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PREAMBLE

It is agreed to by the Parties hereto to amend the May 9, 1986 Director's Final Findings and Orders (1986 Orders). Except for the modifications noted herein, the terms contained in all Sections of the 1986 Orders apply:

I. JURISDICTION

1. These Director's Final Findings and Orders ("Orders") are issued to Respondent PCC Airfoils, LLC ("PCC Airfoils") and Respondent Northrop Grumman Space & Missions Systems Corp. ("NGS&MSC") pursuant to the authority vested in the Director of Ohio EPA under Ohio Revised Code ("ORC") §§ 3734.13, 6111.03, and 3745.01.

II. PARTIES BOUND

2. These Orders shall apply to and be binding upon Respondents and their successors in interest liable under Ohio law.

3. No change in ownership or corporate status of the Respondents including, but not limited to, any transfer of assets or real or personal property shall in any way alter Respondents' obligations under these Orders.

4. Work Respondent shall provide a copy of these Orders to all contractors, subcontractors, laboratories and consultants retained to conduct any portion of the Work performed pursuant to these Orders within fourteen (14) days of the effective date of these Orders or upon date of retention. Work Respondent shall ensure that all contractors, subcontractors, laboratories and consultants retained to perform the Work pursuant to these Orders also comply with the applicable provisions of these Orders.

III. DEFINITIONS

5. Unless otherwise expressly provided herein, all terms used in these Orders or in any appendices shall have the same meaning as defined in ORC Chapters 3734 and 6111, CERCLA, and the rules promulgated thereunder. Whenever the terms listed below are used in these Orders or in any appendices, attached hereto and incorporated herein, the following definitions shall apply:

A. "CERCLA" means the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq.

Director's Findings and Orders for RI/FS and RD/RA
TRW Minerva Site

- B. "Contaminant" and "Contamination" means (1) any "hazardous waste" under ORC §3734.01(J); (2) any "industrial waste" under ORC §6111.01(C); and (3) any "other wastes" under ORC §6111.01(D), including any release of one or more of the same.
- C. "Day" means a calendar day unless expressly stated to be a business day. "Business day" shall mean a day other than a Saturday, Sunday, or state holiday. In computing any period of time under these Orders, where the last day would fall on a Saturday, Sunday, or state holiday, the period shall run until the close of the next business day.
- D. "Decision Document" means the document detailing the remedial action selected by Ohio EPA for the Site after review of the Feasibility Study Report generated by the Work Respondent after it conducts the Feasibility Study. The Decision Document formalizes the remedy chosen in the Preferred Plan.
- E. "Facility" means the former TRW facility located at 3860 Union Avenue Southeast, Minerva, Stark County, Ohio. The Facility property totals approximately 135 acres and encompasses the following Stark County parcels: 4201261, 4201486, 4201488, 4201490, 4100935, 4201487, 4201489, and 4201476. PCC Airfoils owns parcels 4201261, 4201486, 4201488, 4201490, 4100935 totaling 112.74 acres. Respondent NGS&MSC (formerly TRW, Inc.) owns parcels 4201487, 4201489, and 4201476, totaling 22.65 acres.
- F. "Feasibility Study" ("FS") means a study undertaken to develop and evaluate options for remedial action and is more fully described in the SOW. The FS is generally performed concurrently and in an interactive fashion with the Remedial Investigation. The term also refers to a report that describes the results of the study.
- G. "NCP" means the National Oil and Hazardous Substances Pollution Contingency Plan, codified at 40 C.F.R. Part 300 (1990), as amended.
- H. "Ohio EPA" means the Ohio Environmental Protection Agency and its designated representatives.
- I. "Orders" means these Director's Final Findings and Orders and all attachments hereto.
- J. "Paragraph" means a portion of these Orders identified by an Arabic numeral or an uppercase or lowercase letter.

- K. "Parties" means Respondents and the Ohio EPA.
- L. "Preferred Plan" means the plan chosen by Ohio EPA to remediate the Site in a manner that best satisfies the evaluation criteria outlined in the NCP. Such a plan may include remedial actions planned and/or completed.
- M. "Pre-Investigation Evaluation Report" ("PER") means the document prepared by Respondent and submitted to Ohio EPA on September 3, 2008, and the letter (Data Gap Acceptance Letter) provided by Work Respondent to Ohio EPA indicating agreement with the data gaps. The PER and Data Gap Acceptance Letter are attached hereto as Attachment A and incorporated herein by reference.
- N. "Property" means the Facility property totaling 135 acres and encompassing the following Stark County parcels: 4201261, 4201486, 4201488, 4201490, 4100935, 4201487, 4201489, and 4201476.
- O. "Remedial Action" ("RA") means those activities already taken or to be undertaken by Work Respondent to implement and maintain the effectiveness of the final plans and specifications submitted by Work Respondent pursuant to the Remedial Design and Remedial Action Work Plan.
- P. "Remedial Design" ("RD") means those activities already taken or to be undertaken by Work Respondent to develop the final plans and specifications for the Remedial Action pursuant to the Remedial Design and Remedial Action Work Plan.
- Q. "Remedial Design and Remedial Action Work Plan" ("RD/RA Work Plan") means the document submitted by Work Respondent and approved by Ohio EPA pursuant to the Performance of Work Section of these Orders.
- R. "Remedial Investigation" ("RI") means a process undertaken to determine the nature and extent of Contamination at the Site. The RI emphasizes data collection and Site characterization, and is generally performed concurrently and in an interactive fashion with the Feasibility Study. The RI includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for remedial action and to support the evaluation of remedial alternatives. The term also refers to a report that describes the results of the investigation.
- S. "Remedial Investigation and Feasibility Study Work Plan" ("RI/FS Work Plan") means the document submitted by Work Respondent pursuant to the Performance of Work Section of these Orders and approved by Ohio EPA

pursuant to the Review of Submissions Section of these Orders.

- T. "Respondents" means PCC Airfoils, LLC, and Northrop Grumman Space & Missions Systems Corp.
- U. "Response Costs" means all costs incurred in a manner not inconsistent with the NCP including, but not limited to, payroll costs, contractor costs, travel costs, direct costs, overhead costs, legal and enforcement related costs, oversight costs, laboratory costs, and the costs of reviewing or developing plans, reports, and other items pursuant to these Orders, verifying the Work, or otherwise implementing or enforcing these Orders.
- V. "RI/FS Statement of Work" ("RI/FS SOW") means the Generic Statement of Work for Conducting Remedial Investigation and Feasibility Studies" for the implementation of the Remedial Investigation and Feasibility Study at the Site, as set forth in Attachment B to these Orders. The RI/FS SOW is not specific to any Site.
- W. "RD/RA Statement of Work" ("RD/RA SOW") means the Generic Statement of Work for the implementation of the Remedial Design and Remedial Action at the Site, as set forth in Attachment C to these Orders. The RD/RA SOW is not specific to any Site.
- X. "Section" means a portion of these Orders identified by a roman numeral.
- Y. "Site" means the Facility located at 3860 Union Avenue Southeast, Minerva, Stark County, Ohio where the treatment, storage, and/or disposal of hazardous waste, and/or the discharge to waters of the state of industrial waste or other wastes have occurred, including any other area where such hazardous wastes, industrial wastes, and/or other wastes have migrated or threaten to migrate.
- Z. "Supporting Documents" means the field sampling plan ("FSP"), quality assurance project plan ("QAPP"), and health and safety plan ("HASP") developed concurrently with the RI/FS Work Plan and the RD/RA Work Plan pursuant to these Orders and Section 2 of the RI/FS SOW and Section 4 of the RD/RA SOW.
- AA. "Transferee" means any future owner of any interest in the Site, including but not limited to, owners of an interest in fee simple, mortgagors, easement holders, and lessees.
- BB. "Work" means all activities Work Respondent has performed pursuant to the 1986 Orders, as well as all activities Work Respondent is required to perform

under the Performance of Work and Additional Work Sections of these Orders.

- CC. "Work Respondent" means Respondent Northrop Grumman Space & Mission Systems Corp. (NGS&MSC).

IV. FINDINGS

6. All of the findings necessary for the issuance of these Orders pursuant to ORC §§ 3734.01, 6111.01 and 3745.01 have been made and are outlined below. Nothing in these Orders, or attachments thereto, shall be considered to be an admission by Respondent of any matter of law or fact.

- A. Respondent PCC Airfoils owns 112.74 acres of the Property and Respondent NGS&MSC owns 22.65 acres of the Property. TRW, Inc. (now known as NGS&MSC) owned and operated the Facility as a metal casting operation until June 27, 1986, when it sold the buildings and the majority of the Property to Respondent PCC Airfoils. The Facility is currently operated by Respondent PCC Airfoils as a metal casting operation.
- B. Respondent PCC Airfoils is a limited liability company authorized to do business in Ohio. Respondent PCC Airfoils' principal place of business is located at 25201 Chagrin Boulevard, Suite 290, Beachwood, Ohio 44122.
- C. Respondent NGS&MSC is a for-profit corporation authorized to do business in Ohio. Its principal place of business is located at 1840 Century Park East, Los Angeles, California 90067.
- D. Beginning in approximately 1984, and continuing to present, Work Respondent has been investigating and remediating the Site with Ohio EPA oversight.
- E. On March 31, 1989, the Site was listed on the NPL.
- F. Ohio EPA has incurred Response Costs and continues to incur Response Costs associated with this Site.
- G. Modification of the 1986 Orders is needed to: i) include provisions for the investigation of new sources of Contamination that were not contemplated in the 1986 Orders and, therefore, were not adequately addressed by the 1986 Orders; ii) develop and/or compile existing data for the entire Site that will enable Ohio EPA to issue a Decision Document for the Site; and iii) design and implement the Decision Document to ensure compliance with the NCP process.

V. GENERAL PROVISIONS

7. Amendment to 1986 Orders

The provisions of the 1986 Orders are modified only as specifically set forth in the Orders section of these Orders. Any provisions not specifically amended remain in full force and effect as written therein.

8. Objectives of the Parties

These Orders amend the 1986 Orders and add provisions that focus solely on the completion of the investigation and remediation of contaminated soil and groundwater at the Site. These Orders will result in a remedy being completed in accordance with the NCP process. The objectives of the Parties in entering into these Orders are to protect public health and safety and the environment from the disposal, discharge, or release of Contaminants through Work to address the data gaps identified in the PER to complete the RI/FS, design and construction of the Remedy, and development and implementation of a final operation and maintenance plan by Work Respondent as set forth in a Decision Document that will be issued by Ohio EPA following the performance of the RI/FS by Work Respondent. Work Respondent shall perform, in order to address the data gaps identified in the PER, the RI/FS and RD/RA to:

- A. Complete the Investigation of the nature and extent of releases of Contaminants at the Site;
- B. Assess risk to human health and the environment;
- C. Implement interim actions if necessary to address substantial threats;
- D. Collect sufficient additional data to support decisions regarding a remedial action for the Site;
- E. Develop and evaluate any additional potential remedial alternatives;
- F. Design any selected remedy, as concurred with by Ohio EPA;
- G. Construct any designed remedy; and
- H. Operate and maintain any constructed remedy.

9. Commitment of Work Respondent

Consistent with the Objectives of the Parties enumerated in paragraph 8 of these Orders, Work Respondent agrees to perform the Work in accordance with these Orders including but not limited to any additional activities necessary to complete the RI/FS SOW, RD/RA SOW, all relevant guidance documents, and all standards, specifications, and schedules as approved by Ohio EPA pursuant to these Orders. Work Respondent also agrees to reimburse Ohio EPA for all Response Costs and perform all other obligations of these Orders.

10. Compliance with Law

- A. All activities undertaken by Respondents pursuant to these Orders shall be performed in accordance with the requirements of all applicable federal, state and local laws and regulations, and in a manner consistent with the NCP.
- B. Ohio EPA believes that activities conducted pursuant to these Orders, if approved by Ohio EPA, would be considered necessary and consistent with the NCP. If Ohio EPA determines that an activity was conducted consistent with these Orders, Ohio EPA believes the activity would be considered consistent with the NCP.
- C. Where any portion of the Work requires a permit, license or other authorization from Ohio EPA or any other state, federal or local government agency, Respondents shall submit applications in a timely manner and take all other actions necessary to obtain such permit, license or other authorization. These Orders are not, and shall not be construed to be, a permit, license or other authorization issued pursuant to any statute or regulation.

VI. ORDERS

11. Amendment to Section V of the 1986 Orders

- A. Section V. Work to be Performed paragraphs A.1; A.2; A.4; A.7, and V.B remain unchanged and in full force and effect as set forth in the 1986 Orders;
- B. Section V. Work to be Performed paragraphs A.3; A.5; and A.6 are hereby deleted;
- C. Paragraph V.A.8 of the 1986 Orders remains unchanged with the exception of the following modifications:

- i. Paragraph V.A.8b. of the 1986 Orders is modified by these Orders to read as follows: "Groundwater quality reaches background or 1×10^{-5} cancer risk concentrations for the parameters of concern; or. . ."; and
 - ii. The last paragraph of V.A.8. is modified by these Orders to read as follows: "Failure to achieve compliance with applicable criteria at the compliance monitoring points will result in additional corrective actions by Respondent to be specified by Ohio EPA. These additional corrective actions may be, but not limited to, additional actions proposed by Respondent and shall be incorporated into this Order as an amendment thereto." The reference to the dispute resolution section is hereby deleted since the Dispute Resolution Section of these Orders wholly replaces the dispute resolution procedures set forth in the 1986 Orders.
 - D. Paragraph V.C. is hereby deleted;
 - E. Paragraph V.D. is hereby deleted; and
 - F. Paragraph V.E. is hereby deleted.
 - G. The text in the last sentence of the second full paragraph in Section VIII of the 1986 Orders is amended and shall read as follows: "Work Respondent shall notify Ohio EPA not less than seven (7) days in advance of any sample collections activity."
12. The 1986 Orders are amended to include a "**PERFORMANCE OF WORK BY WORK RESPONDENT**" Section that shall read as follows:
- A. Supervising Contractor

All Work performed pursuant to these Orders shall be under the direction and supervision of a contractor with expertise in hazardous waste site investigation and remediation. Prior to the initiation of the Work, Work Respondent shall notify Ohio EPA in writing of the name of the supervising contractor and any subcontractor to be used in performing the Work under these Orders.
 - B. Remedial Investigation and Feasibility Study
 - i. RI/FS project initiation meeting / Site visit. Within fourteen (14) days of the effective date of these Orders, unless otherwise agreed to by the Parties, Work Respondent shall:
 - a. meet with Ohio EPA to discuss, as described in Section 1.1 of the

RI/FS SOW, Work Respondent's performance of the Work required under these Orders; and

b. coordinate with Ohio EPA to establish a date for a Site visit.

ii. Submission of RI/FS Work Plan. Within sixty (60) days of the effective date of these Orders, unless otherwise specified in writing by Ohio EPA, Work Respondent shall submit to Ohio EPA the RI/FS Work Plan and the Supporting Documents for the Site. The RI/FS Work Plan shall incorporate and be based on the PER. Paragraph 12.B.iii. herein refers to the criteria for development of the RI/FS Work Plan.

iii. Criteria for RI/FS Work Plan development. The PER, the RI/FS Work Plan, Supporting Documents and any other deliverables required under the approved RI/FS Work Plan, shall be developed consistent with the RI/FS SOW contained in Attachment B of these Orders and the guidance documents listed in Attachment D of these Orders. The RI/FS Work Plan shall include a proposed schedule that includes a completion date for each task. If, during the pendency of the Work, Ohio EPA determines that any additional or revised guidance documents affect the Work to be performed in implementing the RI/FS, Ohio EPA will notify Work Respondent, and the PER, RI/FS Work Plan, and other affected documents, if any are affected, shall be modified by Work Respondent accordingly.

iv. Handling of any inconsistencies. Should Work Respondent identify any inconsistency between any of the laws and regulations and guidance documents which they are required to follow by these Orders, Work Respondent shall notify Ohio EPA in writing of each inconsistency and the effect of the inconsistencies upon the Work to be performed. Work Respondent shall also recommend, along with a supportable rationale justifying each recommendation, the requirement Work Respondent believes should be followed. Work Respondent shall implement the affected Work as directed in writing by Ohio EPA.

v. Review by Ohio EPA. Ohio EPA will review the RI/FS Work Plan and Supporting Documents pursuant to the procedures set forth in the Review of Submissions Section of these Orders.

vi. Implementation of RI/FS Work Plan. Upon Ohio EPA's approval of the RI/FS Work Plan, Work Respondent shall implement the RI/FS Work Plan as approved. Work Respondent shall submit all plans, reports, or other deliverables required under the approved RI/FS Work Plan, in accordance with the approved schedule, for review and approval pursuant to the Review of Submissions Section of these Orders.

C. Preferred Plan and Decision Document

Based upon the approved RI/FS, the Preferred Plan for remedial action shall be prepared by the Ohio EPA for public review and comment. This Preferred Plan shall be prepared pursuant to Ohio EPA's policy titled "Preferred Plan and Decision Document Procedures," DERR-00-RR-013. Following the public comment period, Ohio EPA may revise the Preferred Plan in response to those comments or may finalize the Preferred Plan without change.

The selection of the preferred alternative shall be documented by Ohio EPA in a Decision Document for the Site. This Decision Document shall include a summary of the RI/FS, a summary of the remedy selection decision and a responsiveness summary. The activities required by this paragraph shall be performed pursuant to Ohio EPA's Preferred Plan and Decision Document Procedures.

D. Remedial Design and Remedial Action

i. RD/RA project initiation meeting. Within fourteen (14) days of the issuance of the Decision Document, unless otherwise mutually agreed to by the Parties, Work Respondent shall meet with Ohio EPA to discuss the requirements of the RD/RA Work Plan.

ii. Submission of RD/RA Work Plan. Within sixty (60) days after the issuance of the Decision Document, unless otherwise specified in writing by Ohio EPA, Work Respondent shall submit to Ohio EPA a RD/RA Work Plan and schedule for implementation of the Work required under the Performance of Work Section of these Orders. The RD/RA Work Plan shall provide for the design, construction, final operation and maintenance of the remedy as set forth in the Decision Document. Paragraph 14.c. herein refers to the criteria for development of the RI/FS Work Plan

iii. Criteria for RD/RA Work Plan development. The RD/RA Work Plan, Supporting Documents, and any other deliverables required under the approved RD/RA Work Plan shall be developed in conformance with the RD/RA SOW contained in Attachment C of these Orders, and the guidance documents listed in Attachment D of these Orders. The RD/RA Work Plan shall include a proposed schedule that includes a completion date for each task. If Ohio EPA determines that any additional or revised guidance documents affect the Work to be performed in implementing the RD/RA, Ohio EPA will notify Work Respondent, and the RD/RA Work Plan and other affected documents shall be modified accordingly.

iv. Handling any inconsistencies. Should Work Respondent identify any inconsistency between any of the laws and regulations and guidance documents that Work Respondent is required to follow by these Orders, Work Respondent shall notify Ohio EPA in writing of each inconsistency and the effect of the inconsistencies upon the Work to be performed. Work Respondent shall also recommend, along with a supportable rationale justifying each recommendation, the requirement that Work Respondent believes should be followed. Work Respondent shall implement the affected Work as directed in writing by Ohio EPA.

v. Review by Ohio EPA. Ohio EPA will review the RD/RA Work Plan and Supporting Documents pursuant to the procedures set forth in the Review of Submissions Section of these Orders.

vi. Implementation of the RD/RA Work Plan. Upon Ohio EPA's approval of the RD/RA Work Plan, Work Respondent shall implement the RD/RA Work Plan as approved. Work Respondent shall submit all plans, reports, or other deliverables required under the approved RD/RA Work Plan, in accordance with the approved Work Plan, for review and approval pursuant to the Review of Submissions Section.

E. Final Operation and Maintenance Plan

The Final O&M Plan, including a schedule for implementation, shall be submitted in accordance with the approved RD/RA Work Plan. Ohio EPA will review the Final O&M Plan pursuant to the procedures set forth in the Review of Submissions Section of these Orders. Upon approval of the Final O&M Plan by Ohio EPA, Work Respondent shall implement the Final O&M Plan. Work Respondent shall submit all plans, reports, or other deliverables required under the approved Final O&M Plan, in accordance with the approved Final O&M schedule set forth therein, for review and approval pursuant to the Review of Submissions Section of these Orders.

13. The 1986 Orders are amended to include an "ASSURANCE OF ABILITY TO COMPLETE WORK" Section that shall read as follows:

- A. Within thirty (30) days of the issuance of the Decision Document, unless otherwise specified in writing by Ohio EPA, Work Respondent shall establish and maintain financial security in the amount of the estimated cost of the operation and maintenance of the selected remedy identified in the Decision Document in order to ensure performance and completion of the Work under these Orders. The financial security shall be a financial assurance mechanism approved by Ohio EPA.

- B. Verification of the existence and adequacy of the approved financial assurance mechanism shall be submitted to the Ohio EPA annually by Work Respondent on the anniversary of the effective date of these Orders, or upon request of Ohio EPA. In the event that Ohio EPA determines at any time that the financial assurance mechanism provided pursuant to this Section is inadequate, Work Respondent shall, within thirty (30) days of receipt of notice of Ohio EPA's determination, obtain and present to Ohio EPA another financial assurance mechanism to be approved by Ohio EPA. The Work Respondent may change the form of the financial assurance mechanism provided under this Section at any time, upon notice and approval by Ohio EPA. Work Respondent's inability to demonstrate financial ability to complete the Work shall not excuse performance of any activities required under this Order.
- C. If Work Respondent can show that the estimated cost to complete the remaining Work has diminished below the financial security amount set forth in this Section, the Work Respondent may request that the amount of the financial security be reduced to the estimated cost of the remaining Work to be performed. This request for a reduction is available no more frequently than biannually. Information relied upon in calculating the revised estimate of costs must be provided with the request for reduction. A reduction in the amount of the financial security can only be made with the approval of Ohio EPA.

14. The 1986 Orders are amended to include a "LAND USE AND CONVEYANCE OF TITLE" section that reads as follows:

A. Deed Notice

- i. Within thirty (30) days after the effective date of these Orders, Respondent PCC Airfoils shall record with the County Recorder's Office for Stark County, Ohio, a deed notice for the real property owned by Respondent PCC Airfoils for the Site. Likewise, Respondent NGS&MSC shall record with the County Recorder's Office for Stark County, Ohio, a deed notice for the real property owned by Respondent NGS&MSC for the Site. The deed notice shall be consistent with the template attached as Attachment E and shall be approved by Ohio EPA. The deed notice shall reference the existence of these Orders and the need to contact the appropriate Respondent before any construction or excavation is undertaken at the Property. A copy of the recorded deed notice shall be submitted to Ohio EPA within thirty (30) days of recording the notice. Thereafter, if a Respondent conveys any interest in its Property included in the Site, each deed, title, or other instrument shall contain a notice stating that the Property is subject to these Orders and shall reference the

potential for any security, monitoring, treatment, or containment systems present on the Property as a result of these Orders. The Respondents shall record a new deed notice for the Property to reflect the subsequent construction of any security, monitoring, treatment or containment systems on their respective Properties.

- ii. To the extent that the Site, or any portion of the Site, is owned or controlled by persons other than either Respondent, Respondents shall use their best efforts to secure the filing of deed notices by said property owners for all the properties affected by the Contamination at the Site. The deed notices shall be consistent with the template attached as Attachment E and shall be approved by Ohio EPA. Copies of any deed notices filed for properties affected by the Contamination on, underlying or emanating from the Site shall be obtained by Respondents and provided to Ohio EPA upon request.

B. Environmental Covenant

If the Decision Document selects a remedy requiring the filing of an Environmental Covenant, for their respective real properties, each Respondent shall, within thirty (30) days after issuance of the Decision Document, or after acquiring an interest in the Property, record with the Stark County Recorder's Office an Environmental Covenant for the Property that is part of the Site owned by each of the Respondents. The Environmental Covenant shall be consistent with the template attached hereto as Attachment F, shall be signed by Respondents, and shall be approved and signed by Ohio EPA. The Environmental Covenant must be recorded in the deed or official records of the County Recorder of Stark County, Ohio pursuant to R.C. 5301.82. The terms and conditions of the Environmental Covenant are incorporated into these Orders and shall be binding upon Respondents. Thereafter, if either Respondent conveys any interest in its Property included in the Site, each deed, title, or other instrument shall contain a notice stating that the Property is subject to these Orders and shall reference any monitoring, treatment, or containment systems present on the Property as a result of these Orders.

C. Proof of Filing Environmental Covenant

Within thirty (30) days after filing with the Stark County Recorder the executed Environmental Covenant, each Respondent shall certify to Ohio EPA that the Environmental Covenant for its Property has been filed for recording, and include with the certification a file and date-stamped copy of the recorded Environmental Covenant. Upon each conveyance by either Respondent of an interest in any portion of the Property, including but not limited to easements, deeds, leases and mortgages, Respondents shall include in the instrument of conveyance a restatement consistent

with paragraph 10 of the Environmental Covenant. The terms and conditions of the Environmental Covenant are hereby incorporated into these Orders and shall be binding upon the Respondents. If the Environmental Covenant is violated or breached by either Respondent, the Respondent causing the violation shall be in violation of these Orders.

D. Land Use Self-Reporting Requirement

Respondent PCC Airfoils for its Property and Respondent NGS&MSC for its Property shall ensure that no portion of their respective Properties at the Site will be used in any manner that would adversely affect the integrity of any security, containment, treatment, or monitoring systems at the Site. Respondent PCC Airfoils for its Property and Respondent NGS&MSC for its Property shall submit on an annual basis, written documentation verifying that any security, containment, treatment, or monitoring systems are in place and operational.

E. Notice of Transfer of Property

Prior to each conveyance by either Respondent of an interest in any portion of its Properties at the Site, including but not limited to easements, deeds, leases and mortgages, the conveying Respondent shall notify Transferee of the existence of the security, containment, treatment, or monitoring systems, and/or activity and use limitations, including environmental covenant(s) and shall provide a copy of these Orders to Transferee. The conveying Respondent shall notify Ohio EPA at least thirty (30) days in advance of each conveyance of an interest in any portion of the Site that is owned by such Respondent. The conveying Respondent's notice shall include the name and address of the Transferee and a description of the provisions made for the continued access to and maintenance of the security, containment, treatment, and monitoring systems.

F. Confirmation of Conveyance

Within thirty (30) days after each conveyance of an interest in any portion of the Site that is owned by the Respondents, the conveying Respondent shall submit to Ohio EPA, via certified mail, the following information:

- i. A copy of the deed or other documentation evidencing the conveyance;
- ii. The name, address, and telephone number of the new property owner and the name, address, and telephone number of the contact person for the Property owner;
- iii. A legal description of the Property, or the portion of the Property, being

transferred;

iv. A survey map of the Property, or the portion of the Property, being transferred; and

v. The closing date of the transfer of ownership of the Property, or portion of the Property.

15. The 1986 Orders are amended to include an "**ADDITIONAL WORK**" section that reads as follows:

A. Ohio EPA or Work Respondent may determine that in addition to the tasks defined in the approved RI/FS Work Plan and/or in the approved RD/RA Work Plan, additional Work may be necessary to accomplish the Objectives of the Parties as provided in the General Provisions Section of these Orders. Additional Work may also include, pursuant to applicable law, the implementation of interim actions to address substantial threats to human health or safety or the environment should such threats be identified during the conduct of the RI/FS and/or RD/RA

B. Within thirty (30) days of receipt of written notice from Ohio EPA that additional Work is necessary, unless otherwise specified in writing by Ohio EPA, Work Respondent shall submit a proposed addendum to the RI/FS Work Plan ("RI/FS Work Plan Addendum") and/or the RD/RA Work Plan ("RD/RA Work Plan Addendum") which contains (a) a work plan for the implementation of additional Work, (b) any revisions to the Supporting Documents and other RI/FS and/or RD/RA deliverable, as appropriate, (c) a schedule for performance of the additional Work, and (d) revisions to other schedules impacted by the additional Work, if any. If Work Respondent disputes the necessity of additional Work, Work Respondent shall initiate the procedures for dispute resolution set forth in the Dispute Resolution Section of these Orders within fourteen (14) days after receipt of Ohio EPA's notification of the need for additional Work. The RI/FS Work Plan Addendum and/or the RD/RA Addendum shall conform to the standards and requirements set forth in the documents attached to these Orders as Attachments A, B, and C (RI/FS SOW, RD/RA SOW and list of relevant guidance documents). Upon approval of the RI/FS Work Plan Addendum by Ohio EPA pursuant to the Review of Submissions Section of these Orders, Work Respondent shall implement the approved RI/FS Work Plan Addendum and/or the RD/RA Work Plan Addendum in accordance with the schedules contained therein.

C. If Work Respondent determines that additional Work is necessary, Work Respondent shall submit a proposal to Ohio EPA to explain what the additional Work is, why the additional Work is necessary, and what impact, if any, the additional Work will have on the RI/FS Work Plan and schedule and/or the RD/RA Work Plan and schedule. Ohio EPA will review the proposal for additional Work pursuant to the Review of

Submissions Section of these Orders. If Ohio EPA concurs with the request to perform additional Work, Work Respondent shall submit a RI/FS Work Plan Addendum and/or RD/RA Work Plan Addendum, as described above, for the performance of additional Work. Any RI/FS Work Plan Addendum and/or RD/RA Work Plan Addendum shall conform to the standards and requirements set forth in the documents attached to these Orders as Attachments A, B, and C. Upon approval of the RI/FS Work Plan Addendum and/or the RD/RA Work Plan Addendum by Ohio EPA pursuant to the Review of Submissions Section of these Orders, Work Respondent shall implement the approved RI/FS Work Plan Addendum and/or the RD/RA Work Plan Addendum in accordance with the schedules contained therein. Additional Work does not include any activity performed in response to an emergency at the Site for which Work Respondent submits to Ohio EPA written notice of the performed activity.

16. The 1986 Orders are amended to include a **PROGRESS REPORTS AND NOTICE** section that reads as follows:

A. Unless otherwise directed by Ohio EPA, Work Respondent shall submit a written progress report to the Ohio EPA by the tenth (10) day of every month, unless an alternate schedule is agreed to by Ohio EPA. At a minimum, the progress reports shall include that information designated in Section 10 of the SOW. Monthly reports may not be used to propose modifications to approved plans; Work Respondent shall submit such requests to Ohio EPA in a separate written correspondence.

B. Progress reports (one copy only) shall be sent either by e-mail (Vicki.deppisch@epa.state.oh.us) or by U.S. Mail to the address listed below. All other documents (two copies) required to be submitted pursuant to these Orders to Ohio EPA shall be sent by U.S. mail to the following agency address(s):

Vicki Deppisch, Site Coordinator
Ohio EPA, Northeast District Office
2110 East Aurora Road
Twinsburg, Ohio 43207-3461

All written correspondence to Respondent PCC Airfoils shall be directed to:

Scotty Richmond
PCC Airfoils, LLC
3860 Union Ave., SE
Minerva, OH 44657

All written correspondence to Respondent NGS&MSC shall be directed to:

Joseph P. Kwan

Corporate Director, Environmental Remediation
Northrop Grumman Corporation
1840 Century Park East
Los Angeles, CA 90067

A Party may designate an alternative contact name or address upon written notification to the other Parties and in accordance with the Designated Site Coordinators Section of these Orders, as applicable.

17. The 1986 Orders are amended to include a **“REVIEW OF SUBMISSIONS”** Section that reads as follows:

A. Ohio EPA shall review any work plan, report, or other item required to be submitted pursuant to these Orders.

B. Upon review, Ohio EPA may in its sole discretion: (a) approve the submission in whole or in part; (b) approve the submission with specified conditions; (c) modify or, modify and approve, the submission; (d) disapprove the submission in whole or in part; or (e) any combination of the above. The results of Ohio EPA's review shall be provided to Work Respondent in writing and shall identify any conditions, modifications and/or deficiencies. Excluded from the requirement to obtain Ohio EPA approval pursuant to this Section are the health and safety plan (HASP), progress reports, and the PER (which is subject to approval once incorporated into the RI/FS Work Plan.).

C. In the event that Ohio EPA approves an initial submission, Work Respondent shall proceed to take such action as required by Ohio EPA. In the event that Ohio EPA approves with condition or modification an initial submission, Work Respondent shall either (a) proceed to take such action as required by Ohio EPA, or (b) initiate the procedures for dispute resolution set forth in the Dispute Resolution Section of these Orders, within fourteen (14) days of receipt of Ohio EPA's written response to Work Respondent's submission. Work Respondent shall proceed to take any action required by an unmodified or unconditioned portion of the submission, as those portions are considered approved.

D. In the event that Ohio EPA disapproves an initial submission in whole or in part, and notifies Work Respondent in writing of the deficiencies, Work Respondent shall within fourteen (14) days, or such longer period of time as specified by Ohio EPA in writing, correct the deficiencies and submit the revised submission to Ohio EPA for approval. The revised submission shall incorporate all of the changes, additions, and/or deletions specified by Ohio EPA in its notice of disapproval. Revised submissions shall be accompanied by a letter indicating how and where each of Ohio EPA's comments was incorporated into the revised submission. To facilitate review of the revised submission, those portions of the document not affected by the Ohio EPA

comments should remain unchanged. The letter accompanying the submission should indicate, however, any indirect changes necessitated by Ohio EPA's comments.

E. To the extent that Work Respondent disputes any of Ohio EPA's changes, additions, and/or deletions to an initial submission, Work Respondent shall initiate the procedures for dispute resolution set forth in the Dispute Resolution Section of these Orders, within fourteen (14) days after receipt of Ohio EPA's notice of disapproval. Notwithstanding the disapproval, Work Respondent shall proceed to take any action required by a portion of the submission that is not specified as disapproved in the notice of disapproval.

F. In the event that Ohio EPA disapproves or modifies a revised submission, in whole or in part, and notifies Work Respondent in writing of the deficiencies or modifications, Work Respondent shall within fourteen (14) days, or such longer period of time as specified in writing by Ohio EPA, correct the deficiencies and incorporate all changes, additions, and/or deletions, and submit the revised submission to Ohio EPA for approval. If Work Respondent fails to submit a revised submission incorporating all changes, additions, modifications and/or deletions within fourteen (14) days, or such longer period of time as specified by Ohio EPA in writing, Work Respondent shall be considered in breach and/or violation of these Orders. If Work Respondent is in breach and/or violation of these Orders, Ohio EPA retains the right to terminate these Orders, perform any additional investigation, conduct a complete or partial Remedial Investigation or Feasibility Study, conduct a complete or partial Remedial Design or Remedial Action, and/or enforce the terms of these Orders as provided in the Reservation of Rights Section of these Orders.

G. All work plans, reports, or other items required to be submitted to Ohio EPA under these Orders shall, upon approval by Ohio EPA, be deemed to be incorporated in and made an enforceable part of these Orders. In the event that Ohio EPA approves a portion of a work plan, report, or other item, the approved portion shall be deemed to be incorporated in and made an enforceable part of these Orders.

18. The text in Section X of the 1986 Orders is wholly replaced and shall read as follows:

A. The Site Coordinators shall, whenever possible, operate by consensus.

B. In the event of a dispute regarding a disapproval, or an approval with condition(s) or modification(s) by Ohio EPA of a submission by Work Respondent, or a disagreement regarding the Work performed under these Orders, Work Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator in writing that Work Respondent wishes to invoke an informal dispute pursuant to this Section. The notification to invoke an informal dispute shall occur prior to the submission deadline.

C. The Parties shall have ten (10) days from the date written notice of the informal dispute is received by Ohio EPA's Site Coordinator to negotiate in good faith to resolve the dispute. This informal dispute resolution period may be extended by agreement of the Site Coordinators for up to twenty (20) additional days.

D. In the event that the dispute is not resolved during the informal dispute resolution period, Work Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator in writing by the end of the informal dispute resolution period that Work Respondent wishes to invoke a formal dispute pursuant to this Section. This notice shall include a brief description of the item(s) in dispute. Within twenty (20) days of receipt of the written notice invoking the formal dispute resolution procedure, the Site Coordinators shall exchange written positions, including technical rationale supporting their positions. The Site Coordinators shall have ten (10) days from the date they have exchanged written positions to negotiate in good faith to resolve the formal dispute. This formal dispute period may be extended by agreement of the Site Coordinators for up to twenty (20) additional days.

E. In the event the dispute is not resolved in the formal dispute resolution period, Work Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator in writing by the end of the formal dispute resolution period whether Work Respondent wishes to submit final written positions to a DERR District Manager for review and resolution. The Site Coordinators shall have ten (10) days from the end of the formal dispute resolution period to submit their written positions. The DERR District Manager will resolve the dispute based upon and consistent with these Orders, the Objectives of the Parties contained in paragraph 8 of these Orders, the RI/FS SOW, RI/FS Work Plan, RD/RA SOW, RD/RA Work Plan, and other applicable federal and state laws and regulations. The decision of the DERR District Manager is considered final for the purposes of these Orders. Ohio EPA's position is that such a decision is not a final action as defined in ORC § 3745.04. Work Respondent's position is that such an action may be a final action as defined in ORC § 3745.04. Ohio EPA and Work Respondent agree that it is premature to raise and resolve the validity of such positions at this time.

F. The pendency of a dispute under this Section shall extend only the time period for completion of the item(s) in dispute, except that upon mutual agreement of the Site Coordinators, any time period may be extended as is deemed appropriate under the circumstances. Such agreement shall not be unreasonably withheld by Ohio EPA. Elements of the Work not affected by the dispute shall be completed in accordance with the applicable schedules and time frames.

19. The 1986 Orders are amended to include an "UNAVOIDABLE DELAYS" section that shall read as follows:

A. Work Respondent shall cause all Work to be performed in accordance with applicable schedules and time frames set forth in these Orders or any approved work plan unless any such performance is prevented or delayed by an event that constitutes an unavoidable delay. For purposes of these Orders, an "unavoidable delay" shall mean an event beyond the control of Work Respondent that prevents or delays performance of any obligation required by these Orders and that could not be overcome by due diligence on the part of Work Respondent. Increased cost of compliance, among other circumstances, shall not be considered an event beyond the control of Work Respondent for the purposes of these Orders.

B. Work Respondent shall notify Ohio EPA in writing within ten (10) days after the occurrence of an event that Work Respondent contends is an unavoidable delay. Such written notification shall describe the anticipated length of the delay, the cause or causes of the delay, the measures taken and to be taken by Work Respondent to minimize the delay, and the timetable under which these measures will be implemented. Work Respondent shall have the burden of demonstrating that the event constitutes an unavoidable delay.

C. If Ohio EPA does not agree that the delay has been caused by an unavoidable delay, Ohio EPA will notify the Work Respondent in writing of that finding and of the noncompliance with these Orders. If Ohio EPA agrees that the delay is attributable to an unavoidable delay, Ohio EPA will notify Work Respondent in writing of the length of the extension for the performance of the obligations affected by the unavoidable delay.

20. The text in Section XII of the 1986 Orders is wholly replaced and shall read as follows:

A. Ohio EPA has incurred and continues to incur Response Costs in connection with the Site. Work Respondent shall reimburse Ohio EPA for all Response Costs incurred both prior to and after the effective date of these Orders.

B. Within thirty (30) days of the effective date of these Orders, Work Respondent shall remit a check to Ohio EPA in the amount of one hundred forty eight thousand, eight hundred fifty two dollars and twenty nine cents (\$148,852.29) for the Response Costs incurred on or before November 21, 2008 ("Past Response Costs"). In the event that Work Respondent does not remit payment of Past Response Costs within sixty (60) days of the effective date of these Orders, Work Respondent shall remit payment for the unpaid balance and interest accrued on the unpaid balance. Interest shall accrue beginning thirty (30) days from the effective date of these Orders until the date payment is remitted and shall be calculated at the rate specified in ORC §5703.47(B) or any subsequent rate adjustments.

C. For Response Costs incurred after November 21, 2008, Ohio EPA will submit to

Work Respondent on an annual basis an itemized invoice of its Response Costs for the previous year. Within thirty (30) days of receipt of such itemized invoice, Work Respondent shall remit payment for all of Ohio EPA's Response Costs for the previous year. To the extent Work Respondent disputes the accuracy of the State of Ohio's request for reimbursement, including whether the costs are Response Costs as defined in these Orders, or whether costs are inconsistent with the NCP, Work Respondent shall initiate the formal dispute provisions of the Dispute Resolution Section within fourteen (14) days after receipt of Ohio EPA's request for reimbursement of costs. Should Work Respondent dispute a portion of the Response Costs set forth in an itemized statement, but not all of the costs, Work Respondent shall timely pay the uncontested portion pursuant to the provisions of the Reimbursement of Costs Section of these Orders. In the event that Work Respondent does not remit payment of Response Costs within sixty (60) days after receipt of such invoice, Work Respondent shall remit payment for the unpaid balance and interest accrued on the unpaid balance. Interest shall accrue beginning thirty (30) days from the date of the invoice until the date payment is remitted and shall be calculated at the rate specified in ORC §5703.47(B) or any subsequent rate adjustments.

D. Work Respondent shall remit payments to Ohio EPA pursuant to this Section as follows:

- i. Payment shall be made by bank check payable to "Treasurer, State of Ohio/Hazardous Waste Special Cleanup Account" and shall be forwarded to Office of Fiscal Administration, Attn: Brenda Case, Ohio EPA, Lazarus Government Center, P.O. Box 1049, Columbus, Ohio 43216-1049;
- ii. A copy of the transmittal letter and check shall be sent to the Fiscal Officer, DERR, Ohio EPA, P.O. Box 1049, Columbus, Ohio 43216-1049, and to the Site Coordinator; and
- iii. Each payment shall identify the name and address of the party making payment, the Site name, and Ohio EPA's revenue number identified on the associated invoice.

21. The 1986 Orders are amended to include a "PERIODIC REVIEW" section that shall read as follows:

A. Work Respondent shall conduct studies and investigations as requested by Ohio EPA in order to permit Ohio EPA to conduct reviews as to the effectiveness of the Remedial Action at least every five (5) years as described in section 121(c) of CERCLA and any applicable regulations.

B. If Ohio EPA determines that information received, in whole or in part, during a

review conducted pursuant to the Periodic Review Section of these Orders indicates that the Remedial Action is not protective of public health and safety and the environment, the Work Respondent shall undertake any further response actions Ohio EPA has determined are appropriate. Work Respondent shall submit a plan for such work to Ohio EPA for approval in accordance with the procedures set forth in the Review of Submittals Section of these Orders, within thirty (30) days of receiving a request from Ohio EPA to submit such a work plan.

C. Work Respondent may invoke the procedures in the Dispute Resolution Section to dispute (1) Ohio EPA's determination that the Remedial Action is not protective of public health and safety and the environment, or (2) Ohio EPA's selection of further response actions as unlawful or unreasonable.

22. Section XV of the 1986 Orders is replaced in its entirety and shall be entitled "Modifications" and shall read as follows:

These Orders may be modified by agreement of the Parties. Modifications shall be in writing, signed by the authorized representative of each of the Respondents, and by the Director, and shall be effective on the date entered in the Journal of the Director of Ohio EPA.

23. The text in Section XIV of the 1986 Orders is amended to read as follows:

Respondents agree to indemnify and save and hold Ohio EPA harmless from any and all claims or causes of action arising from or on account of acts or omissions of Respondents, their officers, employees, receivers, trustees, agents, or assigns. Ohio EPA shall not be considered a party to and shall not be held liable under any contract entered into by Respondents in carrying out the activities pursuant to these Orders. Consistent with federal, state, and common laws, nothing in this Order shall render Respondents liable for any act or omission of Ohio EPA related to the Site if said act is negligent, performed outside the scope of employment or official responsibilities, or performed with malicious purpose, in bad faith, or in a wanton or reckless manner.

24. The text in Section XIII in the 1986 Orders is amended to read as follows:

Nothing herein shall constitute or be construed as a release from any claim, cause of action, or demand in law or equity against any person, firm, partnership, or corporation not a Party to these Orders, for any liability arising from, or related to, events or conditions at the Site.

25. The text in Section XI of the 1986 Orders is amended to read as follows:

Nothing herein shall waive Ohio EPA's right to seek legal and/or equitable relief to

enforce this Consent Order, including penalties against Respondents for noncompliance with these Orders, under Section 106(b) of CERCLA and Chapter 3734, 3745 and 6111 of the Ohio Revised Code. Nothing herein shall waive Ohio EPA's right to take any action authorized by Ohio Revised Code Sections 3734.20 through 3734.26 or Section 107 of CERCLA or any other law.

Ohio EPA reserves the right to terminate these Orders and/or perform all or any portion of the Work or any other measures in the event that the requirements of these Orders are not wholly complied with within the time frames required by these Orders.

Ohio EPA reserves the right to take any action, including but not limited to any enforcement action, action to recover costs, or action to recover damages to natural resources, pursuant to any available legal authority as a result of past, present, or future violations of state or federal laws or regulations or the common law, and/or as a result of events or conditions arising from, or related to, the Site. Upon termination pursuant to the Termination Section of these Orders, Respondents shall have resolved their liability to Ohio EPA only for the Work performed pursuant to these Orders.

26. The text in Section XVII of the 1986 Orders is replaced in its entirety and shall read as follows:

Work Respondents' obligations under these Orders shall terminate upon Ohio EPA's approval in writing of Work Respondent's written certification to Ohio EPA that all Work required to be performed under these Orders including payment of Response Costs has been completed. The Work Respondent's certification shall contain the following attestation: "I certify that the information contained in or accompanying this certification is true, accurate, and complete." This certification shall be submitted by Work Respondent to Ohio EPA and shall be signed by a responsible official of Work Respondent. The termination of Work Respondent's obligations under these Orders shall not terminate the Respondents' obligations under the Reservation of Rights, Access to Information, Indemnity, Other Claims and Land Use and Conveyance of Title Sections of these Orders.

27. The 1986 Orders are amended to include a "**WAIVER AND AGREEMENT**" section that shall read as follows:

A. In order to resolve disputed claims, without admission of fact, violation, or liability, Respondents consent to the issuance of these Orders, and agree to comply with these Orders.

B. Respondents hereby waive the right to appeal the issuance, terms and conditions, and service of these Orders and Respondents hereby waive any and all rights that they may have to seek administrative or judicial review of these Orders either

in law or equity except as provided herein.

C. Notwithstanding the limitations herein on Respondents' right to appeal or seek administrative or judicial review, Ohio EPA and Respondents agree if these Orders are appealed by any other party to the Environmental Review Appeals Commission, or any court, Respondents retain the right to intervene and participate in such appeal. In such event, Respondents shall continue to comply with these Orders notwithstanding such appeal and intervention unless these Orders are stayed, vacated or modified.

28. With the exception of the approved amendments to the 1986 Orders, as set forth in the Orders Section of these Orders, the 1986 Orders remain unchanged and in full force and effect.

29. The effective date of these Orders shall be the date these Orders are entered in the Journal of the Director of Ohio EPA.

30. Each undersigned representative of a Party to these Orders certifies that he or she is fully authorized to enter into these Orders and to legally bind such Party to these Orders.

IT IS SO ORDERED AND AGREED:

OHIO ENVIRONMENTAL PROTECTION AGENCY



Chris Korleski, Director
Ohio Environmental Protection Agency

1/14/09
Date

Director's Findings and Orders for RI/FS and RD/RA
TRW Minerva Site

IT IS SO AGREED:

NORTHROP GRUMMAN SPACE & MISSION SYSTEMS CORP.

BY:

Name

Kyly
Vice President - Administrative Services
Title

Date

12-22-2008

Director's Findings and Orders for RI/FS and RD/RA
TRW Minerva Site

PCC AIRFOILS, LLC

BY: John Sobada
Name

12-30-08
Date

V.P. Finance & Admin
Title

Data Gap Letter Form
TRW Minerva Site

Please sign and mail a copy with an original signature to:

Ann M. Fischbein, Staff Attorney
Ohio EPA, Office of Legal Services
P.O. Box 1049
Columbus, Ohio 43216-1049

**DATA GAP LETTER - ACKNOWLEDGMENT OF AGREEMENT REGARDING
DATA GAPS/GENERAL TASKS AT THE TRW MINERVA SITE**

Ohio EPA has identified the following data gaps/general tasks ("Data Gaps") regarding the former TRW Inc./TRW Minerva Facility, Stark County, Ohio:

1. Data review and analysis and sampling:
 - Review and evaluate all current monitoring well analytical data, identify data gaps, develop a comprehensive sampling plan based on the data gaps identified, and conduct targeted sampling of wells in accordance with the comprehensive sampling plan.
 - Evaluate all current data regarding the ground water model and capture zone for the pump and treat system.
 - Evaluate the compliance point wells.
2. Identify, evaluate and resolve all remaining issues regarding the residential wells, including any remaining residential use.
3. Complete human health and ecological risk assessments.
4. Evaluate on-Site and off-Site vapor intrusion issues.
5. Determine the rate and extent of contamination for the barn and central areas.

Northrop Grumman Space & Mission Systems Corp. ("NGS&MSC") does hereby agree with the Data Gaps listed herein.

The undersigned representative of NGS&MSC certifies that he or she is fully authorized to sign this Acknowledgment of Agreement.

IT IS SO AGREED:

NORTHROP GRUMMAN SPACE & MISSION SYSTEMS CORP.

BY:



Name JOSEPH P. KWAN
CORPORATE DIRECTOR
ENVIRONMENTAL REMEDIATION
Title

12/22/2008
Date

Generic Statement of Work for Conducting Remedial Investigations and Feasibility Studies

Ohio EPA
Division of Emergency and Remedial Response
Remedial Response Program

September 1, 2006

**Generic Statement of Work
for Conducting
Remedial Investigations and Feasibility Studies**

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GENERIC STATEMENT OF WORK REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Purpose:

This Statement of Work (SOW) sets forth the generic requirements for conducting a Remedial Investigation and Feasibility Study (RI/FS) of the Site. The purpose of the RI is to characterize the nature and extent of any releases or potential releases of contaminants at or from the Site, assess potential risks to human health and the environment posed by such releases, and collect the information needed to support the development and evaluation of remedial alternatives. The purpose of the FS is to develop and evaluate remedial alternatives to provide the Ohio Environmental Protection Agency (Ohio EPA) with the information needed to select a site remedy. The RI and FS are conducted in an iterative manner to allow the information gathered during the RI to influence the development of remedial alternatives, which in turn affects data needs and the scope of the RI.

The RI/FS shall be performed in accordance with the requirements of the consensual Director's Final Findings and Orders for the Site, referred to herein as "Orders", and this SOW, and in a manner consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Final Rule (40 CFR Part 300). Respondent shall refer to U.S. EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA/540/G-89/004, October 1988) (U.S. EPA RI/FS Guidance) and other guidance that the Ohio EPA may use in conducting an RI/FS. A partial list of guidance is included as the Guidance List attached to the Orders. Sections of relevant guidance which further describe the RI/FS tasks are referenced throughout this SOW and appendices. Respondent shall furnish all personnel, materials, and services needed or incidental to performing the RI/FS except as otherwise specified in the Orders.

At the completion of the RI/FS, Ohio EPA shall be responsible for the selection of a site remedy and shall memorialize the selected remedy in a Decision Document. The site remedy selected by Ohio EPA shall be protective of human health and the environment, comply with applicable or relevant and appropriate requirements of federal and state environmental laws and regulations (ARARs), be cost-effective, utilize permanent solutions and treatment technologies or resource recovery technologies to the maximum extent practicable, and address the preference for treatment as a principal element. The final RI and FS Reports, as approved by Ohio EPA, shall, with the administrative record, form the basis for selection of the site remedy and provide the information needed to support development of a Decision Document.

Ohio EPA shall provide oversight of Respondent's activities throughout the RI/FS, including field activities. Respondent shall support Ohio EPA's conduct of oversight activities.

Section 1 - RI/FS Project Scoping

Scoping the RI/FS

Scoping is the planning process for the RI/FS. Ohio EPA developed and included in the Orders a general management approach for the Site and preliminary remedial action objectives (RAOs) for the RI/FS. Consistent with the general management approach and preliminary RAOs, and in consultation with Ohio EPA, Respondent shall plan the specific project scope and prepare and submit for review and comment a Pre-investigation Evaluation Report (PER).

Respondent shall document in the PER the performance and results of the scoping tasks identified in this Section 1 and Appendix A of this SOW, thus establishing the framework for subsequent development of the RI/FS Work Plan. Respondent shall address in the PER each RI/FS SOW task by one of the following three methods: 1) indicating that the task has already been performed and providing the results of the task and supporting documentation; 2) indicating that the task is not relevant to the Site and providing the technical justification for omitting the task; or 3) indicating that the task is relevant to the Site and will be addressed in the RI/FS Work Plan.

Respondent shall include in the PER a Level 1 Scoping Ecological Risk Assessment (ERA) meeting the requirements outlined in Appendix I of this SOW and the Ohio EPA Division of Emergency and Remedial Response (DERR) *Ecological Risk Assessment Guidance Document*, February, 2003 (DERR ECO Guidance). Respondent shall also include an annotated bibliography of existing reports relevant to the RI/FS. Upon request, Respondent shall provide copies of the reports to Ohio EPA

Scoping is continued, repeated as necessary, and refined throughout the RI/FS process as data become available. Appendix A of this SOW summarizes the RI/FS project scoping requirements and provides the format for the PER.

1.1 Project Initiation Meeting and Site Visit

Respondent shall contact Ohio EPA's Site Coordinator to set up a Project Initiation Meeting, which is to be held prior to Respondent's submittal of the PER. The purpose of the meeting is to afford Respondent and Respondent's contractors an opportunity to review with Ohio EPA the technical requirements of the Orders and this SOW and seek

clarification regarding the performance of the required work and/or preparation of deliverables, and to establish a date for a site visit as discussed in A. 2. of Appendix A of this SOW. Topics of discussion may include, but need not be limited to, the site management strategy, preliminary RAOs, data quality objectives (DQOs), preparation of the baseline human health risk assessment (HHRA), ERA, initiation and/or integration of emergency or interim actions, involvement and coordination with other Ohio EPA programs and other agencies, community relations activities, performance of the FS, and communication between Respondent and Ohio EPA. The meeting will be attended by Ohio EPA's Site Coordinator and agency staff providing support to the Site Coordinator in overseeing Respondent's conduct of the RI/FS. Ohio EPA also encourages meeting attendance by those persons providing support to Respondent.

Section 2.0 - RI/FS Work Plan and Supporting Documents

RI/FS Work Plan (U.S. EPA RI/FS Guidance Section 2.3.1)

Following receipt of Ohio EPA's comments on the PER, Respondent shall prepare and submit for review and approval an RI/FS Work Plan and supporting documents, including a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). A Health and Safety Plan (HASP) shall also be submitted, but for review and comment only. Respondent shall incorporate the PER, revised in accordance with Ohio EPA's comments, into the RI/FS Work Plan to document the initial RI/FS scoping activities.

The RI/FS Work Plan shall detail the methods and procedures for performing the remaining RI/FS tasks (Sections 3 through 10 of this SOW) and shall be developed in conjunction with the FSP, QAPP, and HASP although each may be delivered under separate cover. The RI/FS Work Plan and supporting documents shall provide a detailed description of the tasks to be performed, the technical rationale for performing the work in the manner proposed, the information needed for each task, the information to be produced during and at the conclusion of each task, and a description of the work products that will be submitted to Ohio EPA. This includes the deliverables set forth in the Orders and this SOW, including Interim Technical Memoranda produced during the field investigation and at the conclusion of each major phase of the RI/FS and meetings and presentations to Ohio EPA.

If Respondent intends to rely on modeling to satisfy any RI/FS task, Respondent shall identify the models Respondent proposes to use and, in a manner consistent with U.S. EPA's *Guidance for Quality Assurance Plans for Modeling*, EPA QA/G-5M, fully explain their application in the RI/FS Work Plan and supporting documents, including model assumptions and operating conditions, input parameters, and verification and calibration procedures. If Respondent identifies the need to conduct modeling following approval

of the RI/FS Work Plan, Respondent shall submit for review and approval an addendum to the RI/FS Work Plan.

The RI/FS Work Plan shall reflect coordination with any identified treatability study requirements (Section 8 and Appendix L of this SOW) and shall include a process for refining and/or identifying additional ARARs and to be considered (TBC) criteria, conducting the HHRA and ERA, refining the conceptual site model (CSM), and submitting monthly progress reports and ITMs to Ohio EPA. The RI/FS Work Plan shall include a comprehensive RI/FS project schedule indicating critical path dependencies and including dates for the initiation, duration, and completion of each RI/FS task. The schedule shall also include field work and development and submittal of required deliverables. The RI/FS Work Plan, FSP, and QAPP must be approved by Ohio EPA prior to the initiation of field activities.

Due to the potentially unknown nature of the Site and the iterative nature of the RI/FS, additional RI/FS tasks may be identified following approval of the RI/FS Work Plan. Ohio EPA may require or Respondent may propose additional RI/FS tasks in accordance with the provisions of the Additional Work Section of the Orders.

2.1 Field Sampling Plan

Respondent shall submit for review and approval a FSP describing the field activities to be performed and defining the procedures and methods that must be used to collect field measurements and samples. Activities and procedures include collection of geophysical data, drilling of soil borings, installation of ground water monitoring wells, collection of multimedia samples, field control samples, and any field measurements. The FSP shall also address sample packaging and shipping requirements, proper testing, handling and disposal of investigation-derived wastes, field documentation procedures, and corrective action procedures.

The FSP shall detail the methods and procedures for each field activity. A field activity includes any task which involves the collection of environmental media or data. The FSP shall discuss the purpose of each task and how it will fulfill the DQOs provided in the associated QAPP. Respondent shall prepare the FSP in a manner consistent with Sections 3.3.4.1 through 3.3.4.12 of the U.S. Army Corps of Engineers' guidance *Requirements for the Preparation of Sampling and Analysis Plans*, EM 200-1-3, February, 2001, using the FSP outline provided in Appendix B of this SOW.

2.2 Quality Assurance Project Plan

Respondent shall submit for review and approval a site-specific QAPP. The QAPP shall address all relevant elements of U. S. EPA's *Guidance for Quality Assurance Project*

Plans, QA-G-5, EPA/240/R-02-009, December 2002, including DQOs developed in a manner consistent with the DQO guidance identified in the Guidance List attached to the Orders. Some QAPP elements may already be provided in the FSP, in which case, Respondent shall clearly cross-reference in the QAPP to the section and page number in the FSP where such information may be located. See Appendix C of this SOW for the QAPP elements included in the referenced U.S. EPA guidance.

Respondent shall include an electronic version of the laboratory(ies) QAPP on disc in PDF format. Upon request, Respondent shall provide to Ohio EPA any other records, documents, or other information generated or stored by the laboratory(ies) as a result of the work Respondent is required to perform by the Orders or this SOW.

2.3 Health and Safety Plan (U.S. EPA RI/FS Guidance Section 2.3.3)

Respondent shall submit for review and comment a HASP that complies with the Occupational Safety and Health Administration (OSHA) regulations and protocols outlined in Title 29 CFR, Part 1910 or as OSHA may otherwise require. See Appendix D of this SOW for the major elements of a HASP. Further, the HASP shall include all other monitoring, procedures, and protocols needed to protect the health and safety of those persons conducting site activities, visiting the Site, and residing or working in the surrounding community.

Section 3 - Site Characterization

Site Investigation

Respondent shall conduct such investigations as necessary to obtain data of sufficient quality and quantity to support the RI/FS. All sampling, analyses, and measurements shall be conducted in accordance with the approved QAPP and FSP. All sampling and measurement locations shall be documented in a project-specific field log and identified on site maps.

3.1. Environmental Setting

Respondent shall collect information to supplement and verify existing information on the environmental setting of the Site and surrounding the Site. Characterization of the environmental setting shall include but not be limited to regional hydrogeology, site hydrogeology, subsurface soil and rock units, surface soils, surface water and sediment, land use, land cover, and local climate. Appendix E of this SOW summarizes the requirements for characterizing the environmental setting at the Site.

3.1.1. Source Characterization

Respondent shall conduct an investigation to locate and characterize any known or potential source(s) of contaminant releases at the Site, including areas where wastes have been placed, collected, come to be located or removed. Methods for source characterization shall include but not be limited to test pits, trenches, and/or borings to characterize buried source areas; determine source area depth, thickness, and volume; and identify and investigate the integrity of any existing natural or engineered containment that may be present. Geophysical characterization methods, such as ground penetrating radar, magnetometry, tomography, or other electromagnetic methods shall be used as appropriate to assist in delineation and characterization of potential contaminant source areas. The source area investigation shall also include, as appropriate, leaching tests and/or modeling to assess the potential leaching of contaminants from source areas, and ground water investigations where potential source areas may exist in a saturated zone. Appendix F of this SOW summarizes the requirements for conducting the source characterization.

3.1.2. Nature and Extent of Contamination

Respondent shall collect analytical data to determine the nature and extent of contamination in all potentially affected media at the Site (see Section 3.2.4 of the U.S. EPA RI/FS Guidance). Data collected shall be sufficient to support determination of the origin, extent, direction, and rate of movement of contaminants. Data shall also be collected to support determination of background concentrations for contaminants in accordance with the background guidance identified in the Guidance List attached to the Orders. Respondent shall collect the data in accordance with the approved RI/FS Work Plan and shall document the methods and procedures used during the investigation in the RI Report. Appendix G of this SOW summarizes the requirements for determining the nature and extent of contamination at the Site.

Section 4 - Risk Assessment

Risk assessment is the process used to evaluate current and reasonably anticipated future site conditions in an effort to quantify risks or hazards to human health and the environment in the absence of any remedial action. Respondent shall collect all data necessary to support the assessments, and include the assessments in the RI Report.

4.1 Risk Assessment Assumptions Document

Respondent shall submit for review and approval a Risk Assessment Assumptions Document (RAAD) prior to performing the HHRA. The RAAD shall provide all

assumptions, inputs, and supporting information required to complete the assessment, including:

- a) refined CSM;
- b) all current and reasonably anticipated receptors to be evaluated;
- c) all exposure scenarios to be evaluated;
- d) all exposure media to be evaluated;
- e) all screening values and sources for values used in the reduction of the contaminants of potential concern (toxicity-based and/or background). Respondent shall derive background concentrations in accordance with the background guidance, and shall include the methods and data used;
- f) list of all contaminants of potential concern per medium;
- g) all risk assessment exposure assumptions needed to complete the HHRA;
- h) all exposure point concentrations and the supporting equations; and,
- i) methods and input values that Respondent proposes to use to evaluate specific contaminants, such as lead, or environments, such as surface waters or wetlands.

Following Ohio EPA approval of the RAAD, Respondent shall prepare the HHRA in accordance with the approved RAAD.

4.2 Human Health Risk Assessment

Respondent shall prepare a baseline HHRA which evaluates current and potential future threats to human health in the absence of any remedial action. The HHRA shall focus on current and reasonably anticipated future risks or hazards to persons coming into contact with site-related contaminants or environmental media containing one or more contaminants (*e.g.*, ground water, soils, sediments, surface water, air, subsurface gases, contaminated organisms).

The HHRA relies upon information gathered at the Site. Respondent shall ensure that the site investigations and resultant data are sufficient in both quality (*e.g.*, DQOs, sample detection limits, quality assurance procedures) and quantity to fully describe the current and potential future threats to human health. Respondent shall plan and

conduct the HHRA in manner consistent with U.S. EPA's *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)* EPA/540/1-89/002 (RAGS, Part A, 1989) and other relevant state and federal guidance as identified in this SOW and the Guidance List attached to the Orders.

The HHRA shall organize and present the results and data from all site investigations such that relationships between and among environmental media and receptors are clear (see Exhibit 9-1 in RAGS Part A for a suggested outline for the baseline risk assessment report; RAGS Part D may also be followed for a suggested format). The HHRA shall project the potential risk of health problems occurring if no cleanup action is taken at the Site and identify areas and media where risks exceed a cumulative excess lifetime cancer risk of 1E-5 and/or a hazard index of 1. Appendix H of this SOW summarizes the requirements for conducting the baseline HHRA.

4.3 Ecological Risk Assessment

Respondent shall prepare an ERA which evaluates current or potential future adverse effects in the absence of any remedial action to flora and fauna at the population, community, ecosystem, and/or individual level as appropriate. The ERA shall be conducted in a manner consistent with the DERR ECO Guidance, U.S. EPA's guidance as referenced therein, and other relevant guidance as identified in the Guidance List attached to the Orders.

The ERA is generally conducted in an iterative or phased approach as data are gathered during the RI and decisions are made regarding the need, or lack thereof, for more comprehensive ecological assessment. Respondent shall conduct a Level I Scoping ERA during the preparation of the PER discussed in Section 1 and Appendix A of this SOW, and include the Level I ERA Report in the PER. If a Level II Screening ERA is needed, Respondent shall describe in detail the tasks necessary to complete the Level II ERA in the RI/FS Work Plan and supporting documents, and include a date for submittal of the Level II ERA Report in the RI/FS project schedule. If during the RI it is determined that additional ecological assessment is needed, Respondent shall, as necessary, submit addendum(s) to the RI/FS Work Plan and supporting documents detailing the tasks necessary to complete each subsequent level of assessment, including a revised RI/FS project schedule with dates for related deliverables. Respondent shall submit an ERA Report for review and approval at the conclusion of each level of the ERA. The ERA Report shall summarize the methodology and results of the assessment, include a recommendation and supporting rationale regarding the need for additional assessment, and provide all data and other site-specific information Respondent relied upon in conducting the assessment. The final ERA Report shall also provide all information necessary to evaluate the environmental impact of proposed

remedial alternatives in the FS. Appendix I of this SOW summarizes the requirements for conducting the ERA.

Section 5 - Site-Specific Preliminary Remediation Goals

Following the completion of the HHRA and the final level of ERA, Respondent shall revisit the preliminary remediation goals (PRGs) initially identified in the PER and develop site-specific PRGs for inclusion in the RI Report. Site-specific PRGs are interim remediation goals generally developed on a media specific basis to assist with risk management and engineering considerations during the development and screening of remedial alternatives (see Section 7.0 below). They do not consider potential cross-media exposures, and therefore, may not account for all exposures a given receptor may potentially experience at a Site absent remediation.

Site-specific PRGs are generally calculated by rearranging the risk assessment equations to derive single chemical, single pathway remediation goals based on a hazard quotient (HQ) of 1 or an excess lifetime cancer risk of $1E-5$ for receptors identified to be at risk due to actual or potential site-related exposures. Site-specific PRGs for protection of human health are then adjusted as necessary to account for multiple chemical and/or multiple routes of exposures within a given medium (*e.g.*, soil, ground water, air) so as not to exceed a cumulative $1E-5$ excess lifetime cancer risk and a hazard index (HI) as appropriate, of 1 for the same receptor population.

Site-specific PRGs for potential ecological hazards are derived in the same manner using an HQ or HI of 1 as appropriate, or other appropriate ecological evaluation (*e.g.*, toxicity test, bioassay, biosurvey, water quality standard, or screening value). Where site-specific ecological PRGs are developed based on multiple receptors, it may be possible to reduce the list of PRGs by selecting the lowest PRG for a given chemical/receptor combination.

Adjustment of PRGs for the protection of human health to account for possible exposures to multiple chemicals and/or multiple routes of exposure is site-specific and dependent on the exposures and associated risks at the Site. Generally, PRGs are calculated for each chemical that individually exceeds or significantly contributes to risk above the cumulative excess lifetime cancer risk of $1E-5$ and the non-cancer HI of 1. Adjustment of the PRGs based on a cancer disease endpoint to account for multiple chemical exposures is completed by dividing each PRG by the total number of chemicals of concern. For PRGs based on a non-cancer disease endpoint, the same procedure is followed. However for PRGs based on non-cancer effects, adjustments or groupings may be made to account for specific toxicological effects of the chemical contaminants. These groups and considerations should be consistent with those used

in the baseline risk assessment. See Section 2.8 of RAGS, Part B for additional information on development of site-specific PRGs.

Some site-specific PRGs may depend on Contaminant and/or site-specific circumstances, such as PRGs for lead, or leach-based values for soils or wastes for the protection of ground and surface waters. PRGs may also be based on background concentrations where the use of background concentrations is determined to be appropriate based on the guidance included in the Guidance List attached to the Orders. These PRGs are stand-alone values and are not generally adjusted to account for exposure to multiple contaminants.

Further adjustment of the site-specific PRGs is dependent on the risk management approach and configuration of each of the remedial alternatives subjected to detailed analysis in the FS. This analysis may include the concept of driver chemicals and other specific attributes of the Site and or contamination. Each alternative must be able to maintain protection of human health and the environment during implementation and achieve a residual site-wide cumulative excess lifetime cancer risk of 1E-5 and a non-cancer HI of 1 following implementation. Final remediation goals are determined by Ohio EPA as part of the remedy selection process and are not part of the AOC or this SOW. See Chapter 2 of RAGS, Part C for additional information on the risk evaluation of remedial alternatives.

Section 6 - Remedial Investigation Report

RI Report

Respondent shall submit for Ohio EPA review and approval a RI Report detailing the methods and results of the remedial investigation and the risk assessments. The format for the RI Report is provided in Appendix J of this SOW.

Section 7 - Alternatives Array Development

Developing and Screening of Remedial Alternatives (U.S. EPA RI/FS Guidance Chapter 4)

Respondent shall begin to develop and evaluate a range of remedial alternatives during RI/FS scoping (Section 1.0 and Appendix A of this SOW; Section 2.2.3 of the U.S. EPA RI/FS Guidance). Respondent shall continue to develop and evaluate the remedial alternatives initially developed during project scoping as RI data become available. With the exception of the "no action" alternative, all alternatives under consideration

must, at a minimum, ensure protection of human health and the environment and comply with the applicable or relevant and appropriate requirements of state and federal laws and regulations.

7.1 Refine Remedial Action Objectives (U.S. EPA RI/FS Guidance Section 4.2.1)

Respondent shall further refine the preliminary RAOs identified during project scoping. RAOs for protection of human health should specify a site-specific PRG, an exposure pathway and receptor, and preliminary points of compliance. RAOs for protecting environmental receptors should seek to preserve or restore a resource (*e.g.*, as ground water) and should be expressed in terms of the medium of interest and target remediation goals whenever possible (see U.S. EPA's RI/FS Guidance, Table 4-1). The refined RAOs shall be based on the results of the RI and the risk assessments, and shall be consistent with Section 300.430 of the NCP. Respondent shall prepare and submit for review an ITM identifying the refined RAOs for protection of human health and the environment and detailing the methods and procedures used to refine them. Respondent shall revise the refined RAOs per Ohio EPA's comments, if any, and include the refined RAOs in the Alternatives Array Document described in 7.2 below.

7.2 Alternatives Array Document (U.S. EPA RI/FS Guidance Chapter 4)

Respondent shall prepare an Alternatives Array Document (AAD) which documents the methods, rationale, and results of the technology, process option, and alternatives development and the screening process. Respondent shall include an evaluation of whether the amount and type of data existing for the Site will support the subsequent detailed analysis of the alternatives. Respondent shall modify the alternatives based on Ohio EPA's comments, if any, to assure identification of an appropriate range of viable alternatives for consideration in the detailed analysis. The AAD, as revised by Respondent to incorporate Ohio EPA comments, shall be combined with the detailed analysis of alternatives to form the FS Report described in Section 9 and Appendix M of this SOW. Appendix K of this SOW summarizes the requirements for conducting the alternatives screening process and provides the required contents of the AAD.

Section 8 - Treatability Studies

Determining the Need for Treatability Studies

Treatability studies are laboratory or field tests designed to provide critical data needed to evaluate one or more treatment technologies. These studies generally involve characterizing untreated waste and evaluating the performance of the technology under different operating conditions. These results may be qualitative or quantitative,

depending on the level of treatability testing. Treatability studies conducted during the RI/FS to support remedy selection are generally used to determine whether the technology can achieve the RAOs and to provide information needed to support the detailed analysis of alternatives in the FS.

Potential remedial technologies and associated treatability study needs are initially evaluated by Respondent during RI/FS scoping activities (Section 1 and Appendix A of this SOW). Due to the iterative nature of the scoping process throughout the conduct of the RI/FS, potential remedial technologies and the need for treatability studies may be reevaluated as data from the RI becomes available. Regardless of when a potential remedial technology is identified, it is incumbent upon Respondent to identify the need for treatability studies as early in the RI/FS process as possible such that treatability studies are substantially completed prior to performing the detailed analysis of alternatives (Section 9 of this SOW). Ohio EPA may also identify the need for treatability studies during the course of the RI/FS and communicate that need to Respondent. Respondent shall conduct treatability studies in a systematic fashion to ensure that the data generated can support the detailed analysis of alternatives during the FS.

Should the need for treatability studies be identified, Respondent shall submit to Ohio EPA a Treatability Study Work Plan for review and approval. Appendix L of this SOW summarizes the requirements for treatability studies.

Section 9 - Feasibility Study Report

Detailed Analysis of Alternatives

Once it has been determined that sufficient data exist to proceed, Respondent shall conduct a detailed analysis of the alternatives surviving the screening process to provide Ohio EPA with the information needed for selection of a site remedy. The detailed analysis shall consist of an individual analysis of each alternative against eight evaluation criteria followed by a comparative analysis of the alternatives using the same evaluation criteria as the basis for comparison.

9.1 Feasibility Study Report (U.S. EPA RI/FS Guidance Section 6.5)

Respondent shall prepare and submit a FS Report for review and approval. The AAD, revised based on comments received from Ohio EPA, shall be incorporated into the FS as it is prepared. Respondent will refer to Table 6-5 of the U.S. EPA RI/FS Guidance for an outline of the FS Report format and required report content. Appendix M of this

SOW summarizes the process and criteria for conducting the detailed analysis of alternatives and provides additional information on the content of the FS Report.

Section 10 - Progress Reports

Respondent shall submit written monthly progress reports in accordance with Section XII of the Orders, Progress Reports and Notice. The Progress Reports shall include the following information:

- a) A description of the Work performed during the reporting period. For field activities, include boring logs, drilling and sampling locations, depths, and descriptions, and field notes;
- b) A description of any deviations from approved work plans or schedules during the reporting period and the date of Ohio EPA's approval of any such deviations;
- c) A summary of all field and laboratory analytical data generated or received during the reporting period;
- d) Summaries of all contacts during the reporting period with representatives of the local community, public interest groups or government agencies related to conducting the Work;
- e) Summaries of problems or potential problems encountered during the reporting period and any actions taken to rectify or prevent problems;
- f) Changes in project personnel or contractors during the reporting period;
- g) Tasks scheduled for the next two reporting periods;
- h) Copies of daily reports, inspection reports, or other reports as may be required by an approved work plan;
- i) Identification of the sources, types, quantities, test results, and disposition of investigation derived and other project wastes generated or disposed of during the reporting period.

In addition, Respondent shall provide all laboratory data within the Progress Reports and in no event later than 60 days after samples are shipped for analysis for raw analytical data and 90 days after samples are shipped for validated analytical data.

Appendix A

Preinvestigation Evaluation Report

Respondent shall prepare and submit for Ohio EPA review and comment a Preinvestigation Evaluation Report (PER) which documents Respondent's performance of the scoping tasks identified in Section 1 and Appendix A of this SOW. The PER shall also include a Level 1 Scoping ERA as described in Appendix I of this SOW and Chapter 2 of the DERR ECO Guidance.

PER Tasks

I. Description of Current Conditions

Respondent shall collect and analyze existing information available for the Site to develop a preliminary CSM to assist in assessing the nature and the extent of contamination, identifying potential exposure pathways and potential human and ecological receptors, preliminarily evaluating ARARs, developing general response actions and preliminary remedial alternatives, and gathering and analyzing existing Site background information. Sources of information include a review of Ohio EPA and other public files (including analytical results obtained from prior site investigations and assessments conducted by Ohio EPA and others relative to the Site) and interviews with employees, officers and agents (past and present) associated with the Site. Additional sources of existing information are described in Table 2.1 of the U.S. EPA RI/FS Guidance and Chapter 2 of the DERR ECO Guidance.

A. Existing Analytical Data (U.S. EPA RI/FS Guidance Section 2.2.2)

Respondent shall compile existing analytical data relating to contamination at the Site, and summarize the results in terms of physical and chemical characteristics, contaminant concentrations, and media affected. Data relating to soil, ground water, surface water, sediment, air, or biotic contamination shall be included as available. Use of any data that was not collected and analyzed pursuant to a QAPP approved by Ohio EPA must be supported by inclusion of all relevant quality assurance and quality control information. Consistent with the DQO guidance listed in the Guidance List attached to the Orders, Respondent shall identify the DQOs for all existing data on which Respondent intends to rely.

B. Conduct Site Visit

Respondent shall coordinate a site visit with Ohio EPA to assist in developing a conceptual understanding of sources and areas of contamination, potential exposure pathways, and potential human and ecological receptors. Respondent shall also observe the Site's physiography, hydrology, geology, demographics, natural resources, and ecological and cultural features.

C. Site Background

Respondent shall prepare and include in the PER a summary of the regional location, pertinent area boundary features, and physical geography at and near the Site. The summary shall be based on existing information and shall include characteristics such as surface hydrology, hydrogeology, geology (including cross-sections if available), and the total area of the Site. The summary shall also include the general nature of the problem, particularly with respect to the historic use of the Site relative to disposal or release of contaminants. Respondent shall also include background information on land use, natural resources, and climatology. Respondent may reference applicable existing reports. Respondent shall, at a minimum, provide the following:

1. Map(s) depicting;
 - a. General geographic location;
 - b. Property lines, with the owners of all adjacent property clearly indicated;
 - c. Topography and surface drainage with appropriate contour interval and scale depicting all waterways, wetlands, flood plains, water features, drainage patterns, and surface water containment areas;
 - d. All tanks, buildings, utilities, paved areas, easements, rights-of-way, and other features;
 - e. All known active or past waste treatment, storage or disposal areas and the dates of their operation;
 - f. All known past and present product and waste underground tanks and/or piping;

- g. All known past or present locations of spills or other releases of contaminants or any other potential contaminant source areas;
- h. Surrounding land uses (residential, commercial, agricultural, recreational) including zoning designations;
- i. Wetlands and surface water bodies;
- j. Previous sampling locations and dates of sampling for all media;
- k. The location of all wells, including monitoring and public and private water supply wells. These wells shall be clearly labeled and ground and top of casing elevations and construction details shall be included where available (elevations and construction details may be included as an appendix to the PER). Respondent shall determine whether any of the identified wells are currently being used, particularly as a source of potable water;
- l. Federal Sole Source Aquifer designations and Drinking Water Source Water Protection Areas for public water supplies.

Maps shall be of sufficient detail and accuracy to locate and depict current and future work performed at the Site. Maps shall be submitted as hard copy and in a digital format, using either a shapefile (*.shp) or drawing exchange format file (*.dxf) in a known coordinate system (e.g., Ohio State Plane South Zone, Datum = NAD83, units = feet)¹. Significant features will be created using standard survey techniques or with a global positioning system unit capable of sub-meter accuracy horizontal data capture.

- 2. A history and description of ownership and operation (past and current), including: generation of wastes and any treatment, storage and/or disposal activities at the Site;

¹ The term "shapefile" (*.shp) refers to the electronic file format used by the ArcGIS software systems produced by the ESRI Company, a major supplier of geographic information system products. The term "dxf" means "drawing exchange format" (*.dxf), a standard electronic file format used by AutoCad[®] and other graphics software systems.

3. Approximate dates or periods of past product and waste spills or discharges, identification of the materials spilled or discharged, the amount spilled or discharged, the location where spilled or discharged, and a description of any response actions conducted at the time (local, state, or federal response units or private parties), including any inspection reports or technical reports generated as a result of the response;
 4. A summary of past and present permits requested and/or received and a list of permit related documents and studies;
 5. A summary of past and present enforcement actions and a list of related documents and studies;
 6. Identification of any violations of past or present discharge permit limitations and related documents;
 7. A summary of any previous response actions conducted by either local, state, federal, or private parties, a summary of the data generated as a result of the response actions, and a list of response related documents and studies; and
 8. A summary of known or suspected source areas and other areas of known or suspected contamination, and a list of related documents and studies.
- D. Nature and Extent of Contamination (U.S. EPA RI/FS Guidance, Section 2.2.2)

Respondent shall prepare a summary of the nature and extent of contamination at the Site based on the review of existing information. The summary shall include, but not be limited to, descriptions of the types, physical states, and amounts of contaminants known or suspected to be associated with the Site; the type and volume of environmental media affected or potentially affected by the contaminants; any known or suspected contaminant source areas; the presence and condition of any drums, tanks, lagoons, landfills, or other forms of containment; the potential pathways of contaminant migration; and any actual or potential human and/or ecological exposure to contaminants. Emphasis should be placed on describing the threat or potential threat that may exist to public health and/or the environment. The summary shall include tables

displaying the minimum and maximum levels of detected contaminants for Site areas and media, and identification of areas where additional information is necessary.

E. Develop a Conceptual Site Model (U.S. EPA RI/FS Guidance, Figure 2-2)

Based on the results of the above tasks, Respondent shall develop a preliminary CSM to evaluate potential threats to human health and the environment. The CSM shall include known and suspected sources of contamination, types of contaminants and affected media, known and potential routes of contaminant migration, and known or potential human and environmental receptors.

II. Review and Integration of Emergency or Interim Actions

Respondent shall evaluate any previous response actions that may have been undertaken at the Site for consistency with the preliminary CSM and to determine if the initial response objectives are being met. Respondent shall include this evaluation and proposals to address identified issues, if any, in the PER.

III. Pre-investigation Evaluation of Remedial Action Technologies, Process Options, and Broadly Defined Remedial Alternatives

Following the review of existing information and development of the preliminary CSM, Respondent shall refine the preliminary RAOs identified in the Orders to specify the contaminants of potential concern, the actual or potential exposure pathways, and the preliminary remediation goals (PRGs) for each exposure pathway (see the Guidance List attached to the Orders, DERR-00-RR-038, *Use of Risk-based numbers in the Remedial Response Process, Overview*, and Section 4.2.1 of the U.S. EPA RI/FS Guidance). The refined RAOs shall be consistent with the preliminary CSM.

Based on the preliminary CSM and refined RAOs, Respondent shall develop, evaluate and screen a preliminary range of potential remedial technologies and associated process options, and develop broadly defined remedial alternatives (Sections 4.2.2 through 4.2.6 of the U.S. EPA RI/FS Guidance). The screening of technologies and process options shall be based on their effectiveness, implementability, and cost as these terms are defined and used in Sections 4.2.5.1 - 4.2.5.3 of the U.S. EPA RI/FS Guidance.

Respondent shall consider the following during development of a preliminary range of potential remedial alternatives:

- A. Technologies and process options that may be appropriate for treating, containing, or disposing of wastes shall be identified, along with sources of literature on the technologies' effectiveness, application, and cost. Innovative technologies and resource recovery options will be included if they appear feasible.
- B. A preliminary list of broadly defined remedial alternatives that reflect the goal of preserving a range of alternatives in which treatment that significantly reduces the toxicity, mobility, or volume of waste is a principal element; one or more alternatives that involve containment with little or no treatment; a limited number of ground-water alternatives that attain site-specific remediation levels within differing time frames, and a no action alternative.
- C. For alternatives involving treatment, the need for treatability studies shall be evaluated as early in the RI/FS process as possible. The need for such studies shall be discussed in the Pre-investigation Evaluation Report.

Respondent shall also preliminarily identify potential ARARs and TBC criteria which may influence potential remedial alternatives and/or site characterization activities (Section 2.2.5 of the U.S. EPA RI/FS Guidance).

Respondent will revise and refine the preliminary CSM and supporting information (RAOs, contaminants of concern, routes of exposure, receptors, preliminary remedial alternatives, ARARs, and TBC criteria) throughout the RI/FS process as data become available and uncertainties are reduced.

IV. Identification of Data Needs and Data Usage

Based on the results of the above scoping tasks, Respondent shall identify the types of data that will need to be collected during the RI. At a minimum, data shall be collected sufficient to:

- A. Define Source Areas of Contamination;
- B. Define the Nature and Vertical and Horizontal Extent of Contamination;
- C. Define the Environmental Setting at the Site;
- D. Define Potential Pathways of Contaminant Migration;

- E. Define Hot Spots (see: U.S. EPA 1991 *A Guide to Principal Threat and Low Level Threat Wastes*) within source areas;
- F. Define Potential Receptors;
- G. Support the HHRA and ERA; and
- H. Support the Development and Evaluation of Remedial Alternatives (support development of the AAD and the FS).

Identification of data needs shall be coordinated with the expected uses for the data and the DQOs. Respondent shall identify the intended uses for the data and its adequacy in meeting the DQOs.

- V. Pre-investigation Evaluation Report Format
 - A. Introduction
 - B. Project Initiation Meeting - summary of discussion and conclusions
 - C. Description of Current Conditions
 - 1. Site Background
 - 2. Existing Data Analysis
 - 3. Site Visit
 - 4. Nature and Extent of Contamination
 - 5. Potential Receptor Identification
 - D. Conceptual Site Model
 - E. Level I Ecological Risk Assessment
 - F. Pre-investigation Evaluation of Remedial Alternatives
 - 1. Preliminary Remediation Goals
 - 2. Remedial Action Objectives

3. Federal ARARs, state requirements, and TBCs
 4. Preliminary Remedial Alternatives
 - a. Preliminary Screening of Remedial Technologies
 - b. Preliminary Screening of Process Options
 - c. Development of Preliminary Remedial Alternatives
- G. Identification of Data Needs and Data Usage
1. Analysis of RI/FS SOW Tasks
 2. Data Needs
 3. Data Quality Objectives

Appendix B

Field Sampling Plan Format

Respondent shall prepare the FSP consistent with Sections 3.3.4.1 through 3.3.4.12 of the U.S. Army Corps of Engineers' guidance *Requirements for the Preparation of Sampling and Analysis Plans*, EM 200-1-3, February, 2001, using the following format:

Title Page
Table of Contents

- 1.0 Project Background
 - 1.1 Site History and Contaminants
 - 1.2 Summary of Existing Site Data
 - 1.3 Site-Specific Definition of Problems
- 2.0 Project Organization and Responsibilities
- 3.0 Project Scope and Objectives
 - 3.1 Task Description
 - 3.2 Applicable Regulations/Standards
 - 3.3 Project Schedule
- 4.0 Nonmeasurement Data Acquisition
- 5.0 Field Activities by Area of Concern (AOC)
 - 5.1 Geophysics
 - 5.1.1 Rationale/Design
 - 5.1.1.1 Method
 - 5.1.1.2 Study Area Definition and Measurement Spacing
 - 5.1.2 Field Procedures
 - 5.1.2.1 Equipment
 - 5.1.2.2 Preliminary Method Testing and Early Termination Procedures
 - 5.1.2.3 Instrument Calibration and QC Procedures
 - 5.1.2.4 Field Progress/Interpretation Reporting
 - 5.1.2.5 Measurement Point/Grid Surveying
 - 5.1.2.6 Data Processing
 - 5.1.2.7 Potential Interpretation Techniques

5.2 Soil Gas Survey

5.2.1 Rationale/Design

5.2.1.1 Soil Gas Sample Locations

5.2.1.2 Sample Collection and Field and Laboratory Analysis

5.2.1.3 Background, QA/QC, and Blank Samples and Frequency

5.2.2 Field Procedures

5.2.2.1 Drilling Methods and Equipment

5.2.2.2 Materials (Casing, screen, etc.)

5.2.2.3 Installation

5.2.2.4 Sampling Methods

5.2.2.5 Field Measurement Procedures and Criteria

5.2.2.6 Documentation

5.3 Ground Water

5.3.1 Rationale/Design

5.3.1.1 Monitoring Well Location and Installation

5.3.1.2 Sample Collection and Field and Laboratory Analysis

5.3.1.3 Upgradient, QA/QC, and Blank Samples and Frequency

5.3.2 Monitoring Well Installation

5.3.2.1 Drilling Methods and Equipment

5.3.2.2 Materials

5.3.2.2.1 Casing/Screen/Centralizers

5.3.2.2.2 Filter Pack, Bentonite Seal, Cement/Bentonite Grout

5.3.2.2.3 Surface Completion

5.3.2.2.4 Water Source

5.3.2.2.5 Delivery, Storage, and Handling of Materials

5.3.2.3 Installation

5.3.2.3.1 Test Holes

5.3.2.3.2 Soil Sampling and Rock Coring During Drilling

5.3.2.3.3 Geophysical Logging

5.3.2.3.4 Borehole Diameter and Depth

5.3.2.3.5 Screen and Well Casing Placement

5.3.2.3.6 Filter Pack Placement

5.3.2.3.7 Bentonite Seal

5.3.2.3.8 Cement/Bentonite Grout Placement

5.3.2.3.9 Concrete/Gravel Pad Placement

5.3.2.3.10 Protective Cover Placement

5.3.2.3.11 Well Identification

5.3.2.3.12 Well Development

5.3.2.3.13 Well Survey

5.3.2.3.14 Alignment Testing

5.3.2.3.15 In Situ Permeability Testing

- 5.3.2.4 Documentation
 - 5.3.2.4.1 Logs and Well Installation Diagrams
 - 5.3.2.4.2 Development Records
 - 5.3.2.4.3 Geophysical Logs
 - 5.3.2.4.4 Decommission/Abandonment Records
 - 5.3.2.4.5 Photographs
 - 5.3.2.5 Well Decommission/Abandonment
 - 5.3.2.6 Water Level Measurement
 - 5.3.3 Determine Free Product Presence and Sampling
 - 5.3.4 Aquifer Testing
 - 5.3.5 Field Measurement Procedures and Criteria
 - 5.3.6 Sampling Methods for Ground Water - General
 - 5.3.7 Sample Handling Methods for Ground Water - Filtration
 - 5.3.8 Sample Containers and Preservation Techniques
 - 5.3.9 Field Quality Control Sampling Procedures
 - 5.3.10 Decontamination Procedures
- 5.4 Subsurface Soil
- 5.4.1 Rationale/Design
 - 5.4.1.1 Soil and Rock Boring Locations
 - 5.4.1.2 Discrete/Composite Soil Sampling Requirement
 - 5.4.1.3 Sample Collection and Field and Laboratory Analysis
 - 5.4.1.4 Background, QA/QC, and Blank Samples and Frequency
 - 5.4.2 Field Procedures
 - 5.4.2.1 Drilling Methods
 - 5.4.2.2 Boring Logs
 - 5.4.2.3 Field Measurement Procedures and Criteria
 - 5.4.2.4 Sampling for Physical/Geotechnical Analyses
 - 5.4.2.5 Sampling for Chemical Analyses
 - 5.4.2.6 Sample Containers and Preservation Techniques
 - 5.4.2.7 Field Quality Control Sampling Procedures
 - 5.4.2.8 Decontamination Procedures
- 5.5 Surface Soil and Sediment
- 5.5.1 Rationale/Design
 - 5.5.1.1 Surface Soil Sample Locations
 - 5.5.1.2 Sediment Sample Locations from Onsite and/or Offsite Drainage Channels
 - 5.5.1.3 Sediment Sample Locations from Ponds, Lakes, and Lagoons
 - 5.5.1.4 Discrete/Composite Soil and/or Sediment Sampling Requirements
 - 5.5.1.5 Sample Collection and Field and Laboratory Analysis

- 5.5.1.6 Upgradient, QA/QC, and Blank Samples and Frequency
- 5.5.2 Field Procedures
 - 5.5.2.1 Sampling Methods for Surface Soil/Dry Sediment
 - 5.5.2.2 Sampling Methods for Underwater Sediments from Ponds, Lakes, and Lagoons
 - 5.5.2.3 Field Measurement Procedures and Criteria
 - 5.5.2.4 Sampling for Physical/Geotechnical Analyses
 - 5.5.2.5 Sampling for Chemical Analyses
 - 5.5.2.6 Sample Containers and Preservation Techniques
 - 5.5.2.7 Field QC Sampling Procedures
 - 5.5.2.8 Decontamination Procedures
- 5.6 Surface Water
 - 5.6.1 Rationale/Design
 - 5.6.1.1 Surface Water Sample Locations
 - 5.6.1.2 Sample Collection and Field and Laboratory Analysis
 - 5.6.1.3 Upgradient, QA/QC, and Blank Samples and Frequency
 - 5.6.2 Field Procedures
 - 5.6.2.1 Sampling Methods for Surface Water - General
 - 5.6.2.2 Sample Handling Methods for Surface Water - Filtration
 - 5.6.2.3 Field Measurement Procedures and Criteria
 - 5.6.2.4 Sample Containers and Preservation Techniques
 - 5.6.2.5 Field Quality Control Sampling Procedures
 - 5.6.2.6 Decontamination Procedures
- 5.7 Other Matrices
 - 5.7.1 Rationale/Design
 - 5.7.1.1 Sample Locations
 - 5.7.1.2 Discrete/Composite Sampling Requirements
 - 5.7.1.3 Sample Collection and Field and Laboratory Analysis
 - 5.7.1.4 Background/Upgradient, QA/QC, and Blank Samples and Frequency
 - 5.7.2 Field Procedures
 - 5.7.2.1 Sampling Methods
 - 5.7.2.2 Field Measurement Procedures and Criteria
 - 5.7.2.3 Sample Containers and Preservation Techniques
 - 5.7.2.4 Field Quality Control Sampling Procedures
 - 5.7.2.5 Decontamination Procedures
- 6.0 Field Operations Documentation
 - 6.1 Daily Quality Control Reports (QCR)
 - 6.2 Field Logbook and/or Sample Field Sheets
 - 6.3 Photographic Records

6.4 Sample Documentation

6.4.1 Sample Numbering System

6.4.2 Sample Labels and/or Tags

6.4.3 Chain-of-Custody Records

6.5 Field Analytical Records

6.6 Documentation Procedures/Data Management and Retention

7.0 Sample Packaging and Shipping Requirements

8.0 Investigation-Derived Wastes (IDW)

9.0 Field Assessment/Three-Phase Inspection Procedures

9.1 Contractor Quality Control (CQC)

9.2 Sampling Apparatus and Field Instrumentation Checklist

10.0 Nonconformance/Corrective Actions

Appendices

A. References

Appendix C

Quality Assurance Project Plan Elements

| Group A. Project Management | Group B. Data Generation and Acquisition | Group C. Assessment and Oversight |
|--------------------------------------|--|---|
| A1 Title and Approval Sheet | B1 Sampling Process Design (Experimental Design) | C1 Assessments and Response Actions |
| A2 Table of Contents | B2 Sampling Methods | C2 Reports to Management |
| A3 Distribution List | B3 Sample Handling and Custody | |
| A4 Project/Task Organization | B4 Analytical Methods | Group D. Data Validation and Usability |
| A5 Problem Definition and Background | B5 Quality Control | D1 Data Review, Verification, and Validation |
| A6 Project/Task Description | B6 Instrument/Equipment Testing, Inspection, and Maintenance | D2 Verification and Validation Methods |
| A7 Quality Objectives and Criteria | B7 Instrument/Equipment Calibration and Frequency | D3 Reconciliation with User Requirements |
| A8 Special Training/Certifications | B8 Inspection/Acceptance of Supplies and Consumables | |
| A9 Documentation and Records | B9 Non-direct Measurements | |
| | B10 Data Management | |

Appendix D

Health and Safety Plan (HASP) - see also SOW Section 2.3

- I. Respondent shall submit a HASP that at a minimum addresses the following:
 - 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
 - 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, including a description of the personal protective equipment to be used for each of the site tasks and operations being conducted;
 - F. Description of the medical monitoring program;
 - 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 personal protective equipment;
 - J. Establishment of site emergency procedures, including a contingency plan that meets the requirements of 29 CFR 1910.120(l)(1) and (l)(2);
 - 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 site personnel;
- N. Entry procedures for confined spaces; and
- O. Establishment of procedures for protecting workers from weather-related problems.

II. The HASP shall be consistent with:

- A. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);
- B. Section 111©)(6) of CERCLA;
- C. U.S. EPA Order 1440.3 -- Respiratory Protection;
- D. U.S. EPA Order 1440.2 -- Health and Safety Requirements for Employees Engaged in Field Activities;
- E. U.S. EPA Occupational Health and Safety Manual;
- F. U.S. EPA Standard Operating Safety Guides (Publication 9285.1-03, PB92-963414, June 1992);
- G. OSHA regulations particularly in 29 CFR 1910 and 1926;
- H. State and local regulations; and
- I. Site or facility conditions.

Although Ohio EPA will review and may provide comment on the draft HASP, Ohio EPA will not approve the HASP. It is Respondent's responsibility to comply with applicable rules and regulations and to ensure that site workers, site visitors, and the surrounding community are protected from any hazards or potential hazards associated with the Site throughout the conduct of the RI/FS.

Appendix E

Environmental Setting

Respondent shall characterize the environmental setting of the Site. Characterization shall include discussion of regional and site hydrogeology, surface water and sediment, local climate, and human and ecological receptors. Components to be addressed include but are not limited to:

I. Regional Hydrogeology

Respondent shall characterize the regional hydrogeology surrounding the facility, including:

- A. Depth to bedrock;
- B. Hydrostratigraphic unit correlation (both map and profile view);
- C. Aquifer and aquitard delineation;
- D. Active and inactive residential, public, industrial, agricultural, and other production well locations within a four (4) mile radius of the Site;
- E. Well logs, with well construction details and average yield;
- F. Average pumping rates for production wells;
- G. Ambient ground water quality characterization;
- H. Average depth to water;
- I. Seasonal variation in ground water flow direction;
- J. Recharge and discharge area identification;
- K. Source water protection area identification;
- L. Aquifer designation (*i.e.*; federal Sole Source Aquifer; Drinking Water Source Water Protection Area);

- M. Regional geomorphology and topography, including locations of surface water bodies and floodways. This description should include an analysis of any features that may influence the ground water flow system; and
- N. Structural feature delineation, including bedding planes and fold, joint, and fracture trace orientation.

II. Site Hydrogeology

Respondent shall characterize site-specific hydrogeology based on data collected from bore holes, monitoring wells, piezometers, and laboratory and field tests. Characterization shall include but not be limited to the following:

- A. An accurate classification and description of the consolidated and unconsolidated stratigraphic units beneath the Site, including:
 - 1. Hydraulic conductivity (vertical and horizontal);
 - 2. Porosity, effective porosity, and bulk density;
 - 3. Rock and soil (ASTM 2488 and 2487) classification;
 - 4. Grain size distribution (sieve and hydrometer) curves;
 - 5. Moisture content;
 - 6. 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); and
 - 7. pH;
- B. Surface soils, including:
 - 1. Soil Conservation Service soil classification;
 - 2. Surface soil distribution;
 - 3. Depth and profile;

4. Organic carbon;
 5. pH;
 6. Porosity (total, air-filled);
 7. Bulk density;
 8. Gravimetric soil moisture content;
 9. Fraction of vegetative cover (of contaminated areas);
 10. ion exchange capacity;
 11. Infiltration; and
 12. Evapotranspiration.
- C. A description of the local ground water flow regime, including:
1. Identification of all aquitards and aquifer systems (hydrogeologic formations wholly or partially saturated and capable of transmitting flow);
 2. Identification of saturated zones;
 3. Identification of water table and potentiometric surface depth with degree of seasonal fluctuation;
 4. Identification of seasonal ground water flow direction for each aquifer system including water table and/or potentiometric surface contour maps for each significant zone of saturation;
 5. Quantification of flow rate throughout each aquifer system;
 6. Quantification of horizontal and vertical gradients;
 7. Quantification of infiltration rates through the unsaturated zone;

8. Quantification of flow across and lateral to hydrostratigraphic units, including the degree of seepage and upward leakage;
 9. Quantification of flow budget across the Site with identification of recharge and discharge areas;
 10. Location of nearest hydraulic boundaries;
 11. Characterization of ambient ground water chemistry both upgradient and downgradient of the Site;
 12. Hydrostratigraphic cross sections depicting horizontal and lateral extent, depth, and thickness of units. Cross sections shall be developed both longitudinally and transverse to the dominant direction of flow across the Site. Cross sections shall include flow nets distinguishing vertical and horizontal components of flow across stratigraphic units; and
 13. Delineation of structural features, including orientation, density, and distribution.
- D. A description of man-made influences that may affect the hydrogeology of the Site, identifying:
1. Active and inactive water supply and production wells with pumping schedules; and
 2. Man-made structures such as injection wells, pipelines, french drains, ditches, unlined and lined ponds, lagoons, septic tanks, NPDES permitted out falls, retention areas and utility lines.
- E. An area-specific description of the geomorphology at the Site. At a minimum this shall include;
1. An analysis of any topographic feature that may influence the ground water flow system;
 2. 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.

F. 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 the approved RI/FS Work Plan. Field methods may include but are not limited to:

1. Borehole characterization;
2. Ground water level measurements;
3. Ground water sampling;
4. Monitoring well and piezometer installation;
5. Aquifer testing (e.g., pump and slug testing) to determine the degree of hydraulic communication between hydrostratigraphic units and subsurface structure;
6. Remote sensing, including geophysical techniques to identify zones of saturation, hydrostratigraphic units, and subsurface structure;
7. Ground water tracer testing to assist in determining migration pathways and hydraulic conductivity; and
8. Isotopic age dating of ground water to assist in migration pathway identification.

III. Surface Water and Sediment

Respondent shall conduct a program to characterize any surface water bodies in the vicinity of the Site. Such characterization shall include, but is not limited to:

A. Description of the perennial and ephemeral surface water bodies including:

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

2. For impoundments: location, elevation, surface area, depth, volume, freeboard and purpose of impoundment;
 3. For streams, ditches, drains, wetlands, and channels: location, hydraulic gradient, flow velocity, base flow, depth, width, bank height and slope, gaining and losing stream sections, seasonal fluctuations, stabilization of stream bed; description of stream banks; flood plain areas, and flood zones (*i.e.*, 50 and 100 year events); area of drainage basin;
 4. Drainage patterns/storm water runoff;
 5. Degree of ground water seepage and/or recharge to surface waterbodies;
 6. Any known discharges including those permitted by NPDES; and.
- B. Description of the chemical, physical and biological/biochemical characteristics of the surface water and sediments. This includes but is not limited to:
1. Chemical (surface water and/or sediment)
 - a. Total organic carbon (TOC);
 - b. pH;
 - c. total dissolved solids;
 - d. total suspended solids;
 - e. biochemical oxygen demand (BOD);
 - f. conductivity; and
 - g. dissolved oxygen.
 2. Physical (surface water and/or sediment)
 - a. temperature;
 - b. particle/grain size;
 - c. appearance/texture/odor/color;
 - d. organic matter deposition;
 - e. Deposition area, patterns, and rates; and
 - f. Thickness profile.

3. Biological/Biochemical
 - a. Aquatic life use designation based on Ohio's Water Quality Standards²;
 - b. Attainment status of water body; and
 - c. Ohio wetland classification.

The RI Report shall document the methods and procedures used to gather and evaluate the surface water and sediment data. These methods and procedures shall be in accordance with the approved RI/FS Work Plan. Field methods may include but are not limited to:

- a. drain tracer studies;
- b. seepage meter installation and data acquisition;
- c. stream piezometer installation and water level acquisition; and
- d. stream weir gauge installation and data acquisition.

IV. Local Climate

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:
 1. Annual and monthly rainfall averages;
 2. Monthly temperature averages and extremes;
 3. Wind speed and direction;
 4. Relative humidity/dew point;
 5. Atmospheric pressure;

² Ohio Water Quality Standards, OAC Chapter 3745-1

6. Evaporation data;
 7. Development of inversions; and
 8. Climate extremes that have been known to occur in the vicinity of the facility, including frequency of occurrence.
- B. A description of topographic or manmade features which may affect air flow or emission patterns, including:
1. Ridges, hills or mountain areas;
 2. Canyons or valleys;
 3. Surface water bodies;
 4. Wind breaks and forests;
 5. Buildings; and
 6. Any other features that may affect air flow or emission patterns.
- V. Human receptors potentially exposed to Site-related contaminants, including:
- A. human population data including demographics;
 - B. sensitive sub-populations;
 - C. populations served by surface water intakes or ground water wells; and
 - D. land use (e.g., residential, commercial, recreational).
- VI. Ecological receptors potentially exposed to site-related contaminants, including:
- A. terrestrial receptors;
 - B. aquatic receptors; and
 - C. special interest species (including Threatened and Endangered species).