Reilly Tar & Chemical Corporation
Dover, Ohio Site

Work Plan
Remedial Investigation/Feasibility Study

Prepared for:
Reilly Industries, Inc.

Prepared by:
ENSR Consulting and Engineering
(Formerly ERT)

March 1991
Document Number 5660-018-100
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 INTRODUCTION</td>
<td>WP-1</td>
</tr>
<tr>
<td>2.0 TECHNICAL APPROACH</td>
<td>WP-6</td>
</tr>
<tr>
<td>3.0 DESCRIPTION OF THE STUDY AREA</td>
<td>WP-9</td>
</tr>
<tr>
<td>3.1 Location</td>
<td>WP-9</td>
</tr>
<tr>
<td>3.2 Physiography, Hydrology, Geology, and Land Use</td>
<td>WP-9</td>
</tr>
<tr>
<td>3.3 Water Usage</td>
<td>WP-13</td>
</tr>
<tr>
<td>3.4 Site History</td>
<td>WP-13</td>
</tr>
<tr>
<td>3.4.1 The Ohio Canal</td>
<td>WP-14</td>
</tr>
<tr>
<td>3.4.2 The Dover Blast Furnace</td>
<td>WP-15</td>
</tr>
<tr>
<td>3.4.3 Coke and Coal Tar Operations</td>
<td>WP-16</td>
</tr>
<tr>
<td>3.4.4 Slag Mining Operations</td>
<td>WP-17</td>
</tr>
<tr>
<td>3.4.5 Summary</td>
<td>WP-18</td>
</tr>
<tr>
<td>3.5 Previous Site Investigative History</td>
<td>WP-19</td>
</tr>
<tr>
<td>4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES</td>
<td>WP-25</td>
</tr>
<tr>
<td>4.1 Reilly Industries Project Coordinator</td>
<td>WP-25</td>
</tr>
<tr>
<td>4.2 Principal-in-Charge</td>
<td>WP-27</td>
</tr>
<tr>
<td>4.3 Program Manager</td>
<td>WP-27</td>
</tr>
<tr>
<td>4.4 Assistant Program Manager and RI Task Manager</td>
<td>WP-28</td>
</tr>
<tr>
<td>4.5 QA/QC Officer</td>
<td>WP-28</td>
</tr>
<tr>
<td>4.6 Health and Safety Officer</td>
<td>WP-29</td>
</tr>
<tr>
<td>4.7 Risk Assessment Task Manager</td>
<td>WP-29</td>
</tr>
<tr>
<td>4.8 FS Task Manager</td>
<td>WP-30</td>
</tr>
<tr>
<td>5.0 PROGRESS REPORTS AND SCHEDULE</td>
<td>WP-31</td>
</tr>
<tr>
<td>5.1 Monthly Progress Reports</td>
<td>WP-31</td>
</tr>
<tr>
<td>5.2 Deliverables</td>
<td>WP-32</td>
</tr>
<tr>
<td>5.3 Meetings</td>
<td>WP-32</td>
</tr>
<tr>
<td>5.4 Project Schedule</td>
<td>WP-33</td>
</tr>
<tr>
<td>6.0 SITE SPECIFIC PROJECT PLANS</td>
<td>WP-39</td>
</tr>
<tr>
<td>6.1 Site-Specific Sampling Plan</td>
<td>WP-39</td>
</tr>
<tr>
<td>6.2 Quality Assurance Project Plan</td>
<td>WP-40</td>
</tr>
<tr>
<td>6.3 Health and Safety Plan</td>
<td>WP-41</td>
</tr>
<tr>
<td>6.4 Data Management Plan</td>
<td>WP-42</td>
</tr>
<tr>
<td>6.5 Community Relations Plan</td>
<td>WP-42</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (Continued)

7.0 REMEDIAL INVESTIGATION - PHASE I
   7.1 Introduction
   7.2 Task 2 - Preliminary Project Activities
      7.2.1 Subcontractor Procurement
      7.2.2 Establishment of a Field Office
      7.2.3 Establishment of an Equipment Decontamination Station
      7.2.4 Collection and Review of Existing Data/Reports
      7.2.5 Well Inventory Survey
      7.2.6 Drum Inventory Survey
      7.2.7 Development of Data Quality Objectives and Preliminary ARARs
   7.3 Initial Field Activities
      7.3.1 Task 3 - Air Investigation
      7.3.2 Task 4 - Radiological Investigation
      7.3.3 Task 5 - Topographic Mapping and Ground Surveying
      7.3.4 Task 6 - Geophysical Survey
   7.4 Task 7 - Residual Waste, Surface Soil and Slag Characterization
      7.4.1 Previous Residual Waste Characterization Activities
      7.4.2 Phase I RI Surface Soil and Slag Sampling
   7.5 Task 8 - Subsurface Soils and Slag Investigation
      7.5.1 Boring Locations
      7.5.2 Drilling Procedures
      7.5.3 Soil and Slag Analyses and Characterization
   7.6 Task 9 - Hydrogeologic Investigation
      7.6.1 General Location Information
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.6.2 Well Screen Placement Selection Criteria</td>
<td>WP-75</td>
</tr>
<tr>
<td>7.6.3 Well Installation Procedures</td>
<td>WP-78</td>
</tr>
<tr>
<td>7.6.4 Monitoring Well Development</td>
<td>WP-80</td>
</tr>
<tr>
<td>7.6.5 Ground Water Monitoring</td>
<td>WP-81</td>
</tr>
<tr>
<td>7.6.5.1 Ground Water Elevations</td>
<td>WP-81</td>
</tr>
<tr>
<td>7.6.5.2 Well Labeling</td>
<td>WP-81</td>
</tr>
<tr>
<td>7.6.6 Ground Water Quality Sampling</td>
<td>WP-82</td>
</tr>
<tr>
<td>7.6.7 Aquifer Testing</td>
<td>WP-83</td>
</tr>
<tr>
<td>7.6.7.1 Insitu Hydraulic Conductivity Testing</td>
<td>WP-83</td>
</tr>
<tr>
<td>7.6.7.2 Aquifer Pump Test</td>
<td>WP-84</td>
</tr>
<tr>
<td>7.7 Task 10 - Surface Water and Sediment Investigation</td>
<td>WP-84</td>
</tr>
<tr>
<td>7.8 Sample Handling, Equipment Decontamination and Chain-of-Custody</td>
<td>WP-87</td>
</tr>
<tr>
<td>7.8.1 Sampling Kits</td>
<td>WP-87</td>
</tr>
<tr>
<td>7.8.2 Equipment Decontamination</td>
<td>WP-88</td>
</tr>
<tr>
<td>7.8.3 Sample Designation</td>
<td>WP-88</td>
</tr>
<tr>
<td>7.8.4 Field Sample Custody Procedures</td>
<td>WP-89</td>
</tr>
<tr>
<td>7.8.5 Documentation</td>
<td>WP-89</td>
</tr>
<tr>
<td>7.8.6 Sample Packaging and Shipment</td>
<td>WP-90</td>
</tr>
<tr>
<td>7.9 Task 11 - Analytical Program</td>
<td>WP-90</td>
</tr>
<tr>
<td>7.10 Task 12 - Phase I Date Analysis and Evaluation</td>
<td>WP-92</td>
</tr>
<tr>
<td>7.10.1 Review Available Data</td>
<td>WP-92</td>
</tr>
<tr>
<td>7.10.2 Summary of Phase I Results</td>
<td>WP-93</td>
</tr>
<tr>
<td>7.10.3 Agency Meetings</td>
<td>WP-93</td>
</tr>
<tr>
<td>8.0 TASK 13 - PHASE II REMEDIAL INVESTIGATION</td>
<td>WP-94</td>
</tr>
<tr>
<td>9.0 TASK 14 - ENDANGERMENT ASSESSMENT</td>
<td>WP-96</td>
</tr>
<tr>
<td>9.1 Identification of Contaminants of Concern</td>
<td>WP-97</td>
</tr>
<tr>
<td>9.2 Toxicity Assessment</td>
<td>WP-98</td>
</tr>
<tr>
<td>9.3 Exposure Assessment</td>
<td>WP-99</td>
</tr>
<tr>
<td>9.4 Risk Characterization</td>
<td>WP-100</td>
</tr>
<tr>
<td>9.5 Endangerment Assessment Report</td>
<td>WP-101</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (Continued)

10.0 TASK 15 - RI REPORT  
11.0 FEASIBILITY STUDY  
   11.1 Introduction  
   11.2 Task 16 - Remedial Alternatives Development/Screening  
      11.2.1 Preliminary Remedial Technology Screening  
      11.2.2 Development of Alternatives  
      11.2.3 Initial Screening of Alternatives  
   11.3 Task 17 - Alternatives Array Document  
   11.4 Task 18 - Post-Screening Field Investigation  
      11.4.1 Post-Screening Field Investigation Work Plan  
      11.4.2 Post-Screening Field Investigation Report  
   11.5 Task 19 - Bench and Pilot-Scale Treatability Tests  
   11.6 Task 20 - Remedial Alternatives Evaluation  
      11.6.1 Detailed Evaluation of Alternatives  
      11.6.2 Comparison of Alternatives  
   11.7 Task 21 - Feasibility Study Report  
12.0 DATA MANAGEMENT PROCEDURES  
   12.1 Technical Data  
   12.2 Administrative Data  

APPENDIX A - AIR INVESTIGATION RESULTS  
APPENDIX B - RADIOLOGICAL INVESTIGATION RESULTS  
APPENDIX C - RESIDUAL WASTE CHARACTERIZATION RESULTS
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table No.</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-1</td>
<td>PROJECT SCHEDULE</td>
<td>WP-34</td>
</tr>
<tr>
<td>7-1</td>
<td>ANALYTICAL PROGRAM</td>
<td>WP-91</td>
</tr>
<tr>
<td>10-1</td>
<td>REMEDIAL INVESTIGATION REPORT FORMAT</td>
<td>WP-103</td>
</tr>
<tr>
<td>11-1</td>
<td>FEASIBILITY STUDY REPORT FORMAT</td>
<td>WP-114</td>
</tr>
</tbody>
</table>

## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure No.</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1</td>
<td>SITE LOCATION MAP</td>
<td>WP-10</td>
</tr>
<tr>
<td>3-2</td>
<td>DETAILED AREA MAP</td>
<td>WP-11</td>
</tr>
<tr>
<td>3-3</td>
<td>MARCH 1985 MONITORING WELL LOCATIONS</td>
<td>WP-20</td>
</tr>
<tr>
<td>4-1</td>
<td>PROJECT ORGANIZATION</td>
<td>WP-26</td>
</tr>
<tr>
<td>7-1</td>
<td>AIR AND RADIOLOGICAL INVESTIGATION SAMPLING</td>
<td>WP-54</td>
</tr>
<tr>
<td>7-2</td>
<td>SEISMIC REfraction TRANSECT LOCATIONS</td>
<td>WP-59</td>
</tr>
<tr>
<td>7-3</td>
<td>GRID SYSTEMS FOR PHASE I RI SOIL AND SLAG INVESTIGATION AND THE FORMER CANAL Turning BASIN INVESTIGATION</td>
<td>WP-62</td>
</tr>
<tr>
<td>7-4</td>
<td>SOIL BORING LOCATIONS</td>
<td>WP-66</td>
</tr>
<tr>
<td>7-5</td>
<td>NEW MONITORING WELL LOCATIONS</td>
<td>WP-67</td>
</tr>
<tr>
<td>7-6</td>
<td>SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS</td>
<td>WP-85</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

The Remedial Investigation/Feasibility Study (RI/FS) Work Plan has been prepared pursuant to a unilateral Administrative Order (AO) issued by the U.S. Environmental Protection Agency, Region V, (U.S. EPA) to Reilly Tar and Chemical Corporation (RTCC) and Ronald and Lois Quillin on March 30, 1989, concerning a former coal tar refining site in Dover, Ohio. Reilly Tar & Chemical Corporation changed its name to Reilly Industries Inc. effective January 1, 1989. Accordingly all references in this Work Plan and supporting documents will be to Reilly Industries or the Reilly site. The Reilly site is defined as the former property boundaries of Reilly Tar & Chemical Corporation when it was in operation. The purpose of the RI will be to define the extent of contamination attributable to the site. References to Agency approval and notification will refer to the U.S. EPA, Region V. Copies of relevant documents, correspondence, reports, and data will be provided to both the U.S. EPA Region V and Ohio EPA. The primary objectives of the RI/FS for the Reilly site in Dover, Ohio are to characterize site conditions relative to air, water and soil media, provide a risk assessment based on constituents of concern, migration pathways, and potential receptors and to recommend remedial action, if necessary, that is consistent with the AO.

Phase I RI activities will concentrate within the site boundaries as defined in the AO by the former property boundaries of Reilly Tar & Chemical Corporation. Accordingly the Phase I RI study will focus upon characterization of onsite conditions and evaluate background conditions. Should the Phase I RI indicate the presence of contaminants within the former property boundaries and/or migration of contaminants beyond the former property boundaries, a Phase II RI program will be initiated to define the level and extent of such offsite migration.
Upon completion of the RI, a Feasibility Study (FS) will be performed to identify, develop, evaluate and select appropriate remedial options for site conditions.

Based upon existing data, potentially feasible remedial actions appropriate for consideration during the FS may include, but are not limited to, the following:

- No action;
- Removal and disposal of waste material;
- Solidification or stabilization of waste material;
- Treatment options such as incineration, bioremediation, etc.;
- In place reconstruction or encapsulation of waste material;
- Continued offsite monitoring;
- Limited access to contaminated areas;
- Ground water collection and treatment; and
- Construction of a clay or synthetic cap over the contaminated area(s).

In addition to the above, new technologies and advances in the state-of-the-art realized during the conduct of the remedial investigation may provide alternative remedial actions which would be considered for the Reilly site. At the present time, the available information concerning the site is insufficient to
provide a definitive selection, screening, and feasibility study of remedial action alternatives without completion of a phased remedial investigation.

The scope of work in this plan was prepared following a careful review of available data. The prescribed work is subject to revision as data are collected in the completion of successive RI tasks. It is the intent of this remedial investigation to retain flexibility so that adjustments in the Work Plan can be accommodated in accordance with professional judgment and technical need. Reilly Industries and its consultant (ENSR Consulting and Engineering) will be responsible for conducting most of the RI/FS activities described in this Work Plan with oversight and/or technical input from the U.S. EPA. Reilly Industries will inform the U.S. EPA of all field investigation work at least ten days in advance so that the U.S. EPA can participate in these investigations.

The scope of work for the RI/FS includes the following tasks:

- **Task 1 - Site Specific Project Plans**
- **Task 2 - Preliminary Project Activities**
  1) Subcontractor procurement
  2) Establishment of field office
  3) Establishment of equipment decontamination station
  4) Collection and review of existing data/reports
  5) Well inventory survey
  6) Drum inventory survey
  7) Development of DQOs and Preliminary ARARs
- **Task 3 - Air Investigation**
- **Task 4 - Radiological Investigation**
- **Task 5 - Topographic Mapping and Ground Surveying**
At certain points during the RI/FS, submissions will be made that require review and approval. All submissions will be reviewed and approved by the U.S. EPA. Copies of relevant documents will be provided to Ohio EPA for review. The RI/FS for the Reilly site is planned as a phased approach.

Tasks 1 through 12 are included in the Phase I RI. These activities are designed to characterize the environmental media at the site and to determine the level of ground water contamination beneath the site. After the data from these tasks has been evaluated, the scope for further investigation will be determined in a review meeting including Reilly Industries, the U.S. EPA, and Ohio EPA.

Should the Phase I data indicate the potential for offsite migration of constituents of concern (i.e., the presence of ground water or surface water contamination), a Phase II RI (Task 13) will
be initiated to define the level and extent of offsite migration of contamination attributable to the site. In addition, offsite contamination which is present at the site boundaries may require further investigation to determine the limits and extent of offsite contamination. An Endangerment Assessment (Task 14) will follow the Phase II RI and will define the impact of site conditions upon human health and the environment. The Remedial Investigation Report (Task 15) will summarize the data and serve as the basis for evaluating the need for source control or management of migration measures, both specific to identified Reilly site contaminant releases.

The FS portion of the project will include Tasks 16 through 21 and is designed to evaluate remedial response options and select the most viable remedial alternative.
2.0 TECHNICAL APPROACH

The objectives of the RI/FS for the Reilly site are as follows:

- Identify specific site contaminants posing acute or chronic hazards to public health, welfare, or the environment;

- Determine the level and extent of ground water, surface water, sediment, and soil contamination attributable to site sources that has occurred and the rate of contaminant migration;

- Determine present ground water gradients and assess contaminant migration;

- Identify pathways of contaminant migration for all media from the site; and

- Evaluate response alternatives necessary to remediate the site.

This work plan focuses on gathering the specific information necessary to evaluate the need for remediation at the Reilly site. It is a flexible document with work elements that can be expanded, reduced, or eliminated based on the data gathered during the project. Any change in scope will be reviewed by U.S. EPA and Ohio EPA and approved by the U.S. EPA prior to implementation.

The ensuing text describes in greater detail the technical approach that will be used at the Reilly Dover, Ohio site. A summary of the following sections of this document is provided below to assist the reader in identifying areas of interest and to
demonstrate how the goals of the technical approach will be accomplished.

Sections 3.0 through 5.0 of this Work Plan provide background information concerning the study area, project management and administration, and reporting and scheduling, respectively. Sections 6.0 through 12.0 provide details on the technical approach.

Section 3.0 defines the study area in detail. Included in this section are the site location, physical and geophysical descriptions, water usage, and the site history. The RI/FS project organization and management and key management elements needed to ensure the project's success are provided in Section 4.0. The progress reporting and schedule required by the Administrative Order is provided in Section 5.0. In addition, project reports, meetings, and milestones have been identified in this section.

Sections 6.0 through 10.0 describe the components or tasks that will be completed during the RI. Although Reilly is using a two-phased approach to the RI, certain site-specific project plans will be used for both phases. These plans are described in Section 6.0. The Phase I RI is described in detail in Section 7.0. This section provides the methodology, procedures, and equipment that will be used to conduct the Phase I RI. Following an evaluation of the data generated by the Phase I RI the need for a Phase II RI will be assessed and work elements will be defined. Should the data generated by the Phase I RI suggest the need for implementation of a Phase II investigation, work elements of the Phase II RI will be developed in accordance with the objectives described in Section 8.0. This section provides a general overview of potential activities which may be conducted. A more detailed description of the activities that may be needed will be developed and submitted to U.S. EPA after onsite conditions and the offsite scope of work are more clearly defined. Section 9.0 describes the activities that will be needed to conduct the Endangerment Assessment. The
activities presented in this section may be conducted after the Phase I RI is completed, should the data suggest no need for Phase II studies. Results of the work conducted in Sections 7.0 through 9.0 will be summarized, compiled, and evaluated and submitted in the RI Report described in Section 10.0.

The FS will be initiated following the RI Report and will include the activities presented in Section 11.0. The initial remedial alternatives development and screening is described in Section 11.2. Several documents will be submitted during the remedial alternatives development and screening studies. These documents include the Alternatives Array Document and the Post-Screening Investigation described in Sections 11.3 and 11.4, respectively. Bench- and pilot-scale treatability testing is described in Section 11.5. The detailed remedial alternatives evaluation will be based on information generated by the previous FS tasks as described in Section 11.6. Results of the FS will be summarized and presented in a FS report as described in Section 11.7.

Records management procedures are included in Section 12.0.
3.0 DESCRIPTION OF THE STUDY AREA

The location, physiography, hydrology, geology, land use, water use and history of Reilly Industries' former plant site in Dover, Ohio are discussed in the following sections.

3.1 Location

The site location is shown on Figure 3-1, a portion of the United States Geological Survey (USGS) topographic map of the Dover quadrangle (7.5 minute series), Tuscarawas County, Ohio.

The site is a 3.63 acre parcel of land situated in Dover, Ohio on Third Avenue, southeast of the junction of State Route 211 and State Route 39, three-quarters of a mile north of the junction of Sugar Creek and the Tuscarawas River. The site is bordered on the northeast by an abandoned canal turning basin. An urban area is located one-quarter mile east and north of the site. To the west, south and east are vacant and occupied industrial areas.

Figure 3-2 is a detailed site map showing nearby land area and structures.

3.2 Physiography, Hydrology, Geology, and Land Use

The site is located on a flood plain at the confluence of Sugar Creek and the Tuscarawas River. The Tuscarawas River flows south and is located approximately 1200 feet east of the site. Sugar Creek flows east and is located approximately 1/2 mile south of the site.

The site lies within an ancient river valley formed by stream erosion and filled with glacial outwash sediments. The sediments are predominately composed of coarse, permeable, sand and gravel deposits. The valley fill material may extend to depths of 240 to 290 feet in thickness over the bedrock.
FIGURE 3-1

SITE LOCATION MAP
REILLY INDUSTRIES, INC. SITE
DOVER, OHIO
FIGURE 3-2
DETAILED AREA MAP
REILLY INDUSTRIES, INC. SITE
DOVER, OHIO
The unconsolidated glacial outwash deposits comprise a highly productive, unconfined aquifer beneath the site. The aquifer is hydraulically interconnected to the surface creeks and rivers, and is capable of producing well yields of more than 500 gallons per minute. Induced infiltration from the overlying streams, rivers, and surface water bodies provides large amounts of industrial and municipal water supplies to area production wells completed in the valley fill deposits.

Underlying the Pleistocene valley fill deposits are Pennsylvanian Age sandstones, shales, limestones, and coals of the Allegheny Plateau. The bedrock typically forms a second aquifer with ground water movement taking place through secondary joints and fractures. The Pottsville Formation, a thin to thick coarse grained sandstone, is the most persistent member of the Pennsylvanian Series. The bedrock aquifer yields sufficient water for domestic and farm use.

Current land use adjacent to the study area is mainly commercial and residential north of the site towards the Dover downtown area and industrial to the west and southwest, although Shenango Steel is currently being decommissioned. Public power and sewage facilities are immediately east of the site, and an open and undeveloped industrial area south of the site is currently used for fill and borrow disposal. The southern area and the site itself were formerly used as a disposal area for molten blast furnace slag. The area around the site is heavily crisscrossed with abandoned and active railroad tracks. Groundwater at the site was encountered at 20 to 25 feet below the surface (References Nos. 15 and 18). The apparent direction of ground water flow, as determined from static water level measurements of existing site wells, is to the east and southeast towards the Tuscarawas River.
3.3 Water Usage

Ground water for industrial and domestic use is obtained from wells completed into the sand and gravel aquifer of the Sugar Creek and Tuscarawas River valleys. Both the cities of Dover and New Philadelphia currently use the valley-fill sediments as their water supply.

The City of Dover water is supplied by a municipal well field about 1.5 miles north-northwest and upgradient of the site. The wells are screened between 100 to 160 feet and pump approximately 2.25 million gallons per day to both residential and industrial users. The City of New Philadelphia also utilizes well water for its municipal supply. Three New Philadelphia deep wells screened at 125 feet are approximately 2.6 miles southeast of the site. The Dover and New Philadelphia municipal water systems, both of which are within a 3 mile radius of the site, together supply drinking water to approximately 38,700 people. Private wells within 3 miles of the site supply water to approximately 4,000 people, although no drinking water wells are apparently in the immediate vicinity of the site which is adjacent to downtown Dover, Ohio. A residential well survey will be performed to confirm the presence or absence of nearby drinking water wells and their locations.

3.4 Site History

The Reilly site is located on Third Street on the southwest edge of Dover in Tuscarawas County, Ohio. The site and adjacent areas have an extensive industrial history which began in the mid-1800's. The development of the site includes part of the Ohio Canal which paralleled the Tuscarawas River, the local pig iron blast furnace industry, a coking plant and foundry, and a coal tar refinery.
The coal tar refining operations were conducted on the site from approximately 1917 through 1956. During that time coal tar wastes accumulated on the ground from spillage and other site activities. Reilly Industries, Inc., (formerly Reilly Tar & Chemical Corporation) owned and operated the site as a coal tar refinery from 1932 to 1956. The site has been vacant and inactive since 1956 when Reilly Tar & Chemical Corporation sold the property. The property has passed through several owners since 1956 and is presently owned by Ronald and Lois Quillin.

The following discussion considers the history and development of the site area and includes sections on the Ohio Canal, the Dover Blast Furnace, coke and coal tar operations, and slag mining operations.

3.4.1 The Ohio Canal

The industrial history of Reilly's Dover, Ohio plant site begins with the construction of the Ohio Canal from 1826 to 1832 (Reference No. 4, page 13). The canal ran very near the Reilly plant site, running roughly north-south and parallel to the Tuscarawas River along the river's west bank. The plant site was located at the intersection of the canal and a dead-end turning basin, which led roughly 1000 feet from the canal towards the old industrial area of downtown Dover. The turning basin ran parallel to and about 25 feet from the northeast property line of the plant site. The eastern corner of the plant property was about 80 feet from the canal (Reference No. 7).

The canal's heyday was in the pre-Civil War years prior to the development of a major rail network. The canal's importance to industry declined in the late nineteenth century, and by the 1890's it was "limping along... badly in need of repair" (Reference No. 4, page 15). A major flood in the spring of 1913 "destroyed what remained of the canal" (Reference No. 1, page 17) and it has since
been filled in. It appears from old site maps (Reference Nos. 7 and 9) that the turning basin was filled in sometime in the 1930's or 1940's. It was unclear when the canal itself was filled, but it has been reported (Reference No. 6) that the canal was part of the city dump which operated south of the site from 1957 to 1969 based on an Ohio EPA report (Reference No. 5) and an interview with Mr. Don Dummermuth of Fiedler and Associates, the City Engineer for Dover. The former canal location is now occupied by the city wastewater treatment plant's access road (Reference No. 6).

3.4.2 The Dover Blast Furnace

The first major industry in the site area was a blast furnace, which was built in 1854-55 (Reference no. 1, page 8). This blast furnace operation "was located on the present site of the Village Plaza on the edge of downtown Dover" (ibid.), which is immediately across from the railroad track running along the northwest property line. The blast furnace "operated under several names until it closed in 1927 as Hanna Furnace Company" (ibid.). According to Hagloch's history of Tuscarawas County, the blast furnace "was started in Dover on the canal basin" in 1855, "changed hands many times and was rebuilt many times but stood for more than 70 years at what was then the foot of West Third Street... until it was abandoned in 1927" (Reference No. 2, page 89). Hagloch notes that "in 1878 a more modern furnace was constructed... (with) a capacity of 55 tons per day of pig iron" (ibid.). "In 1881 the Penn Iron & Coal Company was incorporated to take over the furnace. It was acquired in 1905 by Hanna Furnace Company of Cleveland which again rebuilt the plant. Operations were suspended in 1927 and the furnace was later razed" (ibid.).

After the demise of the blast furnace the Hanna property was apparently occupied by an oil storage terminal. The 1946 Sanborn map shows this property being occupied by a bulk oil terminal with
gasoline tanks, oils and grease storage, and a drum cleaning area. Correspondence from 1956 from Reilly's property files indicates that the property was then owned by Red Head Oil Company and was planned for development as a large supermarket. The current shopping plaza therefore appears to date from the late 1950's.

3.4.3 Coke and Coal Tar Operations

Hagloch states that "The Dover By-Products Coke Company established a coke oven plant at the Hanna Blast Furnace" (Reference No. 2, Page 137). Although no date is given, the context implies the period of 1914 to 1916. An Abstract of Title from Reilly's property file indicates that the Penn Iron & Coal Company sold 15 acres to Dover By-Products Coke Company in November 1915. Old Reilly property maps dated December 1916 and February 1917 show the adjacent property to the south labeled "The Dover By-Product Coke Co.". Apparently the coke ovens, owned by the Hanna Furnace Company, were built just prior to World War I to supply the Hanna blast furnace with coke, and possibly to sell by-product coke oven gas to the City of Dover for heating and lighting. The Hanna blast furnace and coke ovens were closed and demolished between 1929 and 1931.

The Dover coke ovens would have also produced coal tar as a by-product, which led to the start of the tar refinery operation that was later acquired by Reilly. Hagloch notes that "The Lewis Manufacturing Company established a chemical plant at the Hanna blast furnace after the coke ovens were built and the plant later became Reilly Tar & Chemical Corporation" (Reference No. 2, page 138). The Abstract of Title in Reilly's property files indicates that Penn Iron & Coal sold 2.2 acres to the F. J. Lewis Manufacturing Co. in March 1917. F. J. Lewis was acquired by International Combustion Tar & Chemical Corporation in 1928, which was in turn acquired by Reilly Tar & Chemical Corporation in 1932.
Reilly continued to operate the tar refinery until 1956, when the refinery was razed and the land sold to Messrs. Milinsky and Wilkof.

The precise operating history and characteristics of the F. J. Lewis/Reilly Tar & Chemical Corporation tar refinery are uncertain. A senior Reilly employee has reported that the plant focused on production, blending and packaging of road tars (Reference No. 3). Eaton provides a list of "Industries and Their Products in 1960" for Dover, which lists refined coke oven tar, road tar, roof coating paint, pitch, etc. for Reilly Tar and Chemical Corporation, although the date is inconsistent. The 1946 Sanborn map shows a "tar & gravel mixing plant" on the property immediately south of the plant, which apparently belonged to the Edgar Spring, Inc. "slage (sic) & hot mix" operation shown nearby. This is consistent with road tar being a major product. Hagloch states that "a spectacular fire destroyed the F. J. Lewis Manufacturing Company tar plant in Dover" (Reference No. 2, page 151) without giving a date, although the text implies about 1922. The plant was obviously repaired and continued to operate after this fire.

3.4.4 Slag Mining Operations

The Dover blast furnace operation would have generated enormous amounts of slag during its seventy-odd years of operation. Much of this slag apparently was run out molten onto adjacent land for disposal, at least in the early years of operation. It has been reported that the Reilly site property and a large area immediately south were covered with ten to twenty feet of this cooled slag (Reference No. 6). The Reilly site is still underlain by this slag, as evidenced by inspection of the embankment along the northeast property line, the old coke oven foundations to the south, and the drilling logs for monitoring wells installed at the site during March 1985 by Herron Consultants, Inc. and Ecology &
Environment, Inc. (REM/FIT). These logs indicate "fill debris," "concrete," and "concrete slag" extending to depths of nine to nineteen feet at monitoring Wells MW-2 through MW-5. To the south of the Reilly site, however, the slag has been mined out (presumably for use as road aggregate and/or railroad ballast) and the area backfilled. The 1926 Sanborn map, for example, shows that the Standard Slag Co. occupied land to the south of the F. J. Lewis tar plant, and correspondence from 1956 from Reilly's property files indicates that Farbizo Slag Company was the adjacent property owner. Slag mining during the 1940's and 1950's fits with Quillin's recollection, and also with the later use of at least part of this area by the City as a landfill (Reference No. 5) after the slag was mined out.

3.4.5 Summary

The former Reilly tar plant in Dover, Ohio was established and operated in an old, heavy industrial setting. The plant was built about 1917 by the F. J. Lewis Manufacturing Co. on a parcel of land sandwiched between the Hanna Furnace Co. blast furnace facility and the coke oven facility of the Dover By-Products Coke Company. A blast furnace was first established on the Hanna property in 1855 and was in operation until 1927. The coke ovens were built around 1916 and operated for an unknown period before being demolished. The Hanna property was later occupied by a bulk oil terminal, which was replaced by the present shopping center in the late 1950's.

The tar refinery was built on top of ten to twenty feet of slag disposed there earlier by the blast furnace operations. A large area south of the refinery was also covered with slag, which was mined out during the 1940's and 1950's. This mined area, and the former Ohio Canal running along the east border of this area, were then used as a city dump from at least 1957 to 1969. There is some indication from aerial photographs that portions of the Ohio
Canal were filled with municipal waste and trash prior to this period.

3.5 Previous Site Investigative History

Reilly submitted a Notification of Hazardous Waste Site Form (No. 8900-1) to the U.S. EPA in June of 1981. The form identified the general and specific types of waste possibly present at the site to be "organic" and "creosote", respectively. During March of 1985, five ground water monitoring wells were installed on the site by Herron Consultants, Inc., with personnel from Ecology & Environment, Inc. Region V FIT supervising the work. The work was performed to generate ground water data for the Hazard Ranking System model.

The five wells were installed using standard hollow-stem auger drilling techniques and were screened exclusively within the alluvial material. However, no attempt was made during drilling to case off the surficial tar and slag deposits from the borings. Accordingly, these wells may have been contaminated with tar, asphalt, slag or other materials during drilling and should not be used for ground water sampling.

Ground water was found to flow southeast across the site. Tar was detected in one well, Monitoring Well MW-3. Ground water sampling was conducted to determine whether contaminants were leaking into the ground water. Three of the wells, Monitoring Wells MW-2, MW-4, and MW-5, were found to contain polycyclic aromatic hydrocarbons. None were detected in the upgradient well (Monitoring Well MW-1). Well locations are indicated on Figure 3-3. More detailed information on sampling results is provided in the AO.

The report summarizing this investigation was dated February 11, 1986 and titled "Hydrogeologic Report on the Reilly Tar and Chemical Company Site, Dover, Ohio" (Reference No. 15).
A Hazard Ranking Score was prepared for the site based on limited information and assumptions concerning the risk to the local population, the potential migration of hazardous substances in the ground water, the potential contamination of drinking water supplies, and the potential for direct contact. The site was scored at 31.38 and was subsequently proposed for the National Priorities List (NPL) on July 24, 1988. The site has not been finalized on the NPL as of the submission date of this Work Plan.

In July 1988 seven soil samples were collected and analyzed for polycyclic aromatic hydrocarbons (PAHs) by the U.S. EPA. Results of the analyses indicated the presence of PAH compounds common to coal tar. The background soil sample detected only trace amounts of a few PAH compounds.

The site was fenced in early October 1988 by Ronald Quillin and Reilly Industries in accordance with a Consent Order executed with U.S. EPA (Docket No. V-W-88-C-131). The fencing work was performed in accordance with plans approved by the U.S. EPA.

On March 30, 1989, a unilateral Administrative Order (Docket No. V-W-89-C-010) was issued by the U.S. Environmental Protection Agency (EPA) under Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA) to Reilly Tar & Chemical Corporation (now doing business as Reilly Industries) and Ronald and Lois Quillin (co-respondents and current owners of the site). The effective date of the Administrative Order is May 7, 1989.
REFERENCES


3. Lesher, Carl (Reilly Industries V.P.), personal communications with J.C. Craun (Reilly Industries), 1988


7. Reilly Industries, Inc., selected maps from Dover plant property file, in particular:
   - Plat of Property Owned by The Hanna Furnace Co. in Dover, Ohio (dated Dec. 29, 1921)
REFERENCES (Continued)


10. Barber, p.5, 1989 Ground-Water Resources of Tuscarawas County, Ohio Department of Natural Resources, Division of Water.

11. HRS Summary Addendum, Reilly Tar and Chemical Corporation, Third Street, Dover, Ohio, N.OHD980610042.


REFERENCES (Continued)


17. Schmidt, D. J., 1962, Ohio Water Plan Inventory, Middle Tuscarawas River and Sugar Creek Basins, Underground Water Resources; Ohio Department of Natural Resources, Division of Water.

18. ENSR Comments on The Proposed NPL Listing of the Reilly Tar and Chemical Corporation Site, Dover, Ohio, August 1988.

(1) These references are available at the Dover Historical Society Library.
4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Key Reilly Industries and ENSR Consulting and Engineering project personnel and associated responsibilities are discussed below and presented in the project organization chart shown in Figure 4-1.

Reilly Industries Project Coordinator:
James E. Bratina

ENSR Principal-in-Charge:
Robert W. Rittmeyer, P.E.

ENSR Program Manager:
John J. Duck, P.G.

ENSR Assistant Program Manager and R I Task Manager:
Matthew Cousino

ENSR QA/QC Officer:
Scott Whittemore

ENSR Health and Safety Officer:
Kathy Harvey

ENSR FS Task Manager:
Frank Myerski

ENSR Risk Assessment Task Manager:
Paul Anderson

4.1 Reilly Industries Project Coordinator

The project will be organized so as to provide the most efficient use of project personnel. Coordination with U.S. EPA will be the responsibility of Mr. James E. Bratina, Reilly Industries' designated Project Coordinator. His responsibilities include scheduling, manpower allocation, overseeing the technical quality of the project and appropriate Quality Assurance/Quality Control (QA/QC) procedures, reviewing technical reports, and
FIGURE 4-1

PROJECT ORGANIZATION
REILLY INDUSTRIES, INC. SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
coordinating among the parties. The Reilly Industries' Project Coordinator will also have the responsibility for oversight of ENSR's RI/FS work, as well as interacting with the U.S. EPA and Ohio EPA Project Coordinators. The Project Coordinator will provide corporate direction for each phase of the RI/FS project.

4.2 Principal-in-Charge

Robert Rittmeyer, Principal and General Manager of ENSR's Pittsburgh Office, has been designated as the Principal-in-Charge (PIC) for the project. In this capacity, Mr. Rittmeyer will ensure that the Program Manager receives the necessary internal corporate and technical support and that the ENSR program satisfactorily meets the client's requirements. Mr. Rittmeyer will also serve as an alternate line of communication into ENSR's project team.

4.3 Program Manager

The Program Manager is John Duck. The Program Manager will coordinate all field and subcontractor activities, as well as interact with the Reilly Industries Project Coordinator. The Program Manager will coordinate the activities of the QA/QC Officer, Health and Safety Officer, and Task Managers and will provide a liaison between them and the Project Coordinator. In addition, the Program Manager will be responsible for:

- Scheduling, committing, and coordinating appropriate ENSR resources;
- Providing project leadership and direction;
- Monitoring and meeting schedule and budgetary goals; and
Ensuring acceptability and timely submission of project deliverables.

4.4 Assistant Program Manager and RI Task Manager

Mr. Matthew Cousino has been designated as Assistant Program Manager and RI Task Manager. He will be responsible for assisting the Program Manager and ensuring coordination among the many RI/FS activities.

As RI Task Manager, Mr. Matthew Cousino will be responsible for daily site operations including the following:

- Management of field personnel;

- Reporting progress to the Program Manager;

- Conducting field activities;

- Compliance with the QAPP; and

- Preparation of the RI Report.

The RI Task Manager may also serve as a designated alternate QA/QC Officer as necessary.

4.5 QA/QC Officer

Mr. Scott Whittemore has been designated as the QA/QC Officer responsible for ensuring that field, office and laboratory activities and analyses are conducted in accordance with the Quality Assurance Project Plan (QAPP). He or his designated representatives will be responsible for ensuring the following:
- Accurate and complete records are maintained in log books;

- Appropriate sampling and chain-of-custody procedures are followed;

- Equipment is properly calibrated and maintained; and

- Laboratory and field data are validated.

The QA/QC Officer or his representative will also conduct periodic Performance Audits and System Audits to ensure data meets Data Quality Objectives (DQOs) established in the RI/FS Site-Specific Sampling Plan and QAPP. QA/QC problems will be documented in writing and corrective actions will be instituted, as necessary.

4.6 Health and Safety Officer

Ms. Kathy Harvey has been designated as Health and Safety Officer for the project. She will have the responsibility for overseeing the health and safety aspects of field investigations associated with the project.

4.7 Risk Assessment Task Manager

Dr. Paul Anderson, Senior Toxicologist and Manager of ENSR's Risk Assessment Group, will be the Risk Assessment Task Manager for the Endangerment Assessment. Dr. Anderson will be responsible for preparing a quantitative risk assessment and developing appropriate health-based cleanup levels for the site.
4.8 FS Task Manager

Mr. Frank Myerski will serve as the FS Task Manager. In this capacity, Mr. Myerski will be responsible for developing a set of remedial action alternatives for the site based upon the results of the RI. These alternatives will be screened and evaluated based upon criteria such as feasibility, effectiveness and cost. Mr. Myerski will also be responsible for preparation of the FS Report.
5.0 PROGRESS REPORTS AND SCHEDULE

5.1 Monthly Progress Reports

As required by the unilateral Administrative Order, monthly progress reports will be prepared summarizing the activities accomplished during the preceding month and the expected activities to be accomplished during the coming month. These reports will be submitted by the tenth calendar day of each month. Monthly reports will include information pertaining to the following:

- A description of the action(s) which have been taken toward achieving compliance with the Order;

- A description of difficulties encountered in performing work during the reporting period and of actions taken or being taken to rectify problems;

- Results of sampling and analysis and all other raw data generated during the month;

- Plans and procedures completed during the past month, as well as such action, data, and plans which are scheduled for the next month;

- Target and actual completion dates for each activity, including project completion, and an explanation of any deviation from the schedule in the Work Plan;

- Photos illustrating actions taken by Reilly at the site; and

- Changes in key personnel carrying out the RI/FS.
In the event that a monthly progress report cannot be submitted by the tenth calendar day of the month Reilly will verbally inform U.S. EPA of the late delivery of the monthly report prior to its due date. Reilly Industries may also request from U.S. EPA that reporting of raw data in a monthly report be waived and reported in the RI Report or a technical memorandum instead.

5.2 Deliverables

Reports and deliverables containing the results of the phases, tasks and activities of the RI/FS will be submitted to the U.S. EPA and Ohio EPA in accordance with the schedule provided in the AO. These reports and deliverables are:

- Draft and Final Phase I RI Work Plan;
- Draft and Final Phase I RI Report;
- Draft and Final Phase II RI Work Plan Addendum;
- Draft and Final Endangerment Assessment;
- Draft and Final RI Report (Phase I and II);
- Draft and Final Alternatives Array Document;
- Draft and Final Post-Screening Field Investigation Report, if necessary; and
- Draft and Final Feasibility Report.

Reports will be delivered according to the schedule provided in Section 5.4. Should the reports incur a delay due to unforeseen circumstances beyond the control of Reilly Industries, reports will be submitted pursuant to an Agency approved schedule modification.

5.3 Meetings

There will be at least four meetings scheduled during the course of the RI/FS. The meetings will be conducted with
representatives of U.S. EPA, Ohio EPA, and Reilly Industries. These meetings have been established at key decision points when sufficient technical data have been accumulated to determine the need for and applicability of future courses of action. The meetings will occur at the following points:

- Completion of the Phase I Remedial Investigation;
- Completion of the Draft RI Report;
- Completion of the Alternatives Array Document; and
- Completion of the Feasibility Study.

Other meetings may also be required, such as at the end of a Post-Screening Field Investigation, if performed, or at such other times as the Project Coordinators deem appropriate.

5.4 Project Schedule

The schedule required by the AO for the RI/FS is presented in Table 5-1. The scheduled duration of the entire project, from the effective date of the CERCLA Section 106 unilateral Administrative Order until the EPA approval of the Feasibility Study Report is approximately 31.5 months. The schedule allows 14 months for completion and reporting of the RI and 17.5 months for the FS, and was developed assuming 30 day review periods by the U.S. EPA as identified in Table 5-1. The project schedule does not accommodate any time periods necessary to accomplish
TABLE 5-1
PROJECT SCHEDULE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
REILLY INDUSTRIES, INC. SITE
DOVER, OHIO

<table>
<thead>
<tr>
<th>PROJECT TASK</th>
<th>PERIOD OF PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Date of Order</td>
<td>Week 1</td>
</tr>
<tr>
<td>Prepare RI/FS Work Plan</td>
<td>Week 1 to Week 6</td>
</tr>
<tr>
<td>Submit RI/FS Work Plan</td>
<td>Week 6</td>
</tr>
<tr>
<td>EPA Review of RI/FS Work Plan</td>
<td>Week 6 to Week 10</td>
</tr>
<tr>
<td>Revisions to RI/FS Work Plan</td>
<td>Week 10 to Week 12</td>
</tr>
<tr>
<td>Submit Final RI/FS Work Plan</td>
<td>Week 12</td>
</tr>
<tr>
<td>Initiate RI/FS Work Plan</td>
<td>Week 12 to Week 13</td>
</tr>
<tr>
<td>Perform Phase I RI</td>
<td>Week 12 to Week 24</td>
</tr>
<tr>
<td>Prepare Draft Phase I RI Report</td>
<td>Week 24 to Week 28</td>
</tr>
<tr>
<td>Submit Draft Phase I RI Report</td>
<td>Week 28</td>
</tr>
<tr>
<td>EPA Review of Phase I RI Report</td>
<td>Week 28 to Week 32</td>
</tr>
<tr>
<td>Revisions to Phase I RI Report</td>
<td>Week 32 to Week 34</td>
</tr>
<tr>
<td>Submit Final Phase I RI Report</td>
<td>Week 34</td>
</tr>
<tr>
<td>Prepare Draft Phase II RI Addendum to Work Plan</td>
<td>Week 24 to Week 28</td>
</tr>
<tr>
<td>Submit Draft Phase II RI Addendum to Work Plan</td>
<td>Week 28</td>
</tr>
<tr>
<td>EPA Review of Draft Phase II RI Addendum to Work Plan</td>
<td>Week 28 to Week 32</td>
</tr>
<tr>
<td>Revisions to Phase II RI Addendum to Work Plan</td>
<td>Week 32 to Week 34</td>
</tr>
<tr>
<td>Submit Final Phase II RI Addendum to Work Plan</td>
<td>Week 34</td>
</tr>
<tr>
<td>PROJECT TASK</td>
<td>PERIOD OF PERFORMANCE</td>
</tr>
<tr>
<td>------------------------------------------------------------</td>
<td>-----------------------</td>
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<tr>
<td>Perform Phase II RI</td>
<td>Week 34 to Week 42</td>
</tr>
<tr>
<td>Prepare Draft Endangerment Assessment Report</td>
<td>Week 42 to Week 48</td>
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<td>Submit Draft Endangerment Assessment Report</td>
<td>Week 48</td>
</tr>
<tr>
<td>EPA Review of Draft Endangerment Assessment Report</td>
<td>Week 48 to Week 54</td>
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<tr>
<td>Revisions to Draft of Endangerment Assessment Report</td>
<td>Week 54 to Week 56</td>
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<tr>
<td>Submit Final Endangerment Assessment Report</td>
<td>Week 56</td>
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<td></td>
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<tr>
<td>Prepare Draft RI Report</td>
<td>Week 42 to Week 48</td>
</tr>
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<td>Submit Draft RI Report</td>
<td>Week 48</td>
</tr>
<tr>
<td>EPA Review of Draft RI Report</td>
<td>Week 48 to Week 54</td>
</tr>
<tr>
<td>Revisions to Draft RI Report</td>
<td>Week 54 to Week 56</td>
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<tr>
<td>Submit Final RI Report</td>
<td>Week 56</td>
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<td></td>
<td></td>
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<tr>
<td>Prepare Alternatives Array Document</td>
<td>Week 56 to Week 62</td>
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<td>Submit Alternatives Array Document</td>
<td>Week 62</td>
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<tr>
<td>EPA Review of Alternatives Array Document</td>
<td>Week 62 to Week 66</td>
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<tr>
<td>Revisions to Alternatives Array Document</td>
<td>Week 66 to Week 68</td>
</tr>
<tr>
<td>Submit Final Alternatives Array Document &amp; Recommendation</td>
<td>Week 68</td>
</tr>
<tr>
<td>if Post-Screening Field Investigation is Needed</td>
<td></td>
</tr>
<tr>
<td>EPA Notification That a Post-Screening Field Investigation</td>
<td>Week 72</td>
</tr>
<tr>
<td>is Needed</td>
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</tr>
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<td>PROJECT TASK</td>
<td>PERIOD OF PERFORMANCE</td>
</tr>
<tr>
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<td>------------------------</td>
</tr>
<tr>
<td>Prepare Post-Screening Field Investigation Work Plan</td>
<td>Week 72 to Week 78</td>
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<td>Submit Post-Screening Field Investigation Work Plan</td>
<td>Week 78</td>
</tr>
<tr>
<td>EPA Review of Post-Screening Investigation Work Plan</td>
<td>Week 78 to Week 82</td>
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<td>Revisions to Post-Screening Field Investigation Work Plan is Needed</td>
<td>Week 82 to Week 84</td>
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<tr>
<td>Submit Final Post-Screening Field Investigation Work Plan</td>
<td>Week 84</td>
</tr>
<tr>
<td>Perform Post-Screening Field Investigation</td>
<td>Week 84 to Week 97</td>
</tr>
<tr>
<td>Prepare Draft Post-Screening Field Investigation Report</td>
<td>Week 98 to Week 101</td>
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<tr>
<td>Submit Draft Post-Screening Field Investigation Report</td>
<td>Week 102</td>
</tr>
<tr>
<td>EPA Review of Draft Post-Screening Field Investigation Report</td>
<td>Week 102 to Week 106</td>
</tr>
<tr>
<td>Revisions to Draft Post-Screening Field Investigation Report</td>
<td>Week 106 to Week 108</td>
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<tr>
<td>Submit Final Post-Screening Field Investigation Report</td>
<td>Week 108</td>
</tr>
<tr>
<td>Preparation of Draft FS Report</td>
<td>Week 108 to Week 120</td>
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<tr>
<td>Submit Draft FS Report</td>
<td>Week 120</td>
</tr>
<tr>
<td>EPA Review of FS Report</td>
<td>Week 120 to Week 124</td>
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<tr>
<td>Revisions to FS Report</td>
<td>Week 124 to Week 126</td>
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<tr>
<td>Submit Final FS Report</td>
<td>Week 126</td>
</tr>
<tr>
<td>Submit Notification of Completion and Final Report</td>
<td>Week 126</td>
</tr>
</tbody>
</table>
additional field work requested beyond what is presently included in the Work Plan and the Site Specific Sampling Plan. The schedule does not account for the following types of problems which Reilly may encounter:

- Extended laboratory/analytical time requirements;
- QA/QC performance;
- Requirements for additional or more complex sampling and/or treatability studies;
- Delays in mobilization or access to necessary equipment;
- Prolonged unsatisfactory weather conditions;
- Unanticipated site conditions;
- Complex community relations activities;
- Delays in obtaining any required access to offsite sampling locations; and
- Delays in U.S. EPA review and approval of plans or reports.

Reilly will perform the activities set forth in the Work Plan within the time limits shown on Table 5-1 unless performance is delayed by events beyond Reilly's control. Any problems that Reilly encounters which could affect the satisfactory completion of the RI/FS within the scheduled time will be immediately brought to the attention of the U.S. EPA Project Coordinator. If the U.S. EPA Project Coordinator agrees that the delay in question is
attributable to an event beyond Reilly's control, the time period for performance will be extended accordingly. Additionally, the schedule incorporates decision points which require U.S. EPA review and approval of proposed activities to be undertaken during the RI. Should U.S. EPA review exceed the time period currently allocated in the schedule, revisions to the schedule may be necessary and would be submitted by Reilly to the U.S. EPA for approval.
6.0 SITE SPECIFIC PROJECT PLANS

Pursuant to the AO, Reilly has developed several site specific project plans. The plans were prepared according to the guidance provided in U.S. EPA "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA Interim Final" (EPA/540/6-89/004) and "Interim Guidelines and Specifications for Preparing Quality Assurance Plans" (OAMS - 005/80). These plans comprise Task 1 of the Phase I RI for the Reilly Dover, Ohio site. The plans included in this task are:

1. Site Specific Sampling Plan;
2. Quality Assurance Project Plan;
3. Health and Safety Plan;
4. Data Management Plan; and
5. Community Relations Plan.

The functions of these plans are described in greater detail below.

6.1 Site-Specific Sampling Plan

The Site-Specific Sampling Plan (SSSP) contains the detailed operational schedule and describes the procedures and methodology utilized to collect and analyze soil, ground water, surface water, and sediment samples. This plan provides information pertaining to:

1. Sample types and locations;
6.2 Quality Assurance Project Plan

A site specific Quality Assurance Project Plan (QAPP) was developed by Reilly Industries pursuant to EPA guidance. The QAPP contains the QA/QC objectives for field and laboratory tasks. A key element of the QAPP is the establishment of quality control guidelines for:

- Field procedures;
- Sample collection;
- Chain-of-custody;
- Cleaning and decontamination to prevent cross-contamination;
- Data verification and validation;
- Internal and external QC audits; and
- Procedures to assess data accuracy, precision and completeness.

The laboratory or laboratories chosen for the analysis of environmental media will be approved under the Contract Laboratory Program (CLP) by the U.S. EPA for such work, and will be required to prepare QA/QC procedures for these activities. All guidelines, procedures and methods included in the QAPP are consistent with applicable Federal and State requirements.

A copy of the draft QAPP is provided to the U.S. EPA and Ohio EPA as a separate document for review and comment. Upon receipt of written review comments, the draft QAPP will be reviewed and submitted to the U.S. EPA for final approval.

6.3 Health and Safety Plan

A health and safety assessment of available information was conducted to determine whether potentially hazardous chemical exposure levels are associated with the site. Available site information was examined to select and implement adequate warnings and safeguards for investigators or other onsite visitors.

Findings from the assessment of available information were used to develop a site specific Health and Safety Plan (HSP). This plan is consistent with Federal, State, and local health and safety guidelines and procedures. The primary objective for the HSP is to establish health and safety guidelines, requirements and procedures prior to initiation of project activities. In doing so, the HSP provides a guide for personnel involved in the performance of the RI. The plan focuses on the use of personal protective equipment to minimize exposure to hazardous materials through inhalation or
direct contact when performing work at the site. Key elements of the HSP are designed to:

- Ensure adequate training and equipment to safely perform the specific work tasks;

- Protect the general public during the project activities; and

- Establish a program for the monitoring of worksite conditions to verify initial safety requirements and to modify protection levels as necessary.

A copy of the draft HSP is provided to the U.S. EPA and Ohio EPA as a separate document for review and comment. Upon receipt of written review comments, the plan will be revised and submitted to U.S. EPA for final approval.

6.4 Data Management Plan

The Data Management Plan (DMP) describes the types of data obtained or generated during the RI/FS project, and the methods used to store and reference such data. The DMP establishes laboratory and data documentation procedures and project file requirements. For purposes of simplicity the DMP has been incorporated into the RI/FS Work Plan.

6.5 Community Relations Plan

Pursuant to the Statement of Work attached to the AO, the U.S. EPA will take the lead role in providing information about the site to the community and orchestrating meaningful community involvement in the RI/FS process.
7.0 REMEDIAL INVESTIGATION - PHASE I

7.1 Introduction

The Phase I RI will consist of seven work elements incorporating twelve tasks. These work elements include: Preliminary Activities; Initial Field Activities; Residual Waste Characterization; Soils Investigation; Hydrogeologic Investigation; Surface Water and Sediment Investigation; and Data Analysis and Evaluation. These work elements have been designed to characterize the nature and extent of potential environmental impacts resulting from the release of site constituents, to identify and characterize potential sources of ground water contaminants, and to determine potential migration pathways and routes.

Two components of the Initial Field Activities, the Air Investigation and Radiological Investigation, were performed with Agency approval prior to the submittal of this RI. The results of those initial activities (Appendices A and B) have been incorporated into the RI and were used to plan RI/FS work activities.

The Residual Waste Characterization element was also performed prior to the submittal of this RI Work Plan. The results of the characterization program are reported in Appendix C.

In order to better define the work elements necessary to complete the RI, a decision-making point has been identified at the completion of the Phase I RI to provide for an evaluation of findings and allow definition of Phase II RI task activities and U.S. EPA and Ohio EPA review of the Phase II RI work elements. This project decision point is reflected in the project schedule in Section 5.0 and will coincide with the Reilly meeting with the U.S. EPA and Ohio EPA to discuss modifications to existing Work Plan elements or addition of new elements to address informational needs for the Phase II RI. The intent of Work Plan modifications will be to continue to focus upon data pertinent to remedial solutions for
site conditions. The following sections describe the above work elements and associated project tasks in greater detail and provide a framework for execution of project activities necessary to meet the objectives of the Administrative Order.

7.2 Task 2 - Preliminary Project Activities

7.2.1 Subcontractor Procurement

The various field activities planned for completion during Phase I of the RI will require a qualified subcontractor to provide a variety of specialized field services including soil boring and soil sampling, core drilling, and monitoring well installation. A qualified soil boring and well installation subcontractor will be required during the soil boring and monitoring well phases identified in Sections 7.5 and 7.6.

Reilly will solicit statements of qualifications from several drilling firms which meet the following criteria:

- Proven experience on a variety of hazardous waste sites, including Superfund sites;

- Proven geotechnical capabilities;

- Adequate experienced staff and equipment inventory and supplies;

- State of Ohio certification for completion of borings and well installations;

- Employee health and safety training certification in accordance with the provisions of OSHA 29 CFR 1910 and SARA Section 126(d); and
Appropriate contractor/worker liability insurance coverage.

Statements of qualifications (SOQs) and estimates of cost will be requested from the following drilling firms:

- Bowser and Morner, Dayton, Ohio;
- Ohio Drilling, Inc., Massillon, Ohio;
- Layne Northwest Co., Inc., Columbus, Ohio; and
- Pennsylvania Drilling, Pittsburgh, Pennsylvania.

Each of the above-listed companies will receive a proposed scope of work for specific tasks identified in Sections 7.5 (Task 8 - Soils and Slag Investigation) and 7.6 (Task 9 - Hydrogeologic Investigation). The appropriate qualified subcontractor(s) will be selected by Reilly and all appropriate contractual requirements will be finalized prior to initiation of field work. One or more subcontractors may be required dependent upon experience and equipment availability. Other subcontractors not listed above may be contacted as necessary to execute field activities for the Phase I RI. Reilly has also selected Keystone Environmental Resources, Inc. of Houston, Texas and ENSECO, Inc.'s Rocky Mountain Analytical Laboratory in Arvada, Colorado, to perform the surface and ground water, soils, and waste material characterizations.

As required in the AO, subcontractors used to perform RI activities will be approved by the U.S. EPA prior to the initiation of the corresponding project task.
7.2.2 Establishment of a Field Office

The anticipated magnitude and duration of the Phase I field activities will require that a field office be established for use by the ENSR field team for the duration of tasks identified in Sections 7.5, 7.6 and 7.7. The field office will consist of a trailer with phone and electrical service located next to the entry gate of the Reilly site.

The field office will be utilized by the field team for administrative activities, communications, subcontractor meetings, storage of field supplies and sampling equipment, and temporary storage of environmental samples. A portion of the field office will also be reserved for field filtration of water samples collected for metals analysis, and for packaging of sample shipments.

7.2.3 Establishment of an Equipment Decontamination Station

The majority of field activities that are proposed for Phase I of the RI involve a variety of subsurface drilling operations including completion of soil borings and soil sampling, rock coring, and installation of monitoring wells. In order to maintain clean working conditions during completion of each boring it will be required that all drilling equipment be properly decontaminated. Drilling equipment such as hollow-stem augers, drive-and-wash or cable tools will be steam-cleaned following completion of each borehole. Equipment decontamination will be performed during all RI boring activities.

It is anticipated that the decontamination area will be constructed within the southwest portion of the site adjacent to the gate and office trailer and north of the roadway access to the site. The decontamination area will be constructed in such a
manner that the working surface will be relatively impermeable to allow for retention and collection of runoff. A concrete pad will be constructed to collect decontamination fluids. The pad will be sloped to allow decontamination fluids to collect in a sump at one end. Water in the sump will be pumped or allowed to drain into a collection tank. The pad will have a 4-inch high berm around its perimeter to prevent fluids from draining off the pad. The pad will be approximately 4 inches thick, 15 feet wide, and 20 feet long. An accessible supply of water will be provided for operation of the cleaning equipment (i.e., a tank truck or water tank).

Overspray generated during decontamination of the drill rig, auger flights and other large pieces of equipment will be contained by means of temporary walls of plastic sheeting at least 3 feet high which will be erected around the perimeter of the decontamination pad.

Decontamination of drilling equipment will be completed through the use of an electrically or gas-powered high pressure wash/steam cleaner. Wastewater will be collected by a sump pump or directed to a containment system such as a shallow-buried or above ground tank. Some difficulties with operation of the cleaning system may occur if drilling operations occur during the mid-winter months. The potential exists for freezing of water supply lines, including hydrants (if used), and for freezing of wastewater prior to or during collection. Various measures for maintaining thawed working conditions may be required such as storage of water supply lines in heated areas between uses. Decontamination fluids for cleaning drilling equipment will consist primarily of water with provision to add a detergent solution if difficult cleaning conditions are encountered.

The decontamination area will be dismantled following completion of the RI field investigation program. It is currently anticipated that wastewater collected in an onsite holding tank will be disposed of at the New Philadelphia, Ohio POTW. Any
wastewater discharged to the New Philadelphia POTW will be approved by the Ohio EPA Division of Water Pollution Control (i.e., David O'Toole in Logan, Ohio) and the City of New Philadelphia. Reilly Industries, Inc.'s Cleveland, Ohio facility has been identified as an alternative for disposal of decontamination waters.

Drilling cuttings will be drummed for disposal in accordance with applicable regulations and with the approval of the Agency. Depending upon Agency guidance, cutting materials may be stored and disposed of as part of the remedial remedy to be identified following completion of the Feasibility Study.

Sampling equipment that is repetitively used during completion of each boring such as split spoons and tools will be cleaned at the drilling site using established equipment decontamination procedures provided in Appendix B of the QAPP.

7.2.4 Collection and Review of Existing Data/Reports

Federal, State, and local agencies will be contacted to obtain available information on the Dover, Tuscarawas County, Ohio area. Agencies to be contacted will include, but not be limited to: U.S. EPA; Ohio EPA; Ohio Department of Natural Resources (ODNR); Ohio Geological Survey (OGS); Dover Historical Society; and the U.S. Soil Conservation Service.

Other available documents will be reviewed and personal interviews will be conducted. An example of such documents is "The History of Tuscarawas County, Ohio" by Henry C. Hagloch (1956).

Other sources of information will include aerial photographs and historical plant and/or property maps.

7.2.5 Well Inventory Survey

A phased approach residential well survey will be performed. Phase I of the well inventory survey will be conducted during the
Phase I RI to locate wells within a 0.5-mile radius from the site. The survey will be extended to a 1-mile radius from the site during the Phase II RI if impacts by site-specific contaminants are indicated based on the results of the Phase I RI. The survey will be conducted door-to-door to locate all wells utilized by residents and commercial businesses and identify the uses for the water. The survey will place emphasis on those wells used for private potable drinking water. Other information sources will include the Ohio DNR, Dover Public Health Department, and the New Philadelphia Public Health Department. The survey will generate information, if available, regarding previous analyses, well logs, well construction and depth. The need to sample these wells during the Phase II RI will be assessed based on the results of the Phase I RI.

7.2.6 Drum Inventory Survey

During the Phase I RI, a survey will be conducted to visually inspect and inventory any drums onsite or immediately adjacent to the Reilly site. This will include any rusted decaying drums located onsite and in the storm water drainage channel along the northeast boundary of the site. The purpose of this inventory will be to determine whether any drums present are associated with past Reilly site operations. Once an inventory is completed, a program will be developed for the Phase II RI for characterizing the drum contents, as appropriate.

7.2.7 Development of Data Quality Objectives and Preliminary ARARs

Data Quality Objectives (DQOs) have already been developed to define and evaluate the data needs for each RI activity and have been provided in the QAPP. As outlined in OSWER Directive 9355.0-
7B, issued by the U.S. EPA, the evaluations will include data types, data quality needs, data quantity needs, and sampling/analysis options. Review of data quality will, where possible, include precision, accuracy, representativeness, completeness, and comparability as indicators of quality. Analytical work by a laboratory will be required to meet Contract Laboratory Program (CLP) mandated preservation procedures, holding times, analytical methods, quality assurance/quality control and detection limits. Where CLP analytical procedures are not available, such as for Toxicity Characteristic Leaching Procedure and part per trillion polycyclic aromatic hydrocarbon methods other U.S. EPA approved methods will be employed. These methods, times and limits are presented in the QAPP.

7.3 Initial Field Activities

Once the Work Plan and Site Specific Project Plans have been approved, the initial field activities will be performed to characterize the study area. These activities will include topographic mapping and ground surveying, survey of a site sampling grid, preparation of the site base maps, and the geophysical survey. The Air Investigation, Radiological Investigation and Residual Waste Characterization (tar, asphalt and slag sampling) were performed with Agency approval prior to the development of this document.

7.3.1 Task 3 - Air Investigation

The Air Investigation was conducted to determine the presence and extent of atmospheric contamination at the site. The investigation considered the volatility or air dispersion of materials at the site, and the degree of hazard associated with air contaminants. Information generated from the investigation was used to assess airborne hazards.
The initial field screening was performed over a two-hour period on June 8, 1989, to monitor ambient air quality levels. Results of the initial field screening show levels well below OSHA standards for benzene, ethylbenzene, toluene, and xylene, and no detectable organics above background readings at the instrument detection limit of 0.5 part per million. The instrument used to perform the investigation was an Hnu Photoionization Detector (PID) equipped with a 10.2 eV lamp. The Hnu PID was zeroed and calibrated prior to and immediately following the two-hour site survey in accordance with ENSR's SOP-7315, "Operation/Calibration of Hnu Photoionization Analyzer."

A calibrated isobutylene gas mixture (Lot No. 29048) standardized to 54 ppm benzene was used to calibrate the instrument. Following calibration and prior to commencement of the air monitoring program, two ambient background readings were taken offsite outside the gate along the roadway to Third Street. Background readings are presented on Table A-1 in Appendix A.

Once background readings were collected the air investigation was completed by moving the PID around the site in the survey mode to determine ambient levels of volatile organics in the air at ground level and in the breathing zone (four to six feet) at grid points using the 10 meter grid system established for the Radiological Investigation (Figure 7-1). Readings taken in the breathing zone were used to refine the safety program while readings taken near ground level were used to identify areas of potential exposure. Site air quality conditions, as determined by the PID unit or by visual inspection, were logged and noted in a project log book.

In addition, two site air quality measurements were taken with direct reading calorimetric indicator tubes specific to benzene (i.e., Draeger tubes). Because no readings in excess of background and the 0.5 part per million instrument detection limit were detected with the PID, two locations were sampled at random across
the site to provide site data to corroborate the PID air quality survey. Draeger tube air sampling did not detect the presence of benzene at either location.

In summary, results do not indicate the existence of an air quality problem associated with the site. Results of the Air Investigation are presented in Table A-1 (Appendix A) and will be reported in the Phase I RI Report.

Accordingly, the air monitoring program for the field investigation will focus on worker protection during the performance of field activities. A 10.2 eV lamp will be used for future health and safety monitoring. The 10.2 eV lamp is far more "field worthy" than the 11.7 eV lamp and will detect the same volatile compounds, the only exception being methylene chloride which is not a site constituent. Should levels exceed OSHA standards for benzene and other volatile compounds at the site, a site perimeter monitoring program will be established for the subsurface investigation.

The air monitoring, worker protection program will consist of screening samples collected during the subsurface investigation, screening of drilled boreholes, and continuous background monitoring with a PID. The site perimeter monitoring program, if necessary based on monitoring during the field investigation, will consist of perimeter air monitoring and the wearing of organic vapor badges onsite during the performance of field activities to measure exposure levels. The badges and perimeter monitoring will be specific to volatile organic compound exposure.

7.3.2 Task 4 - Radiological Investigation

The Radiological Investigation was conducted on June 5 to 9, 1989, to determine the background levels of radiation at the site. The purpose of this initial survey was to identify levels of
radiation to determine the need to perform a more detailed radiological investigation.

Initially, a grid was established over the entire site to provide specific points of reference where measurements of activity could be obtained. The grid (Figure 7-1) was established using a ten meter spacing. The baseline (x-axis) of the grid was placed against the south fence line. The perpendicular (y-axis) of the grid runs north from the x-axis.

At each grid intersection point, a semi-permanent marker was placed using fluorescent spray paint. At each of these locations two readings were obtained using a SPA-3 gamma scintillation detector that had been cross-calibrated against a pressurized ion chamber (PIC).

A cross-calibration was performed between the gamma scintillation detector and the pressurized ion chamber to provide a correlation equation whereby the readings obtained in counts per minute (cpm) could be converted to micro-roentgen per hour (uR/hr) to provide information with respect to the exposure rate that exists at this site. The background PIC readings were obtained at offsite residential, commercial and industrial locations. In addition, PIC readings were obtained at several locations onsite to provide additional data points to accurately calculate the correlation factor for this site.

The readings that were obtained were done so using the integrated scale of the Eberline PRS-1 ratemeter/scaler, in conjunction with the gamma scintillation probe. The instrument obtained each reading over a six second span and integrated the obtained reading to produce a measurement representing a full one minute count. Quality control was provided by performing a full one minute count for every tenth data point that was obtained.

There were a total of three instruments utilized to perform the Radiological Investigation at the Reilly site in Dover, Ohio:
FIGURE 7-1

AIR AND RADIOLOGICAL INVESTIGATION SAMPLING LOCATIONS
REILLY INDUSTRIES, INC. SITE
DOVER, OHIO
The Eberline SPA-3 gamma scintillation detector was utilized for high sensitivity pulse height applications. The probe contained a 2-inch diameter 2-inch long sodium iodide/thallium crystal (NaI(Tl)), with a 2-inch, 10 stage photomultiplier tube;

The Eberline PRS-1 ratemeter/scaler was the survey instrument utilized in conjunction with the above probe to obtain the necessary readings. In the scaler mode, the detector signal was integrated for the selected count time. The integrated value was displayed as a digital readout; and

The Reuter-Stokes portable Environmental Gamma Radiation Monitor utilized a sensor to determine the exposure rate in uR/hr. Resolution was down to 0.1 uR/hr. The display was LCD in nature and was constantly integrated for a one hour time duration. The sensor contained a pressurized ion chamber and electrometer covering a range of 1 to 500 uR/hr.

The correlation equation that was obtained is presented in Appendix B. Utilizing this equation, an average background measurement of 12.31 uR/hr or 8349 cpm was calculated.

When performing a radiological survey of this nature, it is accepted practice to note any measurements that are greater than or equal to twice the area specific background rate. Values equivalent to this measurement are not indicative of any specific hazard or contaminant but are an indication that further investigation may be necessary.
Readings were taken at each grid intersection. Two measurements were acquired at each location, at "contact" (1.0 centimeter above the ground surface) and at 1.0 meter in height.

For the purposes of exposure evaluation, the one meter in height readings are the more significant measurements as they more accurately represent the potential for whole body exposure at a given measurement location.

Readings from the scintillation detector were obtained as counts per minute. All readings and calibration data were recorded in a field notebook. Results of the Radiological Investigation are presented in Appendix B and will be reported in the Phase I RI Report. However, based on the scintillation detector readings, all values appear to be within the range of natural background. Accordingly, Reilly believes that there is no further need for a radiological investigation at the site.

7.3.3 Task 5 - Topographic Mapping and Ground Surveying

Topographic mapping and survey techniques will be used to establish both horizontal and vertical controls on- and offsite. A licensed land surveyor will perform the survey. The base maps will have a horizontal scale of no more than 1 inch equals 100 feet and no more than 2-foot contour intervals. Existing site structures and proposed data collection points will be shown on the base map. Datum and elevations will be referenced to mean sea level as established by the United States Coast and Geodetic Survey.

In addition, monitoring and sampling points for preliminary activities (e.g., Radiological Investigation, Air Investigation, and Residual Waste Characterization) performed at the site will be marked in the field and located on the site base map.
7.3.4 Task 6 - Geophysical Survey

A geophysical survey will be conducted to identify primary subsurface geological features (i.e., depth to bedrock and bedrock contours) and to assist in determining, if present, the locations and quantities of subsurface waste.

Seismic refraction profiling will be performed to define the depth to bedrock and potential aquitards or confining layers. This information will be used to help determine the depth of intermediate and bedrock depth wells, as necessary, and will provide additional information on site geology.

The site appears to be situated towards the end of the glacial outwash valley and off of the main axis. The bedrock walls in buried valleys tend to be "U" shaped and are characterized by relatively steep slopes. Accordingly, depth to bedrock can change considerably over a short distance.

Five seismic refraction profiles will be run over the existing site terrain. Because the best bedrock contours will be obtained from seismic lines run perpendicular to the sides of the buried valley, only one seismic line (Line No. 1) will be run in an east-west direction and will be roughly parallel to the buried valley. Line No. 1 will be located across the center of the site, approximately parallel to the site's southern fence line. Four additional seismic lines (Nos. 2, 3, 4 and 5) will be run in an approximately north-south direction and will be roughly perpendicular to the buried valley axis. These seismic lines will be spaced at 150 feet across the site. Figure 7-2 shows the tentative locations of the five seismic refraction profiles.

Each seismic transect will be approximately 1,000 feet in length. Any abrupt changes in the depth to bedrock may not be detected over a short distance. These changes may be averaged to adjacent elevations. It is currently anticipated that two seismic transects will be initially run (one in the north-south direction...
and one in the east-west direction) to determine the effectiveness of the seismic profiling program. If the collected data indicates that the seismic refraction does not work due to background noise or site conditions (i.e., slag barriers), then the remaining transect lines will not be run. This initial data will also be used to optimize the location and spacing of the remaining seismic transects.

It is currently anticipated that the distance between the seismic source and first geophone will be a minimum of 120 feet and subsequent geophones spacings will be 20 feet. Within each 480-foot array (two arrays per transect), a total of 9 to 11 shots will be executed. Five shots will be spread through the array; one at each end, one in the middle, and one equidistant between the middle and each end of the array. In addition, two to three shots will be executed at 120-foot, 240-foot, and, site conditions permitting, 360-foot offsets from the ends of each array. The net result of this shooting configuration will be to have a shot every 120 feet along each 1,000-foot seismic line and to have a minimum of three forward and three reverse shots for each seismic line.

An explosive source consisting of Betsy Seisgun or equivalent will be employed. An Abem Terraloc III 24-channel seismograph and a portable field computer will be utilized for data logging and reduction in the field.

Results of the geophysical survey will be used to determine the depth to bedrock and develop bedrock contours for the purpose of locating the two mid-depth and deep (bedrock) well clusters which will be installed onsite.
FIGURE 7-2

SEISMIC REFRACTION TRANSECT LOCATIONS
REILLY INDUSTRIES, INC. SITE
DOVER, OHIO
7.4 Task 7 - Residual Waste, Surface Soil and Slag Characterization

7.4.1 Previous Residual Waste Characterization Activities

As part of the Expedited Response Action Work Plan, composite samples of residual waste materials (e.g., tar, asphalt and slag) were collected and subjected to RCRA characterization testing. This information was used to facilitate general site cleanup before initiating invasive RI/FS tasks.

Representative samples of tar, asphalt and slag exposed at the surface were collected on June 5 to 9, 1989 and placed in the appropriate containers using expendable sampling equipment. Sampling locations were determined in the field, noted on the site grid map, and logged in the project notebook. Methodology, holding times, and sample volume requirements were in accordance with SW-846, 3rd Edition.

The results of the tar, asphalt and slag sampling and SW-846 analyses are presented in Appendix C and were reported in the revised Expedited Response Action Work Plan. Results of the SW-846 analyses indicate that the tar, asphalt and slag are not hazardous wastes by characteristic.

7.4.2 Phase I RI Surface Soil and Slag Sampling

Recognizing that not all surface tar or asphaltic materials were removed during the Expedited Response Action performed during June through August 1990, although an estimated 95% of all surface residual tar and asphaltic materials were remediated, an investigation will be implemented to characterize any surface areas containing residual tar pockets or asphaltic materials. This investigation will be performed by establishing a 50-foot grid system across the 3.63 acre site and drilling borings to a depth of
3 feet at each grid node. The proposed grid system for the surface soil and slag investigation is illustrated on Figure 7-3. Drill cuttings will be visually evaluated for the presence of residual coal tar. The occurrence of residual tar or asphaltic materials as identified by the 50-foot grid system will be summarized on a base map.

Three representative samples of asphaltic materials encountered during this surface characterization task will be analyzed by the Toxicity Characteristic Leaching Procedure (TCLP) for chemical characterization.

Representative samples of the soil/slag underlying areas of residual tar and asphaltic materials will be collected and analyzed for TCL VOCs, and BNAs. Collection of these surface soil/slag samples will focus upon major areas of tar and asphaltic materials removed during the ERA. Utilizing the 50-foot grid system, approximately 12 soil/slag samples will be collected from a depth interval of 24 to 36 inches in these areas i.e., immediately south of the old onsite foundations where the majority of tar and asphaltic materials were encountered.

In addition, the soil/slag underlying the tar pocket previously removed from the eastern end of the site near the proposed boring cluster RI-7MD and-7D will be sampled. A total of 2 soil/slag samples will be collected from a depth of 24 to 36 inches in this area for TCL VOCs and BNAs. An estimated 6 additional soil/slag samples will be collected across the site to characterize surface soil/slag in other areas based on the observations of the field geologist.

The property south of the railroad tracks, located immediately north of the former Reilly property, has small amounts of coal tar on the surface. This area will also be investigated as part of the surface soil/slag investigation. Due to the limited dimensions of this area which constitutes a strip of ground approximately 15 feet wide and about 75 feet long parallel to the fence line, a grid
FIGURE 7-3
GRID SYSTEMS FOR PHASE I RI SOIL AND SLAG INVESTIGATION AND THE FORMER CANAL TURNING BASIN INVESTIGATION
NOTE: GRID SPACING IS 50 FEET
GRID SPACING IS 20 FEET
PROPERTY BOUNDARY
STREAM
FENCE
H G F E D C B A
N M L K J I H G F E D C B A
0 50 100 FEET
NOTE: GRID SPACING IS 50 FEET
spacing of 20 feet will be used along a line parallel to the long axis running down the middle of the area. Accordingly, this area will be investigated by excavating at each grid point (20-foot spacing) to a depth of three feet with a hand auger or pick and shovel to determine the thickness of the tar (Figure 7-3). Four samples of the underlying soil will be collected in this area (one sample from each of the 4 grid nodes) at a depth of 24 to 36 inches for analysis of TCL VOCs and BNAs.

Characterization of soils within the storm water drainage area (the former canal turning basin) is described in Section 7.7 of this Work Plan.

Two duplicate samples will be collected in accordance with quality control requirements.

7.5 Task 8 - Subsurface Soils and Slag Investigation

A soils and slag investigation will be conducted to characterize the site and its potential hazard to public health and the environment. The investigation will generate adequate technical data to support the development and evaluation of remedial alternatives during the FS. The Phase I investigation activities will focus on problem definition and data gathering to support the screening of remedial technologies, alternative development and screening, and detailed evaluation of alternatives. The goals of this investigation are:

- Define all identifiable coal tar contaminant sources at the site;
- Define the characteristics of the soil and slag, their attenuation capacities and their relationship to the mobility of contaminants; and
Determine the horizontal and vertical extent of contamination.

Specifically, the soils and slag investigation will be performed to determine the lateral and vertical extent of slag (and possible tar pockets), characterize the site geology, and provide for characterization of underlying soils. Six shallow borings will be advanced through the slag and approximately 10 feet into the underlying shallow aquifer. Soil samples will be continuously collected beneath the slag for classification and description, according to the Unified Soils Classification System, and three soil samples per boring will be analyzed for TCL VOCs, BNAs, and Target Analyte List (TAL) metals by CLP protocol. These samples will be located at the slag and native soil interface, the soil and ground water interface, and at the base of the boring approximately 10 feet into the shallow aquifer.

Two boring clusters consisting of a mid-depth and deep (bedrock) boring will be located onsite to further evaluate the site geology, hydrogeology, and vertical extent, if any, of contamination. Soil samples will be collected at 20-foot intervals in the mid-depth and deep borings for classification and description purposes. The well cluster borings will also be advanced through the slag and four soil samples per well cluster will be analyzed for TCL VOCs, BNAs, and TAL metals by CLP protocol. Three grab samples of slag material that are free of tar contamination, based on visual observations and PID screening, will also be collected for analysis of TAL metals.

Tar/asphalt materials encountered in the subsurface during drilling operations will be sampled and analyzed for TCL VOCs, BNAs, and TAL metals.
7.5.1 Boring Locations

Approximate boring locations are shown in Figure 7-4. Specific boring locations will be determined in the field based on access and terrain. Borings RI-1 to RI-6 will be converted into shallow ground water monitoring wells and, as such, their locations were selected to provide site coverage, both up- and downgradient as shown on Figure 7-5. Also, the locations consider the existing onsite monitoring wells and the need to fill data gaps.

Boring No. RI-1 will be located upgradient of the site at the site entrance on Third Street adjacent to the railroad tracks. This boring will be used to provide upgradient background soil and ground water quality data. Boring No. RI-2 will be located at the northern corner of the site between the existing concrete foundations and the former canal turning basin. This boring will provide information missing in this area and also help to determine any possible interconnections between the site and the turning basin. Boring No. RI-3 will be located immediately downgradient of the foundations. This boring will check the findings from Well MW-4 (e.g., ground water quality) and assess the potential migration of coal tar constituents from the foundations. However, this boring will not be drilled immediately adjacent to Well MW-4 because the existing wells may have introduced coal tar materials into the subsurface during drilling and well installation. Boring No. RI-4 will be located downgradient of the site inside the property boundary. This boring will provide a check on ground water data obtained from existing well MW-5 and help determine any possible impacts to the Tuscarawas River and downgradient offsite locations. Boring No. RI-5 will be located along the southern edge of the site outside the property boundary where limited data is presently available on ground water quality. Boring RI-6 will be located in the vicinity of existing Well MW-2 to investigate subsurface conditions and ground water quality in the western
FIGURE 7-4

SOIL BORING LOCATIONS
REILLY INDUSTRIES, INC. SITE
DOVER, OHIO
FIGURE 7-5

NEW MONITORING WELL LOCATIONS
REILLY INDUSTRIES, INC. SITE
DOVER, OHIO
portion of the site. Each boring will also be used to provide data on depth of slag, potential tar pockets, and, when converted into site monitoring wells, help to determine ground water flow direction, gradient and connections to surface water bodies (i.e., Tuscarawas River).

In addition to the shallow borings, two clusters of mid-depth and deep borings will be drilled onsite. The first cluster (RI-3MD and -3D) will be located at shallow Boring No. RI-3 (Figure 7-5).

The location of the second mid-depth and deep boring cluster (RI-7MD and -7D) is tentative until the results of the geophysical survey are reviewed (Figure 7-4). The second well cluster boring location will be based on the geophysical survey results and will consider slope of bedrock and structure. In the event that bedrock is less than 100 feet from the surface in these locations, two borings (shallow and deep) will be drilled.

7.5.2 Drilling Procedures

All borings will be initially advanced through the slag using standard NQ or NX rock core drills. Slag core samples will be collected and placed in core boxes for storage and evaluation. The core bit will be advanced to the bottom of the slag.

Rock core runs of five- or ten-foot sections will be completed in the slag portion of each boring. The coring time per foot of core will be determined by the driller and noted by the geologist on the logs. The geologist will log the specific depth of each coring interval and will determine, to the extent possible, any notable structural features (i.e., weathered zones, layering, fractures). Coring will be conducted under the guidance of a field geologist who will have responsibility for decisions to continue or terminate the coring procedures based on materials encountered and the efficiency of coring techniques. Rock core samples will be
photographed and stored in a secure repository for the duration of the RI.

Following collection of rock cores, each boring will be reamed to approximately 12 inches with standard air rotary techniques and cased with 10-inch steel casing. The objective of the casing is to prevent surface tar, tar in the slag, or tar immediately below the slag from entering into the borehole and migrating down the borehole to deeper depths, making the collection of subsequent soil or ground water samples unrepresentative of actual site conditions. The annular space will be grouted from top to bottom with an 80 percent cement to 20 percent bentonite slurry. The grout will be allowed 48 hours to set up.

The actual depth that the casings will be driven will depend on the characteristics of soil beneath the slag. If tar deposits are visibly encountered below the slag, this material will be sampled and the casing will be advanced until visibly clean soil or ground water is encountered (indicated by the absence of tar or tar-like materials). The steel casing will then be hammered an additional foot into the underlying soils for a secure seal.

For each shallow boring, 4 1/4-inch I.D. (6 1/4 O.D.) hollow stem augers will be advanced through the inside of the casings until soils are encountered. Available site geologic information indicates layered slag to 15 to 20 feet with clay, sands and gravels beneath the slag. Soils will be continuously sampled to a depth of approximately 10 feet below the water table. The water table is approximately 20 to 25 feet below the surface. Accordingly, the total depth of the shallow borings is expected to be about 35 feet. Soil samples will be obtained using a standard split-spoon sampler following ASTM Method D-1586. After the necessary soil samples have been collected, Borings RI-1 to 6 will be converted to shallow monitoring wells.

Two mid-depth and deep (bedrock) boring clusters will be installed onsite at locations discussed in Section 7.5.1 and based
on the results of the geophysical survey. Tentative locations are indicated on Figure 7-5.

Conventional cable tool methods will be used to drill the deep and mid-depth borings for each onsite well cluster (RI-3MD and -3D, and RI-7MD and -7D). The deep boring in each onsite well cluster will be drilled first to characterize geology and determine placement of the mid-depth boring. Deep borings will be drilled to bedrock. The mid-depth borings will be drilled to the first significant aquitard or, if none is present, a coarse and permeable gravel zone, based upon the deep boring logs. Samples will be collected in the deep and mid-depth borings using split spoon samplers. Bailers or slurry return may be required for sample collection depending upon the conditions encountered, particularly at depth. As previously indicated, soil samples will be collected at 20-foot intervals in the mid-depth and deep wells for USCS identification and classification purposes. Each deep and mid-depth boring will be converted into a site monitoring well.

Each soil sample collected during the boring program will be inspected for any visible signs of contamination from tar or asphaltic materials and will be scanned using a PID to detect volatile organic compounds. Soils will be logged using the Unified Soil Classification System (USCS). Soil sampling procedures will conform to accepted and approved techniques. These procedures are described in greater detail in the Site-Specific Sampling Plan (SSSP).

7.5.3 Soil and Slag Analyses and Characterization

Ground water at the site is generally expected to be immediately below the bottom of the slag. Soil samples to be analyzed from each shallow boring will be collected at the interface of the slag and native soils and at the soil and ground water interface (provided that they are greater than 3 feet apart)
to help determine vertical migration of potential contaminants. If these interfaces are less than 3 feet apart, only one representative sample will be collected by split-spoon sampling. These samples will be analyzed for TCL VOCs, BNAs, and TAL metals by CLP protocol.

If no visible tar or waste materials are observed, the soil interval approximately 10 feet below the water table will be sampled for analysis of TCL VOCs, BNAs, and TAL metals by CLP protocol to help determine the vertical migration of dissolved constituents or wastes. Shallow boring soil samples will be continuously collected below the slag for screening with an Hnu/PID meter and description and classification (via USCS).

If visible tar or asphaltic materials are encountered in the native soils beneath the slag, either in the unsaturated or saturated zone, one representative sample or composite of the contaminated soil per shallow boring will be collected for laboratory analysis of TCL VOCs, BNAs, and TAL metals by CLP protocol. The shallow borings will then be extended until no tar or asphaltic materials are encountered up to a maximum depth of 50 feet which is the limit of hollow stem auger drilling in sands and gravels. The first visually clean soil interval beneath the tar or asphalt containing soils will be sampled for analysis of TCL VOCs, BNAs, and TAL metals by CLP protocol.

Deep borings will be drilled to bedrock to determine the presence, if any, of tar and asphaltic materials. Each deep boring will have soil samples collected at the native soil and slag interface, at the ground water interface and at bedrock for TCL VOCs, BNAs, and TAL metals analysis. Additional soil samples will be collected at 20-foot intervals for USCS description and classification and Hnu/PID volatile screening. If tar-like or asphaltic materials are encountered within the saturated zone, a representative sample or composite will be collected for TCL VOCs, BNAs and TAL metals analysis.
Because the deep and mid-depth borings will be located adjacent to each other, soil samples will be collected at 20-foot intervals beneath the slag in each mid-depth boring for USCS description and classification and HNU/PID volatile screening only. No samples will be collected from the mid-depth borings for chemical analysis.

It should be noted that the location of RI-3 will include a boring cluster consisting of a shallow (RI-3S), mid-depth (RI-3MD), and deep (RI-3D) boring. In cases such as this where shallow, mid-depth, and deep borings are present at the same location, a total of four soil boring samples will be routinely collected for chemical analysis:

- One soil sample will be collected at the native soil and slag interface;
- One soil sample will be collected at the ground water interface;
- One soil sample will be collected 10 feet below the ground water interface; and
- One soil sample will be collected at bedrock.

The above four samples will be analyzed for TCL VOCs, BNAs, and TAL metals. As previously indicated, should tar-like or asphaltic materials be encountered within the saturated zone, a representative sample or composite will be collected for TCL VOCs, BNAs, and TAL metals analysis.

Additionally, a total of three grab slag samples, free of visible tar contamination, will also be collected for TAL metals analyses from the slag cores retrieved during drilling operations.
Sample labeling, the collection frequency of duplicates and field blanks, and decontamination procedures are described in the SSSP.

Drill cuttings and decontamination water will be drummed and collected in a tank, respectively, for disposal in accordance with applicable regulations and with the approval of the U.S. EPA and Ohio EPA.

7.6 Task 9 - Hydrogeologic Investigation

A hydrogeologic investigation will be conducted to evaluate the site hydrogeology, water bearing formations, and the nature and extent of potential ground water contamination. The goals of this investigation are:

- Determine the site's hydraulic characteristics such as flow direction and gradients (horizontal and vertical), and discharge and recharge areas; and
- Determine potential site ground water contaminants, the horizontal and vertical distribution of site constituents, and plume boundaries.

The information gathered during the hydrogeologic investigation will be used to assess pollutant mobility and potential paths of migration.

The site hydrogeologic investigation will consist of two separate phases (I and II). Phase I will include the installation of two mid-depth and deep (bedrock) well clusters and six shallow onsite ground water monitoring wells, two rounds of ground water sampling for TCL VOCs, BNAs, and possibly pesticides/PCBs and total and dissolved TAL metals analyses by CLP protocol (Section 7.6.5), and the determination of ground water flow direction and gradient.
Based on the Phase I results, an assessment of Phase II requirements will be made to determine the need for additional downgradient shallow, mid-depth and/or bedrock wells. The purpose of Phase II wells will be to further delineate potential contaminants and plume boundaries. Phase II ground water sampling and analyses will target constituents detected in Phase I, as well as additional parameters as needed. The Phase I ground water monitoring wells will be installed in the borings drilled during the Soils and Slag Investigation (Section 7.5).

7.6.1 General Location Information

Expected onsite well locations are shown on Figure 7-5. Ground water monitoring wells will be installed onsite to help define the ground water quality, verify existing site ground water quality data, determine source areas for ground water contamination, and provide additional information on ground water flow direction and gradient. Based on data available from the existing onsite monitoring wells, the proposed new wells have been located in areas where data on subsurface conditions are needed based on a southeastern ground water gradient.

One new shallow well (MWRI-1) will be installed in the assumed upgradient direction at the site entrance on Third Street adjacent to the railroad tracks. This well will help confirm the ground water quality upgradient of the site. A second new well (MWRI-2) will be placed at the northern corner of the site between the onsite foundations and the former canal turning basin. This well will help determine ground water quality in this area and possible relationships between the concrete foundations and the former canal turning basin. The third new well (MWRI-3) will be located immediately downgradient of the foundations to assess ground water quality in this area and further assess the potential presence of buried tar pockets. This well will also serve to check the
findings from Well MW-4 (e.g., ground water quality). However, this well will not be installed in the immediate vicinity of Well MW-4 because the existing wells may have introduced coal tar materials into the subsurface during drilling and well installation. The fourth new well (MWRI-4) will be installed at the most southeastern corner of the site to assess downgradient ground water quality and possible impacts to the Tuscarawas River and other downgradient locations. This well will also check the ground water quality data obtained from Well MW-5. The fifth new well (MWRI-5) will be installed along the site’s southern border to provide information on ground water quality and flow direction. The sixth shallow well (MWRI-6) will be installed in the vicinity of existing Well MW-2 to investigate subsurface conditions and ground water quality in the western portion of the site.

Two mid-depth and deep (bedrock) well clusters will also be installed onsite to investigate deeper portions of the aquifer and to determine whether dense nonaqueous phase liquids are present on bedrock at the base of the aquifer. The first well cluster (MWRI-3MD and -3D) will be located at shallow Well MWRI-3. The location of the second well cluster (MWRI-7MD and -7D) is tentative until the results of the geophysical survey are reviewed. The second well cluster location will be based on the geophysical survey results and will consider slope of bedrock and structure.

Monitoring well locations may be changed, with U.S. EPA and Ohio EPA notification and approval of U.S. EPA, as a result of additional information provided during the boring program and the geophysical survey.

7.6.2 Well Screen Placement Selection Criteria

The criteria for the selection of well screen placement depths for Phases I and II of the RI is based on ENSR's current knowledge of the buried valley aquifer, the nature of the potential coal tar
contaminants, and the monitoring objectives of the RI/FS. These criteria include:

- The detection of constituents immediately below the slag where the highest concentrations of potential contaminants may be found;

- The evaluation of data generated during volatile vapor screening of collected samples;

- The detection of floating or sinking constituents through visual examination of soil cuttings;

- The depth and thickness of potential confining layers and permeable zones beneath the site; and

- The thickness of secondary or confined aquifers beneath the water table aquifer.

The geology beneath the site is expected to consist of a heterogeneous mixture of sand and gravel deposits and lenses of clay and/or silt. The first 10 feet of saturated thickness beneath the slag will be screened to monitor the water table aquifer (shallow Monitoring Wells MWRI-1 through MWRI-6). The shallow wells will use screens which straddle the water table surface with a minimum of two (2) feet of screen above the saturated zone. It is currently anticipated that the shallow monitoring wells will be screened immediately beneath the slag. If the water table extends up and into the slag, the shallow monitoring wells will be screened to intercept this interval.

Mid-depth and deep (bedrock) wells will be located in clusters to help determine vertical ground water gradients and water quality. Mid-depth wells will be screened over a 10-foot interval
above the first aquitard encountered or at an intermediate depth within the aquifer, based on PID screening of soil samples. To correlate upgradient and downgradient data, an attempt will be made to screen the shallow and mid-depth wells, if possible, in the same formation. Deep wells will be screened over a 10-foot interval immediately above the bedrock in a coarse permeable zone.

If numerous variable and layered unconsolidated formations are encountered during the soil boring, then, whenever possible, the well screen will be placed opposite those zones which are assumed to be of greatest permeability.

In addition, the following algorithms will be followed when visual examination and Hnu/PID screening of the soil cuttings indicates the presence of non-aqueous phase liquids (NAPLs), which float on the water table, or dense non-aqueous phase liquids (DNAPLs), which sink to the bottom of a water bearing unit. These algorithms are:

- If the soil boring in the shallow aquifer indicates the presence of NAPLs, the well screen will be positioned to straddle the water table to sample the NAPLs; and
- If the soil boring indicates the presence of DNAPLs, the well screen will be placed at the bottom of the water bearing unit to permit collection of the organic phase.

The above algorithms are general guidance to be used during the placement of Phase I onsite monitoring well screens. Because the site geology and the distribution of potential tar or asphaltic materials and NAPLs or DNAPLs within the strata is unknown, algorithms for the placement of well screens for all possible scenarios are impractical. The need for additional wells will be evaluated in Phase II of the RI.
7.6.3 Well Installation Procedures

Each of the Phase I monitoring wells will be installed in the borings advanced during the soils investigation. Drilling and installation will be supervised and logged by the field geologist. Specific logging procedures will be identified in the SSSP.

Shallow wells will be constructed of two-inch diameter, Schedule 40 polyvinyl chloride (PVC) casing and screen. A ten-foot section of manufactured PVC well screen having a slot size of 0.010 inches will be installed at each well location.

Each shallow well will be installed by placing the PVC riser and screen through the hollow stem auger until the bottom of the borehole is reached. The sand pack will be tremied in the annular space surrounding the screen to approximately two feet above the screen. In the shallow wells, the sand pack will be placed into the annular space while slowly rotating the augers out of the borehole. This procedure should enable the sand to gently flow outwards towards the sides of the borehole. A weighted tape measure will be used to ascertain the depth of the sand pack. The sand pack will extend to two feet above the top of the well screen to allow for settlement.

Mid-depth and deep wells will be installed using conventional cable-tool methods or hollow stem augers. However, other drilling methods may be employed, if warranted by field conditions, in order to accomplish the objectives of the AO. In using the cable tool method, a casing will be driven continuously during drilling operations. Samples will be collected, conditions permitting, at the intervals previously indicated in Section 7.5.3. Drill cuttings will also be continuously monitored for visual classification as they are bailed or water slurried from the borehole. Wells constructed during both Phases of the RI will be completed with a protective steel casing and concrete cap, and
wells outside of the site fence will have protective posts placed around them.

Mid-depth wells will be constructed of 4-inch diameter black steel riser and stainless steel (0.02 slot) screen. After the riser pipe and screen are placed into the borehole, the casing will be slowly withdrawn and a natural gravel pack will be allowed to collapse around the well screen to a height of approximately 10 feet above it. Naturally developed filter packs are the primary method used for the completion of well screens in deep, coarse grained formations. Establishing a surface poured or tremied sandpack at depth in coarse and permeable aquifers (typical of the buried valley beneath the site) is difficult and not necessary. A 5-foot bentonite slurry or pellet seal will be placed through a tremie pipe above the gravel pack. The remaining annular space will be grouted to the surface with an 80 percent cement to 20 percent bentonite mixture. Wells will be completed with a locking protective steel casing and concrete cap.

Deep wells will be constructed of 4-inch black steel riser and stainless steel (0.02 slot) screen. Deep well screens will be placed within a coarse zone immediately above bedrock. The drive casing will be slowly withdrawn and a natural gravel pack will be allowed to collapse around the well screen. A five-foot bentonite slurry or pellet seal will be placed through a tremie pipe above the gravel pack. The remaining annular space will be grouted to the surface with an 80 percent cement to 20 percent bentonite mixture. Deep wells will be completed with a locking protective steel casing and concrete cap.

The deep well in each well cluster will be installed first to aid in the placement of the mid-depth monitoring well. A five-foot minimum horizontal spacing will be required between wells. All drilling equipment which enters the boring and directly contacts soil cuttings will be decontaminated.
It should be noted that the specific number of wells and locations for well screens will be approved by the U.S. EPA prior to the start of the well installation program and the ENSR field team will be following specific installation procedures. All attempts will be made to install each well according to the approved construction specifications and other program requirements. However, modifications may occur during the well installation process due to field conditions. Accordingly, the field geologist, in consultation with the Agency representatives (U.S. EPA Project Coordinator and Ohio EPA Project Coordinator), will exercise his best judgment and utilize accepted standards and practices when installing the wells.

It should be noted that wells located outside the fence or in high traffic areas will either be flush mounted or have protective posts installed around them for protection against damage.

7.6.4 Monitoring Well Development

Newly installed monitoring wells will be developed no sooner than 24 hours after grouting the well. Wells will be developed with a bailer, by hand pump, or by vigorously surging the length of the well screen with a clean surge block. After surging the well screen, water will be evacuated from the well with either a centrifugal pump or bailer (depending on ground water depths). Well development equipment will either be steam cleaned or decontaminated between each well in accordance with procedures described in the QAPP. All well development procedures will be recorded in a field log book. Well development is described in greater detail in the SSSP.
7.6.5 Ground Water Monitoring

Monitoring of the ground water elevations and water quality is a primary task of the RI. These data are necessary to provide the technical basis for the performance of the FS.

7.6.5.1 Ground Water Elevations

Both existing wells and the newly installed wells will be measured to determine the elevation of the ground water surface. A qualified surveyor will be subcontracted to provide horizontal control and vertical data for the ground surface and a designated measuring point on each well. Measurements will be taken according to procedures outlined in the QAPP. Ground water level measurements will be utilized to determine ground water gradients and flow direction. A water level gauge will also be established on the river to allow river levels to be measured during each round of ground water measurements. The SSSP provides additional information pertaining to ground water level measurements. Ground water level measurements will be taken during each round of sampling and on a quarterly basis to establish seasonal fluctuations in the water table.

7.6.5.2 Well Labeling

The protective casing of each well will be painted with a specific well identifier, or number (MWRI-1, 2, 3, etc.). Protective casings will be painted yellow or orange with well labeling in black. Protective posts for wells outside of the site fence should either be painted white, yellow, or red. A proper well depth identifier such as S, M, and D for shallow, mid-depth, and deep wells will be added to the appropriate well.
7.6.6 Ground Water Quality Sampling

During the 1985 boring and ground water monitoring program performed by Herron Consultants, Inc., with personnel from Ecology & Environment, Inc. (Region V FIT) supervising, inappropriate well installation procedures were used that may have significantly compromised the integrity of the wells and ground water samples.

Specifically, these wells were installed without a second casing to separate potential surface contaminants (e.g., tar and asphalt) or contaminants within the slag from entering into the borehole and mixing with the native soils and ground water beneath the slag.

The proposed boring program includes the use of a second and larger casing to be installed before the well and protective casing is installed. The second and larger casing will be grouted and sealed at the bottom to effectively isolate materials in the slag or at the surface from the annular space surrounding the monitoring well, native soils and ground water.

The existing onsite monitoring wells will not be sampled because the drilling procedures used to install these wells may have compromised their integrity due to introduction of surface contaminants. Two rounds of ground water quality sampling from the six newly installed wells for TCL VOCs, BNAs, pesticides/PCBs and total and dissolved TAL metals by CLP protocol will be performed during Phase I activities. Ground water level measurements will be taken during each round of sampling and on a quarterly basis to establish seasonal fluctuations in the water table. The first sampling round will take place after the new monitoring wells have been allowed to stabilize for a period of not less than 24 hours after development. The second sampling round will occur after the analytical results for the first round have been reviewed and will be limited to TCL VOCs, BNAs, and/or ppt PAH analyses with pesticides/PCBs and TAL total and dissolved metals contingent upon
first round results. Sample collection will be completed in the following manner dependent upon the required types of analyses at each well location. The sample fraction for organic constituents will be collected first (volatiles first, direct from the sampling apparatus to the bottles, then base/neutral-acid extractables and pesticides/PCBs), followed by the sample fraction for inorganic constituents.

All samples will be preserved according to the requirements listed in the QAPP. All sampling will be accomplished according to the specific procedures contained in the SSSP and the QAPP. In the event of slow well recovery, the well will be allowed to recharge completely before collecting ground water samples to avoid partially filling containers. Ground water samples collected for dissolved metals analysis will be filtered on site promptly after collection using 0.45 micron filter units per ENSR SOP 7131 (Field Filtration of Water Samples for Inorganics).

7.6.7 Aquifer Testing

Ground water flow rates are governed by the physical properties of the soils and by the elevation of the ground water. To determine the flow rates of the ground water system, testing must be done by stressing the system and measuring its reaction. The primary testing method proposed for Phase I is the use of insitu hydraulic conductivity testing (i.e., slug tests). An aquifer pumping test will be included as needed in Phase II based upon an evaluation of Phase I testing results.

7.6.7.1 Insitu Hydraulic Conductivity Testing

Site monitoring wells constructed as part of the Phase I RI will be tested by the volume displacement (slug) or pump/recovery method to determine the hydraulic conductivity of the soils to
which the well is open. The values obtained with this testing will then be utilized in conjunction with the hydraulic gradients to estimate the ground water velocities at the site. All testing and measurement procedures will conform to guidelines contained in the QAPP and in ENSR SOP-7720 (Rising-Head/Falling-Head Permeability Testing).

7.6.7.2 Aquifer Pump Test

If the need for data on aquifer hydraulics during the Phase II RI is such that an aquifer pumping test is required, the well(s) to be tested will be selected based on the degree to which a test at that location will provide significantly improved or increased knowledge of the ground water system.

Considerations will also be given to water quality in selecting the well(s) for testing. Selections will be based on the data obtained during the Phase I RI. Any testing associated with this task will conform to the guidelines contained in the QAPP.

7.7 Task 10 - Surface Water and Sediment Investigation

A surface water and sediment investigation will be conducted to determine the presence and extent of contaminants reaching the Tuscarawas River via surface water. This investigation will be conducted in two parts. In the first part, three sets of paired surface water and sediment grab samples (including one set of background samples) will be collected from the drainage ditch and culvert pipe that parallels the northeast site boundary. Samples will be collected at the locations shown on Figure 7-6. Specifically, one set of background samples will be collected at the upgradient northwest end of the ditch where it emerges from a culvert under the railroad. The background surface water sample will be collected at a point inside the upgradient culvert pipe at
EXISTING MONITORING WELL
RI SW 3* SURFACE WATER SAMPLING LOCATION
RI SS 3* SEDIMENT SAMPLING LOCATION

FIGURE 7-6
SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS
REILLY INDUSTRIES, INC. SITE
DOVER, OHIO
location RI-SW-1. The background sediment sample will be collected at the mouth of the upgradient culvert pipe at location RI-SS-1. The second set of surface water and sediment samples will be collected at a midpoint adjacent to the site, and the third set will be collected at the downgradient southeast end where the ditch enters a culvert under an access road. This location is also downgradient of the tar pocket identified during the Expedited Response Action (ERA).

The above three sampling locations have been selected to characterize the water and sediment quality of the drainage ditch which carries surface runoff to the Tuscarawas River. Both sediment and surface water samples will be analyzed for TCL VOCs and BNAs.

At each sampling location in the ditch, the grab water sample will be collected first, followed by the grab sediment sample. The location of each sample will be noted in a project log book by the RI Task Manager or his field designee. Photographs of each location will be taken, labeled, and retained in the project file.

Once the surface water and stream sediment sampling is completed, the second part of the investigation within the former canal turning basin will be implemented to characterize the extent of any remaining surface tar. This will be accomplished by establishing a 50-foot grid spacing throughout the basin between the upgradient and downgradient culvert pipes and excavating to a depth of 3 feet at each grid node to visually evaluate whether any, as yet undiscovered, tar pockets remain. The proposed grid system for the former canal turning basin investigation is illustrated on Figure 7-3. Excavation will be performed using a hand auger or pick and shovel depending upon the resistance of the soils to hand-augering. The occurrence of residual tar as asphaltic materials as identified by the grid system excavations will be summarized on a base map.
In the case of the tar pocket identified in the storm water drainage bed during the ERA (and any other tar pockets discovered), a series of closely spaced excavations will be dug to define the lateral and vertical limits of the tar. A sample of the soil from 0- to 12- inches beneath the pocket will be generated and analyzed for TCL VOCs and BNAs. The same sampling and analysis program will apply to any other tar pockets discovered. For planning purposes, it is presently estimated that a total of 3 soil samples and one duplicate quality control sample will be collected. A more detailed discussion of the surface water and sediment investigation is provided in the SSSP.

7.8 Sample Handling, Equipment Decontamination and Chain-of-Custody

7.8.1 Sampling Kits

Sampling kits will be provided to the Field Coordinator by the Sample Custodian. The sampling kits will be enclosed in coolers, and will include the appropriate sample containers, chain-of-custody forms, container labels and appropriate shipping blanks. The sample containers provided in the sampling kits will be pre-cleaned and pre-preserved (if required) by the Sample Custodian. Completed sampling kits will be returned to the Sample Custodian by the Field Coordinator after the samples have been collected. No completed sampling kits should be kept on-site for a period of greater than 48 hours. Individual sample batches of one or more coolers of samples will be sent to the analytical laboratory approximately every other day.
7.8.2 Equipment Decontamination

Equipment decontamination will be completed following ENSR standard procedures as described in the QAPP at each sampling location and following each sample collection. In addition, general equipment conditions will be checked at the end of the day and decontaminated as appropriate. All decontaminated equipment will be stored when not in use within the field vehicle (for short-term storage) or the field office at the site.

7.8.3 Sample Designation

A site-specific sample designation system will be used to identify each sample, including all samples for chemical analysis, duplicates, and blanks. The Task Manager or his designee will be responsible for maintaining a listing of the sample identification numbers in a project log book.

The sample identification number will include a two letter project designation such as "RI" (i.e., Reilly Industries). Each sample will be further identified by a letter code corresponding to the sample type as follows: SB - discrete soil boring; SD - sediment grab; SW - surface water grab; GW - ground water; C - composite sample; FB - field blank; and TB - trip blank. The letter code will be followed by a pre-established location and number.

Field blanks will have the FB designation plus an additional letter code identifying the type of field blank (e.g., a groundwater blank would be designated FBGW). The last two digits of the sample identification number will indicate the sampling round. Duplicate samples will have a separate sample identification code different from the original sample. In the case of metals analyses, each sample will have a suffix following the sampling
round indicating filtered or unfiltered samples with an "F" or "U," respectively.

7.8.4 Field Sample Custody Procedures

The field sampler is personally responsible for the care and custody of samples collected until they are transferred or dispatched properly. The Field Coordinator determines whether proper custody procedures were followed during the field work and decides if additional samples are required. Prior to commencement of sampling, the Field Coordinator will instruct the sampling team in the chain-of-custody procedures.

Samples are accompanied by a Chain-of-Custody Record. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the Sample Custodian and analyst at the laboratory.

The information recorded on the chain-of-custody record in addition to signatures and dates of all custodians will include:

- Project identification;
- Sampling date and time;
- Chain-of-Custody tape number;
- Identification of sample collector;
- Sample identification;
- Sample description (type and quantity); and
- Analyses to be performed.

7.8.5 Documentation

In addition to sample labels and Chain-of-Custody forms, bound field notebooks will be maintained by the ENSR Field Coordinator to
provide a daily record of significant events. All entries will be made in ink and will be signed and dated. All members of the ENSR sampling team will be required to use a field notebook. Notebooks will be kept as permanent project records. The Field Coordinator will also maintain the sample collection records for each well.

7.8.6 Sample Packaging and Shipment

Specific information regarding the documentation, shipping and packaging requirements are detailed in the QAPP.

7.9 Task 11 - Analytical Program

The analytical program will define the constituents of concern at the site and will concentrate on constituents found in coal tar wastes and residues. The program will form the basis for determining the presence and extent of contamination at the site.

The sediment, surface water, residual waste and first and second rounds of Phase I ground water samples will be analyzed for the constituents listed in Table 7-1. The analytical data from the Phase I sampling activities will be reviewed and if a specific compound, except for polycyclic aromatic hydrocarbons, is not found above detection limits in a sample matrix (i.e., soil, residual waste, surface water or ground water), then it may be recommended for elimination from the second Phase I sampling round for that matrix type. Similarly the Phase II RI will target specific constituents detected at significant concentrations during Phase I.

Polycyclic aromatic hydrocarbons (PAHs) will be selected according to the following criteria. If no PAHs are detected in the ground water samples during Round One of the Phase I analytical program at the parts per billion detection level, Round Two sampling and analysis for PAHs will be performed at the parts per trillion (ppt) level. If PAHs are found at or above the ppb
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<td>Sediment</td>
<td></td>
<td>CLP TCL VOCs</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Surface Water</td>
<td>pH, Temp.,</td>
<td>CLP TCL Extractables</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
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<td>CLP TCL Extractables</td>
<td>3</td>
<td>1</td>
<td>4</td>
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<tr>
<td>Ground Water</td>
<td>pH, Temp.,</td>
<td>CLP TCL VOCs</td>
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<tr>
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<td>CLP TCL Extractables</td>
<td>10</td>
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<tr>
<td></td>
<td></td>
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<td>10</td>
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<td>12</td>
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<tr>
<td></td>
<td></td>
<td>CLP TAL Metals(Total)</td>
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<td>12</td>
</tr>
<tr>
<td>Ground Water</td>
<td>pH, Temp.,</td>
<td>CLP TCL VOCs</td>
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<td>CLP TCL Extractables</td>
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<td>and/or Low Level PAH</td>
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<td>10</td>
<td>1</td>
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<td>CLP TAL Metals(Dissolved)</td>
<td>10</td>
<td>1</td>
<td>12</td>
</tr>
</tbody>
</table>

(a) Matrix spike/matrix spike duplicate (MS/MSD) samples are required for organic analysis. Samples designated for MS/MSD analysis will be collected with extra volumes at a frequency of one per group of 20 or fewer investigative samples. Triple the normal sample volumes will be collected for VOCs and double the normal volumes will be collected for extractable organics and pesticides/PCBs.

(b) A total of 29 subsurface soil samples may be collected for TCL VOCs, Extractables, and TAL metals depending upon conditions encountered. Extractables represent TCL acid and base-neutral extractable compounds.

(c) Field blanks are not appropriate for the sample matrix/collection procedure. Trip blanks are analyzed only for CLP TCL VOCs.

(d) Ground water samples collected for CLP TAL Metals analyses will be both filtered and unfiltered to determine dissolved and total metals.

(e) Ground water Round 2 required analyses are contingent upon Round 1 results. CLP TAL metals and TCL PCBs and pesticides, if not significantly present in Round 1, will be excluded from Round 2. PAH's will be tested in Round 2 at the ppt level if Round 1 results are below parts per billion (ppb) level.
detection level, Round Two Phase I sampling and analysis for PAHs will be first performed at the ppb detection level, followed by ppt analysis for any of the identified PAHs (seven compounds listed in the QAPP) not identified in the ppb analysis. Similarly the presence of ppt level PAHs, in the Phase I RI data will trigger analysis at the ppt level during Phase II of the RI.

The U.S. EPA and Ohio EPA will be informed at least 10 days prior to initiation of each sampling round. Reilly will split samples with the U.S. EPA and Ohio EPA, upon request.

7.10 Task 12 – Phase I Data Analysis and Evaluation

The purpose of data analysis and evaluation is to collate data into information that can be used to determine the need and approach for additional RI studies and FS evaluations and alternative screenings.

Sound scientific principles and standards will be strictly followed for data analyses and evaluations. Assumptions utilized in analyses and evaluations will be noted and, where appropriate, a measurement of reliability will be indicated. The type of data to be evaluated and the goals of these evaluations are included in this section.

7.10.1 Review Available Data

The analysis of data collected during the RI will include the examination and comparison of soil, geology, residual waste, surface water/sediment, and ground water data collected throughout the site. The nature and extent of contamination, if any, and, to the extent practicable, the sources of any contamination will be determined.
Information developed during the RI investigation of the site will also be reviewed for its application to the FS. The review of the RI data will be consistent with the objectives of the AO and project specific supporting documents.

7.10.2 Summary of Phase I Results

Data collected during Phase I, including the Initial Field Activities, Residual Waste Characterization, and soil, sediment, surface and ground water analytical results will be summarized in a report to the U.S. EPA and Ohio EPA. The summary report will contain the data analyses and evaluations of all site information collected. Based on the Phase I results, a preliminary description of the RI Phase II hydrogeologic and media sampling program will be developed. The Phase II RI will consider the need for offsite bedrock and mid-depth wells, constituents to be analyzed, sampling locations and depth, and additional soil, sediment, or surface water analyses, locations, and constituents.

7.10.3 Agency Meetings

A meeting with the U.S. EPA and Ohio EPA will be scheduled to discuss the Phase I results and recommendations for the Phase II RI, if necessary.
8.0 TASK 13 - PHASE II REMEDIAL INVESTIGATION

The main objective of the Phase II RI will be to expand upon the Phase I results and perform the necessary work elements, as needed, to further investigate existing environmental conditions off the site within an expanded investigation area. The Phase II RI will determine the extent of potential offsite environmental impacts that may have occurred from former site activities and existing site conditions. The selected Phase II work elements will investigate area hydrogeologic conditions, and further define the nature and extent of potential soil, ground water and surface water contamination.

Based on the Phase I RI results, the work elements of the Phase II RI will be developed. Potential work elements to be performed pursuant to Agency approval will include, but not necessarily be limited to, the following items:

- Assessment of the need for onsite mid-depth and/or bedrock depth wells;
- Assessment of the need for offsite downgradient shallow, mid-depth, and/or bedrock depth wells;
- Assessment of the need to sample offsite private wells;
- Development of key chemical indicators of ground water quality;
- Assessment of the need for additional onsite and off-site soil, sediment, surface water and/or ground water sampling and characterization; and
Additional onsite material characterization necessary for definition of response options.

Information produced from the RI Phase I and II activities will allow for the determination of the need for possible onsite and/or offsite remedial actions to control the migration of constituents attributable to the site.

Because Phase II activities are contingent upon the results of the Phase I RI, Phase II elements cannot be defined beyond the scope provided above. Accordingly, once Phase I activities are completed, Reilly proposes to meet with the U.S. EPA and OEPA to discuss the scope of the Phase II investigation and will submit the revised scope of work as an addendum to the Work Plan. Because of the limited time allowed for completion of the RI in the AO (240 days) and the need for Agency review and approval of all modifications to the work plan, the project schedule as described in Section 5.4 allows two weeks for Agency review and approval of Phase II Work Plan activities.
9.0 TASK 14 - ENDANGERMENT ASSESSMENT

The purpose of the Endangerment Assessment (EA) is to address the potential human health and environmental effects posed by exposure to chemical constituents from the Reilly site under the no-action alternative. The Endangerment Assessment to be conducted for the Reilly site will follow and be consistent with U.S. EPA's Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual (Part A) and Volume II. Environmental Evaluation Manual, and other guidance as provided by U.S. EPA. The Endangerment Assessment will consist, but not be limited to, of the following four elements:

- Identification of Constituents of Concern - Determination of the nature and extent of constituents potentially released from the site and selection of indicator compounds;

- Toxicity Assessment - Classification of identified constituents of concern based on their toxicological properties and dose-response relationships;

- Exposure Assessment - Identification of potential exposure pathways and receptors and an evaluation of the extent of human and environmental exposure to constituents released from the site; and

- Risk Characterization - Description of the nature, magnitude, and uncertainty of the human environmental health risks associated with each indicator compound and risk characterization of environmental receptors such as fish and wildlife.
9.1 Identification of Contaminants of Concern

The purpose of this work element is to characterize any hazards associated with substances found in the various media in site-specific circumstances in order to focus the balance of the appraisal on the most meaningful constituents in terms of the risks faced by the public and the environment. Identification of constituents of concern is provided by the following elements:

- Description of the scope of the compiled and reduced analytical data base;

- Determination of the extent of chemical constituents in the environmental media such as surface and subsurface soils, air, surface water and sediments, and ground water; and

- Selection of indicator parameters that adequately represent specific hazards posed by the site.

Accordingly, this element of the EA process will involve a brief review of available information to determine what compounds should be included in the full EA and also to identify potentially exposed populations and the routes by which exposure can occur. Information to be reviewed when identifying compounds for the EA includes:

- Relevant State regulations and requirements;

- Relevant Federal regulations and requirements;

- EAs for other Superfund sites;
Site specific information;

Peer reviewed scientific journals; and

Any other available and relevant literature.

Indicator constituents will be selected for the Reilly Dover, Ohio site using this information and the procedures outlined by the U.S. EPA in the Risk Assessment Guidance for Superfund.

Potential exposure pathways will be identified after evaluation of the site and its surroundings. Population centers, geography, economic and recreational activities, and any other information that would affect the number and types of human and environmental exposure pathways will be included in the review. The results of this review will be reported in the EA and will include a list of identified indicator constituents and exposure pathways and justification for their selection.

9.2 Toxicity Assessment

The selected constituents of concern will be classified and evaluated in the context of their toxicological properties and related health effects. The toxicity assessment will be a two-step process consisting of a toxicological evaluation and a dose-response assessment. The toxicological evaluation will involve a qualitative evaluation of available information and data to determine the nature and severity of actual or potential health and environmental hazards associated with exposure to each constituent of concern. The evaluation will include a critical review and interpretation of toxicity data from epidemiological, clinical, animal, and in vitro studies resulting in a toxicity profile for each constituent of concern in relation to site-specific circumstances.
In the context of toxicity due to chemical exposure, constituents of concern produce health effects that possess a threshold below which the impact will not occur. Another way of stating this factor is that there will not be any health consequences from exposure to concentrations of such chemicals at levels below the threshold value. For carcinogenic constituents, for which the toxic response is cancer, a no-threshold model will be used in accordance with current U.S. EPA guidance.

The dose-response assessment for non-carcinogenic constituents will utilize appropriate quantitative indices of toxicity identified during the toxicological evaluation to determine "acceptable exposure levels" which are not expected to cause adverse health effects for the constituents of concern. The acceptable levels will be expressed as acceptable daily intakes (ADI's), ambient air standards, water quality criteria, etc. For carcinogenic chemicals, the dose-response assessment will be used to estimate the probability that a specific adverse effect will occur.

9.3 Exposure Assessment

Once the hazard potential of target constituents is characterized, an assessment of potential exposure will be completed for each type of receptor. Of initial concern is the development of exposure pathways, which are the routes hazardous materials take to reach a susceptible human receptor. The following types of potential exposure pathways will be considered for constituents released from the Reilly Dover, Ohio site.

- Inhalation of airborne contaminants;
- Dermal contact with contaminated soils, sediments, water, and vegetation;
Ingestion of contaminated water; and

Ingestion of contaminated soils and sediments.

A related component of the exposure assessment is the evaluation of the environmental fate and transport of constituents between the environmental media. This component generally refers to the physical or chemical mechanisms which release a contaminant to the environmental pathway. Although analytical methods to predict such releases are available (e.g., through geochemical models), common practice is to utilize actual field observations to define the contaminant releases for input to a fate and transport model.

Exposure levels at receptor locations will be primarily developed through the application of ground water and air transport models to calculate concentrations, with appropriate adjustment for the probability, extent, and duration of actual exposure based on generally accepted routines (e.g., inhalation and ingestion rates, transfer and trap efficiencies).

9.4 Risk Characterization

The characterization of risk will integrate all of the information that is developed in the toxicity and exposure assessments to characterize all types of potential or actual risks at the Reilly Dover, Ohio site. These will include carcinogenic risks, non-carcinogenic risks, environmental risks, and risks to public welfare.

Risk to public health will be characterized by comparing any estimated exposure levels to relevant environmental criteria and standards based on the nature of the health impact. Cancer risk levels, for animal or human carcinogens included in the constituent
of concern list, will be quantified. Chronic exposure to the threshold chemicals will also be quantified to the extent possible.

A qualitative environmental impact analysis will be utilized to identify and characterize any actual or potential environmental risks associated with the Reilly site. The analysis will be performed in the context of site-specific circumstances to determine if any environmental impacts are occurring or could occur as a result of exposure to the constituents present at or released from the site.

The risks to public welfare will also be qualitatively evaluated and will include adverse effects on property values, future land use, recreational and commercial activities, public perception and opinion, and the quality of life.

9.5 Endangerment Assessment Report

Following completion of the above elements, a draft risk assessment document will be generated summarizing the results of the Endangerment Assessment. This document will be submitted for U.S. EPA and Ohio EPA review and approval by U.S. EPA concurrent with submission of the draft RI Report. Upon agency approval of the final risk assessment document it will be incorporated in the final RI report.
The results of Tasks 2 through 14 will be documented in a detailed Remedial Investigation Report. A draft report will be prepared for U.S. EPA and Ohio EPA review and approval by U.S. EPA, as will a final report that incorporates all Agency comments.

The RI report will be formatted to generally correspond to the components of the Statement of Work in the unilateral Administrative Order and to the report contents identified in U.S. EPA's *Guidance on Remedial Investigations under CERCLA*. A preliminary table of contents for the RI Report has been reproduced as Table 10-1.
TABLE 10-1

REMEDIAL INVESTIGATION REPORT FORMAT

EXECUTIVE SUMMARY

1.0 INTRODUCTION

1.1 Site Background Information
1.2 Nature and Extent of Problem(s)
1.3 Remedial Investigation Summary
1.4 Overview of Report

2.0 SITE FEATURES INVESTIGATION

2.1 Demography
2.2 Land Use
2.3 Water Resources
2.4 Site History

3.0 HAZARDOUS SUBSTANCE INVESTIGATION

3.1 Waste Types
3.2 Waste Component Characteristics and Behavior

4.0 HYDROGEOLOGIC INVESTIGATION

4.1 Soils
4.2 Geology
4.3 Ground Water

5.0 SURFACE WATER INVESTIGATION

5.1 Surface Water
5.2 Sediments
5.3 Flood Potential
5.4 Drainage

6.0 AIR INVESTIGATION

7.0 RADIOLOGICAL INVESTIGATION

8.0 PUBLIC HEALTH AND ENVIRONMENTAL CONCERNS

8.1 Potential Receptors
8.2 Public Health Impacts
8.3 Environmental Impacts
11.0 FEASIBILITY STUDY

11.1 Introduction

This section of the Work Plan provides a general technical approach for identifying, evaluating, and selecting remedial action alternatives specified in the AO and under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

The Feasibility Study (FS) process begins with the development of specific alternatives based on the general response actions identified during the course of the RI to address site contamination problems. Technologies within response categories such as waste controls, capping, excavation and waste removal, in-situ treatment, process modification, etc., will be screened for technical applicability to the site. Technologies considered technically appropriate will then be combined to form alternatives that fulfill specific categories of remediation. The alternatives will be screened on the basis of technical feasibility, of public health and environmental concerns, and cost-effectiveness.

Alternatives that pass the screening process will undergo detailed analyses to provide the decision maker with information for selecting the preferred alternatives. The detailed analysis will encompass engineering, institutional, public health, environmental, and cost analyses.

Once the detailed analyses are conducted, the information will be organized to compare evaluation results for each alternative. The objective of this summary is to ensure that important information is presented in a concise format so the decision maker may choose the alternative(s) that provides the best balance of health and environmental protection, and engineering reliability and cost-effectiveness.
Subsequent sections will further describe the specific elements to be included in the FS, the rationale for their inclusion, the level of anticipated detail, and the documentation that will accompany the FS report. The following nine tasks will be included in the study:

- Task 16 - Remedial Alternatives Development/Screening
- Task 17 - Alternatives Array Document
- Task 18 - Post-Screening Field Investigation
- Task 19 - Bench- and Pilot-Scale Treatability Tests
- Task 20 - Remedial Alternatives Evaluation
- Task 21 - Feasibility Study Report

11.2 Task 16 - Remedial Alternatives Development/Screening

11.2.1 Preliminary Remedial Technology Screening

Based on the site-specific problems identified in the RI, a master list of feasible technologies will be developed as part of the FS. These technologies will include both onsite and offsite remedies, depending on site problems. The master list will be screened, based on site conditions, waste characteristics, and technical requirements, to eliminate or modify those technologies that may prove extremely difficult to implement, will require unreasonable time periods, or will rely on insufficiently developed technology. Each identified technology will be presented in the FS report with an approach for its analysis.
11.2.2 Development of Alternatives

Based on the results of the RI and the preliminary remedial technologies identified, a limited number of alternatives will be developed on the basis of the full set of response objectives. The objectives will be established based on:

- Public health and environmental concerns;
- Description of the current situation;
- Information gathered during the RI;
- Section 300.68 of the National Contingency Plan (NCP);
- U.S. EPA's interim guidance;
- Federal and State environmental standards; and
- Guidance and advisories as defined under Section 121 of SARA.

The alternatives will be developed in consultation with the U.S. EPA and Ohio EPA and will be targeted toward a comprehensive, site-specific approach. The alternatives will include, but may not be limited to, the following (as appropriate):

- A no action alternative;
- Treatment alternatives for source control that would eliminate the need for long-term management (including monitoring);
o Alternatives involving treatment as a principal element to reduce the toxicity, mobility or volume of waste at the site;

o Alternatives that attain federal public health or environmental standards;

o Alternatives that exceed federal public health or environmental standards;

o An alternative that involves containment of waste with little or no treatment, but provides protection of human health and the environment primarily by preventing potential exposure or reducing the mobility of the waste; and

o For ground water response actions, develop a limited number of remedial alternatives within a performance range that is defined in terms of a remediation level within the risk range of $10^{-4}$ to $10^{-7}$ for maximum increased lifetime risk and includes different rates of restoration.

11.2.3 Initial Screening of Alternatives

The alternatives developed in Task 16 will be screened to eliminate alternatives that are clearly not feasible or appropriate prior to undertaking detailed evaluations of the remaining alternatives. Three broad considerations will be used as a basis for the initial screening: effects of the alternative, acceptable engineering practices, and cost. More specifically, the following factors will be considered at a minimum:
Implementability and Reliability
Alternatives that may prove extremely difficult to implement or will not achieve the remedial action objectives in a reasonable time period will not be retained. In accordance with SARA requirements, those alternatives that will permanently reduce the volume, toxicity, or mobility of the wastes will be examined. In addition, alternatives with an unproven technology will not be automatically ruled out from further investigation if they provide an increased level of protection.

Effectiveness
Only those alternatives that satisfy the remedial action and contribute substantially to the protection of public health, welfare, or the environment will be considered further. In addition to providing protection to human health, welfare, and the environment, alternatives must be evaluated and reported as to whether they attain applicable or relevant and appropriate federal and state public health and environmental requirements, or other criteria. Source control alternatives will achieve adequate control of source materials. Onsite and/or offsite alternatives will minimize or mitigate the threat of harm to public health, welfare, or the environment.

Cost
An alternative whose costs far exceed that of other alternatives providing similar results will be eliminated from further consideration. Total cost will include the cost of implementing the alternative and the cost of operation and maintenance. Cost may be used to discriminate between various treatment alternatives, but not as the basis for deciding between treatment versus...
nontreatment. The cost screening will be conducted only after the environmental and public health screening have been performed.

The initial screening of treatment alternatives will attempt to preserve a range of options for detailed evaluation and consider potentially innovative alternate technologies.

11.3 Task 17 - Alternatives Array Document

Following completion of Task 16 an alternatives array document will be prepared summarizing the results of the initial development and screening of alternatives. This document will include the following elements:

- A brief history and site background;
- Results of the site characterization;
- Identified potential pathways and receptors;
- A description of alternatives including extent of remediation, contaminant levels to be addressed and the method of treatment; and
- Recommendations, if necessary, to conduct a post-screening investigation.

The alternatives array document will be submitted to the U.S. EPA and Ohio EPA for review and approval in accordance with the project schedule provided in this Work Plan.
11.4 Task 18 - Post-Screening Field Investigation

Should detailed analysis of alternatives require additional field investigations to obtain the necessary data for further evaluation, a post-screening field investigation will be proposed.

11.4.1 Post-Screening Field Investigation Work Plan

Prior to commencement of field activities a work plan describing the tasks of the investigation will be prepared and submitted to the U.S. EPA and Ohio EPA for review and U.S. EPA approval. Typical elements for inclusion in the post-screening investigation may include:

- A literature survey to identify existing data on treatment technologies;
- Collection of additional field data to refine and re-evaluate the characterization of the site; and
- Bench and pilot-scale treatability tests.

11.4.2 Post-Screening Field Investigation Report

Results of the Post-Screening Field Investigation will be compiled, summarized, and tabulated on tables and figures in preparation of a draft report. The draft Post-Screening Field Investigation Report will be submitted to U.S. EPA and Ohio EPA for review and comment. Upon receipt of and incorporation of U.S. EPA and Ohio EPA review comments, a final report will be submitted to U.S. EPA for final approval.
11.5 Task 19 - Bench and Pilot-Scale Treatability Tests

After completion of the RI and initial development and screening of alternatives, it may be necessary to conduct laboratory and bench-scale studies to further evaluate some of the actions. This work will include any studies required to evaluate the effectiveness of remedial actions or to establish engineering criteria necessary for design and implementation.

Examples of studies that may be undertaken to support development of various remedial action alternatives include:

- **Capping**
  - Compaction and permeability studies;

- **Containment Barrier**
  - Chemical compatibility studies of leachate and slurry wall materials;

- **Stabilization/Solidification**
  - Chemical compatibility and leaching studies; and

- **Ground Water Removal and Treatment**
  - Determination of pore replacement volumes and treatability studies for flushing of wastes.

Specific studies needed under this task to supplement later detailed evaluation of remedial alternatives will be identified, outlined in detail, and proposed in the form of a work plan prior to execution. Since it is impossible to specifically identify such studies now, this must be considered a scope change when and if the studies are agreed upon by the U.S. EPA.
11.6 Task 20 - Remedial Alternatives Evaluation

11.6.1 Detailed Evaluation of Alternatives

A detailed analysis of alternatives will be conducted and consist of an individual analysis of each alternative against a set of evaluation criteria, and a comparative analysis of all options against the evaluation criteria with respect to one another.

The evaluation criteria are as follows:

- Overall protection of human health and the environment;
- Compliance with ARARs;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume through treatment;
- Short-term effectiveness;
- Implementability;
- Cost;
- State Acceptance; and
- Community Acceptance.

The detailed individual analysis will include: (1) a technical description of each alternative that outlines the waste management strategy involved and identifies the key ARARs
associated with each alternative; and (2) a discussion that profiles the performance of that alternative with respect to each of the evaluation criteria. A table summarizing the ranking of each alternative relative to each of the evaluation criteria will be provided.

11.6.2 Comparison of Alternatives

The remedial alternatives will be compared and contrasted to one another with respect to each of the evaluation criteria. Results of this comparative analysis will be summarized in a table. The purpose of the comparative analysis will be to compare the relative performance of each alternative with respect to each evaluation criteria. The narrative discussion will describe the strengths and weaknesses of the alternatives relative to one another with respect to each criterion, and how reasonable variations of key uncertainties could change the expectations of their relative performance.

11.7 Task 21 - Feasibility Study Report

A draft FS report will be prepared presenting the results of Tasks 16 through 20. The preliminary report will be issued to the U.S. EPA and Ohio EPA for review and comment. A preliminary Table of Contents for the report is presented in Table 11-1.

A final FS report will be prepared presenting and reflecting comments received on the draft FS report. The report will include a discussion of the significant issues and a responsiveness summary based on public comment. The format of the report will be consistent with that of the draft; however, it may be modified to reflect comments. The document will be submitted to the U.S. EPA for final approval.
TABLE 11-1

FEASIBILITY STUDY REPORT FORMAT

EXECUTIVE SUMMARY

1.0 INTRODUCTION

1.1 Site Background Information
1.2 Nature and Extent of Problems
1.3 Objectives of Remedial Action

2.0 SCREENING OF REMEDIAL ACTION TECHNOLOGIES

2.1 Technical Criteria
2.2 Remedial Action Alternatives Developed
2.3 Environmental and Public Health Criteria
2.4 Other Screening Criteria
2.5 Cost Criteria

3.0 REMEDIAL ACTION ALTERNATIVES

3.1 Alternative 1 (no action)
3.2 Alternative 2
3.3 Alternative N

4.0 ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

4.1 Non-cost Criteria Analysis

4.1.1 Technical Feasibility
4.1.2 Environmental Evaluation
4.1.3 Institutional Requirements
4.1.4 Public Health Evaluation

4.2 Cost analysis

5.0 SUMMARY OF ALTERNATIVES

6.0 RECOMMENDED REMEDIAL ACTION (Optional)

7.0 RESPONSIVENESS SUMMARY (in Final Version Only)

REFERENCE

APPENDICES
12.0 DATA MANAGEMENT PROCEDURES

Data received for the Reilly Dover RI/FS will be logged into project log books by the Task Managers. The data will be segregated, by content, into one of the subsections of the two principal categories described below. Where documents contain both technical and administrative data, a copy will be made and the information stored in both categories.

12.1 Technical Data

This category includes data and information from which decisions relative to the site characterization are made, including without limitation, items such as are listed below.

- Water-level measurements;
- Soil-boring logs;
- Well-construction details;
- Geophysical data;
- Well-inventory records;
- Field log books;
- Survey field notes;
- Laboratory results;
- Laboratory QA/QC reports;
- Chain-of-Custody Forms; and
- Air monitoring records.

12.2 Administrative Data

This category includes information and correspondence related to administrative aspects of the project. Listed below are examples of records that will be included in this category:
o Progress reports;
o Health Certification Forms:
o Accident Report Forms; and
o Material storage and disposal records.

All documents, including individual memoranda and notes, will be filed according to category. As required by the AO, files will be maintained for a period of nine (9) years following the completion of the RI/FS. These documents will be stored in the office of the ENSR Program Manager and the ENSR Pittsburgh Office central files until the FS is final, at that time, the documents will be transferred to the Reilly Industries Project Coordinator.
APPENDIX A
AIR INVESTIGATION
# Standard Operating Procedure

**Title:** Operation/Calibration of OVA-123 Portable Organic Vapor Analyzer

## OVA-128 Calibration Form

<table>
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<th>Project Name/No.</th>
<th>Reilly Tar</th>
<th>Recalibration Date</th>
<th>6/8/89</th>
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<td>Time</td>
<td>0635</td>
<td>By Whom</td>
<td>WM</td>
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<td>Calibration Gases:</td>
<td>Cylinder ID Number</td>
<td>Concentration</td>
<td>ppm</td>
</tr>
<tr>
<td>Lot 29048</td>
<td>Isobutenylene</td>
<td>Standardized to</td>
<td>54 ppm</td>
</tr>
<tr>
<td>2. Isobutenylene</td>
<td>Benzene</td>
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</tr>
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<td>Where Recalibrated:</td>
<td>At Site</td>
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</tr>
<tr>
<td>Battery Check:</td>
<td>(Y, N) Good</td>
<td>Recharge Time:</td>
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</tr>
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<td>Zero Adjust:</td>
<td>(Y, N) 0.0</td>
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**First Calibration:** Time 0635  
(Use higher standard gas)

- **Designated Reading:** 54 ppm
- **Observed Reading:** 54 ppm

- **Span Setting:**
  - Initial: 60.9
  - Final: 60.9

- **Post Span Observed Reading:** 54 ppm

- **Post Calibration Zero Adjust:** (Y, N) 0.0

**Second Calibration:** Time 0900

- **Designated Reading:** 54 ppm
- **Observed Reading:** 54 ppm

- **Final Zero Adjust:** (Y, N)

**Calibrated By:** W. Miller  
**Date:** 6/8/89

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0910J-Disk 0066D
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(1) June 8, 1989  
(2) Measurements determined by a HNu-PID with 10.2 Ev Lamp.  
(3) Readings reflect total volatile organics at ground surface and in the breathing zone for each location, respectively.
NOTE: ROW & COLUMN SPACING IS 5 METERS
GRID SPACING IS 10 METERS

FIGURE A-1
AIR AND RADIOLOGICAL INVESTIGATION SAMPLING LOCATIONS
REILLY INDUSTRIES, INC. SITE
APPENDIX B
RADIOLOGICAL INVESTIGATION
TO: JOHN ENGLICK
FROM: Marc Wizeman
DATE: 6-9-89

TMA
Thermo Analytical Inc.

ECSR
Chicago

WE ARE SENDING YOU THE FOLLOWING ITEMS:

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<th>DATE</th>
<th>COPIES</th>
<th>DESCRIPTION</th>
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<td>2</td>
<td>2 DAILY REPORTS 6-7, 6-8</td>
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<td>6-7</td>
<td>4</td>
<td>Pit 15A/13 CORRACATION</td>
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<tr>
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<td>6-8</td>
<td>1</td>
<td>TMA/E FIELD MAP - TMA/E FIELD COPY</td>
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<td>4</td>
<td>6-8</td>
<td>13</td>
<td>TMA/E SURFACE FIELD MEASUREMENT LOGBOOK</td>
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<tr>
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<td>6-7</td>
<td>1</td>
<td>SPECIAL CHECK LOG</td>
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THESE ARE TRANSMITTED AS CHECKED BELOW:

☐ For Approval    ☐ As requested    ☐ For Review and Comment
☐ For Your Use    ☐ For Analysis    ☐ Other (Specify)

TRANSMITTED VIA:

☐ Air Express    ☐ UPS    ☐ U.S. Mail    ☐ Telefax    ☐ Other (Specify)

REMARKS:

RECEIPT ACKNOWLEDGEMENT

SIGNATURE

DATE: 6-9-89

SIGNED: [Signature]
The Operations Report should summarize the events occurring during each shift in a chronological order. Significant "out of the ordinary" events should be discussed in some detail; others should be mentioned and related to the sequence.
OPERATIONS REPORT

MARK S. MIZRAHI

(Supervisor) JOHN ENGELICK

[Handwritten notes and entries]

Operations Report should summarize the events occurring during each shift in a chronological order. Significant "out of the ordinary" events should be discussed in some detail; others should be mentioned and related to the sequence.
<table>
<thead>
<tr>
<th>LOCATION #1: (off-site) Supermarket parking lot</th>
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<tr>
<td>SPA-3 #632</td>
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<tr>
<td>( \overline{X} = 7572 \text{ cpm} )</td>
</tr>
<tr>
<td>PIC #4017</td>
</tr>
<tr>
<td>( \overline{X} = 8.2 \text{ \mu A/m} )</td>
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<tr>
<th>LOCATION #3: (off-site) Grassy area southwest of Ford dealership</th>
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<td>( \overline{X} = 11.2 \text{ \mu A/m} )</td>
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<th>LOCATION #4: (off-site) Access road to site</th>
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<th>LOCATION #5: (on-site) Asphalit south of 8406 foundation</th>
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<td>Location #6: (On-Site) Light colored sludge</td>
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<td><strong>SPA-3 #632</strong></td>
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<td>$\bar{X} = 9.6$ $\text{uc/hr}$</td>
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<th>Location #7: (On-Site) Orangeish sludge</th>
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<th>Location #8: (On-Site) South east corner property</th>
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<td>$\bar{X} = 9531$ $\text{cpm}$</td>
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<tr>
<td>$\bar{X} = 9.7$ $\text{uc/hr}$</td>
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</table>
LOCATION #11: (ON-SITE) TAR + GLASS ON NORTH EAST SIDE FOUNDATION

SPA-3 #632

\( R = 13574 \text{ cpm} \)  

Pic #4617

\( R = 12.1 \text{ curie/hr} \)

LOCATION #12: (ON-SITE) 10' NORTH FROM ABOVE LOCATION

SPA-3 #632

\( \bar{R} = 14039 \)

Pic #4617

\( R = 12.2 \text{ curie/hr} \)

PER ABOVE DATA

\( y = Mx + B \)

\( M = 0.001 \)

\( B = 3.96 \)

\( R = 0.917 \)

\( x = \text{SPA-3 (cpm)} \)

\( y = 0.001x + 3.96 \)
FIGURE B-1

AIR AND RADIOLOGICAL INVESTIGATION SAMPLING LOCATIONS
REILLY INDUSTRIES, INC. SITE
DOVER, OHIO

NOTE: ROW & COLUMN SPACING IS 5 METERS
GRID SPACING IS 10 METERS
## SURFACE MEASUREMENTS FIELD LOGBOOK

**Site:** Dornley Thr, Job No.: [Blank]  
**Surveyors:** ANDREWS, MIZOYANI  
**Area:** [Blank]  
**Recorder:** ANDREWS

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<tr>
<td>10</td>
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</tbody>
</table>

### Legend:
- SPA-3: CONTACT C/Tc
- SPA-4: EXPOSURE @ 1m

### Count Time (Tc): 1 Min.
### Date: 6-8-89
### Bkg: [Blank]

### Surveyors:
- [Blank]

### Comments:
- [Blank]
- [Blank]
- [Blank]
- [Blank]
- [Blank]
- [Blank]
- [Blank]

### Sealer Model:
- SPA-3
- HP-210T

### Probe Model:
- PPS-I
- [Blank]

### PIC Serial No.:
- 332
- 632
- [Blank]

### Notes:
- Comments must be made for specific grid locations.
- Give coordinates of the location to which each comment applies.

---

**Eberline**

SERVICES DIVISION
### SURFACE MEASUREMENTS FIELD LOGBOOK

**Site:** O'Reilly 13  
**Job No.:**  
**Surveyors:** Andrews, Mizeahl 
**Recorder:** Andrews

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**Date:** 6-8-89  
**Bkg:**

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**Serial No.:** 632  
**Scaler Model:**  
**Serial No.:**  
**Probe Model:**  
**Serial No.:**  
**PIC Serial No.:**

**Notes:** Comments must be made for specific grid locations. Give coordinates of the location to which each comment applies.
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Probe Model: SPA-3 Serial No. 532
Scaler Model: SPA-3 Serial No. 632
Probe Model: Serial No. PIC Serial No.

**Notes:** Comments must be made for specific grid locations. Give coordinates of the location to which each comment applies.
**SURFACE MEASUREMENTS FIELD LOGBOOK**

**Site:** 
**Job No.:** 
**Surveyors:** ANNAELIS MAYE, MARRAH

**Area:** 
**No.:** 
**Recorder:** ANNAELIS

**Legend:**
- SPA-3: C/Tc
- HP-210T: C/Tc

**Count Time (Tc):** 1 Min.  
**Bkg:** SPA-3:  
**Date:** 6-8-89  
**HP-210T:**

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**Serial No.:** 332

**Probe Model:** SPA-3  
**Serial No.:** 32

**Scaler Model:**  
**Probe Model:**  
**PIC Serial No.:**

**Notes:**
Comments must be made for specific grid locations. Give coordinates of the location to which each comment applies.

**Eberline**

SERVICES DIVISION
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| O | 10830 10852 | 10939 1132 | 9725 9820 | 11439 1012 10001 | 12969 10435 |
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| R | 10677 11289 | 7526 10257 | 6231 9376 | 10620 9741 | 11343 1215 |
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Comments: 

Scaler Model 1017 Serial No. 332 
Probe Model 560-3 Serial No. C32 
Scaler Model Serial No. 
Probe Model Serial No. 
PIC Serial No. 

Notes: Comments must be made for specific grid locations. Give coordinates of the location to which each comment applies.
SURFACE MEASUREMENTS FIELD LOGBOOK

Site: [Name]  Job No.: [Job No.]  Surveyors: [Surveyors]  Recorder: [Recorder]

Area: [Area]  Count Time (Tc): [Tc Min.]  Date: [Date]

Legend:
- SPA-3: [Legend]
- HP-210T: [Legend]

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Eberline
SERVICES DIVISION

ON-SITE FILE COPY
SURFACE MEASUREMENTS FIELD LOGBOOK

Site: O'Beuly Tc
Job No.: 
Surveyors: ANDREWS, MIZRAHI
Recorder: ANDREWS

Area:

Legend:

HP-210T: C/Tc
SPA-3: C/Tc

Count Time (Tc): 1 Min.
Date: 6-8-89

Bkg:

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Notes: Comments must be made for specific grid location.
Give coordinates of the location to which each comment applies.

Scaler Model: PRES-1
Probe Model: SPA-3
Serial No.: 332

Scaler Model:
Probe Model:
Serial No.:
PIC Serial No.:

Eberline
SERVICES DIVISION

ON-SITE FILE COPY
## SURFACE MEASUREMENTS FIELD LOGBOOK

### Site:

**Openly The**

### Job No.:

**For**

### Surveyors:

**Andrews**

**Mizrah**

### Area:

**Site**

### Recorder:

**Andrews**

### Legend:

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### Count Time (TC):

**1 Min.**

### Date:

**6 - 8 - 89**

### SPA-3:

**Signed**

### HP-210T:

**Signature**

### Comments:

- [ ] comments...

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**P65-1**

### Probe Model:

**510-3**

### Serial No.:

**357**

**632**

### Notes:

Comments must be made for specific grid locations. Give coordinates of the location to which each comment applies.

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**Eberline SERVICES DIVISION**

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**Serial No.:** 332

**Probe Model:** EBERLINE 54A 3
**Serial No.:** 632

**Scaler Model:**
**Probe Model:**
**PIC Serial No.:**

**Notes:** Comments must be made for specific grid locations.

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**Eberline Services Division**

---

**ON-SITE FILE COPY**
**Surface Measurements Field Logbook**

- **Site:** [Redacted]
- **Job No.:** [Redacted]
- **Surveyors:** Andrew, Mirzahi
- **Recorder:** Andrew
- **Date:** 6-5-69

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Probe Model: SPA-3
Serial No.: 632
Scaler Model: [Redacted]
Probe Model: [Redacted]
PIC Serial No.: [Redacted]

**Notes:** Comments must be made for specific grid locations. Give coordinates of the location to which each comment applies.

*Eberline*

*Services Division*
## SURFACE MEASUREMENTS FIELD LOGBOOK

**Site:** Corlyl \( \text{Job No.:} \)  
**Surveys:** Andrews, Mirahati  
**Recorder:** Andrews

### Legend:
- SPA-3:  
- HP-210T:  

### Count Time (TC): 1 Min.  
**Date:** 6-8-89  
**Bkg:** SPA-3

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### Notes:
- Comments must be made for specific grid locations.  
- Give coordinates of the location to which each comment applies.

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Comments:

Scaler Model: PCS-1  Serial No. 332
Probe Model: SPA-3  Serial No. 632
Scaler Model: SPA-3  Serial No. 632
Probe Model: SPA-3  Serial No. 632
PIC Serial No.  

Notes: Comments must be made for specific grid locations. Give coordinates of the location to which each comment applies.
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Notes: Comments must be made for specific grid locations. Give coordinates of the location to which each comment applies.

**Scaler Model** PE2-1 Serial No. 632
**Probe Model** SPA-3 Serial No. 638
**Scaler Model** Serial No. 632
**Probe Model** Serial No. 638
**PIC Serial No.**

**Eberline SERVICES DIVISION**
**WEEKLY FIELD SOURCE CHECK LOG**

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>SOURCE</th>
<th>SERIAL NO.</th>
<th>ACTIVITY</th>
<th>SOURCE - A - CHECK, cpm</th>
<th>BACKGROUND - B - cpm</th>
<th>INSTRUMENT - C - CONV. - ER.</th>
<th>SOURCE BY INSTRUMENT</th>
<th>H.V. AT</th>
<th>BAT</th>
<th>SPKR</th>
<th>DISP</th>
<th>OK</th>
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<tr>
<td>04/20</td>
<td>16:30</td>
<td>14330</td>
<td></td>
<td>Thogian</td>
<td>38541</td>
<td>9189</td>
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<td>30052</td>
<td>1000</td>
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<td>38848</td>
<td></td>
<td>Wattle</td>
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<td>6267</td>
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<td></td>
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<td>2899</td>
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**CALCULATION OF SOURCE BY INSTRUMENT:**

\[
(-A-) \text{SOURCE CHECK, cpm} - (-B-) \text{BACKGROUND, cpm} = \text{dpm OR } \mu\text{R/hr} (-D-)
\]

**NOTE:** CONVERT EFFICIENCY FROM PERCENT TO DECIMAL EXAMPLE 10% TO 0.10 (EFFICIENCY CALIBRATED PROBES ONLY)

**REMARKS:**
APPENDIX C
RESIDUAL WASTE CHARACTERIZATION
RESIDUAL WASTE CHARACTERIZATION

The purpose of the tar, asphalt and slag sampling activity was to help determine disposal options and provide necessary information to facilitate general site cleanup before initiating invasive RI/FS tasks. The tar, asphalt and slag sampling program was performed by collecting one composite each of surface tar, asphalt and slag on June 5 to 9, 1989. Each composite was generated from individual samples collected at three locations on the site where the respective materials were present. Sampling locations are indicated in Figure C-1.

Expendable sampling equipment was used to collect the composite samples to minimize the potential for cross-contamination. Individual samples of each material were composited and the composite samples of tar, asphalt and slag were placed in one liter wide-mouth glass jars for shipment to the laboratory. Composite samples were subjected to RCRA characterization analyses as indicated in Table C-1. Holding times and volume requirements adhered to SW-846, 3rd Edition.

Results of the analyses are presented in the NANCO Laboratory Tables included in this Appendix. Review of these results demonstrates that the surface tar, asphalt and slag are not hazardous based on RCRA characteristics.
**EXPLANATION**

MW-1: EXISTING MONITORING WELL

RI AS-1: ASPHALT SAMPLING LOCATION

RI TR-1: TAR SAMPLING LOCATION

RI SL-1: SLAG SAMPLING LOCATION

**FIGURE C-1**

RESIDUAL WASTE CHARACTERIZATION SAMPLING POINTS
REILLY INDUSTRIES, INC. SITE
DOVER, OHIO
<table>
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<th>Parameter</th>
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<tr>
<td>Metals Digestion FAA or ICP</td>
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</tr>
<tr>
<td>Metals Digestion GFAA</td>
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</tr>
<tr>
<td>Arsenic</td>
<td>7060</td>
</tr>
<tr>
<td>Barium</td>
<td>7080</td>
</tr>
<tr>
<td>Cadmium</td>
<td>6010</td>
</tr>
<tr>
<td>Chromium</td>
<td>6010</td>
</tr>
<tr>
<td>Lead</td>
<td>6010</td>
</tr>
<tr>
<td>Mercury</td>
<td>7470</td>
</tr>
<tr>
<td>Selenium</td>
<td>7740</td>
</tr>
<tr>
<td>Silver</td>
<td>6010</td>
</tr>
<tr>
<td>Pesticide Extraction</td>
<td>3510</td>
</tr>
<tr>
<td>Lindane</td>
<td>8080</td>
</tr>
<tr>
<td>Endrin</td>
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<tr>
<td>Methoxychlor</td>
<td>8080</td>
</tr>
<tr>
<td>Toxaphene</td>
<td>8080</td>
</tr>
<tr>
<td>2,4-D</td>
<td>8150</td>
</tr>
<tr>
<td>Silvex</td>
<td>8150</td>
</tr>
</tbody>
</table>

Ignitability:
Flash Point                   1010

Reactivity:
Free Cyanide                  SW-846, Section 7.3.3.2
Free Sulfide                   SW-846, Section 7.3.4.2
pH                             9040
Corrosivity                   1110

### E.P. TOXICITY METALS

#### Nanco ID: 89-MS-0920  
#### Customer ID: ASPHALT

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<th>MCL</th>
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<td>&lt; 0.150</td>
<td>MG/L</td>
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</tr>
<tr>
<td>2M</td>
<td>BARIUM</td>
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<td>MG/L</td>
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<tr>
<td>3M</td>
<td>CADMIUM</td>
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<td>MG/L</td>
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</tr>
<tr>
<td>4M</td>
<td>CHROMIUM</td>
<td>&lt; 0.010</td>
<td>MG/L</td>
<td>5.0</td>
</tr>
<tr>
<td>5M</td>
<td>LEAD</td>
<td>&lt; 0.090</td>
<td>MG/L</td>
<td>5.0</td>
</tr>
<tr>
<td>6M</td>
<td>MERCURY</td>
<td>&lt; 0.0002</td>
<td>MG/L</td>
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<tr>
<td>7M</td>
<td>SELENIUM</td>
<td>&lt; 0.350</td>
<td>MG/L</td>
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<tr>
<td>8M</td>
<td>SILVER</td>
<td>&lt; 0.010</td>
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MCL = MAXIMUM CONTAMINATION LEVEL
PESTICIDES & HERBICIDES BY G.C.

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<th>Q.C. MATRIX SPIKE</th>
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<td>UG/L</td>
<td>UG/L</td>
<td>UG/L</td>
</tr>
<tr>
<td>HERBICIDES</td>
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<td></td>
<td></td>
</tr>
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<td>1H 2,4 D</td>
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<td>0.2</td>
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<tr>
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<td>N.D.</td>
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<td>N.D.</td>
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<tr>
<td>4P TOXAPHENE</td>
<td>5.0</td>
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<td>2.0</td>
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N.D. = NOT DETECTED  
MRL = MINIMUM REPORTING LEVEL  
MCL = MAXIMUM CONTAMINATION LEVEL
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<tr>
<td>5</td>
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<td>&lt; 0.090</td>
<td>MG/L</td>
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<tr>
<td>6</td>
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MCL = MAXIMUM CONTAMINATION LEVEL
**QUANTITATIVE RESULTS AND QUALITY ASSURANCE DATA**

**ENSR CONSULTANTS**

Date Received: 06/09/89
Date Reported: 06/15/89

**PESTICIDES & HERBICIDES BY G.C.**

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<tr>
<td>UG/L</td>
<td>UG/L</td>
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</table>

**HERBICIDES**

| 1H 2,4 D | 100.0 | N.D. 0.2 | N.D. 2.0 | 50 | N.D. 1.8 | 90 | 79 |
| 2H SILVEX | 10.0 | N.D. 0.1 | N.D. 2.0 | 79 | N.D. 1.8 | 67 | 67 |

**PESTICIDES**

| 1P LINDANE | 4.0 | N.D. 0.1 | N.D. | ----- | ----- | N.D. 2 | 71 | 74 |
| 2P ENDRIN | 0.2 | N.D. 0.2 | N.D. | ----- | ----- | N.D. 5 | 99 | 101 |
| 3P METHOXYCHLOR | 100.0 | N.D. 1.0 | N.D. | ----- | ----- | N.D. | ----- | ----- |
| 4P TOXAPHENE | 5.0 | N.D. 2.0 | N.D. | ----- | ----- | N.D. | ----- | ----- |

N.D. = NOT DETECTED  
MRL = MINIMUM REPORTING LEVEL  
MCL = MAXIMUM CONTAMINATION LEVEL
ENSR CONSULTANTS

Date Received: 06/09/89
Date Reported: 06/15/89

E.P. TOXICITY METALS

Nanco ID: 89-MS-0922  Customer ID: SLAG

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MCL = MAXIMUM CONTAMINATION LEVEL
PESTICIDES & HERBICIDES BY G.C.

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<td>MCL</td>
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<tr>
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<td>UG/L</td>
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**HERBICIDES**

| | 1H 2,4 D | | 2H SILVEX | |
| | [100.0] | N.D. | 0.2 | N.D. | 2.0 | 50 | N.D. | 1.8 | 90 | 79 |
| | [10.0] | N.D. | 0.1 | N.D. | 2.0 | 79 | N.D. | 1.8 | 67 | 67 |

**PESTICIDES**

| | 1P LINDANE | | 2P ENDRIN | | 3P METHOXYCHLOR | | 4P TOXAPHENE | |
| | 4.0 | N.D. | 0.1 | N.D. | N.D. | N.D. | N.D. | 2 | 71 | 74 |
| | 0.2 | N.D. | 0.2 | N.D. | N.D. | N.D. | N.D. | 5 | 99 | 101 |
| | 10.0 | N.D. | 1.0 | N.D. | N.D. | N.D. | N.D. | | | |
| | 5.0 | N.D. | 2.0 | N.D. | N.D. | N.D. | N.D. | | | |

N.D. = NOT DETECTED  MRL = MINIMUM REPORTING LEVEL  MCL = MAXIMUM CONTAMINATION LEVEL
E.P. TOXICITY METALS

Nanco ID: 89-GW-0924  Customer ID: FIELD BLANK

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<tr>
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<tr>
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<td>MG/L</td>
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<tr>
<td>8M</td>
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<td>MG/L</td>
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MCL = MAXIMUM CONTAMINATION LEVEL
NANCO LABS, INC.
QUANTITATIVE RESULTS AND QUALITY ASSURANCE DATA

ENS R CONSULTANTS

PESTICIDES & HERBICIDES BY G.C.

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<td>CONC. MRL</td>
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<td>UG/L UG/L</td>
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<td></td>
</tr>
<tr>
<td>1H 2,4 D</td>
<td>100.0</td>
</tr>
<tr>
<td>2H SILVEX</td>
<td>10.0</td>
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<tr>
<td>PESTICIDES</td>
<td></td>
</tr>
<tr>
<td>1P LINDANE</td>
<td>4.0</td>
</tr>
<tr>
<td>2P ENDRIN</td>
<td>0.2</td>
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<tr>
<td>3P METHOXYCLOR</td>
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<tr>
<td>4P TOXAPHENE</td>
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N.D. = NOT DETECTED
MRL = MINIMUM REPORTING LEVEL
MCL = MAXIMUM CONTAMINATION LEVEL
## Classical Chemistry Data

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<tr>
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<th>Reactivity to Sulfide</th>
<th>Flash Point (Celsius)</th>
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<td>&gt; 100</td>
</tr>
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All results are expressed in mg/kg wet weight unless otherwise indicated.
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