40-8948

OhioEPA
State of Ohio Environmental Protection Agency

Southeast District Office
2195 Front Street
Logan, Ohio 43138-9031
(614) 385-8501
FAX (614) 385-6490

George V. Voinovich
Governor

June 13, 1994

Mr. Chad Glenn, Project Manager
Regulatory Issues Branch Section
Office of Nuclear Materials Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

RE: SHIELDALLOY METALLURGICAL
GUERNSEY COUNTY
DERR CORRESPONDENCE

Dear Chad,

This correspondence regards the fax Ohio EPA received from the Nuclear Regulatory Commission (NRC) on June 7, 1994 concerning information that the NRC will be requesting from the Shieldalloy Metallurgical Corporation (SMC). The NRC requested that Ohio EPA send comments to the NRC by June 13, 1994 concerning the scope of the information request. After review of the information request Ohio EPA has comments which are detailed below. Many of Ohio EPA comments relate to a document titled the Generic Statement of Work (SOW) Remedial Investigation/Feasibility Study (RI/FS) which responsible parties are required to adhere to during the conductance of an RI/FS.

Ohio EPA requests that the investigatory work being required to address the identified data gaps adhere to the attached Statement of Work. To adequately address the information gaps identified by the NRC, Ohio EPA suggests that the NRC require SMC to submit a workplan outlining the work that will be performed and the Quality Assurance and Quality Control measures that will be implemented to insure that the generated information is of high quality.

If the Ohio EPA SOW cannot be adhered to, Ohio EPA suggests that the U.S. EPA's generic Statement of Work, or equivalent, be followed to address the information requirements.

The following are Ohio EPA's comments on the NRC's June 7, 1994 information request:

General Section

1. The second item in this section requests ground water elevations below the east and west piles. Ground water elevations for the entire site are necessary. It should be specified that ground water elevations for the water table are also being requested.

NH10

2. Item 5 requests "As Built" diagrams and maps of the east and west piles. Please clarify what the NRC wants with respect to as built diagrams? This should include the determination of the bottom elevation of the waste piles.

3. Item 7 requests information on the west pile cap materials. Please include the determination of the leachability of metals from the stabilized baghouse dust beneath the cap and along the rim of the cap. This determination must include new tests of exposed, weathered material.

4. Item 10 requests a map of wetlands within one mile of the SMC facility. Please include a map of the wetlands prior to filling activities at the SMC site and estimate the total acreage of wetlands that have been filled.

5. Please include additional information concerning the disposal of waste solvent and waste oil at the site and the excavation of the area used for this activity and placement of the excavated material in the west pile.

6. An evaluation of the impact of the activities at this site on the Cambridge water supply, past, present and future is also required.

7. The evaluation of possible buried vanadyl chloride cylinders at the site should be included with the information request, along with a request on how this will be investigated.

Economic Development & Additional Information

1. These sections request information regarding SMC's role in the economic situation of the Guernsey County area. It would be helpful if an explanation was provided on why this information is being requested.

Other Characterization Information

Ambient Air Quality

1. Please include in this section the items specified on Page 25, Task 5, Section A.4 of the attached SOW.

Surface Water

1. Please include in this section the request for information concerning surface water and sediments and specify that this characterization includes Chapman Run and tributaries, Wills Creek and wetlands. Also please include items specified on page 24, Task 5, Section A.3, of the attachment.

Ground Water Regime, Ground Water Quality, Geology & Soils

1. Please include in these section of the information request the items outlined in the attached SOW, pages 19 through 23, Task 5, Section A.1 and A.2.

2. The information request must make it clear that the NRC is requesting the depth to the water table.

Terrestrial Ecology & Aquatic Ecology

1. Please include in this section of the information request, the language and items of Task 5, Section D. and E. on pages 30 through 34 of the attached SOW.

2. Item 2, Terrestrial Ecology, should specify that identification of species that have been impacted by past activities at this site should also be evaluated, if possible.

General Comment

1. The NRC information request does not specifically request information for source characterization or environmental contamination at the site (both radiological or non-radiological). Please include in the information request the information outlined in Source Characterization, Task 5, Section B. and Contamination Characterization, Task 5, Section C. of the attached SOW.

   Only through a thorough characterization of the environmental contamination that exists at this site can the best remedial or decommissioning action be selected or implemented.

2. The NRC information request does not list the assessment of the risks to human health and the environment from the conditions at the site. Please include in the information request the performance of a Human Health and Environmental Baseline Risk Assessment for the radiological and non-radiological risks that

exist at the site for current and future scenarios as outlined in Tasks 6 and 7 of the attached SOW (pages 34-40).

3. To ensure that the data generated to fulfill the information request is of high quality, please include Task 2, RI/FS Work Plan Requirements, Pages 5 through 16. A workplan, quality assurance project plan, field sampling plan and a health and safety plan should be required per this section.

4. Please include in the information request an evaluation of remedial or decommissioning alternatives following the process outlined in Tasks 8 and 10. Of particular importance is the detailed evaluation of alternatives in Task 10 which specify the criteria for analyzing the alternatives. These criteria include: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements; long-term effectiveness; reduction of toxicity, mobility or volume; short-term effectiveness; implementability; cost; state acceptance; and community acceptance.

Site Closure and Stabilization

1. Please include the evaluation of floodplain management and flood prevention engineering controls for any on-site disposal alternatives being considered and estimate the costs incurred by such measures.

2. Please include the evaluation of wetland mitigation and replacement for the wetlands that have been filled and impacted by activities at this site.

I would like to thank the NRC for the opportunity to participate in this process. Should you have further questions or comments regarding this letter please do not hesitate to call me at 614-385-8501.

Sincerely,

David Hunt

David Hunt
Site Coordinator
Division of Emergency & Remedial Response

cc: Jenifer Kwasniewski, DERR-CO
Catherine Stroup, Legal-CO
Jim Payne & Bob Karl, AGO-Environmental Enf.
Tom Harcarik, DERR-CO
Dwain Baer, ODH-Radiological Health
Jennifer Wendell, USEPA, Region V

Attachment A

Revised 05/26/92

GENERIC STATEMENT OF WORK
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
STATE VERSION

PURPOSE:

The purpose of this remedial investigation/feasibility study (RI/FS) is to investigate the nature and extent of releases of hazardous waste or constituents, pollutants, wastes, industrial wastes or contaminants at the Site, assess the potential risk to human health and the environment, and develop and evaluate potential remedial alternatives. The RI and FS are interactive and may be conducted concurrently so that the data collected in the RI influences the development of remedial alternatives in the FS, which in turn affects the data needs and the scope of treatability studies.

The Respondent shall conduct this RI/FS and shall produce an RI and FS report that are in accordance with this statement of work, the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (RI/FS Guidance) (U.S. EPA, Office of Emergency and Remedial Response, October 1988), and any other guidances that Ohio EPA uses in conducting an RI/FS (a list of the primary guidances is attached), as well as any additional requirements in the administrative order. The RI/FS Guidance describes the report format and the required report content. The Respondent shall furnish all necessary personnel, materials, and services needed, or incidental to, performing the RI/FS, except as otherwise specified in the administrative order.

At the completion of the RI/FS and the terms of this Order, the Ohio EPA shall be responsible for the selection of a site remedy. The remedial action alternative selected by the Ohio EPA shall meet the cleanup standards specified in the How Clean Is Clean Policy. That is, the selected remedial action will be protective of human health and the environment, shall be in compliance with applicable or relevant and appropriate requirements of other laws, will be cost-effective, shall utilize permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable, and shall address the statutory preference for treatment as a principal element. The final RI and FS reports, as approved by the Ohio

EPA, shall, with the administrative record, form the basis for the selection of the site's remedy and will provide the information necessary to support the development of a decision document.

The Ohio EPA shall provide oversight of the Respondent's activities throughout the RI/FS. The Respondent shall support the Ohio EPA's initiation and conduct of activities related to the implementation of oversight activities.

TASKS/DELIVERABLES:

The Remedial Investigation/Feasibility Study consists of eleven tasks:

TASK 1 -- Scoping of the RI/FS

A. Site Background/Site History
B. Current or Previous Interim/Emergency Actions

TASK 2 -- Work Plan Requirements

A. RI/FS Work Plan
B. Quality Assurance Project Plan
C. Field Sampling Plan
D. Health and Safety Plan

TASK 3 -- Interim Actions

TASK 4 -- Community Relations

TASK 5 -- Remedial Investigation

A. Environmental Setting
B. Source Characterization
C. Contamination Characterization
D. Ecological Assessment
E. Potential Receptor Identification
F. RI report

TASK 6 -- Human Health Baseline Risk Assessment

A. Conceptual Site Model
B. Human Risk Assessment Report

TASK 7 -- Environmental Baseline Risk Assessment

A. Conceptual Site Model
B. Environmental Risk Assessment Report

TASK 8 -- Development and Screening Alternatives

A. Remedial Action Objectives
B. Technologies Screening
C. Alternatives Array

TASK 9 -- Treatability Study

A. Treatability Study Work Plan
B. Treatability Study Evaluation Report

TASK 10 -- Detailed Analysis of Alternatives

A. Detailed Analysis of Alternatives Report
B. Feasibility Study Report

TASK 11 -- Monthly Progress Reports

TASK 1 -- SCOPING OF THE RI/FS

The Respondent shall describe the background of the Site, its history and current condition and outline the purpose and need for remedial investigation of the Site. Data gathered during previous investigations, site inspections and other relevant activities shall be used. Previous investigations shall be summarized and referenced. This information shall be documented in the RI/FS Work Plan (Task 2.A.).

A. Site Background/Site History

The Respondent shall review and analyze all existing site background information and will conduct a site visit to assist in planning the scope of the RI/FS.

1. Collect and analyze existing data and document the need for additional data

Before planning RI/FS activities, all existing site data will be thoroughly compiled and reviewed by the Respondent. Specifically, this will include presently available data relating to the varieties and quantities of hazardous, industrial and/or other wastes at the Site, and past disposal practices. This will also include results from any previous sampling events that may have been conducted. The Site background may reference applicable existing reports. The Respondent shall

provide, at a minimum, the following:

a. Map(s) depicting property lines, topography and surface drainage, all known active or past treatment, storage or disposal areas, all known past and present product and waste underground storage tanks and associated piping, surrounding land use and location of wells;

b. A history and description of ownership and operation;

c. A summary of past and present permits requested and/or recieved;

d. A summary of known or suspected source areas; and

e. A summary of any previous response action conducted by state, local, federal or private parties.

The Respondent shall refer to Table 2-1 of the RI/FS Guidance for a comprehensive list of data collection information sources. This information will be utilized in determining additional data needed to characterize the Site, better define potential applicable requirements, and develop a range of preliminarily identified remedial alternatives. Data Quality Objectives (DQOs) will be established subject to Ohio EPA approval which specify the usefulness of existing data. Decisions on the necessary data and DQOs will be made by the Ohio EPA.

The Respondent shall provide an annotated bibliography of existing reports for the Site, including reports relevant to the RI/FS.

2. Conduct Site Visit

The Respondent shall conduct a site visit during the project scoping phase to assist in developing a conceptual understanding of sources and areas of contamination as well as potential exposure pathways and receptors at the site. During the site visit the Respondent shall observe the Site's physiography, hydrology, geology, and demographics, as well as natural resources, ecological and cultural features and recptors. This information will be utilized to better scope the project and to determine the extent of additional data necessary to characterize the site, better define potentially applicable requirements and narrow the range of preliminarily identified remedial alternatives.

B. Implementation of Interim/Emergency Actions.

1. The Respondent's report shall document any interim or emergency action which were or are being undertaken at the Site. This shall include:

   a. Objectives of the interim or emergency actions: how the action has mitigated or is mitigating a potential threat to human health and the environment and/or is consistent with and integrated into any long term remedial action at the Site;

   b. Design, construction, operation and maintenance requirements;

   c. Schedules for design, construction and monitoring; and

   d. Schedule for progress reports.

Respondent shall submit a report to the Ohio EPA documenting the results of Tasks 1.A.1., 1.A.2. and 1.B.1. as part of the of the RI/FS Work Plan.

TASK 2 -- RI/FS WORK PLAN REQUIREMENTS

At the conclusion of the scoping phase, the Respondent will submit an RI/FS work plan, a field sampling plan, a Quality Assurance Project Plan (QAPP), and a site health and safety plan. The RI/FS work plan, field sampling plan, and QAPP must be reviewed and approved by Ohio EPA prior to the initiation of field activities.

A. RI/FS Work Plan

A work plan documenting the decisions and evaluations completed during the scoping process will be submitted to Ohio EPA for review and approval. The work plan should be developed in conjunction with the QAPP, field sampling plan and the site health and safety plan, although each plan may be delivered under separate cover. The RI/FS Work Plan will also include a comprehensive description of the work to be performed as outlined in this SOW, including the methodologies to be utilized, as well as a corresponding schedule for completion. In addition, the work plan must include the rationale for performing the required activities.

In the RI/FS Work Plan, the Respondent shall present the

justification for the proposed omission of any tasks of this SOW because of work that has already been performed or work that is not appropriate to the Site.

The RI/FS Work Plan will present a statement of the real or potential problem(s) posed by the Site and the objectives of the RI/FS. Furthermore, the plan will include a site background summary setting forth the Site description including the geographic location of the Site, and to the extent possible, a description of the Site's physiography, hydrology, geology, demographics, ecological, cultural and natural resource features; a synopsis of the site history and a description of previous responses that have been conducted at the site by local, state, federal, or private parties; a summary of the existing data in terms of physical and chemical characteristics of the contaminants identified, and their distribution among the environmental media at the site.

In addition, the plan will include a description of the site management strategy developed during scoping and data needs for evaluation of remedial alternatives. The plan will reflect coordination with treatability study requirements. The RI/FS Work Plan shall provide sufficient information for the Ohio EPA to identify applicable or relevant and appropriate Federal and state requirements (chemical-specific, location-specific and action-specific).

The RI/FS work plan shall provide a detailed description of the tasks to be performed, information needed for each task (e.g., for human health and environmental risk evaluation), information to be produced during and at the conclusion of each task, and a description of the work products that will be submitted to the Ohio EPA. This includes the deliverables set forth in the remainder of this statement of work: a schedule for each of the required activities; the conceptual site model for and the human health baseline risk assessment; the conceptual site model for and the environmental baseline risk assessment; the RI report; the FS report and required interim deliverables; monthly reports to the Ohio EPA; and meetings and presentations to the Ohio EPA at the conclusion of each major phase of the RI/FS.

Because of the unknown nature of the Site and iterative nature of the RI/FS, additional data requirements and analyses may be identified throughout the process. The Respondent will submit a technical memorandum documenting the need for additional data, and identifying the DQOs whenever such requirements are identified. In any event, the Respondent is responsible for fulfilling additional data and analysis needs identified by the Ohio EPA consistent with the purposes and objectives of this RI/FS.

B. Quality Assurance Project Plan

The Respondent shall prepare a plan to document all monitoring and investigation procedures: sampling, field measurements, sample analysis, toxicity testing, bioassays, and all modeling performed during the investigation to characterize the environmental setting, source(s), contamination, and human and biological receptors to ensure that all information, data and resulting decisions are technically sound, statistically valid and properly documented. This plan shall comport with Ohio EPA's Guidelines and Specifications for Preparing Quality Assurance Projects Plans, policy number DERR-00-RR-008. As required by Section VIII, Paragraph C, of this Order, Respondent shall schedule a meeting with this Agency to discuss the requirements of this plan.

1. Data Collection Strategy

The strategy section of the (QAPP) shall include but not be limited to the following:

a. Description of the types and intended uses for the data, relevance to remediation or restoration goals, and the necessary level of precision, accuracy, and statistical validity for these intended uses;

b. Description of methods and procedures to be used to assess the precision, accuracy and completeness of the measurement data;

c. Description of the rational used to assure that the data accurately and precisely represent a characteristic of a population, variation of physical or chemical parameters throughout the Site, a process condition or an environmental condition. Factors which shall be considered and discussed include, but are not limited to:

i) Environmental conditions at the time of sampling;

ii) Sampling design (including number, location and distribution);

iii) Representativeness of selected media, exposure pathways, or receptors; and

iv) Representativeness of selected analytical parameters.

v) Representativeness of testing procedures and conditions; and

vi) Independence of background or baseline from site influences.

d. Description of the measures to be taken to assure that the following data sets can be compared quantitatively or qualitatively to each other:

i) RI data collected by the Respondent over some time period;

ii) RI data generated by an outside laboratory or consultant employed by the Respondent versus data collected by the Respondent, and;

iii) Data generated by separate consultants or laboratories over some time period not necessarily related to the RI effort.

iv) Data generated by Ohio EPA or by an outside laboratory or consultant employed by Ohio EPA;

e. Details relating to the schedule and information to be provided in quality assurance reports. These reports should include but not be limited to:

i) Periodic assessment of measurement data accuracy, precision and completeness;

ii) Results of performance audits;

iii) Results of system audits;

iv) Significant quality assurance problems and recommended solutions; and

v) Resolutions of previously stated problems.

2. Sample Analysis

The Sample Analysis section of the Quality Assurance Project Plan shall specify the following:

a. Chain-of-custody procedures, including:

i) Identification of a responsible party to act as sample custodian at the laboratory facility authorized to sign for incoming field samples, obtain documents of shipment and verify the data

entered onto the sample custody records;

ii) Provision for a laboratory sample custody log consisting of serially numbered lab-tracking report sheets; and

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

b. Sample storage procedures and storage times;

c. Sample preparation methods;

d. Analytical procedures, including:

i) Scope and application of the procedure;

ii) Sample matrix;

iii) Potential interferences;

iv) Precision and accuracy of the methodology;

v) Method detection limits;

vi) Special analytical services required to ensure contract required detection limits do not exceed known toxicity criteria; and

vii) Verification and reporting of tentatively identified compounds.

e. Calibration procedures and frequency;

f. Data reduction, validation and reporting;

g. Internal quality control checks, laboratory performance and systems audits and frequency, including:

i) Method blank(s);

ii) Laboratory control sample(s);

iii) Calibration check sample(s);

iv) Replicate sample(s);

v) Matrix-spiked sample(s);

vi) "Blind" quality control sample(s);

vii) Control charts;

viii) Surrogate samples;

ix) Zero and span gases; and

x) Reagent quality control checks.

h. Preventative maintenance procedures and schedules;

i. Corrective action (for laboratory problems); and

j. Turnaround time.

3. Modeling

The Modeling section of the Quality Assurance Project Plan shall apply to all models used to predict or describe fate, transport or transformation of contaminants in the environment and shall discuss:

a. Model assumptions and operating conditions;

b. Input parameters; and

c. Verification and calibration procedures.

4. In Situ or Laboratory Toxicity Tests

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

5. Data Record

The QAPP shall also provide the format to be used to present the raw data and the conclusions of the investigation, as described in a,b, and c below:

a. The data record shall include the following:

i) Unique sample or field measurement code;

ii) Sampling or field measurement location and sample or measurement type;

iii) Sampling or field measurement raw data;

iv) Laboratory analysis ID number;

v) Property or component measured; and

vi) Result of analysis (e.g., concentration).

b. Tabular Displays

The following data shall be presented in tabular displays:

i) Unsorted (raw) data;

ii) Results for each medium, organism, or for each constituent measured;

iii) Data reduction for statistical analysis;

iv) Sorting of data by potential stratification factors (e.g., location, soil layer, topography, vegetation form);

v) Summary data (i.e., mean, standard deviation, min/max values, and sample number); and

vi) Comparisons with background or reference data.

c. Graphical Displays

The following data shall be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):

i) Display sampling locations and sampling grid;

ii) Indicate boundaries of sampling area, and areas where more data are required;

iii) Display levels of contamination at each sampling location or location from which organism was taken;

iv) Display geographical extent of contamination;

v) Display contamination levels, averages and maxima;

vi) Illustrate changes in concentration in relation to distance from the source, time, depth or other parameters;

vii) Indicate features affecting intramedia transport and show potential receptors;

viii. Compare nature and extent of contamination with results of ecological or biological sampling or measurements; and

ix) Display comparisons with background or reference analyses or measurements.

C. Field Sampling Plan

1. Sampling

The Sampling section of the Field Sampling Plan shall discuss:

a. Sufficient preliminary sampling to ensurethe proper planning of b through o below;

b. Selecting appropriate sampling locations, depths, vegetation strata, organism age, etc. and documenting relevance of sample for intended biological toxicity tests or analyses;

c. Providing a sufficient number of samples to meet statistical or other data useability objectives;

d. Measuring all necessary ancillary data such as ambient conditions, baseline monitoring, etc.;

e. Determining environmental conditions under which sampling should be conducted;

f. Determining which media, pathways, or receptors are to be sampled (e.g., ground water, air, soil, sediment, biota, etc.);

g. Determining which parameters are to be measured and where;

h. Selecting the frequency and length of sampling period;

i. Selecting the sample design (e.g., composites, grabs, random, repeated, etc.);

j. Selecting the number, location, media or organisms for determining background conditions or reference conditions (refer to Appendix B, Background Sampling Guidance, of Ohio EPA's How Clean Is Clean Policy);

k. Measures to be taken to prevent contamination of the sampling equipment and cross contamination between sampling points;

l. Documenting field sampling operations and procedures, including;

i) Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., filters and adsorbing reagents);

ii) Procedures and forms for recording the exact location and specific considerations associated with sample acquisition;

iii) Documentation of specific sample preservation method;

iv) Calibration of field devices;

v) Collection of replicate and field duplicate samples;

vi) Submission of field-biasedand equipment blanks, where appropriate;

vii) Potential interferences present at the site or facility;

viii) Construction materials and techniques associated with monitoring wells and piezometers;

ix) Field equipment listing and sample containers;

x) Sampling order; and

xi) Decontamination procedures.

m. Selecting appropriate sample containers;

n. Sample preservation; and

o. Chain-of-custody, including:

i) Standardized field tracking reporting forms to establish sample custody in the field prior to and during shipment;

ii) Sample sealing, storing and shipping

procedures to protect the integrity of the sample; and,

iii) Pre-prepared sample labels containing all information necessary for effective sample tracking.

2. Field Measurements

The Field Measurements section of the Field Sampling Plan shall discuss:

a. Selecting appropriate field measurement locations, depths, organism age etc.;

b. Providing a sufficient number of field measurements that meet statistical or data useability objectives;

c. Measuring all necessary ancillary data such as ambient or baseline environmental conditions;

d. Determining conditions under which field measurement should be conducted;

e. Determining which media, pathways, or receptors are to be addressed by appropriate field measurements (e.g., ground water, air, soil, sediment, biota, etc.);

f. Determining which physical, chemical, or biological parameters are to be measured and where;

g. Selecting the frequency and duration of field measurement; and

h. Documenting field measurement operations and procedures, including:

i) Procedures and forms for recording raw data and the exact location, time and Site specific considerations associated with the data acquisition;

ii) Calibration of field devices;

iii) Collection of replicate measurements;

iv) Submission of field-biased blanks, where appropriate;

v) Potential interferences present at the Site;

vi) Construction materials and techniques associated with monitoring wells and piezometers used to collect field data;

vii) Field equipment listing;

viii) Order in which field measurements were made; and

ix) Decontamination procedures; and

i. Selecting the number, location, media, and organisms for determining background or reference conditions.

D. Health and Safety Plan.

The Respondent shall develop a Health and Safety plan to protect the health and safety of personnel involved in the site investigations and the surrounding community.

1. Major elements of the Health and Safety Plan shall include:

a. Facility or site description including availability of resources such as roads, water supply, electricity and telephone service;

b. Description of the known hazards and an evaluation of the risks associated with the incident and with each activity conducted;

c. Listing of key personnel (including the site safety and health officer) and alternates responsible for site safety, response operations, and for protection of public health;

d. Delineation of work area, including a map;

e. Description of levels of protection to be worn by personnel in the work area;

f. Description of the medical monitoring program for on-site responders;

g. Description of standard operating procedures established to assure the proper use and maintenance of personal protective equipment;

h. The establishment of procedures to control site access;

i. Description of decontamination procedures for personnel and equipment;

j. Establishment of site emergency procedures;

k. Availability of emergency medical care for injuries and toxicological problems;

l. Description of requirements for an environmental monitoring program. (This should include a description of the frequency and type of air and personnel monitoring, environmental sampling techniques and a description of the calibration and maintenance of the instrumentation used.);

m. Specification of any routine and special training required for responders; and

n. Establishment of procedures for protecting workers from weather-related problems.

2. The Health and Safety Plan shall be consistent with:

a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);

b. Section 111(c)(6) of CERCLA;

c. EPA Order 1440.3 -- Respiratory Protection;

d. EPA Order 1440.2 -- Health and Safety Requirements for Employees Engaged in Field Activities;

e. EPA Occupational Health and Safety Manual;

f. EPA Interim Standard Operating Safety Procedures and other EPA guidance as developed by EPA;

g. OSHA regulations particularly in 29 CFR 1910 and 1926;

h. State and local regulations; and

i. Site or facility conditions.

The Safety Plan should identify problems or hazards that may be encountered and their solution. Safety procedures to be followed to protect third parties, such as visitors or the surrounding community, should also be provided.

TASK 3 -- INTERIM ACTIONS

A. At any time during the Remedial Investigation, the Respondent may propose to conduct or the Ohio EPA may require that the Respondent conduct an interim remedial action(s). Any interim remedial action proposed by the Respondent for the Site must be approved by the Ohio EPA prior to implementation. The following factors shall be considered in determining the appropriateness of an interim remedial action:

1. Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous wastes or substances;

2. Actual or potential contamination of drinking water supplies or sensitive ecosystems;

3. Hazardous waste or substances in drums, barrels, tanks or other bulk storage containers that may pose a threat of release;

4. High levels of hazardous waste or substances in soils largely at or near the surface that may migrate;

5. Weather conditions that may cause hazardous waste or substances to migrate or be released;

6. Threat of fire or explosion; and

7. Other situations or factors that may pose threats to public health, welfare or the environment.

B. The Respondent shall develop and submit for approval an Interim Action Work Plan that includes, but is not limited to, the following:

1. A discussion of the technical factors of importance for implementing the Interim Action;

2. A justification for selection of the preferred action and/or system modification based on its ability to meet the interim action criteria of preventing, minimizing or mitigating a substantial threat to the public health or the environment;

3. Treatment, storage or disposal of contaminated media in a manner that complies with federal and state laws, requirements and guidance documents adopted thereunder. Respondent shall obtain any permits necessary for implementation of the Interim Action. Ohio EPA shall consider, in a timely manner, such permit applications

which Respondent may be required to submit pursuant to the Interim Action Work Plan;

4. A schedule of tasks, length of tasks and completion times, including any permits, permits-to-install and permits-to-operate, according to calendar days;

5. A monitoring strategy to determine the effectiveness of the Interim Action;

6. A Quality Assurance Project Plan (QAPP) for the Interim Action;

7. a Health and Safety Plan (HASP) for the Interim Action.

C. Within twenty (20) calendar days following Ohio EPA approval of the Interim Action Work Plan, Respondent shall commence implementation of the work as approved and in accordance with the schedule contained therein.

D. Progress on the Interim Action shall be reported in the Monthly Progress Report per Task 11.

TASK 4 -- COMMUNITY RELATIONS

This task shall be completed by the Ohio EPA.

TASK 5 -- REMEDIAL INVESTIGATION

The Respondent shall conduct those investigations necessary to: characterize the site (Environmental Setting); define the source (Source Characterization); define the degree and extent of contamination (Contamination Characterization and Ecological Assessment); and identify actual or potential receptors (Ecological and Human Risk Assessment).

The investigations should result in data of adequate technical quality to support the development of the Human Health Baseline Risk Assessment and the Ecological Risk Assessment and the evaluation of remedial action alternatives of the Feasibility Study.

Remedial Investigation activities shall follow the plans set forth in Task 2. All sampling, analyses, and measurements shall be conducted in accordance with the QAPP. All sampling and measurement locations shall be documented in a log and identified on a detailed site map.

A. Environmental Setting

The Respondent shall collect information to supplement and verify existing information on the environmental setting at the site as well as the environmental setting adjacent to and surrounding the Site. The Respondent shall characterize the following:

1. Regional Hydrogeology

The Respondent shall conduct a program to evaluate the regional hydrogeologic characteristics surrounding the facility. Regional information can be obtained as described in Task 1. This shall include but not be limited to:

a. Depth to bedrock and lithology;

b. Characteristics of major stratigraphic units and the depositional environment;

c. Identification of regional aquifer(s);

d. Identification of all residential, municipal, industrial and agricultural wells within a four (4) mile radius of the Site. Include any available information such as well logs, construction details, average yield and chemical analyses;

e. Direction of ground water flow in the regional aquifer(s);

f. Identification and characterization of recharge and discharge areas, with amount of recharge and discharge;

g. Description of regional geomorphology, including locations of surface water bodies and floodways, etc. This description should include an analysis of any topographic features that may influence the ground water flow system; and

h. Description of structural features such as jointing, faulting and folding.

2. Site Hydrogeology and Soil Characteristics

The Respondent shall conduct a program to evaluate site-specific hydrogeologic characteristics and soil characteristics at the Site. This description shall be based on data collected from

bore holes, piezometers, laboratory and field tests. The description shall include:

a. An accurate classification and description of the consolidated and unconsolidated stratigraphic units beneath the Site. This shall include:

   i) Hydraulic conductivity (vertical and horizontal);

   ii) Porosity, effective porosity, and bulk density;

   iii) Rock and soil (ASTM 2488 and 2487) classification;

   iv) Grain size distribution (sieve and hydrometer) curves;

   v) Thickness;

   vi) Lateral extent;

   vii) Moisture content;

   viii) The attenuation capacity and mechanisms of attenuation of the natural earth material and/or fill (i.e., ion exchange capacity, base saturation, organic carbon content, mineral content, soil sorptive capacity, storage capacity);

   ix) Soil Ph;

b. The Respondent shall conduct a program to characterize the near surface soil and rock units. This shall include:

   i) SCS soil classification;

   ii) Surface soil distribution;

   iii) Infiltration;

   iv) Evapotranspiration;

c. A discussion of the local occurrence of ground water including:

   i) Identification of all aquifer systems, including depth from the surface and lateral

and vertical extent. (Aquifer system means one or more geologic unit or formation that is wholly or partly saturated with water and is able to store, transmit and yield significant amounts of water to wells or springs.);

ii) Identification of all significant saturated zones above the aquifer systems;

iii) Depth to the water table;

iv) Ground water flow direction and rates in the aquifers and all strata above the aquifers;

v) Effects of stratification on saturated and unsaturated flow;

vi) Description of the interconnection between the saturated zones and the aquifers, surface water, seeps and springs;

vii) Description of recharge and discharge areas within the site boundaries. This shall include any relationship between ground water and springs, streams and other surface water features;

viii) Temporal fluctuations (i.e., seasonal and man-made) in ground water levels and their effects on ground water flow direction; and

ix) Identification of zones of high permeability that may act as a migration route for contaminants.

d. Hydrogeologic cross sections showing the extent (depth, thickness and lateral extent) of each hydrogeologic unit shall be developed. Cross sections shall be developed in various orientations across the Site (e.g., in the direction of ground water flow and orthogonal to ground water flow). At a minimum the following shall be identified:

i) Structures such as zones of fracturing or channeling likely to influence contaminant migration in the consolidated or unconsolidated deposits;

ii) Zones of higher permeability, such as sand and gravel deposits, that might direct the flow of contaminants;

iii) Zones of low permeability that may restrict and/or attenuate the flow of contaminants; and

iv) Water-bearing zones above the confining layer that may serve as pathways for contaminant migration including perched zones of saturation.

e. Based on data obtained from ground water monitoring wells and piezometers installed upgradient and downgradient of the potential contaminant source, a representative description of water level or fluid pressure monitoring including:

i) Water level contour and/or potentiometric surface maps;

ii) Hydraulic cross sections showing vertical gradients;

iii) Flow nets, including the vertical and horizontal components of flow and the interconnection between waterbearing strata; and

iv) Any temporal changes in hydraulic gradients and flow directions due, for example, to seasonal or man-made influences.

f. A description of man-made influences that may affect the hydrogeology of the Site, identifying:

i) Active and inactive water supply and production wells with appropriate pumping schedules; and

ii) Man-made structures such as pipelines, french drains, ditches, unlined and lined ponds, lagoons, septic tanks, NPDES permitted outfalls, retention areas and utility lines.

g. An area-specific description of the geomorphology at the Site. At a minimum this shall include;

i) An analysis of any topographic feature that mat influence the ground water flow system;

ii) A surface topography map depicting (at a minimum) streams, wetlands, topographic depressions and springs. The topographic map shall be constructed by a qualified professional and shall provide contour intervals at a level of detail appropriate for the site specific hydrogeologic investigation (e.g., two-foot intervals). The map shall depict the location of all borings, monitoring wells and cross sections.

h. An area-specific description of the structural geology at the Site;

i. The RI report shall document the methods and procedures used to gather and evaluate the hydrogeologic data. These methods and procedures shall be in accordance with Ohio EPA and U.S. EPA guidance. This may include but is not limited to:

i) The drilling and soil sampling methods used in characterizing the soil and hydrogeologic characteristics of the Site (including all boring logs and raw data);

ii) The analytical procedures and methods used to characterize the soil and rock materials obtained from the borings and/or test pits;

iii) The methods, equipment and procedures used to define the aquifer systems and all significant zones of saturation above the uppermost aquifer system including:

1) Well and piezometer location, depth, construction and installation specifications (including diagrams);

2) Water level measurements and procedures;

3) Ground water seepage observations during drilling; and

4) Pumping tests and slug tests (including type, description and rational for its use, raw data and method of interpreting the results).

iv) A description, rationale and raw data of indirect methods such as soil survey, geophysical and modeling. (These methods can be used to infer ground water characteristics and support or guide direct methods. However, no

site remedial investigation can be based strictly on these methods.)

3. Surface Water and Sediment

The Respondent shall conduct a program to characterize any surface water bodies in the vicinity of the Site. Such characterization shall include, but not be limited to, the following activities and information:

a. Description of the temporal and permanent surface water bodies including:

i) For lakes and estuaries: location, elevation, surface area, inflow, outflow, depth, temperature stratification and volume;

ii) For impoundments: location, elevation, surface area, depth, volume, freeboard and purpose of impoundment;

iii) For streams, ditches, drains, swamps and channels: location, elevation, flow, velocity, depth, width, seasonal fluctuations and flood zones (i.e., 50 and 100 year events);

iv) Drainage patterns;

v) Evapotranspiration; and

vi) Any other known discharges including those permitted by NPDES.

b. Description of the chemistry of the surface water and sediments. This includes determining the Ph, total dissolved solids, total suspended solids, biological oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients, chemical oxygen demand, total and dissolved organic carbon, specific contaminant concentrations, etc.

c. Description of sediment characteristics including:

i) Deposition area, patterns, and rates;

ii) Thickness profile; and

iii) Physical and chemical parameters (e.g., grain size, density, organic carbon content, ion exchange capacity, Ph, etc.)

4. Air

The Respondent shall provide information characterizing the climate in the vicinity of the Site in general, and at the time of the investigation(s). Such information shall include, but not be limited to:

a. A description of the following parameters:

i) Annual and monthly rainfall averages;

ii) Monthly temperature averages and extremes;

iii) Wind speed and direction;

iv) Relative humidity/dew point;

v) Atmospheric pressure;

vi) Evaporation data;

vii) Development of inversions; and

viii) Climate extremes that have been known to occur in the vicinity of the facility, including frequency of occurrence.

b. A description of topographic and man-made features which affect air flow or emission patterns, including:

i) Ridges, hills or mountain areas;

ii) Canyons or valleys;

iii) Surface water bodies (e.g. rivers, lakes, bays, etc.);

iv) Wind breaks and forests; and

v) Buildings; and

vi) Any other features that may affect air flow or emission patterns.

B. Source Characterization

The Respondent shall collect analytical data to completely characterize the wastes and the areas where wastes have been placed, collected, came to be located or removed including: type (hazardous, solid, residential, industrial, etc.); quantity; physical form; disposition

(containment or nature of deposits); and Site characteristics affecting release (e.g., Site security and engineering barriers). Data shall include all information referenced in the Remedial Investigation Work Plan (Task 2). This shall include quantification of the following specific characteristics, at each source area:

1. Unit/Disposal Area characteristics:

   a. Location of unit/disposal area;

   b. Type of unit/disposal area;

   c. Design features;

   d. Operating practices (past and present);

   e. Period of operation;

   f. Age of unit/disposal area;

   g. General physical conditions; and

   h. Method used to close the unit/disposal area.

2. Waste Characteristics:

   a. Type of waste received in the unit;

      i) Hazardous classification (e.g., listed, flammable, reactive, corrosive, oxidizing or reducing agent);

      ii) Quantity; and

      iii) Chemical composition.

   b. Physical and chemical characteristics;

      i) Physical form (solid, liquid, gas);

      ii) Physical description (e.g., powder, oily sludge;

      iii) Temperature;

      iv) Ph;

      v) General chemical class (e.g., acid, base, solvent);

      vi) Molecular weight;

vii) Density;

viii) Boiling point;

ix) Viscosity;

x) Solubility in water;

xi) Cohesiveness of the wastes;
xii) Vapor pressure; and

xiii) Flash point.

c. Migration and dispersal characteristics of the waste;

i) Sorption;

ii) Biodegradability, bioconcentration, biotransformation;

iii) Photodegradation rates;

iv) Hydrolysis rates;

v) Chemical transformations;

vi) Chemical interactions; and

vii) Products of all such reactions or processes.

The Respondent shall document the procedures used in making the above determinations.

C. Contamination Characterization

The respondent shall collect analytical data on air, ground water, soils, surface water, sediment and subsurface gas contamination in the vicinity of the Site. This data shall be sufficient to define the extent, origin, direction and rate of movement of contaminants. Data shall include all information referenced in the Remedial Investigation Work Plan (Task 2). The Respondent shall address the following types of contamination at the Site:

1. Ground Water Contamination

The Respondent shall conduct a ground water investigation to characterize the nature and extent of any plumes of contamination at the Site. The investigation shall include a description and quantification of ground water quality in the aquifer systems and all

significant zones of saturation or permeable zones that may act as pathways for contaminant migration. This investigation shall at a minimum provide the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the Site;

b. The horizontal and vertical direction of contamination movement;

c. The velocity of contaminant movement;

d. The horizontal and vertical concentration profiles of Appendix VIII constituents in the plume(s);

e. An evaluation of site specific factors influencing the plume movement;

f. An extrapolation of future contaminant movement; and

g. An investigation to characterize the nature and extent of contamination of residential, municipal, industrial and agricultural wells within the vicinity of the Site.

The Respondent shall document the procedures used in making the above determinations (e.g., well design, well construction, geophysics, modeling, etc.). These procedures shall comport with appropriate U.S. EPA and Ohio EPA guidance.

2. Soil Contamination

The Respondent shall conduct an investigation to characterize the nature and extent of contamination of the soil and rock units in the vicinity of the contaminant release. The investigation shall include the following information:

a. A description of the vertical and horizontal extent and pattern of contamination;

b. A description of contaminant and soil chemical physical, and biological properties within the contaminant source area and plume. This includes a site specific discussion of contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradation, hydrolysis, photolysis, oxidation and other factors that might affect contamination migration and transformation;

c. Specific contaminant concentrations;

d. The velocity and direction of contaminant movement; and

e. An extrapolation of future contaminant movement.

The Respondent shall document the procedures used in making the above determinations.

3. Surface Water and Sediment Contamination

The Respondent shall conduct a investigation to characterize the nature and extent of contamination in surface water bodies and sediment resulting from contaminant releases at the Site. The investigation shall include, but not be limited to, the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the Site, and the extent of contamination in underlying sediments;

b. The horizontal and vertical direction of contaminant movement in surface water and sediment;

c. The contaminant velocity;

d. An evaluation of the physical, biological and chemical factors influencing contaminant movement;

e. An extrapolation of future contaminant movement; and

f. A description of the chemistry of the contaminated surface waters and sediments. This includes determining the Ph, total dissolved solids, specific contaminant concentrations, etc.

Respondent shall document the procedures used in making the above determinations.

4. Air Contamination

The Respondent shall conduct an investigation to characterize the nature and extent of particulate and gaseous contaminants released into the atmosphere. The investigation shall provide the following information:

a. A description of the horizontal and vertical direction and velocity of contaminant movement;

b. The rate and amount of the release;

c. Chemical and physical nature of contaminated particulates including respirable portion, source emission rates, contaminant concentrations in respirable portions;

d. Existing or potential human or biological receptors, of air contaminants, including respirable contaminant concentrations at known or potential receptors; and

e. The chemical and physical composition of the contaminant(s) released, including vertical and horizontal concentration profiles; and

f. Environmental factors that alter or mitigate fate and transport of contaminants in the atmosphere.

The Respondent shall document the procedures used in making the above determinations.

5. Subsurface Gas Contamination

The Respondent shall conduct an investigation to characterize the nature and extent of subsurface gases emitted from buried hazardous, industrial and/or other waste and hazardous constituents in the soil and/or ground water. This investigation shall include the following information:

a. A description of the horizontal and vertical extent of subsurface gases migration;

b. The chemical composition of the gases being emitted from the subsurface or surface;

c. The rate, amount, and density of the gases being emitted; and

d. Horizontal and vertical concentration profiles of the subsurface gases emitted.

The Respondent shall document the procedures used in making the above determinations.

D. Ecological Assessment

The Respondent shall conduct an investigation to characterize any adverse effects to flora and fauna, at the population, community or ecosystem level, that is or has been caused or influenced by contamination from the facility. The data from

this investigation shall be collected in a manner that is compatible and concurrent with the other sections of Task 4. The activities described for this section may be performed iteratively and/or in a phased approach as more data is gathered during other portions of the remedial investigation. Therefore, parts of the work plans(s) for this section may be submitted as separate deliverables from Task 2.C., Phase I Ecological Assessment.

1. Site Characterization

   Based on existing data and limited field work, the respondent shall consider the following:

   a. See Task 1.A. (Site Background/Site History);

   b. Identification of potential and probable ecological receptors including threatened and endangered species, unique and sensitive habitats or resources, etc.;

   c. Identification of potential or probable exposure points for ecological receptors;

   d. Document known or suspected effects of site contaminants to biota; and

   e. Additional data needed for site characterization and the rationale for its necessity.

2. Additional Site Characterization (Phase Ib Ecological Assessment)

   Based on evaluations from Task 5.D.1. above, if existing information is insufficient to determine the extent and magnitude of adverse impacts and whether a Phase II Ecological Assessment is warranted, the Respondent shall develop work plans for and implement the following in keeping with the requirements of Tasks 2.B. and 2.C.:

   a. Identification and evaluation of habitats that are or may be exposed to contamination;

   b. Semiquantitative surveys of flora and fauna that are or may be exposed to contamination, which shall include, but not be limited to:

      i) All vegetative strata;

      ii) Flora and fauna in all contaminated media;

      iii) Population parameters (e.g., density, frequency, age distribution); and

iv) Community parameters (e.g., diversity, structure, stability).

c. Identification of background or reference area for each exposed population, community or ecosystem and completion of surveys for comparison to Tasks 5.D.2.a. and 5.D.2.b. above; and

d. Sampling of media or biota for accumulation or intake studies and toxicity tests to determine the extent of toxicity as related to areas of known or potential contamination.of contaminant concentrations or intakes.

3. Initial Toxicity Assessment (to be performed in conjunction with 5.D.1. and 5.D.2. above, as applicable)

The respondent shall perform a literature review of information regarding the toxicity, fate and transport characteristics, ecological effects, and likely biological receptors for the contaminants of concern.

4. Preliminary Ecological Assessment

The respondent shall combine the results of Tasks 5.D.1. to 5.D.3., above in order to define or evaluate the following on a site-specific basis:

a. Initial identification of exposure pathways and ecological receptors;

b. The existence of or potential for current and future adverse effects to occur on a population, community or ecosystems level; and

c. Determine if the results of the Phase I Ecological Assessment indicate the need for further ecological studies.

5. Phase II Ecological Assessment

Respondent shall prepare and implement, following Ohio EPA approval, a detailed work plan for further site investigations that shall be compatible with requirements listed in 4.D.3, but also include the following:

a. Study objectives and relevance to risk assessment objectives;

b. Identification of ecological measurement endpoints, assessment endpoints, and endpoint selection criteria;

c. Semiquantitative and quantitative surveys of flora and fauna;

d. Chemical sampling in potentially exposed habitats and reference sites;

e. Laboratory and in situ toxicity testing; and

f. Tissue analyses.

6. Ecological Assessment Report

The respondent shall prepare a report including all results from Tasks 5.D.1. to 5.D.5. above for incorporation into the Environmental Risk Assessment (see Task 6).

Special Note: Because seasonal effects can impart a profound influence on the results of biological or ecological sampling, the Ohio EPA requires that all sampling or testing of flora and fauna shall take place between April 1 and October 30 unless otherwise approved by the Site Coordinator.

E. Potential Receptor Identification

The Respondent shall collect data describing the human populations, plant and animal populations, communities, and ecosystems that are or may be susceptible to contaminant exposure from the Site. Chemical analysis of biological samples or data on observable effects in ecosystems may be needed to properly identify biological receptors. Some of this information shall be obtained from information gathered during the Ecological Assessment (see Task 5.D.). The following characteristics shall be identified:

1. Local current and potential future uses of ground water:

a. Type of use (e.g., municipal or residential, agricultural, domestic/non-potable and industrial, nonagricultural use by flora and fauna); and

b. Location of ground water users including wells and discharge areas.

2. Local current and potential future uses of surface waters in the vicinity of the Site:

a. Type of use (e.g., municipal or residential, agricultural, domestic/non-potable and industrial, nonagricultural use be flora and fauna); and

b. Location of surface water users or use areas.

3. Use of or access by humans or biota to the site or facility and adjacent lands, including but not limited to:

a. Recreational;

b. Hunting;

c. Residential;

d. Commercial;

e. Zoning;

f. Nonagricultural use by flora and fauna; and

g. Future land use or access.

4. A demographic profile of the people who use or who have access to the facility and adjacent land including, but not limited to age, sex and sensitive subgroups.

F. RI Report

The Respondent shall prepare a Remedial Investigation (RI) Report to present Task 5, above, and Tasks 6 and 7, described below. The RI Report shall be developed in draft form for Ohio review and approval (refer to Section XIV of this Order, Review of Submittals). The report shall describe the nature and extent of contamination (qualitative/quantitative) in relation to background areas indicative for the area.

TASK 6 -- HUMAN HEALTH BASELINE RISK ASSESSMENT

The Respondent shall prepare a thorough analysis and summary of all Site investigations and their results. The objective of this task will be to ensure that the investigation data are sufficient in quality (e.g, quality assurance procedures have been followed) and quantity to adequately describe the nature and extent of contamination, actual and potential future threats to human health and/or the environment and to support the feasibility study.

The results and data from all site investigations shall be or-

ganized and presented logically so that the relationships between and among remedial investigations for all media and receptors are apparent.

A. Conceptual Site Model.

In order to expedite review and approval of the Human Risk Assessment by the Ohio EPA the Respondent shall prepare a Conceptual Site Model (CSM) prior to completing the Human Risk Assessment Report. The CSM is an interim document that shall briefly describe the following in tables or lists based on pre-existing site information and information gathered to date during the RI:

1. Goals of the assessment;

2. Types and sources of information or data that will be used in the assessment;

3. Major assumptions or limitations influencing the application of the assessment;

4. Criteria for selecting chemicals of concern;

5. Exposure pathways, scenarios, and assumptions; and

6. Other interim deliverables.

B. Human Risk Assessment Report.

Based upon the CSM, the Respondent shall prepare a risk assessment which shall contain a discussion of and present the data required in the tasks outlined below:

1. Selection of Contaminants of Concern. Respondent shall:

   a. Evaluate data based on approved data useability procedures (e.g., laboratory or data validation qualifiers, frequency and contaminant concentrations);

   b. Further reduce the number of chemicals of concern based on chemical toxicity to human and biological receptors, number of chemicals, environmental mobility, background data, etc.; and

   c. Develop a final list of Contaminants of Concern.

2. Estimate of Exposure Point Concentrations of Indicator Chemicals. Respondent shall:

a. Combine site monitoring data and environmental modeling results to:

i) identify exposure pathways;

ii) estimate exposure point concentrations; and

iii) compare these concentrations to requirements, standards and criteria.

3. Estimate of Chemical Intakes. Respondent shall:

a. Provide estimates of chemical intakes from:

i) Air

ii) Ground water

iii) Surface water

iv) Other exposure pathways (soils, food-stuffs, recreation, etc.)

b. Combine pathway-specific intakes to yield total oral and total inhalation routes.

4. Respondent shall evaluate critical toxicity values (i.e., numerical values describing a chemical toxicity) and review general toxicological information for the indicator chemicals.

5. Risk Characterization. Respondent shall provide a detailed characterization of the risk posed by releases of toxic chemicals from the site. The characterization shall include the following elements:

a. Noncarcinogenic effects using the Hazard Index approach, where:

$$HI = E(1)/RL(1) + E(2)/RL(2) + \ldots E(i)/RL(i)$$

E(i) = Exposure level (or intake) for the (i)th toxicant

RL(i) = Reference level (or intake) for the (i)th toxicant

b. Potential carcinogenic effects using the predicted risk approach, where:

Risk = CDI x Carcinogenic Potency Factor

CDI = Chronic Daily Intake

It is assumed that risks are additive and there is independence of action by the compounds involved. Therefore, the following equations are used:

Carcinogenic risk for chemical X = [CDI (inhalation) x PF (inhalation)] + [CDI (oral) x PF (oral)]

Total carcinogenic risk = (carcinogenic risk for chemical 1 + carcinogenic risk for chemical 2 + ... + carcinogenic risk for chemical (i))

c. Uncertainties.

Respondent shall provide a discussion of the uncertainties and assumptions made in the assessment process.

TASK 7 -- ENVIRONMENTAL BASELINE RISK ASSESSMENT.

The Respondent shall prepare a risk assessment which shall contain a discussion of present and future potential risk to ecosystems and populations exposed to contamination; information necessary to evaluate the environmental impact of proposed remedial alternatives; and information that can be utilized for the development of subsequent cleanup criteria in the tasks outlined below (note the Site Coordinator may approve combination of Tasks 6 and 7 into a single set of deliverables):

A. Conceptual Site Model.

The respondent shall prepare an interim document as defined in Task 6.A. above with emphasis on site ecology and biological receptors.

B. Environmental Risk Assessment Report

1. Briefly Describe the Site and Study Area:

a. Describe physical and chemical factors that impact site ecology (e.g., fate and transport of contaminants, bioavailability, etc.);

b. Describe past or current practices, disturbances, or stresses that impact(ed) site ecology;

c. Describe the areal extent of environmental assessment;

d. Provide a full account of ecosystems and populations potentially exposed to contamination; and

e. Describe current and projected land use in and around the site as relevant to site ecology.

2. Describe Contaminants and Ecological Endpoints of Concern:

a. (See Task 6.B.1);

b. Specifically consider contaminants that pose toxicity or bioaccumulation potential to biological receptors and/or are available for exposure to populations and ecosystems; and

c. Measurement and assessment endpoints and indicator species and rationale for their selection.

3. Characterize Exposure:

a. Combine site data, environmental modeling results and peer reviewed scientific literature to:

i) identify exposure pathways; and

ii) estimate exposure point concentrations by species, habitat, and exposure scenario; and

iii) identify site specific fate and transport processes.

b. Verify exposure to populations or ecosystems:

i) show correlations between concentrations and appropriate ecological endpoints (e.g., toxicity tests and population studies) along likely exposure pathways; and

ii) compare data from other toxicity tests, population studies, modeled uptakes,or reference areas to show exposure has occurred.

4. Characterize Risk or Threat.

The Respondent shall discuss and reduce the uncertainty over the receptor populations, communities, or ecosystems that are or may be affected; the estimation that adverse effect(s) will or are occur(ring); the magnitude of such an effect(s); and the temporal character of such an effect(s) by:

a. Identifying requirements, standards and criteria;

b. Identifying relevant, peer reviewed literature toxicity values or toxicological effects where the above are lacking;

c. Comparison of exposure concentrations to a. and b. above, using suitable uncertainty factors and considering both chronic and acute endpoints;

d. Presenting the number and magnitude of exceedances of a and b above;

e. Presenting supporting evidence of risk from:

i) contaminant concentrations in biota;

ii) toxicity test results;

iii) supporting literature;

iv) field surveys of receptor populations;

v) measures of community structure and ecosystem function;

vi) comparison with reference or background data or observations; and

f. Discussing adverse or potential adverse effects under future use conditions.

5. Summary and Conclusions:

a. Summarize effects or potential effects of contamination to biological populations, communities or ecosystems under current and future use conditions;

b. Describe future effects in absence of remedial action; and

c. Describe population, community or ecosystem characteristics that may impact the nature of remedial actions.

6. Assessment of Uncertainties and Limitations:

a. Describe all sources of uncertainty (e.g., variance estimates, underlying model assumptions, lack of toxicity information, unexpected influences on ecological assessment, etc.), their magnitude and direction of impact on estimation of risk; and

b. Describe assessment limitations (e.g., deviations from intended goals, data gaps, etc.).

TASK 8-DEVELOPMENT AND SCREENING OF REMEDIAL ALTERNATIVES

The development and screening of remedial alternatives is performed to develop an appropriate range of waste management options that will be evaluated. This range of alternatives should include as appropriate, options in which treatment is used to reduce the toxicity, mobility, or volume of wastes, but varying in the types of treatment, the amount treated, and the manner in which long-term residuals or untreated wastes are managed; options involving containment with little or no treatment; options involving both treatment and containment; and a no-action alternative. The following activities will be performed by the Respondent as a function of the development and screening of remedial alternatives.

The Respondent will begin to develop and evaluate a range of appropriate waste management options that at a minimum ensure protection of human health and the environment, concurrent with the RI site characterization tasks.

A. Remedial Action Objectives

1. Develop and document remedial action objectives

The Respondent shall develop preliminary remedial objectives, specifying the contaminant(s) and media or medium of interest, exposure pathway and preliminary remediation goals that establish a range of treatment and containment alternatives to be evaluated.

These remedial action objectives shall be based on information gathered during the Remedial Investigation, Ohio EPA's How Clean Is Clean policy and other pertinent Ohio EPA guidance, chemical specific ARAR's, when available other information (e.g., Rfds) and site specific factors, and shall be not inconsistent with section 300.430 of the NCP. Final remediation goals shall be determined by the Ohio EPA at or after the point the remedy is selected and are not part of this order.

In order to expedite review and approval of the Feasibility Study, the Respondent shall prepare a technical memorandum outlining the remedial action objectives.

B. Technologies Screening

1. Develop general response actions

The Respondent shall develop general response actions for each medium of interest defining containment, treatment, excavation, pumping, or other actions, singly or in combination, to satisfy the remedial action objectives.

2. Identify areas or volumes of media

The Respondent shall identify volumes of media to which general response actions may apply, taking into account requirements for protectiveness as identified in the remedial action objectives. The chemical and physical characterization of the Site will also be taken into account.

3. Identify, screen and document remedial technologies

The Respondent shall identify and evaluate technologies applicable to each general response action to eliminate those that cannot be implemented at the Site. General response actions will be refined to specify remedial technology types. Technology process options for each of the technology types will be identified either concurrent with the identification of technology types, or following the screening of the considered technology types. Process options shall be evaluated on the basis of effectiveness, implementability, and cost factors to select and retain one or, if necessary, more representative process for each technology type. Evaluation should typically focus on effectiveness factors at this stage with less effort directed at the implementability and cost factors. The technology types and process options will be documented for inclusion in the Alternatives Array Report as described below under Task 8.C.4. The reasons for eliminating technologies must be specified.

C. Alternatives Array

1. Assemble and document alternatives

The Respondent shall assemble selected representative technologies into alternatives for each affected medium or operable unit. Together, all of the alternatives will represent a range of treatment and containment combinations that will address either the Site or the operable unit as a whole. A summary of the assembled alternatives will be prepared by the Respondent for

inclusion in the Alternatives Array Report described below. The reasons for eliminating alternatives during the preliminary screening process must be specified.

2. Refine alternatives

The Respondent shall refine the remedial alternatives to identify contaminant volume addressed by the proposed process and sizing of critical unit operations as necessary. Sufficient information will be collected for an adequate comparison of alternatives. Remedial action objectives for each medium will also be refined as necessary to incorporate any new risk assessment information being generated from the remedial investigation. Additionally, Ohio EPA will update ARARs as the remedial alternatives are refined.

3. Conduct and document screening evaluation of each alternative

The Respondent may perform a final screening process based on short and long term aspects of effectiveness, implementability, and relative cost. Generally, this screening process is only necessary when there are many feasible alternatives available for detailed analysis. If necessary, the screening of alternatives will be conducted to assure that only the alternatives with the most favorable composite evaluation of all factors are retained for further analysis.

As appropriate, the screening will preserve the range of treatment and containment alternatives that was initially developed. The range of remaining alternatives will include options that use treatment technologies and permanent solutions to the maximum extent practicable, and minimize media transfer. The Respondent shall prepare a summary of the results and reasoning employed in the screening, the assembly of alternatives that remain after screening. The summary will be submitted with the Alternatives Array Report as described below.

4. Alternatives Development and Screening Deliverables

In order to expedite review and approval of the Feasibility Study, the Respondent will prepare an Alternatives Array Report summarizing the work performed in and the results of each activity described above under Task 8, including an Alternatives Array summary. These alternatives shall be modified by the Respondent, if required by Ohio EPA's comments to assure identification of a complete and appropriate range of viable alternatives to be considered in the detailed analysis.

This interim deliverable will document the methods, rationale, and results of the alternatives screening process. The Respondent will refer to the U.S.EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA for an outline of the report format and the required report contents. This report will become a major portion of the Feasibility Study Report to be submitted as part of Task 10.B.

Based upon the Alternatives Array Report, the Ohio EPA shall identify and provide to the Respondent ARARs for the range of alternatives presented. These ARARs may be modified by the Agency based upon the results of other tasks of this SOW.

TASK 9 -- TREATABILITY STUDY

A. Treatability Study Work Plan

1. Determining the Need for Treatability Studies

a. Ohio EPA Required Treatability Studies

The Respondent shall conduct any necessary laboratory and treatability study(ies) required by the Ohio EPA to determine the applicability of remedial technologies.

b. Respondent-Proposed Treatability Studies

Upon approval by the Ohio EPA, the Respondent may conduct any laboratory and treatability study(ies) that it has proposed to the Agency to determine the applicability of remedial technologies.

2. Treatability Study Work Plan

When required or approved of by the Ohio EPA, the Respondent shall develop and submit to this Agency for approval a testing work plan identifying the type(s) and goal(s) of the treatability study(ies), the level of effort needed, the experimental design, and the procedures to be used for data management, validation and interpretation. This work plan shall comport with U.S. EPA's guidance document, Guide for Conducting Treatability Studies Under CERCLA (Interim Final) EPA/540/2-89/058.

The work plan shall include the following elements:

a. Establishing data quality objectives

b. Selecting a contracting mechanism

c. Issuing the Work Assignment

d. Compliance with regulatory requirements

e. Execution of the study

f. Analyzing and interpreting the data

g. Reporting the results

h. Sampling and Analysis Plan

i. Health and Safety Plan

B. Treatability Study Evaluation Report

1. Conducting a Treatability Study

The Respondent will perform the treatability study in accordance with the approved work plan in a systematic fashion to ensure that the data generated can support the remedy evaluation process.

2. Submission of Treatability Study Evaluation Report

Upon completion of the treatability study(ies), the Respondent will prepare a treatability study evaluation report. The Respondent will follow U.S. EPA's guidance document, Guide for Conducting Treatability Studies Under CERCLA (Interim Final) EPA/540/2-89/058,for the appropriate format and content.

TASK 10 -- DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

A. Detailed Analysis of Alternatives Report

The detailed analysis will be conducted by the Respondent to provide the Ohio EPA with the information needed for the selection of a site remedy. Respondent shall conduct a detailed analysis of the alternatives that pass through the initial screening. This detailed analysis shall consist of an analysis of each option against a set of eight evaluation criteria and a comparative analysis of all options using the same evaluation criteria as a basis for comparison.

The detailed analysis shall consist of the following elements:

1. Detailed Description

The detailed description of each remaining alternative shall include as a minimum:

a. Description of appropriate treatment and disposal technologies;

b. Special engineering considerations required to implement the alternative, e.g., pilot treatment facility or additional studies needed to proceed with final remedial design;

c. Operation, maintenance and monitoring requirements of the completed remedy;

d. Off-site disposal needs and transportation plans;

e. Temporary storage requirements;

f. Safety requirements for remedial implementation, including both on-site and off-site health and safety considerations;

g. An analysis of how the alternatives could be phased into individual operations and a discussion of how these operations could best be implemented (individually or in groups) to produce significant environmental improvement;

h. A review of any off-site treatment or disposal facilities to ensure compliance with RCRA, TSCA and State requirements, both current and proposed; and

i. An analysis of the projected performance and expected results of the alternative with emphasis on potential for further future release of hazardous substances.

2. Environmental Assessment

An Environmental Assessment (EA) shall be performed for each alternative including, as a minimum, an evaluation of each alternative's environmental effects, an analysis of measures to mitigate adverse effects, physical or legal constraints and compliance with Federal and State regulatory requirements.

Each alternative will be assessed in terms of the extent to which it will mitigate damage to or protect public health, welfare and the environment, in comparison to the other remedial alternatives.

The no action alternative will be fully evaluated to describe the current site conditions and anticipate environmental conditions if no actions are taken. The no action alternative will serve as a baseline for the Environmental Assessment.

3. Apply Eight Criteria and Document Analysis

The respondent shall apply the eight evaluation criteria described below to the assembled remedial alternatives.

a. Overall Protection of Human Health and the Environment.

Alternatives shall be assessed as to whether they can adequately protect human health and the environment from unacceptable risks posed by hazardous substances, pollutants or contaminants present at the site by eliminating, reducing or controlling exposures to levels established during development of remediation goals. This is a threshold requirement and the primary objective of the remediation program.

b. Compliance with Applicable or Relevant and Appropriate Requirements.

The alternatives shall be assessed as to whether they attain applicable or relevant and appropriate standards, criteria and requirements of state and federal environmental and public health laws.

c. Long-term Effectiveness and Permanence.

Alternatives shall be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that shall be considered, as appropriate, include the following:

i) Nature and magnitude of total residual risks; potential for exposure of human and environmental receptors; concentrations of hazardous substances, pollutants or contaminants remaining following implementation of remedial alternative, considering the persistence, toxicity, mobility and propensity to bioaccumulate of such hazardous substances and their constituents;

ii) The type, degree and adequacy of long-term management required for untreated substances and treatment residuals, including engineering con-

trols (such as containment technologies), institutional controls, monitoring and operation and maintenance;

iii) Long-term reliability of the engineering and institutional controls, including uncertainties associated with land disposal of untreated hazardous substances, pollutants and contaminants, as well as treatment residuals, and;

iv) Potential need for replacement of the remedy, as well as the continuing need for repairs to maintain the performance of the remedy.

d. Reduction of Toxicity, Mobility or Volume.

The degree to which alternatives employ treatment that reduces toxicity, mobility or volume of contaminants shall be assessed. Alternatives which, at a minimum, address the principal threats posed by the site through treatment shall also be identified. Factors that shall be considered, as appropriate, include the following:

i) The treatment or recycling processes the alternatives employ and materials they will treat;

ii) The amount of hazardous substances, pollutants or contaminants that will be destroyed, or treated, or recycled;

iii) The degree of expected reduction in toxicity, mobility or volume of the waste due to treatment or recycling and the specifications of which reduction(s) are occurring;

iv) The degree to which the treatment is irreversible;

v) The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility and propensity to bioaccumulate;

vi) The degree to which treatment will reduce the inherent hazards posed by the principal threats at the Site; and

vii) The degree to which the treatment processes employed reduce the transfer of contaminants

between environmental media.

e. Short-term Effectiveness.

The short-term impacts of the alternatives during the construction and implementation phase, and until the objectives of the remedial action have been met, shall be assessed considering the following:

i) Short-term risks that may be posed to the community during construction and implementation of an alternative and until the remedial action objectives have been met;

ii) Potential impacts on workers during remedial action and with the objectives of remedial action have been met, the effectiveness and reliability of protective measures;

iii) Potential environmental impacts that may result from the remedial action and the effectiveness and reliability of mitigative measures during implementation and until the objectives of the remedial action have been met; and

iv) Time until response action objectives are achieved.

f. Implementability.

The technical and administrative feasibility of implementing the alternatives shall be assessed by considering the following types of factors, as appropriate:

i) Technical Feasibility

- Degree of difficulty or uncertainty associated with construction and operation of the alternative;

- Expected operational reliability of the alternative;

- Ease of undertaking, additional remedial action(s); and

- Ability to monitor the effectiveness of the remedy.

ii) Administrative Feasibility

- Activities needed to coordinate state, local, and federal agencies (e.g., obtaining necessary approvals and permits, right-of-way for construction)

iii) Feasibility of Obtaining Services and Materials

- Capacity and location of adequate treatment, storage, and disposal services;

- Availability of necessary equipment and specialists and provisions to ensure any necessary additional resources;

- Availability of services and materials; and

- Availability of prospective technologies

g. Cost.

The types of costs that shall be assessed include the following:

i) Direct and indirect capital costs, including contingency and engineering fees;

ii) Annual operation and maintenance costs; and

iii) Net present value of capital and O&M costs.

h. Community Acceptance.

This assessment includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This assessment, which will be completed by the Ohio EPA, will occur throughout the implementation of this RI/FS and will be completed after comments on the proposed remedy are received. It is not part of this order.

4. Compare Alternatives Against Each Other and Document the Comparison of Alternatives

The Respondent will perform a comparative analysis between the remedial alternatives. That is, each alternative will be compared against the others using the evaluation criteria as a basis of comparison. Identification and selection of the preferred alternative are reserved by the Ohio EPA and are not part of this Order. The comparative analysis will be documented and presented in the Feasibility Study Report described

below.

B. Feasibility Study Report

The Respondent will submit a draft feasibility study report to the Ohio EPA for review, comment, and approval. This report will include the results of Tasks 9 and 10. The respondent will refer to the U.S.EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA for an outline of the report format and the required report content. Upon satisfactorily addressing Ohio EPA's comments, the Respondent will prepare and submit a final feasibility study report.

TASK 11 -- Monthly Progress Reports

Monthly Technical Progress Reports are required of the Respondent. For each on-going work assignment, Respondent shall submit progress reports with the following elements:

1. Identification of site and activity.
2. Status of work at the site and progress to date.
3. Percentage of completion.
4. Data generated to date
5. Difficulties encountered during the reporting period.
6. Actions being taken to rectify problems.
7. Activities planned for the next month.
8. Changes in personnel.

The monthly progress report will list target and actual completion dates for each activity including project completion and provide an explanation of any deviation from the milestones in the work plan schedule.