DECLARATION FOR THE DECISION DOCUMENT
DataCard Corp. (a.k.a. Addressograph Farrington, Inc.)
Holmesville, Ohio

The DataCard Corporation (a.k.a. Addressograph Farrington, Inc. and Holmesville Facility) Site (the Site) is located at and near 8300 Benton Avenue, Holmesville, Holmes County, Ohio (See Attachment 1). The DataCard facility reconditioned stampings and electronic wiring components for various office equipment, manufactured duplicating machines and mixed and packaged chemicals for industrial printing operations. Contamination of the groundwater and soils on site have been related to releases of solvents from on-site holding tanks as well as from minor spills during the mixing and filling of the tanks. The Site includes the facility formerly known as the DataCard facility and property to the west of the facility, currently owned by Mr. R. Dean Smith.

The Ohio EPA issued a Preferred Plan to describe its proposed strategy to abate pollution at, and prevent migration of contaminants from, the Site. On or about July 24, 1997, the Ohio EPA publicly announced the availability of the Preferred Plan for review and requested comments from interested members of the public. Copies of the Preferred Plan and other documents relevant to remediation of the Site were placed at the Holmes County and Prairie Township libraries. On August 11, 1997, the Ohio EPA held a public hearing regarding the Preferred Plan at the Holmesville Village Hall. Written comments regarding the Preferred Plan were accepted until August 29, 1997.

The Ohio EPA has reviewed and considered all comments submitted regarding the Preferred Plan. Attached to this document is a Responsiveness Summary, which describes the comments the Ohio EPA received and the Agency’s response (see Attachment 6).

This Decision Document describes the remedial action selected by the Ohio EPA for the DataCard Corp. (a.k.a. Addressograph Farrington, Inc. and Holmesville Facility) Site. This Decision Document has three parts. First, it describes the history of the Site, including facility operations and discovery of contamination. Second, the Decision Document summarizes the Remedial Investigation and Feasibility Study Report for the Site, which was generated under an agreement between the Ohio EPA, DataCard Corporation and AM International, Inc., dated June 19, 1990. Third, this Decision Document describes the remedy selected by the Ohio EPA for abating pollution at, and preventing migration of contaminants from, the Site. The Ohio EPA’s selected remedy for the Site involves a phased approach of removing the source of contamination (free-product located in soils and shallow ground water) and treating the aquifer.
via a combination of natural biodegradation and enhanced bioremediation, pumping-and-
treating and potentially sparging and soil vapor extraction. For a more complete description of
the Ohio EPA’s selected remedy, see Section 5.0.

The remedy selected by the Ohio EPA is the same as the remedy proposed in the Preferred
Plan. The remedy meets applicable, relevant and appropriate requirements. The estimated
cost of the project is $2,309,000.00 ($1,760,000.00 for the implementation of the alternative
and $549,000.00 for long term monitoring and potential alternative water supplies). Actual or
threatened releases of hazardous substances from the Site, if not addressed by implementing the
remedy selected in this Decision Document, may endanger public health, welfare or the
environment. This Decision Document does not preclude the Ohio EPA from seeking other
remediation at the Site in the future in a manner not inconsistent with the U.S. Environmental
Protection Agency’s National Contingency Plan (NCP) at Title 40 of the Code of Federal
Regulations, Part 300. Procedures under the NCP call for periodic review to ensure that the
remedy will protect human health and the environment.

[Signature]
Michael J. Czerzele, Acting Chief
Division of Emergency and Remedial Response
Ohio Environmental Protection Agency

[Signature]
Date
OHIO ENVIRONMENTAL PROTECTION AGENCY

DECISION DOCUMENT
FOR THE

DATACARD CORPORATION SITE
(AKA ADDRESOGRAPH FARRINGTON, INC.)
HOLMESVILLE, OHIO

January 2, 1998
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1.0 INTRODUCTION

The DataCard Corporation (a.k.a. Addressograph Farrington, Inc. and Holmesville Facility) Site (the Site) is located at and near 8300 Benton Avenue, Holmesville, Holmes County, Ohio (See Attachment 1). The DataCard facility reconditioned stampings and electronic wiring components for various office equipment, manufactured duplicating machines and mixed and packaged chemicals for industrial printing operations. Contamination of the groundwater and soils on site have been related to releases of solvents from on-site holding tanks as well as from minor spills during the mixing and filling of the tanks. The Site includes the facility formerly known as the DataCard facility and property to the west of the facility, currently owned by Mr. R. Dean Smith.

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The remedy selected by the Ohio EPA is the same as the remedy proposed in the Preferred Plan. The remedy meets applicable, relevant and appropriate requirements. The estimated cost of the project is $2,309,000.00 ($1,760,000.00 for the implementation of the alternative and $549,000.00 for long term monitoring and potential alternative water supplies). Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the remedy selected in this Decision Document, may endanger public health, welfare or the environment. This Decision Document does not preclude the Ohio EPA from seeking other remediation at the Site in the future in a manner not inconsistent with the U.S. Environmental Protection Agency’s National Contingency Plan (NCP) at Title 40 of the Code of Federal Regulations, Part 300. Procedures under the NCP call for periodic review to ensure that the remedy will protect human health and the environment.
2.0 SITE HISTORY

2.1 Site Location

The DataCard Site is located at and near 8300 Benton Avenue, Holmesville, Holmes County, Ohio. The Site consists of the 59-acre former DataCard facility and a 25.9-acre field to the west of the facility, which is currently owned by Mr. R. Dean Smith. The Site is located in a residential/farming area on the edge of Holmesville. The Site is situated on the eastern corner of the intersection of Benton Avenue and County Road 558 and east of State Route 83. Structures currently in place on the former DataCard facility include a 300,000 square foot building, with a few smaller outbuildings. Four residences are located down gradient of the Site, west of Count Road 558 and south of Benton Avenue. A small wetland area exists west of the former DataCard facility, on the east and west sides of State Route 83. The wetland, which is connected via a culvert, provides water to a stream which flows to the north and west and eventually empties into Killbuck Creek.

2.2 Facility Ownership and Operation

From 1960 through 1981, the facility was operated by A M International, Inc. (AMI) and housed the company’s Addressograph and Multigraphics Divisions. The Addressograph Division manufactured and reconditioned stampings and wiring components for data recorders, embossing systems, addressing systems, and mail room equipment. The Multigraphics Division manufactured multi-lith duplicating machines and mixed and packaged chemicals used in industrial printing operations.

In 1981, DBS, Inc. Acquired the assets of AMI’s Addressograph Division, including the facility located on the Site. DBS, Inc. Operated the facility through its operating company, Addressograph Farrington, Inc. In 1986, DBS, Inc. was acquired by DataCard Corporation. From 1986 through 1990 DataCard, through Addressograph Farrington, Inc. manufactured imprinters and embossers at the facility. The facility is currently leased as a warehouse.

2.3 Discovery of Contamination

Groundwater contamination was discovered at the DataCard facility in 1986. Investigations traced the contamination to a tank farm which existed on Site and was used by the former owner, AMI, to store solvents. The tank farm consisted of nine (9) above-ground storage tanks which were used to mix and store solvents sold as products.
by the Multographics Division to remove ink and as a blanket cleaning solvent. The
products were specifically called Blankrola and Blankrola II and contained
tetrachloroethylene (TTE, which is also known as perchloroethylene, PCE) and naphtha,
among other constituents. Contamination was linked to releases of solvents from the
tanks, as well as from minor spills during mixing and filling of the tanks. In 1986, the
tanks were removed by AMI.

On June 19, 1990, DataCard Corporation and AM International, Inc. entered into an
agreement with the Ohio EPA to perform a Remedial Investigation/Feasibility Study at
the DataCard Site. DataCard and AMI have fulfilled this agreement with the approval
3.0 SUMMARY OF THE REMEDIAL INVESTIGATION

DataCard and AMI, with oversight by the Ohio EPA, conducted a Remedial Investigation (RI) of the Site from May, 1991, through June, 1994, in order to: (1) characterize the contaminants present at the Site; (2) determine the actual or potential hazard to public health and the environment; and (3) gather sufficient data to identify and assess potential remedial alternatives and support the detailed evaluation of those alternatives during the Feasibility Study (FS).

3.1 Nature and Extent of Contamination

DataCard and AMI, with Ohio EPA oversight, performed an investigation of the DataCard property and surrounding properties to determine the extent of contamination. The investigation included soil gas and geophysical surveys, soil sampling, and the installation and sampling of monitoring wells, both on and off the Site. In addition, water samples were collected from nearby residences and analyzed. The investigation was performed in two phases.

3.1(a) Source Area

The source area for contamination was determined to be the former tank farm which was located to the west of the warehouse building (see Attachment 1). Free-product (Blankrola) is currently found floating on the water table surface immediately south of the former tank farm. A product recovery system has been installed on the Site and continues to remove the free-product from the surface of the aquifer.

3.1(b) Ground Water

The aquifer underlying the DataCard site is part of the much larger Killbuck Buried Valley Aquifer, which covers large portions of Wayne and Holmes Counties. This aquifer is made up of sands and gravels and is one of the most productive aquifers in the entire state. It is not uncommon to find wells capable of producing water at rates in excess of 1,000 gallons per minute.

On the Site, the aquifer has been divided into three zones — shallow, intermediate, and deep. The shallow well zone extends from the water table (20') to forty-five feet (45') below the ground surface. The intermediate well zone extends from forty-five feet (45') to eighty-six (86') feet below the ground surface. Lastly, the deep well zone extends from eighty-six (86') feet below the ground surface to bedrock (177'). The
deep well zone includes wells screened above the semi-confining layer that exists on a portion of the Site and also wells screened at and into bedrock.

All layers of the aquifer on and adjacent to the Site have shown evidence of contamination. The TTE portion of the Blankrola has a specific gravity higher than water and the naphtha portion has a specific gravity lower than water, with the resultant mixture having a total specific gravity lower than water. This means that both the naphtha and the TTE/naphtha (Blankrola) mixture tend to "float" on the surface of the water, while the TTE tends to "sink." The properties of these chemicals has led to the occurrence of a floating layer of Blankrola product on the surface of the water table and TTE in the intermediate zone and at depth within the aquifer. Levels of contaminants in ground water on Site vary from a maximum of 300,000 mg/L TTE, located in the shallow portion of the aquifer adjacent to the former tank farm, to a maximum of 1.7 mg/L TTE in the intermediate wells and a maximum of 5.9 mg/L TTE in the deep wells. Naphtha was not found independently of TTE within the aquifer; however, degradation products of TTE were found. These break-down products are dichloroethylene (DCE) and trichloroethylene (TCE). Vinyl chloride, another break-down product of TTE, was not found in the aquifer; however, there is a possibility that as degradation of the TTE continues, vinyl chloride will be found. The vinyl chloride, if found, can and will be addressed through the same clean-up method as the TTE, TCE and DCE.

Ground water flow direction in the aquifer varies depending on the Zone. Ground water in the shallow and intermediate zones flows in a south-southwest direction. The flow direction of the deep zone varies from the northwest to the southwest. The majority of residential wells located near the Site are located within the intermediate zone. A farm field and four homes are currently located within the path of contamination. At this time, none of the homes show any evidence of contamination from the Site, however, ground water beneath the farm field has been show to contain as much at 60 mg/L TTE.

3.1° Soils

Soils from eight (8) soil borings and sixteen (16) monitoring wells (on and off-site) were collected during the investigation. These samples exhibited contamination by both TTE and naphtha, with the highest concentrations in the vicinity of the former tank farm. The highest concentration of TTE (2,300 mg/kg) occurred near the water table. Huff & Huff, contractors for DataCard and AMI, estimated that 3.200 pounds of TTE remain in the soils in the tank farm area.
3.2 Risk Assessment

The purpose of the Risk Assessment was to determine the current and potential for on- and off-site human health effects of the contaminants found at the DataCard Site. Four chemicals were identified as contaminants of concern at the Site. Three of the chemicals were addressed in the original Risk Assessment and one was addressed in an addendum to the Feasibility Study, dated October, 1996. The chemicals used in the Risk Assessments were:

- Tetrachloroethylene (TTE)
- Dichloroethylene (DCE)
- Trichloroethylene (TCE)
- Naphtha

The Risk Assessment and Addendum evaluated the ways in which someone could come into contact with one of the contaminants from the Site (route of exposure) and also determined what types of people are most likely to come into contact with the contaminants (receptors). Potential receptors include:

- Current and hypothetical future residents surrounding the Site;
- Farm workers;
- Maintenance workers;
- Plant workers;
- Trespassers.

Routes of exposure include:

- Drinking (ingestion) of ground water;
- Breathing of steam (inhalation) during a shower;
- Skin (dermal) contact with water when showering;
- Swallowing (ingestion) of and skin (dermal) contact with water during swimming;
- Eating (ingestion) and skin (dermal) contact with soil;
- Breathing (inhalation) of chemicals.

A baseline risk assessment was developed to determine current and future carcinogenic (cancer) and non-carcinogenic (diseases other than cancer) risks using TTE, DCE, TCE and naphtha and the above routes of exposure. The U.S. EPA has defined the acceptable risk range as risk falling between $1 \times 10^6$ and $1 \times 10^4$. Calculations in the baseline risk assessment found that current risks were acceptable, but the future risks were not. This indicated that some type of remedy was necessary at the Site. The PRPs then went on to develop risk-based clean-up objectives utilizing this information. The acceptable risk level for TTE was set at $1 \times 10^6$. This objective allowed clean-up
objectives to be calculated for TTE, and then for the other contaminants on Site. The following clean-up objectives, which meet U.S. EPA requirements, have been set for this Site:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Medium</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTE</td>
<td>Ground Water</td>
<td>0.005 mg/L</td>
</tr>
<tr>
<td></td>
<td>Soil</td>
<td>3.9 mg/kg</td>
</tr>
<tr>
<td>TCE</td>
<td>Ground Water</td>
<td>0.005 mg/L</td>
</tr>
<tr>
<td></td>
<td>Soil</td>
<td>18 mg/kg</td>
</tr>
<tr>
<td>DCE</td>
<td>Ground Water</td>
<td>0.070 mg/L</td>
</tr>
<tr>
<td></td>
<td>Soil</td>
<td>44 mg/kg</td>
</tr>
<tr>
<td>Naphtha</td>
<td>Ground Water</td>
<td>0.6 mg/L</td>
</tr>
<tr>
<td></td>
<td>Soil</td>
<td>450 mg/kg</td>
</tr>
</tbody>
</table>

An Ecological Risk Assessment was also performed to determine if plants and animals in the area have been or could be affected by the Site. No impact to plant or animal communities was found.
4.0 SUMMARY OF THE FEASIBILITY STUDY

DataCard Corporation (DataCard) and AM International, Inc. (AMI) jointly developed a feasibility study under an Administrative Consent Order with the Ohio EPA, dated June 19, 1990. The Feasibility Study (FS) Report was approved by the Ohio EPA on March 29, 1995. This FS identifies and screens technologies and alternatives for the Site. The FS evaluates methods to meet the remedial action objectives, which are to:

- Develop remedial action objectives and preliminary remediation goals for media of concern determined during the investigation;
- Develop and evaluate remedial technologies applicable to the Site based on the remedial action objectives and preliminary remediation goals;
- Develop remedial action alternatives from the remedial technologies retained after screening;
- Conduct a detailed analysis of the alternatives, including cost estimates for implementation of the alternatives and relative rankings of the alternatives.

The remedial investigation of the Site identified the following chemicals of concern:
Trichloroethylene (TCE)
Dichloroethylene (DCE)
Tetrachloroethylene (TTE)
Naphtha

The following section describes the remedial alternatives evaluated in the Feasibility Study. This section also provides cost estimates for these remedial alternatives, for comparison only.

4.1 Proposed Technologies

This section briefly discusses the technologies proposed in the following alternatives, which were evaluated as part of the FS. The technologies analyzed in the FS were: natural attenuation, enhanced bioremediation, pump and treat, sparging and soil vapor extraction.

Natural attenuation is a method which is used at sites with contaminated ground water. Through natural attenuation, the chemicals within the aquifer are not actively
remediated, but through biological, chemical and physical processes, such as biodegradation, concentrations of contaminants are reduced. This method relies on the natural conditions at the Site and requires an extensive period of time to reduce contamination.

Enhanced bioremediation is a fairly recent addition to the list of technologies available for use in the active remediation of contaminated aquifers. Enhanced bioremediation utilizes the natural bacterial communities already present in the soils and aquifer of the site to break down contaminants. Over time, chlorinated solvents naturally go through the following process during natural biodegradation:

\[
\text{Tetrachloroethylene (TTE)} \\
\text{\quad \downarrow} \\
\text{Trichloroethylene (TCE)} \\
\text{\quad \downarrow} \\
\text{Dichloroethylene (DCE)} \\
\text{\quad \wedge} \\
\text{Vinyl Chloride + Carbon Dioxide} \\
\text{\quad \downarrow} \\
\text{Ethylene + Water} \\
\text{\quad +} \\
\text{Chlorine}
\]

In order to increase the rate at which this break down of contaminants occurs, and to reduce the amount of harmful breakdown products, such as vinyl chloride, that may be temporarily formed during the process, methanol and methane gas may be added (enhanced bioremediation). These products have been shown to be fully utilized by the bacteria and their addition has not been shown to cause any adverse impact to the aquifer.

Pump and teat systems have been proven to effectively contain contaminated ground water, however, their ability to remediate ground water is limited. These systems involve the removal of contaminated ground water through a single or a series of ground water extraction wells. The water is then passed through an air stripper and carbon adsorption units, which remove contaminants. Once the contaminants are removed, the water is then discharged into a stream, lake or other body of water, or is reinjected into the ground, under state permits.

Sparging and soil vapor extraction are frequently utilized on sites contaminated by volatile chemicals, such as chlorinated solvents. This system involves the injection of air into the soil and shallow portions of the aquifer. The air causes the contaminants to volatilize and they are withdrawn from the soil through a series of vacuum extraction wells. The air collected from these wells is then passed through a treatment system,
usually involving carbon adsorption, and then the treated air is released to the
environment. If the air extracted from the wells falls below permitted requirements for
air emissions, the air does not pass through the treatment system, but is released
directly to the environment. The treatment system, and potentially the air discharges,
must be permitted through the Ohio EPA, Division of Air Pollution Control (DAPC).

4.2 Alternative 1

The Ohio EPA requires Potentially Responsible Parties (PRPs) to include a “No Action"
alternative as part of the variety (or array) of alternatives evaluated as part of the
Feasibility Study (FS) Report. This “No Action” alternative is used as a baseline,
against which other alternatives are compared. In a “No Action” alternative, absolutely
no effort is made to remediate the Site and all attempts at free product recovery are
discontinued. Contaminants within all zones of the aquifer are reduced through natural
biological and chemical means such as degradation, sorption, dispersion and
volatilization, without assistance from man. Monitoring will occur on a quarterly
basis, or as needed, for a thirty (30) year period under this and all other alternatives.
During monitoring, ground water elevations are measured in each well within the
monitoring network and samples are collected and analyzed for a wide variety of
chlorinated solvents and naphtha (see Attachment 2).

Under this Alternative, it is estimated that it will take the following number of years to
remediate the Site to clean-up objectives (risk-based levels):

| Shallow Aquifer Zone (20'–45') | 40 years |
| Intermediate Aquifer Zone (45'–86') | 22 years |
| Deep Aquifer Zone (86'–177') | 20 years |

The cost estimate for this alternative is $494,000.00, which includes monitoring and
analytical costs for thirty (30) years.

4.3 Alternative 2

Alternative 2 combines Alternative 1 with additional limited actions including
provisions for alternative water supplies, institutional controls and monitoring.

Alternative water supplies would be installed, as necessary, for the four (4) residences
to the west of the facility and would also be proposed for the field on the western
portion of the Site, should the owner decide to develop the property. Alternate water
supplies for the four (4) homes would involve the installation of new bedrock wells.
An alternate water supply for the field owned by Mr. R. Dean Smith, located on the western portion of the Site, could involve the development of a bedrock well near Benton Avenue, which is up gradient and has thus far been unaffected by Site contamination.

Institutional controls proposed for use under this alternative include: placing deed restrictions on the Site; regulating the Site for development; limiting or prohibiting the use of ground water on the Site; limiting the depth of excavations on the Site; prohibiting invasive on-site activities; and prohibiting trespassing at the Site. DataCard currently has the ability to enforce these institutional controls on the portion of the Site that they now own; however, the farm field on the western portion of the Site is owned by an individual who is not associated with DataCard. In order to guarantee that these institutional controls would be effective, legal agreements would have to be negotiated between DataCard, AMI and Mr. R. Dean Smith, the property owner, and recorded on the county level.

Monitoring under Alternative 2 would proceed as outlined in Alternative 1. Water levels and analyses for contaminants would occur quarterly, or as needed, for thirty (30) years. As with Alternative 1, reduction of contaminants is a result of natural degradation, sorption, dispersion and volatilization.

Under this Alternative, it is estimated that it will take the following number of years to remediate the site to clean-up objectives (risk-based levels):

- Shallow Aquifer Zone: 40 years
- Intermediate Aquifer Zone: 22 years
- Deep Aquifer Zone: 20 years

The estimated cost of this alternative is $549,000.00, which includes monitoring charges and the installation of four (4) bedrock supply wells for the homes located to the west of the Site. This estimate does not include the cost of installing a water supply for the western portion of the Site or the cost of implementing institutional controls on the field to the west of the Site. Cost of institutional controls for property already owned by DataCard should be negligible.

4.4 Alternative 3

Based on the collection of ground water data and computer modeling, the Potentially Responsible Parties (PRPs) at the Site have suggested that a steady-state condition (equilibrium) currently exists between the amount of new contaminant entering the aquifer from the source and the amount leaving the aquifer through degradation, volatilization, and other processes. This means that if the amount of contaminants
entering the ground water were reduced, the aquifer, through natural chemical and biological means, would remediate itself. Over time, the levels of contaminants in the aquifer could be reduced to clean-up objectives. This has led the PRPs to propose Alternative 3, Source Removal.

Under Alternative 3, the source of contamination consists of chlorinated solvents and naphtha located in the vadose, smear, free-product and shallow ground water zones which exceed 1.0 mg/L TTE (see Attachment 3). The theory behind this alternative is that if the source of contamination is removed, the aquifer will continue to remediate itself, eventually reducing the contaminants within the aquifer to clean-up objectives. A phased approach has been proposed by the PRPs under this alternative. The phases involve the removal of free product from the water table, followed by enhanced bioremediation of the aquifer. The enhanced bioremediation will involve a pump and treat system and methanol addition, both of which will increase the speed at which the bacteria remediate the aquifer. The pump and treat system will physically remove the contaminants from the aquifer, while the addition of methanol will enhance the bacterial activity, thereby increasing the efficiency of the remediation. If the pump and treat system and enhanced bioremediation do not adequately remove contaminants from the aquifer, a sparging and soil vapor extraction system may be installed. This system would involve the injection of air, under pressure, into the ground. The air would then volatilize contaminants, which would be extracted through a vacuum system. The active area of treatment, under this alternative, is within the 5.0 mg/L TTE isopleth (see Attachment 3). [An isopleth is a line which connects points of like concentration of contaminant.] The phased remedial process will be operated until levels of TTE within the aquifer drop to 1.0 mg/L. The system will then be halted and natural biological and chemical processes will continue to reduce the TTE within the aquifer to clean-up levels (0.005 mg/L TTE).

In addition to the approach, described above, Alternative 3 also utilizes the limited approaches outlined in Alternatives 1 and 2. Provisions for alternative ground water supplies, if needed, the implementation of institutional controls, and monitoring will all occur under this alternative. These approaches will all be performed by means described under Alternative 2.

Under this Alternative, it is estimated that it will take the following number of years to remediate the Site to clean-up objectives (risk-based levels):

- Shallow Aquifer Zone: 24 years
- Intermediate Aquifer Zone: 15 years
- Deep Aquifer Zone: 13 years
The cost estimate for this alternative is $1,760,000.00, which includes all costs except those related to monitoring and the potential establishment of alternate private water supplies.

### 4.5 Alternative 3a

Alternative 3a is an expansion of Alternative 3. In this alternative, the active treatment system area is expanded to the 1.0 mg/L isopleth (see Attachment 4). The phased remedial process, which is the same as is proposed in Alternative 3, is operated until levels of TTE within the aquifer drop to 0.1 mg/L. The system is then halted and natural biological and chemical processes continue to reduce the TTE within the aquifer to clean-up levels (0.005 mg/L TTE).

Under this Alternative, it is estimated that it will take the following number of years to remediate the Site to clean-up objectives (risk-based levels):

<table>
<thead>
<tr>
<th>Aquifer Zone</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow Aquifer Zone</td>
<td>22</td>
</tr>
<tr>
<td>Intermediate Aquifer Zone</td>
<td>15</td>
</tr>
<tr>
<td>Deep Aquifer Zone</td>
<td>13</td>
</tr>
</tbody>
</table>

The cost of this alternative is $2,350,000.00, which includes all costs except those related to monitoring and the potential establishment of alternate private water supplies.

### 4.6 Alternative 4

Alternative 4 includes all monitoring, institutional controls and contaminant removal activities outline in Alternatives 1, 2, and 3, as well as additional active remediation of the shallow portion of the intermediate zone of the aquifer to 0.1 mg/L TTE. The additional active remediation of the intermediate zone of the aquifer will be accomplished through the installation of five (5) additional recovery wells, at depths from 35' to 69' below ground surface. Water from the aquifer will be removed at a rate of 165 gallons per minute (gpm) and will be treated and discharged via the same treatment system utilized under Alternative 3. It is anticipated that off-gas treatment will not be required, because the resulting amount of emissions is predicted to be below the regulatory air emissions level.
Under this Alternative, it is estimated that it will take the following number of years to remediate the Site to clean-up objectives (risk-based levels):

<table>
<thead>
<tr>
<th>Aquifer Zone</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow Aquifer Zone</td>
<td>24</td>
</tr>
<tr>
<td>Intermediate Aquifer Zone</td>
<td>11</td>
</tr>
<tr>
<td>Deep Aquifer Zone</td>
<td>13</td>
</tr>
</tbody>
</table>

The cost of this alternative is $2,600,000.00, which includes all costs except those related to monitoring and the potential establishment of alternate private water supplies.

4.7 Alternative 5

This alternative includes all monitoring, institutional controls and contamination removal activities outlined in Alternative 3, with the addition of active remediation of the entire intermediate zone to 0.1 mg/L TTE through a pump-and-treat system. This system will utilize five (5) ground water recovery wells, as in Alternative 4, however, the wells will be placed at depths of 46' to 86'. The water removed from the recovery wells will be treated through an air stripper and discharged to Martin's Creek, which will require an NPDES permit. Water will be recovered at a rate of 165 gpm, as in Alternative 4.

Under this alternative, it is estimated that it will take the following number of years to remediate the Site to clean-up objectives (risk-based levels):

<table>
<thead>
<tr>
<th>Aquifer Zone</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow Aquifer Zone</td>
<td>24</td>
</tr>
<tr>
<td>Intermediate Aquifer Zone</td>
<td>13</td>
</tr>
<tr>
<td>Deep Aquifer Zone</td>
<td>13</td>
</tr>
</tbody>
</table>

The cost of this alternative is $2,780,000.00, which includes all costs except those related to monitoring and the potential establishment of alternate private water supplies.

4.8 Alternative 6

This alternative includes all activities described in Alternative 4, in addition to the active remediation of the deep zone of the aquifer to 0.1 mg/L TTE. This active remediation will involve the installation of nine (9) ground water recovery wells, five (5) screened from 86' to 177' and four (4) screened 15' below the silt/till semi-confining layer. The central well, which will be screened at 86' will be pumped at a rate of 240 gpm, while other wells will be pumped at a 15 gpm rate. In order to avoid drawing contamination deeper into the aquifer, remediation of the upper zones will be
initiated prior to active remediation of the deep zone. Water from the recovery wells will be treated through an air stripper and carbon polishing system and will be discharged to Martin's Creek, which will require an NPDES permit.

Under this Alternative, it is estimated that it will take the following number of years to remediate the Site to clean-up objectives (risk-based levels):

<table>
<thead>
<tr>
<th>Aquifer Zone</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow Aquifer Zone</td>
<td>24</td>
</tr>
<tr>
<td>Intermediate Aquifer Zone</td>
<td>11</td>
</tr>
<tr>
<td>Deep Aquifer Zone</td>
<td>12</td>
</tr>
</tbody>
</table>

The cost for this alternative is $3,400,000.00, which includes all costs except those related to monitoring and the potential establishment of alternate private water supplies.
5.0 OHIO EPA'S SELECTED REMEDY

This chapter sets out the Ohio EPA's selected remedy and includes clean-up standards for the remediation of the DataCard Site.

5.1 Selection Criteria

In selecting a remedy for a contaminated site, the Ohio EPA considers the following eight criteria as outlined under the National Contingency Plan (NCP) promulgated under CERCLA (40 CFR 300):

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, and/or institutional controls;

2. **Compliance with all State, Federal and Local laws and regulations** addresses whether or not a remedy will meet all of the applicable State, Federal and Local environmental statutes;

3. **Long-term effectiveness and permanence** refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once pollution has been abated and clean-up goals have been met;

4. **Reduction of toxicity, mobility, or volume through treatment** is the anticipated performance of the treatment technologies to yield a permanent solution. This includes the ability of the selected alternative to reduce the toxic characteristics of the chemicals of concern or remove the quantities of those chemicals to an acceptable risk concentration or regulatory limit and/or decrease the ability of the contaminants to migrate through the environment;

5. **Short-term effectiveness** involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until pollution has been abated and clean-up goals are achieved;

6. **Implementability** is the technical and administrative feasibility of a remedy, including the availability of goods and services needed to implement the chosen solution;
7. **Cost** includes capital, operation and maintenance costs;

8. **Community acceptance** will be assessed in the Decision Document following review of the public comments received on the Remedial Investigation / Feasibility Study (RI/FS) Report and the Preferred Plan.

### 5.2 Summary

The Ohio EPA has selected Alternative 3 as the remedy for the DataCard Site. This alternative is a phase approach consisting of the following:

- **Phase I**: Free Product Recovery
- **Phase II**: Enhanced Free Product Recovery
- **Phase III**: In-Situ Anaerobic Bioremediation
- **Phase IV**: In-Situ Aerobic Bioremediation
- **Phase V**: Sparging and Soil Vapor Extraction (if necessary)

### 5.3 Discussion of Selected Remedy

Based on the groundwater data collected and the computer modeling performed, it appears that a steady-state condition (equilibrium) currently exists at the DataCard site between the amount of new contamination entering the aquifer from the source and the amount leaving the aquifer through degradation, volatilization, and dispersion. This means that if the amount of contaminants entering the groundwater were reduced, the aquifer, through natural chemical and biological means, would theoretically remediate itself. Over time the levels of contaminants in the aquifer could be reduced to clean-up objectives, which are based on risk. This has lead the PRPs to propose and the Ohio EPA to select Alternative 3.

The source of contamination at this Site consists of chlorinated solvents and naphtha located in the vadose, smear, free-product and shallow ground water zones which exceed concentration of 1.0 mg/L TTE (see Attachment 3). The active treatment system, under this alternative, will involve the area that lies within the 5.0 mg/L TTE isopleth. As stated above, the theory behind this alternative is that if the source of contamination is removed, the aquifer will continue to remediate itself, eventually reducing the contaminants within the aquifer to the clean-up objective, which has been identified as 0.005 mg/L TTE. Source removal will permit the remediation of multiple zones within the aquifer concurrently.
During Phase I, Free-Product Recovery, existing well RW-80 will be utilized to recover free product from the source area. A bulk storage tank will be installed in the vicinity of the well for storage of the free product. Through the use of modeling techniques, consultants for the DataCard Corporation (DataCard) and AM International, Inc. (AMI) have estimated that this extraction well, operated with an electric pump, will withdraw approximately 68 pounds of solvents over a 24 month period. This well will continue to be utilized as long as it is effectively withdrawing free-product, which is estimated to take from one (1) to two (2) years.

Phase II, Enhanced Free-Product Recovery, will involve the installation of 39 two-inch diameter stainless steel wells, spaced 20 feet apart with five (5) foot well screens. The well screens will straddle the free-product layer. The wells will be located both inside and outside the plume of contamination (see Attachment 5) and will be utilized to control plume migration. Manual bailings of these wells, as proposed by the PRPs, is acceptable to the Ohio EPA, since they will be used in combination with the recovery well described below.

Also as part of Phase II, an additional recovery well with a two-phase electric pump will be installed for the purpose of depressing the water table to increase the hydraulic gradient toward the center of the plume, thereby containing the plume and assisting in free-product recovery. This well will be installed during the second year of Phase II and will require the establishment of an extensive water treatment system, which is described in Phase III. This water treatment system, except for the oil/water separator, will also be used during Phase III. This pump-and-treat system will continue to operate until the well no longer recovers free-product.

The Ohio EPA is aware that newer technologies than those listed for use in Phases I and II have emerged since the Feasibility Study Report was submitted. The Ohio EPA is willing to modify the technologies used to recover free-product on Site, at the PRP's request, as long as the new technology is as reliable and does not require an extension on the amount of time predicted to complete Phase I and Phase II. Any modifications must be approved by the Ohio EPA prior to implementation.

Once levels of the free-product within two-thirds (2/3) of the two (2) inch monitoring wells reach one fourth (1/4) inch, Phase III, In-Situ Anaerobic Bioremediation will begin. This phase involves both the treatment of water through a pump-and-treat system and the remediation of contamination within the aquifer by naturally occurring bacteria (enhanced bioremediation). This phase requires the installation of two (2) recovery wells with 25-foot well screens located within the 5 mg/L TTE isopleth indicated in Attachment 4. Modeling performed by Huff & Huff, Inc., consultants for the PRPs, has shown that the pumping of these two wells at 65 gpm, at the proposed
locations, will capture the TTE within the shallow zone of the aquifer. Water from these wells will go through the following clean-up process prior to being reinjected into the ground:

Water from Ground Water Wells
↓
Air Stripper with Carbon Air Filter
↓
Two-Stage Carbon Polishing System (in series)
↓
18,000 Gallon Surge Tank
↓
Additional Particulate Filter
↓
Addition of Methanol to Water (if necessary)
↓
Reinjection and/or Land Application of Treated Water

The ground water extraction wells will pump to the air stripping system. Volatile compounds, such as TTE and TCE, will be removed by the stripper. A carbon filter will be placed on the vapor phase of the air stripper to prevent the release of volatiles to the atmosphere. The water phase from the stripper will then proceed through a particulate filter into a two-stage carbon polishing system, which will remove any additional solvents remaining in the water. The water then enters a surge tank prior to final particulate filtering. Once the water is filtered, methanol may be added from a day tank. Methanol provides a substrate for the bacteria, which enhances bacterial activity and increases the efficiency of the remediation. The filtered water will then either be applied to the ground surface via perforated hoses over the plume or reinjected into the aquifer through the series of enhanced free-product recovery wells that were installed in an earlier phase of Alternative 3. The use of reinjection points will be alternated depending on the location of the plume. In order to ensure capture of the ground water plume by the extraction system, a minimum of 20% of the water remediated through the air stripper will be reinjected in the wells outside of the 1.0 mg/L TTE isopleth. In addition to ensuring the capture of contaminants, reinjection of the water will cause mounding of the ground water, which will lead to an increase in the amount of contaminant released from the soils in the smear and vadose zones. These contaminants, once released to the ground water, can be treated by the pump-and-treat system, as well as by natural biodegradation and enhanced bioremediation.

While the ground water is being actively remediated through the pump-and-treat system, it will also be undergoing bioremediation. This form of treatment relies on the bacteria which occur naturally within the soil and ground water to break down or degrade the chemicals of concern. In order to make bioremediation at the Site more
efficient, the addition of methanol into the ground water may be required. This addition will not affect the quality of the ground water, since studies have shown that methanol is fully reduced by the bacteria. The injection well grid, employed in both the enhanced free-product recovery phase and in this phase will ensure that the methanol will reach the bacteria within the entire plume (out to the 1.0 mg/L TTE isopleth).

One of the side-effects of Phase II may be an increase in the amount of free product in the down gradient shallow wells and the two-phase well. If this does occur, the passive wells and the two-phase well will actively be pumped using electric pumps designed for the recovery of free product.

The estimated time of operation for Phase II is one (1) to two (2) years.

Phase IV, In-Situ Aerobic Bioremediation, will be used to reduce the DCE in the ground water. Through aerobic degradation (by bacteria) of DCE, vinyl chloride, a toxic anaerobic degradation product should not be formed. Huff & Huff, Inc., consultants to the PRPs, have suggested that the lack of vinyl chloride in the ground water is a result of this aerobic process currently occurring on Site.

The pump-and-treat system developed for Phase II of this alternative will also be used in Phase IV. Methane gas, which acts as a substrate to promote bacterial activity, will be added to the water immediately prior to reinjection. In addition to the reinjection of the water/methane mixture, bioventing blowers will be used to inject air into the aquifer through both deep and shallow injection points. The injection of the air and methane will degrade the DCE and vinyl chloride to carbon dioxide. Vapor extraction lines will then be utilized to capture volatiles from the subsurface. These vapors will be treated by activated carbon, unless the total amount of TTE and TCE falls below the permitted air emission limits, at which point the vapors may be released directly to the atmosphere. The technology used in this phase is actually a combination of soil vapor extraction principles and enhanced bioremediation.

In order to eliminate the possibility of explosion from the use of methane, the gas will be injected at concentrations which are well below the lower explosive limit (LEL) and extra valves will be installed to ensure that no methane escapes during the times when water or air are injected.

As the water and air injection/removal systems operate, bacteria will be utilizing the newly oxygenated water and methane to break down DCE and vinyl chloride to carbon dioxide. This will result in an overall reduction in the amount of DCE within the aquifer and soils. It is estimated that Phase IV will take one (1) to two (2) years to complete.
As previously mentioned, if Phases III and IV do not lead to the reduction of contaminants within the aquifer, sparging and soil vapor extraction techniques will be employed. This will involve the injection of air, under pressure, into the soils and ground water, as is done under Phase IV with methane gas. After the air is injected, it is then removed through a vacuum system. The idea behind this technology is that the injected air will volatilize the contaminants within the soil and ground water and the vacuum system will then remove the contaminants. It is not anticipated that utilization of this technique will become necessary.

5.4 Analysis of Selected Remedy

This section evaluates the Selected Remedy against the eight (8) criteria outlined above in Section 5.1.

Alternative 3 appears to meet the requirements for the protection of human health and the environment because it provides protection to all receptors during remediation, through institutional controls and the establishment of alternative water supplies, if needed. Alternative 3 also actively works toward reaching risk-based clean-up objectives at the Site.

Compliance with applicable State law can be achieved for this alternative. A permit must be obtained for the injection of methanol and reinjection of ground waters into the aquifer from the Ohio EPA, Division of Drinking and Ground Waters (DDAGW), Underground Injection Control (UIC) Unit. In addition, a permit for the water treatment system will need to be obtained from the Ohio EPA, Division of Air Pollution Control (DAPC). Construction and operation of the water treatment facility and any discharges resulting from that system, which will not be reinjected into the aquifer, will require permits from the Ohio EPA, Division of Surface Water (DSW).

Alternative 3 appears to meet the requirement for short-term effectiveness through the use of institutional controls and alternative water supplies, both of which will immediately eliminate risk of exposure to residents in the area surrounding the Site.

Long-term effectiveness and permanence are also addressed by this alternative. Alternative 3 focuses on clean-up of the ground water through removal of the source. Once contaminants have been removed or degraded from the vadose, smear, free product and shallow ground water zones, the source of contaminants to the intermediate and deep ground water zones will be reduced. Naturally occurring bacteria will then continue to degrade the remaining contaminants until they fall below the acceptable risk level, at which point monitoring at the Site will stop. Remediation utilizing this methodology will be effective and permanent.
A reduction of toxicity, mobility and volume will occur under this alternative. Alternative 3 addresses the source of contamination directly, which will reduce the amount of chemicals within the soils and ground water. The pump-and-treat and monitoring systems will reduce the potential for contaminants to migrate away from the area undergoing remediation. As the chemicals are reduced, the overall exposure potential at concentrations above levels of concern will be lessened. As previously stated, the amount of time estimated to reach clean-up levels (0.005 mg/L TTE) are as follows:

<table>
<thead>
<tr>
<th>Aquifer Zone</th>
<th>Time Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow Aquifer Zone</td>
<td>24 years</td>
</tr>
<tr>
<td>Intermediate Aquifer Zone</td>
<td>15 years</td>
</tr>
<tr>
<td>Deep Aquifer Zone</td>
<td>13 years</td>
</tr>
</tbody>
</table>

Alternative 3 also appears to meet the criteria for implementability. Permitting of the injection of methanol and reinjection of treated ground water, as well as the permitting of the water treatment system and its discharges, must be accomplished through the Ohio EPA. An increased level of uncertainty does exist with the utilization of enhanced bioremediation, since the technology is fairly new, however, if enhanced bioremediation does not appear to be working to reduce the contaminants on site, air sparging and soil vapor extraction will be implemented. In addition, if the implemented remedies do not appear to be achieving the desired goals within an acceptable time frame, alternative remedies will be investigated and implemented.

The total cost estimate for Alternative 3, including long-term monitoring and potential residential water supply replacement, is $2,309,000.00.

Community acceptance to this selected remedy appears to be positive. During the public hearing which took place on August 11, 1997, no concerns were raised other than those regarding the length of the remediation. Questions from the public focused on clarifying the results of the Remedial Investigation and understanding the Proposed Plan. A summary of the issues and questions raised during the public hearing can be found in the Responsiveness Summary (see Attachment 6). A complete transcript of the hearing may be found in the DataCard public file at the Northeast District Office and is available for review.

Only two letters were received during the public comment period for the Preferred Plan, which concluded on August 29, 1997. The first letter was submitted by Huff & Huff, Inc., on behalf of DataCard Corp. and AM International, Inc., and predominantly included suggestions to clarify the text of the Preferred Plan. The second letter was submitted by Ms. Betty Stutzman regarding cancer risks to employees that worked for the Addressograph Multigraph facility. Ms. Stutzman’s letter was referred on to the Ohio Department of Health for response. A summary of the questions and comments provided to the Ohio EPA by both Huff & Huff, Inc. and Ms. Stutzman can be found in
the Responsiveness Summary (see Attachment 6). Copies of both letters can be found in the DataCard public file at the Northeast District Office and are available for review.
6.0 ATTACHMENTS
<table>
<thead>
<tr>
<th>Compound</th>
<th>Detection Limit (ug/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>0.04</td>
</tr>
<tr>
<td>Bromobenzene</td>
<td>0.03</td>
</tr>
<tr>
<td>Bromochloromethane</td>
<td>0.04</td>
</tr>
<tr>
<td>Bromodichloromethane</td>
<td>0.08</td>
</tr>
<tr>
<td>Bromoform</td>
<td>0.12</td>
</tr>
<tr>
<td>Bromomethane</td>
<td>0.11</td>
</tr>
<tr>
<td>n-Butylbenzene</td>
<td>0.11</td>
</tr>
<tr>
<td>sec-Butylbenzene</td>
<td>0.13</td>
</tr>
<tr>
<td>tert-Butylbenzene</td>
<td>0.14</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>0.21</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>0.04</td>
</tr>
<tr>
<td>Chloroethane</td>
<td>0.10</td>
</tr>
<tr>
<td>Chloroform</td>
<td>0.03</td>
</tr>
<tr>
<td>Chloromethane</td>
<td>0.13</td>
</tr>
<tr>
<td>2-Chlorotoluene</td>
<td>0.04</td>
</tr>
<tr>
<td>4-Chlorotoluene</td>
<td>0.06</td>
</tr>
<tr>
<td>Dibromochloromethane</td>
<td>0.05</td>
</tr>
<tr>
<td>1,2-Dibromo-3-chloropropane</td>
<td>0.26</td>
</tr>
<tr>
<td>1,2-Dibromoethane</td>
<td>0.06</td>
</tr>
<tr>
<td>Dibromomethane</td>
<td>0.24</td>
</tr>
<tr>
<td>1,2-Dichlorobenzene</td>
<td>0.03</td>
</tr>
<tr>
<td>1,3-Dichlorobenzene</td>
<td>0.12</td>
</tr>
<tr>
<td>1,4-Dichlorobenzene</td>
<td>0.03</td>
</tr>
<tr>
<td>Dichlorodifluoromethane</td>
<td>0.10</td>
</tr>
<tr>
<td>1,1-Dichloroethane</td>
<td>0.04</td>
</tr>
<tr>
<td>1,2-Dichloroethane</td>
<td>0.06</td>
</tr>
<tr>
<td>1,1-Dichloroethene</td>
<td>0.12</td>
</tr>
<tr>
<td>cis-1,2-Dichloroethene</td>
<td>0.12</td>
</tr>
<tr>
<td>trans-1,2-Dichloroethene</td>
<td>0.06</td>
</tr>
<tr>
<td>1,2-Dichloropropane</td>
<td>0.04</td>
</tr>
<tr>
<td>1,3-Dichloropropane</td>
<td>0.04</td>
</tr>
<tr>
<td>2,2-Dichloropropane</td>
<td>0.35</td>
</tr>
<tr>
<td>1,1-Dichloropropene</td>
<td>0.10</td>
</tr>
</tbody>
</table>

6.2 Attachment 2 - Analytical List of Compounds and Detection Limits for EPA Drinking Water Method 524.2.
VIII. SPECIAL PROTECTION INFORMATION

Respiration Protection: If required, use approved self-contained breathing apparatus.

Ventilation: Local Exhaust; Only if 50% of TLV is exceeded.

Protective Glove: Solvent Proof

Eye Protection: Safety Glasses

Other Protection: Rubber apron to keep solvent off clothing

IX. SPECIAL PRECAUTIONS

Handling and Storage: Store in a cool dry place in a safe area for Class IIA Combustible Liquids.

Other: Read and follow precautions on label. Support working clothes in safety container to avoid combustion. Do not reuse container.

D) Emergency and First Aid

Eyes: Irrigate immediately with water for 10-15 minutes.

Skin: Wash off in flowing water; Wash contaminated clothing.

Inhalation: Move to fresh air, if not breathing, give mouth-to-mouth resuscitation; if breathing difficulty, give oxygen, call physician.

Ingestion: DO NOT induce vomiting; Get medical attention immediately.

VII. SPECIAL USES

Use only in a well-ventilated area.
STATE OF OHIO
MODEL STATEMENT OF WORK FOR
THE REMEDIAL DESIGN AND REMEDIAL ACTION
AT
AMI Datacard/Addressograph
Holmes County, Ohio

1.0 PURPOSE

The purpose of this Remedial Design/Remedial Action Statement of Work (RD/RA SOW) is to define the procedures the Respondent(s) shall follow in designing and implementing the selected remedy for the AMI Datacard/Addressograph Site as described in this SOW and the Director's Final Findings and Orders (Orders) to which it is attached. The Division of Emergency and Remedial Response (DERR) documented the selection of a remedy for the site in a Decision Document dated 1/8/98. The intent of the remedy is to protect the public health and/or the environment from the actual or potential adverse effects of the contaminants discovered at and related to the Site. Further guidance for performing the RD/RA work tasks may be found in the U.S. EPA Superfund Remedial Design and Remedial Action Guidance document (OSWER Directive 9355.0-4A). All applicable regulatory requirements pertaining to the selected remedy and RD/RA activities shall be followed.

Ohio EPA shall provide oversight of the Respondents' activities throughout the RD/RA. The Respondents' shall support Ohio EPA's initiatives and conduct of activities related to the implementation of oversight activities.
2.0 DESCRIPTION OF THE REMEDIAL ACTION/PERFORMANCE STANDARDS

Performance standards and specifications of the major components of the remedial action to be designed and implemented by the Respondent(s) are described below. Performance standards shall include cleanup standards, standards of control, quality criteria, and other requirements, criteria or limitations as established in the Decision Document, this SOW and the Orders to which it is attached.

See Appendix A, Decision Document, for description of the remedial action components and associated performance standards.
3.0 SCOPE OF THE REMEDIAL DESIGN AND REMEDIAL ACTION

The Remedial Design/Remedial Action (RD/RA) shall consist of seven principal tasks described below. Each task shall be completed and required documentation shall be submitted in accordance with the schedules established in the Orders and in the RD/RA Work Plan approved by Ohio EPA. All work related to this SOW shall be performed by the Respondent(s) in a manner consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended, 42 USC 9601, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300 (1990), and other applicable federal and state rules and regulations.

Task Summary

3.1 Task I: RD/RA Work Plan
   3.1.1 Site Access
   3.1.2 Pre-Design Studies Plan
   3.1.3 Regulatory Compliance Plan
   3.1.4 Natural Resource Damage Assessment

3.2 Task II: Pre-Design Studies

3.3 Task III: Remedial Design
   3.3.1 General Requirements for Plans and Specifications
   3.3.2 Design Phases
   3.3.3 Estimated Cost for Remedial Action
   3.3.4 Remedial Action Implementation Plan
   3.3.5 Community Relations Support

3.4 Task IV: Remedial Action Construction
   3.4.1 Preconstruction Inspection and Conference
   3.4.2 Design Changes During Construction
   3.4.3 Remedial Action Construction Completion and Acceptance
   3.4.4 Community Relations Support

3.5 Task V: Five-Year Reviews

3.6 Task VI: Operation and Maintenance/Performance Monitoring
   3.6.1 Reporting During Operation and Maintenance
   3.6.2 Completion of Remedial Action Report

3.7 Task VII: Reporting Requirements
   3.7.1 Monthly Progress Reports during RD and RA Construction
   3.7.2 Summary of Reports and Submittals

3.1 TASK I: RD/RA WORK PLAN

The Respondent(s) shall submit a work plan for the Remedial Design and Remedial Action (RD/RA) to Ohio EPA for review and approval, which presents the overall strategy for performing the design,
construction, operation, maintenance and monitoring of the Remedial Action (RA). The work plan shall provide a detailed discussion of the specific tasks necessary to implement the selected remedy, including a description of the technical approach, personnel requirements, plans, specifications, permit requirements and other reports described in this SOW.

The work plan shall document the responsibilities and authority of all organizations and key personnel involved with the development and implementation of the RD/RA. The qualifications of key personnel directing the RD/RA tasks, including contractor personnel, shall be described.

The work plan shall include schedules fixed in real time for the development of the RD and implementation of the RA, including milestones for the submittal of the document packages for Ohio EPA review and meetings for discussion of the submittals. The RD/RA Work Plan must be reviewed and approved by Ohio EPA prior to initiation of field activities or proceeding with the RD.

Specific requirements to be addressed by the RD/RA Work Plan are described in the following sections.

3.1.1 Site Access

All site access agreements necessary to implement the RD and RA shall be obtained by the Respondent(s) prior to the initiation of any activities to be conducted under the Work Plan. Site access agreements shall extend for the duration of all remedial activities and shall include allowances for all operation and maintenance considerations and State oversight activities. The work plan shall describe the activities necessary to satisfy these requirements.

3.1.2 Pre-Design Studies Plan

The Respondent(s) shall develop a plan to complete the following pre-design studies, which are required to design and fully implement the remedial action.

The Pre-Design Studies Plan (PDSP), as a component of the RD/RA Work Plan, will identify and describe, in detail, activities necessary to conduct the pre-design studies identified above. The plan shall include sufficient sampling, testing, and analyses to develop quantitative performance, cost and design data for the selected remedy.

At the discretion of the Site Coordinator for Ohio EPA, the PDSP may be submitted for review and comment under separate cover from the work plan in accordance with the schedule established in the Orders. The PDSP must be approved by Ohio EPA prior to initiation of associated field activities or treatability studies.
The Pre-Design Studies Plan shall include, as necessary, a Field Sampling Plan (FSP), a Quality Assurance Project Plan (QAPP) and a Health and Safety Plan (HSP). Section 4.0 of this SOW describes the required content of supporting plans such as the Field Sampling Plans, Quality Assurance Project Plans and Health and Safety Plans.

Prior to development of the Pre-Design Studies Plan, there shall be a meeting of the Site Coordinator for Ohio EPA and the Project Manager representing the Respondent(s) to discuss scope, objectives, quality assurance and quality control issues, resources, reporting, communication channels, schedule, and roles of personnel involved. Other personnel representing the Respondent(s) and Ohio EPA, who may be needed to fully discuss the issues involved, should also participate in this meeting. Guidance documents to be consulted in developing the Pre-Design Studies Plan include U.S. EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies (EPA/540/G-89/004, October 1988) and Guide for Conducting Treatability Studies Under CERCLA (EPA/540/2-89/058, December 1989), as well as others listed in Appendix A, attached to this SOW.

The pre-design studies will be conducted as described under Task II.

3.1.3 Regulatory Compliance Plan

It shall be the responsibility of the Respondent(s) to ensure compliance with all applicable regulatory state and federal requirements for the RD/RA activities to be conducted at the Site. The Respondent(s) shall develop a plan to identify and to satisfy all applicable state and federal laws and regulations for the RD/RA. The plan will include the following information:

1) Permitting authorities
2) Permits required to conduct RD/RA activities
3) Time required by the permitting agency(s) to process permit applications
4) Identification of all necessary forms
5) Schedule for submittal of applications
6) All monitoring and/or compliance testing requirements

The Respondent(s) shall identify in the plan any inconsistencies between any regulatory requirements or permits that may affect any of the work required. The plan shall also include an analysis of the possible effects such inconsistencies may have on the remedial action, recommendations, and supporting rationale for the recommendations. The Regulatory Compliance Plan shall be submitted to Ohio EPA as part of the RD/RA Work Plan.

3.1.4 Natural Resource Damage Assessment
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<tr>
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Other Constituents to be Sampled

Naphtha

Page -28-
6.3 Attachment 3 - Area (within 5 mg/L isopleth) of Active Ground Water Remediation for Alternative 3 (from: Huff & Huff, Inc., 3/20/95, Final Feasibility Study for Holmesville Facility, Holmesville, OH, Fig. 5-19).

FIGURE 5-3
ALTERNATIVE III
SHALLOW GROUND WATER/VADOSE ZONE REMEDIATION LAYOUT

KEY
- MONITORING WELLS
- RECOVERY WELLS
- DEEP SPARGE/INJECTION WELLS
- SOIL VAPOR EXTRACTION LINES
6.6 Attachment 6 - Responsiveness Summary

The following questions were raised by citizens during the public hearing regarding the DataCard site which took place on August 11, 1997. They have been paraphrased for clarity. Anyone desiring to review the transcript from the hearing is invited to contact the Northeast District Office to schedule a file review.

Q. Has Phase I of the cleanup been started and will it be completed by the end of the year (1997)?

A. The removal of free product is currently on-going, therefore Phase I tasks have begun, however, it is highly unlikely that Remedial Design/Remedial Action Orders will be in place by December 31. This means that Phase I tasks will not be complete by the year’s end.

Q. Have the concentrations of contaminants in the ground water remained constant over the past seven (7) years or have they been reduced?

A. The concentrations of contaminants in the ground water have appeared to remain the same since the first sampling in 1987. A slight decline in levels was noticed in 1996, however, without additional data it is impossible to determine if the decline was a result of a decrease in contamination or a fluctuation due to seasonal or precipitation patterns.

Q. Will contaminated soils be removed from the site or remediated in place?

A. No soil will be removed during the remediation. It will be treated in place.

Q. Explain the time span for cleanup to occur.

A. The aquifer has been divided into three (3) zones: a shallow zone; an intermediate zone; and a deep zone. It has been estimated that remediation of the shallow zone will take twenty-four (24) years, the intermediate zone will take fifteen (15) years and the deep zone will take thirteen (13) years.

Q. If cleanup takes so long to complete, does this pose an increased risk to residents living in the area?
A. Residents are not currently being affected by contaminated ground water from the DataCard site. The clean-up method for this site will contain the contaminated ground water to the current boundaries of the Site (which includes property owned by R. Dean Smith). This containment has already begun through the operation of the free product recovery well and will continue throughout the remediation. This means that the length of the clean-up should, at no time, affect the safety of residents that live near the Site.

In addition, at this time, ground water is flowing in the direction of Route 83. Therefore, if containment of contamination was not occurring, it would be reasonable to suspect that the residents along Route 83 would be the ones affected, not those bordering other areas of the Site.

Q. What type of contaminants are in the ground water and what symptoms would result from exposure to these contaminants?

A. Contaminants in the ground water on site fall into the solvent category. They are tetrachloroethylene (TTE, a.k.a. perchloroethylene, PCE), trichloroethylene (TCE), cis-1,2-dichloroethylene (DCE), and naphtha. Information regarding the health effects for TTE, TCE and DCE can be found on fact sheets supplied by the Agency for Toxic Substances Disease Registry (ATSDR - a Federal agency), which appear in Attachment 7 of this document. Information regarding the health effects for Naphtha can be found on the Material Safety Data Sheet (MSDS) for Naphtha supplied by Huff & Huff, Inc., also found in Attachment 7.

Q. Is the contaminant plume moving toward the homes on State Route 83 or is it staying on site?

A. There are three zones of ground water under the DataCard Site. The basic direction of flow in all three zones is to the west or southwest, although one of the zones flows slightly to the northwest. This means that without containment of the plume via the extraction system currently operating on the Site, the contamination could potentially affect the wells of those homes on County Road 558 and State Route 83. Monitoring has occurred since 1990 or 1991 on an annual or semiannual basis and to date we have no evidence that contamination has affected any of the residential wells in the vicinity of the Site. It is believed, based on data gathered during the remedial investigation, that the contamination plume is in equilibrium and that it will not migrate any further, however the containment system mentioned above should ensure that. There is no way to guarantee that the plume will not migrate any further, but AMI, DataCard and...
the Ohio EPA are working hard to minimize that possibility.

Q. Could home in areas other than along State Route 83 be affected by ground water contamination from the Site?

A. Considering the current direction of ground water flow, it is highly unlikely that anyone not located immediately to the west of the site would be affected by potentially migrating contamination in the aquifer from the DataCard site.

Q. If contamination is ever found in residential wells, what would be done?

A. DataCard Corp. and AM International, Inc. have committed to installing alternative water supplies for residents, should their wells ever become contaminated with solvents from the Site. This alternative water supply would involve the installation of new bedrock wells. If the bedrock water supply would become contaminated the Ohio EPA would work with DataCard and AMI to obtain another water supply.

Q. Are property owners in the area notified when residential well samples are collected and do they receive a copy of the results?

A. Home owners are contacted to schedule times for well sample collection. The results are then provided to the home owners through the Holmes County Health Department.

The following questions and comments were submitted to the Ohio EPA during the public comment period, which began on July 24, 1997 and ended on August 29, 1997. (Abbreviations - "C" = comment, "Q" = question, "A" = answer)

Comments from Huff & Huff, Inc., environmental consultants retained by DataCard, Corp. and AM International to perform Remedial Investigation / Feasibility Study actions at the Site:

C. "Pg. 14, Line 39 - “such as dilution” Suggest changing “dilution to biodegradation.”

A. The suggestion has been noted and the word “dilution” has been changed to “biodegradation.”
C. "Pg. 14, Line 39 - "chemical and physical processes" Suggest adding "biological" to list."

A. The suggestion has been noted and the word "biological" has been added to the list.

C. "Pg. 15, Line 11 - "Degradation pathway at Holmesville is a combination anaerobic (to DCE) followed by aerobic (to CO2)" Suggest eliminating vinyl chloride from pathway. (Vinyl chloride under anaerobic conditions further breaks down to ethylene.)"

A. This suggestion has been noted and the diagram under this section has been modified to properly reflect the degradation of DCE and vinyl chloride.

C. "Pg. 15, Line 31 - "The air from the wells is" Suggest changing "is" to "may." Carbon treatment depends on the exhaust rate."

A. This suggestion has been noted and the second half of the paragraph has been rewritten to read: "The air collected from these wells is then passed through a treatment system, usually involving carbon adsorption, and then the treated air is released to the environment. If the air extracted from the wells falls below permitted requirements for air emissions, the air does not pass through the treatment system, but is directly released into the environment. This treatment system, and potentially the air discharges, must be permitted through the Ohio EPA, Division of Air Pollution Control (DAPC)."

C. "Pg. 16, Line 1 - "will occur on a quarterly" Suggest change "will" to "may." "The 30 years of quarterly sampling was selected for cost estimation purposes. Our understanding was that the monitoring extent and frequency would be reduced once a clear pattern was established. Numerous wells were needed to define the extent of chlorinated solvent in the ground water; however, not all of these wells are needed to have a functional monitoring program. Also, the frequency of sampling could vary for specific wells and still provide an adequate measure of the remediation occurring."

A. The suggestion has been noted. The Ohio EPA does agree that quarterly monitoring may not be required for thirty years. As the remedy works to remediate the aquifer, monitoring may be reduced from quarterly to semiannually or annually. The phrase "or as needed" has been added to the text to address this issue.
“Pg. 16, Lines 29-37 - The institutional controls on Mr. Smith’s property needs to be clarified. Our understanding was that the limitation would be the prohibition of water supply wells within the field. There are several ways this could be achieved (e.g. through a County Health Ordinance Restriction), that may not require a deed restriction of Mr. Smith’s field. Suggest this paragraph be rewritten to keep how this restriction is achieved unspecified at this point.”

A. The Ohio EPA notes the concern regarding the placing of a deed restriction on Mr. Smith’s field, however this is the best way the Ohio EPA has of ensuring that new wells will not be installed into the contaminated zone of the aquifer. The Ohio EPA has no control over local ordinances or zoning and therefore we cannot rely on such actions to take the place of deed restrictions. The language in this section of the Preferred Plan will stand as written.

C. “Pg. 17, Line 40 - “drop to 0.1 mg/l” This should be 1.0 mg/l. See pages 5-27 and 6-18 of the FS Report.”

A. This comment has been noted. The level of TTE has been adjusted to read 1.0 mg/l.

C. “Pg. 18, Lines 13-15 - The $1,760,000.00 includes monitoring costs only during the active remediation phase and does not include long term monitoring or the private water supplies, these are additional costs.”

A. This comment has been noted. The language of this paragraph has been changed to read: “The cost estimate for this alternative is $1,760,000.00, which includes all costs except those related to long term monitoring and the establishment of private water supplies.”

C. “Pg. 18, Lines 34 & 35 - Same as comment #9 [comment from Pg. 18, Lines 13 - 15]”

A. This comment has been noted and the appropriate corrections have been made.

C. “Pg. 19, Line 2 - “will be required” should be “will not be required.”
A. This comment has been noted. The original sentence read: "It is not anticipated that off-gas treatment will be required..." This has been rewritten to state: "It is anticipated that off-gas treatment will not be required..."

C. "Pg. 19, Lines 13 & 14 - Same as comment #9 [comment from Pg. 18, Lines 13 - 15]."

A. This comment has been noted and the appropriate correction made.

C. "Pg. 19, Lines 35 & 36 - Same as comment #9 [comment from Pg. 18, Lines 13 - 15]."

A. This comment has been noted and the appropriate correction made.

C. "Pg. 20, Lines 15 & 16 - Same as comment #9 [comment from Pg. 18, Lines 13 - 15]", plus cost should be $3,400,000.00, not 2,370,000.00."

A. This comment has been noted and the appropriate corrections made, including the adjustment for the estimated cost.

C. "Pg. 25, Lines 5 & 6 - "will degrade the vinyl chloride from the DCE to carbon dioxide." Suggest change to "will degrade DCE and vinyl chloride to carbon dioxide."

A. This comment has been noted and the language changed as suggested.

C. "Pg. 25, Line 17 - "break down DCE to vinyl chloride" Suggest changing to "breakdown DCE and vinyl chloride."

A. This comment has been noted and the language changed as suggested.

C. "Pg. 26, Line 37 - The costs presented include both long term monitoring and alternative water supplies."

A. The author of the comment was contacted for clarification. The author stated that this comment was in error and that the costs referred to on Line 37 do not include long term monitoring and alternative water supply charges. The
sentence has been modified to read: "The cost estimate for Alternative 3, including long term monitoring and potential residential water supply development or replacement is $2,309,000.00.

Comments from Betty Stutzman, Sugarcreek, Ohio resident and former Addressograph Multigraph employee:

Q. Has there been an investigation into the deaths of employees? How many have died of cancer of some type or another?

A. The Ohio EPA is currently unaware of any cancer or health studies performed at the former Addressograph Multigraph facility (now owned by DataCard Corp.), however, Mrs. Stutzman’s letter has been forwarded to Robert Indian, Ohio Department of Health, for a response. The Ohio Department of Health is the agency responsible for conducting such studies.
6.7 Attachment 7 - Health Effects Handouts and Material Safety Data Sheets from ATSDR and Huff & Huff, Inc.
What is tetrachloroethylene?

Tetrachloroethylene is a man-made substance widely used for dry cleaning fabrics and textiles and for metal-degreasing operations. It is also used as a starting material (building block) for the production of other man-made chemicals. Other names that may be used for tetrachloroethylene include perchloroethylene, perc, PCE, perclene, and perchlor. Although tetrachloroethylene is a liquid at room temperature, some of the liquid can be expected to evaporate into the air producing an ether-like odor; evaporation increases as temperature increases.

How might I be exposed to tetrachloroethylene?

Humans can be exposed to tetrachloroethylene from environmental, consumer product, and occupational sources. Common environmental levels of tetrachloroethylene (often called background levels) are usually several thousand times lower than levels found in some workplaces. Background levels found in the air we breathe and in the food and water we consume probably result from evaporation from industrial or dry-cleaning operations or from releases from areas where chemical wastes are stored. Tetrachloroethylene has been found in at least 330 of the 1117 National Priorities List (NPL) hazardous waste sites.

In general, tetrachloroethylene levels in air are higher in urban and industrialized areas than in more rural or remote areas. Higher-than-background concentrations of tetrachloroethylene have occasionally been measured in air close to chemical waste sites and in water taken from nearby wells.

Exposure to tetrachloroethylene may also occur from some consumer products. Products that may contain tetrachloroethylene include auto brake quieters and cleaners, suede protectors, water repellants, silicone lubricants, belt lubricants and dressings, specialized aerosol cleaners, ignition wire driers, fabric finishers, spot removers, adhesives, and wood cleaners. Although uncommon, small amounts of tetrachloroethylene have been found in food.
The U.S. Department of Health and Human Services has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Based on evidence from animal studies, tetrachloroethylene is thought to be capable of causing cancer in humans. It should be emphasized, however, that currently available information is not sufficient to determine whether tetrachloroethylene causes cancer in humans.

Is there a medical test to determine if I have been exposed to tetrachloroethylene?

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath. This procedure has been used to measure levels of the chemical in persons living in areas where the air has been contaminated with tetrachloroethylene or in individuals occupationally exposed to the chemical. This procedure is only useful, however, if the exposure is recent (within weeks or less) because tetrachloroethylene is rapidly eliminated from the body. It is also possible to detect tetrachloroethylene in the blood. In addition, samples of blood and urine can be used to identify breakdown products of the chemical in persons suspected of being exposed to tetrachloroethylene. Although these procedures are relatively simple to perform, most physicians do not have the proper equipment and must rely on special laboratories to collect and analyze the samples. It should be noted that exposure to other chemical agents can produce the same breakdown products in the urine and blood. Therefore, these methods cannot be regarded as specific for tetrachloroethylene.

What levels of exposure have resulted in harmful health effects?

The graphs on the following pages show the relationship between exposure to tetrachloroethylene and known health effects. In the first set of graphs (Fig. 1.1) labeled "Health effects from breathing tetrachloroethylene," exposure is measured in parts of tetrachloroethylene per million parts of air (ppm). In all graphs, effects in animals are shown on the left side and effects in humans on the right side.

In the second set of graphs (Fig. 1.2), the same relationship is represented for the known "Health effects from ingesting products containing tetrachloroethylene." Exposures are measured in milligrams of tetrachloroethylene per kilogram of body weight per day (mg/kg/day).

The first column on the graphs, labeled "Short-term exposure," refers to known health effects in laboratory animals and humans from exposure to tetrachloroethylene for 14 days or less. The column labeled "Long-term exposure" refers to tetrachloroethylene exposures of more than 14 days. The levels marked on the graphs as "Minimal risk for effects other than"
1.4 mg/L for longer term exposure of children, and 5.0 mg/L for long-term exposure of adults. In addition, a drinking water equivalent level (DWEL) of 0.5 mg/L has been established.

The Occupational Safety and Health Administration (OSHA) has a legally enforceable exposure limit of 25 ppm tetrachloroethylene in air for an 8-hour workday, 40-hour workweek based on noncancer health considerations. The National Institute for Occupational Safety and Health (NIOSH) has classified tetrachloroethylene as a potential occupational carcinogen and recommends that workplace exposure be limited to the lowest possible level.

Where can I get more information?

If you have more questions or concerns, please contact your state health or environmental department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, E-29
Atlanta, Georgia 30333
Fig. 1.2: Health effects from ingesting tetrachloroethylene.
ATSDR
Public Health Statement

Trichloroethylene

What is trichloroethylene?

Trichloroethylene is a colorless liquid at room temperature with an odor similar to ether or chloroform. It is a man-made chemical that does not occur naturally in the environment. Trichloroethylene is mainly used as a solvent to remove grease from metal parts. It is used as a solvent in other ways, too, and is used as a chemical (building block) to make other chemicals.

How might I be exposed to trichloroethylene?

The two main sources of human exposure to trichloroethylene are the environment and the workplace. Trichloroethylene has been found in at least 460 of 1179 hazardous waste sites on the National Priorities List (NPL). Background levels of trichloroethylene can be found in the outdoor air we breathe (30 to 460 parts of trichloroethylene per trillion parts of air) and in many lakes, streams, and underground water used as sources of tap water for homes and businesses. Various federal and state surveys indicate that between 9 and 34% of the water supply sources in the United States may be contaminated with trichloroethylene. Water supplies that are contaminated typically contain an average of 1 to 2 parts of trichloroethylene per billion parts of water or less. An important source of environmental release of trichloroethylene is evaporation to the atmosphere from work done to remove grease from metal. In addition, at places where wastes are disposed, trichloroethylene is released to the air by evaporation and to underground water when it passes through the soil.

Trichloroethylene can also be released into the environment through:

- Evaporation from adhesive glues, paints, coatings, and other chemicals;

- Release of trichloroethylene and chemicals containing it, when it is made;

- Air-cleaning processes at publicly owned waste treatment plants that receive wastewater containing trichloroethylene; and

- Burning of community and hazardous waste.
Is there a medical test to determine if I have been exposed to trichloroethylene?

Recent or ongoing exposures to trichloroethylene can be determined by measuring trichloroethylene in the breath. Another way of determining whether exposure to trichloroethylene has occurred is by measuring a number of breakdown products (metabolites) of trichloroethylene in the urine or blood. Neither of these tests is routinely available at your doctor's office. Because one of the breakdown products, trichloroacetic acid, is removed very slowly from the body, it can be measured in the urine for up to about 1 week following trichloroethylene exposure. It must be noted, however, that exposure to other chemicals can produce the same breakdown products in the urine and blood. Therefore, these methods cannot tell you if you have been exposed only to trichloroethylene.

What levels of exposure have resulted in harmful health effects?

The graphs on the following pages show the link between exposure to trichloroethylene and known health effects. In the first set of graphs, labeled “Health effects from breathing trichloroethylene,” (Fig. 1.1), exposure is measured in parts of trichloroethylene per million parts of air (ppm). In the second set of graphs, the same relationship is represented for the known “Health effects from ingesting trichloroethylene” (Fig. 1.2). Exposures are measured in milligrams of trichloroethylene per kilogram of body weight per day (mg/kg/day). In all graphs, effects in animals are shown on the left side and effects in humans are shown on the right.

The first column in Figs. 1.1 and 1.2, labeled “Short-Term Exposure,” refers to known health effects in laboratory animals and humans from exposure to trichloroethylene for 2 weeks or less. The column labeled “Long-Term Exposure” refers to trichloroethylene exposures of longer than 2 weeks. The levels marked on the graphs as “minimal risk for effects other than cancer” reflect estimates of levels of exposure at which no adverse effects are expected to occur. These levels are based on information on animals.

Toxic Effects Other Than Cancer—Figure 1.1 shows that short-term and long-term exposures to air containing about 50 ppm or more of trichloroethylene have produced harmful effects in both animals and humans. Figure 1.2 shows that ingesting (drinking) the equivalent of 240 mg (less than a spoonful) of trichloroethylene per kg of body weight (kg = 2.2 pounds) for 2 weeks produced effects in the liver of animals. Drinking similar amounts over longer periods of time caused effects on unborn animals and the kidney as well as on the liver.
Fig. 1.1. Health effects from breathing trichloroethylene.
ATSDR
Public Health Statement

1,2-Dichloroethene

This Statement was prepared to give you information about 1,2-dichloroethene and to emphasize the human health effects that may result from exposure to it. The Environmental Protection Agency (EPA) has identified 1177 sites on its National Priorities List (NPL). 1,2-Dichloroethene has been found in at least 275 of these sites. However, we do not know how many of the 1177 NPL sites have been evaluated for 1,2-dichloroethene. As EPA evaluates more sites, the number of sites at which 1,2-dichloroethene is found may change. The information is important for you because 1,2-dichloroethene may cause harmful health effects and because these sites are potential or actual sources of human exposure to 1,2-dichloroethene.

When a chemical is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment as a chemical emission. This emission, which is also called a release, does not always lead to exposure. You can be exposed to a chemical only when you come into contact with the chemical. You may be exposed to it in the environment by breathing, eating, or drinking substances containing the chemical or from skin contact with it.

If you are exposed to a hazardous substance such as 1,2-dichloroethene, several factors will determine whether harmful health effects will occur and what the type and severity of those health effects will be. These factors include the dose (how much), the duration (how long), the route or pathway by which you are exposed (breathing, eating, drinking, or skin contact), the other chemicals to which you are exposed, and your individual characteristics such as age, sex, nutritional status, family traits, lifestyle, and state of health.

What is 1,2-dichloroethene?

1,2-Dichloroethene, also called 1,2-dichloroethylene or acetylene dichloride, is a highly flammable, colorless liquid with a sharp, harsh odor. You can begin to smell 1,2-dichloroethene in air at a level of 17 parts 1,2-dichloroethene per million parts air (17 ppm). There are two forms of 1,2-dichloroethene; one form is called cis-1,2-dichloroethene, while the other is called trans-1,2-dichloroethene. Sometimes both forms are present as a mixture. It is used most often in the production of solvents and in chemical mixtures.
In a survey of tap water derived from groundwater in the United States, 16 of 466 randomly selected sites contained 1,2-dichloroethene. In this study, it was found that contaminated tap water contained as much as 2 ppb. Little is known about the typical level of 1,2-dichloroethene in tap water originating from lake water or river water. It appears that people in urban and suburban areas commonly breathe small amounts of 1,2-dichloroethene in contaminated air. People are more likely to breathe 1,2-dichloroethene from contaminated air than to swallow it in drinking water. Exposure to 1,2-dichloroethene as the result of eating food is unlikely, unless the food is prepared with contaminated tap water. Heating will reduce the amount present in food.

How can 1,2-dichloroethene enter and leave my body?

1,2-Dichloroethene can enter the body through your lungs when you breathe air contaminated with it, through your stomach and intestines when you eat food or drink water contaminated with it, or through your skin upon contact with the chemical.

No studies have been performed that specifically show how 1,2-dichloroethene leaves the body. Available data indicates some of the swallowed 1,2-dichloroethene may leave the body unchanged, while some of it may be broken down to other substances in the body. The rate of elimination of 1,2-dichloroethene from the body is unknown.

How can 1,2-dichloroethene affect my health?

Breathing high levels of trans-1,2-dichloroethene can make you feel nauseous, drowsy, and tired. Breathing very high levels of 1,2-dichloroethene vapor can cause death. Animals that breathed high levels of trans-1,2-dichloroethene for short or long periods of time had damaged livers and lungs. The effects were more severe with increased exposure time. Animals that breathed very high levels of trans-1,2-dichloroethene had damaged hearts. Extremely high doses of cis- or trans-1,2-dichloroethene given by mouth caused death in animals. Lower oral doses of cis-1,2-dichloroethene caused decreased numbers of red blood cells.

The long-term human health effects following exposure to low concentrations of 1,2-dichloroethene are unknown. Neither birth defects nor cancer have been reported in humans or animals exposed to 1,2-dichloroethene. 1,2-Dichloroethene is not known to affect fertility in humans or animals.
Where can I get more information?

If you have any more questions or concerns not covered here, please contact your state health or environmental department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road, E-29
Atlanta, Georgia 30333

This agency can also give you information on the location of the nearest occupational and environmental health clinics. Such clinics specialize in recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.
TABLE 1-2. Animal Health Effects from Breathing 1,2-Dichloroethenes*

<table>
<thead>
<tr>
<th>Levels in Air (ppm)</th>
<th>Length of Exposure</th>
<th>Description of Effects**</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>8 hours</td>
<td>Liver and lung damage in rats.</td>
</tr>
<tr>
<td>1000</td>
<td>8 hours</td>
<td>Decreased numbers of red and white blood cells in rats.</td>
</tr>
<tr>
<td>3000</td>
<td>8 hours</td>
<td>Heart damage in rats.</td>
</tr>
<tr>
<td>22,000</td>
<td>6 hours</td>
<td>Death in mice.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Levels in Air (ppm)</th>
<th>Length of Exposure</th>
<th>Description of Effects**</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>16 weeks</td>
<td>Severe lung and liver damage in rats.</td>
</tr>
</tbody>
</table>

*Data are based on studies with trans-1,2-dichloroethene.
**These effects are listed at the lowest level at which they were first observed. They may also be seen at higher levels.
Table 1-4. Animal Health Effects from Eating or Drinking 1,2-Dichloroethene*

<table>
<thead>
<tr>
<th>Levels in Food (ppm)</th>
<th>Length of Exposure</th>
<th>Description of Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,800</td>
<td>14 days</td>
<td>Blood changes in rats (cis-1,2-dichloroethene).</td>
</tr>
<tr>
<td>25,500</td>
<td>1 day</td>
<td>Death in rats (trans-1,2-dichloroethene).</td>
</tr>
<tr>
<td>15,300</td>
<td>1 day</td>
<td>Death in mice (trans-1,2-dichloroethene).</td>
</tr>
<tr>
<td>Levels in Water (ppm)</td>
<td></td>
<td>The health effects resulting from short-term animal exposure to water containing specific levels of 1,2-dichloroethene are not known.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Levels in Food</th>
<th>Length of Exposure</th>
<th>Description of Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,900</td>
<td>90 days</td>
<td>Blood changes in rats (cis-1,2-dichloroethene).</td>
</tr>
</tbody>
</table>

| Levels in Water | |
|-----------------| The health effects resulting from long-term animal exposure to water containing specific levels of 1,2-dichloroethene are not known. |

*These effects are listed at the lowest level at which they were first observed. They may also be seen at higher levels.
PRODUCT NAME: Blankdust

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: 10 mg/m³

EFFECTS OF OVEREXPOSURE: none

EMERGENCY & FIRST AID PROCEDURES: Skin contact: wash with soap & water. Eye Contact: flush with water, get medical aid.

SECTION VI - REACTIVITY DATA

STABILITY: UNSTABLE

CONDITIONS TO AVOID: None

INCOMPATIBILITY: None

HAZARDOUS DECOMPOSITION PRODUCTS: None

OXYGENIZATION WILL NOT OCCUR

SECTION VII - SPILL OR LEAK PROCEDURES

TEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Sweep up:

ASTE DISPOSAL METHOD: Refer to local regulations relative to solid waste disposal.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: Not required

VENTILATION: Air exchange rate of approximately 5-6 room volume changes per hour, as is normal for good health in humans.

PROTECTIVE CLOTHES: Not required

EYE PROTECTION: Not required

PROTECTIVE EQUIPMENT: Not required

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING & STORAGE: Store in cool, dry area away from open flames. Keep container closed. Read & follow precautions on container label. Do Not re-use container.

SECTION X - SHIPPIING INFORMATION

T CLASS: Not regulated

HAZ. CLASS: N/A

DOT NO.: None

AUTH: N/A

SECTION XI - PHYSICAL DATA

FLASH POINT (F): 101-110°F

FLAMMABILITY LIMITS: LEL 5.6, UEL 6.0

SECTION XII - FIRE & EXPLOSION HAZARD DATA

EXTINGUISHING MEDIA: CO₂, Foam or dry chem.

UNUSUAL FIRE & EXPLOSION HAZARDS: None

PAGE 1 OF 2

MATERIAL SAFETY DATA SHEET

MARKETED BY: Multigraphics

ADDRESS: 1800 W. Central Rd., Mt. Prospect, IL 60056

TRADE NAME: Blankdust II Solvent

CHEMICAL FAMILY: Petroleum distillate

REORDER No.: 83-6-104315, 83-5-104316, 83-4-104317

USED AS: Blanket cleaning solvent, duplicators

SECTION II - INGREDIENTS

petroleum naphtha 100% CAS No. 8036-30-6

* A blend in the category of High Flash, V.M. & P. naphtha

Container and package to be marked COMBUSTIBLE in accordance with OSHA regulation 1910.106

PACKAGED IN 1 gal., 5 gal., 50 gal. METAL (X) PLASTIC ( )
TRADE NAME: Waxillith® Blankrol® Solvent  DATE: April, 1989
(REVISI)

I. Name/Synonym: Blankrol Cleaning Solvent  Part Number: 83-1-770001-1 gal.
83-1-770002-5 gal.
83-1-770003-10 gal.

Manufactured/Distributed by: MOLYGRAPHICS DIVISION
AN INTERNATIONAL, INC.
1800 West Central Road
Mt. Prospect, Illinois 60056

Emergency Phone - Day - (312) 870-5121
Night - (312) 398-1900

II. INGREDIENTS - Confidential information for safety/health use only
(ALL EXPOSURE LIMITS ARE PPM UNLESS OTHERWISE NOTED)

Chemical Name | CAS# | OSHA | ACGIH | NIOSH | M/T | TLV | IARC | UT | LIMITS
---|---|---|---|---|---|---|---|---|---
Perchloroethylene | 122-11-4 | 25 | 50 | 200 | Yes* | 75 |
Petroleum Methyl | 802-41-1 | 100 | 100 | 200 | No | 55-75 |
Petroleum Naphtha | 8484-95-6 | 100 | 100 | 150 | No | 4-6 |

*Found to be a potential human carcinogen.

III. PHYSICAL PROPERTIES

- Boiling Point (°F): 250-300
- Specific Gravity (H2O = 1): 0.97
- Vapor Pressure (mm Hg): Unknown
- Melting Point: C/K
- Vapor Density (Air = 1): 5.8
- Evaporation Rate:
- Solubility in Water: Insoluble
- (butyl acetate = 1) 1.4
- Appearance/Odor: Blue liquid, odor
- pH: N/A

IV. FIRE AND EXPLOSION HAZARD

- Flash Point (Method): 100°F (Tag CC)
- Flammable Limits: LEL: 1.1 | UEL: 5.9
- Extinguishing Media: CO2, Foam, Dry Chemical
- Special Fire Fighting Procedure: DO NOT use water, it will spread the fire.

- Unusual Fire/Explosion Hazards: Chlorinated hydrocarbons involved in fires can decompose to hydrogen chloride and possible traces of phosgene.

N/A = Not Applicable
N/E = Not Established
If natural resources are or may be injured as a result of a release, the Respondent(s) shall ensure that the trustees of the effected natural resources are notified. The trustees will initiate appropriate actions and provide input into the RD/RA in order to minimize or mitigate natural resource damages in accordance with the NCP and 43 CFR part 11. Trustees define "injury" as "a measurable adverse change, either long- or short-term, in the chemical or physical quality of a natural resource resulting either directly or indirectly from exposure to a discharge of oil or release of a hazardous substance". The Respondent(s) shall make available to the trustees all necessary information and documentation needed to assess actual or potential natural resource injuries.

3.2 TASK II: PRE-DESIGN STUDIES

The Respondent(s) shall schedule and detail the work necessary to accomplish the pre-design studies described in the Pre-Design Studies Plan submitted with the RD/RA Work Plan. The requirements of this section shall apply to studies undertaken to refine the understanding of the nature and extent of contamination at the Site, as well as to bench and pilot scale treatability studies.

For any such studies required, the Respondent(s) shall furnish all services, including necessary field work, materials, supplies, labor, equipment, supervision, and data interpretation. Sufficient sampling, testing, and analyses shall be performed to provide the technical data necessary to support the remedial design effort with the goal of optimizing the required treatment and/or disposal operations and systems.

The Respondent(s) shall submit a draft Pre-Design Studies report for Ohio EPA's review and comment when the investigation and/or testing required by the Pre-Design Studies Plan is complete. The draft report shall present investigation/testing data and results along with an analysis of the implications those results have on the RD/RA, including a cost analysis, when appropriate. The draft report shall be submitted prior to the preliminary design submittal in accordance with the schedule specified in the Orders and approved RD/RA Work Plan. After making any required corrections or modifications based on Ohio EPA comments, the Respondent(s) shall submit the final report with the Preliminary Design Report, unless otherwise specified in the approved RD/RA Work Plan.

3.2.1. Reporting Requirements for Groundwater data.

The Respondent(s) shall submit all groundwater data and monitoring well construction data. The Respondent(s) shall implement a groundwater monitoring program as identified in the RD workplan or as required by Ohio EPA. Respondent(s) shall submit all groundwater data and monitoring well construction data on a 3.5 inch diskette using the most current version of the U.S.EPA developed Ground Water Information Tracking System (GRITS) database.
software. GRITS is free software, and can be obtained by calling EPA office of Research and Development (ORD), at 513-569-7562, ask for Document # EPA/625/11-91/002. Respondent(s) shall submit one copy of each round of sampling data on printed paper in addition to the diskette format. The printed copy will be the official copy of the data.

3.3 TASK III: REMEDIAL DESIGN

The Respondent(s) shall prepare and submit to Ohio EPA, in accordance with the schedule set forth in the compliance schedule of the Orders, construction plans, specifications and supporting plans to implement the remedial action at AMI Datacard/Addressograph Site as defined in the Purpose and Description of the Remedial Action sections of this SOW, the Decision Document, and the Orders.

3.3.1 General Requirements for Plans and Specifications

The construction plans and specifications shall comply with the standards and requirements outlined below. All design documents shall be clear, comprehensive and organized. Supporting data and documentation sufficient to define the functional aspects of the remedial action shall be provided. Taken as a whole, the design documents shall demonstrate that the remedial action will be capable of meeting all objectives of the Decision Document, including any performance standards.

The plans and specifications shall include the following:

1) Discussion of the design strategy and design basis including:
   a. Compliance with requirements of the Decision Document and the Orders and all applicable regulatory requirements;
   b. Minimization of environmental and public health impacts;

2) Discussion of the technical factors of importance including:
   a. Use of currently accepted environmental control measures and technologies;
   b. The constructability of the design;
   c. Use of currently accepted construction practices and techniques;

3) Description of the assumptions made and detailed justification for those assumptions;

4) Discussion of possible sources of error and possible operation and maintenance problems;

5) Detailed drawings of the proposed design including, as appropriate:
   a. Qualitative flow sheets;
   b. Quantitative flow sheets;

6) Tables listing equipment and specifications;

7) Tables giving material and energy balances;

8) Appendices including:
a. Sample calculations (one example presented and clearly explained for significant or unique calculations);
b. Derivation of equations essential to understanding the report;
c. Results of laboratory tests, field tests and any additional studies.

3.3.2 Design Phases

The Respondent(s) shall meet when necessary with Ohio EPA representatives to discuss design issues. The design shall be developed and submitted in the phases outlined below to facilitate progression toward an acceptable and functional design. Submittals shall be made in accordance with the compliance schedule in the Orders, and the schedule in the approved RD/RA Work Plan.

3.3.2.1 Preliminary Design

A Preliminary Design, which reflects the design effort at approximately 30% completion, shall be submitted to Ohio EPA for review and comment. At this stage of the design process, the Respondent(s) shall have verified existing conditions at the Site that may influence the design and implementation of the selected RA. The Preliminary Design shall demonstrate that the basic technical requirements of the remedial action and any permits required have been addressed. The Preliminary Design shall be reviewed to determine if the final design will provide an operable and usable RA that will be in compliance with all permitting requirements and response objectives. The Preliminary Design submittal shall include the following elements, at a minimum:

- Preliminary plans, drawings and sketches, including design calculations;
- Results of treatability studies and additional field sampling;
- Design assumptions and parameters, including design restrictions, process performance criteria, appropriate unit processes for treatment systems, and expected removal or treatment efficiencies for both the process and waste (concentration and volume);
- Proposed cleanup verification methods, including compliance with applicable laws and regulations;
- Outline of design specifications;
- Proposed siting/locations of processes/construction activity;
- Expected long-term operation and monitoring requirements;
- Real estate and easement requirements;
- Preliminary construction schedule, including contracting strategy.

The supporting data and documentation necessary to define the functional aspects of
the RA shall be submitted with the Preliminary Design. The technical specifications shall be outlined in a manner that anticipates the scope of the final specifications. The Respondent(s) shall include design calculations with the Preliminary Design completed to the same degree as the design they support.

If the Pre-Design Studies Report required under Task II have not been submitted prior to submission of the Preliminary Design, it shall be submitted with the Preliminary Design. Any revisions or amendments to the Preliminary Design required by Ohio EPA shall be incorporated into the subsequent design phase.

3.3.2.2 Intermediate Design

Complex project designs necessitate preparation and Ohio EPA review of design documents between the preliminary and prefinal design phases. The Respondent(s) shall submit intermediate design plans and specifications to Ohio EPA for review and comment when the design is approximately 60% complete in accordance with the schedule in the approved RD/RA Work Plan. All plans, specifications, design analyses and design calculations submitted to Ohio EPA shall reflect the same degree of completion. The Respondent(s) shall ensure that any required revisions or amendments resulting from Ohio EPA's review of the Preliminary Design are incorporated into the Intermediate Design.

The Intermediate Design submittal shall include the following components:

- Design Plans and Specifications
- Draft Construction Quality Assurance Plan
- Draft Performance Standard Verification Plan
- Draft Operation and Maintenance Plan
- Health and Safety Plan

The design shall include a Construction Quality Assurance Plan, a Performance Standard Verification Plan, an Operation and Maintenance Plan, and a Health and Safety Plan. The Performance Verification Plan shall include a Field Sampling Plan and a Quality Assurance Project Plan, as necessary. Section 4.0 of this SOW describes the required content of the supporting plans. The final Pre-Design Studies Report shall also be included, if it has not already been submitted. Revisions or amendments to the Intermediate Design required by Ohio EPA shall be incorporated into the Prefinal Design.

3.3.2.3 Prefinal Design

The Respondent(s) shall submit a Prefinal Design for Ohio EPA review in
accordance with the schedule in the approved RD/RA Work Plan when the design effort is at least 90% complete. The Respondent(s) shall ensure that any modifications required by Ohio EPA's prior review of related Pre-design Studies Reports, technical memoranda, the Preliminary and Intermediate Designs, and the QAPP and HSP are incorporated into the Prefinal Design submittal. The Prefinal Design submittal shall consist of the following components, at a minimum:

- Design Plans and Specifications
- Construction Quality Assurance Plan
- Performance Standard Verification Plan
- Operation and Maintenance Plan
- Remedial Action Implementation Plan
- Cost Estimate
- Health and Safety Plan

General correlation between drawings and technical specifications is a basic requirement of any set of working construction plans and specifications. Before submitting the remedial design specifications with the Prefinal Design, the Respondent(s) shall: (1) Coordinate and cross-check the specifications and drawings; (2) Complete the proofing of the edited specifications and required cross-checking of all drawings and specifications.

The Respondent(s) shall prepare and include in the technical specifications governing any treatment systems; contractor requirements for providing appropriate service visits by qualified personnel to supervise the installation, adjustment, startup and operation of the treatment systems; and appropriate training on operational procedures once startup has been successfully accomplished.

Ohio EPA will provide written comments to the Respondent(s) indicating any required revisions to the Prefinal Design. Comments may be provided as a narrative report and/or markings on design plan sheets. Revisions to the plans and specifications required by Ohio EPA shall be incorporated into the Final Design. At the discretion of the Site Coordinator, the Respondent(s) shall also return to Ohio EPA all marked-up prints as evidence that the plans have been completely checked. The Prefinal Design submittal may serve as the Final Design, if Ohio EPA has no further comments and notifies the Respondent(s) that the Prefinal Design has been approved as the Final Design.

3.3.2.4 Final Design

Following incorporation of any required modifications resulting from Ohio EPA's review of the Prefinal Design submittal, the Respondent(s) shall submit to Ohio EPA
the Final Design which is 100% complete in accordance with the approved schedule described in the RD/RA Workplan. The Final Design submittal shall include all the components of the Prefinal Design and each of those components shall be complete. At the discretion of the Site Coordinator, any marked-up prints or drawings, which Ohio EPA may have provided by way of comments on previous design submittals shall be returned to Ohio EPA, if they have not already been returned.

The Respondent(s) shall make corrections or changes based on Ohio EPA comments on the Final Design submittals. The revised Final Design shall then be submitted in their entirety to Ohio EPA for approval as the completed Final Design. Upon approval of the Site Coordinator, final corrections may be made by submitting corrected pages to the Final Design design documents. The quality of the Final Design submittal should be such that the Respondent(s) would be able to include them in a bid package and invite contractors to submit bids for the construction project.

### 3.3.3 Estimated Cost of the Remedial Action

The Respondent(s) shall refine the cost estimate developed in the Feasibility Study to reflect the detailed plans and specifications being developed for the RA. The cost estimate shall include both capital and operation and maintenance costs for the entire project. To the degree possible, cost estimates for operation and maintenance of any treatment system shall be based on the entire anticipated duration of the system’s operation. The final estimate shall be based on the final approved plans and specifications. It shall include any changes required by Ohio EPA during Final Design review, and reflect current prices for labor, material and equipment.

The refined cost estimate shall be submitted by the Respondent(s) with the Prefinal Design and the final cost estimate shall be included with the Final Design submittal.

### 3.3.4 Remedial Action Implementation Plan

The Respondent(s) shall develop a Remedial Action Implementation Plan (RAIP) to help coordinate implementation of the various components of the RA. It shall include a schedule for the RA that identifies timing for initiation and completion of all critical path tasks. The Respondent(s) shall specifically identify dates for completion of the project and major interim milestones in conformance with the approved RD/RA Workplan schedule. The Remedial Action Implementation Plan is a management tool which should address the following topics:

1) Activities necessary to fully implement each of the components of the RA;
2) How these activities will be coordinated to facilitate construction/implementation in accordance with the approved schedule;

3) Potential major scheduling problems or delays, which may impact overall schedule;

4) Lines of communication for discussing and resolving problems, should they arise;

5) Common and/or anticipated remedies to overcome potential problems and delays.

The Remedial Action Implementation Plan shall be submitted with the Prefinal Design for review and comment by Ohio EPA. The final plan and RA project schedule shall be submitted with the Final Design for review and approval.

3.3.5 Community Relations Support

A community relations program will be implemented by Ohio EPA. The Respondent(s) shall cooperate with Ohio EPA in community relations efforts. Cooperation may include participation in preparation of all appropriate information disseminated to the public, and in public meetings that may be held or sponsored by Ohio EPA concerning the Site.

3.4 TASK IV: REMEDIAL ACTION CONSTRUCTION

Following approval of the Final Design submittal by Ohio EPA, the Respondent(s) shall implement the designed remedial action(s) at the AMI Datacard/Addressograph Site in accordance with the plans, specifications, Construction Quality Assurance Plan, Performance Standard Verification Plan, Health and Safety Plan, Remedial Action Implementation Plan, Quality Assurance Project Plan, and Field Sampling Plan approved with the final design. Implementation shall include the activities described in the following sections.

3.4.1 Preconstruction Inspection and Conference

The Respondent(s) shall participate in a preconstruction inspection and conference with Ohio EPA to accomplish the following:

- Review methods for documenting and reporting inspection data;
- Review methods for distributing and storing documents and reports;
- Review work area security and safety protocol;
• Discuss any appropriate modifications to the Construction Quality Assurance Plan to ensure that site specific considerations are addressed. The final CQAP shall be submitted to Ohio EPA at this time, if it has not already been submitted;

• Introduce key construction contractor, engineering and project management personnel and review roles during construction activities; and

• Conduct a site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.

The Respondent(s) shall schedule the preconstruction inspection and conference to be held within 10 days of the award of the construction contract. The preconstruction inspection and conference shall be documented by a designated person and minutes shall be transmitted to all parties by the Respondent(s) to all parties in attendance.

3.4.2 Design Changes During Construction

During construction, unforeseen site conditions, changes in estimated quantities of required construction materials and other problems associated with the project are likely to develop. Such changing conditions may require either major or minor changes to the approved final design. Certain design changes will require approval of Ohio EPA prior to implementation to ensure that the intent and scope of the remedial action is maintained. Changes, which could alter the intent or scope of the RA, may require a revision to the Decision Document and a public comment period.

Changes to the remedial design which require Ohio EPA written approval prior to implementation include:

• Those that involve the deletion or addition of a major component of the approved remedy (e.g. changing one treatment system for another; deleting any designed layer of a multi-layer cap);

• Those that result in a less effective treatment for wastes associated with the Site;

• Any changes that may result in an increase of the exposure to chemicals of concern and/or risk to human health or the environment as compared to the goals for the completed remedial action as stated in the Orders and this SOW;

• Those that result in a significant delay in the completion of the RA; and

• Any other changes that alter or are outside of the scope or intent of the approved
remedial design.

Ohio EPA shall be notified of other changes made during construction through daily inspection reports and monthly progress reports.

3.4.3 **Remedial Action Construction Completion and Acceptance**

As the construction of the remedial action nears completion, the following activities and reporting shall be completed by the Respondent(s) to ensure proper project completion, approval, closeout and transition to the operation and maintenance/monitoring phase.

3.4.3.1 **Prefinal Construction Conference**

Within seven days of making a preliminary determination that construction is complete, the Respondent(s) shall provide written notification to Ohio EPA and a prefinal construction conference shall be held with the construction contractor(s) to discuss procedures and requirements for project completion and closeout. The Respondent(s) shall have responsibility for making arrangements for the conference. Participants should include the Project Manager for the Respondent(s), the Site Coordinator for Ohio EPA, all contractors involved with construction of the remedial action(s) and the remedial design agent (person(s) designed the remedy), if requested.

A list of suggested items to be covered at the conference includes, but is not limited to the following:

- Final Operation and Maintenance (O&M) Plan submission, if it has not been submitted already;
- Cleanup responsibilities;
- Demobilization activities;
- Security requirements for project transfer;
- Prefinal inspection schedule; and
- Operator training;

The prefinal conference shall be documented by a designated person and minutes shall be transmitted to all parties in attendance by the Respondent(s).

3.4.3.2 **Prefinal Inspection**

Following the prefinal construction conference, a prefinal inspection of the project will be conducted. The prefinal inspection will be led by Ohio EPA with assistance from the party with primary responsibility for construction inspection, if requested.
The prefinal inspection will consist of a walk-through inspection of the entire Site. The completed site work will be inspected to determine whether the project is complete and consistent with the contract documents and the approved RD/RA Work Plan. Any outstanding deficient or incomplete construction items should be identified and noted during the inspection.

When the RA includes construction of a treatment system, the facility start-up and "shakedown" shall have been completed as part of the RA. "Shakedown" is considered to be the initial operational period following start-up during which adjustments are made to ensure that the performance standards for the system are reliably being achieved. The contractor shall have certified that the equipment has performed to meet the purpose and intent of the contract specifications. Retesting shall have been successfully completed where deficiencies were revealed. Such shakedown may take several months. Determination of remedy effectiveness for other types of remedial actions will be based on the Performance Standard Verification Plan (PSVP).

If construction of major components of a remedial action is performed in distinct phases or under separate contracts due to the complex scope of the Site remedy, it may be appropriate to conduct the prefinal inspections of those components separately. The approved RAIP should identify those projects and components, which should be handled in that manner.

Upon completion of the prefinal inspection, an inspection report shall be prepared by the Respondent(s) and submitted to Ohio EPA with the minutes from the prefinal conference. A copy of the report will be provided to all parties in attendance at the inspection. The report will outline the outstanding construction items, actions required to resolve those items, completion date for those items and a date for the final inspection. Ohio EPA will review the inspection report and notify the Respondent(s) of any disagreements with it.

3.4.3.3 Final Inspection

Within seven days following completion of any outstanding construction items, the Respondent(s) shall provide written notification to Ohio EPA and schedule a final inspection. A final inspection will be conducted by Ohio EPA with assistance from the party having primary responsibility for construction inspection, if requested.

The final inspection will consist of a walk-through inspection of the project Site focusing on the outstanding construction items identified during the prefinal inspection. The Prefinal Inspection Report shall be used as a checklist. The contractor's demobilization activities shall have been completed, except for
equipment and materials required to complete the outstanding construction items. If any items remain deficient or incomplete, the inspection shall be considered a prefinal inspection requiring another prefinal inspection report and final inspection.

As with the prefinal inspection, it may be appropriate to conduct final inspections of major components of a remedial action separately. Such projects and components should be identified in the approved Remedial Action Implementation Plan.

3.4.3.4 Construction Completion Report and Certification

Upon satisfactory completion of the final inspection, a Construction Completion Report shall be prepared by the Respondent(s) and submitted to Ohio EPA within 30 days after the final inspection. The report shall include the following elements:

1) A brief description of the outstanding construction items from the prefinal inspection and an indication that the items were satisfactorily resolved;

2) A synopsis of the work defined in the approved RD/RA Work Plan and the Final Design and certification that this work was performed;

3) An explanation of any changes to the work defined in the approved RD/RA Work Plan and Final Design, including as-built drawings of the constructed RA facilities, and why the changes were necessary or beneficial for the project; and

4) Certification that the constructed RA or component of the RA is operational and functional.

The construction completion report will be reviewed by Ohio EPA. If Ohio EPA's review indicates that corrections or amendments to the report are necessary, comments will be provided to the Respondent(s). The Respondent(s) shall submit a revised construction completion report based on Ohio EPA comments to Ohio EPA within 30 days of receipt of those comments. Upon determination by Ohio EPA that the report is acceptable, written notice of Ohio EPA's approval of the construction completion report will be provided to the Respondent(s).

3.4.4 Community Relations Support

The Respondent(s) shall provide support for Ohio EPA's community relations program during remedial action implementation as described in Section 3.3.5.
3.5 TASK V: FIVE-YEAR REVIEWS

At sites where contaminants will remain at levels that will not permit unrestricted use of the Site, a review will be conducted no less frequently than once every five years to ensure that the remedy continues to be protective of human health and the environment. This is known as the "five-year review". The Respondent(s) shall complete five-year reviews no less often than every five years after the initiation of the remedial action or until contaminant levels allow for unrestricted use of the Site. Further guidance for performing five-year review work tasks may be found in the U.S. EPA OSWER Directive 9355.7-02, Structure and Components of Five-Year Reviews.

The more specific purpose of the reviews is two-fold: (1) to confirm that the remedial action as specified in the Decision Document and as implemented continues to be effective in protecting human health and the environment (e.g., the remedy is operating and functioning as designed, institutional controls are in place and are protective); and (2) to evaluate whether original cleanup levels remain protective of human health and the environment. A further objective is to evaluate the scope of operation and maintenance, the frequency of repairs, changes in monitoring indicators, costs at the Site, and how each of these relates to protectiveness.

Fifteen months prior to the due date for completion of a five-year review, the Respondent(s) shall meet with Ohio EPA to discuss the requirements of the five-year review. The review must be completed within five years following the initiation of the remedial action. The scope and level of review will depend on conditions at the Site. The scoping effort should include a determination by the Site Coordinator and Respondent(s) as to whether available monitoring data and other documentation will be sufficient to perform the five-year review or whether a field sampling effort will be a necessary component of the review. Within three months of the meeting, the Respondent(s) shall develop and submit a workplan to Ohio EPA that shall describe, at a minimum, the following activities and documentation:

1. Document Review
   a. Background Information
      1. Decision Document
      2. Decision Document Summary
      3. Administrative or Judicial Order for RD/RA
      4. Completion of Remedial Action Report
   b. Design Review
   c. Maintenance and Monitoring
      1. O&M Manual
      2. O&M Reports
      3. Groundwater Monitoring Plan
      4. Monitoring Data and Information
2. Standards Review
   a. Specific performance standards required by Decision Document
   b. Changing Standards
      1. Laws and Regulations applicable to conditions and activities at the Site
   c. Risk Assessment
      1. As summarized in the Decision Document
      2. Review for changes in exposure pathways not previously evaluated

3. Interviews
   a. Background Information
      1. Previous Staff Management
      2. Nearest Neighbors, Respondent(s)
   b. Local Considerations
      1. State Contacts
      2. Local Government Contacts
   c. Operational Problems
      1. Plant Superintendent
      2. O&M Contractors

4. Site Inspection/Technology Review
   a. Performance and Compliance
      1. Visual Inspection
   b. Offsite Considerations
   c. Recommendations

5. Report
   a. Background
      1. Introduction
      2. Remedial Objectives
      3. Review of Applicable Laws and Regulations
   b. Site Conditions
      1. Summary of Site Visit
      2. Areas of Noncompliance
   c. Risk Assessment
   d. Recommendations
      1. Technology Recommendations
      2. Statement on Protectiveness
      3. Timing and Scope of Next Review
      4. Implementation Requirements

If sampling and analysis of environmental samples is required under the five-year review, the Respondent(s) are required to prepare and submit with the workplan other supporting plans.
Supporting plans may include a Quality Assurance Project Plan, Field Sampling Plan and Health and Safety Plan. The purpose and content of these supporting plans are discussed in Section 4 of this SOW. The Five-Year Review Workplan must be reviewed and approved by Ohio EPA prior to initiation of field activities or proceeding with the five-year review.

The Five-Year Review Report will be reviewed by Ohio EPA. If Ohio EPA's review indicates that corrections or amendments to the report are necessary, comments will be provided to the Respondent(s). The Respondent(s) shall submit a revised Five-Year Review Report based on Ohio EPA comments to Ohio EPA within 30 days of receipt of those comments.

3.6 TASK VI: OPERATION AND MAINTENANCE/PERFORMANCE MONITORING

The Respondent(s) shall implement performance monitoring and operation and maintenance procedures as required by the approved Performance Standard Verification Plan and approved Operation and Monitoring (O&M) Plan for the RA once it is demonstrated that the RA components are operational and functional.

3.6.1 Reporting During Operation and Maintenance

3.6.1.1 Operation and Maintenance Sampling and Analysis Data

Unless otherwise specified in the approved O&M Plan, sampling, analysis, and system performance data for any treatment system or other engineering systems required to be monitored during the O&M Phase shall be submitted by the Respondent(s) to Ohio EPA on a monthly basis. These monthly submittals will form the basis for the annual progress report described below in Section 3.6.1.2.

3.6.1.2 Progress Reports During Operation and Maintenance

The Respondent(s) shall prepare and submit annual progress reports during the operation and maintenance/performance monitoring phase of the RA. When appropriate, the RD/RA Work Plan shall specify progress reports during O&M to be submitted more frequently.

The O&M progress reports shall contain the same information as required for the monthly progress reports for the RD and RA construction phases, as specified in Section 3.6.1 of this SOW. It shall also include an evaluation of the effectiveness of any treatment and engineering systems in meeting the cleanup standards,
performance standards and other goals of the RA as defined in the Orders, this SOW, the RD/RA Work Plan and the approved Final Design.

3.6.2 Completion of Remedial Action Report

At the completion of the remedial action, the Respondent(s) shall submit a Completion of Remedial Action Report to Ohio EPA. The RA shall be considered complete when all of the goals, performance standards and cleanup standards for the RA as stated in the Decision Document, this SOW, and the approved Final Design (including changes approved during construction) have been met. The report shall document that the project is consistent with the design specifications, and that the RA was performed to meet or exceed all required goals, cleanup standards and performance standards. The report shall include, but not be limited to the following elements:

1) Synopsis of the remedial action and certification of the design and construction;
2) Listing of the cleanup and performance standards as established in the Decision Document and the Orders, any amendments to those standards with an explanation for adopting the amendments;
3) Summary and explanation of any changes to the approved plans and specifications. An explanation of why the changes were necessary should be included and, where necessary, Ohio EPA approval of the changes should be documented;
4) Summary of operation of treatment systems including monitoring data, indicating that the remedial action met or exceeded the performance standards or cleanup criteria; and
5) Explanation of any monitoring and maintenance activities to be undertaken at the Site in the future as outlined in Section 3.0 of this RD/RA SOW.

3.7 TASK VII: REPORTING REQUIREMENTS

The Respondent(s) shall prepare and submit work plans, design plans, specifications, and reports as set forth in Tasks I through V of this SOW to document the design, construction, operation, maintenance, and performance monitoring of the remedial action. Monthly progress reports shall be prepared, as described below, to enable Ohio EPA to track project progress.

3.7.1 Monthly Progress Reports during RD and RA Construction

The Respondent(s) shall at a minimum provide Ohio EPA with monthly progress reports during the design and construction phases of the remedial action containing the information
listed below. When appropriate, the RD/RA Work Plan shall specify progress reports to be submitted more frequently.

1) A description of the work performed during the reporting period and estimate of the percentage of the RD/RA completed;
2) Summaries of all findings and sampling during the reporting period;
3) Summaries of all changes made in the RD/RA during the reporting period, indicating consultation with Ohio EPA and approval by Ohio EPA of those changes, when necessary;
4) Summaries of all contacts with representatives of the local community, public interest groups or government agencies during the reporting period;
5) Summaries of all problems or potential problems encountered during the reporting period, including those which delay or threaten to delay completion of project milestones with respect to the approved work plan schedule or RAIP schedule;
6) Summaries of actions taken and being taken to rectify problems;
7) Summaries of actions taken to achieve and maintain cleanup standards and performance standards;
8) Changes in personnel during the reporting period;
9) Projected work for the next reporting period; and
10) Copies of daily reports, inspection reports, sampling data, laboratory/monitoring data, etc.

3.7.2 Summary of Reports and Submittals

A summary of the information reporting requirements contained in this RD/RA SOW is presented below:

- Draft RD/RA Work Plan
  Health and Safety Plan (HSP)
  Regulatory Compliance Plan
- Final RD/RA Work Plan
  HSP
  Regulatory Compliance Plan
- Draft Pre-Design Studies Plan
  Quality Assurance Project Plan (QAPP)
  Field Sampling Plan (FSP)
- Final Pre-Design Studies Plan
  QAPP
  FSP
- Pre-Design Studies Reports - Draft
- Preliminary Design Documents
Pre-Design Studies Reports - Final

- **Intermediate Design Documents**
  - Draft Construction Quality Assurance Plan (CQAP)
  - Draft Performance Standard Verification Plan (PSVP)
  - Draft O & M Plan
  - Health and Safety Plan

- **Prefinal Design Documents**
  - CQAP
  - PSVP
  - O & M Plan
  - Draft Remedial Action Implementation Plan (RAIP)
  - Health and Safety Plan

- **Final Design Documents**
  - CQAP
  - PSVP
  - O & M Plan
  - Draft RAIP
  - Health and Safety Plan

- Preconstruction Inspection and Conference Report
- Monthly Progress Reports During RD/RA
- Notification of Preliminary Completion of Construction
- Final O & M Plan
- Prefinal Inspection Report
- Notification for Final Inspection
- Construction Completion Report
- O & M Sampling Data
- Progress Reports during O&M/Performance Monitoring period
- Completion of Remedial Action Report
- Five-Year Review Workplan
- Five-Year Review Report
4.0 CONTENT OF SUPPORTING PLANS

The documents listed in this section shall be prepared and submitted as outlined in Section 3.0 of this SOW to support the activities necessary to design and fully implement the RA. These supporting documents include a Quality Assurance Project Plan (QAPP), a Field Sampling Plan (FSP), a Health and Safety Plan (HSP), a Construction Quality Assurance Plan (CQAP) and a Performance Standard Verification Plan (PSVP). The following sections describe the required contents of each of these supporting documents.

4.1 QUALITY ASSURANCE PROJECT PLAN

The Respondent(s) shall prepare a site-specific Quality Assurance Project Plan (QAPP) to cover sample analysis and data handling based on guidance provided by Ohio EPA. Refer to the list of Ohio EPA and U.S. EPA guidance documents in Exhibit A attached to this SOW. A QAPP shall be developed for any sampling and analysis activities to be conducted as pre-design studies and submitted with the Pre-Design Studies Plan for Ohio EPA review and approval.

During the remedial design phase the Respondent(s) shall review all remedial design information and modify or amend the QAPP developed for the Pre-Design Studies Plan, as necessary, to address the sampling and analysis activities to be conducted during implementation of the Remedial Action, including activities covered by the PSVP and O&M Plan. An amended QAPP shall be submitted with the Intermediate Design documents for review and comment by Ohio EPA. A final Quality Assurance Project Plan, which incorporates comments made by Ohio EPA, shall be submitted for approval with the Final Design documents. Upon agreement of the Site Coordinator, the Respondent(s) may submit only the amended portions of the QAPP developed for the PDSP with the Intermediate, Pre-Final and Final Design documents.

The Respondent(s) shall schedule and attend a pre-QAPP meeting with representatives of Ohio EPA to discuss the scope and format of the QAPP. For sites where the Site Coordinator and Project Manager agree that a pre-QAPP meeting is not needed, this meeting may be omitted. The QAPP shall, at a minimum, include:

1. Data Collection Strategy - The strategy section of the QAPP shall include but not be limited to the following:
   a. Description of the types and intended uses for the data, relevance to remediation or restoration goals, and the necessary level of precision, accuracy, and statistical validity for these intended uses;
   b. Description of methods and procedures to be used to assess the precision, accuracy and completeness of the measurement data;
c. Description of the rationale used to assure that the data accurately and precisely represent a characteristic of a population, variation of physical or chemical parameters throughout the Site, a process condition or an environmental condition. Factors which shall be considered and discussed include, but are not limited to:
   i) Environmental conditions at the time of sampling;
   ii) Sampling design (including number, location and distribution);
   iii) Representativeness of selected media, exposure pathways, or receptors;
   iv) Representativeness of selected analytical parameters;
   v) Representativeness of testing procedures and conditions; and
   vi) Independence of background or baseline from Site influences.

d. Description of the measures to be taken to ensure that the following data sets can be compared quantitatively or qualitatively to each other:
   i) RD/RA data collected by the Respondent(s) over some time period;
   ii) RD/RA data generated by an outside laboratory or consultant employed by the Respondent(s) versus data collected by the Respondent(s);
   iii) Data generated by separate consultants or laboratories over some time period not necessarily related to the RD/RA effort; and
   iv) Data generated by Ohio EPA or by an outside laboratory or consultant employed by Ohio EPA.

e. Details relating to the schedule and information to be provided in quality assurance reports. These reports should include but not be limited to:
   i) Periodic assessment of measurement data accuracy, precision and completeness;
   ii) Results of performance audits;
   iii) Results of system audits;
   iv) Significant quality assurance problems and recommended solutions; and
   v) Resolutions of previously stated problems.

2. Sample Analysis - The Sample Analysis section of the Quality Assurance Project Plan shall specify the following:
   a. Chain-of-custody procedures, including:
      i) Identification of a responsible party to act as sample custodian at the laboratory facility authorized to sign for incoming field samples, obtain documents of shipment and verify the data entered onto the sample custody records;
ii) Provision for a laboratory sample custody log consisting of serially numbered lab-tracking report sheets; and

iii) Specification of laboratory sample custody procedures for sample handling, storage and dispersion for analysis.

b. Sample storage procedures and storage times;
c. Sample preparation methods;
d. Analytical procedures, including:
i) Scope and application of the procedure;
ii) Sample matrix;
iii) Potential interferences;
iv) Precision and accuracy of the methodology;
v) Method detection limits;
vi) Special analytical services required to ensure contract required detection limits do not exceed known toxicity criteria; and
vii) Verification and reporting of tentatively identified compounds.
e. Calibration procedures and frequency;
f. Data reduction, validation and reporting;
g. Internal quality control checks, laboratory performance and systems audits and frequency, including:
i) Method blank(s);
ii) Laboratory control sample(s);
iii) Calibration check sample(s);
iv) Replicate sample(s);
v) Matrix-spiked sample(s);
vi) "Blind" quality control sample(s);
vii) Control charts;
viii) Surrogate samples;
ix) Zero and span gases; and
x) Reagent quality control checks.

h. Preventative maintenance procedures and schedules;
i. Corrective action (for laboratory problems); and
j. Turnaround time.

3. Modeling - The Modeling section of the Quality Assurance Project Plan shall apply to all models used to predict or describe fate, transport or transformation of contaminants in the environment and shall discuss:
a. Model assumptions and operating conditions;
b. Input parameters; and
c. Verification and calibration procedures.

4. In Situ or Laboratory Toxicity Tests - The Toxicity Test section of the Quality Assurance Project Plan shall apply to all tests or bioassays used to predict or describe
impacts of contaminants on a population, community, or ecosystem level.

5. Data Record - The QAPP shall also provide the format to be used to present the raw data and the conclusions of the investigation, as described in a, b, and c below:
   a. The data record shall include the following:
      i) Unique sample or field measurement code;
      ii) Sampling or field measurement location and sample or measurement type;
      iii) Sampling or field measurement raw data;
      iv) Laboratory analysis ID number;
      v) Property or component measured; and
      vi) Result of analysis (e.g., concentration).
   b. Tabular Displays - The following data shall be presented in tabular displays:
      i) Unsorted (raw) data;
      ii) Results for each medium, organism, or for each constituent measured;
      iii) Data reduction for statistical analysis;
      iv) Sorting of data by potential stratification factors (e.g., location, soil layer, topography, vegetation form);
      v) Summary data (i.e., mean, standard deviation, min/max values, and sample number); and
      vi) Comparisons with background or reference data.
   c. Graphical Displays - The following data shall be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):
      i) Display sampling locations and sampling grid;
      ii) Indicate boundaries of sampling area, and areas where more data are required;
      iii) Display levels of contamination at each sampling location or location from which organism was taken;
      iv) Display geographical extent of contamination;
      v) Display contamination levels, averages and maxima;
      vi) Illustrate changes in concentration in relation to distance from the source, time, depth or other parameters;
      vii) Indicate features affecting intramedia transport and show potential receptors;
      viii. Compare nature and extent of contamination with results of ecological or biological sampling or measurements; and
      ix) Display comparisons with background or reference analyses or measurements.
4.2 FIELD SAMPLING PLAN

1. Sampling - The Sampling section of the Field Sampling Plan shall discuss:
   a. Sufficient preliminary sampling to ensure the proper planning of items b.
      through o. below;
   b. Selecting appropriate sampling locations, depths, vegetation strata,
      organism age, etc. and documenting relevance of sample for intended
      biological toxicity tests or analyses;
   c. Providing a sufficient number of samples to meet statistical or other
      data useability objectives;
   d. Measuring all necessary ancillary data such as ambient conditions,
      baseline monitoring, etc.;
   e. Determining environmental conditions under which sampling should
      be conducted;
   f. Determining which media, pathways, or receptors are to be sampled
      (e.g., ground water, air, soil, sediment, biota, etc.);
   g. Determining which parameters are to be measured and where;
   h. Selecting the frequency and length of sampling period;
   i. Selecting the sample design (e.g., composites, grabs, random,
      repeated, etc.);
   j. Selecting the number, location, media or organisms for determining
      background conditions or reference conditions (refer to Appendix B,
      Background Sampling Guidance, of Ohio EPA’s How Clean Is Clean
      Policy);
   k. Measures to be taken to prevent contamination of the sampling
      equipment and cross contamination between sampling points;
   l. Documenting field sampling operations and procedures, including:
      i) Documentation of procedures for preparation of reagents or supplies
         which become an integral part of the sample (e.g., filters and
         adsorbing reagents);
      ii) Procedures and forms for recording the exact location and
          specific considerations associated with sample acquisition;
      iii) Documentation of specific sample preservation method;
      iv) Calibration of field devices;
      v) Collection of replicate and field duplicate samples;
      vi) Submission of field-biased and equipment blanks, where appropriate;
      vii) Potential interferences present at the Site or facility;
      viii) Construction materials and techniques associated with monitoring
            wells and piezometers;
      ix) Field equipment listing and sample containers;
x) Sampling order; and
xi) Decontamination procedures.
m. Selecting appropriate sample containers;
n. Sample preservation; and
o. Chain-of-custody, including:
i) Standardized field tracking reporting forms to establish sample
custody in the field prior to and during shipment;
ii) Sample sealing, storing and shipping procedures to protect the
integrity of the sample; and
iii) Pre-prepared sample labels containing all information necessary for
effective sample tracking.

2. Field Measurements - The Field Measurements section of the Field Sampling
   Plan shall discuss:
a. Selecting appropriate field measurement locations, depths, organism
age etc.;
b. Providing a sufficient number of field measurements that meet
statistical or data useability objectives;
c. Measuring all necessary ancillary data such as ambient or baseline
environmental conditions;
d. Determining conditions under which field measurement should be
conducted;
e. Determining which media, pathways, or receptors are to be addressed
by appropriate field measurements (e.g., ground water, air, soil,
sediment, biota, etc.);
f. Determining which physical, chemical, or biological parameters are
to be measured and where;
g. Selecting the frequency and duration of field measurement; and
h. Documenting field measurement operations and procedures,
including:
i) Procedures and forms for recording raw data and the exact location,
time and Site specific considerations associated with the data
acquisition;
ii) Calibration of field devices;
iii) Collection of replicate measurements;
iv) Submission of field-biased blanks, where appropriate;
v) Potential interferences present at the Site;
vii) Construction materials and techniques associated with
monitoring wells and piezometers used to collect field data;
vii) Field equipment listing;
ix) Order in which field measurements were made; and
x) Decontamination procedures; and
4.3 SITE HEALTH AND SAFETY PLAN

The Respondent(s) shall submit a Health and Safety Plan (HSP) to Ohio EPA with the RD/RA Work Plan for any on-site activities taking place during the design phase. The Respondent(s) shall review the remedial design information and modify the HSP developed for the RD/RA Work Plan, as necessary, to address the activities to be conducted on the Site during implementation of the Remedial Action. It shall be designed to protect on-site personnel and area residents from physical, chemical and other hazards posed by the construction, operation and maintenance activities of the Remedial Action.

The Respondent(s) shall prepare a Site HSP which is designed to protect on-site personnel and area residents from physical, chemical and all other hazards posed by RD/RA activities. The HSP shall address the following topics:

1. Major elements of the Health and Safety Plan shall include:
   a. Facility or Site description including availability of resources such as roads, water supply, electricity and telephone service;
   b. Description of the known hazards and an evaluation of the risks associated with the incident and with each activity conducted;
   c. Listing of key personnel (including the Site safety and health officer) and alternates responsible for site safety, response operations, and for protection of public health;
   d. Delineation of work area, including a map;
   e. Description of levels of protection to be worn by personnel in the work area;
   f. Description of the medical monitoring program for on-site responders;
   g. Description of standard operating procedures established to ensure the proper use and maintenance of personal protective equipment;
   h. The establishment of procedures to control site access;
   i. Description of decontamination procedures for personnel and equipment;
   j. Establishment of site emergency procedures;
   k. Availability of emergency medical care for injuries and toxicological problems;
   l. Description of requirements for an environmental monitoring program. (This should include a description of the frequency and
type of air and personnel monitoring, environmental sampling
techniques and a description of the calibration and maintenance of the
instrumentation used.;
m. Specification of any routine and special training required for
responders; and
n. Establishment of procedures for protecting workers from weather-
related problems.

2. The Health and Safety Plan shall be consistent with:
   a. NIOSH Occupational Safety and Health Guidance Manual for
      Hazardous Waste Site Activities (1985);
   b. CERCLA Sections 104(f) and 111(c)(6);
   c. EPA Order 1440.3 -- Respiratory Protection;
   d. EPA Order 1440.2 -- Health and Safety Requirements for Employees
      Engaged in Field Activities;
   e. EPA Occupational Health and Safety Manual;
   f. EPA Interim Standard Operating Safety Procedures and other EPA
      guidance as developed by EPA;
   g. OSHA regulations particularly in 29 CFR 1910 and 1926;
   h. State and local regulations; and
   i. Site or facility conditions.

4.4 CONSTRUCTION QUALITY ASSURANCE PLAN

The Respondent(s) shall develop a Construction Quality Assurance Plan (CQAP) based on the plans
and specifications and performance standards for the RA. The CQAP is a site specific document that
shall specify procedures to ensure that the completed remedial action work meets or exceeds all
design criteria and specifications. A draft CQAP shall be submitted with the Intermediate Design
submittal for review and comment by Ohio EPA. Subsequent drafts shall be submitted with the
Prefinal and Final Design submittals that incorporate comments made by Ohio EPA. Certain aspects
of the CQAP, for example personnel names and qualifications, may not be known at the time of
design approval. A complete and final CQAP shall be submitted to Ohio EPA for approval prior to
the start of construction. At a minimum, the CQAP shall address the elements listed below.

4.4.1 Responsibility and Authority

The responsibility and authority of all organizations (i.e. technical consultants, construction
firms, etc.) and key personnel involved in the construction of the remedial action(s) shall be
described fully in the CQAP. The Respondent(s) shall provide a copy of the approved
CQAP to each organization with responsibility and authority for implementing the CQAP. The Respondent(s) shall also identify a CQA officer and the necessary supporting inspection staff.

4.4.2 Construction Quality Assurance Personnel Qualifications

The qualifications of the Construction Quality Assurance officer and supporting inspection personnel shall be presented in the CQAP to demonstrate that they possess the training and experience necessary to fulfill their identified responsibilities.

4.4.3 Inspection Activities

The observations and tests that will be used to monitor the construction and/or installation of the components of the remedial action shall be described in the CQAP. The plan shall include scope and frequency of each type of inspection. Inspections shall verify compliance with the design, applicable requirements of state and federal law and performance standards. Inspections shall also ensure compliance with all health and safety standards and procedures. The CQAP shall include provisions for conducting the preconstruction, prefinal and final inspections and associated meetings as described in Section 5.4 of this SOW.

4.4.4 Sampling Requirements

The sampling activities necessary to ensure that the design specifications and performance standards are achieved shall be presented in the CQAP. The description of these activities shall include sample sizes, sample locations, frequency of sampling, testing to be performed, acceptance and rejection criteria, and plans for correcting problems as addressed in the design specifications.

4.4.5 Documentation

Reporting requirements for CQA activities shall be described in detail in the CQAP. This shall include such items as daily summary reports, meeting reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports and final documentation. Provisions for the storage of all records shall be presented in the CQAP.

4.5 PERFORMANCE STANDARD VERIFICATION PLAN
A Performance Standard Verification Plan (PSVP) shall be prepared to consolidate information for required testing, sampling and analyses to ensure that both short-term and long-term performance standards for the RA are met. Performance standards may include clean-up standards for contaminated environmental media as well as the measurement of the effectiveness of engineering controls or other controls used to control migration of or exposure to contaminants. For example, the containment of a plume of contaminated ground water by pumping wells would be a performance standard requiring verification. The PSVP should describe the measurements to be taken, such as water levels in monitoring wells and piezometers, along with any analyses to be conducted on the data obtained, such as ground water modeling, to verify that the plume is contained. The PSVP shall include a FSP and a QAPP for any sampling and analyses to be conducted.

The Draft PSVP shall be submitted with the Intermediate Design for review and comment by Ohio EPA. The final PSVP, which fully addresses comments made by Ohio EPA must be submitted with and approved as part of the Final Design.

4.6 OPERATION AND MAINTENANCE PLAN

The Respondent(s) shall prepare an Operation and Maintenance Plan (O&M Plan) to cover long term operation and maintenance of the RA. Operation and maintenance for all components of the remedial action, shall begin after it is demonstrated that those components are operational and functional. The plan, at a minimum, shall be composed of the elements listed below.

1. Normal Operation and Maintenance
   a. Description of tasks for operation
   b. Description of tasks for maintenance
   c. Description of prescribed treatment or operating conditions
   d. Schedules showing the frequency of each O&M task

2. Potential Operating Problems
   a. Description and analysis of potential operating problems
   b. Sources of information regarding potential operating problems
   c. Description of means of detecting problems in the operating systems
   d. Common remedies for operating problems

3. Routine Monitoring and Laboratory Testing
   a. Description of monitoring tasks
   b. Description of required laboratory tests and interpretation of test results
   c. Required QA/QC procedures to be followed
   d. Schedule of monitoring frequency and provisions to discontinue, if appropriate
Note: Information on monitoring and testing that is presented in the PSVP should be referenced, as appropriate, but should not be duplicated in the O&M Plan.

4. Alternative O&M
   a. Description of alternate procedures to prevent undue hazard, should systems fail
   b. Analysis of the vulnerability and additional resources requirements should a failure occur

5. Safety Plan
   a. Description of safety procedures, necessary equipment, etc. for site personnel
   b. Description of safety tasks required in the event of systems failure (may be linked to the Site Safety Plan developed for the RD/RA)

6. Equipment
   a. Description of equipment necessary to the O&M Plan
   b. Description of installation of monitoring components
   c. Description of maintenance of site equipment
   d. Replacement schedule for equipment and installed components

7. Annual O&M Budget
   a. Costs for personnel
   b. Costs for preventative and corrective maintenance
   c. Costs of equipment and supplies, etc.
   d. Costs of any contractual obligations (e.g., lab expenses)
   e. Costs of operation (e.g., energy, other utilities, etc.)

8. Records and Reporting Mechanisms Required
   a. Daily operating logs
   b. Laboratory records
   c. Records for operating costs
   d. Mechanism for reporting emergencies
   e. Personnel and maintenance records
   f. Monthly/semi-annual reports to Ohio EPA

The Respondent(s) shall submit a draft O&M Plan to Ohio EPA for review and comment with the Intermediate Design submittal. Subsequent drafts of the O&M Plan shall be submitted with the Prefinal and Final Design submittals, which reflect the refined plans and specifications of those submittals and any comments made by Ohio EPA. The final O&M Plan shall be submitted by the Respondent(s) prior to or at the completion of construction of the remedial action and shall incorporate any modifications or corrections required by Ohio EPA.
EXHIBIT A

OHIO EPA AND U.S. EPA GUIDANCE DOCUMENTS
FOR REMEDIAL DESIGN / REMEDIAL ACTION


2. Background Guidance, Final, Ohio EPA, Division of Emergency and Remedial Response, July 26, 1991


7. Superfund Remedial Design and Remedial Action Guidance, OSWER 9355.0-4A, June 1986

8. Guidelines and Specifications for Preparing Quality Assurance Project Plans, Ohio EPA, Division of Emergency and Remedial Response, Policy No. DERR-00-RR-008, March 1990


11. U.S. EPA Integrated Risk Information System (IRIS) Data Base


Exhibit B

OHIO EPA AND U.S. EPA GUIDANCE DOCUMENTS

Statement of Purpose and Use of This Guidance Document List:
The purpose of this list of Ohio EPA and U.S. EPA policies, directives and guidance documents is to provide a reference of the documents which provide essential direction and guidance for conducting investigations, evaluating alternative remedial actions, and designing and implementing selected remedial actions at sites for which the Division of Emergency and Remedial Response has authority over such activities. Certain sites may have contaminants or conditions which are not fully addressed by the documents in this list. There is an evolving body of policy directives, guidance and research documentation which should be utilized, as necessary, to address those conditions and contaminants not encompassed by the documents in this list. For sites where activities are conducted in response to an administrative or judicial order, this list would be an attachment to the order and would govern the work conducted pursuant to it. When entering into or issuing an order for a particular site, Ohio EPA reserves the right to modify this list to fully address the site conditions.

OHIO EPA POLICIES AND GUIDANCE DOCUMENTS

1. Best Available Treatment Technologies (BATT) for Remedial Response Program Sites, Ohio EPA Policy No. DERR-00-RR-016, Final, October 23, 1992
2. Guidelines and Specifications for Preparing Quality Assurance Project Plans, Ohio EPA, Division of Emergency and Remedial Response, Policy No. DERR-00-RR-008, March 1990
5. Wastewater Discharges Resulting from Clean-Up of Response Action Sites Contaminated with Volatile Organic Compounds, Ohio EPA Policy No. DSW-DERR 0100.027, Final, September 22, 1994

Revised July, 1999
Also, if there are any aquatic ecological concerns for the site under investigation please consult the following Biological Criteria documents:


U.S. EPA GUIDANCE DOCUMENTS AND OTHER USEFUL GUIDANCE


8. Use of monitored Natural Attenuation at Superfund, RCRA, Corrective Action, and Underground Storage Tank Sites, OSWER 9200.4-17, Interim Final, November 1997


Revised July, 1999
12. A Rationale for the Assessment of Errors in the Sampling of Soils, EPA/600/4-90/013, July 1990


22.* Guidance on Remedial Actions for Superfund Sites with PCB Contamination, OSWER Directive 9355.4-01, EPA/540/G-90/007, August 1990


25. Guidance for Data Usability in Risk Assessment, OSWER Directive 9285.7-05,
EPA/540/G-90/008, October 1990, interim final


37. Leachate Plume Management, EPA/540/2-85/004, November 1985

38. Preparation Aids for the Development of Category 1 Quality Assurance Project Plans,
EPA/6008-91-003, February 1991


Revised July, 1999


52. Superfund Ground Water Issue: Ground Water Sampling for Metals, EPA/540/4-89/001, March 1989


56. U.S. EPA Integrated Risk Information System (IRIS) Data Base

57. U.S. EPA Health Effects Assessment Summary Tables, Office of Emergency & Remedial Response, published annually


INNOVATIVE TECHNOLOGY AND REGULATORY COOPERATION PROTOCOLS


2. Multi-State Evaluation of Expedited Site Characterization Technology, Site

Revised July, 1999

3. Technology Review of SCAPS Thermal Desorption VOC Sampler-Final-


7. Cost & Performance reporting for In-Situ Bioremediation Technologies-Final-December 1997


14. Technical Requirements for On-Site Thermal Desorption of Solid Media Contaminated and Low Level Mixed Waste Contaminated with Mercury and/or Hazardous Chlorinated Organics-Final-September 1997

Notes:

Revised July, 1999
1) Documents and guidances denoted by an asterisk (*) are those which may be important to the Remedial Design/Remedial Action phase of a project but generally will have limited relevance to the Remedial Investigation/Feasibility Study process.

2) This list of guidance documents is updated periodically. You should check with Ohio EPA to verify that this list is the most current available.

3) The ITRC documents can be downloaded from the itrc web site, www.sso.org/ecos/itrc.