institutional controls, in the form of deed restrictions (or similar measures), modifications to zoning and building codes, and access restrictions (i.e., upgrading of Site security fencing).

Effectiveness

This action will minimize the potential for direct contact with contaminated soil and consumption of the groundwater of the upper water table zone at the Site, through the implementation of deed restrictions, (or similar measures) modifications to zoning and building codes, and access restrictions.

Implementability

The addition of deed restrictions (or similar measures), modifications to zoning and building codes, upgrading of the existing security fence would be easily implemented.

Costs

The cost of implementing the limited action alternative would be low and is expected to include deed restrictions, modifications to zoning and the building code (as appropriate), ongoing maintenance of Site security fencing and implementation of a semi-annual monitoring program as described in Section 6.1.

The estimated capital cost associated with the addition of deed restrictions (or similar measures) is $120,000, while security fence maintenance and semi-annual monitoring costs are expected to be in the range of $35,000 to $40,000 per year.

6.3 PHYSICAL CONTAINMENT

Physical containment of the waste material at the Textile Road Site could be accomplished through the implementation of a low permeability cap and/or a groundwater cutoff wall. Prescreening of potentially applicable groundwater (GW) cutoff walls and capping materials in Section 5.0 identified the following technically feasible options.

Capping

- Michigan Act 64/TSCA Compliant Clay Cap.

GW Cutoff Wall

- Soil Bentonite Slurry Wall; and
- Waterloo Barrier Wall.

6.3.1 Capping

Effectiveness

Construction of a Michigan Act 64/TSCA compliant clay cap over the contaminated soil at the Site would reduce the risk to human health and the environment as it would remove the threat of direct contact with the contaminated soil. Capping is a proven technology which would reduce infiltration through the capped materials, thus reducing the potential for off-Site migration of Site-related contaminants in the upper water table.

Implementability

Construction of a clay cap would be performed using locally available materials. Clearing, grading, and revegitating the capped area would be necessary.

A long-term groundwater monitoring plan would be required under this option.

Cost

The construction cost of a Michigan Act 64/TSCA compliant clay cap for the Site will vary according to final cap design requirements. The estimated capital cost for construction of the cap including a foundation layer is considered to be low in comparison to other technologies and is estimated to be in the range of $1,000,000 to $1,500,000.

The annual costs including groundwater monitoring and cap maintenance are estimated to be $40,000 to $50,000 per year.

6.3.2 Groundwater Cutoff Wall

Effectiveness

Installation of a groundwater cutoff wall and the associated extraction well/groundwater treatment system would effectively reduce the potential for Site-related contaminants to be mobilized in groundwater through isolation of the Site from the groundwater system. The SB and Waterloo Walls are both considered effective.

Implementability

Groundwater cutoff walls are an established technology for which vendors and materials are readily available. No problems with the implementation of this option are anticipated, however, long-term monitoring of Site soils, and groundwater would be required as part of this option.

Cost

This groundwater cutoff alternative would cost approximately $600,000 to implement, with annual costs (including semi-annual monitoring and groundwater treatment) of approximately $60,000.

The costs associated with groundwater cutoff walls are relatively low and fall between the costs of the limited action alternative and capping. The Waterloo Barrier Wall is somewhat more expensive than the SB cutoff wall. As a result, the Waterloo Barrier was will not be considered for further evaluation.

6.4 SOIL TREATMENT

All of the treatment options, with the exception of in situ stabilization/solidification, would require excavation of the soils to be treated.

Section 5.0 provided a screening analysis of removal treatment technologies potentially applicable to the Textile Road Site. The treatment technologies which remain following prescreening include:

- In Situ Stabilization/Solidification;
- Ex Situ Stabilization/Solidification;
- On-Site Incineration;
- Off-Site Incineration;
- Low Temperature Thermal Desorption;
- Solvent Extraction; and
- Gas-Phase Chemical Reduction.

6.4.1 In Situ Stabilization/Solidification

Effectiveness

In situ stabilization/solidification is effective in immobilizing the waste. It also reduces the potentially exposed surface area of the waste, by creating a more durable low permeability matrix, thus minimizing the potential for contaminant transfer through interaction with groundwater in direct contact.

Stabilization/solidification may produce an alkaline environment causing the precipitation of metals. These precipitates are not leachable. Other contaminants, such as organic compounds, would be mechanically locked into the durable, low hydraulic conductivity (usually 10^{-6} to 10^{-8} cm/sec) matrix. Thus, the potential toxicological impacts to human health and the environment are greatly reduced, if not eliminated, as the waste is contained within a monolithic structure.

In situ mixing of contaminated media and solidification/stabilization reagents may be performed by mass mixing (i.e., utilizing a backhoe) or by column mixing. Column mixing is performed by an auger within an open bottom cylinder.

In situ mass-mixing of the waste and reagents may present difficulties in quality control monitoring. Mass-mixing techniques attempt to create a homogeneous product but homogeneity of the treated media is reliant primarily upon the care and skill of the equipment operators.

In situ stabilization/solidification by mass mixing may present potential harmful effects to the on-Site works while the treatment process is in effect. Processing of the waste may cause contaminated dust to become airborne. Dust control monitoring and personal protective equipment (PPE) will be necessary to properly maintain the Site conditions within health guidelines.

In situ column mixing is a carefully controlled process which ensures homogeneity of the treated waste. In situ column mixing also minimizes the concern for dust and organic vapor generation as compared to ex situ techniques.

Stabilization/solidification has been widely used for hazardous waste Site remediation. Column mixing has been used at several sites and was evaluated by the U.S. EPA in a SITE Technology Demonstration and deemed effective.

Implementability

There are no permits required for the implementation of this alternative.

This technology is offered by numerous vendors with extensive experience in earth moving operations and stabilization/solidification treatment processes. With the exception of column mixing, the necessary equipment can be rented by the vendor if they do not own it. In the case of column mixing, several vendors have the equipment and resources required to complete stabilization/solidification of the waste media.

Any storage areas required for temporary stockpiling of material may be accommodated at the Site.

Cost

The cost of treatment of the waste matrix using the in situ solidification/stabilization technology may range from $75 to $200 per ton depending upon the method of mixing and the type of reagent used. The cost to treat 28,000 tons of waste using stabilization/solidification would be approximately $2 to $5 million. This cost is ranked as a medium level cost in relation to other treatment technologies evaluated herein.

Annual costs, including semi-annual monitoring are expected to range from $35,000 to $40,000 per year.

6.4.2 Ex Situ Stabilization/Solidification

Effectiveness

Ex situ stabilization/solidification is effective in immobilizing the waste. It also reduces the potentially exposed surface area of the waste by creating a more durable low permeability matrix, thus minimizing the potential for contaminant transfer through interaction with groundwater in direct contact.

Stabilization/solidification may produce an alkaline environment causing the precipitation of metals. These precipitates have very low leachability. Other contaminants, such as organic compounds, would be mechanically locked into the durable, low hydraulic conductivity (usually 10^{-6} to 10^{-8} cm/sec) matrix. Thus, the potential toxicological impacts to human health and the environment are greatly reduced, if not eliminated, as the waste is contained within a monolithic structure.

Implementation of the ex situ stabilization/solidification technology may release volatile compounds and dust which are potentially

harmful to on-Site workers. Excavation, processing, and backfilling of the waste may cause contaminated dust and volatile organic compounds to become airborne. Dust control measures, air monitoring and personal protective equipment (PPE) may be necessary to properly maintain the Site conditions within health guidelines.

The ex situ solidification/stabilization process has been extensively used and has proven effective for materials with similar characteristics to the soil present at the Textile Road Site.

Implementability

There are no permits required for the implementation of this alternative.

This technology is offered by numerous vendors with extensive experience in earth moving operations and stabilization/solidification treatment processes.

Any storage areas required for temporary stockpiling of materials may be constructed on Site.

This technology would involve the use of general excavation/construction equipment which is easily mobilized to the Site.

Cost

Ex situ stabilization/solidification costs typically range from $75 to $200 per ton. The cost to treat 28,000 tons using stabilization/solidification would be approximately $2 to $5 million. This cost is ranked as a medium level cost in relation to other treatment technologies evaluated herein. It should be noted that ex situ stabilization/solidification would be expected to be marginally more expensive than in situ treatment due to the excavation step required to implement the technology.

Annual costs, including semi-annual monitoring are expected to range from $35,000 to $40,000 per year.

6.4.3 On-Site Incineration

Effectiveness

Incineration is a proven technology with a demonstrated removal efficiency greater than 99.99 percent. Trial burns are required to optimize the temperature and residence time for maximum efficiency. Hazardous products of incineration such as particulates, sulfur dioxide, nitrogen oxides and hydrogen chloride in the off-gas would require air emission control equipment and disposal as a hazardous waste. On-Site incineration may also result in unacceptable inorganics emission due to the levels of inorganics in the waste feed.

The treated waste may require subsequent treatment with solidification/stabilization. In addition, the effectiveness of incineration may be significantly reduced due to the high water content of the soil.

Implementability

On-Site incineration requires a trial burn and permitting. The necessity to comply with permitting requirements could present a significant obstacle to the implementation of on-Site incineration. Other concerns include:

- visibility concerns associated with the release of large volumes of steam;
- the lack of public acceptance;
- a recent re-evaluation by U.S. EPA which has resulted in a preference for the selection of alternatives not involving incineration; and
- problems associated with ash disposal.

Cost

On-Site incineration costs are in the range of $500 to $1,000/ton. The cost to treat 28,000 tons using on-Site incineration would be approximately $14 to $28 million. These costs are considered to be high in comparison to other technologies evaluated herein.

6.4.4 Off-Site Incineration

Effectiveness

Off-Site incineration would have the same effectiveness as the on-Site incineration option discussed in Section 6.4.3.

Implementability

Approvals would be required from the selected incineration facility to permit off-Site incineration. Obtaining these approvals could result in substantial delays in implementation. The availability of TSCA-permitted incinerators is uncertain due to the high demand for incineration of PCB-contaminated materials. The closest TSCA-permitted incinerators are located in Utah and Kentucky.

Permits for the transportation of contaminated soil to the selected incinerators would have to be obtained.

In addition, there are significant concerns associated with the requirement to transport wastes over long distances. Off-Site disposal of the waste materials will require the transport of in excess of 1,000 truck loads of waste over a minimum distance in excess of 1,200 miles. Additional risks may be associated with the disposal of incinerator residuals to other facilities.

Costs

Off-Site incineration typically costs $1,000 to $2,000/ton plus an additional $200/ton for transportation. Therefore, the off-Site incineration of 28,000 tons of waste would cost approximately $28 to $56 million. This cost does not include excavation or any necessary ash treatment. This cost is considered to be very high in comparison to other treatment alternatives evaluated herein. Off-Site incineration, has additional risk associated with the transportation of soils and uncertainty concerning the availability on TSCA-approved incinerators, while being no more effective than an on-Site incinerator. As a result off-Site incineration will not be considered for further evaluation.

6.4.5 Low Temperature Thermal Desorption

Effectiveness

The low temperature thermal desorption (LTTD) process is generally applicable to solids, sludges and liquids which contain a minimum of 30 percent solids (i.e., less than 70 percent moisture) and less than 10 percent organic contaminants.

Low temperature thermal desorption is an effective means of removing organic compounds from contaminated soils. Contaminant levels in the residual solid down to analytical detection limits have been reported. LTTD has been shown to be effective at treating materials contaminated with coal tars, petroleum hydrocarbons, semi-volatile and volatile organic compounds (SVOCs, VOCs), and higher boiling compounds such as PCBs.

Mobility of inorganic Site constituents would still be a concern, as inorganics are not treated by this technology. The treated waste may require subsequent treatment with solidification/stabilization. In addition, the effectiveness of LTTD may be reduced due to the water content of the soil.

As this treatment process is conducted in an enclosed unit, and exhaust gases are treated prior to discharge, chemical emissions to the atmosphere during treatment are not expected to be a concern.

LTTD is a proven technology being selected in increasing numbers at Superfund sites.

Implementability

Permitting for thermal desorbers may require significant time and money. If an afterburner is used, incinerator permitting may be necessary. Public acceptance of thermal desorbers may, however, be greater than if incineration is chosen as the remedial action technology. The use of thermal desorbers on sites may simplify/clarify the permitting process.

Mobile low temperature thermal treatment units are available from several suppliers and, therefore, the technology can be readily implemented.

Any necessary temporary storage facilities can be arranged on Site, though only minimal space is expected to be required for the stockpiling of excavated and treated material.

The desorption units are mobile and are mounted on two to four highway trailers. Desorbers generally require three to six weeks to become operational. Sufficient space is available on Site to accommodate this technology.

Cost

The cost for treatment of soil using a low temperature thermal desorption unit, equipped with an afterburner, ranges from $400 to $800/ton. The cost to treat 28,000 tons of waste would range from approximately $11 to $22 million. This cost is considered to be in the middle range in comparison to other technologies evaluated herein.

The annual costs associated with this option, including semi-annual monitoring, are estimated to be $35,000 to $40,000 per year.

The economics of the remediation of wastes with LTTD technology are highly Site-specific and depend on the type and volume of waste, as wells as, the location and applicable regulations. Economics depend heavily on the moisture content of the waste fed to the LTTD unit. The presence of high levels of organic contaminants or tar in the waste stream will increase LTTD costs. If the contaminants have high boiling points the processing temperatures must be increased resulting in larger heating and cooling requirements. The waste matrix will also affect costs depending on its constituents. Generally sands and loose soils are readily treated by LTTD.

6.4.6 Solvent Extraction

This technology involves the treatment of excavated waste using solvent extraction. Solvent extraction utilizes a solvent to segregate the feed waste into oil, water, and solid fractions. The organic contaminants are concentrated in the oil stream and treated by an alternate destruction technology such as incineration.

Effectiveness

Implementation of solvent extraction would act to reduce the volume of material to be backfilled on Site (i.e., solids) through removal of the oil and waste components of the waste feed.

Protection of human health and the environment from PCBs would be achieved through removal from the treated soils. It should be noted that inorganics would still exist in the treated soil fraction.

Solvent extraction has been SITE demonstrated and found to be effective in removing PCBs from fine sediments (Applications Analysis Report; April 1993).

Implementability

The ability to obtain permits for the on-Site portion of the work is not expected to be of concern. Approval will be required for the off-Site transport and incineration of the product oil produced in the process.

Mobility of inorganic Site constituents would still be a concern, as inorganics are not treated by this technology. The treated waste may require subsequent treatment with solidification/stabilization.

Mobile solvent extraction units are available and can be easily mobilized to the Site. The process requires an area of approximately 1.0 acre to house the unit and provide treatment staging areas. The product oil stream would be stored in 55-gallon drums and could be easily transported off Site for treatment and disposal. The unit and treatment staging areas could be easily housed at the Textile Road Site as the required space is available. Therefore, this technology could be implemented with relative ease for the treatment of the contaminated soil at the Textile Road Site.

Cost

The cost to process the waste material at the Site would range from $200 to $600 per ton. It should be note that the cost range presented above is associated strictly with the processing of waste material through the solvent extraction unit. Any additional costs such as Site preparation, obtaining permits, waste disposal, and post treatment, etc., are not included and as such would have to be determined specifically for the Site.

Based on the unit price range processing 28,000 tons of contaminated soil through the solvent extraction unit would cost on the order of $6 to $17 million. This cost is considered to be in the middle range as compared to other technologies evaluated herein.

Annual costs, including semi-annual monitoring, are estimated to be in the range of $35,000 to $40,000 for the Site.

6.4.7 Gas-Phase Chemical Reduction

Effectiveness

Currently, only one vendor offers the patented gas -phase chemical reduction process. A full-scale unit capable of processing 100 tons/day of sediment or soil is available.

The hazards to human health and the environment are identical to those identified for ex situ stabilization/solidification and deal with the dust and volatilization of VOCs during excavation and handling. Additional risks are not expected.

This technology has been pilot scale demonstrated on soils and sediments with mixed results. One such pilot scale test obtained destruction removal efficiencies (DREs) of 99.9999 percent for PCBs in harbor sediments, however, another pilot study achieved much lower DREs from PCBs in sediments and soil. Site-specific effectiveness would need to be demonstrated in a pilot scale treatability study prior to full-scale use.

As this technology has only been used at laboratory and pilot scale demonstrations, it is considered an unproven technology.

Implementability

Permitting requirements for the gas-phase chemical reduction process will be similar to those for incineration. The off-gases from this process would be required to meet existing emission standards.

This technology is only offered by one vendor as it is a patented process. The schedule of the removal action will have to take into account the limited availability of the technology.

Any necessary storage facilities can be arranged on Site, though only minimal storage space is expected to be required. Sufficient space is available on Site for the mobilization of this technology. The availability of this unit will be dependent upon contractual obligations of the vendor.

Cost

The cost of processing a high-moisture content matrix is projected to be at least $400 per ton for the first 100 ton/day commercial unit. An additional $300,000 is projected to be required for mobilization/demobilization and permitting. Because this technology has not previously been utilized at the full scale, estimated costs are uncertain and could escalate dramatically. Based on these costs, treatment of 28,000 tons of materials is expected to cost on the order of $11,200,000. This cost is considered to be in the middle range in comparison to other technologies evaluated herein.

As the effectiveness of this technology is unknown, additional treatment such as capping and/or solidification/stabilization may be necessary. In the event that the treated soils require additional treatment and/or containment, annual costs, including semi-annual monitoring, are estimated to be in the range of $35,000 to $40,000 for the Textile Road Site.

6.5 DISPOSAL

6.5.1 On-Site Disposal

The on-Site disposal option would consist of on-Site landfilling of soil.

Effectiveness

On-Site disposal of the waste materials provides an effective option for the Site waste materials. PCBs and inorganics exhibit low

aqueous solubilities and, therefore, are amenable to containment within a prepared landfill cell. On-Site disposal could be utilized effectively alone or in combination with removal components including treatment.

Implementability

Standard earth moving equipment would be required to excavate, move and place the material and as such this option is easily implemented.

Cost

The cost associated with on-Site disposal would be on the order of $200 per cubic yard. The cost to excavate and place 18,600 cubic yards of material would be approximately $3.7 million. This cost is considered to be low in comparison to other technologies evaluated herein.

Annual costs, including semi-annual monitoring, are estimated to be in the range of $35,000 to $40,000 for the Textile Road Site.

6.5.2 Off-Site Disposal

The off-Site disposal option consists of excavating the contaminated soil and disposing of it in an off-Site landfill.

Effectiveness

Off-Site disposal of the contaminated soil provides an effective option for the Site. State-of-the-Art TSCA and RCRA landfills are conservatively designed and can reliably contain soils contaminated with PCBs and inorganics.

Implementability

Standard earth moving equipment would be required to excavate the soil. Licensed waste haulers would transport the soil to the off-Site landfills. Earth moving equipment and waste haulers are generally available and competent, therefore this option is easily implemented.

Cost

The cost associated with off-Site disposal would be on the order of $200 per cubic yard for soil transported to a RCRA landfill and $400 per cubic yard for soil transported to a TSCA landfill. The cost to excavate and dispose 18,600 cubic yards of soil would be approximately $3.7 to $5.4 million. This cost is considered to be low in comparison to other technologies evaluated herein.

7.0 DEVELOPMENT OF REMOVAL ACTION ALTERNATIVES

The list of removal response actions, technologies, and process options evaluated in Section 6.0 (see Table 7.1) provides the basis for the development of potential removal action alternatives for further review and analysis. The purpose of this section is to present a series of technically feasible removal action alternatives for further evaluation. These alternatives are identified as follows:

Alternative 1	No Action
Alternative 2	Limited Action
Alternative 3	Physical Site Containment
Alternative 3A	Capping
Alternative 3B	Capping and Groundwater Cutoff Wall
Alternative 4	Source Removal/Treatment
Alternative 4A	Solidification/Stabilization and Capping
Alternative 4B	Solidification/Stabilization, Capping and Groundwater Cutoff Wall
Alternative 4C	Solvent Extraction, Solidification/Stabilization and Capping
Alternative 4D	Gas-Phase Chemical Reduction, Solidification/Stabilization and Capping
Alternative 4E	Low Temperature Thermal Desorption, Solidification/Stabilization and Capping
Alternative 4F	On-Site Incineration, Solidification/Stabilization and Capping
Alternative 5	Disposal
Alternative 5A	On-Site Disposal
Alternative 5B	Off-Site Disposal

Each of these alternatives are discussed in the following sub-sections.

7.1 ALTERNATIVE 1 - NO ACTION

Alternative 1, the No Action alternative, assumes that no removal action or maintenance will be conducted at the Site.

A monitoring program for the Site would be established. A network of existing monitoring wells would be selected to track groundwater quality and provide warnings if contaminants are detected above regulatory levels. Based on the results of monitoring, additional Site remedies could be implemented in the future.

The following groundwater monitoring well locations are proposed for the semi-annual monitoring program:

Groundwater

1. MW1U-93
2. MW2U-93
3. MW4U-93
4. MW5U-93
5. MW6U-93
6. MW1D-93
7. MW2D-93

The sampling locations are presented on Figure 7.1. It is anticipated that all samples would be analyzed for PCBs and inorganics.

The monitoring program frequency could be increased or decreased in the future, as necessary, to support the ongoing evaluation of Site conditions. The final long-term monitoring program will be developed and incorporated in the removal design. The program will involve the installation of additional monitoring wells, as required, or re-positioning of proposed monitoring wells to optimize their locations.

A contingency plan may be developed and implemented dependent upon the results of the monitoring program to address adverse impacts to groundwater within the shallow water table zone.

The components of the No Action alternative are also discussed in Sections 5.1 and 6.1.

7.2 ALTERNATIVE 2 - LIMITED ACTION

Alternative 2 includes institutional controls and access restrictions. In addition, zoning and future land use plans and building codes could be changed to limit the Site use to its current dedicated industrial use. This alternative would limit direct contact with the contaminated soil through the continued use of Site perimeter security fencing and the implementation of further deed and access restrictions. Further discussion regarding the limited action alternative is provided in Sections 5.2 and 6.2.

Regular inspections of the Site would be made to assess the integrity of Site access restrictions and initiate maintenance activities as required.

This alternative also includes all elements identified under Alternative 1.

7.3 ALTERNATIVE 3 - PHYSICAL SITE CONTAINMENT

Physical containment, including a cap, and a groundwater cutoff wall, would eliminate the risk associated with direct contact and greatly reduce the potential movement of contaminants through the groundwater of the upper water table zone. The following two containment alternatives have been assembled to address potential Site containment actions:

3A Capping; and
3B Capping and Groundwater Cutoff Wall.

Each containment option would incorporate all activities associated with Alternative 2.

7.3.1 Alternative 3A - Capping

Alternative 3A consists of constructing a Michigan Act 64/TSCA compliant cap over the contaminated soil north of Pond 1. Removal objectives addressed under this alternative include minimizing direct contact with contaminated media and controlling the potential for leaching of hazardous constituents from the waste.

Capping would consist of an Act 64 cap. The Act 64 cap is made up of a 6-inch topsoil layer, 18-inch fill layer, 12-inch sand drainage layer, 3-foot clay layer (minimum hydraulic conductivity 10^{-7} cm/s) and a foundation (grading) layer. The surface of the cover would be seeded with a prairie grass mixture specifically designed for the local climate. A typical Act 64 cap detail is presented on Figure 5.1. The approximate quantities of topsoil, fill, sand, clay and grading fill required to complete each layer are estimated at 2,416, 9,677, 4,833, 14,500, and 34,500 cy, respectively. The cap will cover the contaminated soil north of Pond 1 and overlap adjacent areas approximately 10 feet areally in all directions. This overlap will ensure complete coverage. The cap will cover an overall area of approximately 3.0 acres.

The foundation layer would provide sufficient subgrade for which to develop adequate top of cap grades (to promote drainage). The material required for the foundation grading layer is approximately 34,500 cy.

Contaminated soils located outside the area north of Pond 1 will be excavated and consolidated in the capped area north of Pond 1 (accounting for a component of the grading layer requirements).

Stormwater run-off from the cap will be controlled through the use of drainage ditches along both the east and west sides of the cap. The ditches will outlet into the on-Site ponds.

This alternative would also include the components of Alternative 2.

7.3.2 Alternative 3B - Capping and Groundwater Cutoff Wall

Alternative 3B consists of constructing a groundwater cutoff wall completely around the capped area north of Pond 1 in addition to the components of Alternative 3A. The groundwater gradient inside the cutoff wall would be controlled by groundwater extraction wells. A typical groundwater extraction well is illustrated on Figure 7.2. Collected groundwater would be treated, if required, prior to discharge to the on-Site Ponds or a POTW.

The cutoff wall would be approximately 1,550 feet long and would be keyed at least 3 feet into the underlying clay layer. The clay confining layer is encountered at an average depth of 12 to 15 feet BGS. A geotechnical investigation would be conducted, if necessary, before construction to confirm the depth to the underlying clay along the entire alignment and to provide further grain size data to be used for backfill mix design.

The performance requirements for the cutoff wall include meeting a maximum hydraulic conductivity of 10^{-7} cm/sec while maintaining compatibility with the Site materials. Based upon the information presented in the EOC Study Report, and the results of the prescreening of the physical containment technology process options (Section 5.3), it is expected that the cutoff wall would be constructed utilizing slurry trench construction techniques with soil/bentonite (SB) backfill.

Groundwater extraction wells may be required inside the cutoff wall to produce and maintain an inward hydraulic gradient. This inward hydraulic gradient promotes the flow of groundwater toward the interior of the wall to prevent migration of groundwater. The life expectancy of the cutoff wall is increased by reducing the amount of leachate in the enclosed area, preventing overtopping of the slurry wall, and reducing the

likelihood of slurry degradation due to contact with organics. Each of these concerns are relatively minor at this Site.

This alternative would also include the components of Alternative 2.

7.4 ALTERNATIVE 4 - SOURCE REMOVAL/TREATMENT

Alternative 4 consists of removing and/or treating the contaminated soil contained on Site. It should be noted that certain treatment options may be completed either in or ex situ. This alternative addresses the removal objective of reducing the toxicity, volume or mobility of hazardous constituents in the soil through treatment and/or containment. Treatment technologies such as LTTD and incineration are ineffective in treating the inorganics present in the soil. Utilization of either LTTD or incineration as well as other technologies may require additional treatment steps (such as solidification/stabilization) and containment of treated waste materials to ensure protection.

The Site contains an estimated 18,600 cubic yards (cy) (28,000 tons based on 1.5 tons/cy) of contaminated soil (materials in excess of 10 ppm PCBs). Excavation would be performed using conventional earth moving equipment (i.e., backhoe, loaders, etc.). Excavated areas outside of the area north of Pond 1 would be graded and covered with a soil/clay cover (as required). It is assumed that the processing of the waste would be done at a central location on Site. Processing is assumed to include screening, sorting and crushing, as necessary. Some additional conditioning or dewatering may also be required. Continuous air monitoring during excavation and processing will be required (dependent upon the waste treatment step selected).

The following seven treatment/disposal alternatives have been developed for further evaluation:

4A Stabilization/Solidification and Capping;

4B Stabilization/Solidification, Capping and Groundwater Cutoff;

4C Solvent Extraction, Stabilization/Solidification and Capping;

4D Gas-Phase Chemical Reduction, Stabilization/Solidification and Capping;

4E Low Temperature Thermal Desorption, Stabilization/Solidification and Capping; and

4F On-Site Incineration, Stabilization/Solidification and Capping

7.4.1 Alternative 4A - Stabilization/Solidification and Capping

Alternative 4A would consist of the components of Alternative 3A with the treatment of all excavated waste materials by a stabilization/solidification process (either in situ or ex situ). It should be noted that the volume increase (10 to 15 percent) due to solidification has been accounted for through the reduction of the material required for the foundation layer. The revised grading fill quantity required for the foundation layer is estimated at 30,000 cy. This alternative could be effectively implemented (based upon past successes) to treat both the organics and inorganics identified at the Site.

7.4.2 Alternative 4B - Stabilization/Solidification, Capping and Groundwater Cutoff Wall

Alternative 4B consists of the components of Alternative 3B with the treatment of all excavated materials by solidification/fixation (either in or ex situ). It should be noted that the volume increase (10 to 15 percent) due to solidification has been accounted for through the reduction of the material required for the foundation layer. The revised grading fill quantity required for the foundation layer is estimated at 30,000 cy. This alternative would include a groundwater cutoff wall to provide additional assurance of long-term protection by further isolating the waste materials. This alternative would result in complete containment of all treated waste materials on Site.

7.4.3 Alternative 4C - Solvent Extraction, Stabilization/ Solidification and Capping

Alternative 4C consists of the components of Alternative 4A in addition to treatment by solvent extraction.

Solvent extraction is an emerging and demonstrated technology which has been shown to be effective in removing PCBs, to below cleanup levels at a number of sites in the United States. A complete technology description of solvent extraction is provided in Sections 5.6.6 and 6.4.6.

The solvent extraction process works to segregate the waste into 3 streams; solids, water and oil. Organic contaminants, such as PCBs, are concentrated in the oil stream.

The oil produced in the process would be stored in 55 gallon drums and shipped off Site for destruction (most likely by incineration). The water product produced would be treated, if required, and discharged to either the on-Site Ponds or a POTW. The required permits would have to be obtained to discharge to either a surface water body or a municipal sanitary sewer.

The treated material produced in the process would be disposed of on Site. As solvent extraction does not specifically address inorganics, the solids would require solidification/stabilization prior to backfill and capping on Site.

7.4.4 Alternative 4D - Gas-Phase Chemical Reduction, Stabilization/Solidification and Capping

Alternative 4D consists of the components of Alternative 4A in addition to the treatment of the waste media by gas-phase chemical reduction (GPCR). A complete description of the technology is provided in Section 5.6.7 and 6.4.7.

The products of the system consist of water, treated off-gas, and treated waste materials. The water product produced would be treated, if required, and discharged to either the on-Site Ponds or the municipal sanitary sewer system. In order to discharge to either of the surface water bodies or the sanitary sewer, the necessary or required permits would have to be obtained.

The treated product produced in the process would be disposed of on Site. As GPCR does not specifically address inorganics, the solids would require solidification/stabilization prior to being backfilled on Site and capped.

7.4.5 Alternative 4E - Low Temperature Thermal Desorption (LTTD), Stabilization/Solidification and Capping

Alternative 4E consists of the components of Alternative 4A in addition to treatment by low temperature thermal desorption (LTTD). The treated material would be solidified/stabilized and backfilling prior to placement of a cap.

LTTD is an ex situ technology which reduces the volume of wastes by separation and collection of the more volatile organic contaminants. A complete technology process description is presented in Sections 5.6.3 and 6.4.5.

The remaining solids would retain inorganics and, therefore, may require solidification/stabilization prior to being backfilled on Site and capped.

7.4.6 Alternative 4F - On-Site Incineration, Stabilization/ Solidification and Capping

Alternative 4F consists of the components of Alternative 4A with the addition of on-Site incineration.

After processing (i.e., dewatering), the waste would be incinerated on Site. Because mobile incineration units generally have a throughput in the range of 4 tons per hour, it was assumed that one such incinerator would be used. The remaining solids would contain concentrations of inorganics and therefore may require stabilization/solidification prior to being backfilled on Site and capped.

On-Site incineration is further discussed in Sections 5.6.2 and 6.4.3.

7.5 ALTERNATIVE 5 - DISPOSAL

7.5.1 Alternative 5A - On-Site Disposal

Alternative 5A consists of construction of a soil containment vault to completely contain all soils exceeding the soil cleanup standards.

The soil vault would be constructed at the north east corner of the property. The vault would have rough dimensions of approximately 200 by 200 feet. The base line would be comprised of low permeability clays to meet the requirements of Act 64 and TSCA. The liner would be constructed entirely above the water table and be provided with a leachate detection and leak detection system.

The vault, from its base, would have a maximum thickness of approximately 20 feet. The top of the vault would be covered with an Act 64/TSCA compliant cap. This alternative would also include the components of Alternative 2.

7.5.2 Alternative 5B - Off-Site Disposal

Alternative 5B would utilize off-Site disposal at one or more of the RCRA and TSCA approved landfills (see Section 5.6.2 and 6.4.4).

The contaminated soils would be excavated and then transported to a RCRA or TSCA approved disposal facility. A complete description of this technology is provided in Section 6.4.4.

Disposal options for the excavated soil depend upon the concentration of PCB contained within the soil, as follows:

25 - 50 mg/kg - Disposal in RCRA landfill
50 - 500 mg/kg - Disposal in TSCA landfill
>500 mg/kg - Incineration in TSCA incinerator or TSCA landfill

8.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

8.1 INTRODUCTION

The detailed analysis of removal action alternatives consists of the refinement of removal action alternatives and evaluation of each alternative against seven evaluation criteria which include technical, cost and institutional considerations; and compliance with statutory requirements. Removal action alternatives are not required to be evaluated against these seven criteria. However, in order to assure a long-term solution, these seven criteria, which are used to evaluate remedial alternatives, have been utilized. The detailed analysis presented in this section follows the outline presented in the U.S. EPA "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA", (May 1989).

The seven evaluation criteria used in the detailed analysis of remedial alternatives are summarized as follows:

1. overall protection of human health and the environment;
2. consideration of applicable or appropriate and relevant requirements (ARARs);
3. short-term impacts and effectiveness;
4. long-term effectiveness and permanence;
5. reduction of toxicity, mobility and volume;
6. implementability; and
7. cost.

A list of evaluation factors to be considered under each evaluation criteria is presented in Table 8.1.

Twelve alternatives were developed in Section 7.0 for detailed analysis. Each alternative was developed incorporating appropriate removal action technologies for the contaminated soil encountered at the Textile Road Site. The 12 alternatives developed for detailed analysis are summarized as follows:

Alternative 1:	No Action;
Alternative 2:	Institutional Controls;
Alternative 3A:	Capping;
Alternative 3B:	Capping and Groundwater Cutoff Wall;
Alternative 4A:	Capping and Stabilization/Solidification;
Alternative 4B:	Capping, Stabilization/Solidification and Groundwater Cutoff Wall;
Alternative 4C:	Low Temperature Thermal Desorption, Stabilization/Solidification and Capping;
Alternative 4D	Solvent Extraction, Stabilization/Solidification and Capping;
Alternative 4E	Gas-Phase Chemical Reduction, Stabilization/Solidification and Capping;
Alternative 4F:	On-Site Incineration, Stabilization/Solidification and Capping; and
Alternative 5A:	On-Site Disposal;
Alternative 5B:	Off-Site Disposal.

A discussion of the removal action components and requirements which are common to the various alternatives, or groups of alternatives, is presented in Section 8.2. These components or requirements include the following:

1. monitoring requirements;
2. institutional controls; and
3. pre-design studies.

The detailed analysis of each alternative is provided in Sections 8.3 through 8.14. A summary evaluation is presented in Section 8.15.

8.2 COMPONENTS COMMON TO VARIOUS ALTERNATIVES

A general Site monitoring program would be implemented with all removal action alternatives including the No Action alternative (Alternative 1). In addition, institutional controls would be implemented to restrict exposure to contaminated soil and groundwater. Finally, pre-design studies may be required to support the successful design and implementation of certain removal action components. These activities are discussed in the following subsections.

8.2.1 Monitoring Programs

The objective of the groundwater monitoring program would be to provide data which would be used to assess the effectiveness of the removal action. A contingency plan would be developed to address adverse impacts identified during the monitoring.

8.2.1.1 General Site Monitoring

The proposed Site monitoring locations are presented on Figure 7.1. Monitoring will be conducted on a semi-annual basis for the first five years, and on an annual basis thereafter. The frequency for the monitoring program would be increased or decreased as required dependent upon Site conditions. Each sample would be analyzed for a Site Specific Parameter List (SSPL) which would be comprised of PCBs and inorganics. Monitoring would be conducted in accordance with a Quality Assurance Project Plan (QAPP) developed for removal action monitoring. The final monitoring program is removal action specific and therefore would be finalized during the removal design.

8.2.1.2 Treatment System Monitoring

Alternatives 4C, 4D, 4E, 4F and 5B involve the treatment of the process off-gas prior to release to the atmosphere. Alternatives 3B and 4B involve groundwater extraction and may require treatment of groundwater prior to discharge. Off-gas and liquid waste stream monitoring of treatment systems would be conducted for a selected list of parameters on an as-required basis.

8.2.1.3 Reporting

An annual report will be prepared which will document sampling activities, present analytical results and provide an evaluation of the data. A review of the removal action alternative would be conducted every five years after completion of the removal action.

8.2.2 Institutional Controls

All removal action alternatives, except the no action alternative, would require institutional controls to restrict exposure to contaminated soil or groundwater. Institutional controls would be comprised of the following:

1. Site security fencing;
2. placement of warning signs;
3. deed restrictions; and
4. modifying building codes and zoning ordinances.

Additional Site security fencing and warning signs would be erected, as necessary, to further restrict access to the Site. The security fence and signs would initially be inspected on a semi-annual basis during the implementation of the Site monitoring program.

Deed restrictions involve placing a notation on the property deed which makes the current, and any prospective property owner, aware of the property's history and the restricted land use of the property. (If a deed restriction is not possible a similar measure will be used). The deed restriction would limit subsurface excavations and groundwater use on Site. The deed restriction would limit property uses to open space uses only. In addition to deed restrictions, the local governments could further ensure that the property would not be developed in the future by modifying the zoning ordinances and building codes, as appropriate. Deed restrictions can be made permanent and enforceable through various legal mechanisms (i.e., consent decree).

8.2.3 Pre-Design Studies

Pre-design studies may be required to verify the effectiveness of removal action technologies (i.e., treatability studies) or verify quantity estimates for the activities associated with removal action contractor procurement. In addition, the pre-design studies will provide further characterization of the Site conditions and also provide design parameters for various removal action components.

The pre-design studies would be completed either before or during the preparation of the preliminary removal action designs. The results of the pre-design studies would be incorporated to support the final removal action design.

8.3 ALTERNATIVE 1 - NO ACTION

The no action alternative does not include any removal activities other than Site monitoring following completion of the EE/CA. PCBs are stable in the environment and only slow degradation would be expected to occur due to natural processes.

The PCB concentrations in Site soil range from below detection limits to 334 mg/kg. The corresponding additional cancer risk associated with these concentrations is above the guideline risk range of 10^{-5} for the maintenance worker exposure scenario.

This alternative would not prevent the potential migration of PCBs off Site via soil transport or leaching of PCBs into the surficial water table zone.

A contingency plan may be developed and implemented dependent upon the results of the monitoring program.

A detailed description of this alternative is presented in Section 7.1.

8.3.1 Alternative 1 - Overall Protection of Human Health and the Environment

The no action alternative would not reduce risks to human health and the environment. Based upon the SRA presented in Section 3.0, the cancer risks and non-carcinogenic hazard indices exceed the levels of concern for the groundwater consumption scenarios utilizing both filtered and unfiltered data. Future uses of the Site would not be restricted from the present conditions under Alternative 1.

8.3.2 Alternative 1 - Consideration of ARARs

This alternative would result in the exceedance of chemical-specific ARARs at the Site in soil and groundwater. It is anticipated that implementation of Alternative 1 would not meet location-specific ARARs including Executive Orders 11988 and 11990, and Michigan Act 347. It is also anticipated that Alternative 1 would not meet performance-specific ARARs regarding wildlife protection including the Fish and Wildlife Coordination Act.

8.3.3 Alternative 1 - Long-Term Effectiveness and Permanence

Since this alternative would not result in any further Site remediation, the magnitude of the residual risks would remain at existing levels in the short term, and decrease slowly with time due to natural attenuation and degradation.

8.3.4 Alternative 1 - Reduction of Toxicity, Mobility or Volume Through Treatment

Alternative 1 provides no additional short term reduction in the toxicity, mobility, or volume of chemicals at the Site. It should be noted, however, that due to natural attenuation and degradation, a reduction in toxicity could be expected over the long term.

8.3.5 Alternative 1 - Short-Term Effectiveness

As Alternative 1 involves no removal action, there would be no additional risk, over that presently existing, to the community, workers or the environment as a result of implementation of this alternative.

8.3.6 Alternative 1 - Implementability

This alternative is easily implemented.

8.3.7 Alternative 1 - Cost

The estimated cost associated with implementation of this alternative is summarized in Table 8.2. This alternative has no capital cost or associated operational costs with the exception of monitoring and reporting.

The annual costs of monitoring and reporting are estimated to be $41,200. The total present worth of this alternative is estimated to be $388,200 based upon a 10 percent discount rate over a 30-year period.

8.4 ALTERNATIVE 2 - LIMITED ACTION

This alternative includes the implementation of institutional controls and access restrictions to minimize potential exposure to chemicals in the soil. The monitoring program described in Section 8.2.1 would also be implemented under this alternative. A detailed description of this alternative is presented in Section 7.2.

8.4.1 Alternative 2 - Overall Protection of Human Health and the Environment

This alternative would reduce the risks to human health for all exposure scenarios through the implementation of the limited action alternative. Potential contact with Site constituents in the soil and groundwater would be reduced by further restricting access to the Site. This alternative would not, however, significantly reduce the risks to the environment.

8.4.2 Alternative 2 - Consideration of ARARs

This alternative would result in the exceedance of chemical-specific ARARs in soil and groundwater. It is anticipated that implementation of Alternative 2 would not meet location-specific ARARs including Executive Orders 11988 and 11990, and Michigan Act 347. It is also anticipated that Alternative 2 would not meet performance-specific ARARs regarding wildlife protection including the Fish and Wildlife Coordination Act.

8.4.3 Alternative 2 - Long-Term Effectiveness and Permanence

Implementation of Alternative 2 would reduce the potential risks due to direct contact/ingestion of soil and consumption of groundwater for future uses through institutional controls. Institutional controls are considered to be reliable as a method to restrict access and possible future land uses at locations such as this Site. These controls can be made permanent and enforceable through various legal mechanisms (i.e., consent decree). A review of the removal alternative would be conducted every five years to ensure that human health and the environment are being protected.

Alternative 2, however, provides no controls other than Site security fencing for the protection of the environment.

8.4.4 Alternative 2 - Reduction of Toxicity, Mobility or Volume Through Treatment

Alternative 2 provides no additional short term reduction in the toxicity, mobility, or volume of chemicals at the Site. It should be noted, however, that due to natural attenuation and degradation, a reduction in toxicity could be expected over the long term.

The effectiveness of this alternative could be readily monitored through implementation of the general Site monitoring program presented in Section 8.2.1.

8.4.5 Alternative 2 - Short-Term Effectiveness

As Alternative 2 involves no disturbance of any of the soil at the Site, there would be no additional short-term impacts to the community, workers or the environment as a result of implementation of this alternative. Institutional controls could be implemented in a relatively short period of time (i.e., approximately one year).

8.4.6 Alternative 2 - Implementability

Generally, institutional controls (deed restrictions, zoning ordinance or building code changes) and Site monitoring plans are easily implemented over a period of a few months. Additional removal actions may be required at a later date depending upon the results of the monitoring program.

8.4.7 Alternative 2 - Cost

A cost breakdown for Alternative 2 is presented in Table 8.3. The total capital cost is estimated to be $120,000. The annual costs for monitoring and reporting are estimated to be $47,800. The total present worth of this alternative is estimated to be $570,400 based upon a 10 percent discount rate over a 30-year period.

8.5 ALTERNATIVE 3A - CAPPING

This alternative involves the construction of a Michigan Act 64 compliant clay cap over the area north of Pond 1. Institutional controls would be implemented to limit Site use. Deed restrictions would also be implemented to prevent the disturbance of capped areas. A detailed description of this alternative is presented in Section 7.3.1.

8.5.1 Alternative 3A - Overall Protection of Human Health and the Environment

This alternative would reduce the risks to human health and the environment for all exposure scenarios. The placement of the cap would eliminate the direct contact with chemicals in the surface soils and potential surface runoff to Site trespassers and reduce potential emissions to the atmosphere of chemicals in the near surface soils. Access to the Site

would be restricted by realigning existing Site security fencing or constructing additional fencing, if required. Construction of the cap would reduce infiltration and thereby reduce the potential for chemical migration through groundwater flow.

8.5.2 Alternative 3A - Consideration of ARARs

The cap would be constructed in accordance with Michigan standards for a hazardous waste landfill. All construction activities would be completed in accordance with Federal and State regulations regarding worker safety, dust control and air emissions, erosion control, and work within floodplains or wetlands.

This alternative would meet the TSCA requirement of being protective of human health and the environment in addition to reducing the mobility of the chemicals of concern. This alternative would not reduce the toxicity or volume of the contaminants.

8.5.3 Alternative 3A - Long-Term Effectiveness and Permanence

Implementation of Alternative 3A would eliminate potential risks due to direct contact/ingestion of soil and reduce infiltration thereby reducing the chemical migration into the groundwater. Potential risks from chemicals in the ambient air would also be reduced by the capping action. Provided that the cap is regularly maintained, the capping action is considered to have high reliability. A mandatory review of the removal action would be required every five years.

8.5.4 Alternative 3A - Reduction of Toxicity, Mobility or Volume Through Treatment

Alternative 3A provides no additional short term reduction in the toxicity or volume of chemicals at the Site. It should be

noted however, that due to natural degradation, a reduction in toxicity could be expected over the long term. The cap will also serve to reduce the mobility of Site constituents.

8.5.5 Alternative 3A - Short-Term Effectiveness

Implementation of Alternative 3A would involve grading of soil with chemical concentrations potentially exceeding cleanup levels. These activities may result in temporary dust production and chemical emissions to the atmosphere. Workers would be required to wear appropriate personal protective equipment and adhere to safe construction practices to minimize potential hazards. It is estimated that the cap could be installed within a period of one construction season after approval of the removal action.

8.5.6 Alternative 3A - Implementability

Implementation of this alternative would involve common construction procedures and the services and materials are readily available. The cap would require regular maintenance to ensure its effectiveness. Additional removal actions, such as a groundwater containment/treatment system could be implemented at a later date, if required. This requirement would be determined based upon the analytical results obtained in the groundwater monitoring program.

The effectiveness of the alternative could be monitored through implementation of the general Site monitoring program presented in Section 8.2.1.

8.5.7 Alternative 3A - Cost

A cost breakdown for Alternative 3A is presented in Table 8.4 The total capital cost is estimated to be $918,600 and the estimated

annual operation and maintenance cost is estimated to be $54,400. The total present worth of this alternative is estimated to be $1,431,200 based upon a 10 percent discount rate over a 30-year period.

8.6 ALTERNATIVE 3B - CAPPING AND GROUNDWATER CUTOFF WALL

Alternative 3B involves the placement of a Michigan Act 64 compliant clay cap over the area north of Pond 1. A groundwater containment system consisting of a perimeter groundwater cut-off wall and upper sand aquifer extraction wells and trenches would be installed, as required, to prevent the potential for migration of chemicals via groundwater transport. The collected water would be treated, if required, prior to discharge. A detailed description of this alternative is presented in Section 7.3.2. Institutional controls would be required to prevent disturbance of the capped areas and to restrict groundwater usage on Site.

Groundwater pumping tests would be conducted to determine design parameters for the groundwater extraction system, as necessary. In addition, samples of the groundwater extracted during the pumping tests would be analyzed to determine the design parameters for the treatment system (if required). Pre-design studies would be conducted as described in Section 8.2.3.

8.6.1 Alternative 3B - Overall Protection of Human Health and the Environment

This alternative would reduce the risks to human health and the environment for all exposure scenarios. The placement of the cap would reduce potential emissions to the atmosphere of chemicals in the near surface soils, and eliminate the potential direct contact with chemicals in the surface soils to Site trespassers. The groundwater containment system would prevent the potential migration of affected groundwater. Access restrictions to the Site would be maintained through the upgrading and realignment of the Site security fence, as necessary.

8.6.2 Alternative 3B - Consideration of ARARs

The cap would be constructed in accordance with Michigan standards for a hazardous waste landfill. All construction activities would be completed in accordance with Federal and State ARARs related to discharge to surface water or sewers.

This alternative would meet the TSCA requirement of being protective of human health and the environment. The alternative would be considered to be more effective in reducing chemical mobility through providing for further containment of the waste materials within the cutoff wall.

8.6.3 Alternative 3B - Long-Term Effectiveness and Permanence

Risks to humans and wildlife would be permanently reduced by Alternative 3B, as installation of the cap would eliminate the potential risks for direct contact/ingestion of soil. In addition, risks due to the potential release of chemicals to the ambient air would also be reduced. Possible future risks due to groundwater ingestion would be further reduced through operation of the groundwater containment system. Provided that the cap is maintained, the capping action is considered to have high reliability. The groundwater containment/treatment action also has high reliability.

A mandatory review of the removal action would be conducted every five years.

Site use restrictions would be implemented on Site.

The effectiveness of the alternative would be monitored through implementation of the general Site monitoring program as

presented in Section 8.2.1. Additional influent and effluent monitoring would be required for the groundwater treatment system.

8.6.4 Alternative 3B - Reduction of Toxicity, Mobility or Volume Through Treatment

Alternative 3B provides no additional short-term reduction in the toxicity or volume of chemicals at the Site. This alternative would, however, reduce the potential mobility of any Site contaminants in the groundwater through the use of the groundwater containment system and capping. Natural attenuation and degradation will provide a reduction in toxicity over the long term.

8.6.5 Alternative 3B - Short-Term Effectiveness

Implementation of Alternative 3B would involve grading of soils with chemical concentrations potentially exceeding cleanup levels. These activities may result in a temporary increase in dust production and chemical emissions to the atmosphere (expected to be minimal). Workers would be required to wear appropriate personal protective equipment and adhere to safe construction practices to minimize potential hazards. It is estimated that this alternative could be implemented within one or two construction seasons following approval of the removal design. The benefits of the capping component, and the elimination of the potential for migration of chemicals in the groundwater would be realized immediately upon installation.

8.6.6 Alternative 3B - Implementability

Implementation of this alternative would involve common construction procedures. The services and material required are readily available. The cap and groundwater containment/treatment system would require regular maintenance to ensure their effectiveness.

8.6.7 Alternative 3B - Cost

A cost breakdown for Alternative 3B is presented in Table 8.5. The total capital cost is estimated to be $1,363,800 and the estimated annual operation and maintenance cost is estimated to be $66,400. The total present worth of this alternative is estimated to be $1,989,600 based upon a 10 percent discount rate over a 30-year period.

8.7 ALTERNATIVE 4A - STABILIZATION/SOLIDIFICATION AND CAPPING

This alternative utilizes a solidification/stabilization treatment procedure which immobilizes the PCBs in the soil in a hard, high-strength matrix, resistant to water infiltration and leaching action:

i) the excavation of soil from the areas identified on Figure 5.12;

ii) treatment of excavated media through the batch mixing of contaminated soils with water and admixtures to form a homogeneous matrix. Alternately, admixtures and water could be mixed in place using one of the methods described in Section 5.4.5; and

iii) placement and curing of the treated materials into the excavated area.

This alternative requires the solidification/stabilization of approximately 28,000 tons of PCB contaminated soil.

The solidification/stabilization process has been successful for various types of waste (including PCB-contaminated media), and has been demonstrated on other CERCLA sites as an effective removal action alternatives.

The treated and solidified solid portion would be capped utilizing a Michigan Act 64 compliant clay cap. Appropriate surface water management controls would be implemented to reduce the probability of surface water infiltration to the solidified monolith.

A description of this alternative is presented in Section 7.4.1.

8.7.1 Alternative 4A - Overall Protection of Human Health and the Environment

This alternative is considered to be protective of human health and the environment for the following reasons:

- both solidification/stabilization and capping effectively eliminate the potential exposure pathways of dermal exposure, ingestion or emissions to the atmosphere;
- the leachability of Site contaminants of concern is reduced within the solidified/stabilized matrix; and
- infiltration through the solidified/stabilized mass is greatly reduced by both solidification/stabilization (reduced hydraulic conductivity) and capping activities.

This alternative would create a containment cell which would meet the substantive technical requirements of TSCA.

8.7.2 Alternative 4A - Consideration of ARARs

It is anticipated that this alternative would meet chemical-specific ARARs at the Site, as solidification/stabilization of the waste media would immobilize contaminants of concern and reduce their leachability (i.e., mobility).

Alternative 4A is expected to meet all performance-specific ARARs including TSCA. The effectiveness of the alternative would be monitored through implementation of the general Site monitoring program as presented in Section 8.2.1.

Approval for the use of an alternative treatment technologies under TSCA will be given providing that incineration and chemical waste landfilling are not reasonable and appropriate, and that the proposed alternative is protective of human health and the environment.

Based on the discussion presented in Section 8.7.1, Alternative 4A will be protective.

Implementation of this alternative would be performed in a manner which meets all location-specific ARARs.

8.7.3 Alternative 4A - Long-Term Effectiveness and Permanence

Alternative 4A would provide an effective long-term reduction in risk to human health and the environment, provided regular maintenance of the cap is performed. The reduced infiltration rate and frost protection afforded by the clay cap will increase the long-term effectiveness and performance of Alternative 4A.

Long-term monitoring of the treated monolith would be required to verify the integrity of the solidified/stabilized matrix.

8.7.4 Alternative 4A - Reduction of Toxicity, Mobility or Volume Through Treatment

This alternative would successfully reduce the mobility of PCBs and inorganics through the immobilization of contaminants within the solidified matrix. Further reductions in the mobility of Site contaminants

would be achieved through the installation of a Michigan Act 64 compliant clay cap to reduce infiltration through the solidified mass.

8.7.5 Alternative 4A - Short-Term Effectiveness

The construction activities for this alternative would pose a minimal risk to the community. No material would be expected to require off-Site transportation or disposal.

The protection of the Site personnel and any impact to the environment would be identical to that discussed for Alternatives 3A and 3B.

The anticipated time frame to complete construction activities (i.e., excavation, solidification, and capping) associated with this alternative would be one construction season for ex situ solidification, and one further construction season for capping. The time frame for the solidification activity was based on a 100 yd^3/day treatment rate. The in situ solidification option would require one construction season to implement.

8.7.6 Alternative 4A - Implementability

This alternative is both technically and administratively feasible. The requisite equipment, labor and materials are readily available.

8.7.7 Alternative 4A - Cost

A cost breakdown for Alternative 4A is presented in Table 8.6. The total capital cost is estimated to be $3,438,600 and the estimated annual operation and maintenance cost is estimated to be $66,400. The total present worth of this alternative is estimated to be $4,064,400 based upon a 10 percent discount rate over a 30-year period.

8.8 ALTERNATIVE 4B - STABILIZATION/SOLIDIFICATION, CAPPING AND GROUNDWATER CUTOFF WALL

Alternative 4B involves the placement of a Michigan Act 64 compliant clay cap over the contaminated soil north of Pond 1 (i.e., the components of Alternative 4A). A groundwater containment system consisting of a groundwater cutoff wall and upper sand aquifer extraction wells and trenches would be installed to prevent the potential migration of chemicals via groundwater transport and to further isolate the treated monolith from the environment. The collected water would be treated, if required, prior to discharge. A detailed description of this alternative is presented in Section 7.4.2. Institutional controls would be required to prevent disturbance of the capped areas and to restrict groundwater usage on Site.

Groundwater pumping tests may be conducted to determine design parameters for the groundwater extraction system. In addition, samples of the groundwater extracted during the pumping tests would be analyzed to determine design parameters for the treatment system. Pre-design studies were described in Section 8.2.3.

This alternative utilizes a solidification/stabilization treatment alternative which immobilizes the PCBs and inorganics in the waste and solidifies the material into a hard, high-strength matrix, resistant to water infiltration and leaching. This would be an on-Site treatment process. Specific remedial activities for this alternative would include the treated and solidified solid portion would be capped utilizing a Michigan Act 64 compliant clay cap. Appropriate surface water management controls would be implemented to reduce the potential for surface water infiltration into the solidified monolith.

This alternative would completely isolate the treated waste material in a containment cell which would meet the substantive technical requirements of TSCA.

8.8.1 Alternative 4B - Overall Protection of Human Health and the Environment

This alternative is considered to be protective of human health and the environment for the following reasons:

- both solidification/stabilization and capping effectively eliminate the potential exposure pathways of direct contact, ingestion or emissions to the atmosphere;

- the leachability (i.e., mobility) of Site contaminants of concern is reduced within the solidified/stabilized matrix; and

- infiltration through the solidified/stabilized mass is greatly reduced by both solidification/stabilization (reduced hydraulic conductivity) and capping activities.

The installation of a groundwater cutoff wall and groundwater extraction/treatment system will prevent the potential future migration of Site-related contaminants and further isolate the treated monolith from the environment.

8.8.2 Alternative 4B - Consideration of ARARs

It is anticipated that this alternative would meet chemical-specific ARARs at the Site, as solidification/stabilization of the waste media would immobilize contaminants of concern and reduce their leachability.

It is anticipated that Alternative 4B would comply with all performance-specific ARARs including TSCA (see Section 8.7.2) and Federal and State regulations governing groundwater extraction, treatment and discharge to sewers or surface water bodies.

Implementation of this alternative would be performed in a manner which meets all location-specific ARARs.

8.8.3 Alternative 4B - Long-Term Effectiveness and Permanence

Alternative 4B would provide an effective long-term reduction in risk to human health and the environment, provided regular maintenance of the cap is performed. The reduced infiltration rate and improved frost protection afforded by the clay cap would greatly increase the long-term effectiveness and performance of Alternative 4B. The cutoff wall would provide additional protection of the environment through further isolation of the treated monolith.

Long-term monitoring of the treated monolith would be required to verify the integrity of the solidified/stabilized matrix.

8.8.4 Alternative 4B - Reduction of Toxicity, Mobility or Volume Through Treatment

This alternative would successfully reduce the mobility of PCBs and inorganics through the immobilization of these contaminants within the solidified matrix. Further reductions in the mobility of Site-related constituents would be achieved through the installation of a Michigan Act 64 compliant clay cap to reduce infiltration and a groundwater cutoff wall to prevent migration of potentially contaminated groundwater.

8.8.5 Alternative 4B - Short-Term Effectiveness

Implementation of Alternative 4B could involve excavation and treatment of soil with chemical concentrations exceeding cleanup levels (if performed ex situ). These activities may result in a temporary increase in dust production and chemical emissions to the atmosphere. Workers would be required to wear appropriate personal

protective equipment and adhere to safe construction practices to minimize potential hazards. In situ treatment would significantly reduce any potential dust or chemical emission as compared to the ex situ approach. The benefits of the capping component, and the reduction of migration of chemicals in the groundwater, would be realized immediately upon installation. In addition, Site use restrictions would be implemented.

The construction activities for this alternative would pose a minimal risk to the community. No material would be expected to require off-Site transportation or disposal.

The anticipated time frame to complete field activities (i.e., excavation, solidification, groundwater cutoff wall installation and capping) associated with this alternative would be approximately one to two construction seasons.

8.8.6 Alternative 4B - Implementability

Implementation of this alternative would involve common construction procedures and the services and material are readily available. The cap and groundwater containment/treatment system would require regular maintenance to ensure their effectiveness.

The effectiveness of the alternative could be easily monitored by implementation of the general Site monitoring program as presented in Section 8.2.1 Additional influent and effluent monitoring would be required for the groundwater treatment system.

This alternative is both technically and administratively feasible. The requisite equipment, labor and material are readily available.

8.8.7 Alternative 4B - Cost

A cost breakdown for Alternative 4B is presented in Table 8.7. The total capital cost is estimated to be $3,883,800 and the estimated annual operation and maintenance cost is estimated to be $66,400. The total present worth of this alternative is estimated to be $4,509,600 based upon a 10 percent discount rate over a 30-year period.

8.9 ALTERNATIVE 4C - SOLVENT EXTRACTION, STABILIZATION/SOLIDIFICATION, AND CAPPING

Alternative 4C involves the treatment of excavated soils with solvent extraction. The solid residuals produced by the solvent extraction process would be treated using stabilization/solidification and capped within the area north of Pond 1. The water product would be pretreated, if required, and discharged. The oil product would be stored and removed from the Site for treatment by incineration.

The treated and solidified/stabilized material would be capped utilizing a Michigan Act 64 compliant clay cap. Appropriate surface water management controls would be implemented to reduce the rate of surface water infiltration to the solidified monolith.

This alternative is discussed in Section 7.4.4.

8.9.1 Alternative 4C - Overall Protection of Human Health and the Environment

This alternative would reduce the risk to human health and the environment through the destruction of a significant proportion of the PCBs present. Solidification/stabilization will serve to reduce the potential for residual levels of PCBs and inorganics, present in the treated materials, to leach into the groundwater. Capping and solidification/stabilization would act to prevent direct contact with the residual levels of PCBs and inorganics present in the treated material

monolith. Further protection is provided through the upgrading at the existing Site security fence (i.e., restricting access) as well as the implementation of deed restrictions.

8.9.2 Alternative 4C - Consideration of ARARs

Alternative 4C is expected to meet all chemical-specific ARARs for air emissions, soil and discharges to surface water or sewers. Performance-specific ARARs are anticipated to be met at both the State and Federal levels.

8.9.3 Alternative 4C - Long Term Effectiveness and Permanence

The implementation of Alternative 4C should remove most of the risks associated with the PCB contamination. The remaining risk of any residual PCBs would be addressed through solidification/stabilization and capping of the treated materials. The long term effectiveness and permanence of this option, however, would have to be determined through the monitoring of groundwater in the vicinity of the capped area.

8.9.4 Alternative 4C - Reduction of Toxicity, Mobility or Volume Through Treatment

It is assumed that Alternative 4C would remove a significant proportion of the PCBs present in the soil. A volume reduction would be realized due to the removal of water and oil from the waste feed by the solvent extraction process. As the PCBs are concentrated in the oil stream, which is subsequently shipped off Site for incineration, toxicity and volume are also reduced. Residual levels of PCBs and inorganics would be solidified/stabilized and capped at the Site.

8.9.5 Alternative 4C - Short-Term Effectiveness

The implementation of Alternative 4C would involve worker contact with contaminated soils. Proper measures would have to be followed to ensure protection of human health.

The treatment of the waste material, solidification and capping activities would take approximately one to two construction seasons to complete.

8.9.6 Alternative 4C - Implementability

A mobile solvent extraction unit is readily available and could be easily mobilized to the Site.

The required permit(s) for the off-Site transportation and treatment of the oil product by incineration, may be difficult to obtain due to public opposition to removal alternatives involving incineration.

Land requirements to house the unit and treatment staging areas could be accommodated at the Site.

This alternative is implementable and may be a viable treatment alternative for the constituents of concern at the Textile Road Site.

8.9.7 Alternative 4C - Cost

The total cost associated with this Alternative is summarized in Table 8.8. The total capital cost is estimated at $12,810,600 and the annual operation and maintenance cost is estimated at $54,400. The total present worth of this alternative is estimated to be $13,323,200 based upon a 10 percent discount over a 30-year period. It should be noted that solvent extraction costs are based on one extraction.

8.10 ALTERNATIVE 4D - GAS-PHASE CHEMICAL REDUCTION, SOLIDIFICATION AND CAPPING

This alternative involves the treatment of excavated soil using the gas-phase chemical reduction (GPCR) technology. The technology utilizes hydrogen to chemically reduce organic constituents into less harmful molecules through chemical reduction at high temperatures. The treated soil portion would be stabilized/solidified prior to capping the area north of Pond 1. Surface water management controls would be implemented to control migration of surface water.

This alternative is further discussed in Section 7.4.5.

8.10.1 Alternative 4D - Overall Protection of Human Health and the Environment

The risk to human health and the environment would be reduced significantly through the destruction of a significant proportion of PCBs in the soil. The risk associated with the residual levels of PCBs would be reduced via stabilization/solidification and capping of treated material. Institutional controls would further protect against risks from Site constituents.

8.10.2 Alternative 4D - Consideration of ARARs

Alternative 4D is expected to meet all chemical-specific ARARs for air emissions, soil and discharges to surface water or sewers. Performance-specific ARARs are anticipated to be met at both the state and federal levels.

8.10.3 Alternative 4D - Long-Term Effectiveness and Permanence

The implementation of Alternative 4D would eliminate most of the risks associated with PCB contamination. The remaining risk attributable to residual PCBs would be low due to the solidification/stabilization and capping activities. The long-term effectiveness of this option, however, would be confirmed through the monitoring of groundwater.

8.10.4 Alternative 4D - Reduction of Toxicity, Mobility or Volume Through Treatment

Implementation of Alternative 4D would reduce risks associated with chemicals at the Site. The GPCR process would effectively reduce the toxicity and volume of PCBs through destruction. The mobility of the inorganic constituents would be reduced through solidification/stabilization and capping.

8.10.5 Alternative 4D - Short-Term Effectiveness

The implementation of Alternative 4D would involve worker contact with contaminated soil. Proper measures would have to be followed to ensure protection of human health.

The GPCR treatment of the waste material, stabilization/solidification and capping activities would require approximately one to two construction seasons to complete.

8.10.6 Alternative 4D - Implementability

As GPCR is a proprietary process, available from only one vendor, the availability of the full-scale unit (currently under construction) is unknown.

It is anticipated that permitting requirements for this process will be similar to that for on-Site incinerators. However, significant time may be required to establish the exact permitting requirements and obtain the permits.

The land requirements for the GPCR unit as well as staging areas may be accommodated at the Site.

8.10.7 Alternative 4D - Cost

The total cost associated with this alternative is summarized in Table 8.9. The total capital cost is estimated at $21,142,200 and the annual operation and maintenance cost is estimated at $54,400. The total present worth of this alternative is estimated to be $21,654,800 based upon a 10 percent discount rate over a 30-year period.

8.11 ALTERNATIVE 4E - LOW TEMPERATURE THERMAL DESORPTION, STABILIZATION/SOLIDIFICATION, AND CAPPING

Alternative 4E involves the treatment of the organic constituents of excavated materials by LTTD. The solid residuals from the LTTD treatment would be stabilized/solidified prior to backfilling on Site to address the presence of residual PCBs and the low levels of inorganics in the treated material. The desorbed organics could be condensed into liquid form for treatment by off-Site incineration, or incinerated through the use of an afterburner as part of the LTTD process.

The treated and solidified solid portion would be capped utilizing a Michigan Act 64 compliant clay cap. Appropriate surface water management controls would be implemented to reduce the potential for surface water infiltration into the solidified monolith.

This alternative is further discussed in Section 7.4.3.

8.11.1 Alternative 4E - Overall Protection of Human Health and the Environment

This alternative would reduce the risk to human health and the environment through the destruction of a significant proportion of PCBs present. Stabilization/solidification will serve to prevent residual levels of PCBs present in the treated materials from leaching into the groundwater thus further reducing the risk. Capping and solidification/stabilization would act to prevent direct contact with the treated material monolith. Further protection would be provided through the upgrading of the existing Site security fence (i.e., restricting access) as well as the implementation of deed restrictions.

8.11.2 Alternative 4E - Consideration of ARARs

Alternative 4E is expected to meet all chemical-specific ARARs for air emissions, soil and discharge to surface water or sewers. Performance-specific ARARs are anticipated to be met at both the State and Federal levels.

8.11.3 Alternative 4E - Long-Term Effectiveness and Permanence

The implementation of Alternative 4E would eliminate most of the risks associated with PCB contamination. The remaining risks associated with residual PCBs would be low due to solidification/stabilization and capping of the treated waste materials. The long-term effectiveness and permanence of this option, however, would have to be determined through the monitoring of groundwater.

8.11.4 Alternative 4E - Reduction of Toxicity, Mobility or Volume Through Treatment

It is assumed that Alternative 4E would remove a significant proportion of PCB contamination in the waste material. A volume reduction would result from treatment due to the removal of water and oil from the waste feed. As the PCBs are concentrated in the oil stream, which is subsequently incinerated, volume and toxicity are also reduced. Toxicity due to residual levels of PCBs would still be present.

8.11.5 Alternative 4E - Short-Term Effectiveness

The implementation of Alternative 4E would involve worker contact with contaminated soil. Proper measures would have to be followed to ensure protection of human health.

The potential for the release of Site-related constituents to the atmosphere through the LTTD off-gas waste stream would have to be addressed. Other concerns are identified in Section 5.6.3.

The treatment of the waste material, solidification/stabilization and capping activities would take approximately one to two construction seasons to complete.

8.11.6 Alternative 4E - Implementability

Mobile LTTD units are available and could be mobilized to the Site.

The substantive requirements for permits for the operation of the afterburner would have to be complied with. Compliance with the substantive requirements of these permits may require significant time due to the public opposition to removal alternatives involving incineration.

Land requirements to house the unit and treatment staging areas may be accommodated at the Site.

8.11.7 Alternative 4E - Cost

A cost breakdown for Alternative 4E is presented in Table 8.10. The total capital cost is estimated to be $24,502,200 and the estimated annual operation and maintenance cost is estimated to be $54,400. The total present worth of this alternative is estimated to be $25,014,800 based upon a 10 percent discount rate over a 30-year period.

8.12 ALTERNATIVE 4F - ON-SITE INCINERATION, STABILIZATION/SOLIDIFICATION, AND CAPPING

Alternative 4F involves the on-Site incineration of the waste media. The incinerated product would be stabilized/solidified and capped utilizing a Michigan Act 64 compliant clay cap.

Institutional controls would be implemented to restrict Site access and use.

This alternative is further discussed in Section 7.4.6.

8.12.1 Alternative 4F - Overall Protection of Human Health and the Environment

This alternative would reduce the risks to human health for all exposure scenarios through the destruction of a significant proportion of PCBs in the soil. Stabilization/solidification of the treated waste would reduce risks from residual PCBs. Further, protection is provided through the placement of the cap which would eliminate direct contact and reduce infiltration through the stabilized/solidified mass.

Health concerns exist regarding the possible release of inorganics and products of incomplete PCB destruction (i.e., dioxins and furans) in the stack gas. Additional concerns regarding incineration are summarized in Section 5.6.2.

8.12.2 Alternative 4F - Consideration of ARARs

Alternative 4F is expected to meet all chemical-specific ARARs for air emissions, soil and discharges to surface water or sewers. Performance-specific ARARs are anticipated to be met at both the State and Federal levels.

8.12.3 Alternative 4F - Long-Term Effectiveness and Permanence

Implementation of Alternative 4F would reduce risks associated with PCBs at the Site through destruction. The remaining risk due to residual inorganics would be low due to immobilization in the solidified/stabilized matrix and construction of a cap.

8.12.4 Alternative 4F - Reduction of Toxicity, Mobility or Volume Through Treatment

Alternative 4F would destroy PCBs present in the waste media, thereby reducing the toxicity and volume of the treated material. The residual inorganics in the incinerated media would be treated utilizing solidification/stabilization prior to being capped on Site. The solidification/stabilization and capping will serve to reduce the mobility of inorganic constituents.

8.12.5 Alternative 4F - Short-Term Effectiveness

Implementation of Alternative 4F would involve some worker contact with soils containing chemicals potentially exceeding the cleanup levels. Workers would be required to wear appropriate personal protective equipment and adhere to safe construction practices to minimize potential hazards.

Capping activities could result in a temporary increase in dust production. A temporary increase in chemical emissions may also result during the treatment process. The operation of an on-Site incinerator may release inorganics and incomplete PCB combustion products to the atmosphere. Proper management controls would be required to reduce this risk.

Other concerns regarding incineration were summarized in Section 5.6.2.

8.12.6 Alternative 4F - Implementability

This alternative is considered technically feasible. The requisite equipment, labor and materials are available. It should be noted that significant time may be required to demonstrate compliance with all substantive requirements of any applicable permits. The community actively opposed construction of a hazardous waste incinerator in nearby Canton Township.

8.12.7 Alternative 4F - Cost

A cost breakdown for Alternative 4F is presented in Table 8.11. The total capital cost is estimated to be $31,228,200 and the estimated annual operation and maintenance cost is estimated to be $54,400. The total present worth of this alternative is estimated to be $31,740,800 based upon a 10 percent discount rate over a 30-year period.

8.13 ALTERNATIVE 5A - ON-SITE DISPOSAL

This alternative involves the construction of a Michigan Act 64 compliant clay liner and cap (e.g., containment vault), to contain all Site soils exceeding the soil cleanup standards. Institutional controls would be implemented to limit Site use. Deed restrictions would also be implemented to prevent the disturbance of capped areas. A detailed description of this alternative is presented in Section 7.5.1.

8.13.1 Alternative 5A - Overall Protection of Human Health and the Environment

This alternative would reduce the risks to human health and the environment for all exposure scenarios. The placement of the vault would eliminate the direct contact with chemicals in the surface soils and potential surface runoff to Site trespassers and reduce potential emissions to the atmosphere of chemicals in the near surface soils. Access to the Site would be restricted by realigning existing Site security fencing or constructing additional fencing, if required. Construction of the vault liner and cap would reduce infiltration and thereby reduce the potential for chemical migration through groundwater flow.

8.13.2 Alternative 5A - Consideration of ARARs

The vault would be constructed in accordance with Michigan standards for a hazardous waste landfill. All construction activities would be completed in accordance with Federal and State regulations regarding worker safety, dust control and air emissions, erosion control, and work within floodplains or wetlands.

This alternative would meet the TSCA requirement of being protective of human health and the environment in addition to

reducing the mobility of the chemicals of concern. This alternative would not reduce the toxicity or volume of the contaminants.

8.13.3 Alternative 5A - Long-Term Effectiveness and Permanence

Implementation of Alternative 5A would eliminate potential risks due to direct contact/ingestion of soil and reduce risks due to consumption of groundwater. Potential risks from chemicals in the ambient air would also be reduced by the capping action. Provided that the vault is regularly maintained, this action is considered to have high reliability. A review of the removal action would be required every five years.

8.13.4 Alternative 5A - Reduction of Toxicity, Mobility or Volume Through Treatment

Alternative 5A provides no additional short term reduction in the toxicity or volume of chemicals at the Site. It should be noted however, that due to natural degradation, a reduction in toxicity could be expected over the long term. The containment vault will also serve to reduce the mobility of Site constituents.

8.13.5 Alternative 5A - Short-Term Effectiveness

Implementation of Alternative 5A would involve grading of soil with chemical concentrations potentially exceeding cleanup levels. These activities may result in temporary dust production and chemical emissions to the atmosphere. Workers would be required to wear appropriate personal protective equipment and adhere to safe construction practices to minimize potential hazards. It is estimated that the vault could be installed within a period of one to two construction seasons after approval of the removal action design. The benefits of the removal action would be realized immediately upon installation.

8.13.6 Alternative 5A - Implementability

Implementation of this alternative would involve common construction procedures and the services and materials are readily available. The containment vault would require regular maintenance to ensure its effectiveness. Additional removal actions, such as a groundwater containment/treatment system could be implemented at a later date, if required. This requirement would be determined based upon the analytical results obtained in the groundwater monitoring program.

The effectiveness of the alternative could be monitored through implementation of the general Site monitoring program presented in Section 8.2.1

8.13.7 Alternative 5A - Cost

A cost breakdown for Alternative 5A is presented in Table 8.12 The total capital cost is estimated to be $1,550,000 and the estimated annual operation and maintenance cost is estimated to be $66,400. The total present worth of this alternative is estimated to be $2,175,600 based upon a 10 percent discount rate over a 30-year period.

8.14 ALTERNATIVE 5B - OFF-SITE DISPOSAL

This alternative would require the excavation, transportation and landfilling or possible incineration of contaminated soil. PCB-contaminated materials would be disposed as follows:

PCB Concentration	*Disposal*
>500 ppm	Off-Site Incineration/TSCA Landfill
>50, <500 ppm	Off-Site TSCA Landfill
>25, <50 ppm	Off-Site RCRA Landfill

Also included in this alternative is the restoration of the excavation area to its original state and the off-Site disposal of residual soils to an approved landfill.

It is estimated that approximately 18,600 cubic yards of soil would require off-Site transport and incineration/disposal.

This alternative is further discussed in Section 7.5.2.

8.14.1 Alternative 5B - Overall Protection of Human Health and the Environment

This alternative may be performed in a manner which is protective of human health and the environment. However, concerns exist regarding the shipment of waste materials over public roads as well as the potential for release of PCBs and inorganics from the off-Site disposal facility.

8.14.2 Alternative 5B - Consideration of ARARs

Alternative 5B is expected to meet all chemical and performance-specific ARARs with respect to air emissions and organic contaminant concentrations. Chemical and performance-specific ARARs pertaining to the disposal of soils are expected to be met through proper disposal.

All off-Site transportation of contaminated materials under this option would be required to meet State and Federal performance-specific ARARs for the transport of hazardous materials.

8.14.3 Alternative 5B - Long-Term Effectiveness and Permanence

The removal of contaminated media from the Site and subsequent land disposal will permanently remove the source of risk from the Site.

8.14.4 Alternative 5B - Reduction of Toxicity, Mobility or Volume Through Treatment

Alternative 4G effectively reduces the mobility, toxicity and volume of organic and inorganic contaminants at the Site through off-Site disposal. The proper off-Site land disposal of soil will reduce the mobility of PCBs and inorganic contaminants in the soil. It should be noted that contaminants will only be relocated to alternate sites where similar toxicity or volume concerns may arise.

8.14.5 Alternative 5B - Short-Term Effectiveness

Implementation of Alternative 5B would involve some worker contact with materials containing chemicals potentially exceeding the cleanup levels. Workers would be required to wear appropriate personal protective equipment and adhere to safe construction practices to minimize potential hazards.

There will be considerable adverse impacts on the community because of the volumes of soil potentially involved in this removal. For example, removal of 18,600 cubic yards of soil will take an estimated 1,000 truck trips.

SARA defines risk as the "possibility of loss or injury" and the "degree of probability of such loss." Because off-Site disposal would require transportation of significant volumes of material over public roads, the risks of accidents associated with such transportation cannot be ignored.

As part of the cleanup, trucks will travel approximately 1,000,000 miles[1] . The risks associated with this alternative include risks resulting from increased transportation of the Site materials, such as risks of accidental release of wastes during transport and vehicle accidents and fatalities.

There is a risk associated with the 1,000,000 miles that will be traveled by the trucks during removal activity. In addition to fatalities and accidents, spills could result from overturned trucks. In the 1988 truck National Safety Council Fleet safety contest, the rate of accidents for all trucks was approximately eight accidents per million miles traveled. According to national statistics, fatality rates for general traffic are approximately 2.5 per hundred million miles traveled (Department of Transportation, 1988). Based on these rates, there is a probability of an accident occurring during removal activity. The probability of a fatality occurring during this travel is about one in forty. The probability of this occurrence contrast sharply with the carcinogenic risk for the exposure assessment conditions that would exist after the removal alternative has been implemented (or as presently identified in the SRA).

8.14.6 Alternative 5B - Implementability

This alternative is technically feasible. The requisite equipment, labor and material are available. It should be noted, however, that if incineration is necessary chronic shortages of TSCA-approved PCB incineration facilities have occurred in the past and may cause some scheduling or coordination problems in the future.

Public or community opposition to increased truck traffic associated with transportation of hazardous waste materials may create difficulties (i.e., public opposition) implementing this alternative.

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1 1,000 truck loads, 1,000 miles round trip.

8.14.7 Alternative 5B - Cost

A cost breakdown for Alternative 5B is presented in Table 8.13. The total capital cost is estimated to be $7,730,500 and the annual operation and maintenance cost is estimated to be $47,800. The total present with of this alternative is estimated to be $8,180,500 based upon a 10 percent discount rate over a 30-year period.

8.15 SUMMARY OF EVALUATION

Each removal action alternative was evaluated separately in Sections 8.3 through 8.14 using the seven evaluation criteria in a detailed analysis. This section presents an evaluation of each of the alternatives relative to each other.

Overall Protection of Human Health and the Environment

All of the alternatives with the exception of the No Action alternative (Alternative 1) would result in a reduction of risks from chemicals in contaminated media. Use of the Site following remediation would not be further restricted for Alternative 1, as no additional physical measures would be taken to minimize potential exposures to chemicals. The reduction to risks from Site chemicals under Alternative 2 is not expected to provide sufficient protection for the environment. Major Site usage restrictions (i.e., deed restrictions and institutional controls) would be required for Alternatives 2 through 4F. Additional minor restrictions to Site usage would be required for Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, and 5A (in order to protect the Site cap from disturbance).

The use of thermal treatment in Alternatives 4C, 4D, 4E, 4F, and 5B may pose additional health-based concerns regarding the emission of inorganics in the off-gas and the potential for the release of incomplete combustion products (i.e., dioxins and furans) which are of more concern than the PCBs from which they were derived.

Consideration of ARARs

Alternatives 1 and 2 do not meet all chemical, action and location-specific ARARs as they do not provide treatment. Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, 5A, and 5B may be performed in a manner which meets or exceeds relevant ARARs.

Long-Term Effectiveness and Permanence

Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, and 5A would reduce the potential risk from contact with chemicals in the soils (via direct contact/ingestion) through placement of a cap over near-surface soils with concentrations exceeding the potential cleanup levels (in addition to institutional controls). This potential risks would be reduced moderately in Alternative 2 through institutional controls and restricted Site access. Alternative 5B would further reduce this risk on Site through removal of the chemical source. However, risks would be created in the communities to which the treated residuals are disposed under Alternatives 5B. Alternative 5B will have additional concerns regarding increased truck traffic. Alternative 1 provides negligible long-term risk reductions as no containment or treatment actions are taken.

Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, and 5A are considered to be reliable provided that the caps are maintained. Alternative 5B is considered reliable as the chemical source is removed. However, long term operation and maintenance would be required for alternatives involving capping or groundwater containment/treatment (alternatives 3B, 4B and 5A). Institutional controls, which are included as components of alternatives 2 through 5A, are considered reliable due to the location of the Site in an industrial area.

All alternatives would require a mandatory review after five years to assess the effectiveness of the remedial actions taken.

Reduction of Toxicity, Mobility or Volume Through Treatment

Alternatives 1 and 2 provide no reductions in toxicity, mobility or volume as they do not involve containment or treatment.

Alternatives 3A, 3B, 4A, 4B, and 5A provide reductions in the mobility of both organic and inorganic contaminants at the Site. These reductions in mobility are achieved through capping (Alternatives 3A, 3B, 4A, 4B and 5A), installation of a groundwater cutoff wall (Alternatives 3B and 4B), and/or stabilization/solidification (Alternatives 4A and 4B). It should be noted, however, that Alternatives 3B and 4B are not expected to significantly increase the reduction in mobility in comparison to Alternatives 3A, 4A and 5A. This is primarily due to the chemical and physical nature of the chemicals of concern (i.e., low solubility) as evidenced by the fact that groundwater contamination associated with the Site was not identified.

Alternatives 4C, 4D, 4E, 4F, and 5B provide reductions in the toxicity, mobility and volume of organic contaminants at the Site through destruction by thermal treatment. In Alternatives 4C and 4D thermal treatment (incineration) is preceded by LTTD and solvent extraction, respectively. Alternatives 4C, 4D, 4E, and 4F provide reductions in the mobility of inorganic contaminants at the Site through the use of stabilization/solidification and capping. Alternative 5B provides a reduction in the mobility of inorganic contaminants (present within the incinerator residues) through off-Site land disposal to an appropriate landfill.

Short-Term Effectiveness

Alternatives 1 and 2 would not have any significant short-term effects on the community, workers or the environment. Alternatives 3A and 3B involve minimal disturbance of chemicals in the soils, however, it could result in a temporary increase in dust generation. Alternatives 4A, 4B, 4C, 4D, 4E, 4F, 5A, and 5B all involve soil excavation. These alternatives also have the highest potentials for significant dust and chemical emissions to the atmosphere during the treatment process. In

addition, Alternatives 4C, 4D, 4E, 4F, and 5B all include thermal destruction of PCBs. Concerns of possible exposure of workers, community and the environment to inorganics or incomplete combustion products exist.

Alternatives 4C, 4D, 4E, and 4F have additional concerns regarding the siting of treatment facilities on Site. These concerns include:

- inorganic constituent emissions from various treatment components (i.e., incinerator stack); and
- public acceptance.

Alternative 5B has significant concerns regarding the trucking of the waste materials over significant distances (i.e., 1,000 truck loads over a minimum of 1,000 miles each). This alternative may result in greater actual short-term risks in comparison to the potential long-term risks identified in the SRA. In addition, Alternative 5B will require the subsequent landfilling of incinerator residue to other off-Site facilities thereby creating other potential long-term risks.

Implementability

Alternatives 1 and 2 require little or no construction. Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, 5A, and 5B would involve common construction procedures to excavate contaminated media, install a groundwater cutoff wall (Alternatives 3B and 4B) and cap the Site (Alternatives 3A, 3B, 4A, 4B, 4C, 4D, 4E, 4F, and 5A). Alternatives 4C, 4D, 4E and 4F may be more difficult to implement due to the addition of one or more treatment steps.

Excavation of the soils to the depths required (approximately 10 feet) would not require specialized equipment.

All of the alternatives could be effectively monitored through implementation of the monitoring plan presented in Section 8.2.1. Services and materials are readily available for each of the alternatives.

Compliance with the substantive requirements of applicable permits may be required for Alternatives 4C, 4D, 4E, 4F, and 5B. NPDES permits may be required for Alternatives 3B, 4B, 4C, 4D, and 4E for the discharge of water from treatment processes. Air and water permits may be difficult to obtain.

Costs

The capital costs for Alternatives 2 through 4F range from $120,000 (Alternative 2), to $31,228,000 (Alternative 4F). The No Action alternative would not involve any capital expenditures. The operation and maintenance costs for Alternatives 1 through 3B and 4B range from $41,200 (Alternative 1) to $66,400 (Alternatives 3B and 4B). The present worth costs for Alternatives 1 through 4F range from $388,000 (Alternative 1) to $31,741,000 (Alternative 4F).

Retreatment of waste materials may be required for Alternatives 4C, 4E and 4F thereby greatly increasing the costs associated with these alternatives.

8.16 SUMMARY

Table 8.14 provides an overall summary of the evaluations presented in this section.

9.0 REMOVAL ACTION SCHEDULE

The removal action schedule will be determined after a removal action alternative has been selected. The removal action schedule will be determined by the U.S. EPA. The estimated time frame to implement each of the removal actions is summarized as follows:

Alternative		
Selection of a removal action alternative		NA
1:	No action (immediate)	3 - 6 months
2:	Institutional Controls (1 year)	6 - 12 months
3A:	Capping (1 construction seasons)	6 - 12 months
3B:	Capping and Groundwater Cutoff Wall (2 construction seasons)	12 - 24 months
4A:	Capping and Stabilization/Solidification (1 construction season)	12 months
4B:	Capping and Stabilization/Solidification and Groundwater Cutoff Wall (2 construction seasons)	12 - 24 months
4C:	Low Temperature Thermal Desorption Stabilization/Solidification and Capping (2 construction seasons)	12 - 24 months
4D:	Solvent Extraction Stabilization/Solidification and Capping (2 construction seasons)	12 - 24 months
4E:	Gas-Phase Chemical Reduction, Stabilization/ Solidification and Capping (2 construction seasons)	12 - 24 months
4F:	On-Site Incineration Stabilization/Solidification and Capping (2 construction seasons)	12 - 24 months
5A:	On-Site Disposal (2 construction seasons)	12 - 24 months

5B:	Off-Site Disposal (1 construction season)	12 months

10.0 PUBLIC INVOLVEMENT PROCESS

The U.S. EPA will coordinate the public involvement process for the Textile Road Site. The Textile Road Site Respondents will support the U.S. EPA public involvement process during the removal action selection, as required.

11.0 REFERENCES

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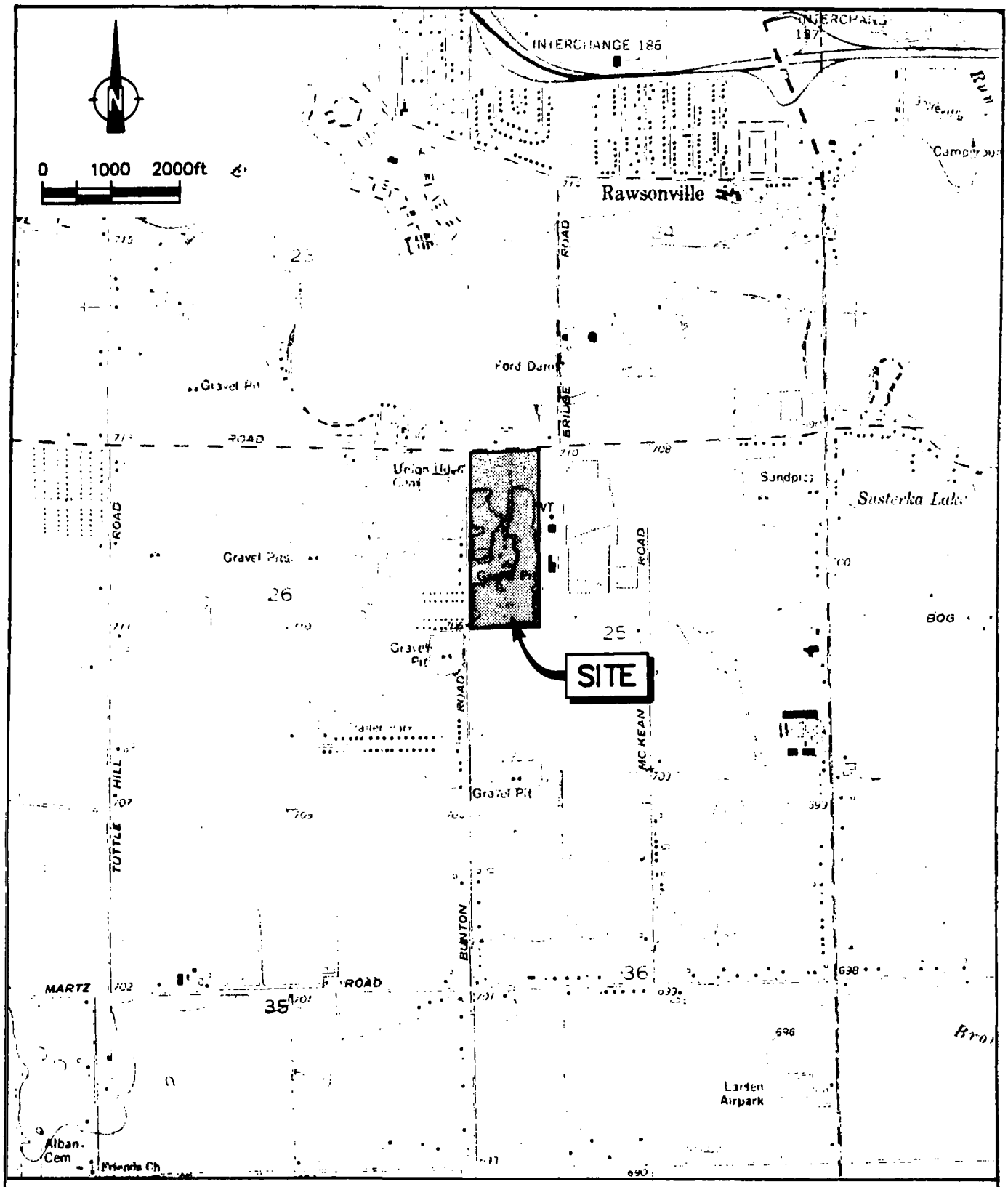
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SOURCE: USGS QUADRANGLE MAP,
YPSILANTI EAST, MICHIGAN



CRA MICHIGAN

figure 2.1

SITE LOCATION
TEXTILE ROAD SITE
Washtenaw County, Michigan

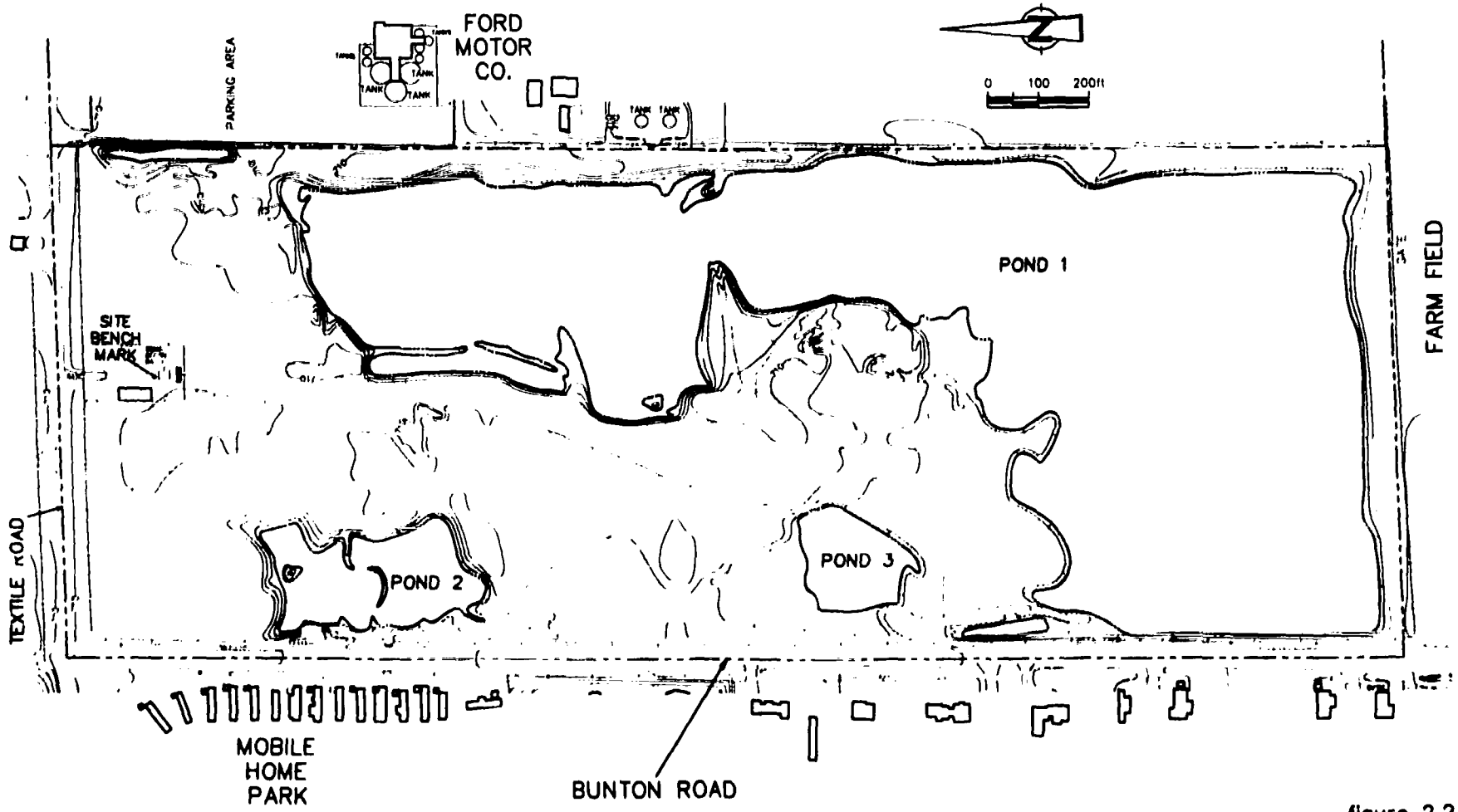
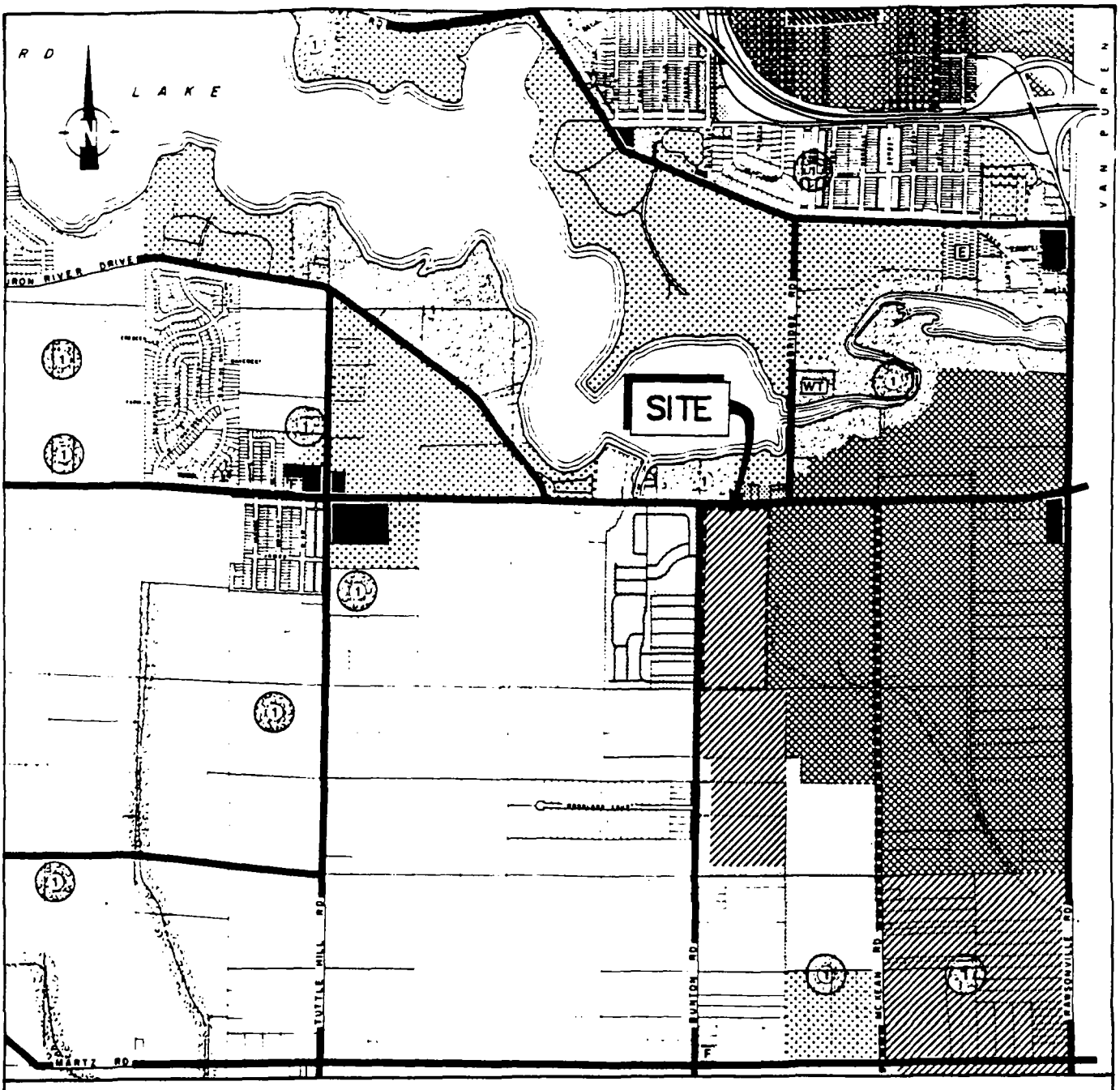


figure 2.2
SITE PLAN
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA



RESIDENTIAL
- Single - Family
- Multiple - Family
- Mobile Home

COMMERCIAL
- Comparison Commercial
- Convenience Commercial
- General Commercial
- Expressway Commercial
- Office
- Parking
- Greenbelt

INDUSTRIAL
- Research Office
- Light Industrial
- General Industrial
- Heavy Industrial

COMMUNITY FACILITIES

Public
- CCC Community Center Complex
- CC Civic Center Complex
- F Fire Station
- DPW Department of Public Works
- WT Water Treatment
- L Library
- P Police

Schools
- E Elementary School
- J Junior High School
- S Senior High School
- A Administrative Office

Parks
- 1 Township
- 2 County
- 3 Semi - Public
- Proposed

THOROFARES
- Expressway
- Major Thorofare
- Collector

0 1000 2000ft

REFERENCE: CHARTER TOWNSHIP OF YPSILANTI MICHIGAN PLANNING COMMISSION ADOPTED AUGUST 25, 1992.

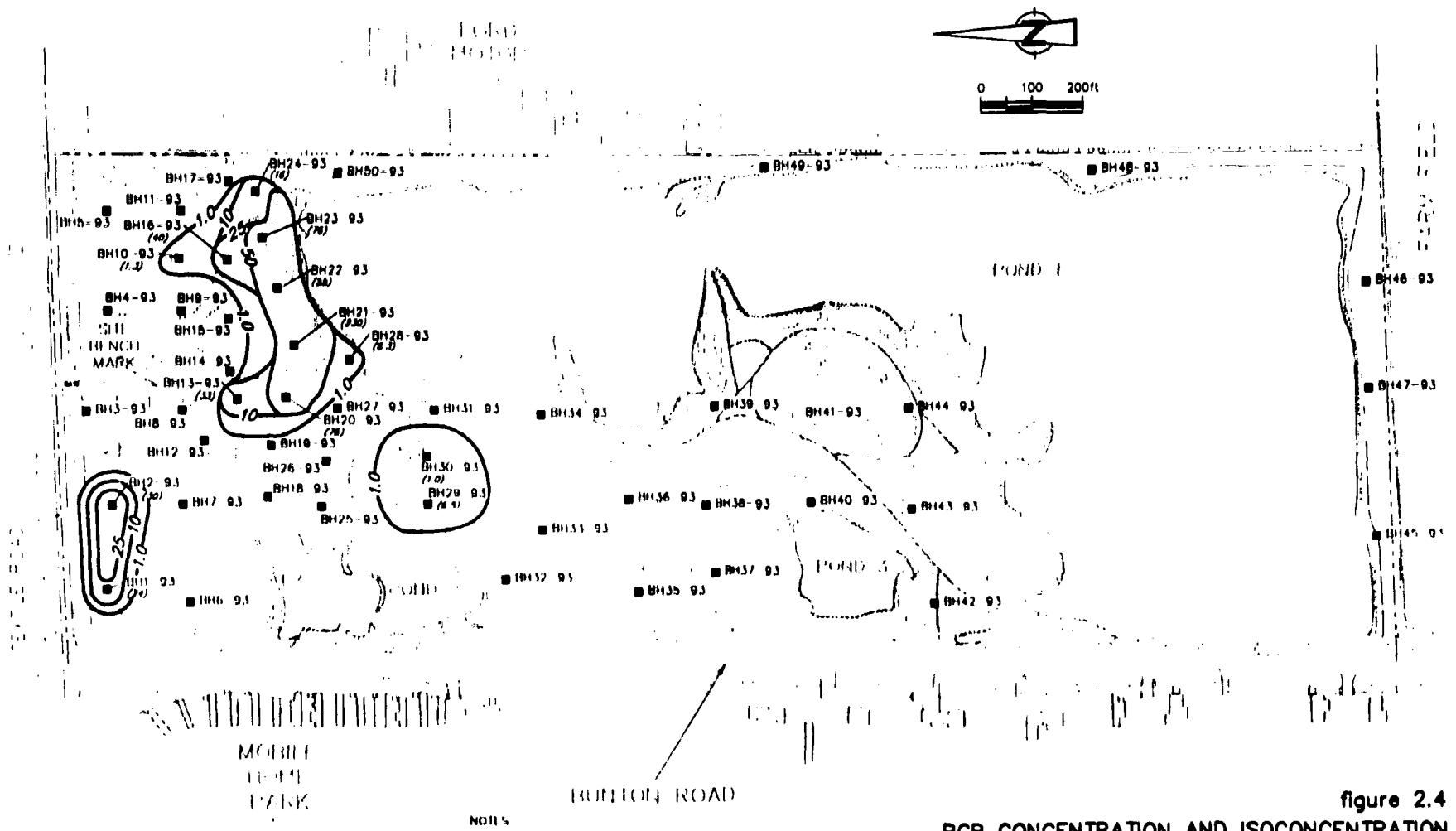
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figure 2.3

MASTER PLAN FOR FUTURE LAND USE YPSILANTI TWP. TEXTILE ROAD SITE

Washtenaw County, Michigan

4770 (12) MAR 09/94(W) REV.0

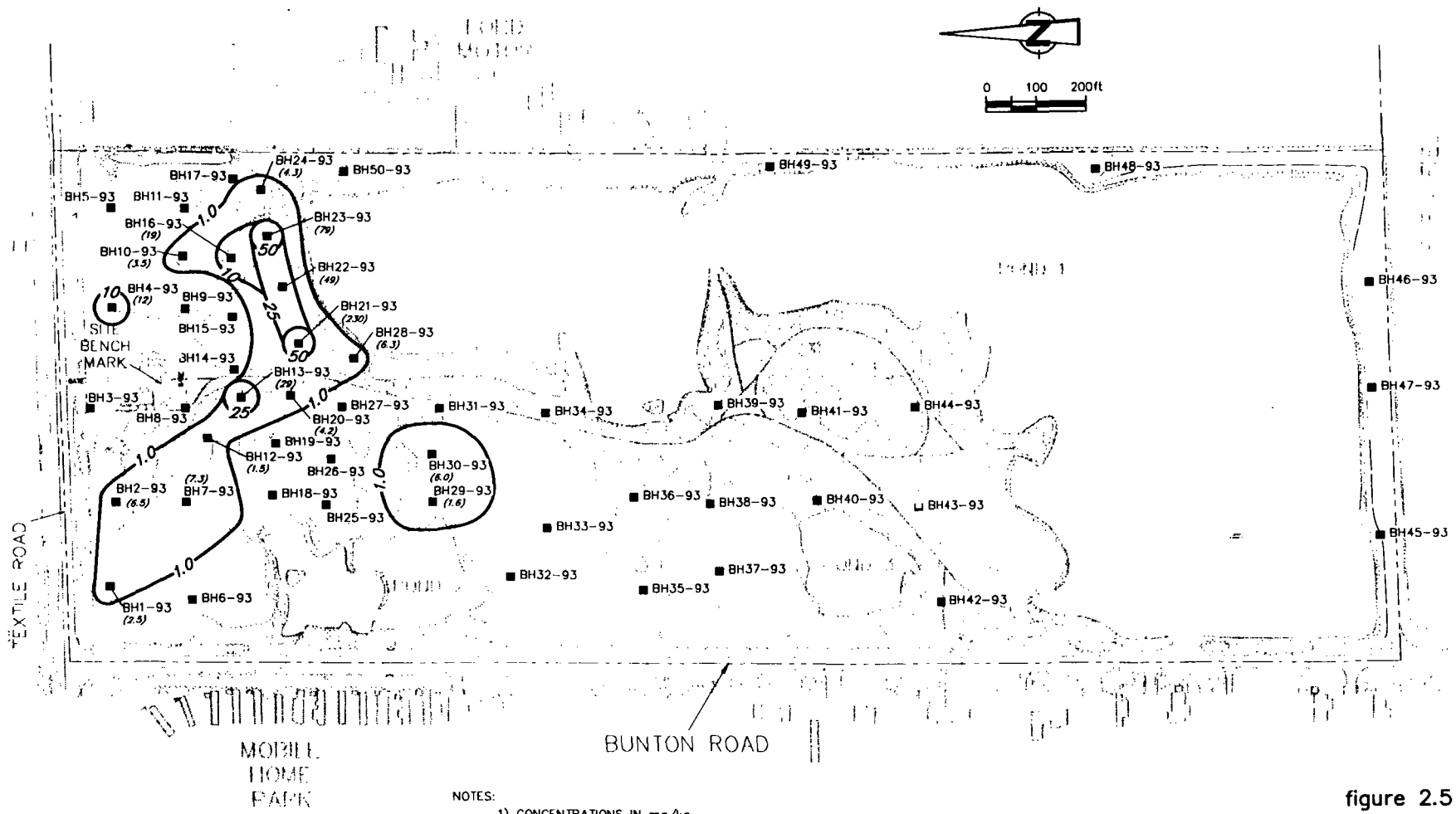


CRA

4770 (17) MAY 11/94(W) REV 1 (p 75)

figure 2.4

PCB CONCENTRATION AND ISOCONCENTRATION IN SURFACE AND BOREHOLE SOIL – 2–4' BGS
TEXTILE ROAD SITE
Washtenaw County, Michigan



NOTES:

1) CONCENTRATIONS IN mg/kg.
2) CONCENTRATIONS BELOW 1mg/kg NOT INDICATED.
3) PCB CONCENTRATIONS IN SOIL @ 6-8' BGS.
4) • – AROLOR 1260

LEGEND

25 —— ISO CONCENTRATION LINE FOR 6-8' BGS

figure 2.5

PCB CONCENTRATION AND ISOCONCENTRATION IN SURFACE AND BOREHOLE SOILS – 6-8' BGS
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

4770 (12) MAY 11/94(W) REV.1 (P-76)

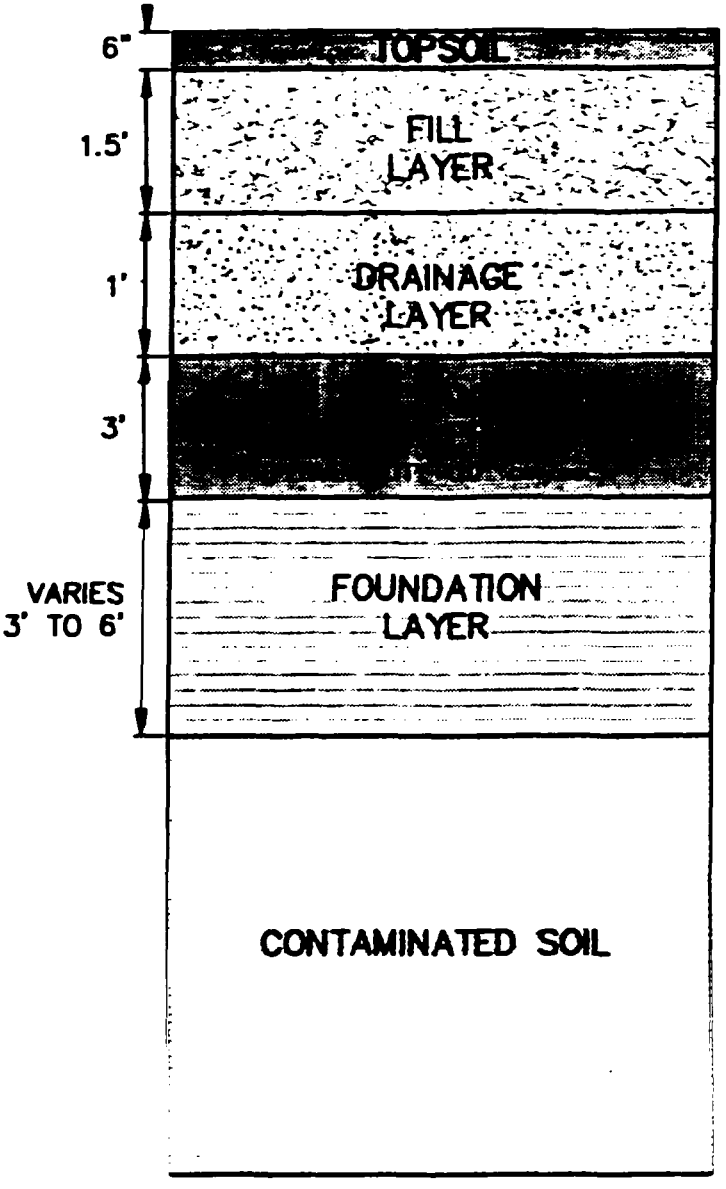
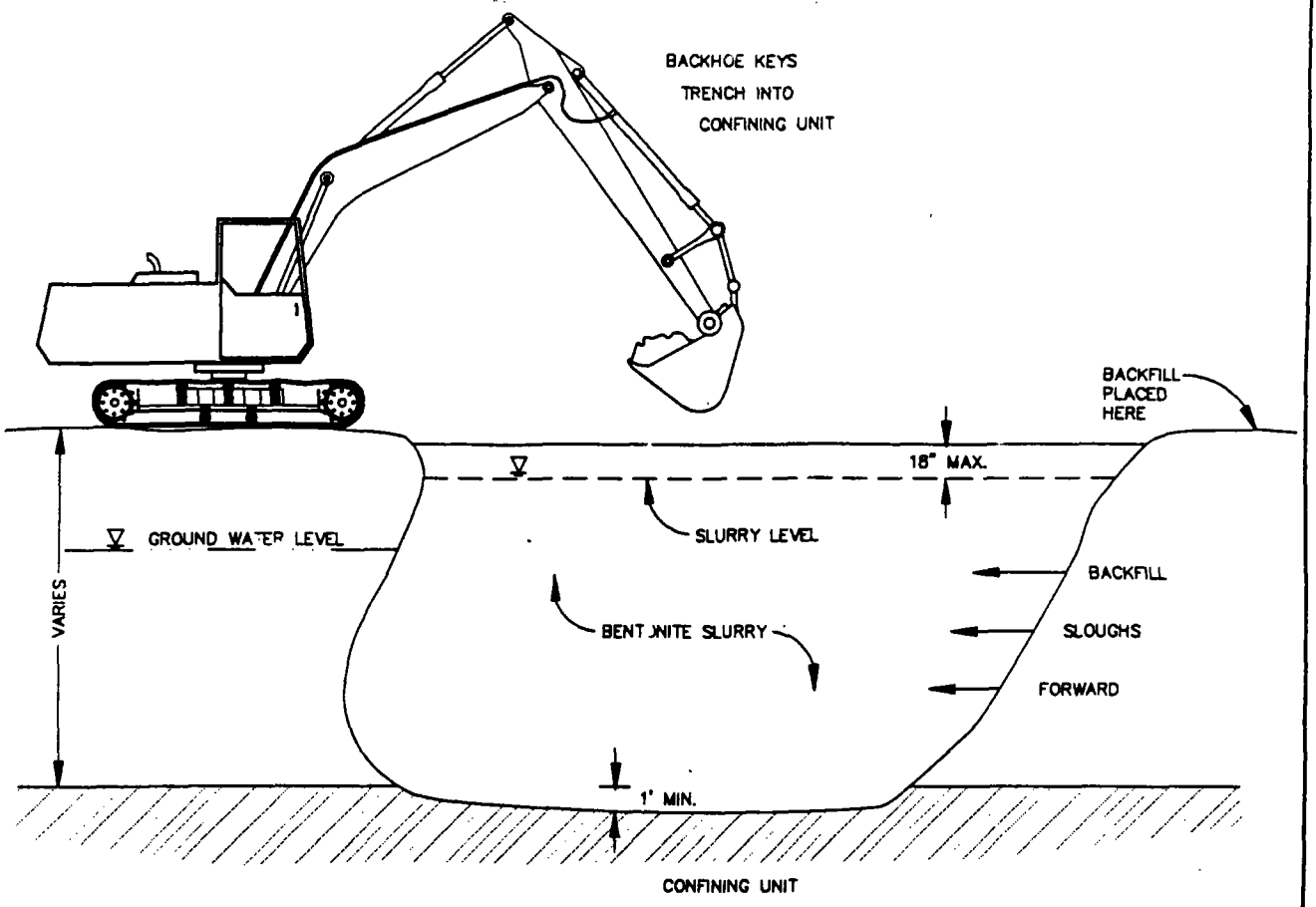


figure 5.1
MICHIGAN ACT 64 CLAY CAP
TEXTILE ROAD SITE
Washtenaw County, Michigan



SLURRY WALL CUTOFF SYSTEMS

PROPOSED CONSTRUCTION MATERIALS

1. BENTONITE–WATER SLURRY
   SOIL–BENTONITE BACKFILL
2. CEMENT–BENTONITE SLURRY
   CEMENT–BENTONITE BACKFILL
3. BENTONITE–WATER SLURRY
   PLASTIC OR DIAPHRAGM CONCRETE WALL
4. ATTAPULGITE–WATER SLURRY
   SOIL–ATTAPULGITE BACKFILL

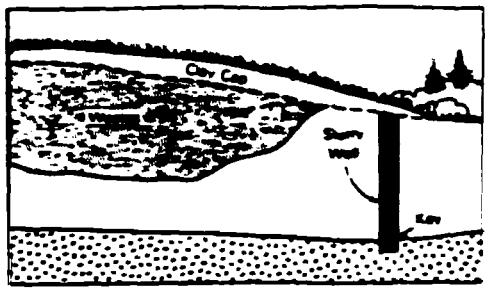
figure 5.2

SLURRY WALL CONSTRUCTION PROCEDURES
TEXTILE ROAD SITE
Washtenaw County, Michigan

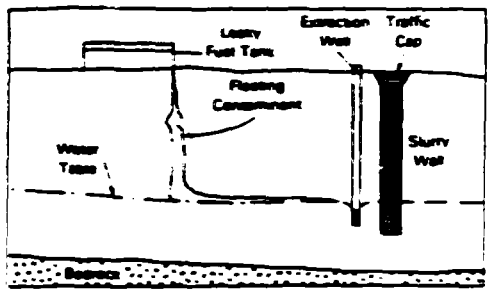
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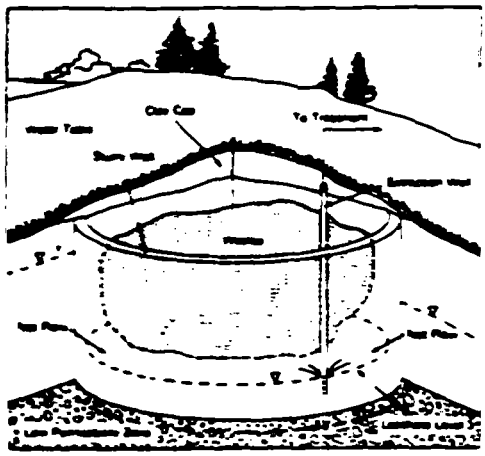
Keyed-in Slurry Wall



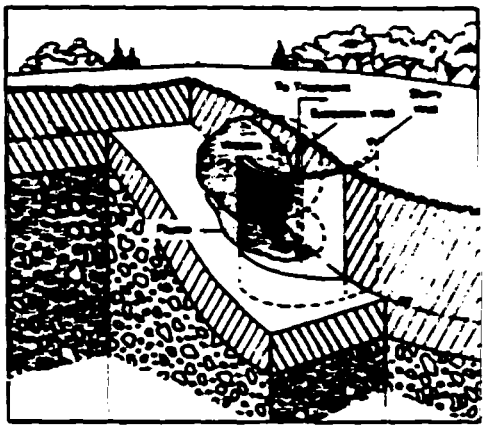
Hanging Slurry Wall



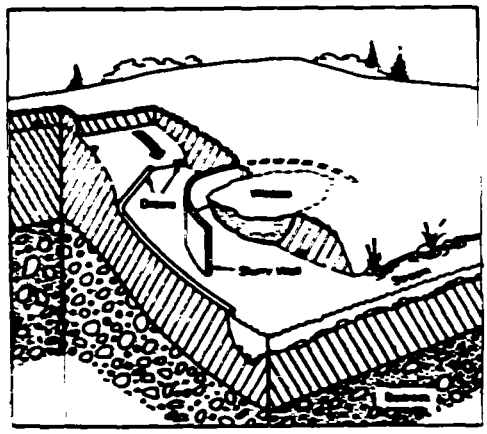
Cut-away Cross-section of Circumferential Wall Placement



Cut-away Cross-section of Downgradient Placement



Cut-away Cross-section of Upgradient Placement with Drain



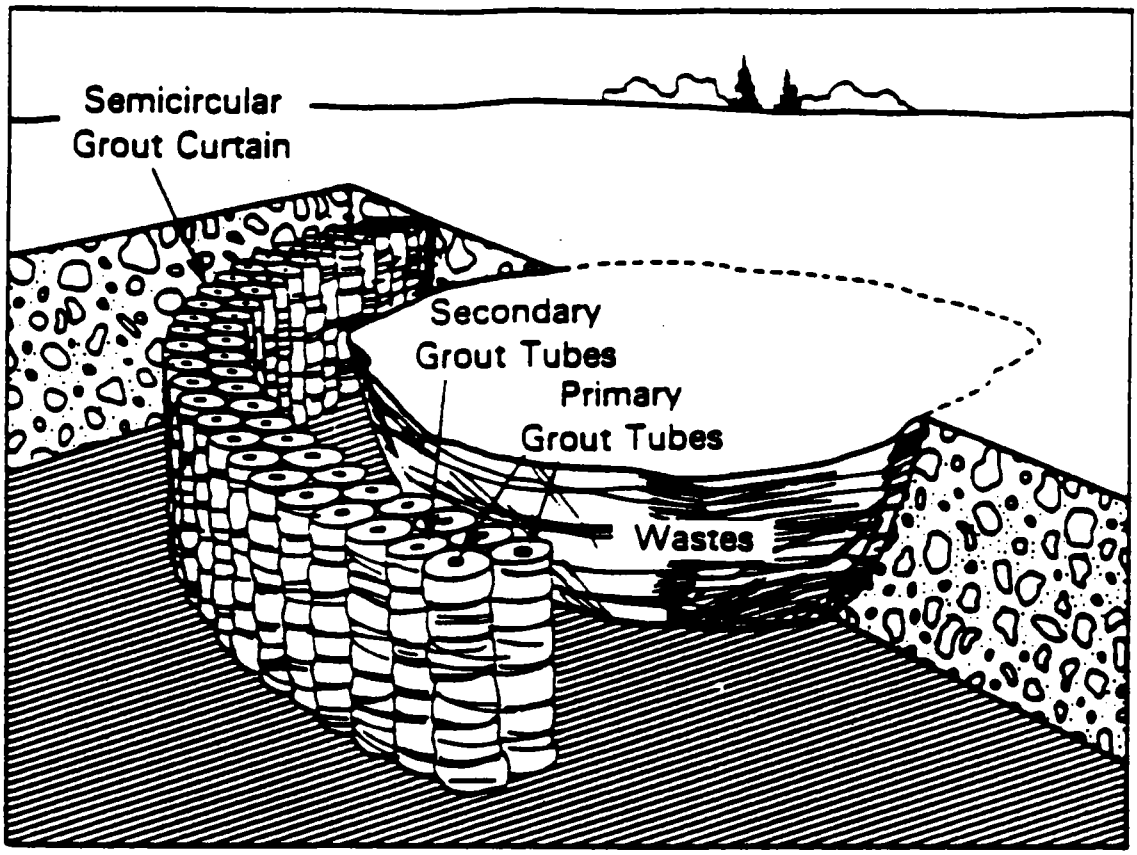
SOURCE: REMEDIAL TECHNOLOGIES, USEPA, 1985

figure 5.3

GROUNDWATER CUTOFF WALL PLACEMENT OPTIONS
TEXTILE ROAD SITE
Washtenaw County, Michigan

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4770 (12) MAR 09/94(W) REV.0



Source: Spooner et al., 1984b

SOURCE: REMEDIAL TECHNOLOGIES, USEPA, 1985

figure 5.4
TYPICAL GROUT CURTAIN
CONSTRUCTION DETAIL
TEXTILE ROAD SITE
Washtenaw County, Michigan

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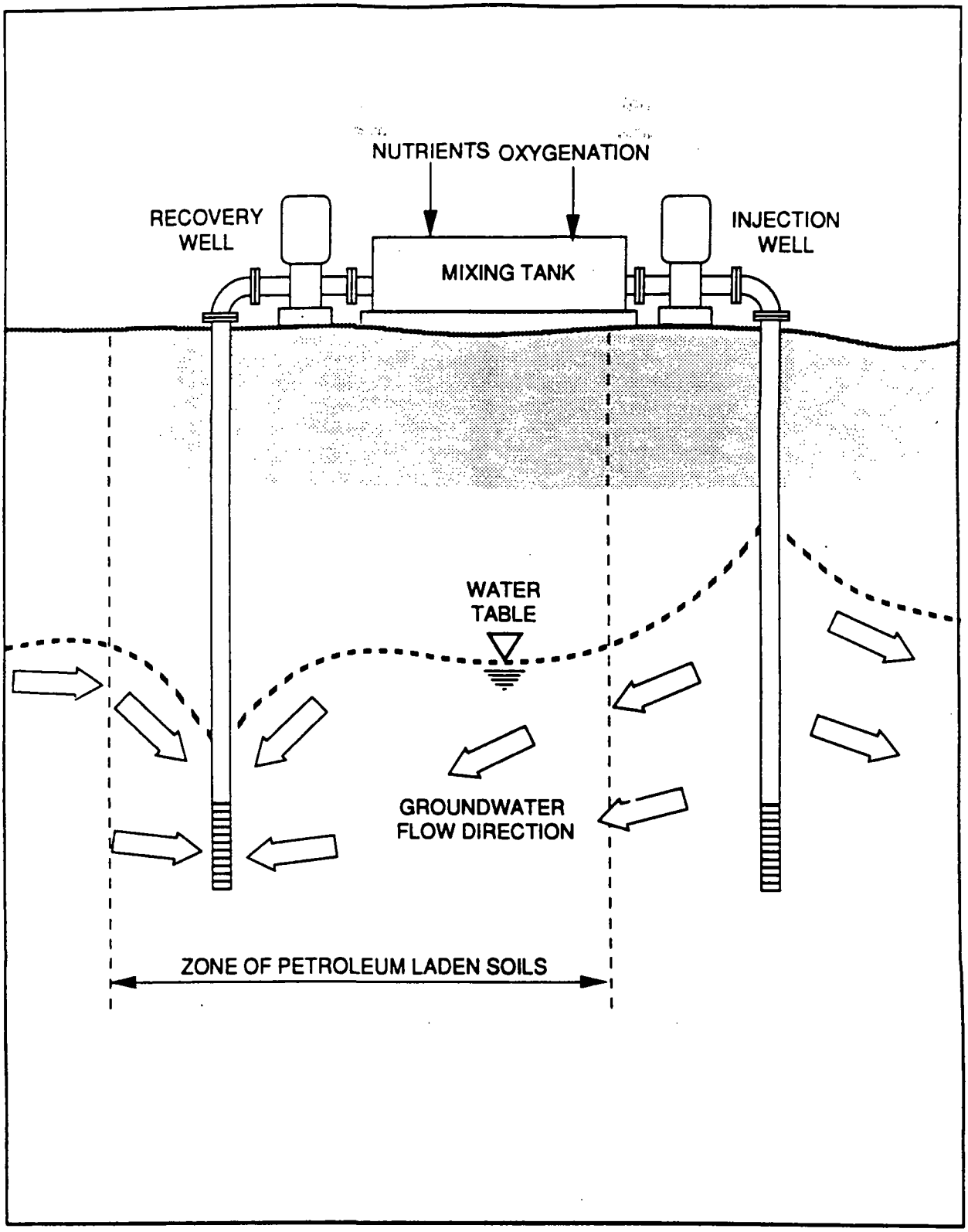


figure 5.5

WATERLOO BARRIER WALL
TEXTILE ROAD SITE
Washtenaw County, Michigan

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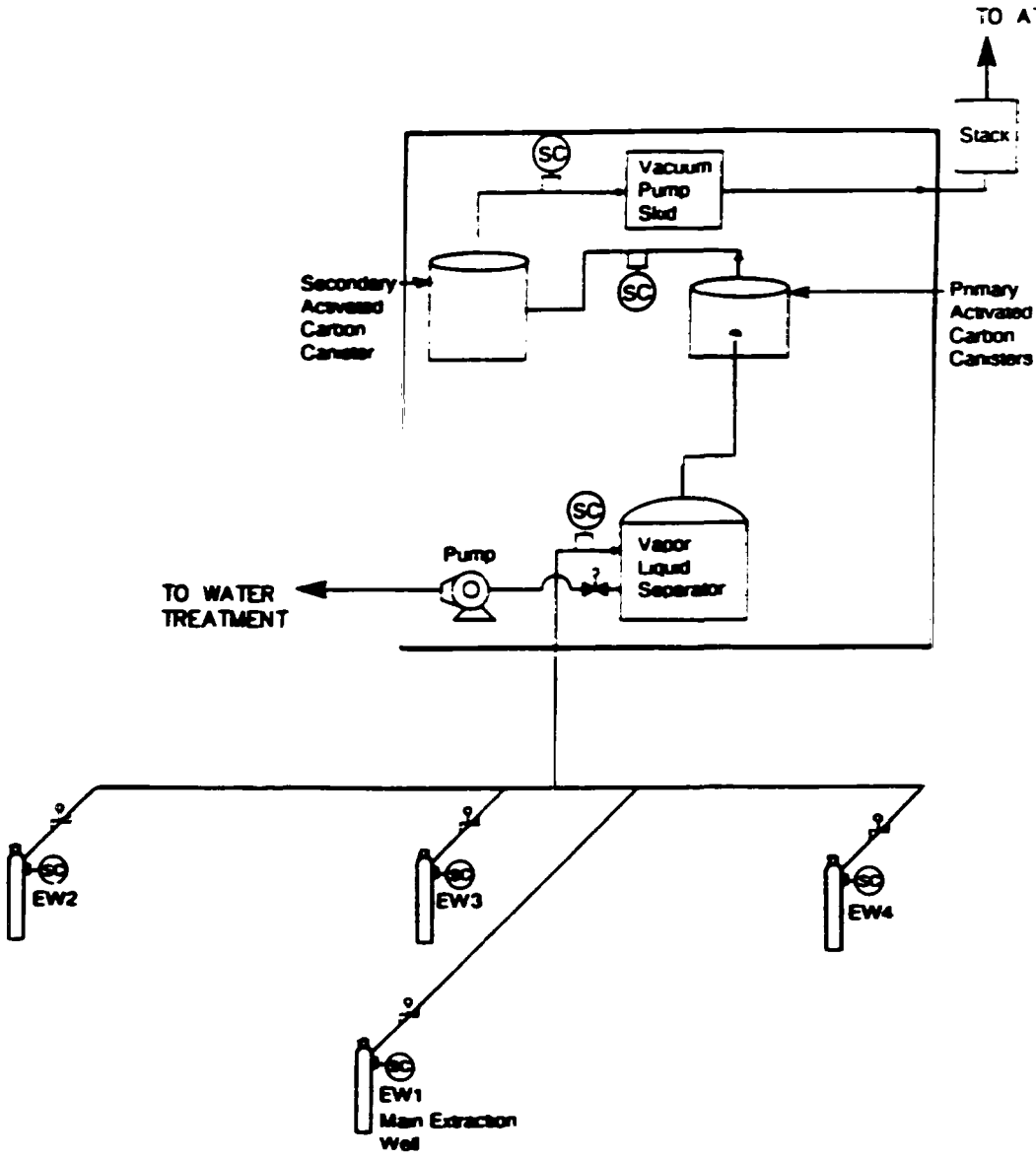
SOURCE: ASSESSING UST CORRECTIVE ACTION TECHNOLOGIES: EARLY SCREENING OF CLEANUP TECHNOLOGIES FOR THE SATURATED ZONE, USEPA, 1990

figure 5.6

IN-SITU BIOLOGICAL TREATMENT SYSTEM
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

4770 (12) MAR 09/94(W) REV.0



SOURCE: SITE REPORT TERRA VAC IN – SITU VACUUM EXTRACTION SYSTEM

NOTES:
SC – SAMPLING COCK
EW – EXTRACTION WELL

figure 5.7
SOIL VACUUM EXTRACTION
TYPICAL EQUIPMENT LAYOUT
TEXTILE ROAD SITE
Washtenaw County, Michigan

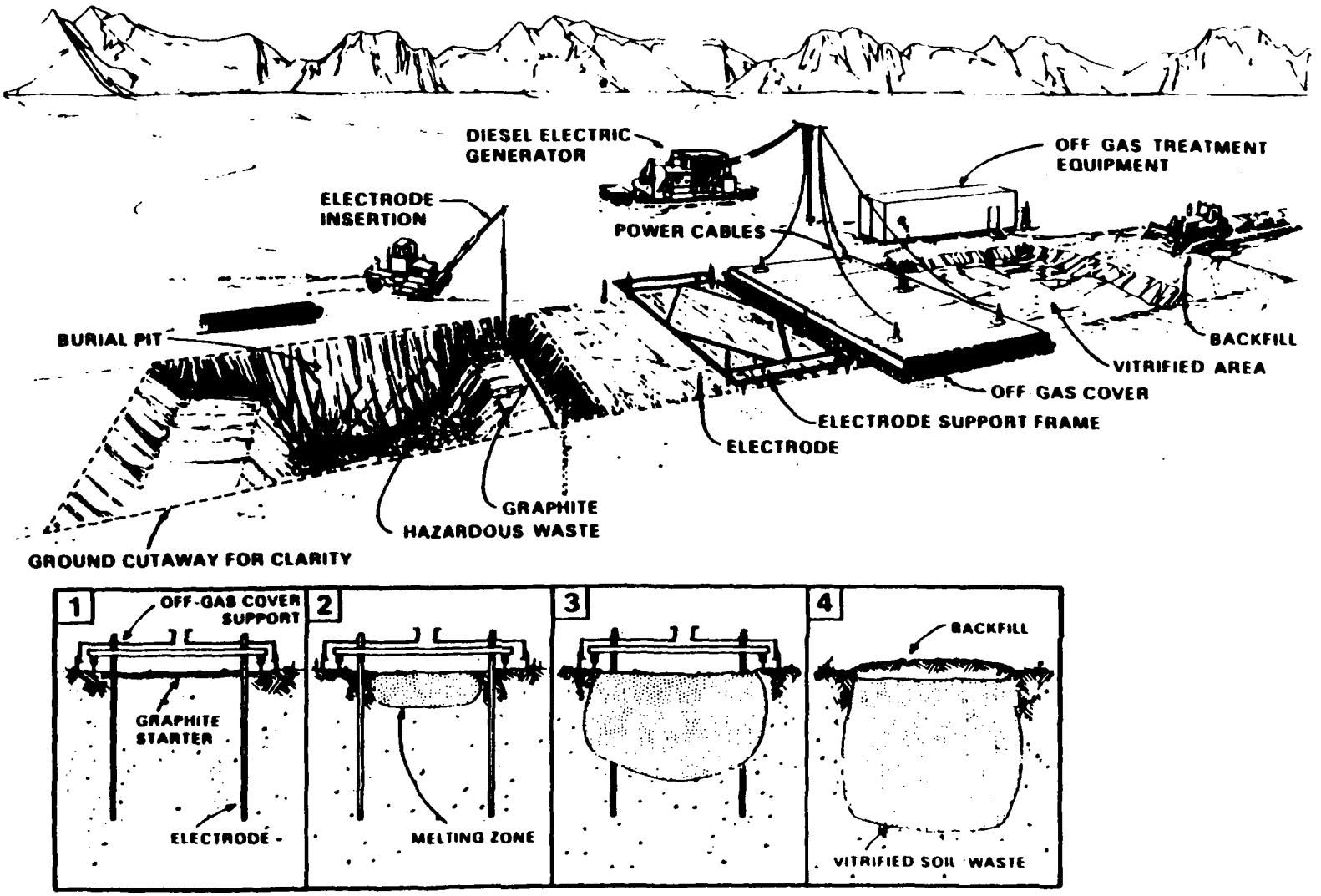
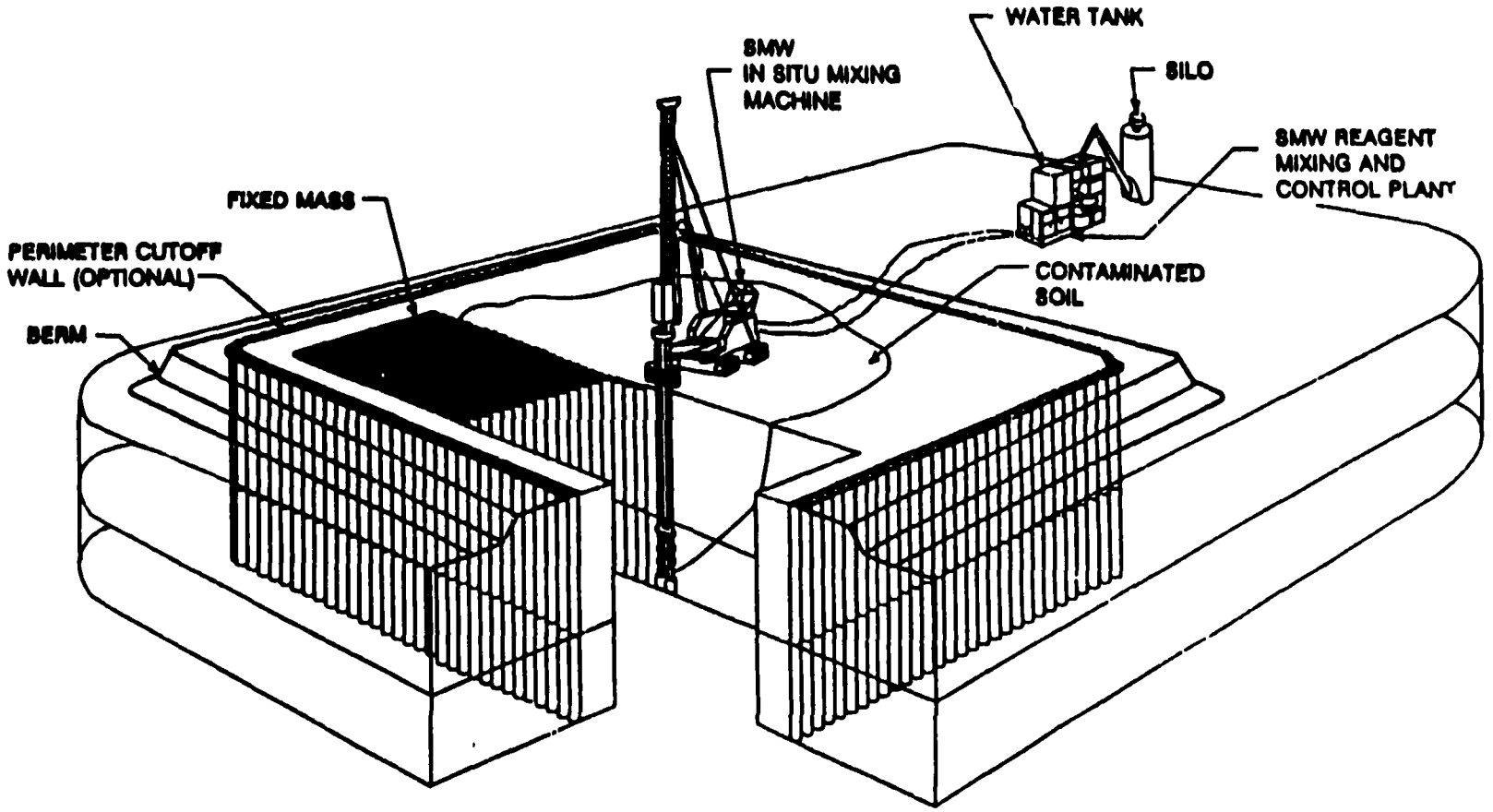


figure 5.8

IN-SITU VITRIFICATION
SCHEMATIC OF TECHNOLOGY
TEXTILE ROAD SITE
Washtenaw County, Michigan

SOURCE: BATTELLE PACIFIC NORTHWEST LABORATORIES

CRA

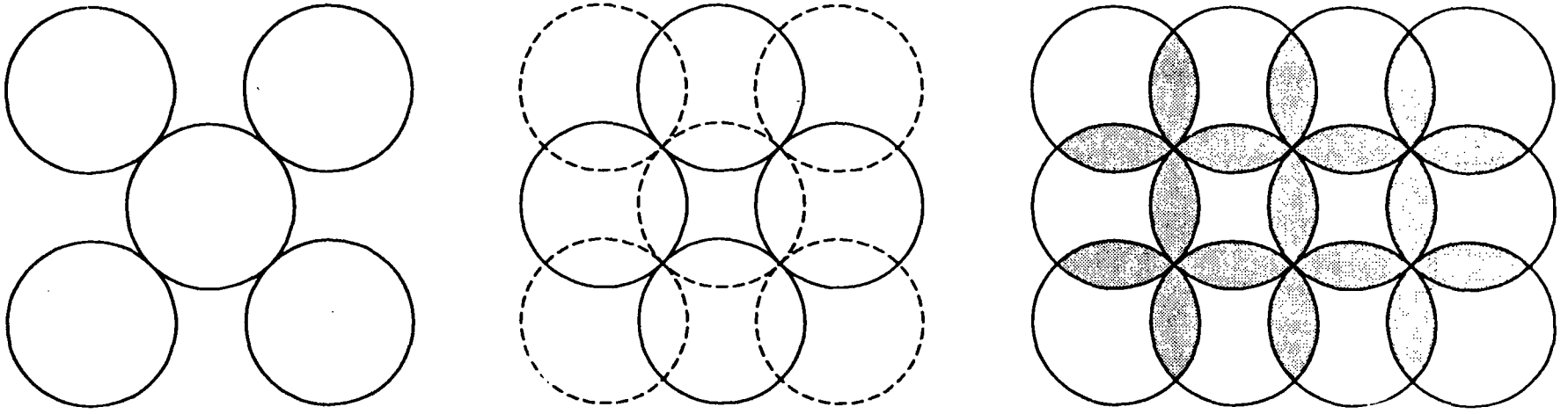


SOURCE: THE SUPERFUND INNOVATIVE TECHNOLOGY EVALUATION PROGRAM: TECHNOLOGY PROFILES FIFTH EDITION, USEPA, 1992

figure 5.9

IN-SITU STABILIZATION/SOLIDIFICATION OF CONTAMINATED SOIL
TEXTILE ROAD SITE
Washtenaw County, Michigan

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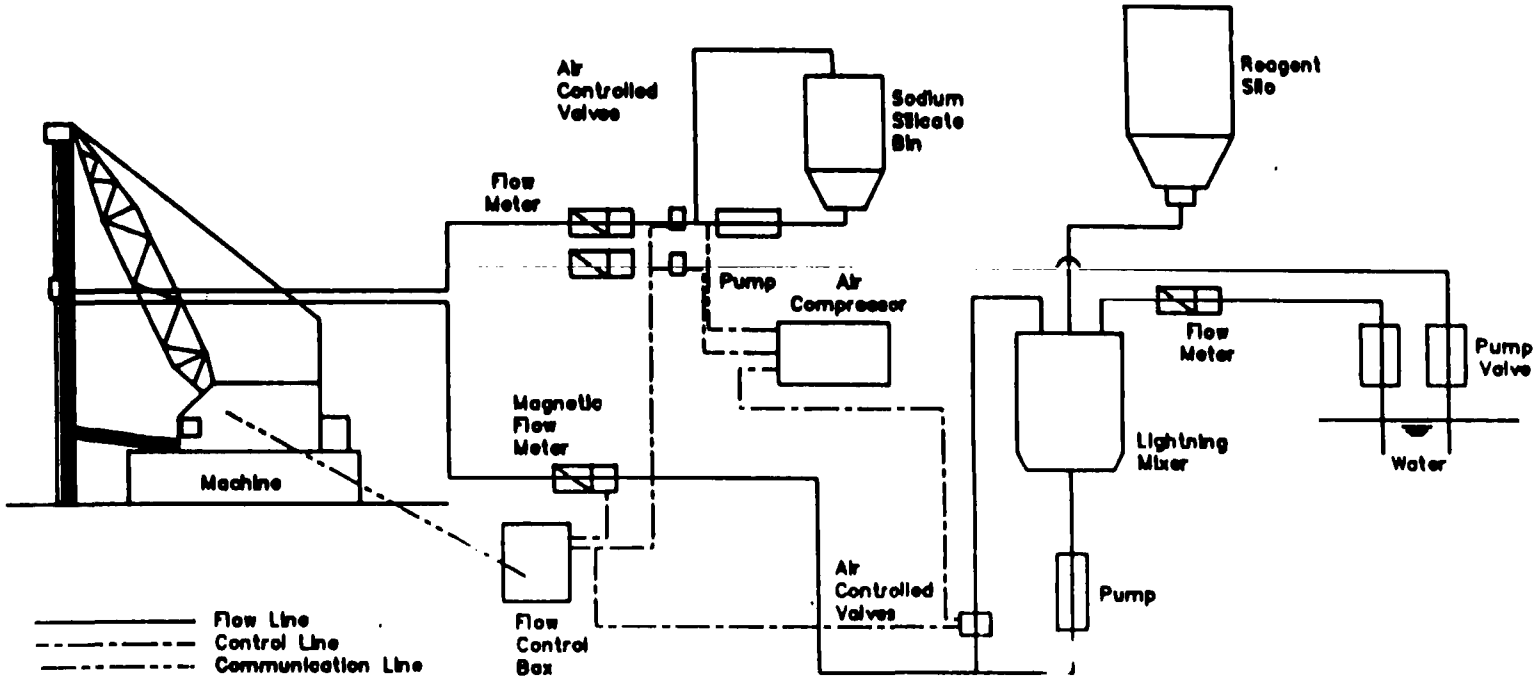
SOURCE: HAZARDOUS WASTE REMEDIATION TECHNICAL BRIEF

figure 5.10

IN-SITU STABILIZATION/SOLIDIFICATION
COLUMN MIXING PATTERN
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

4770 (12) MAR 31/94(W) REV.0 (D-11)



SOURCE: THE SUPERFUND INNOVATIVE TECHNOLOGY EVALUATION PROGRAM: TECHNOLOGY PROFILES FIFTH EDITION, USEPA, 1992

figure 5.11

IN-SITU SOLIDIFICATION BATCH MIXING PLANT PROCESS FLOW
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

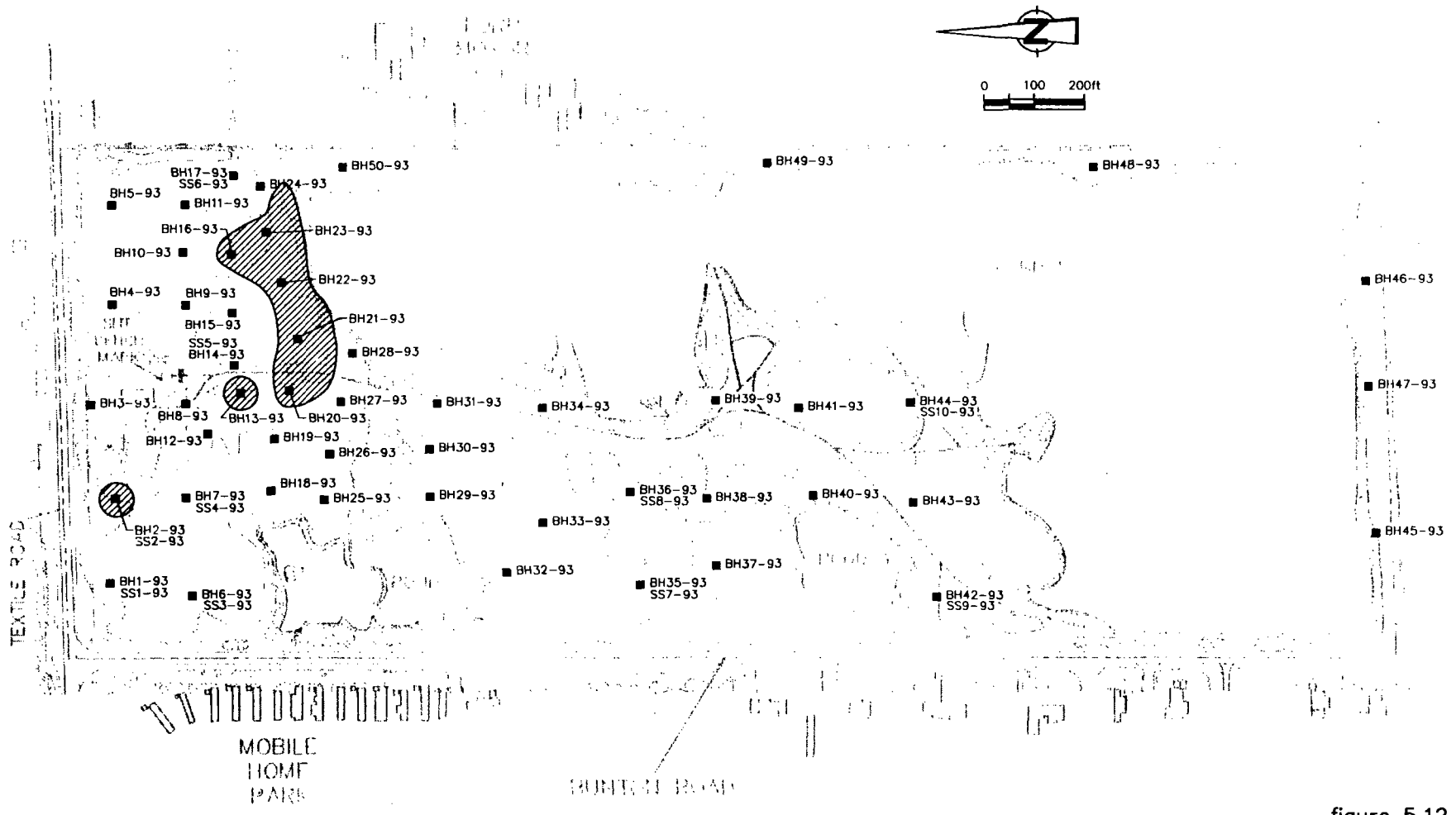
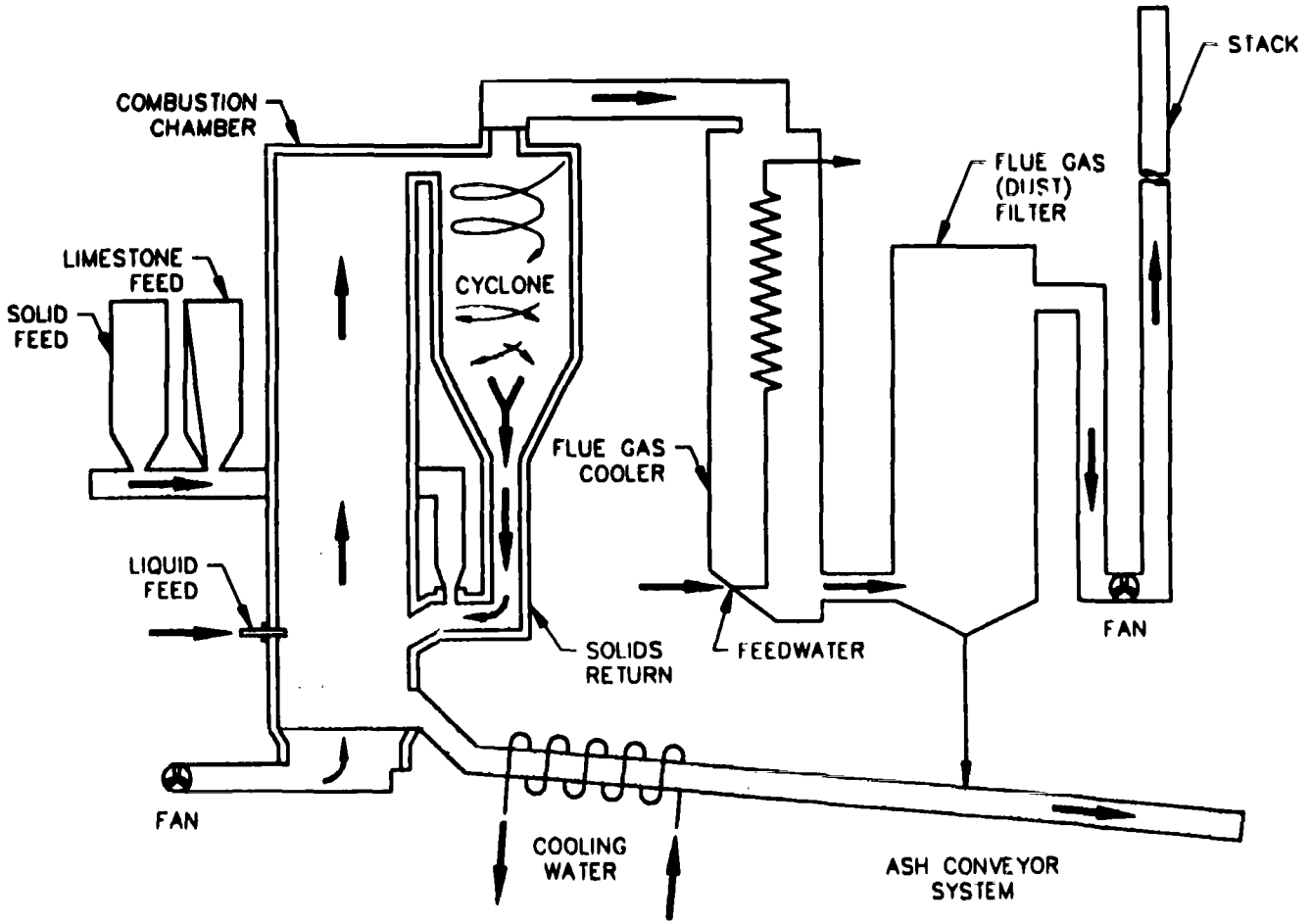


figure 5.12
EXCAVATION AREAS
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

4770 (12) MAR 31/94(W) REV.0 (P-73)



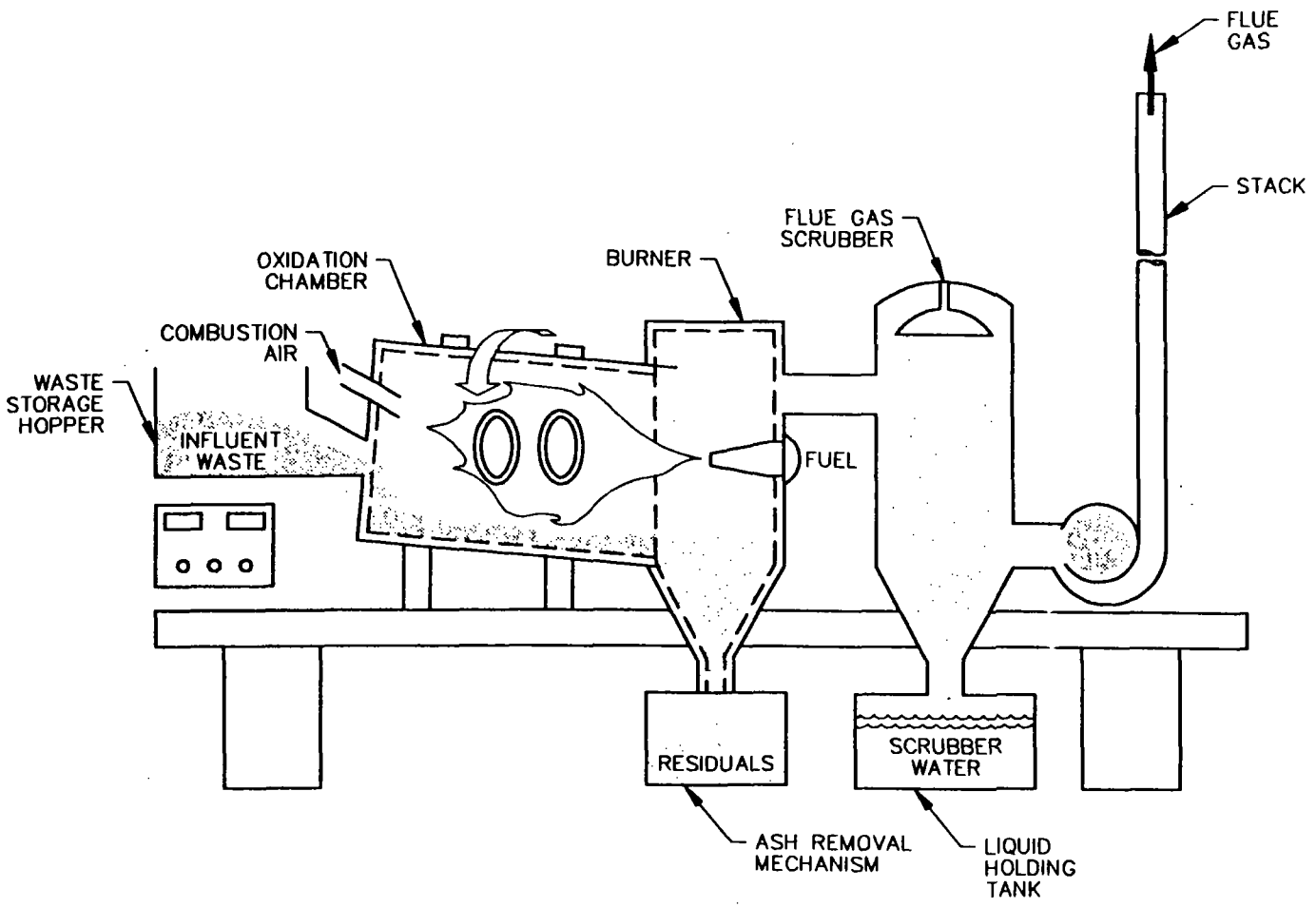
SOURCE: OGDEN ENVIRONMENTAL SERVICES INC.

figure 5.13

ON-SITE INCINERATION
SCHEMATIC OF CIRCULATING BED COMBUSTION
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

4770 (12) MAR 31/94(W) REV.0 (D-12)



SOURCE: GHASSAMI, YU AND QUINLIVAN, 1981

figure 5.14

OFF-SITE INCINERATION
SCHEMATIC OF ROTARY KILN
TEXTILE ROAD SITE.
Washtenaw County, Michigan

CRA

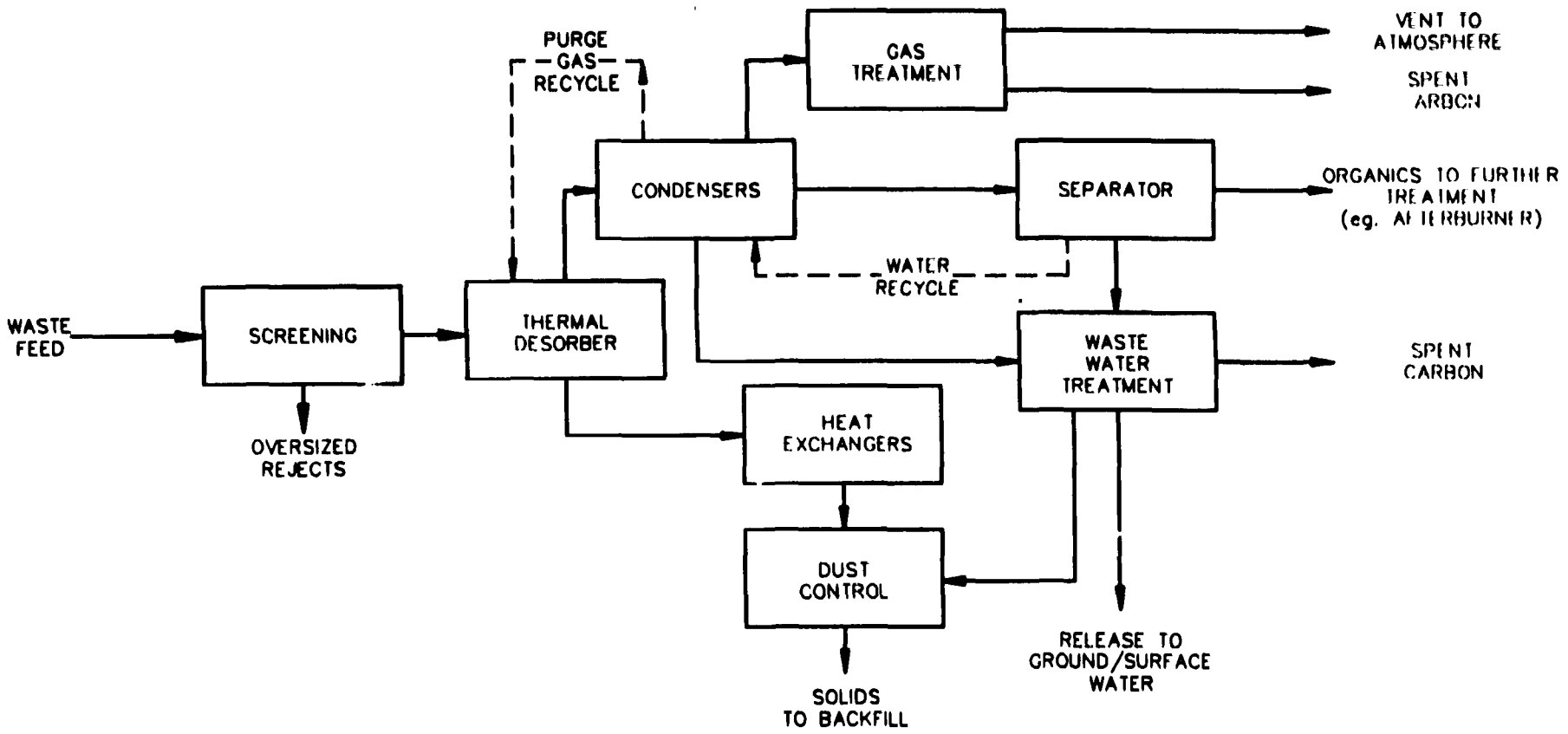
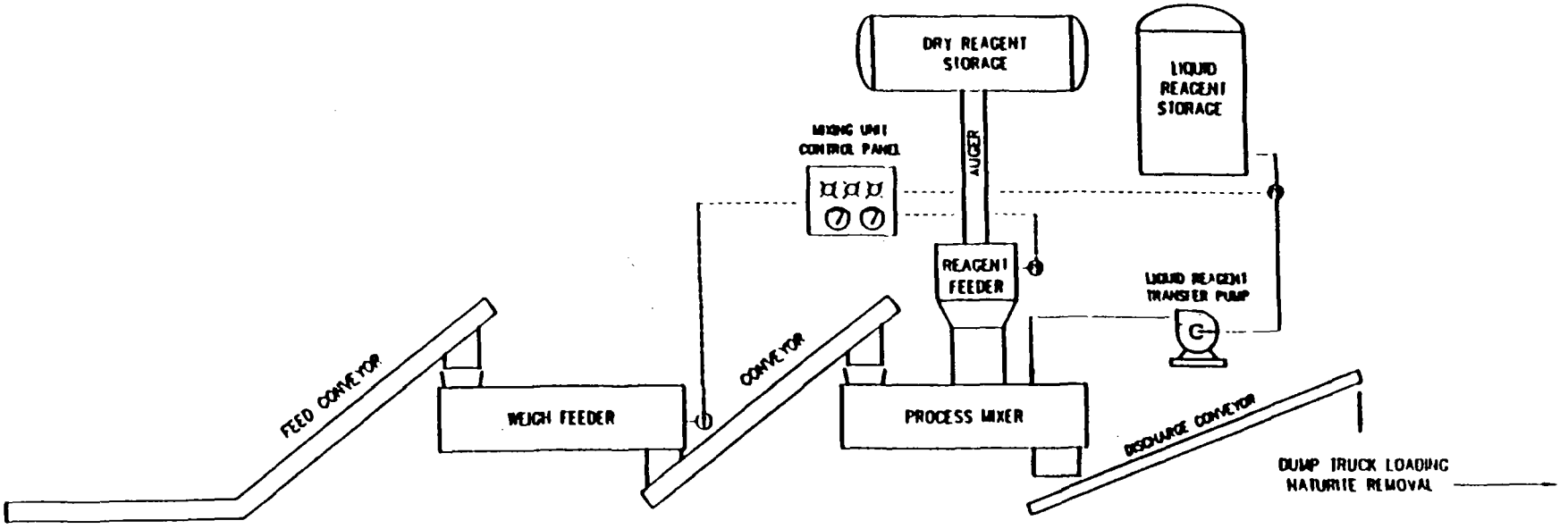


figure 5.15

THERMAL DESORPTION PROCESS
GENERAL FLOW DIAGRAM
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

4770 (12) MAR 31/94(W) REV.0 (C-08)



SOURCE: CHEMFIX TECHNOLOGIES INC.

figure 5.16

IN-SITU STABILIZATION/SOLIDIFICATION TECHNOLOGY
CONCEPTUAL FLOW DIAGRAM
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

4770 (12) MAR 09/94(W) REV.0

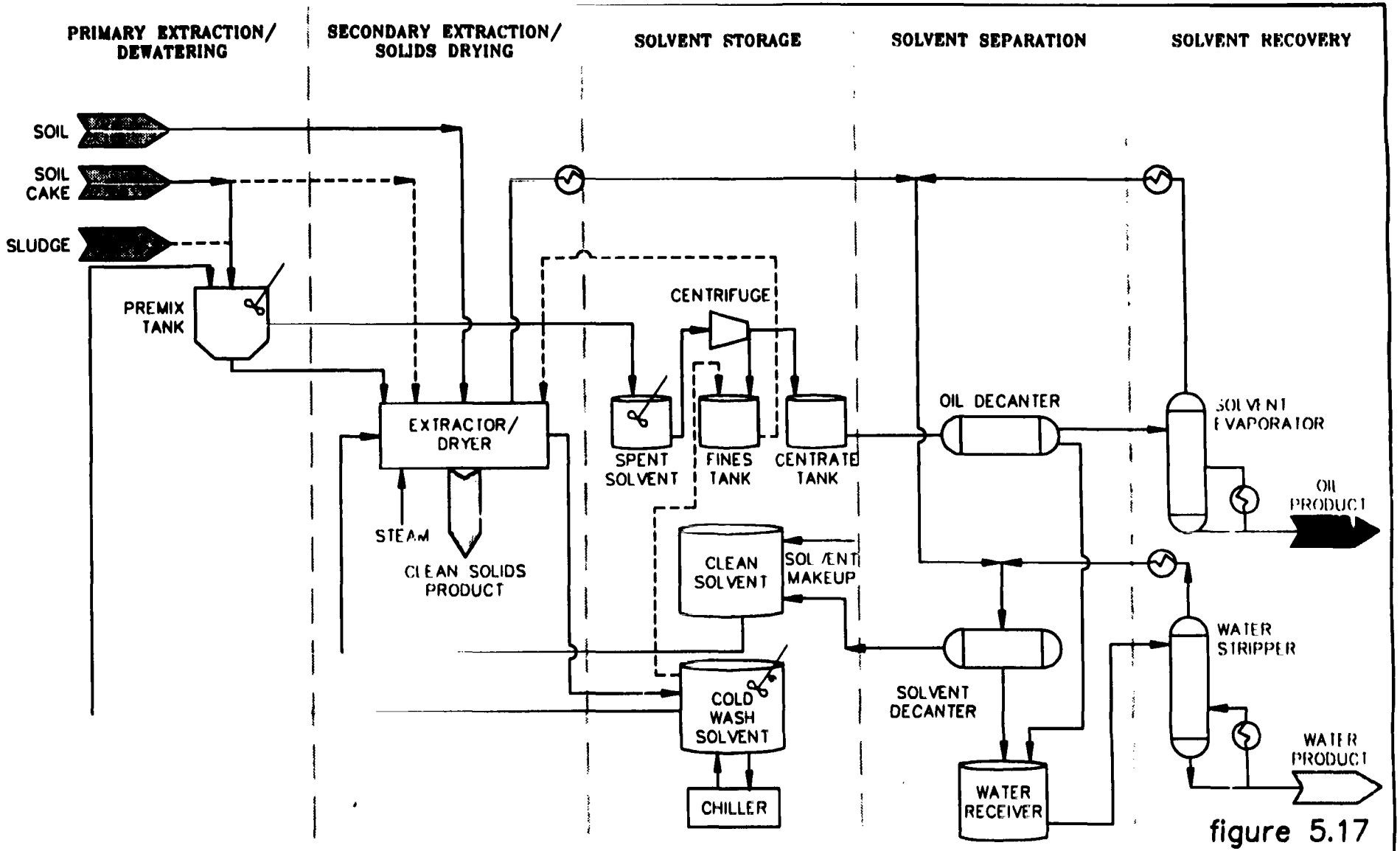


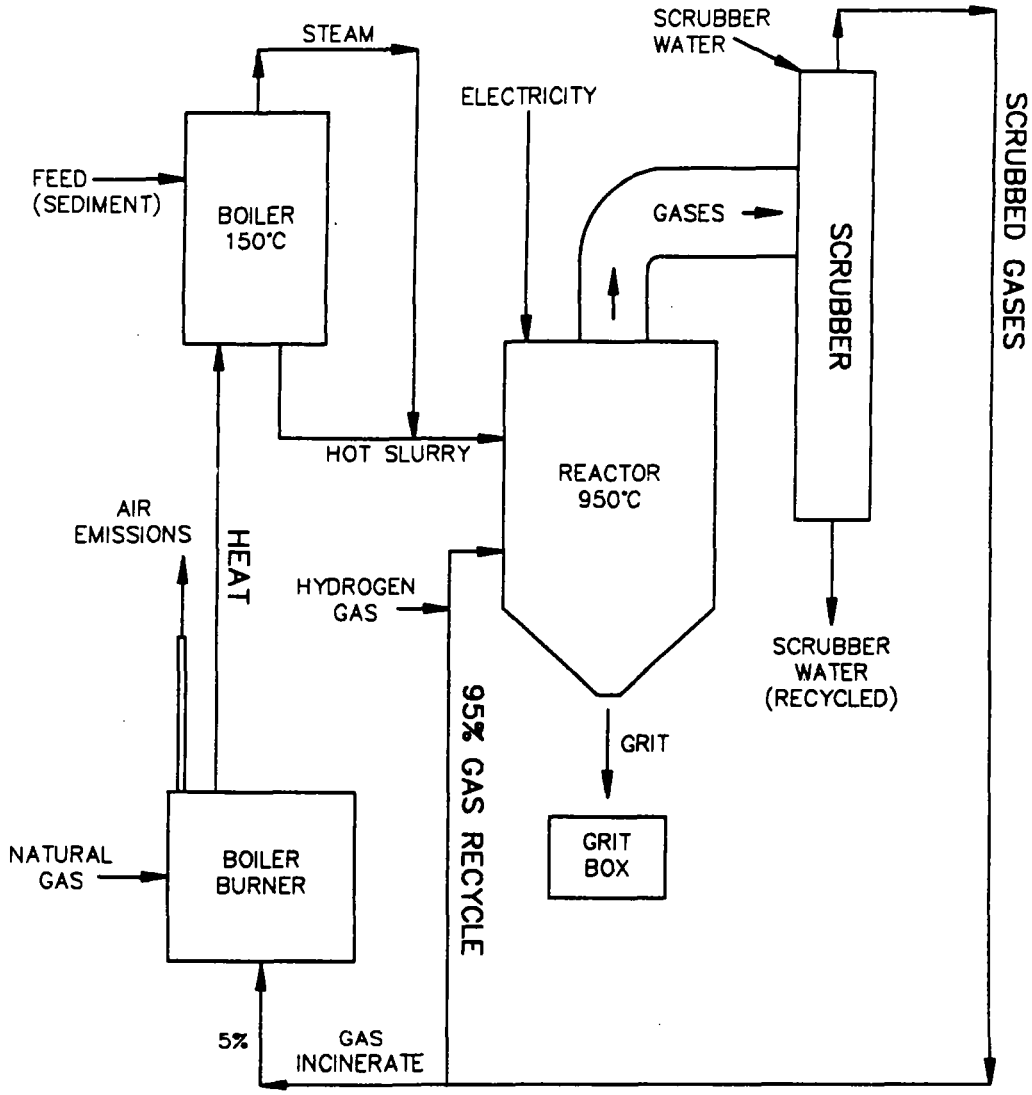
figure 5.17

SOURCE: APPLICATIONS ANALYSIS REPORT, USEPA 1992.

SOLVENT EXTRACTION
PROCESS FLOW SCHEMATIC
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

4770 (12) MAR 31/94(W) REV.0 (C-07)



SOURCE: ECOLOGIC PILOT-SCALE DEMONSTRATION IN HAMILTON HARBOUR DOCUMENT.

figure 5.18

GAS-PHASE CHEMICAL REDUCTION PROCESS
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

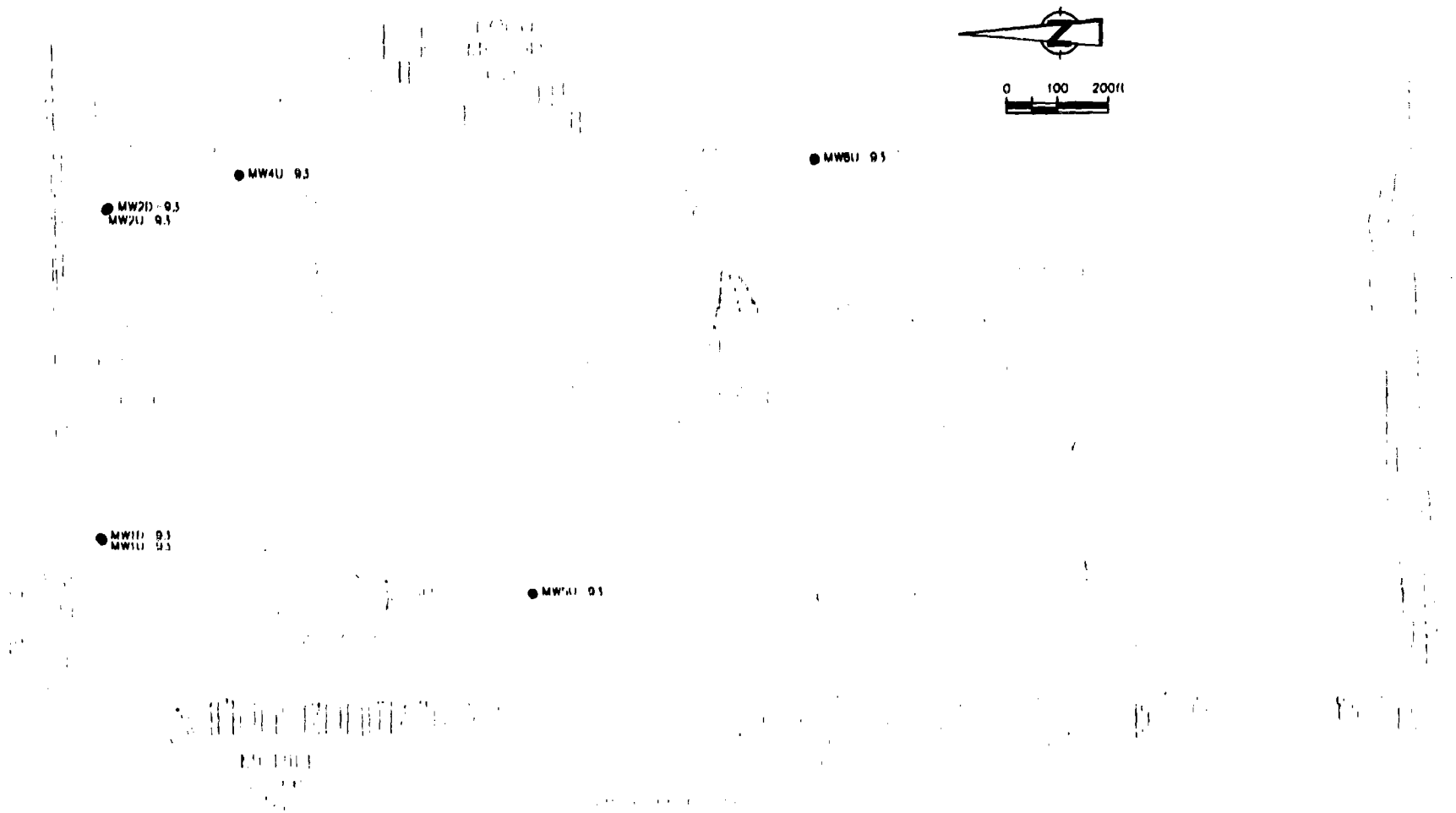
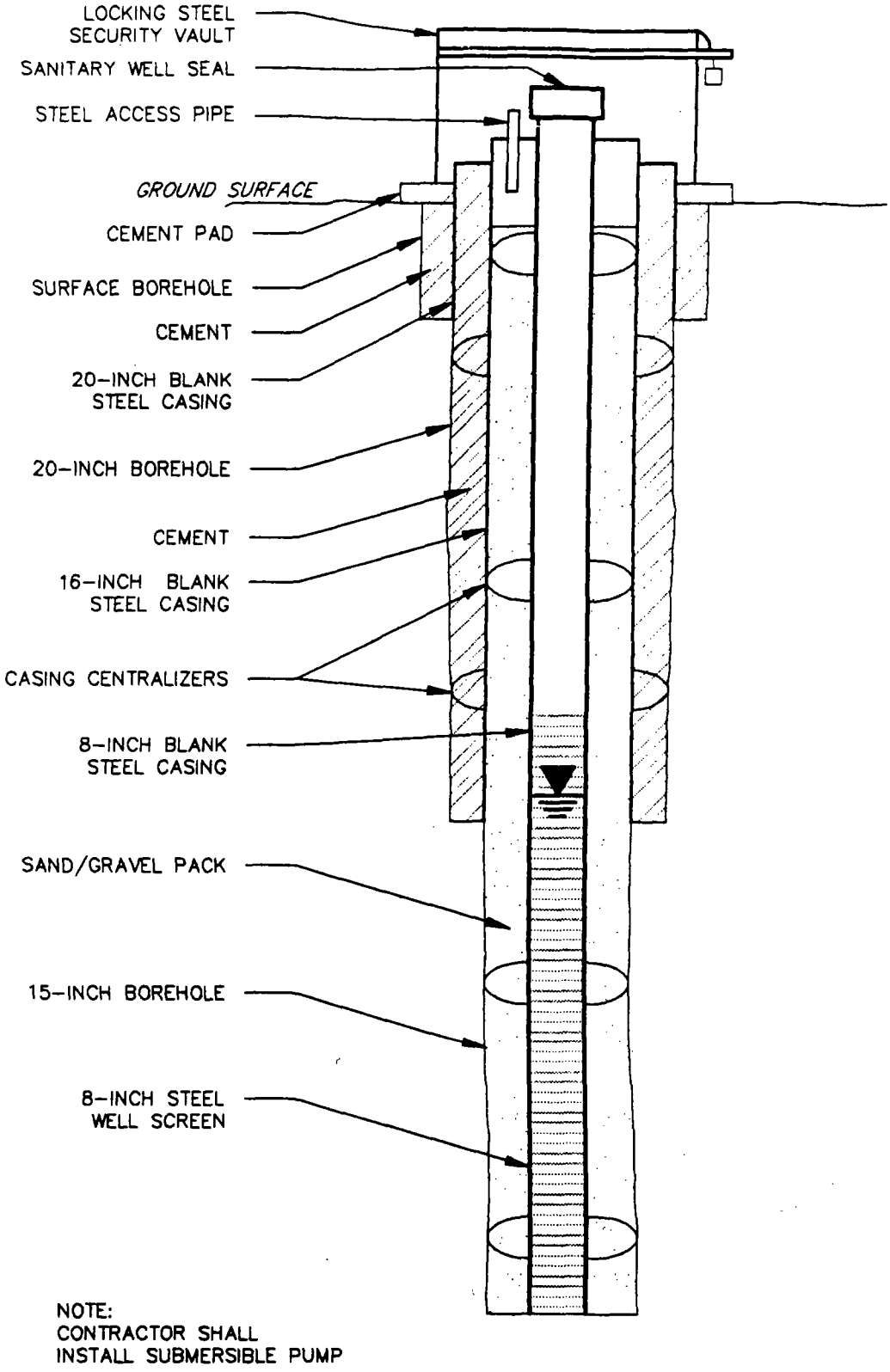


figure 7.1
MONITORING SAMPLE LOCATIONS
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA



NOTE:
CONTRACTOR SHALL
INSTALL SUBMERSIBLE PUMP

figure 7.2

TYPICAL EXTRACTION WELL INSTALLATION
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA

4770 (12) MAR 31/94(W) REV.0 (D-14)

TABLE 3.1

RANGE OF SURFACE AND BOREHOLE SOIL DETECTS
COMPARISON TO MICHIGAN TYPE B CLEANUP STANDARDS AND BACKGROUND CONCENTRATIONS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Parameter	# Occurrences/Analyses	Range (mg/kg)	(1) Michigan Type B (mg/kg)	Site-specific (2) Background Concentrations (mg/kg)	Exceedance of Michigan Type B and Background concentrations: Michigan Type B	Background Concentrations	COCs
PESTICIDES							
4,4' DDE	1/17	0.053	3.8	--			
4,4' DDT	1/17	0.023	3.8	--			
Aroclor-1254	42/98	0.061 - 310	1.0	0.021	X	X	X
Aroclor-1260	18/98	0.064 - 24	1.0	0.021	X	X	X
VOC							
Acetone	10/14	0.012 - 6.2	7,800	0.009		X	
Benzene	1/14	0.008	13	0.007			
Bromomethane	1/14	0.5[J]	110	0.007		X	
2-Butanone	4/14	0.004 - 0.041	3,400	0.009		X	
Carbon Disulfide	3/14	0.001 - 0.27	8,400	0.007		X	
Chlorobenzene	1/14	0.005	1,500	0.007			
Ethylbenzene	3/14	0.002 - 0.46	7,500	0.007		X	
Methylene chloride	6/14	0.001[J] - 0.21	51	0.009		X	
4-Methyl-2-pentanone	1/14	0.008[J]	3,900	0.007			
Toluene	2/14	0.024[J] - 0.44[J]	17,000	0.007		X	
Xylenes (total)	4/14	0.001[J] - 0.20[J]	140,000	0.012		X	
BNA							
Acenaphthene	3/14	0.081[J] - 0.22[J]	45,000	0.205		X	
Anthracene	1/14	0.024[J] - 0.027[J]	240,000	0.205			
Benzo(a) anthracene	6/14	0.036 - 3.0	1.8	0.205	X	X	X
Benzo(b)fluoranthene	7/14	0.022[J] - 1.4[J]	1.8	0.205		X	
Benzo(g, h, i)perylene	3/14	0.038[J] - 0.11[J]	930	0.205			
Benzo(k)pyrene	3/14	0.055 - 0.65	0.33 (4)	0.205	X	X	X
Bis(2-ethylhexyl) phthalate	8/14	0.026[J] - 0.26[J]	92	0.043		X	
Butylbenzyl phthalate	2/14	0.055[J] - 1.2	41,000	0.205		X	
Chrysene	5/14	0.019[J] - 1.9[J]	180	0.423		X	
Dibenz(a, h) anthracene	1/14	0.11[J]	0.33 (4)	0.205			
Dibenzofuran	2/14	0.05[J] - 0.12[J]	--	0.205			
Di-n-butyl phthalate	1/14	0.048[J]	3,100	0.205			
Fluoranthene	6/14	0.02[J] - 3.3	31,000	0.205		X	
Fluorene	5/14	0.04[J] - 1.4[J]	31,000	0.205		X	
Hexachlorobenzene	2/14	0.024[J] - 0.05	0.80	0.205	X	X	X
Hexachlorobutadiene	1/14	0.19[J]	17	0.205			
Indeno(1,2,3-cd)pyrene	1/14	0.07[J]	0.18	0.205			
2-Methylnaphthalene	7/14	0.012[J] - 2.1[J]	630	0.205		X	
Naphthalene	7/14	0.030 - 1.0[J]	9,200	0.205		X	
N-Nitrosodiphenylamine	1/14	0.08[J]	78	0.205			
Phenanthrene	12/14	0.018 - 3.0[J]	930	0.356		X	
Pyrene	6/14	0.020 - 2.8	19,000	0.205		X	
			Michigan (1) Type B (mg/kg)		Michigan (1) Type B (mg/kg)		
INORGANICS							
Aluminum	16/16	608 - 42500	--	16552		X	
Antimony	1/16	14 - 24	91	7.58		X	
Arsenic	16/16	3.4[J] - 65	BKGRD	9.6	X	X	X
Barium	16/16	66 - 696	91000	62		X	
Beryllium	3/16	1.3 - 2.9	--	0.66		X	
Cadmium	2/16	1.3 - 2.9	130	0.66		X	
Calcium	14/16	1370 - 169000	--	168000		X	
Chromium	14/16	2.3 - 1750	74	16.4	X	X	X
Cobalt	3/16	14 - 78	ND	5.89	X	X	X
Copper	14/16	6.2 - 1800	9800	29		X	
Iron	14/16	2770 - 600000	--	21531		X	
Lead	14/16	7.7 - 280	400	17.5		X	
Magnesium	13/16	1560 - 16700	--	27128			
Manganese	16/16	148 - 4170	6200	600		X	
Mercury	2/16	0.19 - 0.28	78	0.07		X	
Nickel	11/16	10 - 443	20000	26.9		X	
Potassium	3/16	1260 - 1320	--	1933			
Selenium	1/16	1.9	1300	1.16		X	
Silver	1/16	2.6 - 4.8	1200	1.24		X	
Vanadium	16/16	12 - 105	--	27.7		X	
Zinc	16/16	12 - 448	86000	75		X	
Total Cyanide	6/16	0.26 - 14	5700	0.12		X	

Notes:

ND- Not Detected

-- - No value

(1) MERA Operations Memorandum #8: Type B Criteria, update June 21, 1994.

(2) Site-specific background level calculated in accordance with MERA Operational Memorandum #15, September 30, 1998. Background sample locations include BH-05, BH-06, BH-07, BH-08 and BH-09-03.

(3) MERA Operations Memorandum #15: Default Type A Cleanup Criteria, September 30, 1998.

(4) Default method detection limit of 0.33 mg/kg.

TABLE 3.2

BACKGROUND SOIL CONCENTRATIONS OF
POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Compound	*Concentration (µg/kg)*		
	Rural Soil	*Agricultural Soil*	*Urban Soil*
Acenaphthene	1.7	6	NA
Acenaphthylene	NA	5	NA
Anthracene	NA	11-13	NA
Benz(a)anthracene	5-20	56-110	169-59,000
Benzo(a)pyrene	2-1,300	4.6-900	165-220
Benzo(b)fluoranthene	20-30	58-220	15,000-62,000
Benzo(e)pyrene		53-130	60-14,000
Benzo(g,h,i)perylene	10-70	66	900-47,000
Benzo(k)fluoranthene	10-110	58-250	300-26,000
Chrysene	38.3	78-120	251-640
Fluoranthene	0.3-40	120-210	200-166,000
Fluorene	NA	9.7	NA
Indeno(1,2,3-c,d)pyrene	10-15	63-100	8,000-61,000
Phenanthrene	30.0	48-140	
Pyrene	1-19.7	99-150	145-147,000

a Derived from
IARC (1973)
White and Vanderslice (1980)
Windsor and Hites (1979)
Edwards (1983)
Butler et al. (1984)
Vogt et al. (1987)
Jones et al. (1987)

NA - Not available

TABLE 3.3

RANGE OF GROUNDWATER DETECTED ANALYTES - ROUND 1 AND ROUND 2
COMPARISON TO MICHIGAN TYPE B CLEANUP STANDARDS, FEDERAL MCLS AND BACKGROUND CONCENTRATIONS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Parameter	# Occurrences/# Analyses		Range (mg/L)	(1) Michigan Type B (mg/L)	(2) Federal MCLs (mg/L)	Site-specific (3) Background Concentrations (mg/L)	Exceedance of Michigan Type B, Federal MCLs and Background concentrations			COCs
	Round 1	Round 2					Michigan Type B	Federal MCLs	Background Concentrations	
PCB										
Aroclor-1254	1/6	1/6	0.0084 - 0.012	0.0002	0.0005	0.001	X	X		X
VOC										
Acetone	4/6	4/6	0.014 - 1.7	0.7	--	0.873	X		X	X
Benzene	1/6	1/6	0.002 - 0.009	0.0012	0.005	0.033	X			
Bromodichloromethane	1/6	0/6	0.002	0.001(4)	0.1 (p)	0.033	X			
Carbon Disulfide	0/6	1/6	0.001	0.77	--	0.033				
Chlorobenzene	2/6	2/6	0.002 - 0.044	0.13	0.1	0.033			X	
Chloroform	1/6	1/6	0.001 - 0.010	0.0056	0.1	0.033	X			
1,2-Dichloroethene (total)	1/6	0/6	0.010	0.077/0.12 (5)	0.07/0.1(5)	0.033				
Methylene chloride	4/6	0/6	0.001	0.0046	0.005	0.034				
Toluene	1/6	0/6	0.001	1.5	1.0	0.033				
Trichloroethene	1/6	1/6	0.001	0.0022	0.005	0.033				
Vinyl chloride	1/6	1/6	0.009 - 0.016	0.001 (4)	0.002	0.033	X	X		
Xylenes (total)	0/6	1/6	0.005	13	10	0.012				
BNA										
Acenaphthene	1/6	0/6	0.002	1.2	--	0.005				
Anthracene	2/6	1/6	0.001 - 0.002	7	--	0.005				
Benzo(a)anthracene	1/6	1/6	0.002 - 0.003	0.005 (4)	0.0001	0.005		X		
Benzo(b)fluoranthene	0/6	1/6	0.003	0.005 (4)	0.0017	0.005		X		
Benzo(k)fluoranthene	1/6	0/6	0.005	0.005 (4)	0.0002	0.005		X		
Benzo(a)pyrene	1/6	1/6	0.001 - 0.002	0.005 (4)	0.0002	0.005		X		
Bis(2-ethylhexyl)phthalate	1/6	1/6	0.006J3 - 0.42B	0.005 (4)	0.006	0.17	X	X	X	X
Chrysene	1/6	1/6	0.003J	0.005 (4)	0.0002 (p)	0.005		X		
Di-n-butyl phthalate	1/6	1/6	0.001J - 0.002J	0.84	--	0.005				
Fluoranthene	2/6	1/6	0.002J - 0.008J	0.84	--	0.005			X	
Fluorene	1/6	1/6	0.002J	0.84	--	0.005				
Naphthalene	1/6	1/6	0.004J - 0.007J	0.25	--	0.005			X	
Phenanthrene	2/6	1/6	0.003J - 0.011J	0.025	--	0.025				
Pyrene	2/6	1/6	0.002J - 0.006J	0.52	--	0.005				

TABLE 3.3

RANGE OF GROUNDWATER DETECTED ANALYTES - ROUND 1 AND ROUND 2
COMPARISON TO MICHIGAN TYPE B CLEANUP STANDARDS, FEDERAL MCLS AND BACKGROUND CONCENTRATIONS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Parameter	# Occurrences/# Analyses Round 1	Round 2	Range (mg/L)	(1) Michigan Type B (mg/L)	(2) Federal MCLs (mg/L)	Site-specific (3) Background Concentrations (mg/L)	Exceedence of Michigan Type B, Federal MCLs and Background concentrations: Michigan Type B	Federal MCLs	Background Concentrations	COCs
Metals (Unfiltered)										
Aluminum	3/6	6/6	1.4 - 35.3	–	0.05-0.2 (s)	48.92				
Arsenic	4/6	3/6	0.010 - 0.067	0.00002/BKD (6)	0.05	0.022	X	X	X	X
Barium	5/6	4/6	0.213 - 2.1	2.4/BKD (6)	2	3.473				
Beryllium	1/6	1/6	0.005 - 0.007	–	0.004	0.003		X	X	X
Calcium	6/6	6/6	73 - 770	–	–	386.95			X	
Chromium	6/6	6/6	0.011 - 0.19	0.12/BKD (6)	0.1	0.303		X		
Cobalt	0/6	1/6	0.068	–	–	0.025			X	
Copper	6/6	6/6	0.03 - 0.23	1.3/BKD (6)	1.3 (AL)	0.178			X	
Iron	6/6	6/6	3.4 - 113	–	0.3 (s)	89.66			X	
Lead	6/6	6/6	0.005 - 0.22	0.004/BKD (6)	0.015 (AL)	0.067	X	X	X	X
Magnesium	6/6	6/6	17 - 220	–	–	96.55			X	
Manganese	6/6	6/6	0.077 - 2.4	0.17/BKD (6)	–	1.532	X		X	X
Mercury	1/6	1/6	0.00031 - 0.0006	0.0021/BKD (6)	0.002	0.0001			X	
Nickel	4/6	3/6	0.042 - 0.183	0.53/BKD (6)	0.1	0.157		X	X	X
Potassium	6/6	6/6	6.19 - 60	–	–	83.08				
Sodium	6/6	6/6	10.4 - 77	150	–	63.74			X	
Vanadium	2/6	2/6	0.06 - 0.10	0.061/BKD (6)	–	0.102				
Zinc	6/6	6/6	0.04 - 1.3	2.3/BKD (6)	5.0 (s)	2.074				
Metals (Filtered)										
Beryllium	0/6	1/6	0.0053	–	0.004	0.0025		X	X	X
Calcium	6/6	6/6	49 - 360	–	–	241.17			X	
Chromium	5/6	0/6	0.04 - 0.12	0.12/BKD (6)	0.1	0.074		X	X	X
Iron	6/6	6/6	0.25 - 10	–	0.3 (s)	6.2			X	
Lead	0/6	0/6	–	0.004/BKD (6)	0.015 (AL)	0.008				
Magnesium	6/6	6/6	12 - 130	–	–	45.72			X	
Manganese	6/6	6/6	0.020 - 0.82	0.17/BKD (6)	–	0.3	X		X	X
Potassium	6/6	6/6	5.2 - 51	–	–	61.26				
Sodium	6/6	6/6	9.4 - 69	150	–	59.73			X	
Zinc	0/6	2/6	0.021 - 0.023	2.3/BKD (6)	5.0 (s)	0.01			X	

Notes:

ND - Not Detected
– - No value
(p) Proposed MCL
(s) Secondary MCL
(AL) Action Level
BKD - Background
(1) Health-based drinking water values - MERA Operation Memorandum #8: Type B Criteria, update January 1994.
(2) USEPA National Primary and Secondary Drinking Water Regulations, 40 CFR 141-3 (56 FR NO.20), July 17, 1992.
USEPA Quality Criteria for Water 1986, EPA 440/5-86-001, May 86 51 Federal Register 43665, Update Sept. 1987.
Drinking Water Regulations and Health Advisories. Office of Water, USEPA, Washington D.C., December 1993.
(3) Site-specific background level calculated in accordance with MERA Operational Memorandum #15, September 30, 1993.
Background sample locations include MW-3U-93, MW-6U-93 and MW-3D-93.
(4) Michigan Type B Acceptable Method Detection Limit (utilized as Type B Cleanup Level if greater than Type B value)
(5) Values represent cis-1,2-dichloroethene and trans-1,2-dichloroethene respectively.
(6) Background concentration is utilized as Type B Cleanup Level if it is greater than the Type B value.

TABLE 3.4

RANGE OF POND SEDIMENT DETECTS
COMPARISON TO NOAA SEDIMENT GUIDELINES AND BACKGROUND CONCENTRATIONS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Parameter	# Occurrences/# Analyses	Range (mg/kg)	NOAA (1) Long and Morgan effects ranges ER-L (mg/kg)	ER-M (mg/kg)	Site-specific Background Concentrations (2) (mg/kg)	Type B GSI (3)	Exceedence of Long and Morgan ER-L and Site-specific background concentrations ER-L	Site-specific Bkd	COCs
VOC									
Acetone	6/6	0.074 - 1.3	--	--	0.009	10.0		X	
Methylene chloride	6/6	0.003 - 0.022	--	--	0.009	1.2		X	
Toluene	3/6	0.002	--	--	0.007	2.2			
BNA									
Di-n-butyl phthalate	4/6	0.035 - 0.40	--	--	0.205	NA		X	NA
Metals									
Aluminum	6/6	770 - 2300	--	--	10552	NA			NA
Arsenic	2/6	2.1 - 5.4	33	85	9.6	0.028			
Calcium	6/6	36000 - 108000	--	--	168300	NA			NA
Chromium	5/6	3.7 - 8.8	80	145	16.4	1.5/0.15			1.5/0.15
Copper	4/6	8.1 - 17	70	390	29	0.37			
Iron	6/6	2100 - 6500	--	--	21531	NA			NA
Lead	6/6	1.9 - 11	35	110	17.5	0.13			
Magnesium	6/6	6900 - 20000	--	--	27128	NA			NA
Manganese	6/6	98 - 240	--	--	609	NA			NA
Nickel	3/6	10 - 26	30	50	26.9	1.1			
Zinc	6/6	12 - 29	120	270	75	1.6			

Notes:
-- - No value
ND - Not detected
(1) Long and Morgan effects ranges are used as guidelines for evaluating the potential for chemical constituents in sediments to cause adverse biological effects. If sediment contaminant concentrations are above ER-M, adverse effects on the biota are considered probable. If contaminant concentrations are between the ER-L and the ER-M, adverse effects are considered possible, and EPA recommends conducting sediment toxicity tests as a follow-up.
Reference: National Oceanic and Atmospheric Administration (NOAA). "The potential for Biological Effects of Sediment-sorbed Contaminants Tested in the National Status and Trends Program." NOAA Technical Memorandum NOS OMA 52, August 1991.
(2) Site specific background level calculated in accordance with MERA Operational Memorandum #15, September 30, 1993.
Background sample locations include BH-46, BH-47, BH-48 and BH-49-93.
(3) Michigan Type B GSI Values (June 21, 1994).

TABLE 3.5

SUMMARY OF CHEMICALS OF CONCERN
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Parameter	*Soils*	*Groundwater*	*Sediment*
PCB/Pesticides			
Aroclor-1254	X	X	
Aroclor-1260	X		
VOC			
Acetone		X	
BNA			
Benzo(a)pyrene	X		
Benzo(a)anthracene	X		
Hexachlorobenzene	X		
Bis(2-ethylhexyl)phthalate		X	
Metals (unfiltered)			
Arsenic	X	X	
Beryllium		X	
Chromium	X		
Cobalt	X		
Lead		X	
Manganese		X	
Nickel		X	
Metals (filtered)			
Beryllium		X	
Chromium		X	
Manganese		X	

TABLE 3.6

SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR SOILS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Parameter	*Surface (1)*			*Subsurface (2)*		
	Mean (mg/kg)	*Maximum (mg/kg)*	*95% UCL (mg/kg)*	*Mean (mg/kg)*	*Maximum (mg/kg)*	*95% UCL (mg/kg)*
PCBs						
Aroclor-1254	11.3	230	20.7	11	310	18.7
Aroclor-1260	0.9	24	1.8	0.7	24	1.2
BNAs						
Benzo(a)anthracene	0.12	0.09	0.18	1.1	3.0	2.4
Benzo(a)pyrene	0.15	0.1	0.20	1.3	0.65	3.0
Hexachlorobenzene	0.13	0.024	0.22	1.3	0.85	3.0
Metals						
Arsenic	13.2	65	28.9	11.8	65	19
Chromium	202	1750	648.3	114	1750	306
Cobalt	11.7	70	28.5	8.5	70	15.8

Notes:

(1) Mean and 95% UCL concentrations were calculated based on data collected from 0' to 4' BGS.
(2) Mean and 95% UCL concentrations were calculated based on data collected from 0' to 10' BGS.
95% UCL = 95th Percent Upper Confidence Limit of the Mean

TABLE 3.7

SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR GROUNDWATER
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Parameter	*Upper Water Table Zone*			*Lower Sands Aquifers*		
	Mean (1) (mg/L)	*Maximum (mg/L)*	*95% UCL (mg/L)*	*Mean (mg/L)*	*Maximum (mg/L)*	*95% UCL (mg/L)*
PCBs						
Aroclor-1254	0.13	0.012	0.32	ND	ND	ND
VOC						
Acetone	0.02	0.060	0.03	0.48	1.7	1.78
BNA						
Bis(2-ethylhexyl)phthalate	0.01	0.022	0.01	0.22	0.42	0.48
Metals (unfiltered)						
Arsenic	0.02	0.032	0.02	0.02	0.047	0.07
Beryllium	0.003	0.007	0.004	0.003	0.005	0.005
Lead	0.07	0.22	0.13	0.03	0.052	0.08
Manganese	1.42	2.4	1.91	0.80	1.545	2.17
Nickel	0.05	0.09	0.08	0.08	0.134	0.19
Metals (filtered)						
Beryllium	0.003	0.0053	0.005	–	–	–
Chromium	0.014	0.08	0.037	0.04	0.12	0.13
Manganese	0.56	0.82	0.77	0.05	0.081	0.10

Note:

(1) Arithmetic mean plus 3 X standard deviations (per MDNR guidance).

TABLE 3.8

SUMMARY OF PHYSICOCHEMICAL PROPERTIES AND TOXICITY DATA
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Parameter	*Molecular Wt.* (g/mol)	*Water Solubility* (mg/L)	*Vapor Pressure* (mm Hg)	*Henry's Law Constant* $atm \cdot m^3/mol$	K_{oc} (mL/g)	Log K_{ow} (L/kg)	*RfD* (mg/kg-d)	*CSF* 1/(mg/kg-d)
PCBs								
Aroclor-1254	3.3E+02	5.7E-02	7.71E-05	2.7E-03	5.3E+05	6.47E+00	7.0E-05	7.7E+00
Aroclor-1260	3.7E+02	8.0E-02	4.05E-05	7.1E-03	1.4E+08	7.15E+00	7.0E-05	7.7E+00
VOC								
Acetone	5.8E+01	1.00E+06	2.66E+02	3.97E-05	2.2E+00	-2.4E-01	1.0E-01	NA
BNA								
Benzo(a)anthracene	2.2829E+02	9.14 x 10-3	2.20 x 10-8	1.0 x 106	2.0E+05	5.61E+00	NA	7.3E-01
Benzo(a)pyrene	2.523E+02	3.8E+00	5.6×10^{-9}	4.9×10^{-7}	5.5E+06	6.06E+00	NA	7.3E+00
Bis(2-ethylhexyl)phthalate	3.9E+02	4.0E-01	1.2E+00	1.1E-05	1.0E+05	9.6E+00	2.0E-02	1.4E-02
Hexachlorobenzene	2.8479E+02	6.0E-03	1.089×10^{-5}	6.8×10^{-4}	1.2E+06	6.18E+00	8.0E-04	1.6E+00
Metals								
Arsenic	7.5E+01	Insoluble	NA	NA	NA	NA	3.0E-04	1.8E+00
Beryllium	9.0E+00	Insoluble	NA	NA	NA	NA	5.0E-03	4.3E+00
Chromium	5.2E+01	Insoluble	1.0E+00 (@ 1,616°C)	NA	NA	NA	1.0E+00	NA
Cobalt	5.9E+01	Insoluble	1.77E+00 (@ 1,910°C)	NA	NA	NA	NA	NA
Lead	2.1E+02	Insoluble	1.77E+00 (@ 1,000°C)	NA	NA	NA	1.4E-03	NA
Manganese	5.5E+01	Insoluble	1.0E+00 (@ 1,292°C)	NA	NA	NA	5.0E-03	NA
Nickel	5.9E+01	Insoluble	1.0E+00 (@ 1,810°C)	NA	NA	NA	2.0E-02	NA

Notes:

NA - Not Available.

Reference: U.S. Department of Health and Human Services. Public Health Service. Agency for Toxic Substances and Disease Registry. Groundwater Chemicals Desk Reference, John H. Montgomery, Linda M. Welkom, Lewis Publishers, Inc. 1990.
USEPA Integrated Risk Information System (IRIS), January 1994.

TABLE 3.9

SUMMARY OF LIFETIME CANCER RISKS AND
HAZARD INDICES
SURFACE SOIL EXPOSURE
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

SCENARIOS:	LIFETIME UPPERBOUND EXCESS CANCER RISK	
	MEAN	RME
Trespasser Exposure	6.14E-07	2.80E-06
Maintenance Worker Exposure	8.77E-07	2.20E-05

SCENARIOS:	HAZARD INDICIES	
	MEAN	RME
Trespasser Exposure	4.31E-03	1.77E-02
Maintenance Worker Exposure	1.13E-02	1.14E-01

TABLE 3.10

SUMMARY OF LIFETIME CANCER RISKS AND
HAZARD INDICES
SUBSURFACE SOIL EXPOSURE
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

SCENARIO:	LIFETIME UPPERBOUND EXCESS CANCER RISK	
	MEAN	RME
Construction Worker Exposure	9.19E-08	8.41E-07

SCENARIO:	HAZARD INDICES	
	MEAN	RME
Construction Worker Exposure	1.09E-02	9.64E-02

TABLE 3.11

SUMMARY OF LIFETIME CANCER RISKS AND
HAZARD INDICES
GROUNDWATER CONSUMPTION
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

SCENARIO: Groundwater Consumption (1)	LIFETIME UPPERBOUND EXCESS CANCER RISK		HAZARD INDICIES	
	MEAN	RME	MEAN	RME
Unfiltered Metals:				
Drinking Water (upper water table zone)	1.44E-03	8.83E-03	2.18E+01	5.02E+01
Drinking Water (lower sands aquifer)	8.28E-05	5.35E-04	2.80E+00	7.60E+00
Filtered Metals:				
Drinking Water (upper water table zone)	1.40E-03	8.69E-03	1.90E+01	4.63E+01
Drinking Water (lower sands aquifer)	4.26E-06	2.32E-05	2.59E-01	6.06E-01

Note:

(1) Assumes a future industrial groundwater utilization.

POTENTIAL ARARs FOR THE TEXTILE ROAD SITE WASHTENAW COUNTY, MICHIGAN

Law or Regulation	*Reference*	*Ambient or Chemical Specific ARAR*	*Performance, Design or Action Specific ARAR*	*Location Specific ARAR*	*Comments*
FEDERAL					
1. CERCLA/SARA	42 USC 9601 et. seq.	Applicable, relevant and appropriate requirements under Section 121 of SARA	Applicable, relevant and appropriate requirements of 40 CFR 300.68 (NCP) and 40 CFR 300.415 (NCP)	N/A	Both removal and remedial actions
2. RCRA Subtitle D	40 CFR 257	N/A	Set standards for land disposal facilities for non-hazardous waste	N/A	Administered by MDNR under Act 641
3. RCRA Subtitle C	40 CFR 260-267	N/A	Regulates the generation, transport, storage, treatment and disposal of hazardous wastes generated in the course of remedial action. Regulates the construction, design, monitoring, operation and closure of hazardous waste facilities	N/A	Administered by MDNR under Act 64
4. RCRA Land Disposal Restrictions (LDRs)	40 CFR 268	N/A	Prohibits land disposal for PCB soils greater than 50 ppm in RCRA Subtitle C landfill facilities	N/A	Applicable in some circumstances if remedial action involved unearthing, treating and redisposing of hazardous waste
5. Toxic Substances Control Act (TSCA)	40 CFR 761	N/A	Applicable to transport and disposal of PCB wastes greater than 50 ppm	N/A	Applicable to PCBs at Site if unearthed and redisposed at a permitted off-Site TSCA facility
6. Clean Air Act	40 CFR 50 and 52	Establishes Ambient Air Quality Standards	Implements and sets rules for a regional air pollution control program. Applicable to air emissions from any on-site treatment alternatives	N/A	Administered by MDNR under Act 348
7. Safe Drinking Water Act		Regulates drinking water quality using MCLs and MCLGs	Applicable to groundwater MCLs and water which may be consumed after any treatment alternative	N/A	

TABLE 4.1

POTENTIAL ARARs FOR THE
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

	Law or Regulation	*Reference*	*Ambient or Chemical Specific ARAR*	*Performance, Design or Action Specific ARAR*	*Location Specific ARAR*	*Comments*
8.	Worker Safety and Health Protection	Occupational Safety and Health Administration (OSHA)	N/A	Worker safety during remedial construction	N/A	Always applicable
9.	Hazardous Materials Regulations	49 CFR 170 to 179	N/A	Applicable to transportation of hazardous materials	N/A	Applicable if removal action includes off-Site transport
10.	Regulations for Hazardous Waste Generators and Transporters	40 CFR 262 and 263	N/A	Establishes responsibilities for transporters of hazardous waste in handling, transportation and management of the waste. Sets requirements for manifesting, recordkeeping, and emergency response action in case of spill	N/A	Applicable if removal action includes off-Site transport
11.	POTW Discharge	40 CFR 403	N/A	Establishes pretreatment standards for controlling pollutants discharge to publicly-owned treatment works (POTWs)	N/A	
12.	Executive Order 12372	40 CFR 29	N/A	Requires state and local coordination and review of proposed EPA-assisted projects	N/A	Applicable to all Sites
13.	Executive Order 11988 and 11990 (Floodplains and Wetlands)	40 CFR 6 Subpart A	N/A	N/A	Requires federal agencies to avoid, whenever possible, adversely affecting floodplains or wetlands and to evaluate potential effects of actions in these designated areas	Applicable to designated flood plains and wetlands none identified on Site
14.	Fish and Wildlife Coordination Act	16 USC 1931	N/A	Protect fish and wildlife wherever federal actions result in the control or modification of a natural stream or body	N/A	Fish identified in Ponds 1, 2 and 3

POTENTIAL ARARs FOR THE TEXTILE ROAD SITE WASHTENAW COUNTY, MICHIGAN

	Law or Regulation	*Reference*	*Ambient or Chemical Specific ARAR*	*Performance, Design or Action Specific ARAR*	*Location Specific ARAR*	*Comments*
15.	Wild and Scenic Rivers Act	40 CFR 6.302 16 USC 1271	N/A	N/A	Requires that any rivers on the National Wildlife and Scenic River System or a study river on the National Rivers Inventory be identified	Site not located on a scenic river
16.	Endangered Species Act	50 CFR 402	N/A	Requires agency to consult with Fish and Wildlife Service if action may affect endangered species or critical habitat	N/A	No endangered species identified or believed to inhabit Site area.
17.	EPA National Primary Drinking Water Regulations	40 CFR 142	Regulates drinking water quality, using MCLs and MCLGs	N/A	N/A	No potable well present. Drinking water not impacted.
STATE OF MICHIGAN						
1.	Environment Response Act and Rules (101 to 1314)	Michigan Public Act 307	Establish acceptable cleanup levels for soil, groundwater, surface water and air	Provides for the identification, risk assessment and priority evaluation of environmental contamination sites in the State	N/A	Applicable parts to all environmental contamination sites
2.	Solid Waste Management Act and Regulations	Michigan Public Act 641	N/A	Regulates the disposal of non-hazardous solid waste	N/A	Applicable to non-hazardous materials generated at the Site
3.	Hazardous Waste Management Act and Rules	Michigan Public Act 64	N/A	Regulates the generation, transport, treatment, storage and disposal of hazardous waste	N/A	Applicable to hazardous residuals to Site
4.	Water Resources Commission Act	Michigan Public Act 245	Establishes surface water quality standards to protect public health and welfare, to enhance and maintain the quality of water, to protect State's natural resources	Establishes rules for groundwater quality. Requires hydrogeologic studies before allowing a discharge into groundwater and establishes monitoring requirements	N/A	Applicable to discharges to surface water

**POTENTIAL ARARs FOR THE
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN**

	Law or Regulation	*Reference*	*Ambient or Chemical Specific ARAR*	*Performance, Design or Action Specific ARAR*	*Location Specific ARAR*	*Comments*
5.	Liquid Industrial Waste Disposal Act	Michigan Public Act 136	N/A	Requires the use of a licensed liquid industrial waste hauler to transport any liquid waste off site	N/A	Applicable to off-Site transport of liquid waste
6.	Safe Drinking Water Act	Michigan Public Act 399	Establishes MCLs for specific contaminants in addition to or different from federal MCLs to protect drinking water quality	N/A	N/A	No potable well present. Drinking water not impacted.
7.	Soil Erosion and Sedimentation Control Act	Michigan Public Act 347	N/A	Requires a soil erosion and sedimentation plan for any earth changes of one or more acres and/or any earth changes within 500 feet of a lake of stream	N/A	Applicable to earthworks in the vicinity of Pond 1.
8.	Goemaere-Anderson Wetland Protection Act	Michigan Public Act 203	N/A	N/A	Regulates any activity within wetlands, specifically dredging, filling, and constructing, operating, or maintaining any use or development in a wetland	None identified on Site.
9.	Air Pollution Act	Michigan Public Act 348	N/A	Controls the emission of airborne contaminants to protect human health or safety, animal life, plant life of significant economic value, or property or reasonable interference with the confortable enjoyment of life or property	N/A	Applicable to any air emissions that may result due to waste disturbance or treatment
10.	The Mineral Well Act (Sections 17 & 21)	Michigan Public Act 315	N/A	Regulates the installation of monitoring wells	N/A	A,'plicable to alternatives involving groundwater monitoring

POTENTIAL ARARs FOR THE TEXTILE ROAD SITE WASHTENAW COUNTY, MICHIGAN

Law or Regulation	*Reference*	*Ambient or Chemical Specific ARAR*	*Performance, Design or Action Specific ARAR*	*Location Specific ARAR*	*Comments*
11. Inland Lakes & Streams Act	Michigan Public Act 346	N/A	N/A	Regulates dredging and other construction within lakes and streams	Applicable to alternatives involving construction or dredging activities
12. Michigan Occupational Health and Safety Act (MIOSHA) (Parts 1-49)	Michigan Public Act 154	N/A	Worker safety during remedial construction	N/A	Applicable to on-Site activities
13. Michigan Vehicle Code (Section 257.722)		N/A	Governs maximum axle loading on highways	N/A	Applicable to all alternatives involving movement of equipment or materials over Michigan highways
14. Public Health Code (Part 127)	Michigan Public Act 368	N/A	Regulates installation of extraction wells	N/A	Applicable to alternatives involving groundwater extraction
15. The Waterworks and Sewerage Systems Act	Michigan Public Act 98	N/A	Regulates discharges to sewers or POTWs	N/A	Applicable to alternatives involving discharges to sewers or POTWs
16. Wetlands Policy	Commission Policy No. 4512	N/A	N/A	Establishes the importance of the protection of wetlands	Applicable to alternatives involving construction in wetlands areas

Notes:

(1) N/A - Not applicable

TABLE 5.1

POTENTIALLY APPLICABLE REMOVAL ACTIONS AND
ASSOCIATED TECHNOLOGIES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Applicable Response Action	*Removal Technology/Process Option*
No Action	• No Action
Limited Action	• Institutional Controls • Access Restriction
Physical Containment	• Capping • Groundwater Cut-off Wall
In Situ Treatment	• Biological Treatment • Soil Vapor Extraction • Soil Flushing/Solvent Washing • Vitrification • Stabilization/Solidification
Removal	• Excavation
Ex Situ Treatment	• Bioremediation • Low Temperature Thermal Desorption • Incineration • Advanced Electric Reactor • Stabilization/Solidification • Solvent Extraction • Gas-Phase Chemical Reduction
Disposal	• On Site • Off Site

TABLE 5.2

PRESCREENING OF POTENTIAL REMOVAL ACTIONS AND TECHNOLOGIES - SOIL TEXTILE ROAD SITE WASHTENAW COUNTY, MICHIGAN

General Response Actions	*Remedial Technology/Process Option*	*Screening Comments*	*Recommendations*
1. No Action	a) No Action	- required by the NCP - will not change existing conditions - soil with concentrations exceeding potential cleanup goals will remain at the Site.	- retained for further evaluation
2. Limited Action	a) Restricted Access and Institutional Controls	- will minimize potential future contact with chemicals in soil - soil with concentrations exceeding potential cleanup goals will remain at the Site.	- retained for further evaluation
3. Physical Containment Action	a) Capping	- will minimize potential contact with chemicals in surface soil (dermal contact and air pathways) - reduce infiltration and hence chemical loading to the groundwater - soil with concentrations exceeding potential cleanup goals will remain at the Site.	- retained for further evaluation
	- Normal Portland Cover	- surface cap - exposed to forces of nature - not conformant with desired land use (i.e. vegetative cover preferred)	- eliminated from further evaluation
	- Asphaltic Concrete Cover	- surface cap - exposed to forces of nature - not conformant with desired land use (i.e. vegetative cover preferred)	- eliminated from further evaluation

TABLE 5.2

PRESCREENING OF POTENTIAL REMOVAL ACTIONS AND TECHNOLOGIES - SOIL
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

General Response Actions	*Remedial Technology/Process Option*	*Screening Comments*	*Recommendations*
3. Physical Containment Action (Cont'd)	- Clay Cover (Act 64 Cap)	- protection against infiltration provided - infiltration layer protected against weathering - conformant with desired land use (i.e. vegetative cover)	- retained for further evaluation
	- Sprayed-On Cover	- surface cap - exposed to forces of nature - infiltration prevention impaired by weathering - not conformant with desired land use (i.e. vegetative cover preferred)	- eliminated from further consideration
	- Synthetic Cover	- uncertain design life - resistance to chemical degradation uncertain	- eliminated from further consideration
	b) Groundwater Cut Off Wall	- will provide physical barrier to potential chemical migration	- retained for further evaluation
	- Slurry Wall	- proven effective - highly chemical resistant	- retained for further evaluation

TABLE 5.2

PRESCREENING OF POTENTIAL REMOVAL ACTIONS AND TECHNOLOGIES - SOIL TEXTILE ROAD SITE WASHTENAW COUNTY, MICHIGAN

General Response Actions	*Remedial Technology/Process Option*	*Screening Comments*	*Recommendations*
3. Physical Containment Action (Cont'd)	- Grout Curtains	- more applicable to applications in rock - grout setting and durability problems could arise - integrity of wall questionable	- eliminated from further evaluation
	- Waterloo Barrier Wall	- easily installed - sealable joints prevent leakage of leachate - readily available - adequate for implementation in terms of Site geology and Site constituents	- retained for further evaluation
4. In situ Treatment	a) Biological - Bioremediation	- difficult to control environment - not effective for inorganics - PCBs are generally resistant to bioremediation	- eliminated from further evaluation
	b) Physical - Soil Vapor Extraction	- effective primarily for VOCs - ineffective for PCBs and inorganics	- eliminated from further evaluation
	- Soil flushing/Solvent Washing	- not effective in reducing PCBs and inorganics with low solubilities - requires hydraulic control - requires collection/disposal of solvent	- eliminated from further evaluation
	- Vitrification	- cost prohibitive - not a proven technology	- eliminated from further evaluation

TABLE 5.2

PRESCREENING OF POTENTIAL REMOVAL ACTIONS AND TECHNOLOGIES - SOIL
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

General Response Actions	*Remedial Technology/Process Option*	*Screening Comments*	*Recommendations*
4. In situ Treatment (Cont'd)	c) Stablilization/Solidification	- will reduce mobility of chemicals in soil (reduce leaching) - effective for organics and inorganics - proven cost-effective	- retained for further evaluation
5. Removal	a) Excavation	- may be cost prohibitive - removes source of contamination - soil may require dewatering depending on treatment technology employed - required to supplement ex situ treatment and disposal	- retained for further evaluation
6. Ex Situ Treatment	a) Biological - Bioremediation	- limited to wastes which are biologically degradable or are readily volatilized - not effective for inorganics - requires large surface area for landfarming - PCBs are generally resistant to bioremediation	- eliminated from further evaluation
6. Ex Situ Treatment (cont'd)	b) Physical - Low Temperature Thermal Desorption (LTTD)	- technically feasible - may require treatment of off-gas - effective for Site-related chemicals - potential for significant air emissions during excavation/ handling - separated oil must be incinerated - solids may require solidification	- retained for further evaluation

TABLE 5.2

PRESCREENING OF POTENTIAL REMOVAL ACTIONS AND TECHNOLOGIES - SOIL TEXTILE ROAD SITE WASHTENAW COUNTY, MICHIGAN

General Response Actions	*Remedial Technology/Process Option*	*Screening Comments*	*Recommendations*
	- Advanced Electrical Reactor	- requires waste stream to be free of solids, not applicable to soil	- eliminated from further
	- Incineration	- technically feasible - effective for organic constituents - potential for significant air emissions during excavation/ handling - not effective for inorganic constituents (special handling of ash)	- retained for further evaluation
	- Chemical Dechlorination	- unproven technology	- eliminated from further evaluation
	c) Stabilization/Solidification	- will reduce mobility of chemicals in soil (reduce leaching) - effective for organics and inorganics - proven cost-effective	- retained for further evaluation
6. Ex Situ Treatment (cont'd)	- Solvent Extraction	- removes contamination from soil - oil product waste stream must be collected and treated/ disposed.	- retained for further evaluation
	- Gas-Phase Chemical Reduction	- Similar treatment potential to LTTD - no potential for formation of dioxins or furans	- retained for further evaluation

TABLE 5.2

PRESCREENING OF POTENTIAL REMOVAL ACTIONS AND TECHNOLOGIES - SOIL
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

General Response Actions	*Remedial Technology/Process Option*	*Screening Comments*	*Recommendations*
7. Disposal Action	Disposal in RCRA/TSCA Landfill (on Site or off Site)	- will remove soil from the Site (off-Site disposal only) - secures waste and minimizes future migration of contaminants - subject to TSCA and RCRA land ban regulations	- retained for further evaluation

TABLE 6.1

SCREENING EVALUATION SUMMARY OF REMOVAL TECHNOLOGIES

Category/Technology	*Effectiveness*	*Implementability*	*Cost*	*Screening Result*
• Monitoring	A1	A1	A1	Select
• Physical Containment				
a) Capping				
- clay	A1	A1	A1	Select
b) Vertical Containment Barriers (Groundwater Cut-Off Walls)				
- slurry walls	A1	A2	A1	Select
- sheet piles	A1	A1	A2	X
• Sludge/Soil Treatment				
a) In Situ Stabilization/Solidification	A3	A1	A1	Select
b) Ex-Situ Stabilization/Solidification	A3	A1	A1	Select
c) On-Site Incineration	A1	A3	A5	Select
d) Off-Site Incineration	A1	A4	A6	X
e) Low Temperature Thermal Desorption	A2	A3	A3	Select
f) Solvent Extraction	A3	A2	A2	Select
g) Gas-Phase Chemical Reduction	A2	A3	A4	Select
• Disposal				
a) On-Site Disposal	A3	A1	A1	Select
b) Off-Site Disposal	A1	A2	A2	Select

Notes:

A - Acceptable
1,2,3,4 - Relative in order of acceptability (1) highest - (6) lowest
N - Not acceptable/not feasible
X - Will not be considered for development of alternatives
Select - Selected for the development of alternatives

TABLE 7.1

REMOVAL ACTIONS, TECHNOLOGIES,
AND PROCESS OPTIONS DEEMED APPLICABLE
TO THE SITE CONSTITUENTS OF CONCERN
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Removal Action	*Technology*	*Process Option*
No Action	No Action	--
Limited Action	Limited Action	• Access Restriction • Institutional Controls
Physical Containment	Capping	• Act 64 Clay Cap
	Groundwater Cutoff Wall	• Soil-Bentonite Slurry Wall • Waterloo Barrier Wall
Removal	Excavation	• Excavation
Soil Treatment	--	• Solidification/Fixation (in-situ and ex-situ) • Low Temperature Thermal Desorption • On-Site incineration • Solvent Extraction • Gas-Phase Chemical Reduction
Disposal	--	• on Site • off Site

TABLE 8.1

DETAILED ANALYSIS CRITERIA AND FACTORS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Evaluation Criteria	*Evaluation Factors*
Overall Protection of Human Health and the Environment	• elimination, reduction or control of risks
Short-Term Impacts and Effectiveness	• protection of human health and environment during implementation • time required to achieve removal action objectives • protection of workers during removal actions
Long-Term Effectiveness and Permanence	• permanence of removal action alternatives • magnitude of residual risk • adequacy of controls imposed after removal action • reliability of controls imposed after removal action
Reduction of Toxicity, Mobility and Volume	• amount of hazardous material destroyed or treated • degree of expected reduction in toxicity, mobility or volume • degree to which treatment is irreversible • type and quantity of residuals remaining after treatment
Consideration of ARARs	• consideration of chemical specific ARARs • consideration of action specific ARARs • consideration of location specific ARARs
Implementability	• technical feasibility • administrative feasibility • availability of services and materials
Cost	• total capital costs • operation and maintenance costs • total present worth cost

TABLE 8.2

COST ESTIMATE FOR REMOVAL ALTERNATIVE 1
NO ACTION
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Capital Costs				
There are no capital costs associated with this alternative				$0.00
Operation and Maintenance (O&M) Annual Costs				
1. Groundwater Monitoring - 7 monitoring wells samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
Estimated Annual Operation and Maintenance Cost				$34,313.92
Contingency (20%)				$6,862.78
Total Annual Operation and Maintenance Cost				$41,176.71
Total Present Worth (30 Years at 10%)				$388,169.32
Total Present Worth Alternative 1				**$388,169.32**

TABLE 8.3

COST ESTIMATE FOR REMOVAL ALTERNATIVE 2
INSTITUTIONAL CONTROLS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Capital Costs				
1. Institutional Controls				
a) deed restrictions	-	L.S.	-	$100,000.00
Estimated Capital Cost				$100,000.00
Contingency (20%)				$20,000.00
Total Estimated Capital Cost				$120,000.00
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater Monitoring	2	Round	$5,800.00	$11,600.00
- 7 monitoring well samples analyzed for PCBs and Inorganics				
2. Soil Monitoring	2	Round	$3,900.00	$7,800.00
- 4 soil samples analyzed for PCBs and Inorganics				
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION & MAINTENANCE				
1. General Site Maintenance	-	L.S.	-	$5,500.00
- Institutional Controls				
Estimated Annual Operation and Maintenance Cost				$39,813.92
Contingency (20%)				$7,962.78
Total Annual Operation and Maintenance Cost				$47,776.71
Total Present Worth (30 Years at 10%)				$450,386.95
Total Present Worth Alternative 2				**$570,386.95**

TABLE 8.4

COST ESTIMATE FOR REMOVAL ALTERNATIVE 3A
CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
<u>Capital Costs</u>				
1. Institutional Controls				
a) deed restrictions	-	L.S	-	$100,000.00
2. Capping and Associated Works				
A. SITE PREPARATION				
a) clearing/ grubbing	14,500	sq.yd	$6.75	$97,875.00
B. MATERIAL AND CONSOLIDATION				
a) grading layer fill	30,000	cu.yd	$3.00	$90,000.00
b) select granular material	4,833	cu.yd	$6.00	$28,998.00
c) fill layer	9,667	cu.yd	$4.00	$38,668.00
d) clay	14,500	cu.yd	$6.00	$87,000.00
e) excavation and consolidation of contaminated soil	1,000	cu.yd	$5.00	$5,000.00
f) verification sampling (PCBs)	50	each	$100.00	$5,000.00
C. CAP CONSTRUCTION				
a) grading layer	30,000	cu.yd	$4.50	$135,000.00
b) surface water runoff diversion (ditching)	500	l.f	$10.00	$5,000.00
c) clay barrier	14,500	cu.yd	$4.50	$65,250.00
d) drainage layer	4,833	cu.yd	$4.50	$21,748.50
e) fill layer	9,677	cu.yd	$4.50	$43,546.50
f) imported topsoil	2,416	cu.yd	$11.00	$26,576.00
g) prairie grass	14,500	sq.yd	$0.75	$10,875.00
h) drainage structure and associated piping	-	L.S	-	$5,000.00
Estimated Capital Cost				$765,537.00
Contingency (20%)				$153,107.40
Total Estimated Capital Cost				$918,644.40

TABLE 8.4

COST ESTIMATE FOR REMOVAL ALTERNATIVE 3A
CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater Monitoring - 7 monitoring well samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION & MAINTENANCE				
1. General Site Maintenance - Institutional Controls	-	L.S.	-	$5,500.00
2. General Cap Maintenance	-	L.S.	-	$5,500.00
Estimated Annual Operation and Maintenance Cost				$45,313.92
Contingency (20%)				$9,062.78
Total Annual Operation and Maintenance Cost				$54,376.71
Total Present Worth (30 Years at 10%)				$512,604.59
Total Present Worth Alternative 3A				**$1,431,248.99**

TABLE 8.5

COST ESTIMATE FOR REMOVAL ALTERNATIVE 3B
CAPPING AND GROUNDWATER CUTOFF WALL
TEXTILE ROAD
WASHTENAW COUNTY, MICHIGAN

Item	Quantity	Unit	Unit Cost	Cost
Capital Costs				
1. Institutional Controls				
a) deed restrictions	-	L.S.	-	$100,000.00
2. Capping and Associated Works				
A. SITE PREPARATION				
a) clearing/ grubbing	14,500	sq.yd	$6.75	$97,875.00
B. MATERIAL AND CONSOLIDATION				
a) grading layer fill	30,000	cu.yd	$3.00	$90,000.00
b) select granular material	4,833	cu.yd	$6.00	$28,998.00
c) fill layer	9,667	cu.yd	$4.00	$38,668.00
d) clay	14,500	cu.yd	$6.00	$87,000.00
e) excavation and consolidation of site contaminated soil	1,000	cu.yd	$5.00	$5,000.00
f) verification sampling (PCBs)	50	each	$100.00	$5,000.00
C. CAP CONSTRUCTION				
a) grading layer	30,000	cu.yd	$4.50	$135,000.00
b) surface water runoff diversion (ditching)	500	l.f	$10.00	$5,000.00
c) clay barrier	14,500	cu.yd	$4.50	$65,250.00
d) drainage layer	4,833	cu.yd	$4.50	$21,748.50
e) fill layer	9,677	cu.yd	$4.50	$43,546.50
f) imported topsoil	2,416	cu.yd	$11.00	$26,576.00
g) prairie grass	14,500	sq.yd	$0.75	$10,875.00
h) drainage structure and associated piping	-	L.S	-	$5,000.00
3. Cutoff Wall and Associated Works				
a) slurry wall	23,250	sq. ft.	$8.00	$186,000.00
b) gradient control (monitoring well installation)	3	each	$10,000.00	$30,000.00
c) piping and controls	-	L.S.	-	$20,000.00
d) pre-treatment plant	-	L.S.	-	$100,000.00
e) forcemain to POTW	1,000	ft.	$35.00	$35,000.00
Estimated Capital Cost				$1,136,537.00
Contingency (20%)				$227,307.40
Total Estimated Capital Cost				$1,363,844.40

TABLE 8.5

COST ESTIMATE FOR REMOVAL ALTERNATIVE 3B
CAPPING AND GROUNDWATER CUTOFF WALL
TEXTILE ROAD
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Capital Costs				
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater Monitoring - 7 monitoring well samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION AND MAINTENANCE				
1. General Site Maintenance - Institutional Controls	-	L.S	-	$5,500.00
2. General Cap Maintenance	-	L.S	-	$5,500.00
3. Pre-treatment Plant Operation & Maintenance	-	L.S	-	$10,000.00
Estimated Annual Operation and Maintenance Cost				$55,313.92
Contingency (20%)				$11,062.78
Total Annual Operation and Maintenance Cost				$66,376.71
Total Present Worth (30 Years at 10%)				$625,727.56
Total Present Worth Alternative 3B				**$1,989,571.96**

TABLE 8.6

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4A
SOLIDIFICATION/STABILIZATION AND CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Capital Costs				
1. Institutional Controls				
a) deed restrictions	-	L.S.	-	$100,000.00
2. Capping and Associated Works				
A. SITE PREPARATION				
a) clearing/ grubbing	14,500	sq.yd	$6.75	$97,875.00
B. MATERIAL AND CONSOLIDATION				
a) grading layer fill	30,000	cu.yd	$3.00	$90,000.00
b) select granular material	4,833	cu.yd	$6.00	$28,998.00
c) fill layer	9,667	cu.yd	$4.00	$38,668.00
d) clay	14,500	cu.yd	$6.00	$87,000.00
e) excavation and consolidation of site contaminated soil	1,000	cu.yd	$5.00	$5,000.00
f) verification sampling (PCBs)	50	each	$100.00	$5,000.00
C. CAP CONSTRUCTION				
a) grading layer	30,000	cu.yd	$4.50	$135,000.00
b) surface water runoff diversion (ditching)	500	l.f	$10.00	$5,000.00
c) clay barrier	14,500	cu.yd	$4.50	$65,250.00
d) drainage layer	4,833	cu.yd	$4.50	$21,748.50
e) fill layer	9,677	cu.yd	$4.50	$43,546.50
f) imported topsoil	2,416	cu.yd	$11.00	$26,576.00
g) prairie grass	14,500	sq.yd	$0.75	$10,875.00
h) drainage structure and associated piping	-	L.S	-	$5,000.00
3. Solidification				
a) solidification of contaminated soil	28,000	ton	$75.00	$2,100,000.00
Estimated Capital Cost				$2,865,537.00
Contingency (20%)				$573,107.40
Total Estimated Capital Cost				$3,438,644.40

TABLE 8.6

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4A
SOLIDIFICATION/STABILIZATION AND CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater Monitoring - 7 monitoring well samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION AND MAINTENANCE				
1. General Site Maintenance - Institutional Controls	-	LS	-	$5,500.00
2. General Cap Maintenance	-	LS	-	$5,500.00
3. Pre-treatment Plant Operation & Maintenance	-	LS	-	$10,000.00
Estimated Annual Operation and Maintenance cost				$55,313.92
Contingency (20%)				$11,062.78
Total Annual Operation and Maintenance cost				$66,376.71
Total Present Worth (30 Years at 10%)				$625,727.56
Total Present Worth Alternative 4B				**$4,064,371.96**

TABLE 8.7

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4B
SOLIDIFICATION/STABILIZATION, CAPPING AND GROUNDWATER CUTOFF WALL
TEXTILE ROAD
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
<u>Capital Costs</u>				
1. Institutional Controls				
a) deed restrictions	-	L.S.	-	$100,000.00
2. Capping and Associated Works				
A. SITE PREPARATION				
a) clearing/ grubbing	14,500	sq.yd	$6.75	$97,875.00
B. MATERIAL AND CONSOLIDATION				
a) grading layer fill	30,000	cu.yd	$3.00	$90,000.00
b) select granular material	4,833	cu.yd	$6.00	$28,998.00
c) fill layer	9,667	cu.yd	$4.00	$38,668.00
d) clay	14,500	cu.yd	$6.00	$87,000.00
e) excavation and consolidation of site contaminated soil	1,000	cu.yd	$5.00	$5,000.00
f) verification sampling (PCBs)	50	each	$100.00	$5,000.00
C. CAP CONSTRUCTION				
a) grading layer	30,000	cu.yd	$4.50	$135,000.00
b) surface water runoff diversion (ditching)	500	l.f	$10.00	$5,000.00
c) clay barrier	14,500	cu.yd	$4.50	$65,250.00
d) drainage layer	4,833	cu.yd	$4.50	$21,748.50
e) fill layer	9,677	cu.yd	$4.50	$43,546.50
f) imported topsoil	2,416	cu.yd	$11.00	$26,576.00
g) prairie grass	14,500	sq.yd	$0.75	$10,875.00
h) drainage structure and associated piping	-	L.S	-	$5,000.00
3. Solidification				
a) solidification of contaminated soil	28,000	ton	$75.00	$2,100,000.00

TABLE 8.7

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4B
SOLIDIFICATION/STABILIZATION, CAPPING AND GROUNDWATER CUTOFF WALL
TEXTILE ROAD
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
4. Cutoff Wall and Associated Works				
a) slurry wall	23,250	sq. ft.	$8.00	$186,000.00
b) gradient control (monitoring well installation)	3	each	$10,000.00	$30,000.00
c) piping and controls	-	L.S.	-	$20,000.00
d) pre-treatment plant	-	L.S.	-	$100,000.00
e) forcemain to POTW	1,000	ft	$35.00	$35,000.00
Estimated Capital Cost				$3,236,537.00
Contingency (20%)				$647,307.40
Total Estimated Capital Cost				$3,883,844.40
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater Monitoring - 7 monitoring well samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION AND MAINTENANCE				
1. General Site Maintenance - Institutional Controls	-	LS	-	$5,500.00
2. General Cap Maintenance	-	LS	-	$5,500.00
3. Pre-treatment Plant Operation & Maintenance	-	LS	-	$10,000.00
Estimated Annual Operation and Maintenance cost				$55,313.92
Contingency (20%)				$11,062.78
Total Annual Operation and Maintenance cost				$66,376.71
Total Present Worth (30 Years at 10%)				$625,727.56
Total Present Worth Alternative 4B				**$4,509,571.96**

TABLE 8.8

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4C
SOLVENT EXTRACTION, SOLIDIFICATION/STABILIZATION AND CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Capital costs				
1. Institutional Controls				
a) deed restrictions	-	L.S.	$100,000.00	$100,000.00
2. Capping and Associated Works				
A. SITE PREPARATION				
a) clearing/ grubbing	14,500	sq.yd	$6.75	$97,875.00
B. MATERIAL AND CONSOLIDATION				
a) grading layer fill	30,000	cu.yd	$3.00	$90,000.00
b) select granular material	4,833	cu.yd	$6.00	$28,998.00
c) fill layer	9,667	cu.yd	$4.00	$38,668.00
d) clay	14,500	cu.yd	$6.00	$87,000.00
e) verification sampling (PCBs)	50	each	$100.00	$5,000.00
C. CAP CONSTRUCTION				
a) grading layer	30,000	cu.yd	$4.50	$135,000.00
b) surface water runoff diversion (ditching)	500	l.f	$10.00	$5,000.00
c) clay barrier	14,500	cu.yd	$4.50	$65,250.00
d) drainage layer	4,833	cu.yd	$4.50	$21,748.50
e) fill layer	9,677	cu.yd	$4.50	$43,546.50
f) imported topsoil	2,416	cu.yd	$11.00	$26,576.00
g) prairie grass	14,500	sq.yd	$0.75	$10,875.00
h) drainage structure and associated piping	-	L.S	-	$5,000.00
3. Solidification				
a) solidification of treated solids	28,000	ton	$75.00	$2,100,000.00
4. Solvent Extraction				
a) excavation of contaminated soil	18,600	cu.yd	$15.00	$279,000.00
b) solvent extraction	28,000	ton	$250.00	$7,000,000.00
c) water treatment	1,000,000	gallon	$0.20	$200,000.00
d) off Site incineration of oil product	280	ton	$1,200.00	$336,000.00
Estimated Capital Cost				$10,675,537.00
Contingency (20%)				$2,135,107.40
Total Estimated Capital Cost				$12,810,644.40

TABLE 8.8

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4C
SOLVENT EXTRACTION, SOLIDIFICATION/STABILIZATION AND CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater/ Surface Water Monitoring - 7 monitoring well samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION AND MAINTENANCE				
1. General Site Maintenance - Institutional Controls	-	L.S	-	$5,500.00
2. General Cap Maintenance	-	L.S	-	$5,500.00
Estimated Annual Operation and Maintenance cost				$45,313.92
Contingency (20%)				$9,062.78
Total Annual Operation and Maintenance cost				$54,376.71
Total Present Worth (30 Years at 10%)				$512,604.59
Total Present Worth Alternative 4C				**$13,323,248.99**

TABLE 8.9

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4D
GAS-PHASE CHEMICAL REDUCTION, SOLIDIFICATION/STABILIZATION AND CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Capital costs				
1. Institutional Controls				
a) deed restrictions	-	L.S.	$100,000.00	$100,000.00
2. Capping and Associated Works				
A. SITE PREPARATION				
a) clearing/ grubbing	14,500	sq.yd	$6.75	$97,875.00
B. MATERIAL AND CONSOLIDATION				
a) grading layer	30,000	cu.yd	$3.00	$90,000.00
b) granular material	4,833	cu.yd	$6.00	$28,998.00
c) fill layer	9,667	cu.yd	$4.00	$38,668.00
d) clay	14,500	cu.yd	$6.00	$87,000.00
e) verification sampling (PCBs)	50	each	$100.00	$5,000.00
C. CAP CONSTRUCTION				
a) grading layer	30,000	cu.yd	$4.50	$135,000.00
b) surface water runoff diversion (ditching)	500	l.f	$10.00	$5,000.00
c) clay barrier	14,500	cu.yd	$4.50	$65,250.00
d) drainage layer	4,833	cu.yd	$4.50	$21,748.50
e) fill layer	9,677	cu.yd	$4.50	$43,546.50
f) imported topsoil	2,416	cu.yd	$11.00	$26,576.00
g) prairie grass	14,500	sq.yd	$0.75	$10,875.00
h) drainage structure and associated piping	-	LS	-	$5,000.00
3. Solidification				
a) solidification of treated solids	28,000	ton	$75.00	$2,100,000.00
4. Gas Phase Chemical Reduction				
a) excavation of contaminated soil	18,600	cu.yd	$15.00	$279,000.00
b) gas phase chemical reduction	28,000	ton	$500.00	$14,000,000.00
c) water treatment	1,000,000	gallon	$0.20	$200,000.00
d) dewatering	18,600	cu.yd	$15.00	$279,000.00
Estimated Capital Cost				$17,618,537.00
Contingency (20%)				$3,523,707.40
Total Estimated Capital Cost				$21,142,244.40

TABLE 3.9

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4D
GAS-PHASE CHEMICAL REDUCTION, SOLIDIFICATION/STABILIZATION AND CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater Monitoring - 7 monitoring well samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION AND MAINTENANCE				
1. General Site Maintenance - Institutional Controls	-	LS	-	$5,500.00
2. General Cap Maintenance	-	LS	-	$5,500.00
Estimated Annual Operation and Maintenance cost				$45,313.92
Contingency (20%)				$9,062.78
Total Annual Operation and Maintenance cost				$54,376.71
Total Present Worth (30 Years at 10%)				$512,604.59
Total Present Worth Alternative 4D				**$21,654,848.99**

TABLE 8.10

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4E
LOW TEMPERATURE THERMAL DESORPTION, SOLIDIFICATION/STABILIZATION AND CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Capital costs				
1. Institutional Controls				
a) deed restrictions	-	L.S.	-	$100,000.00
2. Capping and Associated Works				
A. SITE PREPARATION				
a) clearing/ grubbing	14,500	sq.yd	$6.75	$97,875.00
B. MATERIAL AND CONSOLIDATION				
a) grading layer fill	30,000	cu.yd	$3.00	$90,000.00
b) select granular material	4,833	cu.yd	$6.00	$28,998.00
c) fill layer	9,667	cu.yd	$4.00	$38,668.00
d) clay	14,500	cu.yd	$6.00	$87,000.00
e) verification sampling (PCBs)	50	each	$100.00	$5,000.00
C. CAP CONSTRUCTION				
a) grading layer	30,000	cu.yd	$4.50	$135,000.00
b) surface water runoff diversion (ditching)	500	l.f	$10.00	$5,000.00
c) clay barrier	14,500	cu.yd	$4.50	$65,250.00
d) drainage layer	4,833	cu.yd	$4.50	$21,748.50
e) fill layer	9,677	cu.yd	$4.50	$43,546.50
f) imported topsoil	2,416	cu.yd	$11.00	$26,576.00
g) prairie grass	14,500	sq.yd	$0.75	$10,875.00
h) drainage structure and associated piping	-	L.S	-	$5,000.00
3. Solidification				
a) solidification of treated solids	28,000	ton	$75.00	$2,100,000.00
4. Low Temperature Thermal Desorption (LTTD)				
a) excavation of contaminated soil	18,600	cu.yd	$15.00	$279,000.00
b) dewatering	18,600	cu.yd	$15.00	$279,000.00
c) water treatment	1,000,000	gallon	$0.20	$200,000.00
d) LTTD of soil (including incineration of organics)	28,000	ton	$600.00	$16,800,000.00
Estimated Capital Cost				$20,418,537.00
Contingency (20%)				$4,083,707.40
Total Estimated Capital Cost				$24,502,244.40

TABLE 8.10

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4E
LOW TEMPERATURE THERMAL DESORPTION, SOLIDIFICATION/STABILIZATION AND CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater Monitoring - 7 monitoring well samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION AND MAINTENANCE				
1. General Site Maintenance - Institutional Controls	-	L.S	-	$5,500.00
2. General Cap Maintenance	-	L.S	-	$5,500.00
Estimated Annual Operation and Maintenance cost				$45,313.92
Contingency (20%)				$9,062.78
Total Annual Operation and Maintenance cost				$54,376.71
Total Present Worth (30 Years at 10%)				$512,604.59
Total Present Worth Alternative 4E				**$25,014,848.99**

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4F
ON-SITE INCINERATION, SOLIDIFICATION/STABILIZATION AND CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Capital Costs				
1. Institutional Controls				
a) deed restrictions	-	L.S.	-	$100,000.00
2. Capping and Associated Works				
A. SITE PREPARATION				
a) clearing/ grubbing	14,500	sq.yd	$6.75	$97,875.00
B. MATERIAL AND CONSOLIDATION				
a) grading layer fill	30,000	cu.yd	$3.00	$90,000.00
b) select granular material	4,833	cu.yd	$6.00	$28,998.00
c) fill layer	9,667	cu.yd	$4.00	$38,668.00
d) clay	14,500	cu.yd	$6.00	$87,000.00
e) excavation of contaminated soil	1,000	cu.yd	$5.00	$5,000.00
f) verification sampling (PCBs)	50	each	$100.00	$5,000.00
C. CAP CONSTRUCTION				
a) grading layer	30,000	cu.yd	$4.50	$135,000.00
b) surface water runoff diversion (ditching)	500	l.f	$10.00	$5,000.00
c) clay barrier	14,500	cu.yd	$4.50	$65,250.00
d) drainage layer	4,833	cu.yd	$4.50	$21,748.50
e) fill layer	9,677	cu.yd	$4.50	$43,546.50
f) imported topsoil	2,416	cu.yd	$11.00	$26,576.00
g) prairie grass	14,500	sq.yd	$0.75	$10,875.00
h) drainage structure and associated piping	-	L.S	-	$5,000.00
3. Solidification				
a) solidification of soil	28,000	ton	$75.00	$2,100,000.00
4. On-Site Incineration				
a) excavation of contaminated soil	18,600	cu.yd	$15.00	$279,000.00
b) dewatering	18,600	cu.yd	$15.00	$279,000.00
c) water treatment	1,000,000	gallon	$0.20	$200,000.00
d) on-site incineration	28,000	ton	$800.00	$22,400,000.00
Estimated Capital Cost				$26,023,537.00
Contingency (20%)				$5,204,707.40
Total Estimated Capital Cost				$31,228,244.40

COST ESTIMATE FOR REMOVAL ALTERNATIVE 4F
ON-SITE INCINERATION, SOLIDIFICATION/STABILIZATION AND CAPPING
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater Monitoring - 7 monitoring well samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION AND MAINTENANCE				
1. General Site Maintenance - Institutional Controls	-	L.S	-	$5,500.00
2. General Cap Maintenance	-	L.S	-	$5,500.00
Estimated Annual Operation and Maintenance cost				$45,313.92
Contingency (20%)				$9,062.78
Total Annual Operation and Maintenance cost				$54,376.71
Total Present Worth (30 Years at 10%)				$512,604.59
Total Present Worth Alternative 4F				**$31,740,848.99**

TABLE 8.12

COST ESTIMATE FOR REMOVAL ALTERNATIVE 5A
ON-SITE DISPOSAL
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Capital Costs				
1. Institutional Controls				
a) deed restrictions	-	L.S	-	$100,000.00
2. Capping and Associated Works				
A. SITE PREPARATION				
a) clearing/ grubbing	7,200	sq. yd.	$6.75	$48,600.00
B. MATERIAL AND CONSOLIDATION				
a) select granular material	3,100	cu. yd.	$6.30	$19,530.00
b) fill layer	4,650	cu. yd.	$6.30	$29,167.00
c) clay	13,200	cu. yd.	$6.30	$83,160.00
d) excavation and consolidation of contaminated soil	14,000	cu. yd.	$10.00	$140,000.00
e) verification sampling (PCBs)	100	each	$100.00	$10,000.00
f) dewatering	14,000	cu. yd.	$15.00	$210,000.00
g) water treatment	1,000,000	gallon	$0.20	$200,000.00
h) site restoration	7,200	sq. yd.	$7.50	$54,000.00
C. LINER CONSTRUCTION				
a) excavation for vault and stockpiling of soils	30,000	cu. yd.	$4.00	$120,000.00
b) 36" clay liner	6,250	cu. yd.	$4.50	$28,125.00
c) flexible membrane lines (60 mil HDPE)	56,000	sq. ft.	$0.65	$36,400.00
d) drainage layer	1,800	cu. yd.	$4.50	$8,100.00
e) leachate collection piping	1000	l.f	$20.00	$20,000.00
f) leachate treatment system	–	L.S.	–	$100,000.00
D. CAP CONSTRUCTION				
a) surface water runoff diversion (ditching)	500	l.f	$10.00	$5,000.00
b) clay barrier	6,950	cu. yd.	$4.50	$31,275.00
c) drainage layer	1,600	cu. yd.	$4.50	$7,200.00
d) fill layer	4,650	cu. yd.	$4.50	$20,925.00
e) imported topsoil	1,160	cu. yd.	$8.50	$9,860.00
f) prairie grass	6,944	sq. yd.	$0.75	$5,208.00
g) drainage structure and associated	-	L.S	-	$5,000.00
h) piping				
Estimated Capital Cost				$1,291,550.00
Contingency (20%)				$258,310.00
Total Estimated Capital Cost				$1,549,860.00

TABLE 8.12

COST ESTIMATE FOR REMOVAL ALTERNATIVE 5A
ON-SITE DISPOSAL
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater Monitoring - 7 monitoring well samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION & MAINTENANCE				
1. General Site Maintenance - Institutional Controls	-	L.S.	-	$5,500.00
2. General Cap Maintenance	-	L.S.	-	$5,500.00
3. Leachate Disposal	-	L.S.	-	$10,000.00
Estimated Annual Operation and Maintenance Cost				$55,313.92
Contingency (20%)				$11,062.78
Total Annual Operation and Maintenance Cost				$66,376.71
Total Present Worth (30 Years at 10%)				$625,727.56
Total Present Worth Alternative 5A				**$2,175,587.56**

TABLE 8.13

COST ESTIMATE FOR REMOVAL ALTERNATIVE 5B
OFF-SITE DISPOSAL
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Operation and Maintenance (O&M) Annual Costs				
A. MONITORING AND SITE EVALUATION				
1. Groundwater Monitoring - 7 monitoring well samples analyzed for PCBs and Inorganics	2	Round	$5,800.00	$11,600.00
2. Soil Monitoring - 4 soil samples analyzed for PCBs and Inorganics	2	Round	$3,900.00	$7,800.00
3. Annual Monitoring Report	-	L.S.	-	$10,000.00
4. Site Evaluation ($30,000 every 5 years)	-	L.S.	-	$4,913.92
B. GENERAL SITE OPERATION AND MAINTENANCE				
1. General Site Maintenance - Institutional Controls	-	L.S	-	$5,500.00
Estimated Annual Operation and Maintenance cost				$39,813.92
Contingency (20%)				$7,962.78
Total Annual Operation and Maintenance cost				$47,776.71
Total Present Worth (30 Years at 10%)				$450,386.95
Total Present Worth Alternative 5B				**$8,180,486.95**

TABLE 8.13

COST ESTIMATE FOR REMOVAL ALTERNATIVE 5B
OFF-SITE DISPOSAL
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Item	*Quantity*	*Unit*	*Unit Cost*	*Cost*
Capital Costs				
1. Institutional Controls				
a) deed restrictions	-	L.S.	$100,000.00	$100,000.00
2. Soil Excavation and associated work				
a) excavation of contaminated soil	18,600	cu. yd.	$15.00	$279,000.00
b) verification sampling (PCBs)	100	each	$100.00	$10,000.00
c) dewatering	18,600	cu. yd.	$15.00	$279,000.00
d) water treatment	1,000,000	gallon	$0.20	$200,000.00
E) site restoration	14,500	sq. yd.	$7.50	$108,750.00
3. Off-Site Incineration				
a) off-Site incineration	0 (1)	tons	$1,650.00	$0.00
b) transportation to incinerator	0 (1)	tons	$150.00	$0.00
4. Transportation and Disposal of TSCA Permitted Landfill	12,650	tons	$250.00	$3,162,500.00
5. Transportation and Disposal of RCRA Permitted Landfill	15,350	tons	$150.00	$2,302,500.00
Estimated Capital Cost				$6,441,750.00
Contingency (20%)				$1,288,350.00
Total Estimated Capital Cost				$7,730,100.00

Note:

(1) No soil containing PCBs at concentrations above 500 ppm were identified in the EOC Report.

TABLE 8.14

SUMMARY OF REMOVAL ACTION ALTERNATIVES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Alternative Identification	*Remedy Components*	*Short-Term Effectiveness*	*Long-Term Effectiveness*	*Reduction In Mobility, Toxicity or Volume*	*Technical Feasibility*	*Administrative Feasibility*	*Cost (1) [R299.5603(1)(f)]*	*Overall Protection of Human Health and the Environment*
Alternative 1 No Action	- monitoring program	yes	no -	no - least reduction in MTV - natural attenuation only	yes - easy to implement	no - not acceptable alone	$388,000 - lowest cost - Table 8.2	- unprotective
Alternative 2 Institutional Controls	- monitoring program - institutional controls • fence, warning signs • deed restrictions (or similar measures)	yes	no	no - least reduction in MTV - natural attenuation only	yes - easy to implement	yes	$570,000 - Table 8.3	- protective
Alternative 3A Capping	- monitoring program - institutional controls • fence, warning signs • Michigan Act 64 Clay Cap	yes	yes	yes - reduction in mobility	yes	yes	$1,431,000 - Table 8.4	- protective
Alternative 3B Capping, Groundwater Cutoff Wall	- monitoring program - institutional controls • fence, warning signs • Michigan Act 64 Clay Cap - groundwater cutoff wall - groundwater extraction within cutoff wall and pre-treatment	yes	yes	yes - reduction in mobility - reduction in volume	yes	yes	$1,990,000 - Table 8.5	- protective
Alternative 4A Stabilization/ Solidification, Capping	- monitoring program - institutional controls • fence, warning signs • Michigan Act 64 Clay Cap - in-situ stabilization/ solidification	yes	yes	yes - reduction in mobility	yes	yes	$4,064,000 - Table 8.6	- protective
Alternative 4B Stabilization/ Solidification, Capping, Groundwater Cutoff Wall	- monitoring program - institutional controls • fence, warning signs • Michigan Act 64 Clay Cap - in-situ stabilization/ solidification - groundwater cutoff wall - groundwater extraction within cutoff wall and pre-treatment	yes	yes	yes - reduction in mobility	yes	yes	$4,510,000 - Table 8.7	- protective

TABLE 8.14

SUMMARY OF REMOVAL ACTION ALTERNATIVES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Alternative Identification	*Remedy Components*	*Short-Term Effectiveness*	*Long-Term Effectiveness*	*Reduction in Mobility, Toxicity or Volume*	*Technical Feasibility*	*Administrative Feasibility*	*Cost (1) (R299.5603(1)(f))*	*Overall Protection of Human Health and the Environment*
Alternative 4C Solvent Extraction, Stabilization/ Solidification, Capping	- monitoring program - institutional controls • fence, warning signs • Michigan Act 64 Clay Cap - solvent extraction - stabilization/solidification of residuals - excavation of soil	no - risk associated with soil excavation	yes	yes - reduction in mobility, toxicity and volume	yes	yes	$13,323,000 - Table 8.8	- protective
Alternative 4D Gas-phase Chemical Reduction Stabilization/ Solidification, Capping	- monitoring program - institutional controls • fence, warning signs • Michigan Act 64 Clay Cap - excavation of soil - GPCR - stabilization/solidification of residuals	no - risk associated with soil excavation - off gases	yes	yes - reduction in mobility, toxicity and volume	yes - possible public acceptance problems	yes	$21,655,000 - Table 8.9	- protective
Alternative 4E Low Temperature Thermal Desorption, Stabilization/ Solidification, Capping	- monitoring program - institutional controls • fence, warning signs • Michigan Act 64 Clay Cap - excavation of soil - LTTD - stabilization/solidification of residuals	no - risk associated with soil excavation - off gases	yes	yes - reduction in mobility, toxicity and volume	yes	yes - possible public acceptance problems	$25,015,000 - Table 8.10	- protective
Alternative 4F On-Site Incineration Stabilization/ Solidification, Capping	- monitoring program - institutional controls • fence, warning signs • Michigan Act 64 Clay Cap - excavation of soil - Incineration - stabilization/solidification of residuals	no - risk associated with soil excavation - off gases	yes	yes - reduction in mobility, toxicity and volume	yes	yes - possible public acceptance problems	$31,741,000 - Table 8.11	- protective

TABLE 8.14

SUMMARY OF REMOVAL ACTION ALTERNATIVES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Alternative Identification	*Remedy Components*	*Short-Term Effectiveness*	*Long-Term Effectiveness*	*Reduction In Mobility, Toxicity or Volume*	*Technical Feasibility*	*Administrative Feasibility*	*Cost (1) [R299.5603(1)(f)]*	*Overall Protection of Human Health and the Environment*
Alternative 5A On-Site Disposal Liner and Cap	- monitoring program - institutional controls • fence, warning signs • Michigan Act 64 Clay Cap - liner - on-Site Landfill - excavation of soil - site restoration	no - risk associated with soil excavation	yes	yes - reduction in mobility	yes	yes	$2,176,000 - Table 8.12	- protective
Alternative 5B Soil Removal and Off-Site Disposal	- monitoring program - institutional controls - excavation of soil - off-Site disposal - Site restoration	no - risk associated with soil excavation risk associated with the transportation of soil off Site	yes	yes - reduction in mobility	yes	yes	$8,180,000 - Table 8.13	protective

Note:

(1) Cost based on conservative cleanup level for PCBs of 10 ppm.

APPENDIX E

STREAMLINED RISK ASSESSMENT CALCULATION TABLES

TABLE : 1

EXPOSURE SCENARIO FORMULA AND ASSUMPTIONS

EXPOSURE SCENARIO : TRESPASSER-SURFACE SOIL
SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS).
LOCATION : ON-SITE

$$\text{EQUATION : INTAKE (mg/kg-day)} = \frac{CS \times CF \times SA \times AF \times MF \times ABS \times EF \times ED}{AT \times BW} + \frac{CS \times IR \times ABS \times CF \times EF \times ED}{AT \times BW} \times PTF$$

where :
CS = Chemical Concentration in Soil (mg/kg)
IR = Ingestion Rate (mg soil/day)
SA = Skin Surface Area Available for Contact (cm2/event)
CF = Conversion Factor (10E-06 kg/mg)
EF = Exposure Frequency (days/years)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged -- days)
AF = Soil to Skin Adherence Factor (mg/cm2)
ABS = Absorption Factor (unitless)
MF = Matrix Factor; partt of chemical on soil that is in contact with skin (%/100)
PTF = Percent of Time Factor: Percent of time in contaminated area. (%/100)

VARIABLE ASSUMPTIONS	MEAN	RME	REFERENCES
CS (mg/kg)	MEAN	95th %	RAGS (1, 2)
IR - (mg/exposure)	100	100	RAGS (1, 2)
SA (cm2)	5230	5230	DEAP (3)
CF (kg/mg)	0.000001	0.000001	RAGS (1, 2)
EF- OLDER CHILD (days/year)	32	64	PROFESSIONAL JUDGEMENT
D- OLDER CHILD (CARCINOGEN) (yrs)	12	12	PROFESSIONAL JUDGEMENT
F-ADULT (days/year)	15	20	
ED-ADULT(days/year)	20	40	
ED - (NON-CARC.) (yr)	1	1	RAGS (1, 2)
BW (OLDER CHILD) kg	48	48	RAGS (1, 2)
BW (ADULT) kg	70	70	
AT (CARCINOGEN) (yrs x days/yr)	25550	25550	RAGS (1, 2)
AT (NON-CARCINOGEN) (yrs x days/yr)	365	365	RAGS (1, 2)
AF (mg/cm2)	0.5	1	DEAP (3)
MF	0.15	0.15	HAWLEY (4)
ABS ORAL (CHEMICAL SPECIFIC)			
DERMAL (CHEMICAL SPECIFIC)			
PTF	0.2	0.2	PROFESSIONAL JUDGEMENT

NOTE:
(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND MANUAL, DECEMBER 1989, EPA/540/1-89/002.
(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS", OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991
(3) EPA DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA/600/8-89/011B, JANUARY 1992.
(4) HAWLEY, J.K., "ASSESSMENT OF HEALTH RISK FROM EXPOSURE TO CONTAMINATED SOIL", RISK ANALYSIS, VOL.5 NO.4, 1985.

TABLE : 2

MEDIA CONCENTRATIONS AND CHEMICAL CONSTANTS

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS).
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : OLDER CHILDREN AND ADULTS (HIKERS AND HUNTERS)
EXPOSURE SCENARIO : TRESPASSER-SURFACE SOIL

	MEDIA CONCENTRATION				ORAL BIOAVAIL. FACTOR		DERMAL BIOAVAIL. FACTOR	
			ORAL	ORAL				
	MEAN	RME	CSF	RfD	MEAN	RME	MEAN	RME
PARAMETER	mg/kg	mg/kg	1/(mg/kg/d)	mg/kg/d	%/100	%/100	%/100	%/100
PCBs								
AROCLOR-1254	1.13E+01	2.07E+01	7.70E+00	7.0E-05	0.50	0.50	0.01	0.01
AROCLOR-1260	9.02E-01	1.77E+00	7.70E+00	7.0E-05	0.50	0.50	0.01	0.01
BASE/NEUTRAL								
BENZO (A) ANTHRACENE	1.23E-01	1.80E-01	7.30E-01	NA	0.50	0.50	0.01	0.01
BENZO (A) PYRENE	1.45E-01	1.97E-01	7.30E+00	NA	0.50	0.50	0.01	0.01
HEXACHLOROBENZENE	1.35E-01	2.24E-01	1.60E+00	8.00E-04	0.50	0.50	0.01	0.01
METALS								
ARSENIC	1.32E+01	2.89E+01	1.75E+00	3.00E-04	0.50	0.50	0.01	0.01
CHROMIUM	2.02E+02	6.48E+02	NA	1.00E+00	0.50	0.50	0.01	0.01
COBALT	1.17E+01	2.85E+01	NA	NA	0.50	0.50	0.01	0.01

A = NOT AVAILABLE

TABLE : 3

EXPOSURE, RISK AND HAZARD CALCULATIONS

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS).
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : OLDER CHILDREN AND ADULTS (HIKERS AND HUNTERS)
EXPOSURE SCENARIO : TRESPASSER-SURFACE SOIL

	LIFETIME AVERAGE DAILY INTAKE (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK		ANNUAL AVERAGE DAILY INTAKE (mg/kg/d)		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN	RME	MEAN	RME	MEAN	RME	MEAN	RME
PCBs								
AROCLOR-1254	5.86E-08	2.57E-07	4.51E-07	1.98E-06	2.23E-07	8.74E-07	3.18E-03	1.25E-02
AROCLOR-1260	4.68E-09	2.20E-08	3.60E-08	1.69E-07	1.78E-08	7.48E-08	2.54E-04	1.07E-03
BASE/NEUTRAL								
BENZO (A) ANTHRACENE	6.38E-10	2.24E-09	4.66E-10	1.63E-09	2.42E-09	7.61E-09	0.00E+00	0.00E+00
BENZO (A) PYRENE	7.52E-10	2.45E-09	5.49E-09	1.79E-08	2.86E-09	8.33E-09	0.00E+00	0.00E+00
HEXACHLOROBENZENE	7.00E-10	2.78E-09	1.12E-09	4.45E-09	2.66E-09	9.47E-09	3.32E-06	1.18E-05
METALS								
ARSENIC	6.83E-08	3.59E-07	1.20E-07	6.29E-07	2.60E-07	1.22E-06	8.65E-04	4.08E-03
CHROMIUM	1.05E-06	8.05E-06	0.00E+00	0.00E+00	3.97E-06	2.74E-05	3.97E-06	2.74E-05
COBALT	6.05E-08	3.54E-07	0.00E+00	0.00E+00	2.30E-07	1.21E-06	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		6.14E-07	2.80E-06	**HAZARD INDEX:**		4.31E-03	1.77E-02

TABLE : 4

SUMMARY TABLE

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS).
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : OLDER CHILDREN AND ADULTS (HIKERS AND HUNTERS)
EXPOSURE SCENARIO : TRESPASSER-SURFACE SOIL

	MEDIA CONCENTRATION		LIFETIME UPPER BOUND EXCESS CANCER RISK		HAZARD QUOTIENT CDI/RfD	
	MEAN	RME				
PARAMETER	mg/kg	mg/kg	MEAN	95th %	MEAN	95th %
PCBs						
AROCLOR-1254	1.13E+01	2.07E+01	4.51E-07	1.98E-06	3.18E-03	1.25E-02
AROCLOR-1260	9.02E-01	1.77E+00	3.60E-08	1.69E-07	2.54E-04	1.07E-03
BASE/NEUTRAL						
BENZO (A) ANTHRACENE	1.23E-01	1.80E-01	4.66E-10	1.63E-09	0.00E+00	0.00E+00
BENZO (A) PYRENE	1.45E-01	1.97E-01	5.49E-09	1.79E-08	0.00E+00	0.00E+00
HEXACHLOROBENZENE	1.35E-01	2.24E-01	1.12E-09	4.45E-09	3.32E-06	1.18E-05
METALS						
ARSENIC	1.32E+01	2.89E+01	1.20E-07	6.29E-07	8.65E-04	4.08E-03
CHROMIUM	2.02E+02	6.48E+02	0.00E+00	0.00E+00	3.97E-06	2.74E-05
COBALT	1.17E+01	2.85E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		6.14E-07	2.80E-06		
			HAZARD INDEX:		4.31E-03	1.77E-02

TABLE : 5

EXPOSURE SCENARIO FORMULA AND ASSUMPTIONS

EXPOSURE SCENARIO : MAINTENANCE WORKER
SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS)
LOCATION : ON-SITE

$$\text{EQUATION : INTAKE (mg/kg-day)} = \left[\frac{CS \times CF \times SA \times AF \times MF \times ABS \times EF \times ED}{BW \times AT} + \frac{CS \times IR \times ABS \times CF \times EF \times ED}{BW \times AT}\right] \times PTF$$

where :
CS = Chemical Concentration in Soil (mg/kg)
IR = Ingestion Rate (mg soil/day)
SA = Skin Surface Area Available for Contact (cm2/event)
CF = Conversion Factor (10E-06 kg/mg)
EF = Exposure Frequency (days/years)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged -- days)
AF = Soil to Skin Adherence Factor (mg/cm2)
ABS = Absorption Factor (unitless)
MF = Matrix Factor; part of chemical on soil that is in contact with skin (%/100)
PTF = Percent of Time Factor: Percent of time in contaminated area. (%/100)

VARIABLE ASSUMPTIONS	MEAN	RME	REFERENCES
CS (mg/kg)	MEAN	95th %	RAGS (1)
IR - ADULT (mg/exposure)	50	50	RAGS (1,2)
SA - ADULT) (cm2)	2000	2000	DEAP (3)
CF (kg/mg)	0.000001	0.000001	RAGS (1,2)
EF (days/year)	250	250	RAGS (1) & PROFESSIONAL JUDGEMENT
ED - (CARCINOGEN) (yrs)	10	25	RAGS (1,2)
ED - (NON-CARC.) (yr)	1	1	RAGS (1,2)
BW (ADULT) (kg)	70	70	RAGS (1,2)
AT (CARCINOGEN) (yrs x days/yr)	25550	25550	RAGS (1,2)
AT (NON-CARCINOGEN) (yrs x days/yr)	365	365	RAGS (1,2)
AF (mg/cm2)	0.5	1	DEAP (3)
MF	0.15	0.15	HAWLEY (4)
ABS ORAL (CHEMICAL SPECIFIC)			
DERMAL (CHEMICAL SPECIFIC)			
PTF	0.2	1	PROFESSIONAL JUDGEMENT

NOTE:
(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND MANUAL, DECEMBER 1989, EPA/540/1-89/002.
(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS". OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991
(3) EPA DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA/600/8-89/011B, JANUARY 1992.
HAWLEY, J.K. "ASSESSMENT OF HEALTH RISK FROM EXPOSURE TO CONTAMINATED SOIL", RISK ANALYSIS, VOL. 5, NO. 4, 1985.

TABLE : 6

MEDIA CONCENTRATIONS AND CHEMICAL CONSTANTS

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4" BGS)
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : MAINTENANCE WORKER

	MEDIA CONCENTRATION				ORAL BIOAVAIL. FACTOR		DERMAL BIOAVAIL. FACTOR	
PARAMETER	MEAN mg/kg	RME mg/kg	ORAL CSF 1/(mg/kg/d)	ORAL RfD mg/kg/d	MEAN %/100	RME %/100	MEAN %/100	RME %/100
PCBs								
AROCLOR-1254	1.13E+01	2.07E+01	7.70E+00	7.00E-05	0.50	0.50	0.01	0.01
AROCLOR-1260	9.02E-01	1.77E+00	7.70E+00	7.00E-05	0.50	0.50	0.01	0.01
BASE/NEUTRAL								
BENZO (A) ANTHRACENE	1.23E-01	1.80E-01	7.30E-01	NA	0.50	0.50	0.01	0.01
BENZO (A) PYRENE	1.45E-01	1.97E-01	7.30E+00	NA	0.50	0.50	0.01	0.01
HEXACHLOROBENZENE	1.35E-01	2.24E-01	1.60E+00	8.00E-04	0.50	0.50	0.01	0.01
METALS								
ARSENIC	1.32E+01	2.89E+01	1.75E+00	3.00E-04	0.50	0.50	0.01	0.01
BARIUM	2.02E+02	6.48E+02	NA	1.00E+00	0.50	0.50	0.01	0.01
COBALT	1.17E+01	2.85E+01	NA	NA	0.50	0.50	0.01	0.01

NA = NOT AVAILABLE

TABLE : 7

EXPOSURE, RISK AND HAZARD CALCULATIONS

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS)
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : MAINTENANCE WORKER

	LIFETIME AVERAGE DAILY INTAKE (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK		ANNUAL AVERAGE DAILY INTAKE (mg/kg/d)		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN	RME	MEAN	95th %	MEAN	95th %	MEAN	95th %
PCBs								
;OCLOR-1254	8.37E-08	2.02E-06	6.45E-07	1.56E-05	5.86E-07	5.66E-06	8.37E-03	8.09E-02
AROCLOR-1260	6.68E-09	1.73E-07	5.15E-08	1.33E-06	4.68E-08	4.84E-07	6.68E-04	6.91E-03
BASE/NEUTRAL								
BENZO (A) ANTHRACENE	9.11E-10	1.76E-08	6.65E-10	1.29E-08	6.38E-09	4.93E-08	0.00E+00	0.00E+00
BENZO (A) PYRENE	1.07E-09	1.92E-08	7.84E-09	1.40E-07	7.52E-09	5.38E-08	0.00E+00	0.00E+00
HEXACHLOROBENZENE	9.99E-10	2.19E-08	1.60E-09	3.51E-08	6.99E-09	6.13E-08	8.74E-06	7.67E-05
METALS								
:NIC	9.76E-08	2.83E-06	1.71E-07	4.95E-06	6.83E-07	7.93E-06	2.28E-03	2.64E-02
CHROMIUM	1.50E-06	6.34E-05	0.00E+00	0.00E+00	1.05E-05	1.78E-04	1.05E-05	1.78E-04
COBALT	8.65E-08	2.79E-06	0.00E+00	0.00E+00	6.05E-07	7.82E-06	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		8.77E-07	2.20E-05	HAZARD INDEX:		1.13E-02	1.14E-01

TABLE : 8

SUMMARY TABLE

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4" BGS)
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : MAINTENANCE WORKER

	MEDIA CONCENTRATION		LIFETIME UPPER BOUND EXCESS CANCER RISK		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN mg/kg	RME mg/kg	MEAN	95th %	MEAN	95th %
PCBs						
AROCLOR-1254	1.13E+01	2.07E+01	6.45E-07	1.56E-05	8.37E-03	8.09E-02
AROCLOR-1260	9.02E-01	1.77E+00	5.15E-08	1.33E-06	6.68E-04	6.91E-03
BASE/NEUTRAL						
BENZO (A) ANTHRACENE	1.23E-01	1.80E-01	6.65E-10	1.29E-08	0.00E+00	0.00E+00
BENZO (A) PYRENE	1.45E-01	1.97E-01	7.84E-09	1.40E-07	0.00E+00	0.00E+00
HEXACHLOROBENZENE	1.35E-01	2.24E-01	1.60E-09	3.51E-08	8.74E-06	7.67E-05
METALS						
ARSENIC	1.32E+01	2.89E+01	1.71E-07	4.95E-06	2.28E-03	2.64E-02
CADMIUM	2.02E+02	6.48E+02	0.00E+00	0.00E+00	1.05E-05	1.78E-04
COBALT	1.17E+01	2.85E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		8.77E-07	2.20E-05		
			HAZARD INDEX:		1.13E-02	1.14E-01

TABLE : 9

EXPOSURE SCENARIO FORMULA AND ASSUMPTIONS

EXPOSURE SCENARIO : CONSTRUCTION WORKER
SITE : TEXTILE ROAD SITE
SECTOR : SUB-SURFACE SOIL - ALL SAMPLES COLLECTED IN SITE AREA (0' - 10' BGS).
LOCATION : ON-SITE

$$\text{EQUATION : INTAKE (mg/kg-day)} = \frac{CS \times CF \times SA \times AF \times MF \times ABS \times EF \times ED}{BW \times AT} + \frac{CS \times IR \times ABS \times CF \times EF \times ED}{BW \times AT} \times PTF$$

where :
CS = Chemical Concentration in Soil (mg/kg)
IR = Ingestion Rate (mg soil/day)
SA = Skin Surface Area Available for Contact (cm2/event)
CF = Conversion Factor (10E-06 kg/mg)
EF = Exposure Frequency (days/years)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged -- days)
AF = Soil to Skin Adherence Factor (mg/cm2)
ABS = Absorption Factor (unitless)
MF = Matrix Factor; part of chemical on soil that is in contact with skin (%/100)
PTF = Percent of Time Factor: Percent of time in contaminated area. (%/100)

VARIABLE ASSUMPTIONS	MEAN	RME	REFERENCES
CS (mg/kg)	MEAN	95th %	
IR - ADULT (mg/exposure)	50	50	RAGS (1,2)
SA - ADULT) (cm2)	2000	2000	DEAP (3)
CF (kg/mg)	0.000001	0.000001	RAGS (1,2)
EF (days/year)	250	250	RAGS (1,2)
ED - (CARCINOGEN) (yrs)	1	1	RAGS (1)& PROFESSIONAL JUDGEMENT
ED - (NON-CARC.) (yr)	1	1	RAGS (1,2)
BW (ADULT) (kg)	70	70	RAGS (1,2)
AT (CARCINOGEN) (yrs x days/yr)	25550	25550	RAGS (1,2)
AT (NON-CARCINOGEN) (yrs x days/yr)	365	365	RAGS (1,2)
AF (mg/cm2)	0.5	1	DEAP (3)
MF	0.15	0.15	HAWLEY (4)
ABS ORAL (CHEMICAL SPECIFIC)			
DERMAL (CHEMICAL SPECIFIC)			
PTF	0.2	1	PROFESSIONAL JUDGEMENT

NOTE:
(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND MANUAL, DECEMBER 1989, EPA/540/1-89/002.
(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS", OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991
(3) EPA DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA/600/8-89/011B, JANUARY 1992.
(4) HAWLEY, J.K.. "ASSESSMENT OF HEALTH RISK FROM EXPOSURE TO CONTAMINATED SOIL", RISK ANALYSIS, VOL.5, NO.4, 1985.

TABLE : 10

MEDIA CONCENTRATIONS AND CHEMICAL CONSTANTS

SITE : TEXTILE ROAD SITE
SECTOR : SUB-SURFACE SOIL - ALL SAMPLES COLLECTED IN SITE AREA (0' - 10' BGS).
LOCATION : ON-SITE
MEDIA : SUB-SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : CONSTRUCTION WORKER

	MEDIA CONCENTRATION				ORAL BIOAVAIL. FACTOR		DERMAL BIOAVAIL. FACTOR	
PARAMETER	MEAN mg/kg	RME mg/kg	ORAL CSF 1/(mg/kg/d)	ORAL RfD mg/kg/d	MEAN %/100	RME %/100	MEAN %/100	RME %/100
PCBs								
AROCLOR-1254	1.11E+01	1.87E+01	7.70E+00	7.0E-05	0.50	0.50	0.01	0.01
AROCLOR-1260	7.19E-01	1.22E+00	7.70E+00	7.0E-05	0.50	0.50	0.01	0.01
BASE/NEUTRAL								
BENZO (A) ANTHRACENE	1.13E+00	2.39E+00	7.30E-01	NA	0.50	0.50	0.01	0.01
BENZO (A) PYRENE	1.35E+00	2.99E+00	7.30E+00	NA	0.50	0.50	0.01	0.01
HEXACHLOROBENZENE	1.34E+00	2.99E+00	1.60E+00	8.00E-04	0.50	0.50	0.01	0.01
METALS								
ARSENIC	1.18E+01	1.91E+01	1.75E+00	3.00E-04	0.50	0.50	0.01	0.01
CHROMIUM	1.14E+02	3.06E+02	NA	1.00E+00	0.50	0.50	0.01	0.01
COBALT	8.50E+00	1.58E+01	NA	NA	0.50	0.50	0.01	0.01

NA = NOT AVAILABLE

TABLE : 11

EXPOSURE, RISK AND HAZARD CALCULATIONS

SITE : TEXTILE ROAD SITE
SECTOR : SUB-SURFACE SOIL - ALL SAMPLES COLLECTED IN SITE AREA (0' - 10' BGS).
LOCATION : ON-SITE
MEDIA : SUB-SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : CONSTRUCTION WORKER

	LIFETIME AVERAGE DAILY INTAKE (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK		ANNUAL AVERAGE DAILY INTAKE (mg/kg/d)		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN	RME	MEAN	95th %	MEAN	95th %	MEAN	95th %
PCBs								
AROCLOR-1254	8.19E-09	7.31E-08	6.31E-08	5.63E-07	5.73E-07	5.12E-06	8.19E-03	7.31E-02
AROCLOR-1260	5.32E-10	4.76E-09	4.10E-09	3.66E-08	3.73E-08	3.33E-07	5.32E-04	4.76E-03
BASE/NEUTRAL								
BENZO (A) ANTHRACENE	8.33E-10	9.35E-09	6.08E-10	6.83E-09	5.83E-08	6.55E-07	0.00E+00	0.00E+00
BENZO (A) PYRENE	9.98E-10	1.17E-08	7.28E-09	8.54E-08	6.99E-08	8.19E-07	0.00E+00	0.00E+00
HEXACHLOROBENZENE	9.93E-10	1.17E-08	1.59E-09	1.87E-08	6.95E-08	8.19E-07	8.69E-05	1.02E-03
METALS								
ARSENIC	8.73E-09	7.47E-08	1.53E-08	1.31E-07	6.11E-07	5.23E-06	2.04E-03	1.74E-02
CHROMIUM	8.45E-08	1.20E-06	0.00E+00	0.00E+00	5.91E-06	8.38E-05	5.91E-06	8.38E-05
COBALT	6.30E-09	6.18E-08	0.00E+00	0.00E+00	4.41E-07	4.33E-06	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		9.19E-08	8.41E-07	HAZARD INDEX:		1.09E-02	9.64E-02

TABLE : 12

SUMMARY TABLE

SITE : TEXTILE ROAD SITE
SECTOR : SUB-SURFACE SOIL - ALL SAMPLES COLLECTED IN SITE AREA (0' - 10' BGS).
LOCATION : ON-SITE
MEDIA : SUB-SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : CONSTRUCTION WORKER

	MEDIA CONCENTRATION		LIFETIME UPPER BOUND EXCESS CANCER RISK		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN mg/kg	RME mg/kg	MEAN	95th %	MEAN	95th %
PCBs						
AROCLOR-1254	1.11E+01	1.87E+01	6.31E-08	5.63E-07	8.19E-03	7.31E-02
AROCLOR-1260	7.19E-01	1.22E+00	4.10E-09	3.66E-08	5.32E-04	4.76E-03
BASE/NEUTRAL						
BENZO (A) ANTHRACENE	1.13E+00	2.39E+00	6.08E-10	6.83E-09	0.00E+00	0.00E+00
BENZO (A) PYRENE	1.35E+00	2.99E+00	7.28E-09	8.54E-08	0.00E+00	0.00E+00
HEXACHLOROBENZENE	1.34E+00	2.99E+00	1.59E-09	1.87E-08	8.69E-05	1.02E-03
METALS						
ARSENIC	1.18E+01	1.91E+01	1.53E-08	1.51E-07	2.04E-03	1.74E-02
CHROMIUM	1.14E+02	3.06E+02	0.00E+00	0.00E+00	5.91E-06	8.38E-05
COBALT	8.50E+00	1.58E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		9.19E-08	8.41E-07		
			HAZARD INDEX:		1.09E-02	9.64E-02

TABLE : 13

EXPOSURE SCENARIO FORMULA AND ASSUMPTIONS

EXPOSURE SCENARIO : DRINKING WATER
SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - UPPER WATER TABLE ZONE
LOCATION : ON-SITE

EQUATION : $\text{INTAKE (mg/kg-day)} = \frac{CW \times IR \times EF \times ED}{BW \times AT}$

where :

CW = Chemical Concentration in Water (mg/liter)
IR = Ingestion Rate (liters/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time - period over which exposure is averaged (days)

VARIABLE	MEAN	RME	REFERENCES:
CW (mg/liter)	MEAN	95th %	RAGS (1,2)
IR ADULT (liters/day)	1	1	RAGS (1,2)
EF (days/yr)	250	250	RAGS (1,2)
ED - carc. (yr)	10	25	RAGS (1,2)
non-carc. (yr)	1	1	RAGS (1,2)
BW ADULT (kg)	70	70	RAGS (1,2)
AT - carcinogen (years x days)	25550	25550	RAGS (1,2)
AT - non-carcinogen (years x days)	365	365	RAGS (1,2)

NOTES :
(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND" MANUAL, DECEMBER 1989; EPA/540/1-89/002.
(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS", OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991

TABLE : 14

MEDIA CONCENTRATIONS/CONSTANTS

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - UPPER WATER TABLE ZONE
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

	MEDIA CONCENTRATION			
PARAMETER	MEAN mg/L	RME mg/L	ORAL CSF 1/(mg/kg/d)	ORAL RfD mg/kg/d
PCBs				
AROCLOR-1254	1.28E-01	3.20E-01	7.70E+00	7.0E-05
VOC				
ACETONE	2.00E-02	3.46E-02	NA	1.00E-01
BNA				
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E-02	1.10E-02	1.40E-02	2.00E-02
METALS (UNFILTERED)				
ARSENIC	2.00E-02	2.47E-02	1.75E+00	3.00E-04
BERYLLIUM	3.10E-03	4.40E-03	4.30E+00	5.00E-03
LEAD	7.00E-02	1.25E-01	NA	1.40E-03
MANGANESE	1.42E+00	1.91E+00	NA	5.00E-03
NICKEL	5.00E-02	7.61E-02	NA	2.00E-02
ALS (FILTERED)				
BERYLLIUM	3.20E-03	5.40E-03	4.30E+00	5.00E-03
CHROMIUM	1.44E-02	3.65E-02	NA	1.00E+00
MANGANESE	5.60E-01	7.67E-01	NA	5.00E-03

NA = NOT AVAILABLE

TABLE : 15

EXPOSURE, RISK AND HAZARD CALCULATIONS

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - UPPER WATER TABLE ZONE
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

	LIFETIME AVERAGE DAILY INTAKE (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK		ANNUAL AVERAGE DAILY INTAKE (mg/kg/d)		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN	RME	MEAN	95th %	MEAN	95th %	MEAN	95th %
PCBs								
AROCLOR-1254	1.79E-04	1.12E-03	1.38E-03	8.61E-03	1.25E-03	3.13E-03	1.79E+01	4.47E+01
VOC								
ACETONE	2.80E-05	1.21E-04	0.00E+00	0.00E+00	1.96E-04	3.39E-04	1.96E-03	3.39E-03
BNA								
BIS(2-ETHYLHEXYL)PHTHALATE	1.40E-05	3.84E-05	1.96E-07	5.38E-07	9.78E-05	1.08E-04	4.89E-03	5.38E-03
METALS (UNFILTERED)								
ARSENIC	2.80E-05	8.63E-05	4.89E-05	1.51E-04	1.96E-04	2.42E-04	6.52E-01	8.06E-01
BERYLLIUM	4.33E-06	1.54E-05	1.86E-05	6.61E-05	3.03E-05	4.31E-05	6.07E-03	8.61E-03
LEAD	9.78E-05	4.38E-04	0.00E+00	0.00E+00	6.85E-04	1.23E-03	4.89E-01	8.76E-01
MANGANESE	1.98E-03	6.69E-03	0.00E+00	0.00E+00	1.39E-02	1.87E-02	2.78E+00	3.75E+00
NICKEL	6.99E-05	2.66E-04	0.00E+00	0.00E+00	4.89E-04	7.45E-04	2.45E-02	3.72E-02
METALS (FILTERED)								
BERYLLIUM	4.47E-06	1.89E-05	1.92E-05	8.11E-05	3.13E-05	5.28E-05	6.26E-03	1.06E-02
CHROMIUM	2.01E-05	1.28E-04	0.00E+00	0.00E+00	1.41E-04	3.57E-04	1.41E-04	3.57E-04
MANGANESE	7.83E-04	2.68E-03	0.00E+00	0.00E+00	5.48E-03	7.51E-03	1.10E+00	1.50E+00
	TOTAL ADDITIONAL ESTIMATED CANCER RISKS:				HAZARD INDEX :			
	WITH UNFILTERED METALS		1.44E-03	8.83E-03	WITH UNFILTERED METALS		2.18E+01	5.02E+01
	WITH FILTERED METALS		1.40E-03	8.69E-03	WITH FILTERED METALS		1.90E+01	4.63E+01

TABLE : 16

SUMMARY TABLE

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - UPPER WATER TABLE ZONE
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

	MEDIA CONCENTRATION		LIFETIME UPPER BOUND EXCESS CANCER RISK		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN mg/L	RME mg/L	MEAN	95th %	MEAN	95th %
PCBs						
AROCLOR-1254	1.28E-01	3.20E-01	1.38E-03	8.61E-03	1.79E+01	4.47E+01
VOC						
ACETONE	2.00E-02	3.46E-02	0.00E+00	0.00E+00	1.96E-03	3.39E-03
BNA						
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E-02	1.10E-02	1.96E-07	5.38E-07	4.89E-03	5.38E-03
METALS (UNFILTERED)						
ARSENIC	2.00E-02	2.47E-02	4.89E-05	1.51E-04	6.52E-01	8.06E-01
BERYLLIUM	3.10E-03	4.80E-03	1.86E-05	6.61E-05	6.07E-03	8.61E-03
LEAD	7.00E-02	1.25E-01	0.00E+00	0.00E+00	4.89E-01	8.76E-01
MANGANESE	1.42E+00	1.91E+00	0.00E+00	0.00E+00	2.78E+00	3.75E+00
NICKEL	5.00E-02	7.61E-02	0.00E+00	0.00E+00	2.45E-02	3.72E-02
METALS (FILTERED)						
BERYLLIUM	3.20E-03	5.40E-03	1.92E-05	8.11E-05	6.26E-03	1.06E-02
CHROMIUM	1.44E-02	3.65E-02	0.00E+00	0.00E+00	1.41E-04	3.57E-04
MANGANESE	5.60E-01	7.67E-01	0.00E+00	0.00E+00	1.10E+00	1.50E+00
	TOTAL ADDITIONAL ESTIMATED CANCER RISKS:				HAZARD INDEX :	
	WITH UNFILTERED METALS		1.44E-03	8.83E-03	2.18E+01	5.02E+01
	WITH FILTERED METALS		1.40E-03	8.69E-03	1.90E+01	4.63E+01

TABLE : 17

EXPOSURE SCENARIO FORMULA AND ASSUMPTIONS

EXPOSURE SCENARIO : DRINKING WATER
SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - LOWER SANDS AQUIFER
LOCATION : ON-SITE

EQUATION : $\text{INTAKE (mg/kg-day)} = \frac{CW \times IR \times EF \times ED}{BW \times AT}$

where :

CW = Chemical Concentration in Water (mg/liter)
IR = Ingestion Rate (liters/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time - period over which exposure is averaged (days)

VARIABLE	MEAN	RME	REFERENCES:
CW (mg/liter)	MEAN	95th %	RAGS (1,2)
IR ADULT (liters/day)	1	1	RAGS (1,2)
EF (days/yr)	250	250	RAGS (1,2)
ED - carc. (yr)	10	25	RAGS (1,2)
non-carc. (yr)	1	1	RAGS (1,2)
BW ADULT (kg)	70	70	RAGS (1,2)
AT - carcinogen (years x days)	25550	25550	RAGS (1,2)
AT - non-carcinogen (years x days)	365	365	RAGS (1,2)

NOTES :
(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND" MANUAL, DECEMBER 1989, EPA/540/1-89/002.
(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS", OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991

TABLE 18

MEDIA CONCENTRATIONS/CONSTANTS

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - LOWER SANDS AQUIFER
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

	MEDIA CONCENTRATION			
PARAMETER	MEAN mg/L	RME mg/L	ORAL CSF 1/(mg/kg/d)	ORAL RfD mg/kg/d
VOC				
ACETONE	4.80E-01	1.78E+00	NA	1.00E-01
BNA				
BIS(2-ETHYLHEXYL)PHTHALATE	2.18E-01	4.74E-01	1.40E-02	2.00E-02
METALS (UNFILTERED)				
ARSENIC	2.45E-02	7.11E-02	1.75E+00	3.00E-04
BERYLLIUM	3.10E-03	5.10E-03	4.30E+00	5.00E-03
IRON	4.64E+01	1.21E+02	NA	NA
LEAD	3.25E-02	7.54E-02	NA	1.40E-03
MANGANESE	8.04E-01	2.17E+00	NA	5.00E-03
NICKEL	7.63E-02	1.92E-01	NA	2.00E-02
METALS (FILTERED)				
CHROMIUM	4.00E-02	1.27E-01	NA	1.00E+00
MANGANESE	5.35E-02	1.82E-01	NA	5.00E-03

NA = NOT AVAILABLE

TABLE : 19

EXPOSURE, RISK AND HAZARD CALCULATIONS

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - LOWER SANDS AQUIFER
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

CHEMICALS EVALUATED IN GROUNDWATER	LIFETIME AVERAGE DAILY INTAKE (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK		ANNUAL AVERAGE DAILY INTAKE (mg/kg/d)		HAZARD QUOTIENT CDI/RfD	
	MEAN	RME	MEAN	95th %	MEAN	95th %	MEAN	95th %
VOC								
ACETONE	6.71E-04	6.21E-03	0.00E+00	0.00E+00	4.69E-03	1.74E-02	4.69E-02	1.74E-01
BNA								
BIS(2-ETHYLHEXYL)PHTHALATE	3.04E-04	1.66E-03	4.26E-06	2.32E-05	2.13E-03	4.64E-03	1.07E-01	2.32E-01
METALS (UNFILTERED)								
ARSENIC	3.42E-05	2.48E-04	5.99E-05	4.35E-04	2.40E-04	6.96E-04	7.99E-01	2.32E+00
BERYLLIUM	4.33E-06	1.78E-05	1.86E-05	7.66E-05	3.03E-05	4.99E-05	6.07E-03	9.98E-03
IRON	6.49E-02	4.23E-01	0.00E+00	0.00E+00	4.54E-01	1.18E+00	0.00E+00	0.00E+00
LEAD	4.54E-05	2.63E-04	0.00E+00	0.00E+00	3.18E-04	7.38E-04	2.27E-01	5.27E-01
MANGANESE	1.12E-03	7.58E-03	0.00E+00	0.00E+00	7.87E-03	2.12E-02	1.57E+00	4.24E+00
NICKEL	1.07E-04	6.72E-04	0.00E+00	0.00E+00	7.47E-04	1.88E-03	3.73E-02	9.41E-02
METALS (FILTERED)								
CHROMIUM	5.59E-05	4.43E-04	0.00E+00	0.00E+00	3.91E-04	1.24E-03	3.91E-04	1.24E-03
MANGANESE	7.48E-05	3.55E-04	0.00E+00	0.00E+00	5.23E-04	9.94E-04	1.05E-01	1.99E-01
	ESTIMATED CANCER RISKS:				HAZARD INDEX:			
	WITH UNFILTERED METALS		8.28E-05	5.35E-04	WITH UNFILTERED METALS		2.80E+00	7.60E+00
	WITH FILTERED METALS		4.26E-06	2.32E-05	WITH FILTERED METALS		2.59E-01	6.06E-01

TABLE : 20

SUMMARY TABLE

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - LOWER SANDS AQUIFER
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

	MEDIA CONCENTRATION		LIFETIME UPPER BOUND EXCESS CANCER RISK		HAZARD QUOTIENT CDI/RfD	
CHEMICALS EVALUATED IN GROUNDWATER	MEAN mg/L	RME mg/L	MEAN	95th %	MEAN	95th %
VOC						
ACETONE	4.80E-01	1.78E+00	0.00E+00	0.00E+00	4.69E-02	1.74E-01
BNA						
BIS(2-ETHYLHEXYL)PHTHALATE	2.18E-01	4.74E-01	4.26E-06	2.32E-05	1.07E-01	2.32E-01
METALS (UNFILTERED)						
ARSENIC	2.45E-02	7.11E-02	5.99E-05	4.35E-04	7.99E-01	2.32E+00
BERYLLIUM	3.10E-03	5.10E-03	1.86E-05	7.66E-05	6.07E-03	9.98E-03
LEAD	3.25E-02	7.54E-02	0.00E+00	0.00E+00	2.27E-01	5.27E-01
MANGANESE	8.04E-01	2.17E+00	0.00E+00	0.00E+00	1.57E+00	4.24E+00
NICKEL	7.63E-02	1.92E-01	0.00E+00	0.00E+00	3.73E-02	9.41E-02
METALS (FILTERED)						
CHROMIUM	4.00E-02	1.27E-01	0.00E+00	0.00E+00	3.91E-04	1.24E-03
MANGANESE	5.35E-02	1.02E-01	0.00E+00	0.00E+00	1.05E-01	1.99E-01
	ESTIMATED CANCER RISKS:				HAZARD INDEX:	
	WITH UNFILTERED METALS		8.28E-05	5.35E-04	2.80E+00	7.60E+00
	WITH FILTERED METALS		4.26E-06	2.32E-05	2.59E-01	6.06E-01

APPENDIX A

ANALYTICAL RESULTS
SURFACE SOIL AND BOREHOLES

TABLE A.1

SURFACE AND BOREHOLE SOILS - VOCs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-2B-93	BH-2C-93	BH-2D-93	BH-60C-93	BH-5D-93	BH-6B-93	BH-11A-93
Sample Location		BH-2-93	BH-2-93	BH-2-93	BH-5-93	BH-5-93	BH-6-93	BH-11-93
Sample Interval (BGS)		6'-8'	27.5'-29.5'	70'-72'	21'-23.5'	68.5'-70.5'	6'-8'	2'-4'
Date Sampled		5/11/93	5/17/93	5/17/93	5/17/93	5/16/93	5/17/93	5/18/93
Date Analyzed		5/21/93	5/25/93	5/21/93	5/21/93	5/21/93	5/21/93	5/21/93
Units		(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
Parameter	CAS Number							
Acetone	67-64-1	0.017 B(0.012)u	0.22(0.023)	0.012 (0.011)	0.11(0.012)	ND(0.011)	2.2(0.12)	0.047 (0.011)
Benzene	71-43-2	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Bromodichloromethane	75-27-4	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Bromoform	75-25-2	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Bromomethane	74-83-9	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
2-Butanone	78-93-3	ND(0.012)	ND(0.023)	ND(0.011)	0.007 J(0.012)	0.003 JB(0.011)u	0.038 J(0.12)	0.004 J(0.011)
Carbon Disulfide	75-15-0	0.002 J(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Carbon tetrachloride	56-23-5	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Chlorobenzene	108-90-7	0.003 J(0.012)j	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Chloroethane	75-00-3	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Chloroform	67-66-3	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Chloromethane	74-87-3	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Dibromochloromethane	124-48-1	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
1,1-Dichloroethane	75-34-3	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
1,2-Dichloroethane	107-06-2	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
1,1-Dichloroethene	75-35-4	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
1,2-Dichloroethene (total)	540-59-0	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
1,2-Dichloropropane	78-87-5	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
cis-1,3-Dichloropropene	10061-01-5	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
trans-1,3-Dichloropropene	10061-02-6	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Ethylbenzene	100-41-4	0.002 J(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
2-Hexanone	591-78-6	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Methylene chloride	75-09-2	ND(0.012)	0.005 J(0.023)u	0.002 JB(0.011)u	0.004 JB(0.012)u	0.002 J(0.011)	ND(0.12)	0.002 JB(0.011)u
4-Methyl-2-pentanone	108-10-1	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Styrene	100-42-5	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
1,1,2,2-Tetrachloroethane	79-34-5	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Tetrachloroethene	127-18-4	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Toluene	108-88-3	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
1,1,1-Trichloroethane	71-55-6	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
1,1,2-Trichloroethane	79-00-5	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Trichloroethene	79-01-6	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Vinyl acetate	108-05-4	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Vinyl chloride	75-01-4	ND(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)
Xylenes (total)	1330-20-7	0.005 J(0.012)	ND(0.023)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.12)	ND(0.011)

TABLE A.1

SURFACE AND BOREHOLE SOILS - VOCs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-11R-93	BH-16B-93	BH-72B-93	SS-6-93	BH-21A-93	BH-71A-93	BH-26B-93
Sample Location		BH-11-93	BH-16-93	BH-16-93	BH-17-93	BH-21-93	BH-21-93	BH-26-93
Sample Interval (BGS)		2'-4'	6'-8'	6'-8'	0'-1'	2'-4'	2'-4'	6'-8'
Date Sampled		5/18/93	5/18/93	5/18/93	5/17/93	5/18/93	5/18/93	5/16/93
Date Analyzed		6/6/93	5/25/93	5/26/93	5/22/93	5/26/93	5/26/93	5/21/93
Units		(mg/L)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
		Rinsate		Duplicate			Duplicate	
Parameter	CAS Number							
Acetone	67-64-1	0.006 J(0.010)J	0.56(0.087)	6.2(2.1)	0.22(0.012)	ND(1.4)	1.7(1.4)	0.072 (0.011)
Benzene	71-43-2	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Bromodichloromethane	75-27-4	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Bromoform	75-25-2	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Bromomethane	74-83-9	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	0.50 JB (1.4)	ND(0.011)
2-Butanone	78-93-3	0.003 JB(0.010)u	ND(0.087)	ND(2.1)	0.005 JB(0.012)u	1.4 B(1.4)u	0.23 J (1.4)u	0.002 JB(0.011)u
Carbon Disulfide	75-15-0	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	0.27 J(1.4)	ND(1.4)	ND(0.011)
Carbon tetrachloride	56-23-5	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Chlorobenzene	108-90-7	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Chloroethane	75-00-3	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Chloroform	67-66-3	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Chloromethane	74-87-3	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Dibromochloromethane	124-48-1	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
1,1 Dichloroethane	75-34-3	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
1,2-Dichloroethane	107-06-2	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
1,1-Dichloroethene	75-35-4	ND(0.010)UJ	ND(0.087)	ND(2.1)uj	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
1,2-Dichloroethene (total)	540-59-0	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
1,2-Dichloropropane	78-87-5	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
cis-1,3-Dichloropropene	10061-01-5	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
trans-1,3-Dichloropropene	10061-02-6	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Ethylbenzene	100-41-4	ND(0.010)UJ	ND(0.087)	0.46 J(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
2-Hexanone	591-78-6	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Methylene chloride	75-09-2	0.004 JB(0.010)u	ND(0.087)	ND(2.1)	0.002 JB(0.012)u	ND(1.4)	0.21 J(1.4)	0.004 J(0.011)
4-Methyl-2-pentanone	108-10-1	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Styrene	100-42-5	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
1,1,2,2-Tetrachloroethane	79-34-5	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Tetrachloroethene	127-18-4	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Toluene	108-88-3	ND(0.010)UJ	0.026 J(0.087)	ND(2.1)uj	ND(0.012)	ND(1.4)	0.46 J(1.4)	ND(0.011)
1,1,1-Trichloroethane	71-55-6	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
1,1,2-Trichloroethane	79-00-5	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Trichloroethene	79-01-6	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Vinyl acetate	108-05-4	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Vinyl chloride	75-01-4	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	ND(1.4)	ND(1.4)	ND(0.011)
Xylenes (total)	1330-20-7	ND(0.010)UJ	ND(0.087)	ND(2.1)	ND(0.012)	0.20 J(1.4)	0.20 J(1.4)	0.001 J(0.011)

SURFACE AND BOREHOLE SOILS - VOCs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-31A-93	BH-36B-93	BH-55B-93	BH-36R-93	BH-41A-93	BH-46B-93	BH-46C-93
Sample Location		BH-31-93	BH-36-93	BH-36-93	BH-36-93	BH-41-93	BH-46-93	BH-46-93
Sample Interval (BGS)		2'-4'	6'-8'	6'-8'	6'-8'	2'-4'	6'-8'	24'-39.5'
Date Sampled		5/14/93	5/13/93	5/13/93	5/14/93	5/12/93	5/12/93	5/15/93
Date Analyzed		5/21/93	5/20/93	5/20/93	6/6/93	5/21/93	5/21/93	5/21/93
Units		(mg/Kg)	(mg/Kg)	(mg/Kg) Duplicate	(mg/L) Rinsate	(mg/Kg)	(mg/Kg)	(mg/Kg)
Parameter	CAS Number							
Acetone	67-64-1	0.85 B(0.055)	0.015(0.012)	0.031(0.012)	0.005 J(0.010)j	ND(0.011)	ND(0.011)	0.014 B(0.012)u
Benzene	71-43-2	ND(0.055)	0.003 J(0.012)	0.003 J(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Bromodichloromethane	75-27-4	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Bromoform	75-25-2	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Bromomethane	74-83-9	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
2-Butanone	78-93-3	0.011 JB(0.055)u	0.041(0.012)	0.004 J(0.012)	0.003 JB(0.010)u	0.003 JB(0.011)u	ND(0.011)	0.004 JB(0.012)u
Carbon Disulfide	75-15-0	ND(0.055)	0.001 J(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Carbon tetrachloride	56-23-5	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Chlorobenzene	108-90-7	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Chloroethane	75-00-3	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Chloroform	67-66-3	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Chloromethane	74-87-3	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Dibromochloromethane	124-48-1	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
1,1-Dichloroethane	75-34-3	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
1,2-Dichloroethane	107-06-2	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
1,1-Dichloroethene	75-35-4	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
1,2-Dichloroethene (total)	540-59-0	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
1,2-Dichloropropane	78-87-5	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
cis-1,3-Dichloropropene	10061-01-5	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
trans-1,3-Dichloropropene	10061-02-6	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Ethylbenzene	100-41-4	ND(0.055)	0.002 J(0.012)	0.002 J(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
2-Hexanone	591-78-6	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Methylene chloride	75-09-2	0.016 J(0.055)	0.005 JB(0.012)u	0.005 JB(0.012)U	0.004 JB(0.010)u	0.001 J(0.011)	0.001 J(0.011)	0.004 J(0.012)
4-Methyl-2-pentanone	108-10-1	ND(0.055)	0.003 J(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Styrene	100-42-5	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
1,1,2,2-Tetrachloroethane	79-34-5	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Tetrachloroethene	127-18-4	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Toluene	108-88-3	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
1,1,1-Trichloroethane	71-55-6	ND(0.055)	ND(0.012)	ND(0.012)	0.001 J(0.010)j	ND(0.011)	ND(0.011)	ND(0.012)
1,1,2 Trichloroethane	79-00-5	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Trichloroethene	79-01-6	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Vinyl acetate	108-05-4	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Vinyl chloride	75-01-4	ND(0.055)	ND(0.012)	ND(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)
Xylenes (total)	1330-20-7	ND(0.055)	0.004 J(0.012)	0.004 J(0.012)	ND(0.010)uj	ND(0.011)	ND(0.011)	ND(0.012)

TABLE A.1

SURFACE AND BOREHOLE SOILS - VOCs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-46D-93	DW-1-93
Sample Location		BH-46-93	WATER TRUCK
Sample Interval (BGS)		83.5'-88.5'	-
Date Sampled		5/15/93	5/18/93
Date Analyzed		5/21/93	6/6/93
Units		(mg/Kg)	(mg/L)
Parameter	**CAS Number**		
Acetone	67-64-1	0.014 B(0.012)u	0.003 J(0.010)j
Benzene	71-43-2	ND(0.012)	ND(0.010)uj
Bromodichloromethane	75-27-4	ND(0.012)	0.008 J(0.010)j
Bromoform	75-25-2	ND(0.012)	ND(0.010)uj
Bromomethane	74-83-9	ND(0.012)	ND(0.010)uj
2-Butanone	78-93-3	0.002 JB(0.012)u	0.002 JB(0.010)u
Carbon Disulfide	75-15-0	ND(0.012)	ND(0.010)uj
Carbon tetrachloride	56-23-5	ND(0.012)	ND(0.010)uj
Chlorobenzene	108-90-7	ND(0.012)	ND(0.010)uj
Chloroethane	75-00-3	ND(0.012)	ND(0.010)uj
Chloroform	67-66-3	ND(0.012)	0.030(0.010)j
Chloromethane	74-87-3	ND(0.012)	ND(0.010)uj
Dibromochloromethane	124-48-1	ND(0.012)	0.003 J(0.010)j
1,1-Dichloroethane	75-34-3	ND(0.012)	ND(0.010)uj
1,2-Dichloroethane	107-06-2	ND(0.012)	ND(0.010)uj
1,1-Dichloroethene	75-35-4	ND(0.012)	ND(0.010)uj
1,2-Dichloroethene (total)	540-59-0	ND(0.012)	ND(0.010)uj
1,2-Dichloropropane	78-87-5	ND(0.012)	ND(0.010)uj
cis-1,3-Dichloropropene	10061-01-5	ND(0.012)	ND(0.010)uj
trans-1,3-Dichloropropene	10061-02-6	ND(0.012)	ND(0.010)uj
Ethylbenzene	100-41-4	ND(0.012)	ND(0.010)uj
2-Hexanone	591-78-6	ND(0.012)	ND(0.010)uj
Methylene chloride	75-09-2	0.005 J(0.012)	0.004 JB(0.010)u
4-Methyl-2-pentanone	108-10-1	ND(0.012)	ND(0.010)uj
Styrene	100-42-5	ND(0.012)	ND(0.010)uj
1,1,2,2-Tetrachloroethane	79-34-5	ND(0.012)	ND(0.010)uj
Tetrachloroethene	127-18-4	ND(0.012)	ND(0.010)uj
Toluene	108-88-3	ND(0.012)	ND(0.010)uj
1,1,1-Trichloroethane	71-55-6	ND(0.012)	ND(0.010)uj
1,1,2-Trichloroethane	79-00-5	ND(0.012)	ND(0.010)uj
Trichloroethene	79-01-6	ND(0.012)	ND(0.010)uj
Vinyl acetate	108-05-4	ND(0.012)	ND(0.010)uj
Vinyl chloride	75-01-4	ND(0.012)	ND(0.010)uj
Xylenes (total)	1330-20-7	0.001 J(0.012)	ND(0.010)uj

SURFACE AND BOREHOLE SOILS - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-2B-93	BH-2C-93	BH-2D-93	BH-60C-93	BH-5D-93	BH-6B-93	BH-11A-93	BH-11R-93
Sample Location		BH-2-93	BH-2-93	BH-2-93	BH-5-93	BH-5-93	BH-6-93	BH-11-93	BH-11-93
Sample Interval (BGS)		6'-8'	27.5'-29.5'	70'-72'	21'-23.5'	68.5'-70.5'	6'-8'	2'-4'	2'-4'
Date Sampled		5/11/93	5/17/93	5/17/93	5/17/93	5/16/93	5/17/93	5/18/93	5/18/93
Date Analyzed		6/2/93	6/6/93	6/6/93	6/6/93	6/2/93	6/4/93	6/4/93	6/4/93
Units		(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/L) Rinsate
Base/Neutral Compounds	**CAS Number**								
Acenaphthene	83-32-9	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	0.22 J(0.410)	ND(0.330)	ND(0.010)
Acenaphthylene	208-96-8	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Anthracene	120-12-7	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Benzo(a)anthracene	56-55-3	3.0 J(12)	ND(0.780)	0.036 J(0.350)	ND(0.380)	ND(0.370)	0.55(0.410)	ND(0.330)	ND(0.010)
Benzo(b)fluoranthene	205-99-2	1.6 J(12)	ND(0.780)	0.022 J(0.350)	ND(0.380)	ND(0.370)	0.85(0.410)	0.022 J(0.330)	ND(0.010)
Benzo(k)fluoranthene	207-08-9	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Benzo(g,h,i)perylene	191-24-2	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	0.11 J(0.410)	ND(0.330)	ND(0.010)
Benzo(a)pyrene	50-32-8	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	0.41(0.410)	ND(0.330)	ND(0.010)
Benzoic acid	65-85-0	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Benzyl alcohol	100-51-6	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Bis(2-chloroethoxy)methane	111-91-1	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Bis(2-chloroethyl)ether	111-44-4	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Bis(2-chloroisopropyl)ether	39638-32-9	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Bis(2-ethylhexyl)phthalate	117-81-7	ND(12)	0.14 J(0.780)	0.21 J(0.350)	ND(0.380)	0.26 J(0.370)	0.11 J(0.410)	0.035 J(0.330)	0.002 JB(0.010)u
4-Bromophenyl phenyl ether	101-55-3	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Butyl benzyl phthalate	85-68-7	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	1.2(0.410)	ND(0.330)	ND(0.010)
4-Chloroaniline	106-47-8	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
2-Chloronaphthalene	91-58-7	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
4-Chlorophenyl phenyl ether	7005-72-3	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Chrysene	218-01-9	1.9 J(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	1.2(0.410)	ND(0.330)	ND(0.010)
Dibenz(a,h)anthracene	53-70-3	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	0.11 J(0.410)	ND(0.330)	ND(0.010)
Dibenzofuran	132-64-9	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	0.12 J(0.410)	ND(0.330)	ND(0.010)
Di-n-butyl phthalate	84-74-2	ND(12)	0.061 JB(0.780)u	0.035 JB(0.350)u	0.030 JB (0.380)u	ND(0.370)	ND(0.410)	0.085 J(0.330)u	0.001 JB(0.010)u
1,2-Dichlorobenzene	95-50-1	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
1,3-Dichlorobenzene	541-73-1	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
1,4-Dichlorobenzene	106-46-7	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
3,3'-Dichlorobenzidine	91-94-1	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Diethyl phthalate	84-66-2	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Dimethyl phthalate	131-11-3	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
2,4-Dinitrotoluene	121-14-2	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
2,6-Dinitrotoluene	606-20-2	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Di-n-octyl phthalate	117-84-0	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Fluoranthene	206-44-0	3.3 J(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.330)	ND(0.010)
Fluorene	86-73-7	1.8 J(12)	ND(0.780)	ND(0.350)	ND(0.380)	0.044 J(0.370)	0.27 J(0.410)	ND(0.330)	ND(0.010)

TABLE A.2

SURFACE AND BOREHOLE SOILS - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-2B-93	BH-2C-93	BH-2D-93	BH-60C-93	BH-5D-93	BH-6B-93	BH-11A-93	BH-11R-93
Sample Location		BH-2-93	BH-2-93	BH-2-93	BH-5-93	BH-5-93	BH-6-93	BH-11-93	BH-11-93
Sample Interval (BGS)		6'-8'	27.5'-29.5'	70'-72'	21'-23.5'	68.5'-70.5'	6'-8'	2'-4'	2'-4'
Date Sampled		5/11/93	5/17/93	5/17/93	5/17/93	5/16/93	5/17/93	5/18/93	5/18/93
Date Analyzed		6/2/93	6/6/93	6/6/93	6/6/93	6/2/93	6/4/93	6/4/93	6/4/93
Units		(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/L) Rinsate
Hexachlorobenzene	118-74-1	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	0.85(0.410)	0.024 J(0.360)	ND(0.010)
Hexachlorobutadiene	87-68-3	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	0.19 J(0.410)	ND(0.360)	ND(0.010)
Hexachlorocyclopentadiene	77-47-4	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
Hexachloroethane	67-72-1	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
Indeno(1,2,3-cd)pyrene	193-39-5	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
Isophorone	78-59-1	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
2-Methylnaphthalene	91-57-6	2.1 J(12)	0.078 J(0.780)	0.14 J(0.350)	ND(0.380)	ND(0.370)	0.060 J(0.410)	ND(0.360)	ND(0.010)
Naphthalene	91-20-3	1.2 J(12)	0.16 J(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	0.055 J(0.410)	ND(0.360)	ND(0.010)
2-Nitroaniline	88-74-4	ND(29)	ND(1.9)	ND(0.850)	ND(0.920)	ND(0.910)	ND(1.0)	ND(0.880)	ND(0.050)
3-Nitroaniline	99-09-2	ND(29)	ND(1.9)	ND(0.850)	ND(0.920)	ND(0.910)	ND(1.0)	ND(0.880)	ND(0.050)
4-Nitroaniline	100-01-6	ND(29)	ND(1.9)	ND(0.850)	ND(0.920)	ND(0.910)	ND(1.0)	ND(0.880)	ND(0.050)
Nitrobenzene	98-95-3	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
N-Nitrosodiphenylamine	86-30-6	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	0.031 J(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
N-Nitroso-di-n-propylamine	621-64-7	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
Phenanthrene	85-01-8	8.1 J(12)	0.080 J(0.780)	0.10 J(0.350)	0.022 J(0.380)	0.018 J(0.370)	1.3(0.410)	ND(0.360)	ND(0.050)
Pyrene	129-00-0	2.8 J(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	1.9(0.410)	0.028 J(0.360)	ND(0.010)
1,2,4-Trichlorobenzene	120-82-1	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
Acid Compounds									
4-Chloro-3-methylphenol	59-50-7	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
2-Chlorophenol	95-57-8	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
2,4-Dichlorophenol	120-83-2	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
2,4-Dimethylphenol	105-67-9	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
4,6 Dinitro-2-methylphenol	534-52-1	ND(29)	ND(1.9)	ND(0.850)	ND(0.920)	ND(0.910)	ND(1.0)	ND(0.880)	ND(0.050)
2,4-Dinitrophenol	51-28-5	ND(29)	ND(1.9)	ND(0.850)	ND(0.920)	ND(0.910)	ND(1.0)	ND(0.880)	ND(0.050)
2-Methylphenol	95-48-7	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
4-Methylphenol	106-44-5	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
2-Nitrophenol	88-75-5	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
4-Nitrophenol	100-02-7	ND(29)	ND(1.9)	ND(0.850)	ND(0.920)	ND(0.910)	ND(1.0)	ND(0.880)	ND(0.050)
Pentachlorophenol	87-86-5	ND(29)	ND(1.9)	ND(0.850)	ND(0.920)	ND(0.910)	ND(1.0)	ND(0.880)	ND(0.050)
Phenol	108-95-2	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)
2,4,5-Trichlorophenol	95-95-4	ND(29)	ND(1.9)	ND(0.850)	ND(0.920)	ND(0.910)	ND(1.0)	ND(0.880)	ND(0.050)
2,4,6-Trichlorophenol	88-06-2	ND(12)	ND(0.780)	ND(0.350)	ND(0.380)	ND(0.370)	ND(0.410)	ND(0.360)	ND(0.010)

SURFACE AND BOREHOLE SOILS - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-16B-93	BH-72B-93	SS-6-93	BH-21A-93	BH-71A-93	BH-26B-93	BH-31A-93	BH-36B-93
Sample Location		BH-16-93	BH-16-93	BH-17-93	BH-21-93	BH-21-93	BH-26-93	BH-31-93	BH-36-93
Sample Interval (BGS)		6'-8'	6'-8'	0'-1'	2'-4'	2'-4'	6'-8'	2'-4'	6'-8'
Date Sampled		5/18/93	5/18/93	5/17/93	5/18/93	5/18/93	5/16/93	5/14/93	5/13/93
Date Analyzed		6/4/93	6/4/93	6/6/93	6/6/93	6/6/93	6/2/93	6/2/93	6/2/93
Units		(mg/Kg)	(mg/Kg) Duplicate	(mg/Kg)	(mg/Kg)	(mg/Kg) Duplicate	(mg/Kg)	(mg/Kg)	(mg/Kg)
Base/Neutral Compounds	**CAS Number**								
Acenaphthene	83-32-9	ND(0.570)	0.031 J(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Acenaphthylene	208-96-8	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Anthracene	120-12-7	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	0.027 J(0.410)
Benzo(a)anthracene	56-55-3	ND(0.570)	ND(0.570)	0.090 J(0.380)	ND(200)	ND(190)	ND(11)	0.080 J(0.360)	0.12 J(0.410)
Benzo(b)fluoranthene	205-99-2	ND(0.570)	ND(0.570)	0.22 J(0.380)	ND(200)	ND(190)	ND(11)	0.048 J(0.360)	ND(0.410)
Benzo(k)fluoranthene	207-08-9	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Benzo(g,h,i)perylene	191-24-2	ND(0.570)	ND(0.570)	0.080 J(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	0.038 J(0.410)
Benzo(a)pyrene	50-32-8	ND(0.570)	ND(0.570)	0.10 J(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	0.055 J(0.410)
Benzoic acid	65-85-0	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Benzyl alcohol	100-51-6	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Bis(2-chloroethoxy)methane	111-91-1	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Bis(2-chloroethyl)ether	111-44-4	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Bis(2-chloroisopropyl)ether	39638-32-9	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Bis(2-ethylhexyl)phthalate	117-81-7	ND(0.570)	0.16 J(0.570)	0.050 J(0.380)	ND(200)	ND(190)	1.5 JB(11)u	ND(0.360)	ND(0.410)
4-Bromophenyl phenyl ether	101-55-3	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Butyl benzyl phthalate	85-68-7	ND(0.570)	0.055 J(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
4-Chloroaniline	106-47-8	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
2-Chloronaphthalene	91-58-7	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
4-Chlorophenyl phenyl ether	7005-72-3	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Chrysene	218-01-9	ND(0.570)	ND(0.570)	0.15 J(0.380)	ND(200)	ND(190)	ND(11)	0.055 J(0.360)	0.085 J(0.410)
Dibenz(a,h)anthracene	53-70-3	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Dibenzofuran	132-64-9	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Di-n-butyl phthalate	84-74-2	ND(0.570)	0.050 JB(0.570)u	0.048 J(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
1,2-Dichlorobenzene	95-50-1	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
1,3-Dichlorobenzene	541-73-1	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
1,4-Dichlorobenzene	106-46-7	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
3,3'-Dichlorobenzidine	91-94-1	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Diethyl phthalate	84-66-2	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Dimethyl phthalate	131-11-3	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
2,4-Dinitrotoluene	121-14-2	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
2,6-Dinitrotoluene	606-20-2	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Di-n-octyl phthalate	117-84-0	ND(0.570)	0.070 J(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Fluoranthene	206-44-0	ND(0.570)	ND(0.570)	0.17 J(0.380)	ND(200)	ND(190)	ND(11)	0.12 J(0.360)	0.020 J(0.410)
Fluorene	86-73-7	ND(0.570)	0.22 J(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)

TABLE A.2

SURFACE AND BOREHOLE SOILS - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-16B-93	BH-72B-93	SS-6-93	BH-21A-93	BH-71A-93	BH-26B-93	BH-31A-93	BH-36B-93
Sample Location		BH-16-93	BH-16-93	BH-17-93	BH-21-93	BH-21-93	BH-26-93	BH-31-93	BH-36-93
Sample Interval (BGS)		6'-8'	6'-8'	0'-1'	2'-4'	2'-4'	6'-8'	2'-4'	6'-8'
Date Sampled		5/18/93	5/18/93	5/17/93	5/18/93	5/18/93	5/16/93	5/14/93	5/13/93
Date Analyzed		6/4/93	6/4/93	6/6/93	6/6/93	6/6/93	6/2/93	6/2/93	6/2/93
Units		(mg/Kg)	(mg/Kg) Duplicate	(mg/Kg)	(mg/Kg)	(mg/Kg) Duplicate	(mg/Kg)	(mg/Kg)	(mg/Kg)
Hexachlorobenzene	118-74-1	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Hexachlorobutadiene	87-68-3	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Hexachlorocyclopentadiene	77-47-4	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Hexachloroethane	67-72-1	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Indeno(1,2,3-cd)pyrene	193-39-5	ND(0.570)	ND(0.570)	0.070 J(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Isophorone	78-59-1	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
2-Methylnaphthalene	91-57-6	ND(0.570)	0.012 J(0.570)	ND(0.380)	ND(470)	ND(470)	ND(11)	0.042 J(0.360)	0.047 J(0.410)
Naphthalene	91-20-3	0.20 J(0.570)	0.055 J(0.570)	ND(0.380)	28 J(470)	105 J(470)	ND(11)	0.032 J(0.360)	0.030 J(0.410)
2-Nitroaniline	88-74-4	ND(1.4)	ND(1.4)	ND(0.920)	ND(470)	ND(470)	ND(28)	ND(0.880)	ND(1.0)
3-Nitroaniline	99-09-2	ND(1.4)	ND(1.4)	ND(0.920)	ND(200)	ND(190)	ND(28)	ND(0.880)	ND(1.0)
4-Nitroaniline	100-01-6	ND(1.4)	ND(1.4)	ND(0.920)	ND(200)	ND(190)	ND(28)	ND(0.880)	ND(1.0)
Nitrobenzene	98-95-3	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
N-Nitrosodiphenylamine	86-30-6	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
N-Nitroso-di-n-propylamine	621-64-7	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Phenanthrene	85-01-8	ND(0.570)	0.080 J(0.570)	0.065 J(0.380)	ND(200)	38 J(190)	ND(11)	0.037 J(0.360)	0.13 J(0.410)
Pyrene	129-00-0	ND(0.570)	ND(0.570)	0.23 J(0.380)	ND(200)	ND(190)	ND(11)	0.15 J(0.360)	0.19 J(0.410)
1,2,4-Trichlorobenzene	120-82-1	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
Acid Compounds									
4-Chloro-3-methylphenol	59-50-7	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
2-Chlorophenol	95-57-8	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
2,4-Dichlorophenol	120-83-2	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
2,4-Dimethylphenol	105-67-9	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
4,6 Dinitro-2-methylphenol	534-52-1	ND(1.4)	ND(1.4)	ND(0.920)	ND(470)	ND(470)	ND(28)	ND(0.880)	ND(1.0)
2,4-Dinitrophenol	51-28-5	ND(1.4)	ND(1.4)	ND(0.920)	ND(470)	ND(470)	ND(28)	ND(0.880)	ND(1.0)
2-Methylphenol	95-48-7	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
4-Methylphenol	106-44-5	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
2-Nitrophenol	88-75-5	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
4-Nitrophenol	100-02-7	ND(1.4)	ND(1.4)	ND(0.920)	ND(470)	ND(470)	ND(28)	ND(0.880)	ND(1.0)
Pentachlorophenol	87-86-5	ND(1.4)	ND(1.4)	ND(0.920)	ND(470)	ND(470)	ND(28)	ND(0.880)	ND(1.0)
Phenol	108-95-2	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)
2,4,5-Trichlorophenol	95-95-4	ND(1.4)	ND(1.4)	ND(0.920)	ND(470)	ND(470)	ND(28)	ND(0.880)	ND(1.0)
2,4,6-Trichlorophenol	88-06-2	ND(0.570)	ND(0.570)	ND(0.380)	ND(200)	ND(190)	ND(11)	ND(0.360)	ND(0.410)

TABLE A.2

SURFACE AND BOREHOLE SOILS - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-55B-93	BH-36R-93	BH-41A-93	BH-46B-93	BH-46C-93	BH-46D-93
Sample Location		BH-36-93	BH-36-93	BH-41-93	BH-46-93	BH-46-93	BH-46-93
Sample Interval (BGS)		6'-8'	6'-8'	2'-4'	6'-8'	24'-39.5'	83.5'-88.5'
Date Sampled		5/13/93	5/13/93	5/12/93	5/12/93	5/15/93	5/15/93
Date Analyzed		6/2/93	6/11/93	6/2/93	6/2/93	6/2/93	6/2/93
Units		(mg/Kg)	(mg/L)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
		Duplicate	Rinsate				
Base/Neutral Compounds	CAS Number						
Acenaphthene	83-32-9	0.090 J(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Acenaphthylene	208-96-8	0.028 J(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Anthracene	120-12-7	0.024 J(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Benzo(a)anthracene	56-55-3	1.4(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Benzo(b)fluoranthene	205-99-2	1.4(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Benzo(k)fluoranthene	207-08-9	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Benzo(g,h,i)perylene	191-24-2	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Benzo(a)pyrene	50-32-8	0.65 (0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Benzoic acid	65-85-0	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Benzyl alcohol	100-51-6	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Bis(2-chloroethoxy)methane	111-91-1	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Bis(2-chloroethyl)ether	111-44-4	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Bis(2-chloroisopropyl)ether	39638-32-9	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Bis(2-ethylhexyl)phthalate	117-81-7	0.031 J(0.410)	ND(0.010)uj	0.026 J(0.360)	0.032 J(0.370)	0.035 J(0.380)	0.027 J(0.390)
4-Bromophenyl phenyl ether	101-55-3	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Butyl benzyl phthalate	85-68-7	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
4-Chloroaniline	106-47-8	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
2-Chloronaphthalene	91-58-7	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
4-Chlorophenyl phenyl ether	7005-72-3	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Chrysene	218-01-9	0.80 (0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	0.019 J(0.390)
Dibenz(a,h)anthracene	53-70-3	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Dibenzofuran	132-64-9	0.050 J(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Di-n-butyl phthalate	84-74-2	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
1,2-Dichlorobenzene	95-50-1	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
1,3-Dichlorobenzene	541-73-1	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
1,4-Dichlorobenzene	106-46-7	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
3,3'-Dichlorobenzidine	91-94-1	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Diethyl phthalate	84-66-2	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Dimethyl phthalate	131-11-3	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
2,4-Dinitrotoluene	121-14-2	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
2,6-Dinitrotoluene	606-20-2	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Di-n-octyl phthalate	117-84-0	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Fluoranthene	206-44-0	1.8(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Fluorene	86-73-7	0.085 J(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)

TABLE A.2

SURFACE AND BOREHOLE SOILS - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-35B-93	BH-36R-93	BH-41A-93	BH-46B-93	BH-46C-93	BH-46D-93
Sample Location		BH-36-93	BH-36-93	BH-41-93	BH-46-93	BH-46-93	BH-46-93
Sample Interval (BGS)		6'-8'	6'-8'	2'-4'	6'-8'	24'-39.5'	83.5'-88.5'
Date Sampled		5/13/93	5/13/93	5/12/93	5/12/93	5/15/93	5/15/93
Date Analyzed		6/2/93	6/11/93	6/2/93	6/2/93	6/2/93	6/2/93
Units		(mg/Kg)	(mg/L)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
		Duplicate	Rinsate				
Hexachlorobenzene	118-74-1	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Hexachlorobutadiene	87-68-3	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Hexachlorocyclopentadiene	77-47-4	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Hexachloroethane	67-72-1	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Indeno(1,2,3-cd)pyrene	193-39-5	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Isophorone	78-59-1	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
2-Methylnaphthalene	91-57-6	0.050 j(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Naphthalene	91-20-3	0.042 j(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
2-Nitroaniline	88-74-4	ND(1.0)	ND(0.050)uj	ND(0.860)	ND(0.900)	ND(0.930)	ND(0.950)
3-Nitroaniline	99-09-2	ND(1.0)	ND(0.050)uj	ND(0.860)	ND(0.900)	ND(0.930)	ND(0.950)
4-Nitroaniline	100-01-6	ND(1.0)	ND(0.050)uj	ND(0.860)	ND(0.900)	ND(0.930)	ND(0.950)
Nitrobenzene	98-95-3	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
N-Nitrosodiphenylamine	86-30-6	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
N-Nitroso di-n-propylamine	621-64-7	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Phenanthrene	85-01-8	1.1(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	0.020 j(0.380)	0.030 j(0.390)
Pyrene	129-00-0	1.1(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
1,2,4-Trichlorobenzene	120-82-1	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
Acid Compounds							
4-Chloro-3-methylphenol	59-50-7	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
2-Chlorophenol	95-57-8	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
2,4-Dichlorophenol	120-83-2	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
2,4-Dimethylphenol	105-67-9	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
4,6 Dinitro-2-methylphenol	534-52-1	ND(1.0)	ND(0.050)uj	ND(0.860)	ND(0.900)	ND(0.930)	ND(0.950)
2,4-Dinitrophenol	51-28-5	ND(1.0)	ND(0.050)uj	ND(0.860)	ND(0.900)	ND(0.930)	ND(0.950)
2-Methylphenol	95-48-7	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
4-Methylphenol	106-44-5	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
2-Nitrophenol	88-75-5	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
4-Nitrophenol	100-02-7	ND(1.0)	ND(0.050)uj	ND(0.860)	ND(0.900)	ND(0.930)	ND(0.950)
Pentachlorophenol	87-86-5	ND(1.0)	ND(0.050)uj	ND(0.860)	ND(0.900)	ND(0.930)	ND(0.950)
Phenol	108-95-2	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)
2,4,5-Trichlorophenol	95-95-4	ND(1.0)	ND(0.050)uj	ND(0.860)	ND(0.900)	ND(0.930)	ND(0.950)
2,4,6-Trichlorophenol	88-06-2	ND(0.410)	ND(0.010)uj	ND(0.360)	ND(0.370)	ND(0.380)	ND(0.390)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-1A-93	BH-1B-93	SS-1-93	BH-2A-93	BH-2B-93	BH-2C-93	BH-2D-93
Sample Location		BH-1-93	BH-1-93	BH-1-93	BH-2-93	BH-2-93	BH-2-93	BH-2-93
Sample Interval (BGS)		2'-4'	6'-8'	0'-1'	2'-4'	6'-8'	27.5'-29.5'	70'-72'
Date Sampled		5/17/93	5/17/93	5/18/93	5/11/93	5/11/93	5/17/93	5/17/93
Date Analysed		6/10/93	6/9/93	6/10/93	5/27/93	5/26/93	6/7/93	6/7/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	CAS Number							
Aldrin	309-00-2	NA	NA	NA	NA	ND(10)	ND(2.0)uj	ND(1.8)uj
alpha-BHC	319-84-6	NA	NA	NA	NA	ND(10)	ND(2.0)uj	ND(1.8)uj
beta-BHC	319-85-7	NA	NA	NA	NA	ND(10)	ND(2.0)uj	ND(1.8)uj
delta-BHC	319-86-8	NA	NA	NA	NA	ND(10)	ND(2.0)uj	ND(1.8)uj
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	ND(10)	ND(2.0)uj	ND(1.8)uj
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	ND(10)	ND(2.0)uj	ND(1.8)uj
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	ND(10)	ND(2.0)uj	ND(1.8)uj
4,4'-DDD	72-54-8	NA	NA	NA	NA	ND(20)	ND(3.8)uj	ND(3.5)uj
4,4'-DDE	72-55-9	NA	NA	NA	NA	ND(20)	ND(3.8)uj	ND(3.5)uj
4,4'-DDT	50-29-3	NA	NA	NA	NA	ND(20)	ND(3.8)uj	ND(3.5)uj
Dieldrin	60-57-1	NA	NA	NA	NA	ND(20)	ND(3.8)uj	ND(3.5)uj
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	ND(10)	ND(2.0)uj	ND(1.8)uj
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	ND(20)	ND(3.8)uj	ND(3.5)uj
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	ND(20)	ND(3.8)uj	ND(3.5)uj
Endrin	72-20-8	NA	NA	NA	NA	ND(20)	ND(3.8)uj	ND(3.5)uj
Endrin Ketone	53494-70-5	NA	NA	NA	NA	ND(20)	ND(3.8)uj	ND(3.5)uj
Heptachlor	76-44-8	NA	NA	NA	NA	ND(10)	ND(2.0)uj	ND(1.8)uj
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	ND(10)	ND(2.0)uj	ND(1.8)uj
Methoxychlor	72-43-5	NA	NA	NA	NA	ND(100)	ND(20)uj	ND(18)uj
Toxaphene	8001-35-2	NA	NA	NA	NA	ND(1000)	ND(200)uj	ND(180)uj
Aroclor-1016	12674-11-2	ND(3300)	ND(670)	ND(33)	ND(3300)	ND(200)	ND(38)uj	ND(35)uj
Aroclor-1221	11104-28-2	ND(3300)	ND(670)	ND(67)	ND(3300)	ND(400)	ND(78)uj	ND(71)uj
Aroclor-1232	11141-16-5	ND(3300)	ND(670)	ND(33)	ND(3300)	ND(200)	ND(38)uj	ND(35)uj
Aroclor-1242	53469-21-9	ND(3300)	ND(670)	ND(33)	ND(3300)	ND(200)	ND(38)uj	ND(35)uj
Aroclor-1248	12672-29-6	ND(3300)	ND(670)	ND(33)	ND(3300)	ND(200)	ND(38)uj	ND(35)uj
Aroclor-1254	11097-69-1	ND(3300)	ND(670)	88(33)	30000(3300)	6500(200)	ND(38)uj	ND(35)uj
Aroclor-1260	11096-82-5	24000 (3300)	2500(670)	ND(33)	ND(3300)	ND(200)	ND(38)uj	ND(35)uj

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		SS-2-93	BH-3A-93	BH-3B-93	BH-4A-93	BH-4B-93	BH-5A-93	BH-5B-93
Sample Location		BH-2-93	BH-3-93	BH-3-93	BH-4-93	BH-4-93	BH-5-93	BH-5-93
Sample Interval (BGS)		0'-1'	2'-4'	6-8'	2'-4'	6-8'	2'-4'	6-8'
Date Sampled		5/18/93	5/17/93	5/17/93	5/17/93	5/17/93	5/13/93	5/13/93
Date Analysed		6/8/93	6/9/93	6/9/93	6/9/93	6/9/93	6/3/93	6/3/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	**CAS Number**							
Aldrin	309-00-2	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(67)	ND(33)	ND(33)	ND(33)	ND(1700)	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(67)	ND(67)	ND(67)	ND(67)	ND(1700)	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(67)	ND(33)	ND(33)	ND(33)	ND(1700)	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(67)	ND(33)	ND(33)	ND(33)	ND(1700)	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(67)	ND(33)	ND(33)	ND(33)	ND(1700)	ND(33)	ND(33)
Aroclor-1254	11097-69-1	120(67)	ND(33)	ND(33)	ND(33)	12000(1700)	ND(33)	ND(33)
Aroclor-1260	11096-82-5	ND(67)	ND(33)	ND(33)	ND(33)	ND(1700)	ND(33)	ND(33)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-60C-93	BH-5D-93	BH-5R-93	BH-6A-93	BH-6B-93	SS-3-93	BH-7A-93
Sample Location		BH-5-93	BH-5-93	BH-5B-93	BH-6-93	BH-6-93	BH-6-93	BH-7-93
Sample Interval (BGS)		21'-23.5'	68.5'-70.5'	6-8'	2'-4'	6-8'	0'-1'	2'-4'
Date Sampled		5/17/93	5/16/93	5/13/93	5/17/93	5/17/93	5/18/93	5/17/93
Date Analysed		6/7/93	5/26/93	5/26/93	6/9/93	6/7/93	6/8/93	6/10/93
units		(µg/kg)	(µg/kg)	(µg/L) Rinsate	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	CAS Number							
Aldrin	309-00-2	ND(2.0)uj	ND(1.9)uj	NA	NA	ND(2.1)uj	NA	NA
alpha-BHC	319-84-6	ND(2.0)uj	ND(1.9)uj	NA	NA	ND(2.1)uj	NA	NA
beta-BHC	319-85-7	ND(2.0)uj	ND(1.9)uj	NA	NA	ND(2.1)uj	NA	NA
delta-BHC	319-86-8	ND(2.0)uj	ND(1.9)uj	NA	NA	ND(2.1)uj	NA	NA
gamma-BHC (Lindane)	58-89-9	ND(2.0)uj	ND(1.9)uj	NA	NA	ND(2.1)uj	NA	NA
Alpha-Chlordane	5103-71-9	ND(2.0)uj	ND(1.9)uj	NA	NA	ND(2.1)uj	NA	NA
Gamma-Chlordane	5103-74-2	ND(2.0)uj	ND(1.9)uj	NA	NA	ND(2.1)uj	NA	NA
4,4'-DDD	72-54-8	ND(3.8)uj	ND(3.7)uj	NA	NA	ND(4.1)uj	NA	NA
4,4'-DDE	72-55-9	ND(3.8)uj	ND(3.7)uj	NA	NA	ND(4.1)uj	NA	NA
4,4'-DDT	50-29-3	ND(3.8)uj	ND(3.7)uj	NA	NA	ND(4.1)uj	NA	NA
Dieldrin	60-57-1	ND(3.8)uj	ND(3.7)uj	NA	NA	ND(4.1)uj	NA	NA
alpha-Endosulfan	959-98-8	ND(2.0)uj	ND(1.9)uj	NA	NA	ND(2.1)uj	NA	NA
beta-Endosulfan	33213-65-9	ND(3.8)uj	ND(3.7)uj	NA	NA	ND(4.1)uj	NA	NA
Endosulfan Sulfate	1031-07-08	ND(3.8)uj	ND(3.7)uj	NA	NA	ND(4.1)uj	NA	NA
Endrin	72-20-8	ND(3.8)uj	ND(3.7)uj	NA	NA	ND(4.1)uj	NA	NA
Endrin Ketone	53494-70-5	ND(3.8)uj	ND(3.7)uj	NA	NA	ND(4.1)uj	NA	NA
Heptachlor	76-44-8	ND(2.0)uj	ND(1.9)uj	NA	NA	ND(2.1)uj	NA	NA
Heptachlor Epoxide	1024-57-3	ND(2.0)uj	ND(1.9)uj	NA	NA	ND(2.1)uj	NA	NA
Methoxychlor	72-43-5	ND(20)uj	ND(19)uj	NA	NA	ND(21)uj	NA	NA
Toxaphene	8001-35-2	ND(200)uj	ND(190)uj	NA	NA	ND(210)uj	NA	NA
Aroclor-1016	12674-11-2	ND(38)uj	ND(37)uj	ND(1.0)uj	ND(33)	ND(41)uj	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(77)uj	ND(76)uj	ND(2.0)uj	ND(67)	ND(84)uj	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(38)uj	ND(37)uj	ND(1.0)uj	ND(33)	ND(41)uj	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(38)uj	ND(37)uj	ND(1.0)uj	ND(33)	ND(41)uj	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(38)uj	ND(37)uj	ND(1.0)uj	ND(33)	ND(41)uj	ND(33)	ND(33)
Aroclor-1254	11097-69-1	ND(38)uj	ND(37)uj	ND(1.0)uj	ND(33)	45(41)j	ND(33)	270(33)
Aroclor-1260	11096-82-5	ND(38)uj	ND(37)uj	ND(1.0)uj	ND(33)	ND(41)uj	ND(33)	160(33)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-7B-93	SS-4-93	BH-8A-93	BH-8B-93	BH-9A-93	BH-9B-93	BH-10A-93
Sample Location		BH-7-93	BH-7-93	BH-8-93	BH-8-93	BH-9-93	BH-9-93	BH-10-93
Sample Interval (BGS)		6'-8'	0'-1'	2'-4'	6'-8'	2'-4'	6'-8'	2'-4'
Date Sampled		5/17/93	5/18/93	5/17/93	5/17/93	5/17/93	5/17/93	5/18/93
Date Analysed		6/9/93	6/8/93	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	CAS Number							
Aldrin	309-00-2	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(1700)	ND(33)	ND(33)	ND(33)	ND(170)	ND(33)	ND(170)
Aroclor-1221	11104-28-2	ND(1700)	ND(67)	ND(67)	ND(67)	ND(170)	ND(67)	ND(170)
Aroclor-1232	11141-16-5	ND(1700)	ND(33)	ND(33)	ND(33)	ND(170)	ND(33)	ND(170)
Aroclor-1242	53469-21-9	ND(1700)	ND(33)	ND(33)	ND(33)	ND(170)	ND(33)	ND(170)
Aroclor-1248	12672-29-6	ND(1700)	ND(33)	ND(33)	ND(33)	ND(170)	ND(33)	ND(170)
Aroclor-1254	11097-69-1	7300(1700)	41(33)	ND(33)	170(33)	870(170)	ND(33)	1300(170)
Aroclor-1260	11096-82-5	ND(1700)	ND(33)	ND(33)	ND(33)	ND(170)	ND(33)	ND(170)

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-10B-93	BH-11A-93	BH-11B-93	BH-11R-93	BH-12A-93	BH-12B-93	BH-13A-93
Sample Location		BH-10-93	BH-11-93	BH-11-93	BH-11A-93	BH-12-93	BH-12-93	BH-13-93
Sample Interval (BGS)		6'-8'	2'-4'	6'-8'	2'-4'	2'-4'	6-8'	2'-4'
Date Sampled		5/18/93	5/18/93	5/18/93	5/18/93	5/17/93	5/17/93	5/18/93
Date Analysed		6/6/93	6/7/93	6/6/93	6/7/93	6/9/93	6/7/93	6/8/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/L) Rinsate	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	**CAS Number**							
Aldrin	309-00-2	NA	ND(1.9)	NA	ND(0.05)	NA	NA	NA
alpha-BHC	319-84-6	NA	ND(1.9)	NA	ND(0.05)	NA	NA	NA
beta-BHC	319-85-7	NA	ND(1.9)	NA	ND(0.05)	NA	NA	NA
delta-BHC	319-86-8	NA	ND(1.9)	NA	ND(0.05)	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	ND(1.9)	NA	ND(0.05)	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	ND(1.9)	NA	ND(0.05)	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	ND(1.9)	NA	ND(0.05)	NA	NA	NA
4,4'-DDD	72-54-8	NA	ND(3.6)	NA	ND(0.10)	NA	NA	NA
4,4'-DDE	72-55-9	NA	ND(3.6)	NA	ND(0.10)	NA	NA	NA
4,4'-DDT	50-29-3	NA	ND(3.6)	NA	ND(0.10)	NA	NA	NA
Dieldrin	60-57-1	NA	ND(3.6)	NA	ND(0.10)	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	ND(1.9)	NA	ND(0.05)	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	ND(3.6)	NA	ND(0.10)	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	ND(3.6)	NA	ND(0.10)	NA	NA	NA
Endrin	72-20-8	NA	ND(3.6)	NA	ND(0.10)	NA	NA	NA
Endrin Ketone	53494-70-5	NA	ND(3.6)	NA	ND(0.10)	NA	NA	NA
Heptachlor	76-44-8	NA	ND(1.9)	NA	ND(0.05)	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	ND(1.9)	NA	ND(0.05)	NA	NA	NA
Methoxychlor	72-43-5	NA	ND(19)	NA	ND(0.5)	NA	NA	NA
Toxaphene	8001-35-2	NA	ND(190)	NA	ND(5.0)	NA	NA	NA
Aroclor-1016	12674-11-2	ND(2500)	ND(36)	ND(33)	ND(1.0)	ND(33)	ND(330)	ND(3300)
Aroclor-1221	11104-28-2	ND(2500)	ND(74)	ND(67)	ND(2.0)	ND(67)	ND(330)	ND(3300)
Aroclor-1232	11141-16-5	ND(2500)	ND(36)	ND(33)	ND(1.0)	ND(33)	ND(330)	ND(3300)
Aroclor-1242	53469-21-9	ND(2500)	ND(36)	ND(33)	ND(1.0)	ND(33)	ND(330)	ND(3300)
Aroclor-1248	12672-29-6	ND(2500)	ND(36)	ND(33)	ND(1.0)	ND(33)	ND(330)	ND(3300)
Aroclor-1254	11097-69-1	**3500(2500)**	ND(36)	ND(33)	ND(1.0)	**81(33)**	**1500(330)**	**33000(3300)**
Aroclor-1260	11096-82-5	ND(2500)	ND(36)	ND(33)	ND(1.0)	ND(33)	ND(330)	ND(3300)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-13B-93	BH-14A-93	BH-14B-93	SS-5-93	BH-15A-93	BH-15B-93	BH-16A-93
Sample Location		BH-13-93	BH-14-93	BH-14-93	BH-14-93	BH-15-93	BH-15-93	BH-14-93
Sample Interval (BGS)		6-8'	2'-4'	6'-8'	0'-1'	2'-4'	6'-8'	2'-4'
Date Sampled		5/18/93	5/18/93	5/18/93	5/18/93	5/18/93	5/18/93	5/18/93
Date Analyzed		6/8/93	6/10/93	6/8/93	6/8/93	6/8/93	6/8/93	6/8/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	**CAS Number**							
Aldrin	309-00-2	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(3300)	ND(33)	ND(330)	ND(33)	ND(67)	ND(33)	ND(3300)
Aroclor-1221	11104-28-2	ND(3300)	ND(67)	ND(330)	ND(67)	ND(67)	ND(67)	ND(3300)
Aroclor-1232	11141-16-5	ND(3300)	ND(33)	ND(330)	ND(33)	ND(67)	ND(33)	ND(3300)
Aroclor-1242	53469-21-9	ND(3300)	ND(33)	ND(330)	ND(33)	ND(67)	ND(33)	ND(3300)
Aroclor-1248	12672-29-6	ND(3300)	ND(33)	ND(330)	ND(33)	ND(67)	ND(33)	ND(3300)
Aroclor-1254	11097-69-1	29000(3300)	ND(33)	920(330)	320(33)	190(67)	42(33)	40000(3300)
Aroclor-1260	11096-82-5	ND(3300)	ND(33)	ND(330)	ND(33)	ND(67)	ND(33)	ND(3300)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-16B-93	BH-72B-93	BH-17A-93	BH-17B-93	SS-6-93	BH-18A-93	BH-18B-93
Sample Location		BH-16-93	BH-16-93	BH-17-93	BH-17-93	BH-17-93	BH-18-93	BH-18-93
Sample Interval (BGS)		6'-8'	6'-8'	2'-4'	6'-8'	0'-1'	2'-4'	6'-8'
Date Sampled		5/18/93	5/18/93	5/14/93	5/14/93	5/18/93	5/16/93	5/16/93
Date Analysed		6/7/93	6/7/93	6/4/93	6/6/93	6/7/93	6/5/93	6/5/93
units		(µg/kg)	(µg/kg) Duplicate	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	CAS Number							
Aldrin	309-00-2	ND(150)	ND(29)uj	NA	NA	ND(2.0)	NA	NA
alpha-BHC	319-84-6	ND(150)	ND(29)uj	NA	NA	ND(2.0)	NA	NA
beta-BHC	319-85-7	ND(150)	ND(29)uj	NA	NA	ND(2.0)	NA	NA
delta-BHC	319-86-8	ND(150)	ND(29)uj	NA	NA	ND(2.0)	NA	NA
gamma-BHC (Lindane)	58-89-9	ND(150)	ND(29)uj	NA	NA	ND(2.0)	NA	NA
Alpha-Chlordane	5103-71-9	ND(150)	ND(29)uj	NA	NA	ND(2.0)	NA	NA
Gamma-Chlordane	5103-74-2	ND(150)	ND(29)uj	NA	NA	ND(2.0)	NA	NA
4,4'-DDD	72-54-8	ND(280)	ND(57)uj	NA	NA	ND(3.8)	NA	NA
4,4'-DDE	72-55-9	ND(280)	ND(57)uj	NA	NA	53(3.8)	NA	NA
4,4'-DDT	50-29-3	ND(280)	ND(57)uj	NA	NA	23(3.8)	NA	NA
Dieldrin	60-57-1	ND(280)	ND(57)uj	NA	NA	ND(3.8)	NA	NA
alpha-Endosulfan	959-98-8	ND(150)	ND(29)uj	NA	NA	ND(2.0)	NA	NA
beta-Endosulfan	33213-65-9	ND(280)	ND(57)uj	NA	NA	ND(3.8)	NA	NA
Endosulfan Sulfate	1031-07-08	ND(280)	ND(57)uj	NA	NA	ND(3.8)	NA	NA
Endrin	72-20-8	ND(280)	ND(57)uj	NA	NA	ND(3.8)	NA	NA
Endrin Ketone	53494-70-5	ND(280)	ND(57)uj	NA	NA	ND(3.8)	NA	NA
Heptachlor	76-44-8	ND(150)	ND(29)uj	NA	NA	ND(2.0)	NA	NA
Heptachlor Epoxide	1024-57-3	ND(150)	ND(29)uj	NA	NA	ND(2.0)	NA	NA
Methoxychlor	72-43-5	ND(1500)	ND(290)uj	NA	NA	ND(20)	NA	NA
Toxaphene	8001-35-2	ND(15000)	ND(2900)uj	NA	NA	ND(200)	NA	NA
Aroclor-1016	12674-11-2	ND(2800)	ND(570)uj	ND(33)	ND(33)	ND(38)	ND(33)	ND(170)
Aroclor-1221	11104-28-2	ND(5800)	ND(1200)uj	ND(67)	ND(67)	ND(77)	ND(67)	ND(170)
Aroclor-1232	11141-16-5	ND(2800)	ND(570)uj	ND(33)	ND(33)	ND(38)	ND(33)	ND(170)
Aroclor-1242	53469-21-9	ND(2800)	ND(570)uj	ND(33)	ND(33)	ND(38)	ND(33)	ND(170)
Aroclor-1248	12672-29-6	ND(2800)	ND(570)uj	ND(33)	ND(33)	ND(38)	ND(33)	ND(170)
Aroclor-1254	11097-69-1	19000(2800)	3600(570)j	ND(33)	ND(33)	ND(38)	ND(33)	ND(170)
Aroclor-1260	11096-82-5	ND(2800)	ND(570)uj	ND(33)	ND(33)	ND(38)	ND(33)	510(170)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-19A-93	BH-19B-93	BH-20A-93	BH-20B-93	BH-70B-93	BH-21A-93	BH-71A-93
Sample Location		BH-19-93	BH-19-93	BH-20-93	BH-20-93	BH-20-93	BH-21-93	BH-21-93
Sample Interval (BGS)		2'-4'	6'-8'	2'-4'	6'-8'	6'-8'	2'-4'	2'-4'
Date Sampled		5/17/93	5/17/93	5/18/93	5/18/93	5/18/93	5/18/93	5/18/93
Date Analysed		6/9/93	6/9/93	6/8/93	6/8/93	6/8/93	6/7/93	6/7/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg) Duplicate	(µg/kg)	(µg/kg) Duplicate
Parameter	CAS Number							
Aldrin	309-00-2	NA	NA	NA	NA	NA	ND(200)	ND(200)
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	ND(200)	ND(200)
beta-BHC	319-85-7	NA	NA	NA	NA	NA	ND(200)	ND(200)
delta-BHC	319-86-8	NA	NA	NA	NA	NA	ND(200)	ND(200)
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	ND(200)	ND(200)
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	ND(200)	ND(200)
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	ND(200)	ND(200)
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	ND(390)	ND(380)
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	ND(390)	ND(380)
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	ND(390)	ND(380)
Dieldrin	60-57-1	NA	NA	NA	NA	NA	ND(390)	ND(380)
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	ND(200)	ND(200)
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	ND(390)	ND(380)
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	ND(390)	ND(380)
Endrin	72-20-8	NA	NA	NA	NA	NA	ND(390)	ND(380)
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	ND(390)	ND(380)
Heptachlor	76-44-8	NA	NA	NA	NA	NA	ND(200)	ND(200)
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	ND(200)	ND(200)
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	ND(2000)	ND(2000)
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	ND(20000)	ND(20000)
Aroclor-1016	12674-11-2	ND(33)	ND(170)	ND(3300)	ND(670)	ND(330)	ND(3900)	ND(3800)
Aroclor-1221	11104-28-2	ND(67)	ND(170)	ND(3300)	ND(670)	ND(330)	ND(7900)	ND(7800)
Aroclor-1232	11141-16-5	ND(33)	ND(170)	ND(3300)	ND(670)	ND(330)	ND(3900)	ND(3800)
Aroclor-1242	53469-21-9	ND(33)	ND(170)	ND(3300)	ND(670)	ND(330)	ND(3900)	ND(3800)
Aroclor-1248	12672-29-6	ND(33)	ND(170)	ND(3300)	ND(670)	ND(330)	ND(3900)	ND(3800)
Aroclor-1254	11097-69-1	ND(33)	730(170)	76,000(3300)	4200(670)	1000(330)	230,000(3900)	44,000(3800)
Aroclor-1260	11096-82-5	ND(33)	ND(170)	ND(3300)	ND(670)	ND(330)	ND(3900)	ND(3800)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-21B-93	BH-55B-93	BH-22A-93	BH-22B-93	BH-56B-93	BH-23A-93	BH-23B-93
Sample Location		BH-21-93	BH-21-93	BH-22-93	BH-22-93	BH-22-93	BH-23-93	BH-23-93
Sample Interval (BGS)		6'-8'	6'-8'	2'-4'	6'-8'	6'-8'	2'-4'	6'-8'
Date Sampled		5/18/93	5/18/93	5/18/93	5/18/93	5/18/93	5/18/93	5/18/93
Date Analysed		6/10/93	6/10/93	6/8/93	6/8/93	6/8/93	6/8/93	6/8/93
units		(µg/kg)	(µg/kg) Duplicate	(µg/kg)	(µg/kg)	(µg/kg) Duplicate	(µg/kg)	(µg/kg)
Parameter	**CAS Number**							
Aldrin	309-00-2	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(17000)	ND(17000)	ND(3300)	ND(3300)	ND(3300)	ND(3300)	ND(3300)
Aroclor-1221	11104-28-2	ND(17000)	ND(17000)	ND(3300)	ND(3300)	ND(3300)	ND(3300)	ND(3300)
Aroclor-1232	11141-16-5	ND(17000)	ND(17000)	ND(3300)	ND(3300)	ND(3300)	ND(3300)	ND(3300)
Aroclor-1242	53469-21-9	ND(17000)	ND(17000)	ND(3300)	ND(3300)	ND(3300)	ND(3300)	ND(3300)
Aroclor-1248	12672-29-6	ND(17000)	ND(17000)	ND(3300)	ND(3300)	ND(3300)	ND(3300)	ND(3300)
Aroclor-1254	11097-69-1	230,000(17000)	310,000(17000)	55,000(3300)	49,000(3300)	50,000(3300)	76,000(3300)	79,000(3300)
Aroclor-1260	11096-82-5	ND(17000)	ND(17000)	ND(3300)	ND(3300)	ND(3300)	ND(3300)	ND(3300)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-57B-93	BH-24A-93	BH-58A-93	BH-24B-93	BH-25A-93	BH-25B-93	BH-26A-93
Sample Location		BH-23-93	BH-24-93	BH-24-93	BH-24-93	BH-25-93	BH-25-93	BH-26-93
Sample Interval (BGS)		6'-8'	2'-4'	2'-4'	6'-8'	2'-4'	6'-8'	2'-4'
Date Sampled		5/18/93	5/18/93	5/18/93	5/18/93	5/16/93	5/16/93	5/16/93
Date Analysed		6/8/93	6/8/93	6/10/93	6/8/93	6/5/93	6/5/93	6/5/93
units		(µg/kg) Duplicate	(µg/kg)	(µg/kg) Duplicate	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	**CAS Number**							
Aldrin	309-00-2	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	NA	NA	NA	NA
gamma BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(3300)	ND(3300)	ND(17000)	ND(170)	ND(33)	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(3300)	ND(3300)	ND(17000)	ND(170)	ND(67)	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(3300)	ND(3300)	ND(17000)	ND(170)	ND(33)	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(3300)	ND(3300)	ND(17000)	ND(170)	ND(33)	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(3300)	ND(3300)	ND(17000)	ND(170)	ND(33)	ND(33)	ND(33)
Aroclor-1254	11097-69-1	69,000(3300)	16,000(3300)	130,000(17000)	4300(170)	ND(33)	ND(33)	ND(33)
Aroclor-1260	11096-82-5	ND(3300)	ND(3300)	ND(17000)	ND(170)	ND(33)	ND(33)	ND(33)

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-26B-93	BH-27A-93	BH-27B-93	BH-28A-93	BH-28B-93	BH-29A-93	BH-29B-93
Sample Location		BH-26-93	BH-27-93	BH-27-93	BH-28-93	BH-28-93	BH-29-93	BH-29-93
Sample Interval (BGS)		6'-8'	2'-4'	6'-8'	2'-4'	6'-8'	2'-4'	6'-8'
Date Sampled		5/16/93	5/16/93	5/16/93	5/16/93	5/16/93	5/14/93	5/14/93
Date Analysed		5/26/93	6/5/93	6/8/93	6/5/93	6/5/93	6/5/93	6/5/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	CAS Number							
Aldrin	309-00-2	ND(1.9)uj	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	ND(1.9)uj	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	ND(1.9)uj	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	ND(1.9)uj	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	ND(1.9)uj	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	ND(1.9)uj	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	ND(1.9)uj	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	ND(3.7)uj	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	ND(3.7)uj	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	ND(3.7)uj	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	ND(3.7)uj	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	ND(1.9)uj	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	ND(3.7)uj	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	ND(3.7)uj	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	ND(3.7)uj	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	ND(3.7)uj	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	ND(1.9)uj	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	ND(1.9)uj	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	ND(19)uj	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	ND(190)uj	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(37)uj	ND(33)	ND(33)	ND(1700)	ND(33)	ND(1700)	ND(330)
Aroclor-1221	11104-28-2	ND(76)uj	ND(67)	ND(67)	ND(1700)	ND(67)	ND(1700)	ND(330)
Aroclor-1232	11141-16-5	ND(37)uj	ND(33)	ND(33)	ND(1700)	ND(33)	ND(1700)	ND(330)
Aroclor-1242	53469-21-9	ND(37)uj	ND(33)	ND(33)	ND(1700)	ND(33)	ND(1700)	ND(330)
Aroclor-1248	12672-29-6	ND(37)uj	ND(33)	ND(33)	ND(1700)	ND(33)	ND(1700)	ND(330)
Aroclor-1254	11097-69-1	ND(37)uj	ND(33)	130(33)	6300(1700)	ND(33)	6500 E(1700)	1600 E(330)
Aroclor-1260	11096-82-5	ND(37)uj	ND(33)	ND(33)	ND(1700)	ND(33)	8000(1700)	2200(330)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-30A-93	BH-30B-93	BH-31A-93	BH-31B-93	BH-32A-93	BH-32B-93	BH-33A-93
Sample Location		BH-30-93	BH-30-93	BH-31-93	BH-31-93	BH-32-93	BH-32-93	BH-33-93
Sample Interval (BGS)		2'-4'	6'-8'	2'-4'	6'-8'	2'-4'	6'-8'	2'-4'
Date Sampled		5/14/93	5/14/93	5/14/93	5/14/93	5/14/93	5/14/93	5/14/93
Date Analysed		6/5/93	6/5/93	5/26/93	6/5/93	6/6/93	6/5/93	6/5/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	**CAS Number**							
Aldrin	309-00-2	NA	NA	ND(1.9)uj	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	ND(1.9)uj	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	ND(1.9)uj	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	ND(1.9)uj	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	ND(1.9)uj	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	ND(1.9)uj	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	ND(1.9)uj	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	ND(3.6)uj	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	ND(3.6)uj	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	ND(3.6)uj	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	ND(3.6)uj	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	ND(1.9)uj	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	ND(3.6)uj	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	ND(3.6)uj	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	ND(3.6)uj	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	ND(3.6)uj	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	ND(1.9)uj	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	ND(1.9)uj	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	ND(19)uj	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	ND(190)uj	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(170)	ND(330)	ND(36)uj	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(170)	ND(330)	ND(74)uj	ND(67)	ND(67)	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(170)	ND(330)	ND(36)uj	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(170)	ND(330)	ND(36)uj	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(170)	ND(330)	ND(36)uj	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1254	11097-69-1	1000(170)	6000(330)	ND(36)uj	470(33)	ND(33)	ND(33)	ND(33)
Aroclor-1260	11096-82-5	ND(170)	ND(330)	ND(36)uj	ND(33)	ND(33)	ND(33)	ND(33)

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-33B-93	BH-34A-93	BH-34B-93	BH-34R-93	BH-35A-93	BH-35R-93	BH-35B-93
Sample Location		BH-33-93	BH-34-93	BH-34-93	BH-34A-93	BH-35-93	BH-35A-93	BH-35-93
Sample Interval (BGS)		6'-8'	2'-4'	2'-4'	2'-4'	2'-4'	2'-4'	6'-8'
Date Sampled		5/14/93	5/13/93	5/13/93	5/13/93	5/13/93	5/13/93	5/13/93
Date Analysed		6/5/93	6/3/93	6/3/93	5/26/93	6/3/93	5/27/93	6/3/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg) Rinsate	(µg/kg)	(µg/kg) Rinsate	(µg/kg)
Parameter	CAS Number							
Aldrin	309-00-2	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(33)	ND(33)	ND(33)	ND(1.0)	ND(33)	ND(1.0)	ND(33)
Aroclor-1221	11104-28-2	ND(67)	ND(67)	ND(67)	ND(2.0)	ND(67)	ND(2.0)	ND(67)
Aroclor-1232	11141-16-5	ND(33)	ND(33)	ND(33)	ND(1.0)	ND(33)	ND(1.0)	ND(33)
Aroclor-1242	53469-21-9	ND(33)	ND(33)	ND(33)	ND(1.0)	ND(33)	ND(1.0)	ND(33)
Aroclor-1248	12672-29-6	ND(33)	ND(33)	ND(33)	ND(1.0)	ND(33)	ND(1.0)	ND(33)
Aroclor-1254	11097-69-1	ND(33)	ND(33)	ND(33)	ND(1.0)	ND(33)	ND(1.0)	ND(33)
Aroclor-1260	11096-82-5	ND(33)	ND(33)	ND(33)	ND(1.0)	ND(33)	ND(1.0)	ND(33)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		SS-7-93	BH-36A-93	BH-36B-93	BH-55B-93	BH-36R-93	SS-8-93	BH-37A-93
Sample Location		BH-35-93	BH-36-93	BH-36-93	BH-36-93	BH-36B-93	BH-36-93	BH-37-93
Sample Interval (BGS)		0'-1'	2'-4'	6'-8'	6'-8'	6'-8'	0'-1'	2'-4'
Date Sampled		5/18/93	5/13/93	5/13/93	5/13/93	5/13/93	5/18/93	5/13/93
Date Analyzed		6/8/93	5/3/93	5/26/93	5/26/93	6/11/93	6/9/93	6/3/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg) Duplicate	(µg/L) Rinsate	(µg/kg)	(µg/kg)
Parameter	**CAS Number**							
Aldrin	309-00-2	NA	NA	ND(2.1)uj	ND(2.1)uj	ND(0.05)	NA	NA
alpha-BHC	319-84-6	NA	NA	ND(2.1)uj	ND(2.1)uj	ND(0.05)	NA	NA
beta-BHC	319-85-7	NA	NA	ND(2.1)uj	ND(2.1)uj	ND(0.05)	NA	NA
delta-BHC	319-86-8	NA	NA	ND(2.1)uj	ND(2.1)uj	ND(0.05)	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	ND(2.1)uj	ND(2.1)uj	ND(0.05)	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	ND(2.1)uj	ND(2.1)uj	ND(0.05)	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	ND(2.1)uj	ND(2.1)uj	ND(0.05)	NA	NA
4,4'-DDD	72-54-8	NA	NA	ND(4.1)uj	ND(4.1)uj	ND(0.10)	NA	NA
4,4'-DDE	72-55-9	NA	NA	ND(4.1)uj	4.4(4.1)j	ND(0.10)	NA	NA
4,4'-DDT	50-29-3	NA	NA	ND(4.1)uj	8.0(4.1)j	ND(0.10)	NA	NA
Dieldrin	60-57-1	NA	NA	ND(4.1)uj	ND(4.1)uj	ND(0.10)	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	ND(2.1)uj	ND(2.1)uj	ND(0.05)	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	ND(4.1)uj	ND(4.1)uj	ND(0.10)	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	ND(4.1)uj	ND(4.1)uj	ND(0.10)	NA	NA
Endrin	72-20-8	NA	NA	ND(4.1)uj	ND(4.1)uj	ND(0.10)	NA	NA
Endrin Ketone	53494-70-5	NA	NA	ND(4.1)uj	ND(4.1)uj	ND(0.10)	NA	NA
Heptachlor	76-44-8	NA	NA	ND(2.1)uj	ND(2.1)uj	ND(0.05)	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	ND(2.1)uj	ND(2.1)uj	ND(0.05)	NA	NA
Methoxychlor	72-43-5	NA	NA	ND(21)uj	ND(21)uj	ND(0.5)	NA	NA
Toxaphene	8001-35-2	NA	NA	ND(210)uj	ND(210)uj	ND(5.0)	NA	NA
Aroclor-1016	12674-11-2	ND(33)	ND(33)	ND(41)uj	ND(41)uj	ND(1.0)	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(67)	ND(67)	ND(83)uj	ND(83)uj	ND(2.0)	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(33)	ND(33)	ND(41)uj	ND(41)uj	ND(1.0)	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(33)	ND(33)	ND(41)uj	ND(41)uj	ND(1.0)	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(33)	ND(33)	ND(41)uj	ND(41)uj	ND(1.0)	ND(33)	ND(33)
Aroclor-1254	11097-69-1	ND(33)	ND(33)	ND(41)uj	ND(41)uj	ND(1.0)	ND(33)	ND(33)
Aroclor-1260	11096-82-5	ND(33)	320(33)	ND(41)uj	ND(41)uj	ND(1.0)	ND(33)	ND(33)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-37B-93	BH-37R-93	BH-38A-93	BH-38R-93	BH-38B-93	BH-39A-93	BH-51A-93
Sample Location		BH-37-93	BH-37B-93	BH-38-93	BH-38A-93	BH-38-93	BH-39-93	BH-39-93
Sample Interval (BGS)		6'-8'	6'-8'	2'-4'	2'-4'	6'-8'	2'-4'	2'-4'
Date Sampled		5/13/93	5/13/93	5/13/93	5/13/93	5/13/93	5/12/93	5/11/93
Date Analysed		6/3/93	5/27/93	6/3/93	5/27/93	6/3/93	5/27/93	6/3/93
units		(µg/kg)	(µg/L) Rinsate	(µg/kg)	(µg/L) Rinsate	(µg/kg)	(µg/kg)	(µg/kg) Duplicate
Parameter	**CAS Number**							
Aldrin	309-00-2	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(33)	ND(1.0)uj	ND(33)	ND(1.0)	ND(33)	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(67)	ND(2.0)uj	ND(67)	ND(2.0)	ND(67)	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(33)	ND(1.0)uj	ND(33)	ND(1.0)	ND(33)	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(33)	ND(1.0)uj	ND(33)	ND(1.0)	ND(33)	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(33)	ND(1.0)uj	ND(33)	ND(1.0)	ND(33)	ND(33)	ND(33)
Aroclor-1254	11097-69-1	ND(33)	ND(1.0)uj	ND(33)	ND(1.0)	**680(33)**	ND(33)	ND(33)
Aroclor-1260	11096-82-5	ND(33)	ND(1.0)uj	**44(33)**	ND(1.0)	**110(33)**	ND(33)	ND(33)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-39B-93	BH-40A-93	BH-40B-93	BH-41A-93	BH-41B-93	BH-52B-93	SS-9-93
Sample Location		BH-39-93	BH-40-93	BH-40-93	BH-41-93	BH-41-93	BH-41-93	BH-42-93
Sample Interval (BGS)		6'-8'	2'-4'	6'-8'	2'-4'	6'-8'	6'-8'	0'-1'
Date Sampled		5/12/93	5/12/93	5/12/93	5/12/93	5/12/93	5/12/93	5/18/93
Date Analysed		6/3/93	5/28/93	5/28/93	5/26/93	6/3/93	5/28/93	6/9/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg) Duplicate	(µg/kg)
Parameter	**CAS Number**							
Aldrin	309-00-2	NA	NA	NA	ND(1.8)	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	ND(1.8)	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	ND(1.8)	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	ND(1.8)	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	ND(1.8)	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	ND(1.8)	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	ND(1.8)	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	ND(3.5)	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	ND(3.5)	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	ND(3.5)	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	ND(3.5)	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	ND(1.8)	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	ND(3.5)	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	ND(3.5)	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	ND(3.5)	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	ND(3.5)	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	ND(1.8)	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	ND(1.8)	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	ND(18)	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	ND(180)	NA	NA	NA
Aroclor-1016	12674-11-2	ND(33)	ND(33)	ND(33)	ND(35)	ND(33)	ND(33)uj	ND(33)
Aroclor-1221	11104-28-2	ND(67)	ND(67)	ND(67)	ND(72)	ND(67)	ND(67)uj	ND(67)
Aroclor-1232	11141-16-5	ND(33)	ND(33)	ND(33)	ND(35)	ND(33)	ND(33)uj	ND(33)
Aroclor-1242	53469-21-9	ND(33)	ND(33)	ND(33)	ND(35)	ND(33)	ND(33)uj	ND(33)
Aroclor-1248	12672-29-6	ND(33)	ND(33)	ND(33)	ND(35)	ND(33)	ND(33)uj	ND(33)
Aroclor-1254	11097-69-1	ND(33)	ND(33)	ND(33)	ND(35)	ND(33)	ND(33)uj	ND(33)
Aroclor-1260	11096-82-5	ND(33)	ND(33)	ND(33)	ND(35)	ND(33)	ND(33)uj	280(33)

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-42A-93	BH-53A-93	BH-42B-93	BH-43A-93	BH-54A-93	BH-43B-93	BH-44A-93
Sample Location		BH-42-93	BH-42-93	BH-42-93	BH-43-93	BH-43-93	BH-43-93	BH-44-93
Sample Interval (BGS)		2'-4'	2'-4'	6'-8'	2'-4'	2'-4'	6'-8'	2'-4'
Date Sampled		5/12/93	5/12/93	5/12/93	5/11/93	5/11/93	5/11/93	5/11/93
Date Analysed		5/27/93	5/27/93	5/27/93	5/28/93	5/28/93	5/27/93	5/28/93
units		(µg/kg)	(µg/kg) Duplicate	(µg/kg)	(µg/kg)	(µg/kg) Duplicate	(µg/kg)	(µg/kg)
Parameter	CAS Number							
Aldrin	309-00-2	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1254	11097-69-1	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1260	11096-82-5	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-44B-93	SS-10-93	BH-45A-93	BH-45B-93	BH-46A-93	BH-46B-93	BH-46C-93
Sample Location		BH-44-93	BH-44-93	BH-45-93	BH-45-93	BH-46-93	BH-46-93	BH-46-93
Sample Interval (BGS)		6'-8'	0'-1'	2'-4'	6'-8'	2'-4'	6'-8'	24'-39.5'
Date Sampled		5/11/93	5/18/93	5/15/93	5/15/93	5/12/93	5/12/93	5/15/93
Date Analysed		5/28/93	6/11/93	6/5/93	6/5/93	5/27/93	5/26/93	5/26/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	**CAS Number**							
Aldrin	309-00-2	NA	NA	NA	NA	NA	ND(1.9)	ND(2.0)uj
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	ND(1.9)	ND(2.0)uj
beta-BHC	319-85-7	NA	NA	NA	NA	NA	ND(1.9)	ND(2.0)uj
delta-BHC	319-86-8	NA	NA	NA	NA	NA	ND(1.9)	ND(2.0)uj
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	ND(1.9)	ND(2.0)uj
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	ND(1.9)	ND(2.0)uj
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	ND(1.9)	ND(2.0)uj
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	ND(3.7)	ND(3.8)uj
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	ND(3.7)	ND(3.8)uj
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	ND(3.7)	ND(3.8)uj
Dieldrin	60-57-1	NA	NA	NA	NA	NA	ND(3.7)	ND(3.8)uj
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	ND(1.9)	ND(2.0)uj
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	ND(3.7)	ND(3.8)uj
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	ND(3.7)	ND(3.8)uj
Endrin	72-20-8	NA	NA	NA	NA	NA	ND(3.7)	ND(3.8)uj
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	ND(3.7)	ND(3.8)uj
Heptachlor	76-44-8	NA	NA	NA	NA	NA	ND(1.9)	ND(2.0)uj
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	ND(1.9)	ND(2.0)uj
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	ND(19)	ND(20)uj
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	ND(190)	ND(200)uj
Aroclor-1016	12674-11-2	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(37)	ND(38)uj
Aroclor-1221	11104-28-2	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(75)	ND(78)uj
Aroclor-1232	11141-16-5	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(37)	ND(38)uj
Aroclor-1242	53469-21-9	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(37)	ND(38)uj
Aroclor-1248	12672-29-6	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(37)	ND(38)uj
Aroclor-1254	11097-69-1	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(37)	ND(38uj
Aroclor-1260	11096-82-5	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(37)	ND(38)uj

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-46D-93	BH-47A-93	BH-47B-93	BH-48A-93	BH-48B-93	BH-49A-93	BH-56A-93
Sample Location		BH-46-93	BH-47-93	BH-47-93	BH-48-93	BH-48-93	BH-49-93	BH-49-93
Sample Interval (BGS)		83.5'-88.5'	2'-4'	6'-8'	2'-4'	6'-8'	2'-4'	2'-4'
Date Sampled		5/15/93	5/15/93	5/15/93	5/15/93	5/15/93	5/14/93	5/14/93
Date Analysed		5/26/93	6/5/93	6/5/93	6/5/93	6/5/93	6/5/93	6/5/93
units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg) Duplicate
Parameter	CAS Number							
Aldrin	309-00-2	ND(2.0)uj	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	ND(2.0)uj	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	ND(2.0)uj	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	ND(2.0)uj	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	ND(2.0)uj	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	ND(2.0)uj	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	ND(2.0)uj	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	ND(3.9)uj	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	ND(3.9)uj	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	ND(3.9)uj	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	ND(3.9)uj	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	ND(2.0)uj	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	ND(3.9)uj	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	ND(3.9)uj	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	ND(3.9)uj	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	ND(3.9)uj	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	ND(2.0)uj	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	ND(2.0)uj	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	ND(20)uj	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	ND(200)uj	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(39)uj	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(80)uj	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(39)uj	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(39)uj	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(39)uj	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1254	11097-69-1	ND(39)uj	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1260	11096-82-5	ND(39)uj	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)

TABLE A.3

SURFACE AND BOREHOLE SOILS - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		BH-49B-93	BH-50A-93	BH-59A-93	BH-50B-93
Sample Location		BH-49-93	BH-50-93	BH-50-93	BH-50-93
Sample Interval (BGS)		6'-8'	2'-4'	2'-4'	6'-8'
Date Sampled		5/14/93	5/18/93	5/18/93	5/18/93
Date Analysed		6/5/93	6/10/93	6/10/93	6/10/93
units		(µg/kg)	(µg/kg)	(µg/kg) Duplicate	(µg/kg)
Parameter	CAS Number				
Aldrin	309-00-2	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(67)	ND(67)	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(33)	ND(33)	ND(33)	ND(33)uj
Aroclor-1254	11097-69-1	ND(33)	49(33)	ND(33)	ND(33)
Aroclor-1260	11096-82-5	ND(33)	ND(33)	ND(33)	ND(33)

TABLE A.4

SURFACE AND BOREHOLE SOILS - INORGANICS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	BH-2B-93	BH-2C-93	BH-2D-93	BH-60C-93	BH-5D-93	BH-6B-93	BH-11A-93
Sample Location	BH-2-93	BH-2-93	BH-2-93	BH-5-93	BH-5-93	BH-6-93	BH-11-93
Sample Interval (BGS)	6'-8'	27.5'-29.5'	70'-72'	21'-23.5'	68.5'-70.5'	6'-8'	2'-4'
Date Sampled	5/11/93	5/17/93	5/17/93	5/17/93	5/16/93	5/17/93	5/18/93
Date Analyzed	5/24 - 6/10/93	6/3 - 6/14/93	6/2 - 6/14/93	6/3 - 6/14/93	5/26 - 6/15/93	6/4 - 6/14/93	6/3 - 6/15/93
Units	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
Parameter							
Aluminum	42500(48)	7550(47)	601(43)	5620(46)	1840(45)	6200(50)	3240(44)
Antimony	ND(15)r	ND(14)r	ND(13)r	ND(14)r	ND(14)r	ND(15)r	ND(13)r
Arsenic	15(2.0)j	8.9(2.0)j	5.8(2.0)j	7.5(2.0)j	6.2(2.0)j	16(2.0)j	5.6(2.0)j
Barium	235(40)	55(40)	ND(4.0)	59(40)	ND(40)	108(40)	ND(40)
Beryllium	1.7(1.2)	ND(1.2)	ND(1.1)	ND(1.2)	ND(1.1)	ND(1.2)	ND(1.1)
Cadmium	1.4(1.0)j	ND(1.2)	ND(1.1)	ND(1.2)	ND(1.1)	ND(1.2)	ND(1.1)
Calcium	64300(1000)j	74600(1000)	169000(1000)	76900(1000)	91000(1000)j	63100(1000)	28100(1000)
Chromium	86(2.4)j	11(2.3)	ND(2.1)	9.4(2.3)	7.5(2.3)j	ND(2.5)	4.9(2.2)
Cobalt	ND(10)	32(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Copper	495(5.0)j	38(5.0)	15(5.0)	18(5.0)	18(5.0)j	21(5.0)	8.3(5.0)
Iron	61900(20)	18500(20)	6420(20)	12600(20)	9050(20)	11100(20)	4860(20)
Lead	166(9.7)j	13(1.2)j	8.2(0.6)j	13(1.2)j	7.7(0.6)	55(2.5)j	12(1.1)j
Magnesium	13000(1000)	16100(1000)	16700(1000)	12800(1000)	13000(1000)	13800(1000)	3670(1000)
Manganese	1180(3.0)j	353(3.0)j	391(3.0)j	336(3.0)j	222(3.0)j	412(3.0)j	378(3.0)j
Mercury	0.19(0.1)	ND(0.12)	ND(0.11)	ND(0.12)	ND(0.11)	ND(0.12)	ND(0.11)
Nickel	68(8.0)	41(8.0)	ND(8.0)	14(8.0)	10(8.0)	12(8.0)	ND(8.0)
Potassium	ND(1000)	1320(1000)	ND(1000)	1260(1000)	ND(1000)	1270(1000)	ND(1000)
Selenium	ND(1.2)j	ND(1.2)	ND(1.1)	ND(1.2)	ND(1.1)uj	ND(1.2)	ND(1.1)
Silver	ND(2.4)	ND(2.3)	ND(2.1)	ND(2.3)	ND(2.3)	ND(2.5)	ND(2.2)
Sodium	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)
Thallium	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Vanadium	20(10)	13(10)	ND(10)	12(10)	ND(10)	17(10)	ND(10)
Zinc	346(4.8)	64(4.7)	13(4.3)	37(4.6)	58(4.5)	61(5.0)	15(4.4)
Total Cyanide	1.3(.20)	ND(2.0)uj	ND(0.20)uj	ND(0.20)r	ND(0.20)uj	ND(0.20)uj	ND(0.20)uj

TABLE A.4

SURFACE AND BOREHOLE SOILS - INORGANICS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	BH-11r-93	BH-16B-93	BH-72B-93	SS-6-93	SS-6r-93	BH-21A-93	BH-71A-93
Sample Location	BH-11-93	BH-16-93	BH-16-93	BH-17-93	BH-17-93	BH-21-93	BH-21-93
Sample Interval (BGS)	2'-4'	6'-8'	6'-8'	0'-1'	0'-1'	2'-4'	2'-4'
Date Sampled	5/18/93	5/18/93	5/18/93	5/17/93	5/17/93	5/18/93	5/18/93
Date Analyzed	6/2 - 6/16/93	6/2 - 6/17/93	6/2 - 6/17/93	6/2 - 6/17/93	6/2 - 6/16/93	6/2 - 6/17/93	6/2 - 6/17/93
Units	(mg/L) rinsate	(mg/Kg)	(mg/Kg) Duplicate	(mg/Kg)	(mg/L) rinsate	(mg/Kg)	(mg/Kg) Duplicate
Parameter							
Aluminum	ND(0.200)	9310(69)	3040(69)	4090(46)	ND(0.200)	27800(47)	27500(47)
Antimony	ND(0.060)	ND(21)r	ND(21)r	ND(14)r	ND(0.060)	24(14)j	14(14)j
Arsenic	ND(0.010)	29(8.7)j	19(8.6)j	20(5.8)j	ND(0.010)	65(5.9)j	37(5.8)j
Barium	ND(0.200)	498(40)	410(40)	51(40)	ND(0.200)	46(40)	83(40)
Beryllium	ND(0.005)	2.9(1.7)	2.7(1.7)	ND(1.2)	ND(0.005)	ND(1.2)	ND(1.2)
Cadmium	ND(0.005)	1.3 j(1.7)	ND(1.7)	ND(1.2)	ND(0.005)	2.9(1.2)	2.5(1.2)
Calcium	ND(5.000)	2140(1000)	1370(1000)	8410(1000)	ND(5.000)	ND(1000)	ND(1000)
Chromium	ND(0.010)	193(3.5)	32(3.5)	7.4(2.3)	ND(0.010)	1750(2.4)	1240(2.3)
Cobalt	ND(0.050)	16(10)	ND(10)	ND(10)	ND(0.050)	70(10)	61(10)
Copper	ND(0.025)	671(6.9)	72(6.9)	17(6.9)	ND(0.025)	1800(5.0)	1570(5.0)
Iron	ND(0.100)	101000(20)	19500(20)	6900(20)	ND(0.100)	604000(47)	489000(47)
Lead	ND(0.003)	31(1.7)j	16(1.7)j	139(12)j	ND(0.003)	74(4.7)j	64(4.7)j
Magnesium	ND(5.000)	ND(1000)	ND(1000)	2350(1000)	ND(5.000)	ND(1000)	ND(1000)
Manganese	ND(0.015)	818(3.0)j	148(3.0)j	665(3.0)j	ND(0.015)	4170(12)j	3080(12)j
Mercury	ND(0.0002)	ND(0.17)	ND(0.17)	ND(0.12)	ND(0.0002)	ND(0.12)	ND(0.12)
Nickel	ND(0.040)	99(8.0)	19(8.0)	ND(8.0)	ND(0.040)	443(47)	288(47)
Potassium	ND(5.000)	ND(1000)	ND(1000)	ND(1000)	ND(5.000)	ND(1000)	ND(1000)
Selenium	ND(0.005)	1.9(1.7)	ND(1.7)	ND(1.2)	ND(0.005)	ND(1.2)	ND(1.2)
Silver	ND(0.010)	ND(3.5)	ND(3.5)	ND(2.3)	ND(0.010)	4.8(2.4)	2.6(2.3)
Sodium	ND(5.000)	ND(1000)	ND(1000)	ND(1000)	ND(5.000)	ND(1000)	ND(1000)
Thallium	ND(0.010)	ND(2.0)	ND(2.0)	ND(2.0)	ND(0.010)	ND(2.0)	ND(2.0)
Vanadium	ND(0.050)	26(10)	20(10)	ND(10)	ND(0.050)	105(10)	88(10)
Zinc	ND(0.020)	82(6.9)	16(6.9)	46(4.6)	ND(0.020)	448(47)	412(47)
Total Cyanide	NA	0.56(0.20)j	ND(0.20)uj	0.24(0.20)j	NA	1.2(0.50)j	14(10)j

TABLE A.4

SURFACE AND BOREHOLE SOILS - INORGANICS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	BH-26B-93	BH-31A-93	BH-36B-93	BH-55B-93	BH-36r-93	BH-41A-93	BH46B-93
Sample Location	BH-26-93	BH-31-93	BH-36-93	BH-36-93	BH-36-93	BH-41-93	BH-46-93
Sample Interval (BGS)	6'-8'	2'-4'	6'-8'	6'-8'	6'-8'	2'-4'	6'-8'
Date Sampled	5/16/93	5/14/93	5/13/93	5/13/93	5/13/93	5/12/93	5/12/93
Date Analyzed	5/26 - 6/10/93	5/26 - 6/17/93	5/26 - 6/17/93	5/19 - 6/10/93	5/24-6/16/93	5/24-6/16/93	5/24-6/15/93
Units	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg) Duplicate	(mg/Kg) rinsate	(mg/Kg)	(mg/Kg)
Parameter							
Aluminum	6600(46)	4690(44)	5910(50)	6720(50)	ND(0.200)	5110(43)	5020(45)
Antimony	ND(14)r	ND(13)r	ND(15)r	ND(15)r	ND(0.060)	ND(15)	ND(14)r
Arsenic	4.1(2.0)j	4.2(2.0)j	9.9(2.0)j	5.0(2.0)j	ND(0.010)	3.6(2.0)j	6.1(2.0)j
Barium	108(40)	124(40)	254(40)	122(40)	ND(0.200)	ND(40)	ND(40)
Beryllium	ND(1.1)	ND(1.1)	1.3(1.2)	ND(1.2)	ND(0.005)	ND(1.1)	ND(1.1)
Cadmium	ND(1.1)	ND(1.1)	ND(1.2)	ND(1.2)	ND(0.005)	ND(1.1)	ND(1.1)
Calcium	19000(1000)j	38100(1000)j	14900(1000)j	38000(1000)j	ND(5.000)	13800(1000)j	19600(1000)j
Chromium	13(2.3)j	13(2.2)j	14(2.5)j	21(2.5)j	ND(0.010)	11(2.2)j	8.3(2.3)j
Cobalt	ND(1.0)	ND(0.11)	ND(10)	ND(10)	ND(0.050)	ND(10)	ND(10)
Copper	58(5.0)j	34(5.0)j	36(5.0)j	109(5.0)j	ND(0.025)	14(5.0)j	11(5.0)j
Iron	10500(20)	8250(20)	8970(20)	16300(20)	ND(0.100)	11200(20)	11400(20)
Lead	8.8(1.4)	23(1.1)	14(5.0)	290(10)j	ND(0.003)	7.7(1.0)	13(1.1)
Magnesium	5360(1000)	6130(1000)	4790(1000)	9020(1000)	ND(5.000)	5500(1000)	3470(1000)
Manganese	230(3.0)j	222(3.0)j	235(3.0)j	591(3.0)j	ND(0.015)	280(3.0)	347(3.0)j
Mercury	ND(0.11)	ND(0.11)	ND(0.12)	0.28(0.12)	ND(0.0002)	ND(0.1)	ND(0.1)
Nickel	12(8.0)	10(8.0)	15(8.0)	15(8.0)	ND(0.040)	11(8.0)	8.3(8.0)
Potassium	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(5.000)	ND(1000)	ND(1000)
Selenium	ND(1.1)uj	ND(1.1)uj	ND(1.2)uj	ND(1.2)uj	ND(0.005)	ND(1.1)j	ND(1.1)uj
Silver	ND(2.3)	ND(2.2)	ND(2.5)	ND(2.5)	ND(0.010)	ND(2.2)	ND(2.3)
Sodium	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(5.000)	ND(1000)	ND(1000)
Thallium	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(0.010)	ND(2.0)	ND(2.0)
Vanadium	23(10)	15(10)	22(10)	23(10)	ND(0.050)	17(10)	16(10)
Zinc	58(4.6)	41(4.4)	57(5.0)	470(5.0)	ND(0.020)	30(4.3)	32(4.5)
Total Cyanide	0.27(0.20)j	ND(0.20)uj	ND(0.20)	0.27(0.20)	ND(0.010)	ND(0.20)	ND(0.20)

TABLE A.4

SURFACE AND BOREHOLE SOILS - INORGANICS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	BH-46C-93	BH-46D-93	BH-47A-93	BH-47B-93	BH-48A-93	BH-48B-93	BH-49A-93
Sample Location	BH-46-93	BH-46-93	BH-47-93	BH-47-93	BH-48-93	BH-48-93	BH-49-93
Sample Interval (BGS)	24'-39.5'	83.5'-88.5'	2'-4'	6'-8'	2'-4'	6' - 8'	2'-4'
Date Sampled	5/15/93	5/15/93	5/15/93	5/15/93	5/15/93	5/15/93	5/15/93
Date Analyzed	5/26-6/15/93	5/26-6/17/93	7/13-7/15/93	7/12 - 7/15/93	7/13 - 7/15/93	7/13 - 7/15/93	7/12 - 7/15/93
Units	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
Parameter							
Aluminum	8290(47)	1740(48)	2100(44)	3100(46)	6000(46)	1900(46)	1600(44)
Antimony	ND(14)r	ND(14)r	ND(13)uj	ND(14)uj	ND(14)uj	ND(14)uj	ND(13)uj
Arsenic	6.6(2.0)j	4.3(2.0)j	ND(2.0)uj	2.1(2.0)j	ND(2.0)uj	3.2(2.0)j	2.1(2.0)j
Barium	58(40)	ND(40)	ND(40)	ND(40)	ND(40)	ND(40)	ND(40)
Beryllium	ND(1.2)	ND(1.2)	ND(1.1)	ND(1.2)	ND(1.2)	ND(1.2)	ND(1.1)
Cadmium	ND(1.2)	ND(1.2)	ND(1.1)	ND(1.2)	ND(1.2)	ND(1.2)	ND(1.1)
Calcium	94200(1000)j	118000(1000)	13000(1000)	61000(1000)	7200(1000)	37000(1000)	75000(1000)
Chromium	12(2.3)j	4.5(2.4)j	6.8(2.2)	9.2(2.3)	12(2.3)	6.2(2.3)	3.4(2.2)
Cobalt	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Copper	24(5.0)j	15(5.0)j	12(5.0)	8.7(5.0)	ND(5.0)	5.2(5.0)	6.9(5.0)
Iron	18300(20)	7290(20)	5100(20)	6100(20)	7500(20)	3200(20)	4900(20)
Lead	12(1.2)	8.5(1.4)	4.1(0.6)	8.9(1.2)j	4.8(0.6)j	5.4(0.6)j	3.0(0.6)j
Magnesium	18200(1000)	12000(1000)	15000(1000)	13000(1000)	3800(1000)	8200(1000)	10000(1000)
Manganese	430(3.0)j	245(3.0)j	370(3.0)	170(3.0)	77(3.0)	87(3.0)	210(3.0)
Mercury	ND(0.12)	ND(0.12)	ND(0.11)uj	ND(0.12)uj	ND(0.12)uj	ND(0.12)uj	ND(0.11)uj
Nickel	23(8.0)	9.3(8.0)	ND(8.0)	ND(8.0)	9.2(8.0)	ND(8.0)	ND(8.0)
Potassium	1790(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)
Selenium	ND(1.2)uj	ND(1.2)uj	ND(1.1)	ND(1.2)	ND(1.2)	ND(1.2)	ND(1.1)
Silver	ND(2.3)	ND(2.4)	ND(2.2)	ND(2.3)	ND(2.3)	ND(2.3)	ND(2.2)
Sodium	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)
Thallium	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Vanadium	19(10)	ND(10)	ND(10)	ND(10)	14(10)	ND(10)	ND(10)
Zinc	63(4.7)	39(4.8)	20(4.4)	20(4.6)	34(4.6)	32(4.6)	13(4.4)
Total Cyanide	ND(0.20)uj	ND(0.20)uj	ND(0.21)uj	ND(0.23)uj	ND(0.23)uj	ND(0.22)uj	ND(0.21)uj

TABLE A.4

SURFACE AND BOREHOLE SOILS - INORGANICS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	BH-56A-93	BH-49B-93	BH-50A-93	BH-59A-93	BH-50B-93
Sample Location	BH-49-93	BH-49-93	BH-50-93	BH-50-93	BH-50-93
Sample Interval (BGS)	2'-4'	6'-8'	2'-4'	2'-4'	6'-8'
Date Sampled	5/15/93	5/15/93	5/18/93	5/18/93	5/18/93
Date Analyzed	7/12 - 7/15/93	7/13 - 7/16/93	6/2 - 6/14/93	6/2 - 6/14/93	6/2 - 6/14/93
Units	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
	Duplicate			Duplicate	
Parameter					
Aluminum	4700(44)	1800(45)	2350(45)	3250(46)	2620(46)
Antimony	ND(13)uj	ND(13)uj	ND(13)r	ND(14)r	ND(14)r
Arsenic	3.2(2.0)j	ND(2.0)uj	15(2.0)j	15(2.0)j	19(5.8)j
Barium	ND(40)	ND(40)	ND(40)	ND(40)	ND(40)
Beryllium	ND(1.1)	ND(1.1)	ND(1.1)	ND(1.2)	ND(1.2)
Cadmium	ND(1.1)	ND(1.1)	ND(1.1)	ND(1.2)	ND(1.2)
Calcium	35000(1000)	78000(1000)	ND(1000)	ND(1000)	7000(1000)
Chromium	9.7(2.2)	4.3(2.2)	2.3(2.2)	4.5(2.3)	4.8(2.3)
Cobalt	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Copper	11(5.0)	8.3(5.0)	8.6(5.0)	8.2(5.0)	6.2(5.0)
Iron	10000(20)	4500(20)	3770(20)	4750(20)	4660(20)
Lead	4.9(1.2)j	6.1(0.6)j	69(2.2)j	80(4.6)j	68(4.6)j
Magnesium	8200(1000)	17000(1000)	ND(1000)	ND(1000)	1560(1000)
Manganese	190(3.0)	160(3.0)	328(3.0)	488(3.0)	366(3.0)
Mercury	ND(0.11)uj	ND(0.11)uj	ND(0.11)	ND(0.12)	ND(0.12)
Nickel	11(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)
Potassium	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)
Selenium	ND(1.1)	ND(1.2)	ND(1.1)	ND(1.2)	ND(1.2)
Silver	ND(2.2)	ND(2.2)	ND(2.2)	ND(2.3)	ND(2.3)
Sodium	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)
Thallium	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Vanadium	15(10)	ND(10)	ND(10)	ND(10)	ND(10)
Zinc	23(4.4)	16(4.5)	12(4.5)	28(4.6)	14(4.6)
Total Cyanide	ND(0.21)uj	ND(0.21)uj	NA	NA	NA

APPENDIX B

ANALYTICAL RESULTS GROUNDWATER

ROUND 1 AND ROUND 2

GROUNDWATER ROUND 1 - VOCs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		L-060993-JL-001	L-060993-JL-002	L-060993-JL-003	L-060993-JL-004	L-060993-JL-005	L-060993-JL-006
Sample Location		MW-3U-93	-	MW-3D-93	MW-1D-93	MW-1U-93	MW-1U-93
Date Sampled		6/9/93	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed		6/17/93	6/17/93	6/17/93	6/17/93	6/17/93	6/17/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
			Rinsate				Duplicate
Parameter	CAS Number						
Acetone	67-64-1	ND(0.010)	ND(0.010)	**0.017(0.010)**	**0.014(0.010)**	ND(0.010)	ND(0.010)
Benzene	71-43-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bromodichloromethane	75-27-4	ND(0.010)	ND(0.010)	ND(0.010)	**0.002 J (0.010)**	ND(0.010)	ND(0.010)
Bromoform	75-25-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bromomethane	74-83-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Butanone	78-93-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Carbon Disulfide	75-15-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Carbon tetrachloride	56-23-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chlorobenzene	108-90-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	**0.032(0.010)**	**0.032(0.010)**
Chloroethane	75-00-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chloroform	67-66-3	ND(0.010)	ND(0.010)	ND(0.010)	**0.010(0.010)**	ND(0.010)	ND(0.010)
Chloromethane	74-87-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dibromochloromethane	124-48-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1-Dichloroethane	75-34-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichloroethane	107-06-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1-Dichloroethene	75-35-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichloroethene (total)	540-59-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichloropropane	78-87-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
cis-1,3-Dichloropropene	10061-01-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
trans-1,3-Dichloropropene	10061-02-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Ethylbenzene	100-41-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Hexanone	591-78-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Methylene chloride	75-09-2	**0.001 J (0.010)**	**0.001 J (0.010)**	**0.001 J (0.010)**	**0.001 J (0.010)**	ND(0.010)	**0.001 J (0.010)**
4-Methyl-2-pentanone	108-10-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Styrene	100-42-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1,2,2-Tetrachloroethane	79-34-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Tetrachloroethene	127-18-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Toluene	108-88-3	ND(0.010)	ND(0.010)	ND(0.010)	**0.001 J (0.010)**	ND(0.010)	ND(0.010)
1,1,1-Trichloroethane	71-55-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1,2-Trichloroethane	79-00-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Trichloroethene	79-01-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Vinyl acetate	108-05-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Vinyl chloride	75-01-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Xylenes (total)	1330-20-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

TABLE B.1

GROUNDWATER ROUND 1 - VOCs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		L-060993-JL-007	L-060993-JL-008	L-060993-JL-009	L-060993-JL-010	L-060993-JL-011
Sample Location		MW-2D-93	MW-2U-93	MW-6U-93	MW-4U-93	MW-5U-93
Date Sampled		6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed		6/17/93	6/17/93	6/17/93	6/17/93	6/17/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Parameter	**CAS Number**					
Acetone	67-64-1	0.075(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.038(0.010)
Benzene	71-43-2	ND(0.010)	0.003 J (0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bromodichloromethane	75-27-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bromoform	75-25-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bromomethane	74-83-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Butanone	78-93-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Carbon Disulfide	75-15-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Carbon tetrachloride	56-23-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chlorobenzene	108-90-7	ND(0.010)	ND(0.010)	ND(0.010)	0.001 J (0.010)	ND(0.010)
Chloroethane	75-00-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chloroform	67-66-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chloromethane	74-87-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dibromochloromethane	124-48-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1-Dichloroethane	75-34-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichloroethane	107-06-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1-Dichloroethene	75-35-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichloroethene (total)	540-59-0	ND(0.010)	0.010(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichloropropane	78-87-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
cis-1,3-Dichloropropene	10061-01-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
trans-1,3-Dichloropropene	10061-02-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Ethylbenzene	100-41-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Hexanone	591-78-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Methylene chloride	75-09-2	0.001 J (0.010)	ND(0.010)	ND(0.010)	0.001 J (0.010)	ND(0.010)
4-Methyl-2-pentanone	108-10-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Styrene	100-42-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1,2,2-Tetrachloroethane	79-34-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Tetrachloroethene	127-18-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Toluene	108-88-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1,1-Trichloroethane	71-55-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1,2-Trichloroethane	79-00-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Trichloroethene	79-01-6	ND(0.010)	0.001 J (0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Vinyl acetate	108-05-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Vinyl chloride	75-01-4	ND(0.010)	0.009 J (0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Xylenes (total)	1330-20-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

GROUNDWATER ROUND 1 - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		L-060993-JL-001	L-060993-JL-002	L-060993-JL-003	L-060993-JL-004	L-060993-JL-005	L-060993-JL-006
Sample Location		MW-3U-93	-	MW-3D-93	MW-1D-93	MW-1U-93	MW-1U-93
Date Sampled		6/9/93	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed		6/22/93	6/22/93	6/22/93	6/30/93	6/22/93	6/22/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
			Rinsate				Duplicate
Base/Neutral Compounds	**CAS Number**						
Acenaphthene	83-32-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Acenaphthylene	208-96-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Anthracene	120-12-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.001 J (0.010)
Benzo(a)anthracene	56-55-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(b)fluoranthene	205-99-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(k)fluoranthene	207-08-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(g,h,i)perylene	191-24-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(a)pyrene	50-32-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzoic acid	65-85-0	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Benzyl alcohol	100-51-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-chloroethoxy)methane	111-91-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-chloroethyl)ether	111-44-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-chloroisopropyl)ether	39638-32-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-ethylhexyl)phthalate	117-81-7	0.007 J B (0.010)u	0.005 J B (0.010)u	0.099 B (0.010)	0.42 B (0.010)	ND(0.010)	0.004 J B (0.010)u
4-Bromophenyl phenyl ether	101-55-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Butyl benzyl phthalate	85-68-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Chloroaniline	106-47-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Chloronaphthalene	91-58-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Chlorophenyl phenyl ether	7005-72-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chrysene	218-01-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dibenz(a,h)anthracene	53-70-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dibenzofuran	132-64-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Di-n-butyl phthalate	84-74-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichlorobenzene	95-50-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,3-Dichlorobenzene	541-73-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,4-Dichlorobenzene	106-46-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
3,3'-Dichlorobenzidine	91-94-1	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Diethyl phthalate	84-66-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dimethyl phthalate	131-11-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4-Dinitrotoluene	121-14-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,6-Dinitrotoluene	606-20-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Di-n-octyl phthalate	117-84-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Fluoranthene	206-44-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.002 J (0.010)	0.002 J (0.010)
Fluorene	86-73-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

TABLE B.2

GROUNDWATER ROUND 1 - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		L-060993-JL-001	L-060993-JL-002	L-060993-JL-003	L-060993-JL-004	L-060993-JL-005	L-060993-JL-006
Sample Location		MW-3U-93	-	MW-3D-93	MW-1D-93	MW-1U-93	MW-1U-93
Date Sampled		6/9/93	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed		6/22/93	6/22/93	6/22/93	6/30/93	6/22/93	6/22/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
			Rinsate				Duplicate
Hexachlorobenzene	118-74-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexachlorobutadiene	87-68-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexachlorocyclopentadiene	77-47-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexachloroethane	67-72-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Indeno(1,2,3-cd)pyrene	193-39-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Isophorone	78-59-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Methylnaphthalene	91-57-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Naphthalene	91-20-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Nitroaniline	88-74-4	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
3-Nitroaniline	99-09-2	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
4-Nitroaniline	100-01-6	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Nitrobenzene	98-95-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
N-Nitrosodiphenylamine	86-30-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
N-Nitroso-di-n-propylamine	621-64-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Phenanthrene	85-01-8	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	0.003 J (0.050)	0.003 J (0.050)
Pyrene	129-00-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.002 J (0.010)	0.002 J (0.010)
1,2,4-Trichlorobenzene	120-82-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Acid Compounds							
4-Chloro-3-methylphenol	59-50-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Chlorophenol	95-57-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4-Dichlorophenol	120-83-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4-Dimethylphenol	105-67-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4,6 Dinitro-2-methylphenol	534-52-1	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2,4-Dinitrophenol	51-28-5	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2-Methylphenol	95-48-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Methylphenol	106-44-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Nitrophenol	88-75-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Nitrophenol	100-02-7	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Pentachlorophenol	87-86-5	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Phenol	108-95-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4,5-Trichlorophenol	95-95-4	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2,4,6-Trichlorophenol	88-06-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

GROUNDWATER ROUND 1 - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		L-060993-JL-007	L-060993-JL-008	L-060993-JL-009	L-060993-JL-010	L-060993-JL-011
Sample Location		MW-2D-93	MW-2U-93	MW-6U-93	MW-4U-93	MW-5U-93
Date Sampled		6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed		6/22/93	6/22/93	6/22/93	6/22/93	6/22/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Base/Neutral Compounds	**CAS Number**					
Acenaphthene	83-32-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.002 J (0.010)
Acenaphthylene	208-96-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Anthracene	120-12-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.002 J (0.010)
Benzo(a)anthracene	56-55-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.002 J (0.010)
Benzo(b)fluoranthene	205-99-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(k)fluoranthene	207-08-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.005 J (0.010)
Benzo(g,h,i)perylene	191-24-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(a)pyrene	50-32-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.001 J (0.010)
Benzoic acid	65-85-0	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Benzyl alcohol	100-51-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-chloroethoxy)methane	111-91-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-chloroethyl)ether	111-44-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-chloroisopropyl)ether	39638-32-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-ethylhexyl)phthalate	117-81-7	0.18 B (0.010)	ND(0.010)	0.004 J B (0.010)u	0.003 J B (0.010)u	0.022 B (0.010)
4-Bromophenyl phenyl ether	101-55-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Butyl benzyl phthalate	85-68-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Chloroaniline	106-47-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Chloronaphthalene	91-58-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Chlorophenyl phenyl ether	7005-72-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chrysene	218-01-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.003 J (0.010)
Dibenz(a,h)anthracene	53-70-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dibenzofuran	132-64-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Di-n-butyl phthalate	84-74-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.001 J (0.010)
1,2-Dichlorobenzene	95-50-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,3-Dichlorobenzene	541-73-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,4-Dichlorobenzene	106-46-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
3,3'-Dichlorobenzidine	91-94-1	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Diethyl phthalate	84-66-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dimethyl phthalate	131-11-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4-Dinitrotoluene	121-14-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,6-Dinitrotoluene	606-20-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Di-n-octyl phthalate	117-84-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Fluoranthene	206-44-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.008 J (0.010)
Fluorene	86-73-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.002 J (0.010)

TABLE B.2

GROUNDWATER ROUND 1 - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		L-060993-JL-007	L-060993-JL-008	L-060993-JL-009	L-060993-JL-010	L-060993-JL-011
Sample Location		MW-2D-93	MW-2U-93	MW-6U-93	MW-4U-93	MW-5U-93
Date Sampled		6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed		6/22/93	6/22/93	6/22/93	6/22/93	6/22/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Hexachlorobenzene	118-74-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexachlorobutadiene	87-68-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexachlorocyclopentadiene	77-47-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexachloroethane	67-72-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Indeno(1,2,3-cd)pyrene	193-39-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Isophorone	78-59-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Methylnaphthalene	91-57-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Naphthalene	91-20-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.004 J (0.010)
2-Nitroaniline	88-74-4	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
3-Nitroaniline	99-09-2	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
4-Nitroaniline	100-01-6	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Nitrobenzene	98-95-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
N-Nitrosodiphenylamine	86-30-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
N-Nitroso-di-n-propylamine	621-64-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Phenanthrene	85-01-8	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	0.009 J (0.050)
Pyrene	129-00-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.005 J (0.010)
1,2,4-Trichlorobenzene	120-82-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Acid Compounds						
4-Chloro-3-methylphenol	59-50-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Chlorophenol	95-57-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4-Dichlorophenol	120-83-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4-Dimethylphenol	105-67-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4,6-Dinitro-2-methylphenol	534-52-1	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2,4-Dinitrophenol	51-28-5	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2-Methylphenol	95-48-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Methylphenol	106-44-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Nitrophenol	88-75-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Nitrophenol	100-02-7	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Pentachlorophenol	87-86-5	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Phenol	108-95-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4,5-Trichlorophenol	95-95-4	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2,4,6-Trichlorophenol	88-06-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

GROUNDWATER ROUND 1 - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		L-060993-JL-001	L-060993-JL-002	L-060993-JL-003	L-060993-JL-004	L-060993-JL-005	L-060993-JL-006
Sample Location		MW-3U-93	-	MW-3D-93	MW-1D-93	MW-1U-93	MW-1U-93
Date Sampled		6/9/93	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analysed		6/23/93	6/23/93	6/23/93	6/23/93	6/23/93	6/23/93
Units		(µg/L)	(µg/L) Rinsate	(µg/L)	(µg/L)	(µg/L)	(µg/L) Duplicate
Parameter	**CAS Number**						
Aldrin	309-00-2	ND(0.05)uj	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj
alpha-BHC	319-84-6	ND(0.05)uj	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj
beta-BHC	319-85-7	ND(0.05)uj	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj
delta-BHC	319-86-8	ND(0.05)uj		ND(0.05)uj	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj
gamma-BHC (Lindane)	58-89-9	ND(0.05)uj	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj
Alpha-Chlordane	5103-71-9	ND(0.05)uj	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj
Gamma-Chlordane	5103-74-2	ND(0.05)uj	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj
4,4'-DDD	72-54-8	ND(0.10)uj	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj
4,4'-DDE	72-55-9	ND(0.10)uj	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj
4,4'-DDT	50-29-3	ND(0.10)uj	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj
Dieldrin	60-57-1	ND(0.10)uj	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj
alpha-Endosulfan	959-98-8	ND(0.05)uj	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj
beta-Endosulfan	33213-65-9	ND(0.10)uj	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj
Endosulfan Sulfate	1031-07-08	ND(0.10)uj	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj
Endrin	72-20-8	ND(0.10)uj	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj
Endrin Ketone	53494-70-5	ND(0.10)uj	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj
Heptachlor	76-44-8	ND(0.05)uj	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj
Heptachlor Epoxide	1024-57-3	ND(0.05)uj	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj	ND(0.05)uj
Methoxychlor	72-43-5	ND(0.50)uj	ND(0.50)	ND(0.50)uj	ND(0.50)uj	ND(0.50)uj	ND(0.50)uj
Toxaphene	8001-35-2	ND(5.0)uj	ND(5.0)	ND(5.0)uj	ND(5.0)uj	ND(5.0)uj	ND(5.0)uj
Aroclor-1016	12674-11-2	ND(1.0)uj	ND(1.0)	ND(1.0)uj	ND(1.0)uj	ND(1.0)uj	ND(1.0)uj
Aroclor-1221	11104-28-2	ND(2.0)uj	ND(2.0)	ND(2.0)uj	ND(2.0)uj	ND(2.0)uj	ND(2.0)uj
Aroclor-1232	11141-16-5	ND(1.0)uj	ND(1.0)	ND(1.0)uj	ND(1.0)uj	ND(1.0)uj	ND(1.0)uj
Aroclor-1242	53469-21-9	ND(1.0)uj	ND(1.0)	ND(1.0)uj	ND(1.0)uj	ND(1.0)uj	ND(1.0)uj
Aroclor-1248	12672-29-6	ND(1.0)uj	ND(1.0)	ND(1.0)uj	ND(1.0)uj	ND(1.0)uj	ND(1.0)uj
Aroclor-1254	11097-69-1	ND(1.0)uj	ND(1.0)	ND(1.0)uj	ND(1.0)uj	**8.4(1.0)j**	**8.9(1.0)j**
Aroclor-1260	11096-82-5	ND(1.0)uj	ND(1.0)	ND(1.0)uj	ND(1.0)uj	ND(1.0)uj	ND(1.0)uj

TABLE B.3

GROUNDWATER ROUND 1 - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		L-060993-JL-007	L-060993-JL-008	L-060993-JL-009	L-060993-JL-010	L-060993-JL-011
Sample Location		MW-2D-93	MW-2U-93	MW-6U-93	MW-4U-93	MW-5U-93
Date Sampled		6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed		6/23/93	6/23/93	6/23/93	6/23/93	6/23/93
Units		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Parameter	CAS Number					
Aldrin	309-00-2	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)	ND(0.05)
alpha-BHC	319-84-6	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)	ND(0.05)
beta-BHC	319-85-7	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)	ND(0.05)
delta-BHC	319-86-8	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)	ND(0.05)
gamma-BHC (Lindane)	58-89-9	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)	ND(0.05)
Alpha-Chlordane	5103-71-9	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)	ND(0.05)
Gamma-Chlordane	5103-74-2	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)	ND(0.05)
4,4'-DDD	72-54-8	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)	ND(0.10)
4,4'-DDE	72-55-9	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)	ND(0.10)
4,4'-DDT	50-29-3	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)	ND(0.10)
Dieldrin	60-57-1	ND(0.10)uj	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)
alpha-Endosulfan	959-98-8	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)	ND(0.05)
beta-Endosulfan	33213-65-9	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)	ND(0.10)
Endosulfan Sulfate	1031-07-08	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)	ND(0.10)
Endrin	72-20-8	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)	ND(0.10)
Endrin Ketone	53494-70-5	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)	ND(0.10)
Heptachlor	76-44-8	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)	ND(0.05)
Heptachlor Epoxide	1024-57-3	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)	ND(0.05)
Methoxychlor	72-43-5	ND(0.50)uj	ND(0.50)uj	ND(0.50)	ND(0.50)	ND(0.50)
Toxaphene	8001-35-2	ND(5.0)uj	ND(5.0)uj	ND(5.0)	ND(5.0)	ND(5.0)
Aroclor-1016	12674-11-2	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)	ND(1.0)
Aroclor-1221	11104-28-2	ND(2.0)uj	ND(2.0)uj	ND(2.0)	ND(2.0)	ND(2.0)
Aroclor-1232	11141-16-5	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)	ND(1.0)
Aroclor-1242	53469-21-9	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)	ND(1.0)
Aroclor-1248	12672-29-6	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)	ND(1.0)
Aroclor-1254	11097-69-1	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)	ND(1.0)
Aroclor-1260	11096-82-5	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)	ND(1.0)

GROUNDWATER ROUND 1 - INORGANICS (FILTERED)
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	L-060993-JL-001	L-060993-JL-002	L-060993-JL-003	L-060993-JL-004	L-060993-JL-005	L-060993-JL-006
Sample Location	MW-3U-93	-	MW-3D-93	MW-1D-93	MW-1U-93	MW-1U-93
Date Sampled	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed	6/15/93	6/15/93	6/15/93	6/15/93	6/15/93	6/15/93
Units	(mg/L)	(mg/L) Rinsate	(mg/L)	(mg/L)	(mg/L)	(mg/L) Duplicate
Parameter						
Aluminum	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
Antimony	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)
Arsenic	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj
Barium	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
Beryllium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Cadmium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Calcium	**140(5.000)**	ND(5.000)	**24(5.000)**	**49(5.000)**	**360(5.000)**	**360(5.000)**
Chromium	**0.03(0.010)**	**0.03(0.010)**	**0.05(0.010)**	**0.12(0.010)**	**0.08(0.010)**	**0.04(0.010)**
Cobalt	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Copper	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)
Iron	**2.8(0.100)**	ND(0.100)	ND(0.100)	**0.25(0.100)**	**10(0.100)**	**9.1(0.100)**
Lead	ND(0.003)	ND(0.003)	**0.006(0.003)**	ND(0.003)	ND(0.003)	ND(0.003)
Magnesium	**27(5.000)**	ND(5.000)	ND(5.000)	**12(5.000)**	**130(5.000)**	**130(5.000)**
Manganese	**0.19(0.015)**	ND(0.015)	ND(0.015)	**0.020(0.015)**	**0.82(0.015)**	**0.81(0.015)**
Mercury	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)
Nickel	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)
Potassium	**2.6(5.000)**	ND(5.000)	**45(5.000)**	**43(5.000)**	**50(5.000)**	**51(5.000)**
Selenium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Silver	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Sodium	**13(5.000)**	ND(5.000)	**38(5.000)**	**24(5.000)**	**69(5.000)**	**69(5.000)**
Thallium	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj
Vanadium	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Zinc	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Total Cyanide	NA	NA	NA	NA	NA	NA

TABLE B.4

GROUNDWATER ROUND 1 - INORGANICS (FILTERED)
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	L-060993-JL-007	L-060993-JL-008	L-060993-JL-009	L-060993-JL-010	L-060993-JL-011
Sample Location	MW-2D-93	MW-2U-93	MW-6U-93	MW-4U-93	MW-5U-93
Date Sampled	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed	6/15/93	6/15/93	6/15/93	6/15/93	6/15/93
Units	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Parameter					
Aluminum	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
Antimony	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)
Arsenic	ND(0.010)uj	ND(0.010)uj	ND(0.010)	ND(0.010)	ND(0.010)
Barium	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
Beryllium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Cadmium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Calcium	110(5.000,	130(5.000)	56(5.000)	120(5.000)	140(5.000)
Chromium	0.03(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Cobalt	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Copper	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)
Iron	0.14(0.100)	6.5(0.100)	ND(0.100)	0.28(0.100)	1.1(0.100)
Lead	ND(0.003)	ND(0.003)	ND(0.003)	ND(0.003)	ND(0.003)
Magnesium	29(5.000)	27(5.000)	18(5.000)	24(5.000)	41(5.000)
Manganese	0.036(0.015)	0.68(0.015)	0.102(0.015)	0.80(0.015)	0.22(0.015)
Mercury	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)
Nickel	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)
Potassium	24(5.000)	9.7(5.000)	5.0(5.000)	7.8(5.000)	21(5.000)
Selenium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Silver	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Sodium	40(5.000)	36(5.000)	32(5.000)	25(5.000)	68(5.000)
Thallium	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj
Vanadium	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Zinc	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Total Cyanide	NA	NA	NA	NA	NA

GROUNDWATER ROUND 1 - INORGANICS (UNFILTERED)
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	L-060993-JL-001	L-060993-JL-002	L-060993-JL-003	L-060993-JL-004	L-060993-JL-005	L-060993-JL-006	L-060993-JL-007
Sample Location	MW-3U-93	-	MW-3D-93	MW-1D-93	MW-1U-93	MW-1U-93	MW-2D-93
Date Sampled	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed	6/15 - 6/28/1993	6/15/93	6/15/93	6/15/93	6/15/93	6/15/93	6/15/93
Units	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
		Rinsate				oii	
Parameter							
Aluminum	**13(0.200)**	ND(0.200)	**30(0.200)**	**1.4(0.200)**	**23(0.200)**	**21(0.200)**	**16(0.200)**
Antimony	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)
Arsenic	ND(0.010)uj	ND(0.010)uj	**0.014(0.010)uj**	ND(0.010)uj	**0.032(0.010)uj**	**0.031(0.010)uj**	**0.021(0.010)uj**
Barium	**1.8(0.200)**	ND(0.200)	**2.0(0.200)**	**1.8(0.200)**	**2.1(0.200)**	**2.1(0.200)**	**0.37(0.200)**
Beryllium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Cadmium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Calcium	**230(5.000)**	ND(5.000)	**200(5.000)**	**73(5.000)**	**770(5.000)**	**710(5.000)**	**310(5.000)**
Chromium	**0.07(0.010)**	**0.03(0.010)**	**0.19(0.010)**	**0.08(0.010)**	**0.09(0.010)**	**0.10(0.010)**	**0.11(0.010)**
Cobalt	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Copper	**0.05(0.025)**	ND(0.025)	**0.10(0.025)**	**0.03(0.025)**	**0.23(0.025)**	**0.23(0.025)**	**0.11(0.025)**
Iron	**31(0.100)**	ND(0.100)	**48(0.100)**	**3.4(0.100)**	**73(0.100)**	**67(0.100)**	**40(0.100)**
Lead	**0.017(0.003)**	ND(0.003)	**0.044(0.003)**	**0.005(0.003)**	**0.22(0.003)**	**0.21(0.003)**	**0.033(0.003)**
Magnesium	**54(5.000)**	ND(5.000)	**37(5.000)**	**17(5.000)**	**220(5.000)**	**200(5.000)**	**55(5.000)**
Manganese	**0.73(0.015)**	ND(0.015)	**0.72(0.015)**	**0.077(0.015)**	**2.4(0.015)**	**2.2(0.015)**	**0.65(0.015)**
Mercury	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)	**0.0005(0.0002)**	**0.0006(0.0002)**	ND(0.0002)
Nickel	**0.05(0.040)**	ND(0.040)	**0.09(0.040)**	ND(0.040)	**0.09(0.040)**	**0.09(0.040)**	**0.06(0.040)**
Potassium	**7.7(5.000)**	ND(5.000)	**60(5.000)**	**36(5.000)**	**57(5.000)**	**58(5.000)**	**29(5.000)**
Selenium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Silver	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Sodium	**22(5.000)**	ND(5.000)	**50(5.000)**	**27(5.000)**	**77(5.000)**	**77(5.000)**	**42(5.000)**
Thallium	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj
Vanadium	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	**0.07(0.050)**	**0.06(0.050)**	ND(0.050)
Zinc	**1.1(0.020)**	ND(0.020)	**1.2(0.020)**	**1.1(0.020)**	**1.3(0.020)**	**1.2(0.020)**	**0.52(0.020)**
Total Cyanide	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

TABLE B.5

GROUNDWATER ROUND 1 - INORGANICS (UNFILTERED)
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	L-060993-JL-008	L-060993-JL-009	L-060993-JL-010	L-060993-JL-011
Sample Location	MW-2U-93	MW-6U-93	MW-4U-93	MW-5U-93
Date Sampled	6/9/93	6/9/93	6/9/93	6/9/93
Date Analyzed	6/15/93	6/15/93	6/15/93	6/15/93
Units	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Parameter				
Aluminum	31(0.200)	26(0.200)	9.9(0.200)	17(0.200)
Antimony	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)
Arsenic	0.021(0.010)uj	0.013(0.010)uj	ND(0.010)uj	0.010(0.010)uj
Barium	0.92(0.200)	ND(0.200)	ND(0.200)	0.23(0.200)
Beryllium	0.007(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Cadmium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Calcium	320(5.000)	210(5.000)	190(5.000)	290(5.000)
Chromium	0.06(0.010)	0.15(0.010)	0.04(0.010)	0.12(0.010)
Cobalt	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Copper	0.13(0.025)	0.12(0.025)	0.05(0.025)	0.08(0.025)
Iron	66(0.100)	60(0.100)	22(0.100)	41(0.100)
Lead	0.062(0.003)	0.039(0.003)	0.042(0.003)	0.042(0.003)
Magnesium	77(5.000)	62(5.000)	47(5.000)	85(5.000)
Manganese	2.0(0.015)	1.1(0.015)	1.3(0.015)	1.2(0.015)
Mercury	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)
Nickel	0.08(0.040)	0.10(0.040)	ND(0.040)	0.08(0.040)
Potassium	14(5.000)	10(5.000)	9.1(5.000)	25(5.000)
Selenium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Silver	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Sodium	37(5.000)	31(5.000)	24(5.000)	66(5.000)
Thallium	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)
Vanadium	0.10(0.050)	0.08(0.050)	ND(0.050)	ND(0.050)
Zinc	0.28(0.020)	0.28(0.020)	0.11(0.020)	0.17(0.020)
Total Cyanide	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

GROUNDWATER ROUND 2 - VOCs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		GW-081793-JM-101	GW-081793-JM-102	GW-081793-JM-103	GW-081793-JM-104	GW-081793-JM-105	GW-081793-JM-106
Sample Location		-	MW-1D-93	MW-1D-93	MW-1U-93	MW-2D-93	MW-2U-93
Date Sampled		8/17/93	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93
Date Analyzed		8/24/93	8/24/93	8/24/93	8/24/93	8/24/93	8/24/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
	CAS	Rinsate		Duplicate			
Parameter	Number						
Acetone	67-64-1	0.010(0.010)u	0.11(0.010)	0.13(0.010)	0.016(0.010)u	1.7 (0.20)	0.005 J(0.010)u
Benzene	71-43-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	0.002 J(0.010)
Bromodichloromethane	75-27-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Bromoform	75-25-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Bromomethane	74-83-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
2-Butanone	78-93-3	0.003 J(0.010)u	0.008 J(0.010)u	0.005 J(0.010)u	0.004 J(0.010)u	ND(0.20)	0.004 J(0.010)u
Carbon Disulfide	75-15-0	ND(0.010)	0.001 J(0.010)	0.001 J(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Carbon tetrachloride	56-23-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Chlorobenzene	108-90-7	0.002 J(0.010)	ND(0.010)	ND(0.010)	0.044(0.010)	ND(0.20)	ND(0.010)
Chloroethane	75-00-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Chloroform	67-66-3	ND(0.010)	0.001 J(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Chloromethane	74-87-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Dibromochloromethane	124-48-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
1,1-Dichloroethane	75-34-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
1,2-Dichloroethane	107-06-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
1,1-Dichloroethene	75-35-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
1,2-Dichloroethene (total)	540-59-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	0.011(0.010)
1,2-Dichloropropane	78-87-5	ND(0.010)	ND(0 010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
cis-1,3-Dichloropropene	10061-01-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
trans-1,3-Dichloropropene	10061-02-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Ethylbenzene	100-41-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
2-Hexanone	591-78-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Methylene chloride	75-09-2	0.003 J (0.010)u	0.005 JB(0.010)u	0.002 J B(0.010)u	0.001 J B (0.010)u	ND(0.20)	ND(0.010)
4-Methyl-2-pentanone	108-10-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Styrene	100-42-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
1,1,2,2-Tetrachloroethane	79-34-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Tetrachloroethene	127-18-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Toluene	108-88-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
1,1,1-Trichloroethane	71-55-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
1,1,2-Trichloroethane	79-00-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Trichloroethene	79-01-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	0.001 J(0.010)
Vinyl acetate	108-05-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	ND(0.010)
Vinyl chloride	75-01-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	0.014(0.010)
Xylenes (total)	1330-20-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.20)	0.005 J(0.010)

TABLE B.6

GROUNDWATER ROUND 2 - VOCs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		GW-081793-JM-107	GW-081793-JM-108	GW-081793-JM-109	GW-081793-JM-110	GW-081793-JM-111
Sample Location		MW-3D-93	MW-3U-93	MW-4U-93	MW-6U-93	MW-5U-93
Date Sampled		8/17/93	8/17/93	8/17/93	8/17/93	8/17/93
Date Analyzed		8/24/93	8/24/93	8/24/93	8/24/93	8/24/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Parameter	CAS Number					
Acetone	67-64-1	0.63(0.050)	0.014(0.010)u	0.014(0.010)u	0.007 J(0.010)u	0.060(0.010)
Benzene	71-43-2	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bromodichloromethane	75-27-4	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bromoform	75-25-2	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bromomethane	74-83-9	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Butanone	78-93-3	ND(0.050)	ND(0.010)	0.003 J(0.010)u	0.004 J(0.010)u	ND(0.010)
Carbon Disulfide	75-15-0	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Carbon tetrachloride	56-23-5	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chlorobenzene	108-90-7	ND(0.050)	ND(0.010)	0.002 J(0.010)	ND(0.010)	ND(0.010)
Chloroethane	75-00-3	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chloroform	67-66-3	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chloromethane	74-87-3	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dibromochloromethane	124-48-1	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1-Dichloroethane	75-34-3	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichloroethane	107-06-2	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1-Dichloroethene	75-35-4	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichloroethene (total)	540-59-0	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichloropropane	78-87-5	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
cis-1,3-Dichloropropene	10061-01-5	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
trans-1,3-Dichloropropene	10061-02-6	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Ethylbenzene	100-41-4	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Hexanone	591-78-6	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Methylene chloride	75-09-2	ND(0.050)	ND(0.010)	ND(0.010)	0.003 J B (0.010)u	ND(0.010)
4-Methyl-2-pentanone	108-10-1	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Styrene	100-42-5	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1,2,2-Tetrachloroethane	79-34-5	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Tetrachloroethene	127-18-4	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Toluene	108-88-3	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1,1-Trichloroethane	71-55-6	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,1,2-Trichloroethane	79-00-5	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Trichloroethene	79-01-6	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Vinyl acetate	108-05-4	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Vinyl chloride	75-01-4	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Xylenes (total)	1330-20-7	ND(0.050)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

TABLE B.7

GROUNDWATER ROUND 2- BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		GW-081793-JM-101	GW-081793-JM-102	GW-081793-JM-103	GW-081793-JM-104	GW-081793-JM-105	GW-081793-JM-106	GW-081793-JM-107
Sample Location		-	MW-1D-93	MW-1D-93	MW-1U-93	MW-2D-93	MW-2U-93	MW-3D-93
Date Sampled		8/17/93	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93
Date Analyzed		8/27/93	8/27/93	8/27/93	8/27/93	8/27/93	8/27/93	8/27/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
	CAS	Rinsate		Duplicate				
Base/Neutral Compounds	Number							
Acenaphthene	83-32-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Acenaphthylene	208-96-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Anthracene	120-12-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Benzo(a)anthracene	56-55-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Benzo(b)fluoranthene	205-99-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Benzo(k)fluoranthene	207-08-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Benzo(g,h,i)perylene	191-24-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Benzo(a)pyrene	50-32-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Benzoic acid	65-85-0	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.050)
Benzyl alcohol	100-51-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Bis(2-chloroethoxy)methane	111-91-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Bis(2-chloroethyl)ether	111-44-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Bis(2-chloroisopropyl)ether	39638-32-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Bis(2-ethylhexyl)phthalate	117-81-7	0.003 J B (0.010)u	0.023 B (0.010)u	0.031 B (0.010)u	0.006 J B (0.010)u	0.24 B(0.020)u	0.004 J B (0.010)u	0.083 B(0.010)u
4-Bromophenyl phenyl ether	101-55-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Butyl benzyl phthalate	85-68-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
4-Chloroaniline	106-47-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
2-Chloronaphthalene	91-58-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
4-Chlorophenyl phenyl ether	7005-72-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Chrysene	218-01-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Dibenz(a,h)anthracene	53-70-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Dibenzofuran	132-64-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Di-n-butyl phthalate	84-74-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	0.002 J(0.010)	ND(0.010)
1,2-Dichlorobenzene	95-50-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
1,3-Dichlorobenzene	541-73-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
1,4-Dichlorobenzene	106-46-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
3,3'-Dichlorobenzidine	91-94-1	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.040)	ND(0.020)	ND(0.020)
Diethyl phthalate	84-66-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Dimethyl phthalate	131-11-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
2,4-Dinitrotoluene	121-14-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
2,6-Dinitrotoluene	606-20-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Di-n-octyl phthalate	117-84-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Fluoranthene	206-44-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Fluorene	86-73-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)

TABLE B.7

GROUNDWATER ROUND 2- BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		GW-081793-JM-101	GW-081793-JM-102	GW-081793-JM-103	GW-081793-JM-104	GW-081793-JM-105	GW-081793-JM-106	GW-081793-JM-107
Sample Location		-	MW-1D-93	MW-1D-93	MW-1U-93	MW-2D-93	MW-2U-93	MW-3D-93
Date Sampled		8/17/93	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93
Date Analyzed		8/27/93	8/27/93	8/27/93	8/27/93	8/27/93	8/27/93	8/27/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
		Rinsate		Duplicate				
Base/Neutral Compounds	**CAS Number**							
Hexachlorobenzene	118-74-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Hexachlorobutadiene	87-68-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Hexachlorocyclopentadiene	77-47-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Hexachloroethane	67-72-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Indeno(1,2,3-cd)pyrene	193-39-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Isophorone	78-59-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
2-Methylnaphthalene	91-57-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Naphthalene	91-20-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
2-Nitroaniline	88-74-4	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.050)
3-Nitroaniline	99-09-2	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.050)
4-Nitroaniline	100-01-6	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.050)
Nitrobenzene	98-95-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
N-Nitrosodiphenylamine	86-30-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
N-Nitroso-di-n-propylamine	621-64-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Phenanthrene	85-01-8	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.050)
Pyrene	129-00-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
1,2,4-Trichlorobenzene	120-82-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Acid Compounds								
4-Chloro-3-methylphenol	59-50-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
2-Chlorophenol	95-57-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
2,4-Dichlorophenol	120-83-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
2,4-Dimethylphenol	105-67-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
4,6 Dinitro-2-methylphenol	534-52-1	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.050)
2,4-Dinitrophenol	51-28-5	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.050)
2-Methylphenol	95-48-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
4-Methylphenol	106-44-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
2-Nitrophenol	88-75-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
4-Nitrophenol	100-02-7	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.050)
Pentachlorophenol	87-86-5	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.050)
Phenol	108-95-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
2,4,5-Trichlorophenol	95-95-4	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.050)
2,4,6-Trichlorophenol	88-06-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)

TABLE B.7

GROUNDWATER ROUND 2- BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		GW-081793-JM-108	GW-081793-JM-109	GW-081793-JM-110	GW-081793-JM-111
Sample Location		MW-3U-93	MW-4U-93	MW-6U-93	MW-5U-93
Date Sampled		8/17/93	8/17/93	8/17/93	8/17/93
Date Analyzed		8/27/93	8/27/93	8/27/93	8/27/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)
Base/Neutral Compounds	CAS Number				
Acenaphthene	83-32-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Acenaphthylene	208-96-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Anthracene	120-12-7	ND(0.010)	ND(0.010)	ND(0.010)	0.002 J (0.010)
Benzo(a)anthracene	56-55-3	ND(0.010)	ND(0.010)	ND(0.010)	0.003 J (0.010)
Benzo(b)fluoranthene	205-99-2	ND(0.010)	ND(0.010)	ND(0.010)	0.003 J (0.010)
Benzo(k)fluoranthene	207-08-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(g,h,i)perylene	191-24-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(a)pyrene	50-32-8	ND(0.010)	ND(0.010)	ND(0.010)	0.002 J (0.010)
Benzoic acid	65-85-0	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Benzyl alcohol	100-51-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-chloroethoxy)methane	111-91-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-chloroethyl)ether	111-44-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-chloroisopropyl)ether	39638-32-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Bis(2-ethylhexyl)phthalate	117-81-7	0.044 B(0.010)u	0.006 J B (0.010)u	0.003 J B (0.010)u	0.004 J B (0.010)u
4-Bromophenyl phenyl ether	101-55-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Butyl benzyl phthalate	85-68-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Chloroaniline	106-47-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Chloronaphthalene	91-58-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Chlorophenyl phenyl ether	7005-72-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Chrysene	218-01-9	ND(0.010)	ND(0.010)	ND(0.010)	0.003 J (0.010)
Dibenz(a,h)anthracene	53-70-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dibenzofuran	132-64-9	ND(0.010)	ND(0.010)	ND(0.010)	0.001 J (0.010)
Di-n-butyl phthalate	84-74-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,2-Dichlorobenzene	95-50-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,3-Dichlorobenzene	541-73-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
1,4-Dichlorobenzene	106-46-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
3,3'-Dichlorobenzidine	91-94-1	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Diethyl phthalate	84-66-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dimethyl phthalate	131-11-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4-Dinitrotoluene	121-14-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,6-Dinitrotoluene	606-20-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Di-n-octyl phthalate	117-84-0	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Fluoranthene	206-44-0	ND(0.010)	ND(0.010)	ND(0.010)	0.008 J (0.010)
Fluorene	86-73-7	ND(0.010)	ND(0.010)	ND(0.010)	0.002 J (0.010)

TABLE B.7

GROUNDWATER ROUND 2- BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		GW-081793-JM-108	GW-081793-JM-109	GW-081793-JM-110	GW-081793-JM-111
Sample Location		MW-3U-93	MW-4U-93	MW-6U-93	MW-8U-93
Date Sampled		8/17/93	8/17/93	8/17/93	8/17/93
Date Analyzed		8/27/93	8/27/93	8/27/93	8/27/93
Units		(mg/L)	(mg/L)	(mg/L)	(mg/L)
Base/Neutral Compounds	**CAS Number**				
Hexachlorobenzene	118-74-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexachlorobutadiene	87-68-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexachlorocyclopentadiene	77-47-4	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexachloroethane	67-72-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Indeno(1,2,3-cd)pyrene	193-39-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Isophorone	78-59-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Methylnaphthalene	91-57-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Naphthalene	91-20-3	ND(0.010)	ND(0.010)	ND(0.010)	0.007 J (0.010)
2-Nitroaniline	88-74-4	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
3-Nitroaniline	99-09-2	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
4-Nitroaniline	100-01-6	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Nitrobenzene	98-95-3	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
N-Nitrosodiphenylamine	86-30-6	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
N-Nitroso-di-n-propylamine	621-64-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Phenanthrene	85-01-8	ND(0.050)	ND(0.050)	ND(0.050)	0.011 J (0.050)
Pyrene	129-00-0	ND(0.010)	ND(0.010)	ND(0.010)	0.006 J (0.010)
1,2,4-Trichlorobenzene	120-82-1	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Acid Compounds					
4-Chloro-3-methylphenol	59-50-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Chlorophenol	95-57-8	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4-Dichlorophenol	120-83-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4-Dimethylphenol	105-67-9	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4,6 Dinitro-2-methylphenol	534-52-1	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2,4-Dinitrophenol	51-28-5	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2-Methylphenol	95-48-7	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Methylphenol	106-44-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2-Nitrophenol	88-75-5	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
4-Nitrophenol	100-02-7	ND(0.050)uj	ND(0.050)	ND(0.050)	ND(0.050)
Pentachlorophenol	87-86-5	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Phenol	108-95-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
2,4,5-Trichlorophenol	95-95-4	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2,4,6-Trichlorophenol	88-06-2	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

TABLE B.8

GROUNDWATER ROUND 2 - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		GW-081793-JM-101	GW-081793-JM-102	GW-081793-JM-103	GW-081793-JM-104	GW-081793-JM-105	GW-081793-JM-106
Sample Location		-	MW-1D-93	MW-1D-93	MW-1U-93	MW-2D-93	MW-1D-93
Date Sampled		8/17/93	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93
Date Analysed		6/26/93	6/27/93	6/27/93	6/27/93	6/26/93	6/26/93
Units		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
		Rinsate		Duplicate			
Parameter	CAS Number						
Aldrin	309-00-2	ND(0.05)	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)
alpha-BHC	319-84-6	ND(0.05)	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)
beta-BHC	319-85-7	ND(0.05)	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)
delta-BHC	319-86-8	ND(0.05)	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)
gamma-BHC (Lindane)	58-89-9	ND(0.05)	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)
Alpha-Chlordane	5103-71-9	ND(0.05)	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)
Gamma-Chlordane	5103-74-2	ND(0.05)	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)
4,4'-DDD	72-54-8	ND(0.10)	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)
4,4'-DDE	72-55-9	ND(0.10)	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)
4,4'-DDT	50-29-3	ND(0.10)	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)
Dieldrin	60-57-1	ND(0.10)	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)
alpha-Endosulfan	959-98-8	ND(0.05)	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)
beta-Endosulfan	33213-65-9	ND(0.10)	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)
Endosulfan Sulfate	1031-07-08	ND(0.10)	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)
Endrin	72-20-8	ND(0.10)	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)
Endrin Ketone	53494-70-5	ND(0.10)	ND(0.10)	ND(0.10)uj	ND(0.10)uj	ND(0.10)	ND(0.10)
Heptachlor	76-44-8	ND(0.05)	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)
Heptachlor Epoxide	1024-57-3	ND(0.05)	ND(0.05)	ND(0.05)uj	ND(0.05)uj	ND(0.05)	ND(0.05)
Methoxychlor	72-43-5	ND(0.50)	ND(0.50)	ND(0.50)uj	ND(0.50)uj	ND(0.50)	ND(0.50)
Toxaphene	8001-35-2	ND(5.0)	ND(5.0)	ND(5.0)uj	ND(5.0)uj	ND(5.0)	ND(5.0)
Aroclor-1016	12674-11-2	ND(1.0)	ND(1.0)	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)
Aroclor-1221	11104-28-2	ND(2.0)	ND(2.0)	ND(2.0)uj	ND(2.0)uj	ND(2.0)	ND(2.0)
Aroclor-1232	11141-16-5	ND(1.0)	ND(1.0)	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)
Aroclor-1242	53469-21-9	ND(1.0)	ND(1.0)	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)
Aroclor-1248	12672-29-6	ND(1.0)	ND(1.0)	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)
Aroclor-1254	11097-69-1	ND(1.0)	ND(1.0)	ND(1.0)uj	12 (1.0)uj	ND(1.0)	ND(1.0)
Aroclor-1260	11096-82-5	ND(1.0)	ND(1.0)	ND(1.0)uj	ND(1.0)uj	ND(1.0)	ND(1.0)

TABLE B.8

GROUNDWATER ROUND 2 - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		GW-081793-JM-107	GW-081793-JM-108	GW-081793-JM-109	GW-081793-JM-110	GW-081793-JM-111
Sample Location		MW-3D-93	MW-3U-93	MW-4U-93	MW-6U-93	MW-5U-93
Date Sampled		8/17/93	8/17/93	8/17/93	8/17/93	8/17/93
Date Analysed		6/27/93	6/27/93	6/27/93	6/27/93	6/27/93
Units		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
Parameter	CAS Number					
Aldrin	309-00-2	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
alpha-BHC	319-84-6	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
beta-BHC	319-85-7	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
delta-BHC	319-86-8	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
gamma-BHC (Lindane)	58-89-9	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
Alpha-Chlordane	5103-71-9	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
Gamma-Chlordane	5103-74-2	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
4,4'-DDD	72-54-8	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
4,4'-DDE	72-55-9	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
4,4'-DDT	50-29-3	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Dieldrin	60-57-1	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
alpha-Endosulfan	959-98-8	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
beta-Endosulfan	33213-65-9	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Endosulfan Sulfate	1031-07-08	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Endrin	72-20-8	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Endrin Ketone	53494-70-5	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Heptachlor	76-44-8	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
Heptachlor Epoxide	1024-57-3	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
Methoxychlor	72-43-5	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Toxaphene	8001-35-2	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Aroclor-1016	12674-11-2	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Aroclor-1221	11104-28-2	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Aroclor-1232	11141-16-5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Aroclor-1242	53469-21-9	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Aroclor-1248	12672-29-6	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Aroclor-1254	11097-69-1	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Aroclor-1260	11096-82-5	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)

TABLE B.9

GROUNDWATER ROUND 2 - INORGANICS (FILTERED)
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	GW-081793-JM-101	GW-081793-JM-102	GW-081793-JM-103	GW-081793-JM-104	GW-081793-JM-105	GW-081793-JM-106
Sample Location	-	MW-1D-93	MW-1D-93	MW-1U-93	MW-2D-93	MW-2U-93
Date Sampled	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93
Date Analyzed	8/28-9/2/93	8/28-9/2/93	8/28-9/2/93	8/28-9/2/93	8/28-9/2/93	8/28-9/2/93
Units	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
	Rinsate		Duplicate			
Parameter						
Aluminum	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
Antimony	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)
Arsenic	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Barium	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
Beryllium	ND(0.005)	ND(0.005)	ND(0.005)	0.0053(0.005)	ND(0.005)	ND(0.005)
Cadmium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Calcium	ND(5.00)	94.4(5.00)	92.8(5.00)	340(5.00)	94.4(5.00)	129(5.00)
Chromium	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Cobalt	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Copper	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)
Iron	ND(0.100)	0.595(0.100)	0.407(0.100)	18.5(0.100)	1.67(0.100)	6.30(0.100)
Lead	ND(0.003)	ND(0.003)	ND(0.003)	ND(0.003)	ND(0.003)	ND(0.003)
Magnesium	ND(5.000)	19.9(5.000)	21.2(5.000)	104(5.000)	18.7(5.000)	27.6(5.000)
Manganese	ND(0.015)	0.077(0.015)	0.049(0.015)	0.726 (0.015)	0.081(0.015)	0.580(0.015)
Mercury	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)
Nickel	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)
Potassium	ND(5.000)	16.0(5.000)	8.32(5.000)	45.5(5.000)	6.20(5.000)	9.81(5.000)
Selenium	ND(0.005)uj	ND(0.005)uj	ND(0.005)uj	ND(0.005)uj	ND(0.005)uj	ND(0.005)uj
Silver	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Sodium	ND(5.000)	14.4(5.000)	11.3(5.000)	52.3(5.000)	9.38(5.000)	30.5(5.000)
Thallium	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj
Vanadium	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Zinc	0.038(0.020)	ND(0.020)	0.023(0.020)	0.021(0.020)	ND(0.020)	ND(0.020)
Total Cyanide	NA	NA	NA	NA	NA	NA

TABLE B.9

GROUNDWATER ROUND 2 - INORGANICS (FILTERED)
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	GW-081793-JM-107	GW-081793-JM-108	GW-081793-JM-109	GW-081793-JM-110	GW-081793-JM-111
Sample Location	MW-3D-93	MW-3U-93	MW-4U-93	MW-6U-93	MW-5U-93
Date Sampled	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93
Date Analyzed	8/28-9/2/93	8/28-9/2/93	8/28-9/2/93	8/28-9/2/93	8/28-9/2/93
Units	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Parameter					
Aluminum	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
Antimony	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)	ND(0.060)
Arsenic	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Barium	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
Beryllium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Cadmium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Calcium	56.7(5.00)	156(5.000)	68.4(5.00)	57.1(5.00)	146(5.000)
Chromium	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Cobalt	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Copper	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)
Iron	0.279(0.100)	3.87(0.100)	0.434(0.100)	0.934(0.100)	2.48(0.100)
Lead	ND(0.003)	ND(0.003)	ND(0.003)	ND(0.003)	ND(0.003)
Magnesium	14.3(5.000)	27.9(5.000)	14.8(5.000)	17(5.000)	34.5(5.000)
Manganese	0.045(0.015)	0.136(0.015)	0.465(0.015)	0.129(0.015)	0.191(0.015)
Mercury	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)
Nickel	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)
Potassium	9.48(5.000)	ND(5.000)	5.16(5.000)	5.16(5.000)	14.8(5.000)
Selenium	ND(0.005)uj	ND(0.005)uj	ND(0.005)uj	ND(0.005)uj	ND(0.005)uj
Silver	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Sodium	22.0(5.000)	15.6(5.000)	23.4(5.000)	38.0(5.000)	68.3(5.000)
Thallium	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj
Vanadium	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Zinc	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Total Cyanide	NA	NA	NA	NA	NA

TABLE B.10

GROUNDWATER ROUND 2 - INORGANICS (UNFILTERED)
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	GW-081793-JM-101	GW-081793-JM-102	GW-081793-JM-103	GW-081793-JM-104	GW-081793-JM-105	GW-081793-JM-106
Sample Location	-	MW-1D-93	MW-1D-93	MW-1U-93	MW-2D-93	MW-2U-93
Date Sampled	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93
Date Analyzed	8/25-9/2/93	8/25-9/2/93	8/25-9/2/93	8/25-9/2/93	8/25-9/2/93	8/25-9/2/93
Units	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
	Rinsate		Duplicate			
Parameter						
Aluminum	ND(0.200)	15.4(0.200)j	35.3(0.200)j	7.80(0.200)j	11.8(0.200)j	23.5(0.200)j
Antimony	ND(0.060)	ND(0.060)uj	ND(0.060)uj	ND(0.060)uj	ND(0.060)uj	ND(0.060)uj
Arsenic	ND(0.010)	0.027(0.010)	0.067(0.050)	0.017(0.010)	ND(0.010)	0.029(0.010)
Barium	ND(0.200)	0.281(0.200)	0.458(0.200)	0.225(0.200)	0.453(0.200)	0.598(0.200)
Beryllium	ND(0.005)	ND(0.005)	0.0050(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Cadmium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Calcium	ND(5.000)	395(5.000)	667(50.00)	550(50.00)	241(5.000)	255(5.00)
Chromium	ND(0.010)	0.046(0.010)	0.122(0.010)	0.029(0.010)	0.055(0.010)	0.041(0.010)
Cobalt	ND(0.050)	ND(0.050)	0.068(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Copper	ND(0.025)	0.104(0.025)	0.195(0.025)	0.106(0.025)	0.090(0.025)	0.087(0.025)
Iron	ND(0.100)	55.4(0.100)	113(0.100)	45.8(0.100)	29.2(0.100)	51.5(0.100)
Lead	ND(0.003)	0.035(0.015)	0.069(0.015)	0.105(0.015)	0.023(0.003)	0.049(0.015)
Magnesium	ND(5.000)	67.3(5.000)	104(5.000)	142(5.000)	37.7(5.000)	58.6(5.000)
Manganese	ND(0.015)	1.05(0.015)	2.04(0.015)	1.62(0.015)	0.450(0.015)	1.44(0.015)
Mercury	ND(0.0002)	ND(0.0002)	ND(0.0002)	0.00031(0.0002)	ND(0.0002)	ND(0.0002)
Nickel	ND(0.040)	0.086(0.040)	0.183(0.040)	ND(0.040)	0.042(0.040)	0.064(0.040)
Potassium	ND(5.000)	7.53(5.000)	17.4(5.000)	50.6(5.000)	10.3(5.000)	13.7(5.000)
Selenium	ND(0.005)r	ND(0.005)r	ND(0.025)r	ND(0.025)r	ND(0.025)r	ND(0.005)r
Silver	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj
Sodium	ND(5.000)	10.4(5.000)	13.5(5.000)	56.7(5.000)	10.8(5.000)	33.7(5.000)
Thallium	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj
Vanadium	ND(0.050)	ND(0.050)	0.085(0.050)	ND(0.050)	ND(0.050)	0.060(0.050)
Zinc	ND(0.020)	0.197(0.020)	0.423(0.020)	0.172(0.020)	0.372(0.020)	0.179(0.020)
Total Cyanide	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

TABLE B.10

GROUNDWATER ROUND 2 - INORGANICS (UNFILTERED)
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	GW-081793-JM-107	GW-081793-JM-108	GW-081793-JM-109	GW-081793 JM-110	GW-081793-JM-111
Sample Location	MW-3D-93	MW-3U-93	MW-4U-93	MW-6U-93	MW-5U-93
Date Sampled	8/17/93	8/17/93	8/17/93	8/17/93	8/17/93
Date Analyzed	8/25-9/2/93	8/25-9/2/93	8/25-9/2/93	8/25-9/2/93	8/25-9/2/93
Units	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Parameter					
Aluminum	5.64(0.200)j	3.14(0.200)j	3.44(0.200)j	3.71(0.200)j	3.37(0.200)j
Antimony	ND(0.060)uj	ND(0.060)uj	ND(0.060)uj	ND(0.060)uj	ND(0.060)uj
Arsenic	ND(0.010)	ND(0.010)	ND(0.010)	0.011(0.010)	ND(0.010)
Barium	0.213(0.200)	ND(0.200)	ND(0.200)	ND(0.200)	ND(0.200)
Beryllium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Cadmium	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)
Calcium	113(5.00)	263(5.000)	130(5.000)	92.4(5.000)	253(5.000)
Chromium	0.044(0.010)	0.012(0.010)	0.012(0.010)	0.011(0.010)	0.016(0.010)
Cobalt	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Copper	0.070(0.025)	0.030(0.025)	0.025(0.025)	0.031(0.025)	0.035(0.025)
Iron	20.0(0.100)	15.4(0.100)	9.04(0.100)	10.2(0.100)	13.6(0.100)
Lead	0.016(0.003)	0.010(0.003)	0.018(0.003)	0.012(0.003)	0.020(0.003)
Magnesium	20.5(5.000)	60.0(5.000)	30.4(5.000)	27(5.000)	64.4(5.000)
Manganese	0.281(0.015)	0.526(0.015)	0.803(0.015)	0.313(0.015)	0.635(0.015)
Mercury	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)	ND(0.0002)
Nickel	0.045(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)
Potassium	22.9(5.000)	ND(5.000)	6.19(5.000)	6.18(5.000)	16.3(5.000)
Selenium	ND(0.005)r	ND(0.025)r	ND(0.005)r	ND(0.005)r	ND(0.005)r
Silver	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj
Sodium	26.6(5.000)	19.1(5.000)	25.3(5.000)	34.4(5.000)	72.1(5.000)
Thallium	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj	ND(0.010)uj
Vanadium	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Zinc	0.127(0.020)	0.048(0.020)	0.040(0.020)	0.059(0.020)	0.065(0.020)
Total Cyanide	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)

APPENDIX C

ANALYTICAL RESULTS

POND SEDIMENTS

TABLE C.1

POND SEDIMENT - VOCs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		SD-061893-4770-01	SD-061893-4770-02	SD-061893-4770-03	SD-061893-4770-16	SD-061893-4770-17	SD-061893-4770-20	SD-061893-4770-21
Sample Location		SD-1-93	SD-1-93	SD-1-93	SD-7-93	SD-7-93	SD-9-93	SD-9-93
Sample Interval (BGS)		0"-6"	6"-24"	6"-24"	0"-6"	6"-24"	0"-6"	6"-24"
Date Sampled		6/18/93	6/18/93	6/18/93	6/21/93	6/21/93	6/21/93	6/21/93
Date Analysed		6/28/93	6/28/93	6/28/93	6/29/93	6/28/93	6/28/93	6/28/93
Units		(mg/kg)	(mg/kg)	(mg/kg) Duplicate	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Parameter	CAS Number							
Acetone	67-64-1	0.38(0.026)	0.074(0.013)	0.074(0.012)	1.3(0.057)	0.12(0.011)	0.26(0.013)	0.14(0.011)
Benzene	71-43-2	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Bromodichloromethane	75-27-4	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Bromoform	75-25-2	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Bromomethane	74-83-9	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
2-Butanone	78-93-3	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Carbon Disulfide	75-15-0	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Carbon tetrachloride	56-23-5	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Chlorobenzene	108-90-7	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Chloroethane	75-00-3	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Chloroform	67-66-3	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Chloromethane	74-87-3	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Dibromochloromethane	124-48-1	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
1,1-Dichloroethane	75-34-3	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
1,2-Dichloroethane	107-06-2	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
1,1-Dichloroethene	75-35-4	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
1,2-Dichloroethene (total)	540-59-0	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
1,2-Dichloropropane	78-87-5	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
cis-1,3-Dichloropropene	10061-01-5	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
trans-1,3-Dichloropropene	10061-02-6	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Ethylbenzene	100-41-4	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
2-Hexanone	591-78-6	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Methylene chloride	75-09-2	0.016 J (0.026)	0.003 J (0.013)	0.006 J (0.012)	0.022 J B (0.057)	0.004 J (0.011)	0.004 J (0.013)	0.003 J (0.011)
4-Methyl-2-pentanone	108-10-1	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Styrene	100-42-5	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
1,1,2,2-Tetrachloroethane	79-34-5	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Tetrachloroethene	127-18-4	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Toluene	108-88-3	ND(0.026)	0.002 J (0.013)	0.002 J (0.012)	ND(0.057)	0.002 J (0.011)	0.002 J (0.013)	ND(0.011)
1,1,1-Trichloroethane	71-55-6	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
1,1,2-Trichloroethane	79-00-5	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Trichloroethene	79-01-6	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Vinyl acetate	108-05-4	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Vinyl chloride	75-01-4	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)
Xylenes (total)	1330-20-7	ND(0.026)	ND(0.013)	ND(0.012)	ND(0.057)	ND(0.011)	ND(0.013)	ND(0.011)

TABLE C.2

POND SEDIMENT - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		SD-061893-4770-01	SD-61893-4770-02	SD-61893-4770-03	SD-62193-4770-16	SD-62193-4770-17	SD-62193-4770-20	SD-62193-4770-21
Sample Location		SD-1-93	SD-1-93	SD-1-93	SD-7-93	SD-7-93	SD-9-93	SD-9-93
Sample Interval (BGS)		0"-6"	6"-24"	6"-24"	0"-6"	6"-24"	0"-6"	6"-24"
Date Sampled		6/18/93	6/18/93	6/18/93	6/21/93	6/21/93	6/21/93	6/21/93
Date Analyzed		7/9/93	7/9/93	7/9/93	7/9/93	7/9/93	7/9/93	7/9/93
units		(mg/Kg)	(mg/Kg)	(mg/Kg) Duplicate	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
Base/Neutral Compounds	CAS Number							
Acenaphthene	83-32-9	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Acenaphthylene	208-96-8	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Anthracene	120-12-7	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Benzo(a)anthracene	56-55-3	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Benzo(b)fluoranthene	205-99-2	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Benzo(k)fluoranthene	207-08-9	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Benzo(g,h,i)perylene	191-24-2	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Benzo(a)pyrene	50-32-8	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Benzoic acid	65-85-0	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Benzyl alcohol	100-51-6	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Bis(2-chloroethoxy)methane	111-91-1	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Bis(2-chloroethyl)ether	111-44-4	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Bis(2-chloroisopropyl)ether	39638-32-9	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Bis(2-ethylhexyl)phthalate	117-81-7	0.039 J B (0.330)u	0.058 J B (0.330)u	0.042 J B (0.330)u	0.093 J B (0.330)u	0.057 J B (0.330)u	0.096 J B (0.330)u	0.046 J B (0.330)u
4-Bromophenyl phenyl ether	101-55-3	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Butyl benzyl phthalate	85-68-7	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
4-Chloroaniline	106-47-8	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
2-Chloronaphthalene	91-58-7	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
4-Chlorophenyl phenyl ether	7005-72-3	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Chrysene	218-01-9	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Dibenz(a,h)anthracene	53-70-3	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Dibenzofuran	132-64-9	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Di-n-butyl phthalate	84-74-2	ND(0.330)	0.049 J (0.330)	ND(0.330)	0.40(0.330)	0.22 J (0.330)	0.035 J (0.330)	ND(0.330)
1,2-Dichlorobenzene	95-50-1	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
1,3-Dichlorobenzene	541-73-1	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
1,4-Dichlorobenzene	106-46-7	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
3,3'-Dichlorobenzidine	91-94-1	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Diethyl phthalate	84-66-2	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Dimethyl phthalate	131-11-3	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
2,4-Dinitrotoluene	121-14-2	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
2,6-Dinitrotoluene	606-20-2	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Di-n-octyl phthalate	117-84-0	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Fluoranthene	206-44-0	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Fluorene	86-73-7	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)

POND SEDIMENT - BNAs
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		SD-061893-4770-01	SD-61893-4770-02	SD-61893-4770-03	SD-62193-4770-16	SD-62193-4770-17	SD-62193-4770-20	SD-62193-4770-21
Sample Location		SD-1-93	SD-1-93	SD-1-93	SD-7-93	SD-7-93	SD-9-93	SD-9-93
Sample Interval (BGS)		0"-6"	6"-24"	6"-24"	0"-6"	6"-24"	0"-6"	6"-24"
Date Sampled		6/18/93	6/18/93	6/18/93	6/21/93	6/21/93	6/21/93	6/21/93
Date Analysed		7/9/93	7/9/93	7/9/93	7/9/93	7/9/93	7/9/93	7/9/93
units		(mg/Kg)	(mg/Kg)	(mg/Kg) Duplicate	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
Hexachlorobenzene	118-74-1	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Hexachlorobutadiene	87-68-3	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Hexachlorocyclopentadiene	77-47-4	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Hexachloroethane	67-72-1	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Indeno(1,2,3-cd)pyrene	193-39-5	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Isophorone	78-59-1	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
2-Methylnaphthalene	91-57-6	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Naphthalene	91-20-3	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
2-Nitroaniline	88-74-4	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)
3-Nitroaniline	99-09-2	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)
4-Nitroaniline	100-01-6	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)
Nitrobenzene	98-95-3	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
N-Nitrosodiphenylamine	86-30-6	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
N-Nitroso-di-n-propylamine	621-64-7	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Phenanthrene	85-01-8	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Pyrene	129-00-0	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
1,2,4-Trichlorobenzene	120-82-1	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
Acid Compounds								
4-Chloro-3-methylphenol	59-50-7	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
2-Chlorophenol	95-57-8	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
2,4-Dichlorophenol	120-83-2	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
2,4-Dimethylphenol	105-67-9	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
4,6 Dinitro-2-methylphenol	534-52-1	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)
2,4-Dinitrophenol	51-28-5	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)
2-Methylphenol	95-48-7	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
4-Methylphenol	106-44-5	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
2-Nitrophenol	88-75-5	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
4-Nitrophenol	100-02-7	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)
Pentachlorophenol	87-86-5	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)
Phenol	108-95-2	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)
2,4,5-Trichlorophenol	95-95-4	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)	ND(0.800)
2,4,6-Trichlorophenol	88-06-2	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)	ND(0.330)

TABLE C.3

POND SEDIMENT - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		SD-061893-4770-01	SD-061893-4770-02	SD-061893-4770-03	SD-061893-4770-04	SD-061893-4770-05	SD-061893-4770-06
Sample Location		SD-1-93	SD-1-93	SD-1-93	SD-2-93	SD-2-93	SD-2-93
Sample Interval (BGS)		0"-6"	6"-24"	6"-24"	0"-6"	6"-24"	6"-24"
Date Sampled		6/18/93	6/18/93	6/18/93	6/18/93	6/18/93	6/18/93
Date Analysed		7/8/93	7/8/93	7/8/93	7/9/93	7/9/93	7/9/93
Units		(µg/kg)	(µg/kg)	(µg/kg) Duplicate	(µg/kg)	(µg/kg)	(µg/kg) Duplicate
Parameter	**CAS Number**						
Aldrin	309-00-2	ND(2.3)uj	ND(2.2)	ND(2.1)	NA	NA	NA
alpha-BHC	319-84-6	ND(2.3)uj	ND(2.2)	ND(2.1)	NA	NA	NA
beta-BHC	319-85-7	ND(2.3)uj	ND(2.2)	ND(2.1)	NA	NA	NA
delta-BHC	319-86-8	ND(2.3)uj	ND(2.2)	ND(2.1)	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	ND(2.3)uj	ND(2.2)	ND(2.1)	NA	NA	NA
Alpha-Chlordane	5103-71-9	ND(2.3)uj	ND(2.2)	ND(2.1)	NA	NA	NA
Gamma-Chlordane	5103-74-2	ND(2.3)uj	ND(2.2)	ND(2.1)	NA	NA	NA
4,4'-DDD	72-54-8	ND(4.4)uj	ND(4.2)	ND(4.1)	NA	NA	NA
4,4'-DDE	72-55-9	ND(4.4)uj	ND(4.2)	ND(4.1)	NA	NA	NA
4,4'-DDT	50-29-3	ND(4.4)uj	ND(4.2)	ND(4.1)	NA	NA	NA
Dieldrin	60-57-1	ND(4.4)uj	ND(4.2)	ND(4.1)	NA	NA	NA
alpha-Endosulfan	959-98-8	ND(2.3)uj	ND(2.2)	ND(2.1)	NA	NA	NA
beta-Endosulfan	33213-65-9	ND(4.4)uj	ND(4.2)	ND(4.1)	NA	NA	NA
Endosulfan Sulfate	1031-07-08	ND(4.4)uj	ND(4.2)	ND(4.1)	NA	NA	NA
Endrin	72-20-8	ND(4.4)uj	ND(4.2)	ND(4.1)	NA	NA	NA
Endrin Ketone	53494-70-5	ND(4.4)uj	ND(4.2)	ND(4.1)	NA	NA	NA
Heptachlor	76-44-8	ND(2.3)uj	ND(2.2)	ND(2.1)	NA	NA	NA
Heptachlor Epoxide	1024-57-3	ND(2.3)uj	ND(2.2)	ND(2.1)	NA	NA	NA
Methoxychlor	72-43-5	ND(23)uj	ND(22)	ND(21)	NA	NA	NA
Toxaphene	8001-35-2	ND(230)uj	ND(220)	ND(210)	NA	NA	NA
Aroclor-1016	12674-11-2	ND(44)uj	ND(42)	ND(41)	ND(33)	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(89)uj	ND(85)	ND(84)	ND(67)	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(44)uj	ND(42)	ND(41)	ND(33)	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(44)uj	ND(42)	ND(41)	ND(33)	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(44)uj	ND(42)	ND(41)	ND(33)	ND(33)	ND(33)
Aroclor-1254	11097-69-1	ND(44)uj	ND(42)	ND(41)	ND(33)	ND(33)	ND(33)
Aroclor-1260	11096-82-5	ND(44)uj	ND(42)	ND(41)	ND(33)	ND(33)	ND(33)

POND SEDIMENT - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		SD-061893-4770-07	SD-061893-4770-09	SD-061893-4770-08	SD-061893-4770-10	SD-061893-4770-11	SD-061893-4770-12
Sample Location		SD-3-93	SD-3-93	SD-3-93	SD-4-93	SD-4-93	SD-5-93
Sample Interval (BGS)		0"-6"	0"-6"	6"-24"	0"-6"	6"-24"	0"-6"
Date Sampled		6/18/93	6/18/93	6/18/93	6/18/93	6/18/93	6/18/93
Date Analysed		7/9/93	7/9/93	7/9/93	7/9/93	7/9/93	7/9/93
Units		(µg/kg)	(µg/kg) Duplicate	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	CAS Number						
Aldrin	309-00-2	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	NA	NA	NA	NA
4,4'-DDD	72-54-8	NA	NA	NA	NA	NA	NA
4,4'-DDE	72-55-9	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	NA	NA	NA	NA	NA	NA
Dieldrin	60-57-1	NA	NA	NA	NA	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	NA	NA	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	NA	NA	NA	NA
Endrin	72-20-8	NA	NA	NA	NA	NA	NA
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	NA
Heptachlor	76-44-8	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	NA	NA	NA	NA
Aroclor-1016	12674-11-2	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1221	11104-28-2	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)	ND(67)
Aroclor-1232	11141-16-5	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1242	53469-21-9	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1248	12672-29-6	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1254	11097-69-1	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)
Aroclor-1260	11096-82-5	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)	ND(33)

TABLE C.3

POND SEDIMENT - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		SD-061893-4770-14	SD-061893-4770-15	SD-061893-4770-16	SD-061893-4770-17	SD-061893-4770-18	SD-061893-4770-19
Sample Location		SD-6-93	SD-6-93	SD-7-93	SD-7-93	SD-8-93	SD-8-93
Sample Interval (BGS)		0"-6"	6"-24"	0"-6"	6"-24"	0"-6"	6"-24"
Date Sampled		6/18/93	6/18/93	6/21/93	6/21/93	6/21/93	6/21/93
Date Analysed		7/9/93	7/9/93	7/8/93	7/8/93	7/9/93	7/9/93
Units		(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)
Parameter	**CAS Number**						
Aldrin	309-00-2	NA	NA	ND(2.0)	ND(2.0)	NA	NA
alpha-BHC	319-84-6	NA	NA	ND(2.0)	ND(2.0)	NA	NA
beta-BHC	319-85-7	NA	NA	ND(2.0)	ND(2.0)	NA	NA
delta-BHC	319-86-8	NA	NA	ND(2.0)	ND(2.0)	NA	NA
gamma-BHC (Lindane)	58-89-9	NA	NA	ND(2.0)	ND(2.0)	NA	NA
Alpha-Chlordane	5103-71-9	NA	NA	ND(2.0)	ND(2.0)	NA	NA
Gamma-Chlordane	5103-74-2	NA	NA	ND(2.0)	ND(2.0)	NA	NA
4,4'-DDD	72-54-8	NA	NA	ND(3.8)	ND(3.8)	NA	NA
4,4'-DDE	72-55-9	NA	NA	ND(3.8)	ND(3.8)	NA	NA
4,4'-DDT	50-29-3	NA	NA	ND(3.8)	ND(3.8)	NA	NA
Dieldrin	60-57-1	NA	NA	ND(3.8)	ND(3.8)	NA	NA
alpha-Endosulfan	959-98-8	NA	NA	ND(2.0)	ND(2.0)	NA	NA
beta-Endosulfan	33213-65-9	NA	NA	ND(3.8)	ND(3.8)	NA	NA
Endosulfan Sulfate	1031-07-08	NA	NA	ND(3.8)	ND(3.8)	NA	NA
Endrin	72-20-9	NA	NA	ND(3.8)	ND(3.8)	NA	NA
Endrin Ketone	53494-70-5	NA	NA	ND(3.8)	ND(3.8)	NA	NA
Heptachlor	76-44-8	NA	NA	ND(2.0)	ND(2.0)	NA	NA
Heptachlor Epoxide	1024-57-3	NA	NA	ND(2.0)	ND(2.0)	NA	NA
Methoxychlor	72-43-5	NA	NA	ND(20)	ND(20)	NA	NA
Toxaphene	8001-35-2	NA	NA	ND(200)	ND(200)	NA	NA
Aroclor-1016	12674-11-2	ND(33)	ND(33)	ND(38)	ND(38)	ND(33)uj	ND(33)
Aroclor-1221	11104-28-2	ND(67)	ND(67)	ND(77)	ND(77)	ND(67)uj	ND(67)uj
Aroclor-1232	11141-16-5	ND(33)	ND(33)	ND(38)	ND(38)	ND(33)uj	ND(33)
Aroclor-1242	53469-21-9	ND(33)	ND(33)	ND(38)	ND(38)	ND(33)uj	ND(33)
Aroclor-1248	12672-29-6	ND(33)	ND(33)	ND(38)	ND(38)	ND(33)uj	ND(33)uj
Aroclor-1254	11097-69-1	ND(33)	ND(33)	ND(38)	ND(38)	ND(33)uj	ND(33)
Aroclor-1260	11096-82-5	ND(33)	ND(33)	ND(38)	ND(38)	ND(33)uj	ND(33)uj

POND SEDIMENT - PCBs/PESTICIDES
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID		**SD-061893-4770-20**	**SD-061893-4770-21**
Sample Location		**SD-9-93**	**SD-9-93**
Sample Interval (BGS)		**0"-6"**	**6"-24"**
Date Sampled		**6/21/93**	**6/21/93**
Date Analysed		**7/8/93**	**7/8/93**
Units		**(µg/kg)**	**(µg/kg)**
Parameter	**CAS Number**		
Aldrin	309-00-2	ND(2.2)uj	ND(1.9)
alpha-BHC	319-84-6	ND(2.2)uj	ND(1.9)
beta-BHC	319-85-7	ND(2.2)uj	ND(1.9)
delta-BHC	319-86-8	ND(2.2)uj	ND(1.9)
gamma-BHC (Lindane)	58-89-9	ND(2.2)uj	ND(1.9)
Alpha-Chlordane	5103-71-9	ND(2.2)uj	ND(1.9)
Gamma-Chlordane	5103-74-2	ND(2.2)uj	ND(1.9)
4,4'-DDD	72-54-8	ND(4.2)uj	ND(3.7)
4,4'-DDE	72-55-9	ND(4.2)uj	ND(3.7)
4,4'-DDT	50-29-3	ND(4.2)uj	ND(3.7)
Dieldrin	60-57-1	ND(4.2)uj	ND(3.7)
alpha-Endosulfan	959-98-8	ND(2.2)uj	ND(1.9)
beta-Endosulfan	33213-65-9	ND(4.2)uj	ND(3.7)
Endosulfan Sulfate	1031-07-08	ND(4.2)uj	ND(3.7)
Endrin	72-20-8	ND(4.2)uj	ND(3.7)
Endrin Ketone	53494-70-5	ND(4.2)uj	ND(3.7)
Heptachlor	76-44-8	ND(2.2)uj	ND(1.9)
Heptachlor Epoxide	1024-57-3	ND(2.2)uj	ND(1.9)
Methoxychlor	72-43-5	ND(22)uj	ND(19)
Toxaphene	8001-35-2	ND(220)uj	ND(190)
Aroclor-1016	12674-11-2	ND(42)uj	ND(37)
Aroclor-1221	11104-28-2	ND(86)uj	ND(74)
Aroclor-1232	11141-16-5	ND(42)uj	ND(37)
Aroclor-1242	53469-21-9	ND(42)uj	ND(37)
Aroclor-1248	12672-29-6	ND(42)uj	ND(37)
Aroclor-1254	11097-69-1	ND(42)uj	ND(37)
Aroclor-1260	11096-82-5	ND(42)uj	ND(37)

TABLE C.4

POND SEDIMENT - INORGANICS
TEXTILE ROAD SITE
WASHTENAW COUNTY, MICHIGAN

Sample ID	SD-061893-4770-01	SD-061893-4770-02	SD-061893-4770-03	SD-061893-4770-16	SD-061893-4770-17	SD-061893-4770-20	SD-061893-4770-21
Sample Location	SD-1-93	SD-1-93	SD-1-93	SD-7-93	SD-7-93	SD-9-93	SD-9-93
Sample Interval (BGS)	0"-6"	6"-24"	6"-24"	0"-6"	6"-24"	0"-6"	6"-24"
Date Sampled	6/18/93	6/18/93	6/18/93	6/21/93	6/21/93	6/21/93	6/21/93
Date Analysed	7/1/93	7/1/93	7/1/93	7/1/93	7/1/93	7/1/93	7/1/93
units	(mg/kg)	(mg/kg)	(mg/kg) Duplicate	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Parameter							
Aluminum	1100(53)j	1200(51)j	770(50)j	2300(46)j	1700(46)j	2200(51)j	1200(45)j
Antimony	ND(16)	ND(15)	ND(15)j	ND(14)	ND(12)	ND(15)	ND(13)
Arsenic	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	2.1(2.0)	5.4(2.0)	ND(2.0)
Barium	ND(40)	ND(40)	ND(40)	ND(40)	ND(40)	ND(40)	ND(40)
Beryllium	ND(1.3)	ND(1.3)	ND(1.2)	ND(1.1)	ND(1.1)	ND(1.3)	ND(1.1)
Cadmium	ND(1.3)	ND(1.3)	ND(1.2)	ND(1.1)	ND(1.1)	ND(1.3)	ND(1.1)
Calcium	36000(1000)	46000(1000)	44000(1000)	64000(1000)	65000(1000)	64000(1000)	108000(1000)
Chromium	ND(2.7)uj	3.8(2.5)j	3.7(2.5)j	7.3(2.3)j	5.4(2.3)j	7.1(2.6)j	8.8(2.2)j
Cobalt	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Copper	ND(5.0)	ND(5.0)	ND(5.0)	17(5.0)	8.1(5.0)	11(5.0)	9.6(5.0)
Iron	3200(20)j	3100(20)j	2100(20)j	6300(20)j	3700(20)j	6500(20)j	4100(20)j
Lead	4.3(0.6)	2.9(0.6)	1.9(0.6)	4.2(0.6)	4.5(0.6)	11(0.6)	4.0(0.6)
Magnesium	6900(1000)	9400(1000)	8200(1000)	10600(1000)	13000(1000)	9800(1000)	20000(1000)
Manganese	98(3.0)j	110(3.0)j	97(3.0)j	130(3.0)j	120(3.0)j	240(3.0)j	170(3.0)j
Mercury	ND(0.13)	ND(0.13)	ND(0.12)	ND(0.11)	ND(0.11)	ND(0.13)	ND(0.11)
Nickel	ND(8.0)	ND(8.0)	ND(8.0)	10(8.0)	ND(8.0)	ND(8.0)	ND(8.0)
Potassium	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)
Selenium	ND(1.3)uj	ND(1.3)uj	ND(1.2)uj	ND(1.1)uj	ND(1.1)uj	ND(1.3)uj	ND(1.1)uj
Silver	ND(2.7)	ND(2.5)	ND(2.5)	ND(2.3)	ND(2.3)	ND(2.6)	ND(2.2)
Sodium	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)
Thallium	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Vanadium	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Zinc	17(5.3)	16(5.1)	12(5.0)	29(4.6)	17(4.6)	26(5.1)	18(4.5)
Total Cyanide	ND(0.26)r	ND(0.25)r	ND(0.25)r	ND(0.22)r	ND(0.23)r	ND(0.25)r	ND(0.22)r

APPENDIX D

VALIDATION MEMORANDUMS

MEMO

TO: Glenn Turchan REFERENCE NO: 4770-12

FROM: Jack Lindsay DATE: September 17, 1993

RE: Data Quality Assessment and Validation for Eleven Water Samples Collected from the Textile Road Site, Washtenaw County, Michigan

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The following details a data quality assessment and validation for eleven water samples collected June 9, 1993 from the Textile Road Site, Washtenaw County, Michigan. The samples were analyzed for the parameters listed in Table 1. The analyses were performed by Environmental Control Technology Corporation (ENCOTEC) of Ann Arbor, Michigan. The quality assurance criteria were established in the associated quality assurance project plan.[1]

Holding Time Periods

The holding time periods for the analyses are listed in Table 1. Due to low SVOC surrogate recoveries, the re-extraction of samples L-060993-JL-003, L-060993-JL-004 and L-060993-JL-007 was performed outside of the holding time period. The laboratory did not report the results of the reanalyses. On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by ENCOTEC, the remaining analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The majority of method blank samples were reported to be free from detectable concentrations of target analytes, indicating no significant laboratory contamination occurred. Analytes detected in the method blank samples are listed in Table 2. The associated data should be qualified as noted in the table.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for organic analyses was monitored by surrogate recoveries. The original SVOC analysis of samples L-060993-JL-003, L-060993-JL-004 and L-060993-JL-007 violated the surrogate recovery criteria for the acid extractable compounds. The samples were reportedly re-extracted and reanalyzed; however, the results were not reported. The original data for the acid extractable compounds should be qualified as unusable (R). Table 3 list the Pest/PCB samples that should be qualified due to

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1 *Application of relevant quality assurance criteria was consistent with* "National Functional Guidelines for Organic Data Review", December 1990 (Revised June 1991) and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses", July 1988.

violation of surrogate recovery criteria. The remaining surrogate recoveries met the acceptance criteria.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results - Organic Analyses

To assess the long term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for organic analyses. The majority of MS/MSD percent recoveries and RPDs were within the acceptance criteria, indicating adequate accuracy and precision were achieved for the methods. Table 4 lists MS/MSD results which violated the acceptance criteria. The associated data should be qualified as noted in the table.

Matrix Spike/Laboratory Duplicate (MS/DUP) Results - Inorganic Analyses

To assess the long term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent differences of duplicate results were determined. The majority of percent recoveries and all the RPDs were within the acceptance criteria, indicating an adequate level of accuracy and precision was achieved for the methods. Table 5 lists MS results which exceeded the acceptance criteria. The associated data should be qualified as noted in the table.

Laboratory Control Sample (LCS) - Inorganic

The LCS serves as a monitor of the overall performance of all steps in the analysis, including the sample preparation. All LCS data were within the control limits indicating that the analyses were performed adequately.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC collected for this sampling event consisted of one rinsate blank sample, one field duplicate sample set and one trip blank sample.

To evaluate the possibility of contamination arising from transport, the environment and/or storage, a trip blank sample was submitted to ENCOTEC for VOC analysis. The trip blank yielded a positive concentration of methylene chloride. Samples L-060993-JL-001, L-060993-JL-002, L-060993-JL-003, L-060993-JL-004, L-060993-JL-006, L-060993-JL-007, and L-060993-JL-010 contained a similar concentration of methylene chloride and the data should be qualified as non-detect (U) with the associated value becoming the quantitation limit.

As a check on cleanliness of sampling equipment, one rinsate blank sample (L-060993-JL-002) was collected an authentic sample for labeling and submission to the laboratory. Chromium was detected in the filtered and unfiltered metals samples at 0.03 mg/L. Interpretation of investigative sample data for chromium at or near this concentration should be performed with caution. Methylene chloride and bis(2-ethylhexyl)phthalate were also detected, but were previously qualified as non-detect (U) due to trip blank and method blank contamination, respectively.

Overall precision for the sampling event was monitored by the evaluation of field duplicate sample set results. The relative percent difference of the results were calculated. Field duplicate sample results are listed in Table 6. The RPDs were deemed acceptable.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the qualifications noted above.

JPL/rlg

cc: Steve Day, CRA

TABLE 1

SUMMARY OF ANALYTICAL PARAMETERS AND HOLDING TIME PERIODS TEXTILE ROAD SITE JUNE 1993 SAMPLING EVENT

Analysis Method[1]	*Holding Time*[2]
Volatile Organic Compounds (VOC) CLP SOW OLM01.8 water	14 Days
Semivolatile Organic Compounds (SVOC) CLP SOW OLM01.8 water	7/40 days[3]
Pesticides/Polychlorinated Biphenyls (Pest/PCB) CLP SOW OLM01.8 water	7/40 days
Metals CLP SOW ILM03.0 water	6 months (except mercury - 28 days)
Cyanide CLP SOW ILM03.0 water	14 days

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1 Methods were derived from:
CLP SOW - "Contract Laboratory Program Statement of Work For Organic Analyses, Multi-Media, Multi-Concentration" and "Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration", USEPA, March 1990 (or most recent revision).

2 Holding time periods are based from sample collection date to sample analysis date.

3 Seven days from sample collection to sample extraction, then forty days to sample analysis.

TABLE 2

ANALYTES DETECTED IN METHOD BLANK SAMPLES
TEXTILE ROAD SITE
JUNE 1993 SAMPLING EVENT

Analysis	*Parameter*	*Sample ID*	*Qualifier*
SVOC	bis(2-Ethylhexyl)phthalate	L-060993-JL-001	0.010U[1]
		L-060993-JL-002	0.010U
		L-060993-JL-006	0.010U
		L-060993-JL-009	0.010U
		L-060993-JL-010	0.010U

[1] U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

TABLE 3

VIOLATION OF SURROGATE RECOVERY ACCEPTANCE CRITERIA
TEXTILE ROAD SITE
JUNE SAMPLING EVENT

Analysis	*Sample ID*	*Surrogate Compound*	*% Recovery*	*% Recovery Limits*	*Qualifier*[1]
Pest/PCB	L-060993-JL-001	Decachlorobiphenyl	38	60-150	UJ
	L-060993-JL-003	Decachlorobiphenyl	17	60-150	UJ
	L-060993-JL-004	Decachlorobiphenyl	27	60-150	UJ
	L-060993-JL-005	Decachlorobiphenyl	37	60-150	J/UJ
	L-060993-JL-006	Decachlorobiphenyl	38	60-150	J/UJ
	L-060993-JL-007	Decachlorobiphenyl	19	60-150	UJ
	L-060993-JL-008	Decachlorobiphenyl	49	60-150	UJ

1 Sample results should be qualified as:

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

TABLE 4

OUTLYING MS/MSD RESULTS
ORGANIC ANALYSES
TEXTILE ROAD SITE
JUNE SAMPLING EVENT

Analysis	*Sample ID*	*Spiking Compound*	*MS % Recovery*	*MSD % Recovery*	*% Recovery Limits*	*RPD*	*RPD Limit*	*Qualifier*[1]
Pest/PCB	L-060993-JL-009	Dieldrin	77	63	52-126	20	19	UJ

[1] Sample results should be qualified as:

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

TABLE 5

OUTLYING MATRIX SPIKE RESULTS
INORGANIC ANALYSES
TEXTILE ROAD SITE
JUNE SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Result (mg/l*
					(unfiltered)	
Metals	L-060993-JL-001	Arsenic	45	75-125	L-060993-JL-001	0.010UJ
					L-060993-JL-002	0.010UJ
					L-0609930JL-003	0.014J
					L-0609930JL-004	0.010UJ
					L-060993-JL-005	0.032J
					L-060993-JL-006	0.031J
					L-060993-JL-007	0.021J
					L-060993-JL-008	0.021J
					L-060993-JL-009	0.013J
					L-060993-JL-010	0.010UJ
					L-060993-JL-011	0.010J
					(filtered)	
Metals	L-060993-JL-001	Arsenic	45	75-125	L-060993-JL-001	0.010UJ
					L-060993-JL-002	0.010UJ
					L-060993-JL-003	0.010UJ
					L-060993-JL-004	0.010UJ
					L-060993-JL-005	0.010UJ
					L-060993-JL-006	0.010UJ
					L-060993-JL-007	0.010UJ
					L-060993-JL-008	0.010UJ
					(unfiltered)	
Metals	L-060993-JL-001	Thallium	60	75-125	L-060993-JL-001	0.010UJ
					L-060993-JL-002	0.010UJ
					L-060993-JL-003	0.010UJ
					L-060993-JL-004	0.010UJ
					L-060993-JL-005	0.010UJ
					L-060993-JL-006	0.010UJ
					L-060993-JL-007	0.010UJ
					L-060993-JL-008	0.010UJ
					L-060993-JL-009	0.010UJ
					L-060993-JL-010	0.010UJ
					(filtered)	
Metals	L-060993-JL-001	Thallium	60	75-125	L-060993-JL-001	0.010UJ
					L-060993-JL-002	0.010UJ
					L-060993-JL-003	0.010UJ
					L-060993-JL-004	0.010UJ
					L-060993-JL-005	0.010UJ

TABLE 5

OUTLYING MATRIX SPIKE RESULTS
INORGANIC ANALYSES
TEXTILE ROAD SITE
JUNE SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Result (mg/l*
Metals	L-060993-JL-001	Thallium	60	75-125	L-060993-JL-006	0.010UJ
					L-060993-JL-007	0.010UJ
					L-060993-JL-008	0.010UJ
					(filtered)	
Metals	L-060993-JL-009	Thallium	56	75-125	L-060993-JL-009	0.010UJ
					L-060993-JL-010	0.010UJ
					L-060993-JL-011	0.010UJ

TABLE 6

FIELD DUPLICATE SAMPLE RESULTS
TEXTILE ROAD SITE
JUNE SAMPLING EVENT

	Investigative Sample L-060993-JL-005 (mg/L)	Duplicate Sample L-060993-JL-006 (mg/L)	RPD
Unfiltered Metals			
Aluminum	23	21	9
Arsenic	0.032	0.031	3
Barium	2.1	2.1	0
Calcium	770	710	8
Chromium	0.09	0.10	10
Copper	0.23	0.23	0
Iron	73	67	8
Lead	0.22	0.21	4.6
Magnesium	220	200	9.5
Manganese	2.4	2.2	8.6
Mercury	0.0005	0.0006	18
Nickel	0.09	0.09	0
Potassium	57	58	1.7
Sodium	77	77	0
Vanadium	0.07	0.06	15
Zinc	1.3	1.2	8
Filtered Metals			
Calcium	360	360	0
Chromium	0.08	0.04	66
Iron	10	9.1	9.4
Magnesium	130	130	0
Manganese	0.82	0.81	1.2
Potassium	50	51	1.9
Sodium	69	69	0
Organics			
PCB-1254	0.0084	0.0089	5
Chlorobenzene	0.032	0.032	0
Fluoranthene	0.002J[1]	0.002J	0
Phenanthrene	0.003J	0.003J	0
Pyrene	0.002J	0.002J	0
Anthracene	ND[2] (0.010)	0.001	NC[3]

1 J - Analyte present at level less than the quantitation limit.
2 ND - Not detected at the quantitation limit in parantheses.
3 NC - Non calculable.

TABLE 1

SUMMARY OF ANALYTICAL PARAMETERS
AND HOLDING TIME PERIODS
TEXTILE ROAD SITE
AUGUST 1993 SAMPLING EVENT

Analysis Method[1]	*Holding Time*[2]
Volatile Organic Compounds (VOC) CLP SOW OLM01.8 water	14 Days
Semivolatile Organic Compounds (SVOC) CLP SOW OLM01.8 water	7/40 days[3]
Pesticides/Polychlorinated Biphenyls (Pest/PCB) CLP SOW OLM01.8 water	7/40 days
Metals CLP SOW ILM03.0 water	6 months (except mercury - 28 days)
Cyanide CLP SOW ILM03.0 water	14 days

1 Methods were derived from:
CLP SOW - "Contract Laboratory Program Statement of Work For Organic Analyses, Multi-Media, Multi-Concentration" and "Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration", USEPA, March 1990 (or most recent revision).

2 Holding time periods are based from sample collection date to sample analysis date.

3 Seven days from sample collection to sample extraction, then forty days to sample analysis.

TABLE 2

ANALYTES DETECTED IN METHOD BLANK SAMPLES
TEXTILE ROAD SITE
AUGUST 1993 SAMPLING EVENT

Analysis	*Parameter*	*Sample ID*	*Qualified Sample Result (mg/L)*[1]
VOC	methylene chloride	GW-081793-JM-101	0.010U
		GW-081793-JM-102	0.010U
		GW-081793-JM-103	0.010U
		GW-081793-JM-104	0.010U
		GW-081793-JM-110	0.010U
SVOC	bis(2-Ethylhexyl)phthalate	GW-081793-JM-101	0.010U
		GW-081793-JM-104	0.010U
		GW-081793-JM-106	0.010U
		GW-081793-JM-109	0.010U
		GW-081793-JM-110	0.010U
		GW-081793-JM-111	0.010U

[1] U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

TABLE 3

VIOLATION OF SURROGATE RECOVERY ACCEPTANCE CRITERIA
TEXTILE ROAD SITE
AUGUST SAMPLING EVENT

Analysis	*Sample ID*	*Surrogate Compound*	*% Recovery*	*% Recovery Limits*	*Qualifier*[1]
Pest/PCB	GW-081793-JM-103	Decachlorobiphenyl	44	60-150	UJ
	GW-081793-JM-104	Decachlorobiphenyl	50	60-150	J/UJ
	GW-081793-JM-105	Decachlorobiphenyl	29	60-150	UJ
	GW-081793-JM-107	Decachlorobiphenyl	27	60-150	UJ

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1 Sample results should be qualified as:

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

TABLE 4

OUTLYING MS/MSD RESULTS
ORGANIC ANALYSES
TEXTILE ROAD SITE
AUGUST SAMPLING EVENT

Analysis	*Sample ID*	*Spiking Compound*	*MS % Recovery*	*MSD % Recovery*	*% Recovery Limits*	*RPD*	*RPD Limit*	*Qualifier*[1]
SVOC	GW-081793-JM-108	4-Nitrophenol	87	89	10-80	3.0	50	UJ

[1] Sample results should be qualified as:

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

TABLE 5

QUALIFIED SAMPLE DATA DUE TO VIOLATION
OF MATRIX SPIKE RECOVERY CRITERIA
INORGANIC ANALYSES
TEXTILE ROAD SITE
AUGUST SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Sample Results (mg/L)* [1]
					(unfiltered)	
Metals	GW-081793-JM-102	Aluminum	220	75-125	GW-081793-JM-102	15.4J
					GW-081793-JM-103	35.3J
					GW-081793-JM-104	7.80J
					GW-081793-JM-105	11.8J
					GW-081793-JM-106	23.5J
					GW-081793-JM-107	5.64J
					GW-081793-JM-108	3.14J
					GW-081793-JM-109	3.44J
					GW-081793-JM-110	3.71J
					GW-081793-JM-111	3.37J
					(unfiltered)	
Metals	GW-081793-JM-102	Antimony	67	75-125	GW-081793-JM-101	ND(0.060)UJ
					CW-081793-JM-102	ND(0.060)UJ
					GW-081793-JM-103	ND(0.060)UJ
					GW-081793-JM-104	ND(0.060)UJ
					GW-081793-JM-105	ND(0.060)UJ
					GW-081793-JM-106	ND(0.060)UJ
					GW-081793-JM-107	ND(0.060)UJ
					GW-081793-JM-108	ND(0.060)UJ
					GW-081793-JM-109	ND(0.060)UJ
					GW-081793-JM-110	ND(0.060)UJ
					GW-081793-JM-110	ND(0.060)UJ
					(unfiltered)	
Metals	GW-081793-JM-102	Selenium	0	75-125	GW-081793-JM-101	ND(0.005)
					GW-081793-JM-102	ND(0.025)R
					GW-081793-JM-103	ND(0.025)R
					GW-081793-JM-104	ND(0.025)R
					GW-081793-JM-105	ND(0.025)R
					GW-081793-JM-106	ND(0.025)R
					GW-081793-JM-107	ND(0.005)R
					GW-081793-JM-108	ND(0.025)R
					GW-081793-JM-109	ND(0.005)R
					GW-081793-JM-110	ND(0.005)R
					GW-081793-JM-111	ND(0.025)R

1 Sample results should be qualified as:

J - The associated value is an estimated quantity.

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

TABLE 5

QUALIFIED SAMPLE DATA DUE TO VIOLATION
OF MATRIX SPIKE RECOVERY CRITERIA
INORGANIC ANALYSES
TEXTILE ROAD SITE
AUGUST SAMPLING EVENT

Analysis	Spiked Sample ID	Spiking Compound	MS % Recovery	% Recovery Limits	Associated Samples	Qualified Sample Results (mg/L)
					(unfiltered)	
Metals	GW-081793-JM-102	Silver	69	75-125	GW-081793-JM-101	ND(0.010)UJ
					GW-081793-JM-102	ND(0.010)UJ
					GW-081793-JM-103	ND(0.010)UJ
Metals	GW-081793-JM-102	Silver	69	75-125	GW-081793-JM-104	ND(0.010)UJ
					GW-081793-JM-105	ND(0.010)UJ
					GW-081793-JM-106	ND(0.010)UJ
					GW-081793-JM-107	ND(0.010)UJ
					GW-081793-JM-108	ND(0.010)UJ
					GW-081793-JM-109	ND(0.010)UJ
					GW-081793-JM-110	ND(0.010)UJ
					GW-081793-JM-111	ND(0.010)UJ
					(unfiltered)	
Metals	GW-081793-JM-102	Thallium	73	75-125	GW-081793-JM-101	ND(0.010)UJ
					GW-081793-JM-102	ND(0.010)UJ
					GW-081793-JM-103	ND(0.010)UJ
					GW-081793-JM-104	ND(0.010)UJ
					GW-081793-JM-105	ND(0.010)UJ
					GW-081793-JM-106	ND(0.010)UJ
					GW-081793-JM-107	ND(0.010)UJ
					GW-081793-JM-108	ND(0.010)UJ
					GW-081793-JM-109	ND(0.010)UJ
					GW-081793-JM-110	ND(0.010)UJ
					GW-081793-JM-111	ND(0.010)UJ
					(filtered)	
Metals	GW-081793-JM-102	Selenium	40	75-125	GW-081793-JM-101	ND(0.010)UJ
					GW-081793-JM-102	ND(0.010)UJ
					GW-081793-JM-103	ND(0.010)UJ
					GW-081793-JM-104	ND(0.010)UJ
					GW-081793-JM-105	ND(0.010)UJ
					GW-081793-JM-106	ND(0.010)UJ
					GW-081793-JM-107	ND(0.010)UJ
					GW-081793-JM-108	ND(0.010)UJ
					GW-081793-JM-109	ND(0.010)UJ
					GW-081793-JM-110	ND(0.010)UJ
					GW-081793-JM-111	ND(0.010)UJ

TABLE 5

QUALIFIED SAMPLE DATA DUE TO VIOLATION
OF MATRIX SPIKE RECOVERY CRITERIA
INORGANIC ANALYSES
TEXTILE ROAD SITE
AUGUST SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Sample Results (mg/L)*
					(filtered)	
Metals	GW-081793-JM-102	Thallium	62	75-125	GW-081793-JM-101	ND(0.010)UJ
					GW-081793-JM-102	ND(0.010)UJ
					GW-081793-JM-103	ND(0.010)UJ
					GW-081793-JM-104	ND(0.010)UJ
					GW-081793-JM-105	ND(0.010)UJ
					GW-081793-JM-106	ND(0.010)UJ
Metals	GW-081793-JM-102	Thallium	62	75-125	GW-081793-JM-107	ND(0.010)UJ
					GW-081793-JM-108	ND(0.010)UJ
					GW-081793-JM-109	ND(0.010)UJ
					GW-081793-JM-110	ND(0.010)UJ
					GW-081793-JM-111	ND(0.010)UJ

TABLE 6

QUALIFIED SAMPLE DATA DUE TO VIOLATION OF
LABORATORY DUPLICATE ACCEPTANCE CRITERIA
TEXTILE ROAD SITE
AUGUST SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Result (mg/L)*[1]
					(unfiltered)	
Metals	Aluminum	GW-081793-JM-108	24	20	GW-081793-JM-102	NR
					GW-081793-JM-103	NR
					GW-081793-JM-105	NR
					GW-081793-JM-106	NR
					GW-081793-JM-107	NR
					GW-081793-JM-108	NR
					GW-081793-JM-109	NR
					GW-081793-JM-110	NR
					GW-081793-JM-111	NR

[1] Sample resuts should be qualified as:

NR - No additional sample qualification was deemed necessary.

TABLE 7

ANALYTES DETECTED IN TRIP BLANK SAMPLES
TEXTILE ROAD SITE
AUGUST 1993 SAMPLING EVENT

Analyte	*Sample ID*	*Qualifier*
acetone	GW-081793-JM-101	0.010U[1]
	GW-081793-JM-104	0.016U
	GW-081793-JM-106	0.010U
	GW-081793-JM-108	0.014U
	GW-081793-JM-109	0.014U
	GW-081793-JM-110	0.010U
2-butanone	GW-081793-JM-101	0.010U
	GW-081793-JM-102	0.010U
	GW-081793-JM-103	0.010U
	GW-081793-JM-104	0.010U
	GW-081793-JM-106	0.010U
	GW-081793-JM-109	0.010U
	GW-081793-JM-110	0.010U

1 Sample results should be qualified as:

U - The analyte was analyzed for, but was not detected abov e the reported sample quantitation limit.

TABLE 8

FIELD DUPLICATE SAMPLE RESULTS
TEXTILE ROAD SITE
AUGUST SAMPLING EVENT

	Investigative Sample GW-081793-JM-102 (mg/L)	Duplicate Sample GW-081793-JM-103 (mg/L)	RPD
Unfiltered Metals			
Aluminum	15.4	35.3	78
Arsenic	0.027	0.067	136
Barium	0.281	0.458	47
Calcium	395	667	51
Chromium	0.046	0.122	90
Copper	0.104	0.195	60
Iron	55.4	113	68
Lead	0.035	0.069	65
Magnesium	67.3	104	42
Manganese	1.05	2.04	64
Nickel	0.086	0.183	72
Potassium	7.53	17.4	79
Sodium	10.4	13.5	25
Vanadium	ND[1] (0.005)	0.085	NC[2]
Zinc	0.197	0.423	72
Beryllium	ND(0.005)	0.023	NC
Filtered Metals			
Calcium	94.4	92.8	1.7
Iron	0.595	0.407	37
Magnesium	19.9	21.2	6
Manganese	0.077	0.049	44
Potassium	16.0	8.32	63
Sodium	14.4	11.3	24
Zinc	ND(0.020)	0.023	NC
Organics			
Acetone	0.11	0.13	16
Carbon disulfide	0.001J	0.001J	0
Chloroform	0.001J	ND(0.010)	NC

1 ND - Not detected at the quantitation limit in parantheses.
2 NC - Non calculable

MEMO

TO: Glenn Turchan REFERENCE NO: 4770-25

FROM: Jack Lindsay DATE: September 21, 1993

RE: Data Quality Assessment and Validation for Eleven Water Samples Collected from the Textile Road Site, Washtenaw County, Michigan

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The following details a data quality assessment and validation for the round two sampling event which consisted of the August 17, 1993 collection of eleven water samples from the Textile Road Site, Washtenaw County, Michigan. The samples were analyzed for the parameters listed in Table 1. The analyses were performed by Environmental Control Technology Corporation (ENCOTEC) of Ann Arbor, Michigan. The quality assurance criteria were established in the associated quality assurance project plan.[1]

Holding Time Periods

The holding time periods for the analyses are listed in Table 1. On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by ENCOTEC, the remaining analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The majority of method blank samples were reported to be free from detectable concentrations of target analytes, indicating no significant laboratory contamination occurred. Analytes detected in the method blank samples are listed in Table 2. The associated data should be qualified as noted in the table.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for organic analyses was monitored by surrogate recoveries. The SVOC surrogate compounds for sample GW-081793-JM-105 were reported as being diluted out. However, only a 1:2 dilution was performed on the sample and the surrogates should have been present in the diluted sample. This would indicate that the surrogate recoveries were low and the quantitation limits for parameter results should be qualified as estimated (UJ). Qualified sample data due to violation of surrogate recovery criteria are presented in Table 3. The associated sample data should be qualified as noted in the table.

---

1 Application of relevant quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", December 1990 (Revised June 1991) and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses", July 1988.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results - Organic Analyses

To assess the long term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for organic analyses. The majority of MS/MSD percent recoveries and RPDs were within the acceptance criteria, indicating adequate accuracy and precision were achieved for the methods. Table 4 lists MS/MSD results which violated the acceptance criteria. The associated data should be qualified as noted in the table.

Matrix Spike/Laboratory Duplicate (MS/DUP) Results - Inorganic Analyses

To assess the long term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent differences of duplicate results were determined. The majority of percent recoveries and RPDs were within the acceptance criteria, indicating an adequate level of accuracy and precision was achieved for the methods. Table 5 lists MS results which violated the acceptance criteria. Table 6 lists laboratory duplicate results which violated the acceptance criteria. The associated data should be qualified as noted in the respective tables.

Laboratory Control Sample (LCS) - Inorganic

The LCS serves as a monitor of the overall performance of all steps in the analysis, including the sample preparation. All LCS data were within the control limits indicating that the analyses were performed adequately.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC collected for this sampling event consisted of one rinsate blank sample, one field duplicate sample set and one trip blank sample.

To evaluate the possibility of contamination arising from transport, the environment and/or storage, a trip blank sample was submitted to ENCOTEC for VOC analysis. Analytes detected in the trip blank samples are listed in Table 7. Those samples with similar concentrations of analytes should be qualified as noted in the table.

As a check on cleanliness of sampling equipment, one rinsate blank sample GW-081793-JM-101 was collected as authentic samples for labeling and submission to the laboratory. Zinc was detected in the filtered metal sample at 0.038 mg/L. Also chlorobenzene was detected at an estimated concentration of 0.002 mg/L. Interpretation of investigative sample data for zinc and chlorobenzene at or near these concentrations should be performed with caution. Acetone and 2-butanone were also detected, but were previously qualified as non-detect (U) due to trip blank contamination. Methylene chloride and bis(2-ethylhexyl)phthalate were also detected, but were previously qualified as non-detect (U) due to method blank contamination.

Overall precision for the sampling event was monitored by the evaluation of field duplicate sample set results. The relative percent difference of the results were calculated. Field duplicate sample results are listed in Table 8. The high RPDs in the unfiltered metals samples may be due to an elevated level of suspended matter in the samples.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the qualifications noted above.

JPL/rlg

cc: Steve Day, CRA

TABLE 1

SUMMARY OF ANALYTICAL PARAMETERS AND HOLDING TIME PERIODS TEXTILE ROAD SITE MAY 1993 SAMPLING EVENT

Analysis Method[1]	*Holding Time*[2]
Volatile Organic Compounds (VOC) CLP SOW OLM01.8 sediment	14 Days
Semivolatile Organic Compounds (SVOC) CLP SOW OLM01.8 sediment	14/40 days[3]
Pesticides/Poly Chlorinated Biphenyls (Pest/PCB) CLP SOW OLM01.8 sediment	14/40 days
Metals CLP SOW ILM03.0 sediment	6 months (except mercury - 28 days)
Cyanide CLP SOW ILM03.0 sediment	14 days

1 Methods were derived from:
CLP SOW - "Contract Laboratory Program Statement of Work for Organic Analyses, Multi-Media, Multi-Concentration," and "Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration," USEPA, March 1990 (or almost recent revision).

2 Holding time periods are based from sample collection date to sample analysis date.

3 Fourteen days from sample collection to sample extraction, then forty days to sample analysis.

TABLE 2

ANALYTES DETECTED IN METHOD
BLANKS, TEXTILE ROAD SITE
JUNE 1993 SAMPLING EVENT

Analysis	*Parameter*	*Sample ID*	*Qualifier*
SVOC	bis(2-Ethylhexyl)phthalate	SD-061893-4770-01	0.330U[1]
		SD-061893-4770-02	0.330U
		SD-061893-4770-03	0.330U
		SD-062193-4770-16	0.330U
		SD-062193-4770-17	0.330U
		SD-062193-4770-20	0.330U
		SD-062193-4770-21	0.330U

1 Sample results should be qualified as:
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

TABLE 3

OUTLYING SURROGATE RECOVERIES
TEXTILE ROAD SITE
JUNE SAMPLING EVENT

Analysis	*Sample ID*	*Surrogate Compound*	*% Recovery*	*% Recovery Limits*	*Qualifier*[1]
Pest/PCB	SD-062193-4770-20	Decachlorobiphenyl	56	60-150	UJ
	SD-061893-4770-01	Decachlorobiphenyl	52	60-150	UJ
PCB	SD-062193-4770-18	Decachlorobiphenyl	59	60-150	UJ

1 Sample results should be qualified as:

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

TABLE 4

OUTLYING MS/MSD RESULTS
ORGANIC ANALYSES
TEXTILE ROAD SITE
JUNE SAMPLING EVENT

Analysis	*Sample ID*	*Spiking Compound*	*MS % Recovery*	*MSD % Recovery*	*% Recovery Limits*	*RPD*	*RPD Limit*	*Qualifier*[1]
PCB	SD-062193-4770-19	PCB 1221	119	72	48-163	49	20	UJ
		PCB 1248	105	65	39-155	48	19	UJ
		PCB 1260	89	68	37-166	26	23	UJ

[1] Sample results should be qualified as:

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

TABLE 5

OUTLYING MATRIX SPIKE RESULTS
INORGANIC ANALYSES
TEXTILE ROAD SITE
JUNE SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Sample Result (mg/kg)*[1]
Cyanide	SD-062193-4770-21	Cyanide	6.9	75-125	SD-061893-4770-01	ND(0.26)R
					SD-061893-4770-02	ND(0.25)R
					SD-061893-4770-03	ND(0.25)R
					SD-062193-4770-16	ND(0.22)R
					SD-062193-4770-17	ND(0.23)R
					SD-062193-4770-20	ND(0.24)R
					SD-062193-4770-21	ND(0.22)R
Metals	SD-062193-4770-21	Selenium	59	75-125	SD-061893-4770-01	1.3UJ
					SD-061893-4770-02	1.3UJ
					SD-061893-4770-03	1.2UJ
					SD-062193-4770-16	1.1UJ
					SD-062193-4770-17	1.1UJ
					SD-062193-4770-20	1.3UJ
					SD-062193-4770-21	1.1UJ
Metals	SD-061293-4770-21	Manganese	196	75-125	SD-061893-4770-01	98J
					SD-061893-4770-02	110J
					SD-061893-4770-03	1.2J
					SD-062193-4770-16	130J
					SD-062193-4770-17	120J
					SD-062193-4770-20	240J
					SD-062193-4770-21	170J

1 Sample results should be qualified as:

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

ND( ) - Not detected at the quantitation limit in parentheses.

R - The data are unusable (Note: Analyte may or may not be present.)

TABLE 6

OUTLYING DUPLICATE RESULTS
INORGANIC ANALYSES
TEXTILE ROAD SITE
JUNE SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Sample Result (mg/kg*[1])
Metals	SD-062193-4770-21	Aluminum	59	35	SD-061893-4770-01	1,100J
					SD-061893-4770-02	1,200J
					SD-061893-4770-03	770J
					SD-062193-4770-16	2,300J
					SD-062193-4770-17	1,700J
					SD-062193-4770-20	2,200J
					SD-062193-4770-21	1,200J
Metals	SD-062193-4770-21	Chromium	38	35	SD-061893-4770-01	2.7UJ
					SD-061893-4770-02	3.8J
					SD-061893-4770-03	3.7J
					SD-062193-4770-16	7.3J
					SD-062193-4770-17	5.4J
					SD-062193-4770-20	7.1J
					SD-062193-4770-21	8.8J
Metals	SD-062193-4770-21	Iron	116	35	SD-061893-4770-01	3,200J
					SD-061893-4770-02	3,100J
					SD-061893-4770-03	2,100J
					SD-062193-4770-16	6,300J
					SD-062193-4770-17	3,700J
					SD-062193-4770-20	6,500J
					SD-062193-4770-21	4,100J
Metals	SD-062193-4770-21	Manganese	62	35	SD-061893-4770-01	NR
					SD-061893-4770-02	NR
					SD-061893-4770-03	NR
					SD-062193-4770-16	NR
					SD-062193-4770-17	NR
					SD-062193-4770-20	NR
					SD-062193-4770-21	NR

[1] Sample results should be qualified as:

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary accurately and precisely measure the analyte in the sample.
NR - No additional qualification was deemed necessary.

TABLE 7

FIELD DUPLICATE SAMPLE RESULTS
TEXTILE ROAD SITE
JUNE SAMPLING EVENT

	Investigative Sample SD-061893-4770-02 (mg/kg)	Duplicate Sample SD-061893-4770-03 (mg/kg)	RPD
Aluminum	1,200	770	43
Calcium	46,000	44,000	4
Chromium	3.8	3.7	2.6
Iron	3,100	2,100	38
Lead	2.9	1.9	41
Magnesium	9,400	8,200	6
Manganese	110	97	12
Zinc	16	12	28
Methyl chloride	0.003	0.006	66
Toluene	0.002	0.002	0
Di-n-butyl phthalate	0.049J	ND[1] (0.330)	NC[2]

1 ND - Not detected at the quantitation limit in parantheses.
2 NC - Non calculable

MEMO

TO: Glenn Turchan REFERENCE NO: 4770-25

FROM: Jack Lindsay DATE: September 20, 1993

RE: Data Quality Assessment and Validation for Soil Samples and Water Samples Collected at the Textile Road Site, Washtenaw County, Michigan

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The following details a data quality assessment and validation for soil and water samples collected May, 1993 at the Textile Road Site, Washtenaw County, Michigan. The samples were selectively analyzed for the parameters listed in Table 1. The analyses were performed by Environmental Control Technology Corporation (ENCOTEC) of Ann Arbor, Michigan. The quality assurance criteria were established in the associated quality assurance project plan.[1]

Holding Time Periods

The holding time periods for the analyses are listed in Table 1. On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by ENCOTEC, the analyses were completed within the specified holding time periods, with the exception of those samples listed in Table 2. The associated data should be qualified as noted in the table.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The majority of method blank samples were reported to be free from detectable concentrations of target analytes, indicating no significant laboratory contamination occurred. Analytes detected in the method blank samples are listed in Table 3. The associated data should be qualified as noted in the table.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for organic analyses was monitored by surrogate recoveries. The majority of surrogate recoveries for the analyses were within the acceptance criteria. Due to sample dilutions required by the presence of high concentrations of target and non-target compounds, several samples could not be assessed based on surrogate recoveries. Samples with surrogate recoveries violating the acceptance criteria are presented in Table 4. The associated sample data should be qualified as noted in the table.

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1 Application of relevant quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", December 1990 (Revised June 1991) and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses", July 1988.

In addition, matrix interferences were reported to have distorted two or fewer of the surrogated compound peaks in samples BH-16B-93, BH-21A-93, and BH-72B-93. Qualification of the sample data was deemed unnecessary as the remaining surrogate(s) was recovered within the acceptance limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results - Organic Analyses

To assess the long term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for organic analyses. The majority of MS/MSD percent recoveries and RPDs were within the acceptance criteria, indicating adequate accuracy and precision were achieved for the methods. Table 5 lists MS/MSD results which violated the acceptance criteria. The associated data should be qualified as noted in the table.

Matrix Spike/Laboratory Duplicate (MS/DUP) Results - Inorganic Analyses

To assess the long term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent differences of laboratory duplicate results were determined. The majority of percent recoveries and RPDs were within the acceptance criteria, indicating an adequate level of accuracy and precision were achieved for the methods. Table 6 lists MS results which exceeded the acceptance criteria. Table 7 lists laboratory duplicate results which violated the acceptance criteria. The associated data should be qualified as noted in the respective tables.

Laboratory Control Sample (LCS) - Inorganic

The LCS serves as a monitor of the overall performance of all steps in the analysis, including the sample preparation. All LCS were within the control limits indicating that the methods were adequately performed.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC collected for this sampling event consisted of eight rinsate blank samples and nine field duplicate sample sets.

As a check on cleanliness of sampling equipment, rinsate blank samples were collected as authentic samples for labeling and submission to the laboratory. Acetone and 1,1,1-trichloroethane were detected in two of the rinsate blanks at estimated concentrations of 0.006 and 0.001 mg/L, respectively. The remaining rinsate blanks were free from detectable concentrations of target analytes indicating the field decontamination procedure was adequate.

Overall precision for the sampling event was monitored by the evaluation of field duplicate sample set results. Relative percent difference of the results were calculated. The results of detected field duplicate sample results are listed in Table 8. The high RPD value may be attributable to the heterogeneity inherent to soil samples or may reflect a sample identification problem in the field and/or laboratory.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the qualifications noted above.

JPL/rlg

cc: Steve Day, CRA

TABLE 1

SUMMARY OF ANALYTICAL PARAMETERS
AND HOLDING TIME PERIODS
TEXTILE ROAD SITE
MAY 1993 SAMPLING EVENT

Analysis Method[1]	*Holding Time*[2]
Volatile Organic Compounds (VOC) CLP SOW OLM01.8 water/soil	14 Days
Semivolatile Organic Compounds (SVOC) CLP SOW OLM01.8	
water	7/40 days[3]
soil	14/40 days
Pesticides/Poly Chlorinated Biphenyls (Pest/PCB) CLP SOW OLM01.8	
water	7/40 days
soil	14/40 days
Metals CLP SOW ILM3.0 water/soil	6 months (except mercury - 28 days)
Cyanide CLP SOW ILM03.0 water/soil	14 days

1 Methods were derived from:
CLP SOW - "Contract Laboratory Program Statement of Work for Organic Analyses, Multi-Media, Multi-Concentration" and "Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration", USEPA, March 1990 (or most recent revision).

2 Holding time periods are based from sample collection date to sample analysis date.

3 Seven days from sample collection to sample extraction, then forty days to sample analysis.

TABLE 2

SAMPLE HOLDING TIME VIOLATIONS
TEXTILE ROAD SITE
MAY SAMPLING EVENT

Analysis	*Sample ID*	*Qualifier*[1]
Cyanide	BH-5D-93	UJ
	BH-26B-93	J
	BH-31A-93	UJ
	BH-46D-93	UJ
	BH-46C-93	UJ
	BH-2C-93	UJ
	BH-2D-93	UJ
	BH-6B-93	UJ
	BH-60C-93	UJ
	BH-11A-93	UJ
	BH-16B-93	J
	BH-47A-93	UJ
	BH-21A-93	J
	BH-71A-93	J
	BH-72B-93	UJ
	SS-6-93	J
	BH-47B-93	UJ
	BH-48A-93	UJ
	BH-48B-93	UJ
	BH-49A-93	UJ
	BH-56A-93	UJ
	BH-49B-93	UJ
Mercury	BH-47A-93	UJ
	BH-47B-93	UJ
	BH-48A-93	UJ
	BH-48B-93	UJ
	BH-49A-93	UJ
	BH-56A-93	UJ
	BH-49B-93	UJ
VOC	DW-1-93	J/UJ
	BH-11R-93	J/UJ
	BH-36R-93	J/UJ
SVOC	BH-36R-93	UJ

1 Sample results should be qualified as:
J - The associated value is an estimated quantity for detected analytes.
UJ - The analyte was checked for, but not detected. The associated value is an estimate.

TABLE 3

ANALYTES DETECTED IN METHOD BLANKS
TEXTILE ROAD SITE
MAY 1993 SAMPLING EVENT

Analysis	*Parameter*	*Sample ID*	*Qualified Sample Result (mg/kg)* [1]
VOC	Acetone	BH-2B-93	0.017U
		BH-46D-93	0.014U
		BH-46C-93	0.014U
	2-Butanone	BH-41A-93	0.011U
		BH-5D-93	0.011U
		BH-26B-93	0.011U
		BH-31A-93	0.055U
		BH-46D-93	0.012U
		BH-46C-93	0.012U
		BH-21A-93	1.4U
		BH-71A-93	1.4U
		SS-6-93	0.012U
		DW-1-93	0.010U(mg/L)
		BH-11R-93	0.010U(mg/L)
		BH-36R-93	0.010U(mg/L)
	Methylene chloride	BH-36B-93	0.012U
		BH-55B-93	0.012U
		BH-2D-93	0.011U
		BH-60C-93	0.012U
		BH-11A-93	0.011U
		SS-6-93	0.012U
		DW-1-93	0.010U(mg/L)
		BH-11R-93	0.010U(mg/L)
		BH-36R-93	0.010U(mg/L)
SVOC	Di-n-butylphthalate	BH-2C-93	0.780U
		BH-2D-93	0.350U
		BH-60C-93	0.380U
		BH-11A-93	0.330U
		BH-72B-93	0.570U
		BH-11R-93	0.010U(mg/L)
	bis(2-Ethylhexyl)phthalate	BH-26B-93	11U
		BH-11R-93	0.010U(mg/L)

[1] Sample results should be qualified as:
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

TABLE 4

QUALIFIED SAMPLE DATA DUE TO VIOLATION OF SURROGATE RECOVERY ACCEPTANCE CRITERIA TEXTILE ROAD SITE MAY SAMPLING EVENT

Analysis	*Sample ID*	*Surrogate Compound*	*% Recovery*	*% Recovery Limits*	*Qualifier*[1]
PCB	BH-52B-93	Decachlorobiphenyl	51	60-150	UJ
	BH-5R-93	Decachlorobiphenyl	55	60-150	UJ
		2,4,5,6-Tetrachloro-m-xylene	58	60-150	NR
	BH-37R-93	Decachlorobiphenyl	12	60-150	UJ
		2,4,5,6-Tetrachloro-m-xylene	21	60-150	NR
	BH-38R-93	2,4,5,6-Tetrachloro-m-xylene	40	60-150	UJ
Pest/PCB	BH-36B-93	Decachlorobiphenyl	54	60-150	UJ
	BH-55B-93	Decachlorobiphenyl	41	60-150	J/UJ
	BH-5D-93	Decachlorobiphenyl	40	60-150	UJ
	BH-26B-93	Decachlorobiphenyl	46	60-150	UJ
	BH-31A-93	Decachlorobiphenyl	19	60-150	UJ
	BH-46D-93	Decachlorobiphenyl	49	60-150	UJ
	BH-46C-93	Decachlorobiphenyl	54	60-150	UJ
	BH-2C-93	Decachlorobiphenyl	39	60-150	UJ
	BH-2D-93	Decachlorobiphenyl	34	60-150	UJ
	BH-6B-93	Decachlorobiphenyl	47	60-150	J/UJ
	BH-72B-93	Decachlorobiphenyl	20	60-150	J/UJ
	BH-60C-93	Decachlorobiphenyl	50	60-150	UJ

[1] Sample results should be qualified as:

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

NR - No additional qualification was deemed necessary.

TABLE 5

OUTLYING MS/MSD RESULTS
ORGANIC ANALYSES
TEXTILE ROAD SITE
MAY SAMPLING EVENT

Analysis	*Sample ID*	*Spiking Compound*	*MS % Recovery*	*MSD % Recovery*	*% Recovery Limits*	*RPD*	*RPD Limit*	*Qualifier*[1]
Pest/PCB	BH-28-93	4,4'-DDT	54	100	23-134	60	50	UJ
		Dieldrin	25	120	31-134	131	38	UJ
		Endrin	259	464	42-139	57	45	UJ
VOC	BH-2B-93	Chlorobenzene	146	106	60-133	32	21	J
	BH-72B-93	1,1-Dichloroethane	181	111	59-172	48	22	UJ
		Toluene	143	131	59-139	95	21	UJ
PCB	BH-50B-93	PCB 1248	87	112	39-155	25	19	UJ

[1] Sample results should be qualified as:
J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

TABLE 6

QUALIFIED SAMPLE DATA DUE TO VIOLOATION OF
MATRIX SPIKE ACCEPTANCE CRITERIA
INORGANIC ANALYSES
TEXTILE ROAD SITE
MAY SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Sample Result (mg/kg)*
Cyanide	BH-60C-93	Cyanide	23	75-125	BH-60C-93	ND(0.20)R
Metals	BH-2B-93	Cadmium	17	75-125	BH-2B-93	1.4J
Metals	BH-60C-93	Lead	0	75-125	BH-50A-93	69J
					BH-50B-93	68J
					BH-59A-93	80J
					BH-2C-93	13J
					BH-2D-93	8.2J
					BH-6B-93	55J
					BH-60C-93	13J
					BH-11A-93	12J
					BH-16B-93	31J
					BH-21A-93	74J
					BH-71A-93	64J
					BH-72B-93	16J
					SS-6-93	139J
Metals	BH-2B-93	Arsenic	0	75-125	BH-2B–93	15J
					BH-41A-93	3.6J
					BH-46B-93	6.1J
					BH-36B-93	9.9J
					BH-55B-93	5.0J
					BH-5D-93	6.2J
					BH-26B-93	4.1J
					BH-31A-93	4.2J
					BH-46D-93	4.3J
					BH-46C-93	6.6J
Metals	BH-60C-93	Arsenic	49	75-125	BH-50A-93	15J
					BH-50B-93	19J
					BH-59A-93	15J
					BH-2C-93	8.9J
					BH-2D-93	5.8J
					BH-6B-93	16J
					BH-60C-93	7.5J
					BH-11A-93	5.6J
					BH-16B-93	29J
					BH-21A-93	65J
					BH-71A-93	37J
					BH-72B-93	19J
					SS-6-93	20J

TABLE 6

QUALIFIED SAMPLE DATA DUE TO VIOLOATION OF
MATRIX SPIKE ACCEPTANCE CRITERIA
INORGANIC ANALYSES
TEXTILE ROAD SITE
MAY SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Sample Result (mg/kg)*
Metals	BH-2B-93	Antimony	21	75-125	BH-2B-93	ND(15)R
					BH-41A-93	ND(13)R
					BH-46B-93	ND(14)R
					BH-36B-93	ND(15)R
					BH-55B-93	ND(15)R
					BH-5D-93	ND(14)R
Metals	BH-2B-93	Antimony	21	75-125	BH-26B-93	ND(14)R
					BH-31A-93	ND(13)R
					BH-46D-93	ND(14)R
					BH-46C-93	ND(14)R
Metals	BH-60C-93	Antimony	29	75-125	BH-50A-93	ND(13)R
					BH-50B-93	ND(14)R
					BH-59A-93	ND(14)R
					BH-2C-93	ND(14)R
					BH-2D-93	ND(13)R
					BH-6B-93	ND(15)R
					BH-60C-93	ND(14)R
					BH-11A-93	ND(13)R
					BH-16B-93	ND(21)R
					BH-21A-93	24J
					BH-71A-93	14J
					BH-72B-93	ND(21)R
					SS-6-93	ND(14)R
Metals	BH-2B-93	Arsenic	0	75-125	BH-2B-93	ND(1.2)R
					BH-41A-93	ND(1.1)R
					BH-46B-93	ND(1.1)R
					BH-36B-93	ND(1.2)R
					BH-55B-93	ND(1.2)R
					BH-5D-93	ND(1.1)R
					BH-26B-93	ND(1.1)R
					BH-31A-93	ND(1.1)R
					BH-46D-93	ND(1.2)R
					BH-46C-93	ND(1.2)R
Metals	BH-2B-93	Chromium	161	75-125	BH-2B-93	86J
					BH-41A-93	11J
					BH-46B-93	8.3J
					BH-36B-93	14J
					BH-55B-93	21J
					BH-5D-93	7.5J
					BH-26B-93	13J

TABLE 6

QUALIFIED SAMPLE DATA DUE TO VIOLOATION OF
MATRIX SPIKE ACCEPTANCE CRITERIA
INORGANIC ANALYSES
TEXTILE ROAD SITE
MAY SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Sample Result (mg/kg)*
Metals	BH-2B-93	Chromium	161	75-125	BH-31A-93	13J
					BH-46D-93	4.5J
					BH-46C-93	12J
Metals	BH-2B-93	Copper	976	75-125	BH-2B-93	495J
					BH-41A-93	14J
					BH-46B-93	11J
					BH-36B-93	36J
					BH-55B-93	109J
					BH-5D-93	18J
					BH-26B-93	58J
					BH-31A-93	34J
					BH-46D-93	15J
Metals	BH-2B-93	Copper	976	75-125	BH-46C-93	24J
Metals	BH-2B-93	Lead	258	75-125	BH-2B-93	166J
					BH-55B-93	290J
Metals	BH-2B-93	Manganese	248	75-125	BH-2B-93	13,000J
					BH-41A-93	280J
					BH-46B-93	347J
					BH-36B-93	235J
					BH-55B-93	591J
					BH-5D-93	222J
					BH-26B-93	230J
					BH-31A-93	222J
					BH-46D-93	245J
					BH-46C-93	430J
Metals	BH-60C-93	Manganese	171	75-125	BH-50A-93	328J
					BH-50B-93	366J
					BH-59A-93	488J
					BH-2C-93	16,100J
					BH-2D-93	391J
					BH-6B-93	412J
					BH-60C-93	336J
					BH-11A-93	378J
					BH-16B-93	818J
					BH-21A-93	4,170J
					BH-71A-93	3,080J
					BH-72B-93	148J
					SS-6-93	665J

TABLE 6

QUALIFIED SAMPLE DATA DUE TO VIOLOATION OF
MATRIX SPIKE ACCEPTANCE CRITERIA
INORGANIC ANALYSES
TEXTILE ROAD SITE
MAY SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*MS % Recovery*	*% Recovery Limits*	*Associated Samples*	*Qualified Sample Result (mg/kg)*[1]
Metals	BH-2B-93	Zinc	1,100	75-125	BH-2B-93	346J
					BH-41A-93	30J
					BH-46B-93	32J
					BH-36B-93	57J
					BH-55B-93	470J
					BH-5D-93	58J
					BH-26B-93	58J
					BH-31A-93	41J
					BH-46D-93	39J
					BH-46C-93	63J
Metals	BH-56A-93	Antimony	65	75-125	BH-47A-93	ND(13)UJ
					BH-47B-93	ND(14)UJ
					BH-48A-93	ND(14)UJ
					BH-48B-93	ND(14)UJ
					BH-49A-93	ND(13)UJ
					BH-56A-93	ND(13)UJ
					BH-49B-93	ND(13)UJ
Metals	BH-56A-93	Arsenic	47	75-125	BH-47A-93	ND(2.0)UJ
					BH-47B-93	2.1J
					BH-48A-93	ND(2.0)UJ
					BH-48B-93	3.2J
					BH-49A-93	2.1J
					BH-56A-93	3.2J
					BH-49B-93	ND(2.0)UJ
Metals	BH-56A-93	Lead	34	75-125	BH-47A-93	4.1J
					BH-47B-93	8.9J
					BH-48A-93	4.8J
					BH-48B-93	5.4J
					BH-49A-93	3.0J
					BH-56A-93	4.9J
					BH-49B-93	6.1J

[1] Sample results should be qualified as:

J - The associated value is an estimated quantity.
UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R - The data are unusable.

TABLE 7

QUALIFIED SAMPLE DATA DUE TO VIOLATION OF
LABORATORY DUPLICATE
INORGANIC ANALYSES
TEXTILE ROAD SITE
MAY SAMPLING EVENT

Analysis	*Spiked Sample ID*	*Spiking Compound*	*RPD*	*RPD Limit*	*Associated Samples*	*Qaulified Sample Results (mg/kg)*[1]
Metal	BH-2B-93	Calcium	41	20	BH-2B-93	64.300J
					BH-41A-93	13,800J
					BH-46B-93	19,600J
					BH-36B-93	14,900J
					BH-55B-93	38,000J
					BH-5D-93	91,000J
					BH-26B-93	19,000J
					BH-31A-93	38,100J
					BH-46D-93	118,000J
					BH-46C-93	94,200J
Metal	BH-2B-93	Lead	39	20	BH-2B-93	166J
Metals	BH-2B-93	Manganese	49	20	BH-2B-93	NR
					BH-41A-93	NR
					BH-46B-93	NR
					BH-36B-93	NR
					BH-55B-93	NR
					BH-5D-93	NR
					BH-26B-93	NR
					BH-31A-93	NR
					BH-46D-93	NR
					BH-46C-93	NR
Metals	BH-60C-93	Lead	39	35	BH-50A-93	NR
					BH-50B-93	NR
					BH-59A-93	NR
					BH-2C-93	NR
					BH-2D-93	NR
					BH-6B-93	NR
					BH-60C-93	NR
					BH-11A-93	NR
					BH-16B-93	NR
					BH-21A-93	NR
					BH-71A-93	NR
					BH-72B-93	NR
					SS-6-93	NR

1 Sample results should be qualified as:

J - The analyte was positively identifed; the associated numerical value is the approximate concentration of the analyte in the sample.
NR - No additional qualification was deemed necessary.

TABLE 8

FIELD DUPLICATE SAMPLE RESULTS
TEXTILE ROAD SITE
MAY SAMPLING EVENT

	Investigative Sample BH-36B-93 (mg/kg)	Duplicate Sample BH-55B-93 (mg/kg)	RPD
Aluminum	5,910	6,720	12
Arsenic	9.9	5.0	66
Barium	254	122	70
Beryllium	1.3	ND[1] (1.2)	NC[2]
Calcium	14,900	38,000	87
Chromium	14	21	40
Copper	36	109	100
Iron	8,970	16,300	58
Lead	14	290	181
Magnesium	4,790	9,020	61
Manganese	235	591	86
Nickel	15	15	0
Vanadium	22	23	4
Zinc	57	470	156
Mercury	ND(0.12)	0.28	NC
4,4'-DDE	ND(0.0041)	0.0044	NC
4,4'-DDT	ND(0.0041)	0.0080	NC
Acetone	0.015	0.031	61
Benzene	0.003J	0.003J	0
2-Butanone	0.041	0.004J	164
Carbon disulfide	0.001J	ND(0.012)	NC
Ethylbenzene	0.002J	0.002J	0
Methlene chloride	0.005JB	0.005JB	0
4-methyl-2-pentanone	0.003J	ND(0.012)	NC
Xylenes(total)	0.004J	0.004J	0

1 ND - Non-derect
2 NC - Non calculable

TABLE 8

FIELD DUPLICATE SAMPLE RESULTS
TEXTILE ROAD SITE
MAY SAMPLING EVENT

	Investigative Sample BH-21A-93 mg/kg	Duplicate Sample BH-71A-93 mg/kg	RPD
Aluminum	27,800	27,500	1.1
Antimony	24	14	52
Arsenic	65	37	54
Barium	46	83	57
Cadmium	2.9	2.5	14
Chromium	1,750	1,240	34
Cobalt	70	61	13
Copper	1,800	1,570	13
Iron	604,000	489,000	21
Lead	74	64	14
Manganese	4,170	3,080	27
Nickel	443	288	42
Silver	4.8	2.6	59
Vanadium	105	38	17
Zinc	448	412	0.8
PCB-1254	230	44	136
Acetone	ND(1.4)	1.7	NC
2-Butanone	1.4B	0.23J	143
Carbon disulfide	0.27J	ND(1.4)	NC
Total-xylenes	0.20J	0.20J	0
Bromomethane	ND(1.4)	0.50JB	NC
Methylene chloride	ND(1.4)	0.21J	NC
Toluene	ND(1.4)	0.46J	NC

TABLE 8

FIELD DUPLICATE SAMPLE RESULTS
TEXTILE ROAD SITE
MAY SAMPLING EVENT

	Investigative Sample BH-16B-93 (mg/kg)	Duplicate Sample BH-72B-93 (mg/kg)	RPD
Aluminum	9,310	3,040	101
Arsenic	29	19	41
Barium	498	410	19
Beryllium	2.9	2.7	7
Cadmium	1.3	ND(1.7)	NC
Calcium	2,140	1,370	43
Chromium	193	32	143
Cobalt	16	ND(10)	NC
Copper	671	72	161
Iron	101,000	195,000	135
Lead	31	16	63
Manganese	818	148	138
Nickel	99	19	135
Selenium	1.9	ND(1.7)	NC
Vanadium	26	20	26
Zinc	82	16	134
PCB-1254	19	3.6	176
Acetone	0.56	6.2	166
Toluene	0.026J	ND(2.1)	NC
Ethylbenzene	(ND)0.087	0.46	NC
Aluminum	1,600	4,700	98
Arsenic	2.1	3.2	41
Calcium	75,000	35,000	72
Chromium	3.4	9.7	96
Copper	6.9	11	45
Iron	4,900	10,000	68
Lead	3.0	4.9	48
Magnesium	10,000	8200	19
Manganese	210	190	10
Nickel	ND(8.0)	11	NC
Vanadium	ND(10)	15	NC
Zinc	13	32	84

TABLE 8

FIELD DUPLICATE SAMPLE RESULTS
TEXTILE ROAD SITE
MAY SAMPLING EVENT

	Investigative Sample BH-16B-93 (mg/kg)	Duplicate Sample BH-72B-93 (mg/kg)	RPD
PCB-1254	19,000	3,600	136
	BH-20B-93	BH-70B-93	
PCB-1254	4,200	1,000	123
	BH-21A-93	BH-71A-93	
PCB-1254	230,000	44,000	135
	BH-21B-93	BH-55B-93	
PCB-1254	230,000	310,000	29
	BH-22B-93	BH-56B-93	
PCB-1254	49,000	50,000	2
	BH-24A-93	BH-58A-93	
PCB-1254	16,000	130,000	156

APPENDIX E

STREAMLINED RISK ASSESSMENT CALCULATION TABLES

APPENDIX E

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APPENDIX E

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TABLE : 1

EXPOSURE SCENARIO FORMULA AND ASSUMPTIONS

EXPOSURE SCENARIO : TRESPASSER-SURFACE SOIL
SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS).
LOCATION : ON-SITE

$$\text{EQUATION : INTAKE (mg/kg-day)} = \frac{CS \times CF \times SA \times AF \times MF \times ABS \times EF \times ED}{AT \times BW} + \frac{CS \times IR \times ABS \times CF \times EF \times ED}{AT \times BW} \times PTF$$

where :
CS = Chemical Concentration in Soil (mg/kg)
IR = Ingestion Rate (mg soil/day)
SA = Skin Surface Area Available for Contact (cm2/event)
CF = Conversion Factor (10E-06 kg/mg)
EF = Exposure Frequency (days/years)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged -- days)
AF = Soil to Skin Adherence Factor (mg/cm2)
ABS = Absorption Factor (unitless)
MF = Matrix Factor; partt of chemical on soil that is in contact with skin (%/100)
PTF = Percent of Time Factor: Percent of time in contaminated area. (%/100)

VARIABLE ASSUMPTIONS	MEAN	RME	REFERENCES
CS (mg/kg)	MEAN	95th %	RAGS (1, 2)
IR - (mg/exposure)	100	100	RAGS (1, 2)
SA (cm2)	2000	2000	DEAP (3)
CF (kg/mg)	0.000001	0.000001	RAGS (1, 2)
EF (days/year)	12	24	PROFESSIONAL JUDGEMENT
ED - (CARCINOGEN) (yrs)	9	18	RAGS (1, 2)
ED - (NON-CARC.) (yr)	1	1	RAGS (1, 2)
BW (OLDER CHILD) kg	48	48	RAGS (1, 2)
AT (CARCINOGEN) (yrs x days/yr)	25550	25550	RAGS (1, 2)
AT (NON-CARCINOGEN) (yrs x days/yr)	365	365	RAGS (1, 2)
AF (mg/cm2)	0.5	1	DEAP (3)
MF	0.15	0.15	HAWLEY (4)
ABS ORAL (CHEMICAL SPECIFIC)			
DERMAL (CHEMICAL SPECIFIC)			
PTF	1	1	PROFESSIONAL JUDGEMENT

NOTE:
(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND MANUAL, DECEMBER 1989, EPA/540/1-89/002.
(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS", OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991
(3) EPA DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA/600/8-89/011B, JANUARY 1992.
(4) HAWLEY, J.K.. "ASSESSMENT OF HEALTH RISK FROM EXPOSURE TO CONTAMINATED SOIL", RISK ANALYSIS, VOL.5 NO.4, 1985.

TABLE : 2

MEDIA CONCENTRATIONS AND CHEMICAL CONSTANTS

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS).
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : OLDER CHILDREN
EXPOSURE SCENARIO : TRESPASSER-SURFACE SOIL

	MEDIA CONCENTRATION				ORAL BIOAVAIL. FACTOR		DERMAL BIOAVAIL. FACTOR	
PARAMETER	MEAN mg/kg	RME mg/kg	ORAL CSF 1/(mg/kg/d)	ORAL RfD mg/kg/d	MEAN %/100	RME %/100	MEAN %/100	RME %/100
PCBs								
AROCLOR-1254	8.80E+00	1.53E+01	7.70E+00	7.0E-05	0.50	0.50	0.01	0.01
AROCLOR-1260	7.90E-01	1.60E+00	7.70E+00	7.0E-05	0.50	0.50	0.01	0.01
METALS								
ARSENIC	1.58E+01	3.02E+01	1.75E+00	3.00E-04	0.50	0.50	0.01	0.01
CHROMIUM	1.73E+02	5.54E+02	NA	1.00E+00	0.50	0.50	0.01	0.01
COBALT	1.12E+01	2.69E+01	NA	NA	0.50	0.50	0.01	0.01

NA = NOT AVAILABLE

TABLE : 3

EXPOSURE, RISK AND HAZARD CALCULATIONS

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS).
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : OLDER CHILDREN
EXPOSURE SCENARIO : TRESPASSER-SURFACE SOIL

	LIFETIME AVERAGE DAILY INTAKE (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK		ANNUAL AVERAGE DAILY INTAKE (mg/kg/d)		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN	RME	MEAN	95th %	MEAN	95th %	MEAN	95th %
PCBs								
AROCLOR-1254	3.99E-08	2.86E-07	3.07E-07	2.20E-06	3.10E-07	1.11E-06	4.43E-03	1.59E-02
AROCLOR-1260	3.58E-09	2.99E-08	2.76E-08	2.30E-07	2.79E-08	1.16E-07	3.98E-04	1.66E-03
METALS								
ARSENIC	7.17E-08	5.64E-07	1.25E-07	9.87E-07	5.57E-07	2.19E-06	1.86E-02	7.31E-03
CHROMIUM	7.86E-07	1.03E-05	0.00E+00	0.00E+00	6.11E-06	4.02E-05	6.11E-06	4.02E-05
COBALT	5.08E-08	5.02E-07	0.00E+00	0.00E+00	3.95E-07	1.95E-06	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		4.60E-07	3.42E-06	HAZARD INDEX:		6.70E-03	2.49E-02

TABLE : 4

SUMMARY TABLE

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - A... SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS).
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : OLDER CHILDREN
EXPOSURE SCENARIO : TRESPASSER-SURFACE SOIL

	MEDIA CONCENTRATION		LIFETIME UPPER BOUND EXCESS CANCER RISK		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN mg/kg	RME mg/kg	MEAN	95th %	MEAN	95th %
PCBs						
AROCLOR-1254	8.80E+00	1.53E+01	3.07E-07	2.20E-06	4.43E-03	1.59E-02
AROCLOR-1260	7.90E-01	1.60E+00	2.76E-08	2.30E-07	3.98E-04	1.66E-03
METALS						
ARSENIC	1.58E+01	3.02E+01	1.25E-07	9.87E-07	1.86E-03	7.31E-03
CHROMIUM	1.73E+02	5.54E+02	0.00E+00	0.00E+00	6.11E-06	4.02E-05
COBALT	1.12E+01	2.69E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL LIFETIME ADDED CANCER RISK:			4.60E-07	3.42E-06		
HAZARD INDEX:					6.70E-03	2.49E-02

TABLE : 5

EXPOSURE SCENARIO FORMULA AND ASSUMPTIONS

EXPOSURE SCENARIO : MAINTENANCE WORKER
SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS)
LOCATION : ON-SITE

$$\text{EQUATION : INTAKE (mg/kg-day)} = \frac{CS \times CF \times SA \times AF \times MF \times ABS \times EF \times ED}{BW \times AT} + \frac{CS \times IR \times ABS \times CF \times EF \times ED}{BW \times AT} \times PTF$$

where :
CS = Chemical Concentration in Soil (mg/kg)
IR = Ingestion Rate (mg soil/day)
SA = Skin Surface Area Available for Contact (cm2/event)
CF = Conversion Factor (10E-06 kg/mg)
EF = Exposure Frequency (days/years)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged -- days)
AF = Soil to Skin Adherence Factor (mg/cm2)
ABS = Absorption Factor (unitless)
MF = Matrix Factor; part of chemical on soil that is in contact with skin (%/100)
PTF = Percent of Time Factor: Percent of time in contaminated area. (%/100)

VARIABLE ASSUMPTIONS	MEAN	RME	REFERENCES
CS (mg/kg)	MEAN	95th %	RAGS (1)
IR - ADULT (mg/exposure)	50	50	RAGS (1,2)
SA - ADULT) (cm2)	2000	2000	DEAP (3)
CF (kg/mg)	0.000001	0.000001	RAGS (1,2)
EF (days/year)	250	250	RAGS (1) & PROFESSIONAL JUDGEMENT
ED - (CARCINOGEN) (yrs)	10	25	RAGS (1,2)
ED - (NON-CARC.) (yr)	1	1	RAGS (1,2)
BW (ADULT) (kg)	70	70	RAGS (1,2)
AT (CARCINOGEN) (yrs x days/yr)	25550	25550	RAGS (1,2)
AT (NON-CARCINOGEN) (yrs x days/yr)	365	365	RAGS (1,2)
AF (mg/cm2)	0.5	1	DEAP (3)
MF	0.15	0.15	HAWLEY (4)
ABS ORAL (CHEMICAL SPECIFIC)			
DERMAL (CHEMICAL SPECIFIC)			
PTF	1	1	PROFESSIONAL JUDGEMENT

NOTE:
(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND MANUAL, DECEMBER 1989, EPA/540/1-89/002.
(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS", OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991
(3) EPA DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA/600/8-89/011B, JANUARY 1992.
(4) HAWLEY, J.K. "ASSESSMENT OF HEALTH RISK FROM EXPOSURE TO CONTAMINATED SOIL", RISK ANALYSIS, VOL. 5, NO. 4, 1985.

TABLE : 6

MEDIA CONCENTRATIONS AND CHEMICAL CONSTANTS

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS)
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : MAINTENANCE WORKER

	MEDIA CONCENTRATION				ORAL BIOAVAIL. FACTOR		DERMAL BIOAVAIL. FACTOR	
PARAMETER	MEAN mg/kg	RME mg/kg	ORAL CSF 1/(mg/kg/d)	ORAL RfD mg/kg/d	MEAN %/100	RME %/100	MEAN %/100	RME %/100
PCBs								
AROCLOR-1254	8.80E+00	1.53E+01	7.70E+00	7.00E-05	0.50	0.50	0.01	0.01
AROCLOR-1260	7.90E-01	1.60E+00	7.70E+00	7.00E-05	0.50	0.50	0.01	0.01
METALS								
ARSENIC	1.58E+01	3.02E+01	1.75E+00	3.00E-04	0.50	0.50	0.01	0.01
CHROMIUM	1.73E+02	5.54E+02	NA	1.00E+00	0.50	0.50	0.01	0.01
COBALT	1.12E+01	2.69E+01	NA	NA	0.50	0.50	0.01	0.01

NA = NOT AVAILABLE

TABLE : 7

EXPOSURE, RISK AND HAZARD CALCULATIONS

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS)
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : MAINTENANCE WORKER

	LIFETIME AVERAGE DAILY INTAKE (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK		ANNUAL AVERAGE DAILY INTAKE (mg/kg/d)		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN	RME	MEAN	95th %	MEAN	95th %	MEAN	95th %
PCBs								
AROCLOR-1254	3.26E-07	1.50E-06	2.51E-06	1.15E-05	2.28E-06	4.19E-06	3.26E-02	5.99E-02
AROCLOR-1260	2.93E-08	1.57E-07	2.25E-07	1.21E-06	2.05E-07	4.38E-07	2.93E-03	6.26E-03
METALS								
ARSENIC	5.85E-07	2.95E-06	1.02E-06	5.17E-06	4.10E-06	8.27E-06	1.37E-02	2.76E-02
CHROMIUM	6.42E-06	5.42E-05	0.00E+00	0.00E+00	4.49E-05	1.52E-04	4.49E-05	1.52E-04
COBALT	4.15E-07	2.63E-06	0.00E+00	0.00E+00	2.90E-06	7.37E-06	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		3.76E-06	1.79E-05	**HAZARD INDEX:**		4.92E-02	9.39E-02

TABLE : 8

SUMMARY TABLE

SITE : TEXTILE ROAD SITE
SECTOR : SURFACE SOIL - ALL SURFACE SAMPLES COLLECTED IN SITE AREA (0 - 4' BGS)
LOCATION : ON-SITE
MEDIA : SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : MAINTENANCE WORKER

	MEDIA CONCENTRATION		LIFETIME UPPER BOUND EXCESS CANCER RISK		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN mg/kg	RME mg/kg	MEAN	95th %	MEAN	95th %
PCBs						
AROCLOR-1254	8.80E+00	1.53E+01	2.51E-06	1.15E-05	3.26E-02	5.99E-02
AROCLOR-1260	7.90E-01	1.60E+00	2.25E-07	1.21E-06	2.93E-03	6.26E-03
METALS						
ARSENIC	1.58E+01	3.02E+01	1.02E-06	5.17E-06	1.37E-02	2.76E-02
CHROMIUM	1.73E+02	5.54E+02	0.00E+00	0.00E+00	4.49E-05	1.52E-04
COBALT	1.12E+01	2.69E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		3.76E-06	1.79E-05		
			HAZARD INDEX:		4.92E-02	9.39E-02

TABLE : 9

EXPOSURE SCENARIO FORMULA AND ASSUMPTIONS

EXPOSURE SCENARIO : CONSTRUCTION WORKER
SITE : TEXTILE ROAD SITE
SECTOR : SUB-SURFACE SOIL - ALL SAMPLES COLLECTED IN SITE AREA (0' - 10' BGS).
LOCATION : ON-SITE

$$\text{EQUATION : INTAKE (mg/kg-day)} = \frac{CS \times CF \times SA \times AF \times MF \times ABS \times EF \times ED}{BW \times AT} + \frac{CS \times IR \times ABS \times CF \times EF \times ED}{BW \times AT} \times PTF$$

where :
CS = Chemical Concentration in Soil (mg/kg)
IR = Ingestion Rate (mg soil/day)
SA = Skin Surface Area Available for Contact (cm2/event)
CF = Conversion Factor (10E-06 kg/mg)
EF = Exposure Frequency (days/years)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time (period over which exposure is averaged -- days)
AF = Soil to Skin Adherence Factor (mg/cm2)
ABS = Absorption Factor (unitless)
MF = Matrix Factor; part of chemical on soil that is in contact with skin (%/100)
PTF = Percent of Time Factor: Percent of time in contaminated area. (%/100)

VARIABLE ASSUMPTIONS	MEAN	RME	REFERENCES
CS (mg/kg)	MEAN	95th %	
IR - ADULT (mg/exposure)	50	50	RAGS (1,2)
SA - ADULT) (cm2)	2000	2000	DEAP (3)
CF (kg/mg)	0.000001	0.000001	RAGS (1,2)
EF (days/year)	250	250	RAGS (1,2)
ED - (CARCINOGEN) (yrs)	1	1	RAGS (1)& PROFESSIONAL JUDGEMENT
ED - (NON-CARC.) (yr)	1	1	RAGS (1,2)
BW (ADULT) (kg)	70	70	RAGS (1,2)
AT (CARCINOGEN) (yrs x days/yr)	25550	25550	RAGS (1,2)
AT (NON-CARCINOGEN) (yrs x days/yr)	365	365	RAGS (1,2)
AF (mg/cm2)	0.5	1	DEAP (3)
MF	0.15	0.15	HAWLEY (4)
ABS ORAL (CHEMICAL SPECIFIC)			
DERMAL (CHEMICAL SPECIFIC)			
PTF	1	1	PROFESSIONAL JUDGEMENT

NOTE:
(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND MANUAL, DECEMBER 1989, EPA/540/1-89/002.
(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS", OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991
(3) EPA DERMAL EXPOSURE ASSESSMENT: PRINCIPLES AND APPLICATIONS, EPA/600/8-89/011B, JANUARY 1992.
(4) HAWLEY, J.K.. "ASSESSMENT OF HEALTH RISK FROM EXPOSURE TO CONTAMINATED SOIL", RISK ANALYSIS, VOL.5, NO.4, 1985.

TABLE : 1u

MEDIA CONCENTRATIONS AND CHEMICAL CONSTANTS

SITE : TEXTILE ROAD SITE
SECTOR : SUB-SURFACE SOIL - ALL SAMPLES COLLECTED IN SITE AREA (0' - 10' BGS).
LOCATION : ON-SITE
MEDIA : SUB-SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : CONSTRUCTION WORKER

	MEDIA CONCENTRATION				ORAL BIOAVAIL. FACTOR		DERMAL BIOAVAIL. FACTOR	
PARAMETER	MEAN mg/kg	RME mg/kg	ORAL CSF 1/(mg/kg/d)	ORAL RfD mg/kg/d	MEAN %/100	RME %/100	MEAN %/100	RME %/100
PCBs								
AROCLOR-1254	9.20E+00	1.53E+01	7.70E+00	7.0E-05	0.50	0.50	0.01	0.01
AROCLOR-1260	6.50E-01	1.10E+00	7.70E+00	7.0E-05	0.50	0.50	0.01	0.01
METALS								
ARSENIC	1.26E+01	1.94E+01	1.75E+00	3.00E-04	0.50	0.50	0.01	0.01
CHROMIUM	9.60E+01	2.60E+02	NA	1.00E+00	0.50	0.50	0.01	0.01
COBALT	8.27E+00	1.51E+01	NA	NA	0.50	0.50	0.01	0.01

NA = NOT AVAILABLE

TABLE : 11

EXPOSURE, RISK AND HAZARD CALCULATIONS

SITE : TEXTILE ROAD SITE
SECTOR : SUB-SURFACE SOIL - ALL SAMPLES COLLECTED IN SITE AREA (0' - 10' BGS).
LOCATION : ON-SITE
MEDIA : SUB-SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : CONSTRUCTION WORKER

	LIFETIME AVERAGE DAILY INTAKE (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK		ANNUAL AVERAGE DAILY INTAKE (mg/kg/d)		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN	RME	MEAN	95th %	MEAN	95th %	MEAN	95th %
PCBs								
AROCLOR-1254	3.41E-08	5.99E-08	2.62E-07	4.61E-07	2.39E-06	4.19E-06	3.41E-02	5.99E-02
AROCLOR-1260	2.41E-09	4.31E-09	1.85E-08	3.32E-08	1.69E-07	3.01E-07	2.41E-03	4.31E-03
METALS								
ARSENIC	4.67E-08	7.59E-08	8.17E-08	1.33E-07	3.27E-06	5.32E-06	1.09E-02	1.77E-02
CHROMIUM	3.56E-07	1.02E-06	0.00E+00	0.00E+00	2.49E-05	7.12E-05	2.49E-05	7.12E-05
COBALT	3.06E-08	5.91E-08	0.00E+00	0.00E+00	2.14E-06	4.14E-06	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		3.63E-07	6.27E-07	**HAZARD INDEX:**		4.74E-02	8.20E-02

TABLE : 12

SUMMARY TABLE

SITE : TEXTILE ROAD SITE
SECTOR : SUB-SURFACE SOIL - ALL SAMPLES COLLECTED IN SITE AREA (0' - 10' BGS).
LOCATION : ON-SITE
MEDIA : SUB-SURFACE SOIL
POPULATION : ADULT WORKER
EXPOSURE SCENARIO : CONSTRUCTION WORKER

	MEDIA CONCENTRATION		LIFETIME UPPER BOUND EXCESS CANCER RISK		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN mg/kg	RME mg/kg	MEAN	95th %	MEAN	95th %
PCBs						
AROCLOR-1254	9.20E+00	1.53E+01	2.62E-07	4.61E-07	3.41E-02	5.99E-02
AROCLOR-1260	6.50E-01	1.10E+00	1.85E-08	3.32E-08	2.41E-03	4.31E-03
METALS						
ARSENIC	1.26E+01	1.94E+01	8.17E-08	1.33E-07	1.09E-02	1.77E-02
CHROMIUM	9.60E+01	2.60E+02	0.00E+00	0.00E+00	2.49E-05	7.12E-05
COBALT	8.27E+00	1.51E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL LIFETIME ADDED CANCER RISK:		3.63E-07	6.37E-07		
			HAZARD INDEX:		4.74E-02	8.20E-02

TABLE : 13

EXPOSURE SCENARIO FORMULA AND ASSUMPTIONS

EXPOSURE SCENARIO : DRINKING WATER
SITE : TEXTILE ROAD SITE
SECTOR : *GROUNDWATER - UPPER WATER TABLE ZONE*
LOCATION : ON-SITE

EQUATION : $\text{INTAKE (mg/kg-day)} = \frac{CW \times IR \times EF \times ED}{BW \times AT}$

where :

CW = Chemical Concentration in Water (mg/liter)
IR = Ingestion Rate (liters/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time - period over which exposure is averaged (days)

VARIABLE	MEAN	RME	REFERENCES:
CW (mg/liter)	MEAN	95th %	RAGS (1,2)
IR ADULT (liters/day)	1	1	RAGS (1,2)
EF (days/yr)	250	250	RAGS (1,2)
ED - carc. (yr)	10	25	RAGS (1,2)
ED - non-carc. (yr)	1	1	RAGS (1,2)
BW ADULT (kg)	70	70	RAGS (1,2)
AT - carcinogen (years x days)	25550	25550	RAGS (1,2)
AT - non-carcinogen (years x days)	365	365	RAGS (1,2)

NOTES :
(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND" MANUAL, DECEMBER 1989; EPA/540/1-89/002.
(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS", OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991

TABLE : 14

MEDIA CONCENTRATIONS/CONSTANTS

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - UPPER WATER TABLE ZONE
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

	MEDIA CONCENTRATION			
PARAMETER	MEAN mg/L	RME mg/L	ORAL CSF 1/(mg/kg/d)	ORAL RfD mg/kg/d
PCBs				
AROCLOR-1254	1.30E-01	3.20E-01	7.70E+00	7.0E-05
VOC				
ACETONE	2.00E-02	3.00E-02	NA	1.00E-01
BNA				
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E-02	1.00E-02	1.40E-02	2.00E-02
METALS (UNFILTERED)				
ARSENIC	2.00E-02	2.00E-02	1.75E+00	3.00E-04
BERYLLIUM	3.00E-03	4.00E-03	4.30E+00	5.0. E-03
LEAD	7.00E-02	1.20E-01	NA	1.40E-03
MANGANESE	1.41E+00	1.80E+00	NA	5.00E-03
NICKEL	5.00E-02	8.00E-02	NA	2.00E-02
METALS (FILTERED)				
BERYLLIUM	3.00E-03	5.00E-03	4.30E+00	5.00E-03
CHROMIUM	1.20E-02	2.80E-02	NA	1.00E+00
MANGANESE	5.60E-01	7.70E-01	NA	5.00E-03

NA = NOT AVAILABLE

TABLE : 15

EXPOSURE, RISK AND HAZARD CALCULATIONS

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - UPPER WATER TABLE ZONE
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

	LIFETIME AVERAGE DAILY INTAKE (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK		ANNUAL AVERAGE DAILY INTAKE (mg/kg/d)		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN	RME	MEAN	95th %	MEAN	95th %	MEAN	95th %
PCBs								
AROCLOR-1254	1.82E-04	1.12E-03	1.40E-03	8.61E-03	1.27E-03	3.13E-03	1.82E+01	4.47E+01
VOC								
ACETONE	2.80E-05	1.05E-04	0.00E+00	0.00E+00	1.96E-04	2.94E-04	1.96E-03	2.94E-03
BNA								
BIS(2-ETHYLHEXYL)PHTHALATE	1.40E-05	3.49E-05	1.96E-07	4.89E-07	9.78E-05	9.78E-05	4.89E-03	4.89E-03
METALS (UNFILTERED)								
ARSENIC	2.80E-05	6.99E-05	4.89E-05	1.22E-04	1.96E-04	1.96E-04	6.52E-01	6.52E-01
BERYLLIUM	4.19E-06	1.40E-05	1.80E-05	6.01E-05	2.94E-05	3.91E-05	5.87E-03	7.83E-03
LEAD	9.78E-05	4.19E-04	0.00E+00	0.00E+00	6.85E-04	1.17E-03	4.89E-01	8.39E-01
MANGANESE	1.97E-03	6.57E-03	0.00E+00	0.00E+00	1.38E-02	1.84E-02	2.76E+00	3.68E+00
NICKEL	6.99E-05	2.80E-04	0.00E+00	0.00E+00	4.89E-04	7.83E-04	2.45E-02	3.91E-02
METALS (FILTERED)								
BERYLLIUM	4.19E-06	1.75E-05	1.80E-05	7.51E-05	2.94E-05	4.89E-05	5.87E-03	9.78E-03
CHROMIUM	1.68E-05	9.78E-05	0.00E+00	0.00E+00	1.17E-04	2.74E-04	1.17E-04	2.74E-04
MANGANESE	7.83E-04	2.69E-03	0.00E+00	0.00E+00	5.48E-03	7.53E-03	1.10E+00	1.51E+00
	TOTAL ADDITIONAL ESTIMATED CANCER RISKS:				HAZARD INDEX :			
	WITH UNFILTERED METALS		1.47E-03	8.79E-03	WITH UNFILTERED METALS		2.21E+01	4.99E+01
	WITH FILTERED METALS		1.42E-03	8.68E-03	WITH FILTERED METALS		1.93E+01	4.62E+01

TABLE : 16

SUMMARY TABLE

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - UPPER WATER TABLE ZONE
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

	MEDIA CONCENTRATION		LIFETIME UPPER BOUND EXCESS CANCER RISK		HAZARD QUOTIENT CDI/RfD	
PARAMETER	MEAN mg/L	RME mg/L	MEAN	95th %	MEAN	95th %
PCBs						
AROCLOR-1254	1.30E-01	3.20E-01	1.40E-03	8.61E-03	1.82E+01	4.47E+01
VOC						
ACETONE	2.00E-02	3.00E-02	0.00E+00	0.00E+00	1.96E-03	2.94E-03
BNA						
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E-02	1.00E-02	1.96E-07	4.89E-07	4.89E-03	4.89E-03
METALS (UNFILTERED)						
ARSENIC	2.00E-02	2.00E-02	4.89E-05	1.22E-04	6.52E-01	6.52E-01
BERYLLIUM	3.00E-03	4.00E-03	1.80E-05	6.01E-05	5.87E-03	7.83E-03
LEAD	7.00E-02	1.20E-01	0.00E+00	0.00E+00	4.89E-01	8.39E-01
MANGANESE	1.41E+00	1.88E+00	0.00E+00	0.00E+00	2.76E+00	3.68E+00
NICKEL	5.00E-02	8.00E-02	0.00E+00	0.00E+00	2.45E-02	3.91E-02
METALS (FILTERED)						
BERYLLIUM	3.00E-03	5.00E-03	1.80E-05	7.51E-05	5.87E-03	9.78E-03
CHROMIUM	1.20E-02	2.80E-02	0.00E+00	0.00E+00	1.17E-04	2.74E-04
MANGANESE	5.60E-01	7.70E-01	0.00E+00	0.00E+00	1.10E+00	1.51E+00
	TOTAL ADDITIONAL ESTIMATED CANCER RISKS:				HAZARD INDEX :	
	WITH UNFILTERED METALS		1.47E-03	8.79E-03	2.21E+01	4.99E+01
	WITH FILTERED METALS		1.42E-03	8.68E-03	1.93E+01	4.62E+01

TABLE : 17

EXPOSURE SCENARIO FORMULA AND ASSUMPTIONS

EXPOSURE SCENARIO : DRINKING WATER
SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - LOWER SANDS AQUIFER
LOCATION : ON-SITE

EQUATION : $\text{INTAKE (mg/kg-day)} = \frac{CW \times IR \times EF \times ED}{BW \times AT}$

where :

CW = Chemical Concentration in Water (mg/liter)
IR = Ingestion Rate (liters/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT = Averaging Time - period over which exposure is averaged (days)

VARIABLE	MEAN	RME	REFERENCES:
CW (mg/liter)	MEAN	95th %	RAGS (1,2)
IR ADULT (liters/day)	1	1	RAGS (1,2)
EF (days/yr)	250	250	RAGS (1,2)
ED - carc. (yr)	10	25	RAGS (1,2)
ED - non-carc. (yr)	1	1	RAGS (1,2)
BW ADULT (kg)	70	70	RAGS (1,2)
AT - carcinogen (years x days)	25550	25550	RAGS (1,2)
AT - non-carcinogen (years x days)	365	365	RAGS (1,2)

NOTES :
(1) EPA "RISK ASSESSMENT GUIDANCE FOR SUPERFUND" MANUAL, DECEMBER 1989, EPA/540/1-89/002.
(2) SUPPLEMENTAL GUIDANCE: "STANDARD DEFAULT EXPOSURE FACTORS", OSWER DIRECTIVE: 9285.6-03, MARCH 25, 1991

TABLE 16

MEDIA CONCENTRATIONS/CONSTANTS

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - LOWER SANDS AQUIFER
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

	MEDIA CONCENTRATION			
PARAMETER	MEAN mg/L	RME mg/L	ORAL CSF 1/(mg/kg/d)	ORAL RfD mg/kg/d
VOC				
ACETONE	4.77E-01	1.78E+00	NA	1.00E-01
BNA				
BIS(2-ETHYLHEXYL)PHTHALATE	2.17E-01	4.75E-01	1.40E-02	2.00E-02
METALS (UNFILTERED)				
ARSENIC	1.95E-02	5.10E-02	1.75E+00	3.00E-04
BERYLLIUM	3.10E-03	5.10E-03	4.30E+00	5.00E-03
IRON	3.92E+01	9.28E+01	NA	NA
LEAD	2.83E-02	5.95E-02	NA	1.40E-03
MANGANESE	6.81E-01	1.67E+00	NA	5.00E-03
NICKEL	6.41E-02	1.43E-01	NA	2.00E-02
METALS (FILTERED)				
CHROMIUM	4.00E-02	1.30E-01	NA	1.00E+00
MANGANESE	5.00E-02	9.33E-02	NA	5.00E-03

NA = NOT AVAILABLE

TABLE : 19

EXPOSURE, RISK AND HAZARD CALCULATIONS

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - LOWER SANDS AQUIFER
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

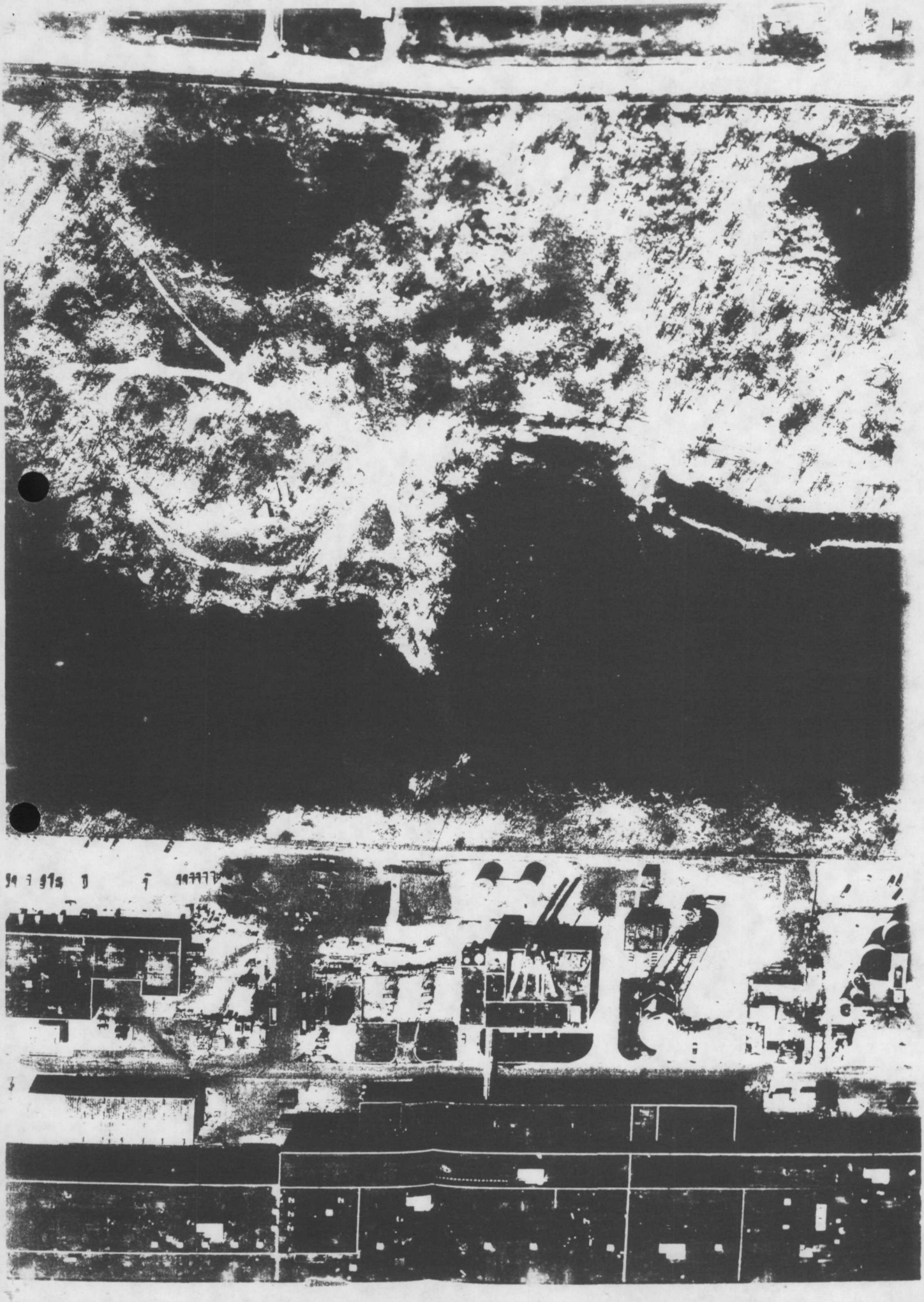
CHEMICALS EVALUATED IN GROUNDWATER	LIFETIME AVERAGE DAILY INTAKE (mg/kg/day)		LIFETIME UPPER BOUND EXCESS CANCER RISK		ANNUAL AVERAGE DAILY INTAKE (mg/kg/d)		HAZARD QUOTIENT CDI/RfD	
	MEAN	RME	MEAN	95th %	MEAN	95th %	MEAN	95th %
VOC								
ACETONE	6.67E-04	6.21E-03	0.00E+00	0.00E+00	4.67E-03	1.74E-02	4.67E-02	1.74E-01
BNA								
BIS(2-ETHYLHEXYL)PHTHALATE	3.03E-04	1.66E-03	4.24E-06	2.33E-05	2.12E-03	4.65E-03	1.06E-01	2.33E-01
METALS (UNFILTERED)								
ARSENIC	2.73E-05	1.78E-04	4.77E-05	3.12E-04	1.91E-04	4.99E-04	6.36E-01	1.66E+00
BERYLLIUM	4.33E-06	1.78E-05	1.86E-05	7.66E-05	3.03E-05	4.99E-05	6.07E-03	9.98E-03
IRON	5.48E-02	3.24E-01	0.00E+00	0.00E+00	3.84E-01	9.08E-01	0.00E+00	0.00E+00
LEAD	3.96E-05	2.08E-04	0.00E+00	0.00E+00	2.77E-04	5.82E-04	1.98E-01	4.16E-01
MANGANESE	9.51E-04	5.84E-03	0.00E+00	0.00E+00	6.66E-03	1.64E-02	1.33E+00	3.27E+00
NICKEL	8.96E-05	5.00E-04	0.00E+00	0.00E+00	6.27E-04	1.40E-03	3.14E-02	7.01E-02
METALS (FILTERED)								
CHROMIUM	5.59E-05	4.54E-04	0.00E+00	0.00E+00	3.91E-04	1.27E-03	3.91E-04	1.27E-03
MANGANESE	6.99E-05	3.26E-04	0.00E+00	0.00E+00	4.89E-04	9.13E-04	9.78E-02	1.83E-01
	ESTIMATED CANCER RISKS:				HAZARD INDEX:			
	WITH UNFILTERED METALS		7.06E-05	4.12E-04	WITH UNFILTERED METALS		2.36E+00	5.84E+00
	WITH FILTERED METALS		4.24E-06	2.33E-05	WITH FILTERED METALS		2.51E-01	5.90E-01

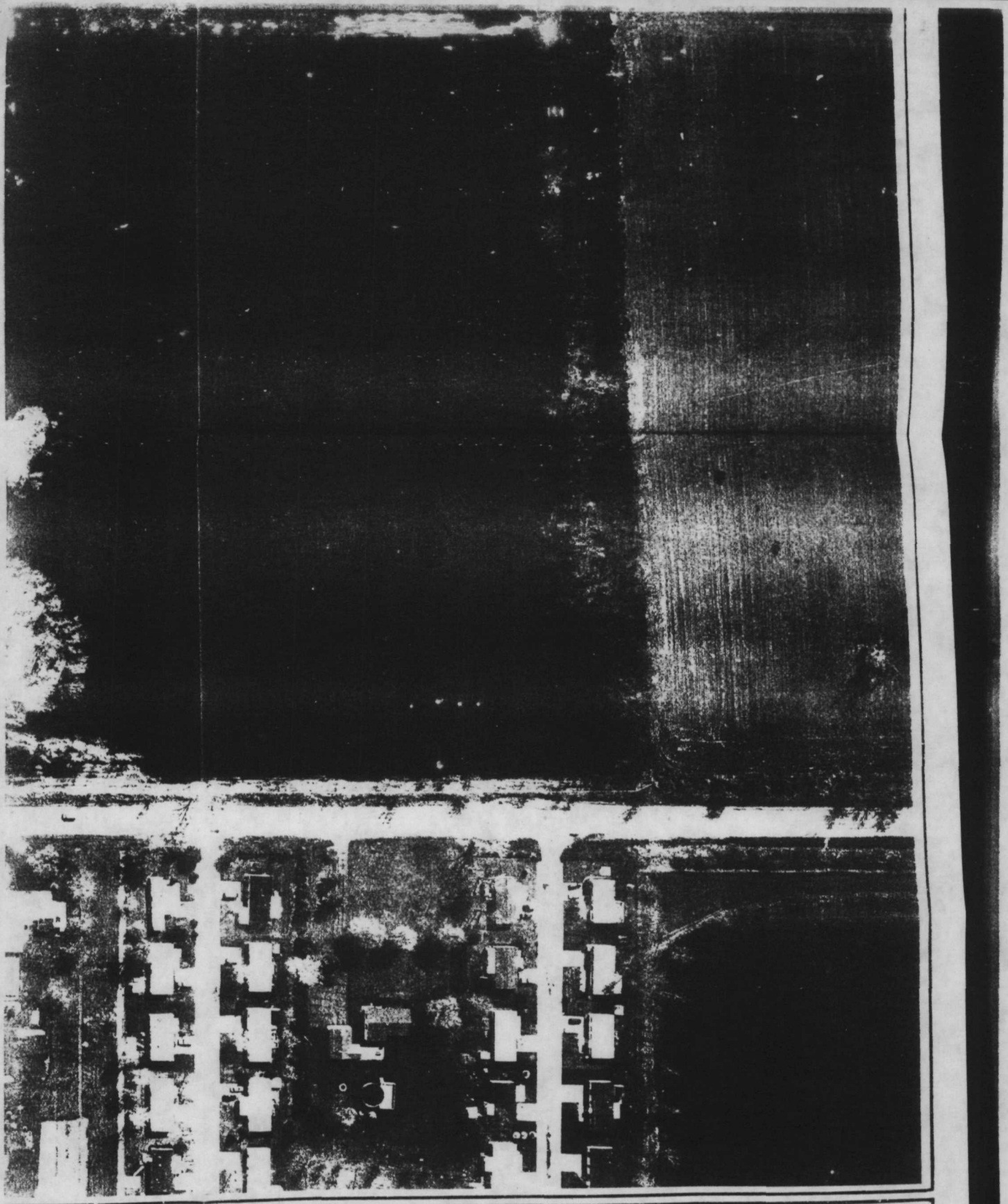
TABLE : 20

SUMMARY TABLE

SITE : TEXTILE ROAD SITE
SECTOR : GROUNDWATER - LOWER SANDS AQUIFER
LOCATION : ON-SITE
MEDIA : GROUNDWATER
EXPOSURE SCENARIO : DRINKING WATER

	MEDIA CONCENTRATION		LIFETIME UPPER BOUND EXCESS CANCER RISK		HAZARD QUOTIENT CDI/RfD	
CHEMICALS EVALUATED IN GROUNDWATER	MEAN mg/L	RME mg/L	MEAN	95th %	MEAN	95th %
VOC						
ACETONE	4.77E-01	1.78E+00	0.00E+00	0.00E+00	4.67E-02	1.74E-01
BNA						
BIS(2-ETHYLHEXYL)PHTHALATE	2.17E-01	4.75E-01	4.24E-06	2.33E-05	1.06E-01	2.33E-01
METALS (UNFILTERED)						
ARSENIC	1.95E-02	5.10E-02	4.77E-05	3.12E-04	6.36E-01	1.66E+00
BERYLLIUM	3.10E-03	5.10E-03	1.86E-05	7.66E-05	6.07E-03	9.98E-03
LEAD	2.83E-02	5.95E-02	0.00E+00	0.00E+00	1.98E-01	4.16E-01
MANGANESE	6.81E-01	1.67E+00	0.00E+00	0.00E+00	1.33E+00	3.27E+00
NICKEL	6.41E-02	1.43E-01	0.00E+00	0.00E+00	3.14E-02	7.01E-02
METALS (FILTERED)						
CHROMIUM	4.00E-02	1.30E-01	0.00E+00	0.00E+00	3.91E-04	1.27E-03
MANGANESE	5.00E-02	9.33E-02	0.00E+00	0.00E+00	9.78E-02	1.83E-01
	ESTIMATED CANCER RISKS:				HAZARD INDEX:	
	WITH UNFILTERED METALS		7.06E-05	4.12E-04	2.36E+00	5.84E+00
	WITH FILTERED METALS		4.24E-06	2.33E-05	2.51E-01	5.90E-01





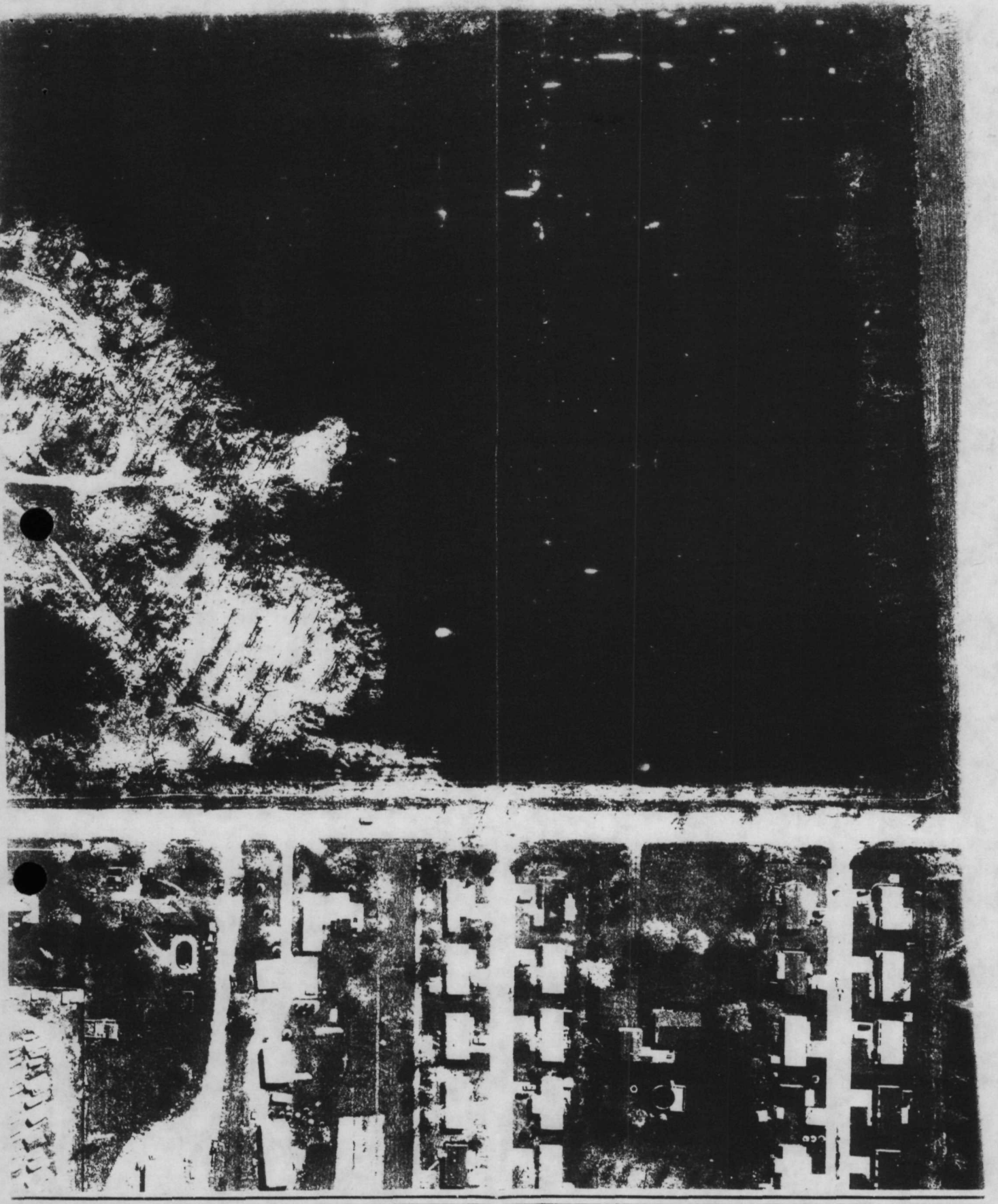
TEXTILE ROAD SITE
Washtenaw County, Michigan

CRA
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EECA REPORT

AERIAL PHOTOGRAPH

4770 2

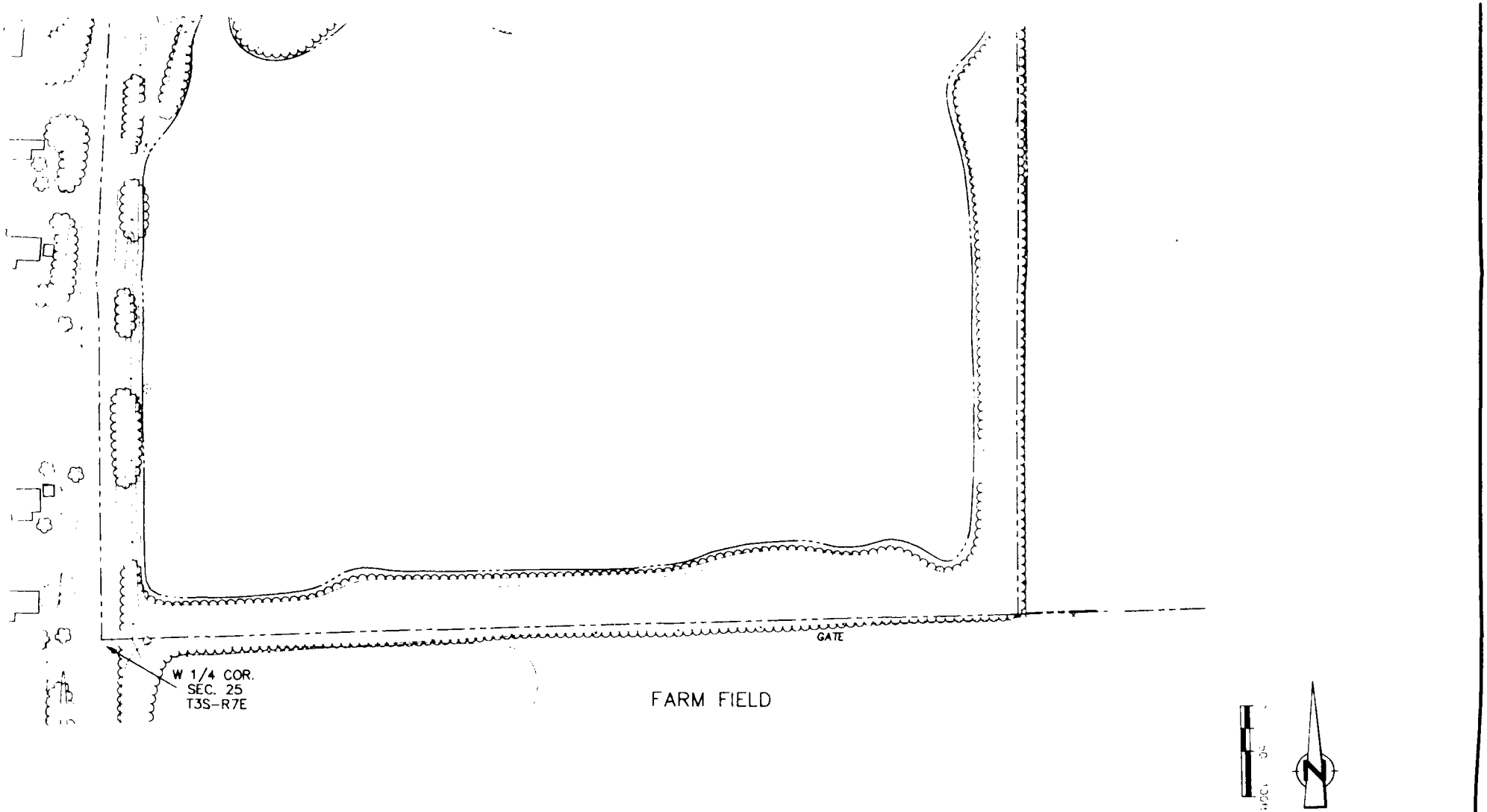


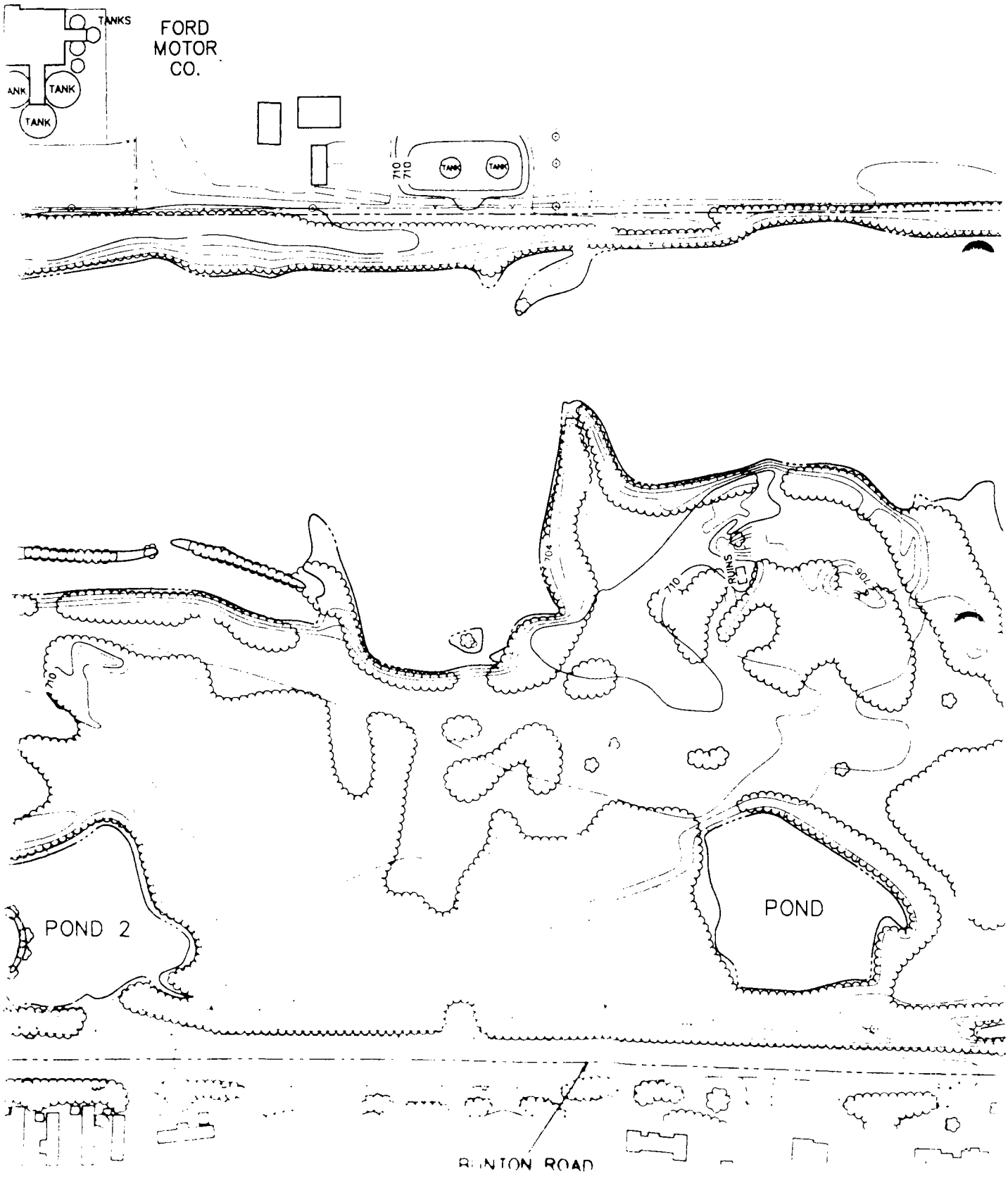
TEXTILE ROAD SITE
Washtenaw County, Michigan

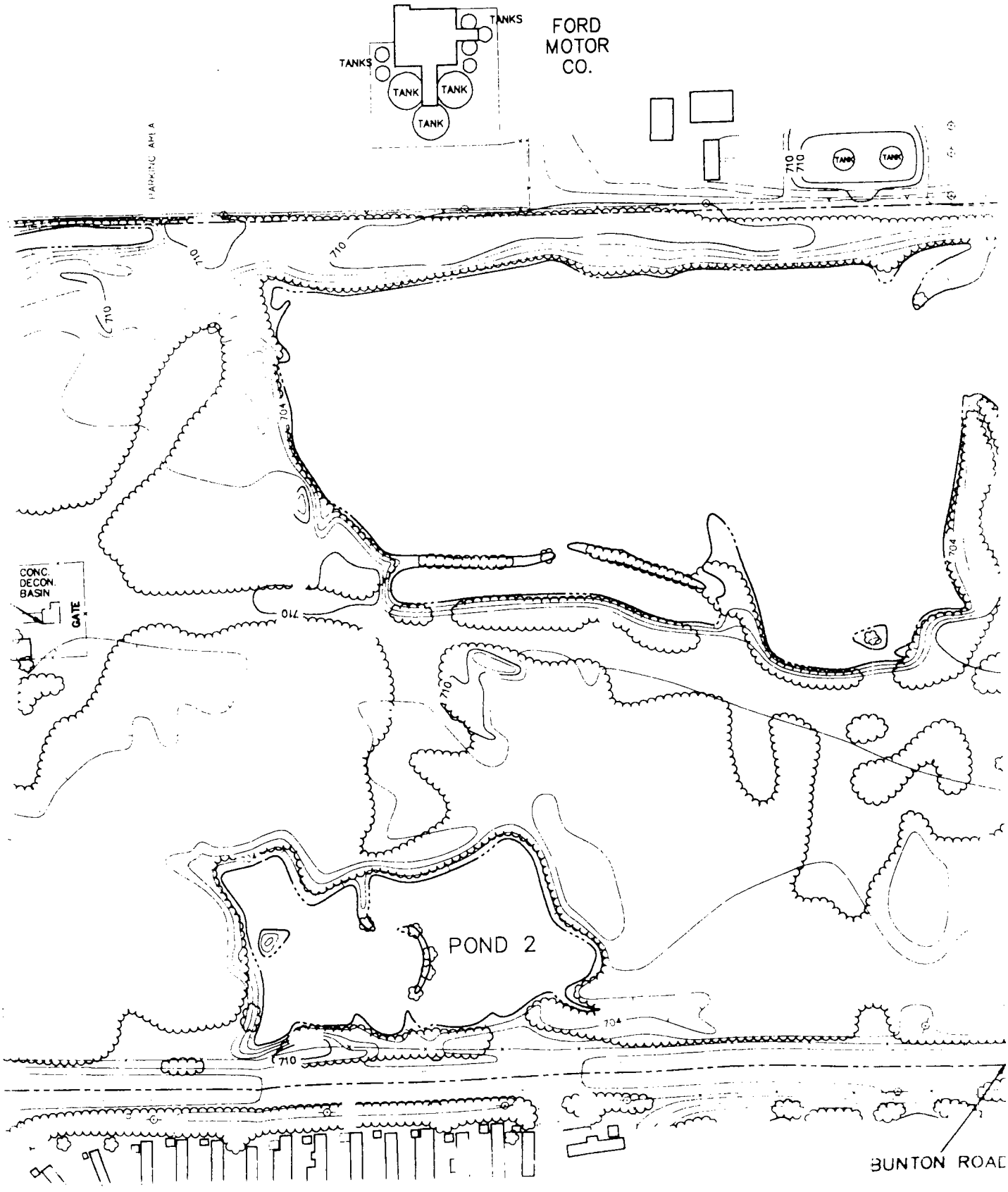
CRA
CONESTOGA-ROVERS

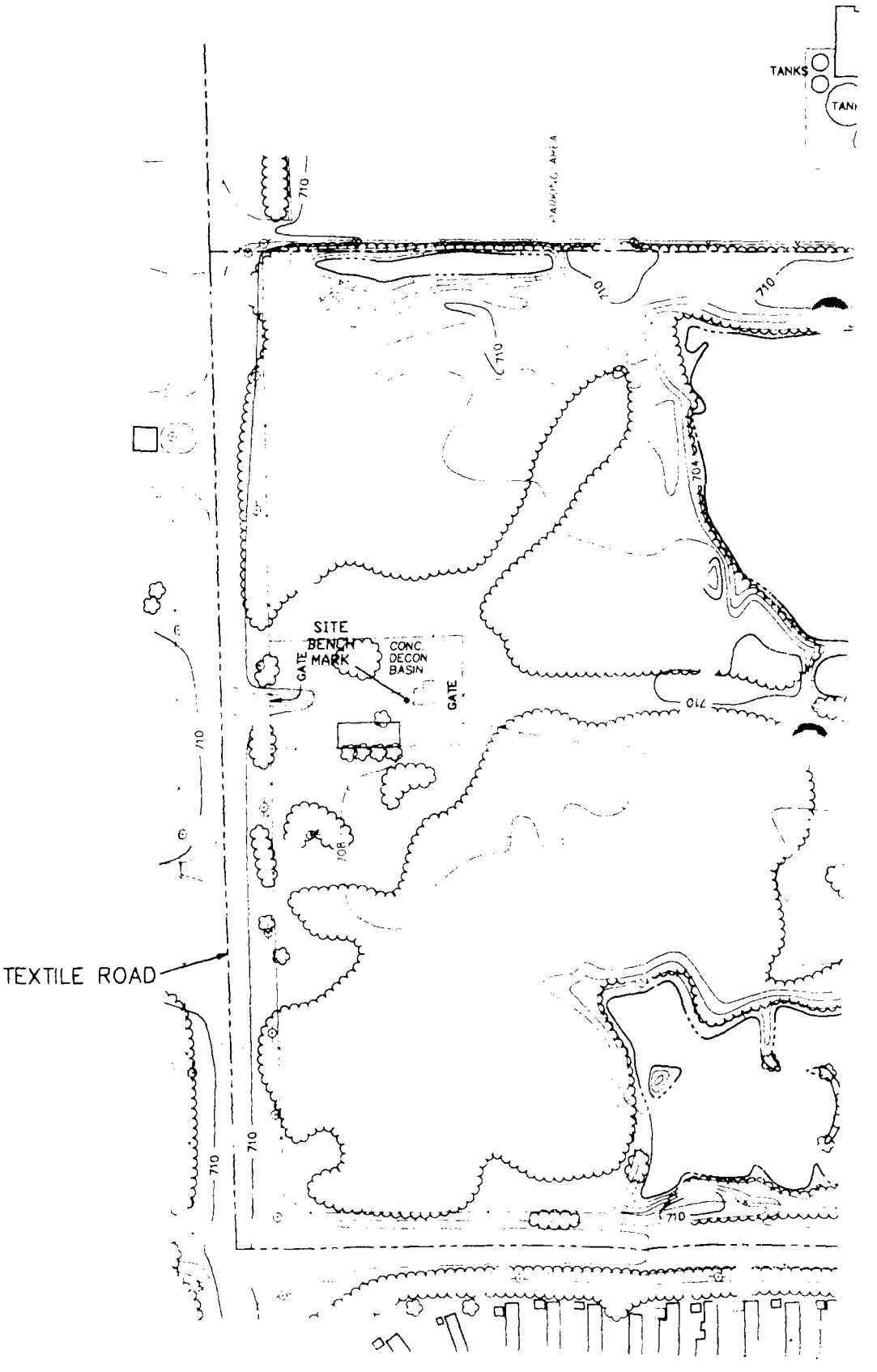
EECA REPORT

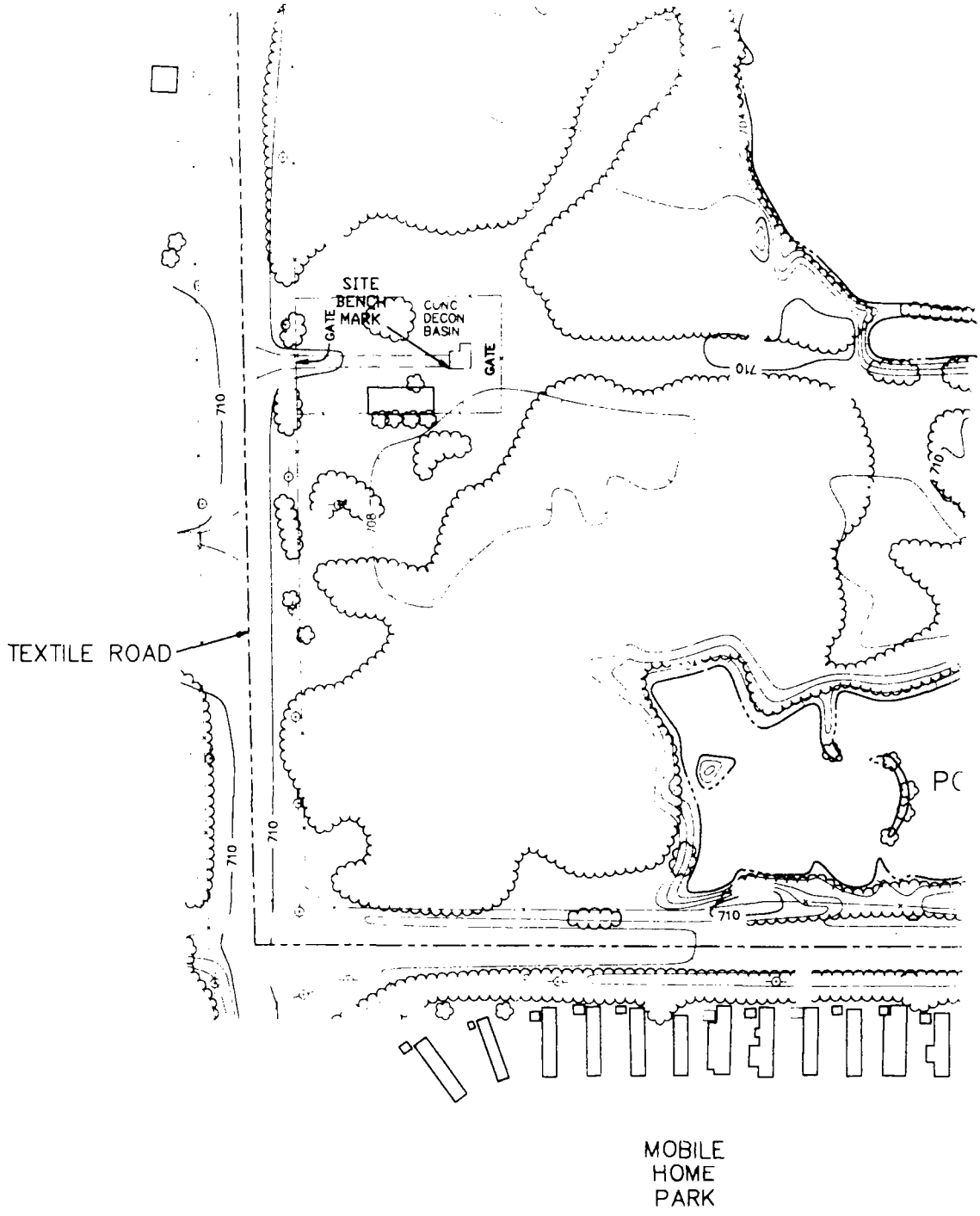
AERIAL PHOTOGRAPH


GATE
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SEC. 25
T3S-R7E
FARM FIELD
N


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FORD
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CO.
TANK
TANK
TANK
710
710
704
710
706
710
POND 2
POND
RUNTON ROAD


TANKS
TANKS
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FORD
MOTOR
CO.
PARKING AREA
710
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CONC.
DECON.
BASIN
GATE
POND 2
BUNTON ROAD


TANKS
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GATE
GATE
TEXTILE ROAD



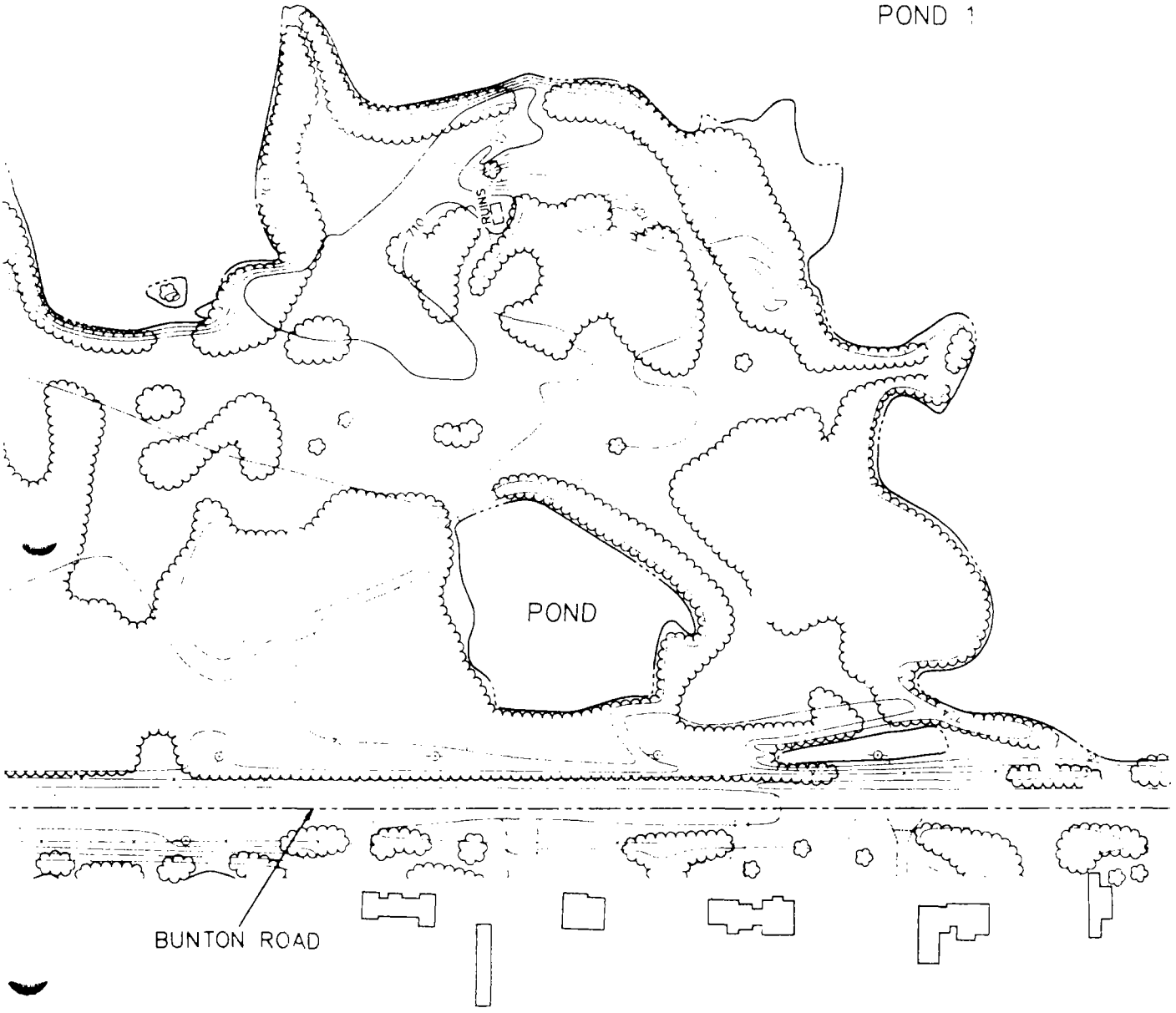
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PROPERTY LINE

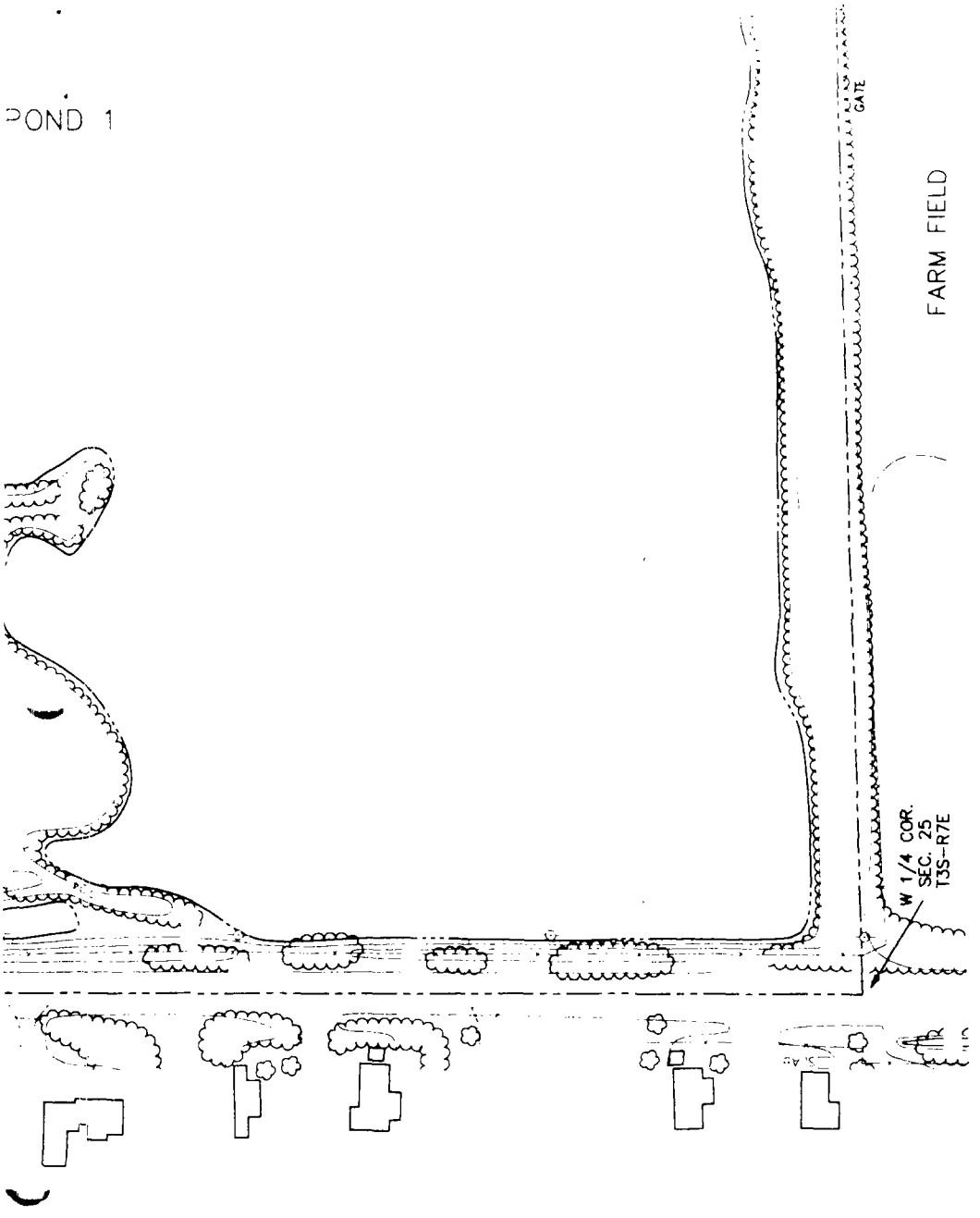
LIGHT STANDARD

710 EXISTING CONTOUR

ORIGINAL PLAN SURVEYED BY DARRELL D. HUGHES & ASSOCIATES, MAY 1993

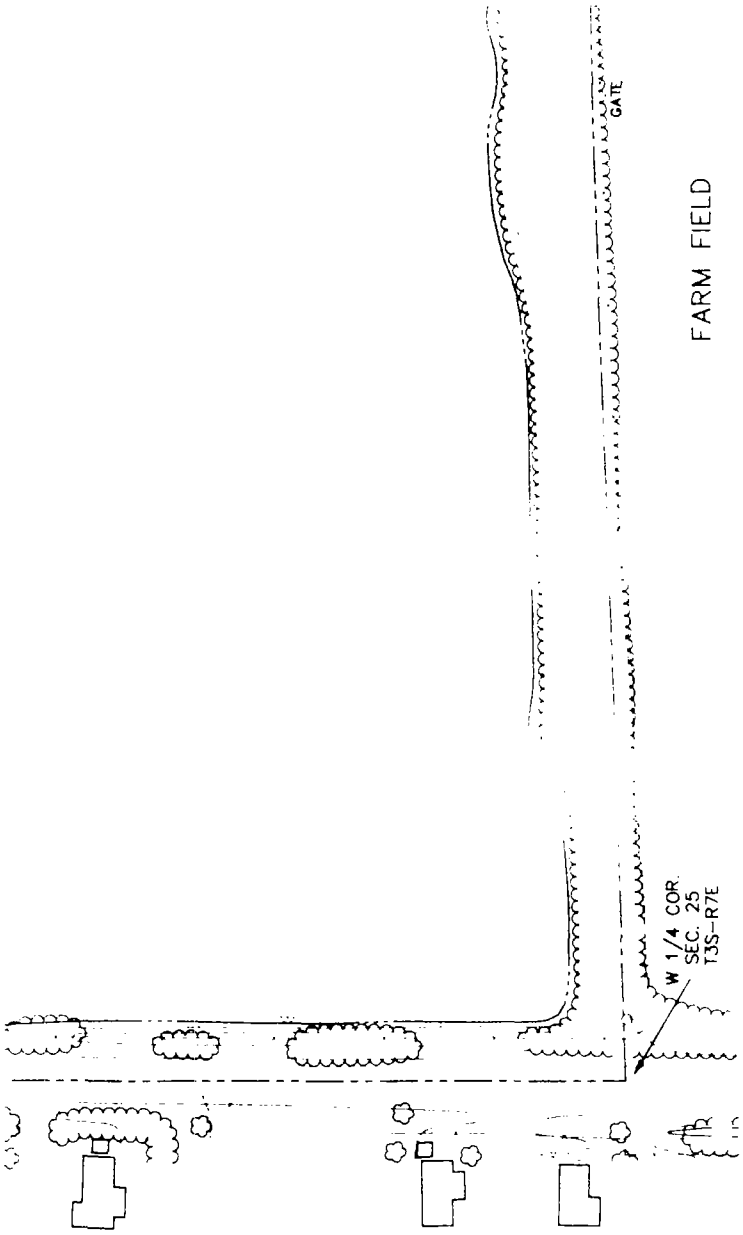


Revision	Date	Initial	Approved	TEXTILE Washtenaw C
				EECA
				SITE



TEXTILE ROAD SITE Washtenaw County, Michigan	**CRA** **CONESTOGA-ROVERS & ASSOCIATES**				
EECA REPORT	Drawn by: DCR	Scale: 1"=100	Date: SEPEMBER 1993	File No: P-46	Rev No:
SITE PLAN	Designed by: TG				
	Checked by: TG	Field book:	Project No: 4770	Drawing No: 1	

SEPT 28 93(W)



TILE ROAD SITE
aw County, Michigan

EECA REPORT

SITE PLAN

CRA
CONESTOGA-ROVERS & ASSOCIATES

Drawn
Designed
Checked

Scale
Date
SEPTEMBER 1991
Project No.
4770
Drawing No.
1

SEP 28 93