

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF OHIO
WESTERN DIVISION
(AT DAYTON)

UNITED STATES OF AMERICA,)
)
PLAINTIFF,)
)
)
vs.)
)
3M COMPANY, *et al.*,)
)
DEFENDANTS.)
)
)

Case No. 3:14cv32
Judge Rice
Magistrate _____

REMEDIAL DESIGN/REMEDIAL ACTION (RD/RA) AND
DE MINIMIS CONSENT DECREE

TABLE OF CONTENTS

	Page
I. BACKGROUND	1
II. JURISDICTION	5
III. PARTIES BOUND	5
IV. DEFINITIONS	6
V. GENERAL PROVISIONS	12
VI. PERFORMANCE OF THE WORK BY SETTLING PERFORMING DEFENDANTS	16
VII. REMEDY REVIEW	25
VIII. QUALITY ASSURANCE, SAMPLING, AND DATA ANALYSIS	25
IX. ACCESS AND INSTITUTIONAL CONTROLS	27
X. REPORTING REQUIREMENTS	34
XI. EPA APPROVAL OF PLANS, REPORTS, AND OTHER DELIVERABLES	36
XII. PROJECT COORDINATORS	38
XIII. PERFORMANCE GUARANTEE	39
XIV. CERTIFICATION OF COMPLETION	48
XV. EMERGENCY RESPONSE	50
XVI. PAYMENTS FOR RESPONSE COSTS	51
XVII. INDEMNIFICATION AND INSURANCE	59
XVIII. FORCE MAJEURE	61
XIX. DISPUTE RESOLUTION	64
XX. STIPULATED PENALTIES	67
XXI. COVENANTS BY PLAINTIFF	73
XXII. COVENANTS BY SETTLING DEFENDANTS AND SETTLING FEDERAL AGENCIES	79
XXIII. EFFECT OF SETTLEMENT; CONTRIBUTION	83
XXIV. ACCESS TO INFORMATION	85
XXV. RETENTION OF RECORDS	87
XXVI. NOTICES AND SUBMISSIONS	89
XXVII. RETENTION OF JURISDICTION	91
XXVIII. APPENDICES	91
XXIX. COMMUNITY INVOLVEMENT	92
XXX. MODIFICATION	93
XXXI. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT	93
XXXII. SIGNATORIES/SERVICE	94
XXXIII. FINAL JUDGMENT	95

I. BACKGROUND

A. The United States of America (“United States”), on behalf of the Administrator of the United States Environmental Protection Agency (“EPA”), filed a complaint in this matter pursuant to Sections 106 and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act (“CERCLA”), 42 U.S.C. §§ 9606, 9607.

B. The United States in its complaint seeks, *inter alia*: (1) reimbursement of costs incurred by EPA and the Department of Justice (“DOJ”) for response actions at the Lammers Barrel Superfund Site in Beavercreek, Ohio, together with accrued interest; and (2) performance of response actions by the defendants at the Site consistent with the National Contingency Plan, 40 C.F.R. Part 300 (“NCP”).

C. In accordance with the NCP and Section 121(f)(1)(F) of CERCLA, 42 U.S.C. § 9621(f)(1)(F), EPA notified the State of Ohio (the “State”) on or about May 10, 2012, of negotiations with potentially responsible parties (“PRPs”) regarding the implementation of the remedial design and remedial action for the Site, and EPA has provided the State with an opportunity to participate in such negotiations and be a party to this Consent Decree.

D. In accordance with Section 122(j)(1) of CERCLA, 42 U.S.C. § 9622(j)(1), EPA notified the United States Department of Interior and the National Oceanic and Atmospheric Administration Office of Natural Resource Restoration (collectively, the “Natural Resource Trustees”) on or about May 10, 2012, of negotiations with PRPs regarding the release of hazardous substances that may have resulted in injury to the natural resources under federal trusteeship and encouraged the trustees to participate in the negotiation of this Consent Decree.

E. The defendants that have entered into this Consent Decree (“Settling Defendants”) do not admit any liability to Plaintiff arising out of the transactions or occurrences

alleged in the complaint, nor do they acknowledge that the release or threatened release of hazardous substances at or from the Site constitutes an imminent and substantial endangerment to the public health or welfare or the environment. Settling Federal Agencies do not admit any liability arising out of the transactions or occurrences alleged in any counterclaim asserted by Settling Defendants.

F. Pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List (“NPL”), set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on September 29, 2003, 68 Fed. Reg. 55875.

G. On March 22, 1990, EPA entered into an administrative agreement with Lamson & Sessions, the Ford Motor Company, General Motors Corporation, Navistar International, Monsanto, Specialty Papers Company, Aluminum Company of America, Virginia Lammers, and Anthony Kohnen under CERCLA Section 122(h), 42 U.S.C. § 9622(h), to resolve certain past costs incurred in connecting nine residences at the Valleywood Subdivision Site (SF ID no. 053H) to the public water supply.

H. In response to a release or a substantial threat of a release of hazardous substances at or from the Site, certain of the Settling Defendants and/or other PRPs at the Site commenced in April, 2002, a Remedial Investigation and Feasibility Study (“RI/FS”) for the Site pursuant to 40 C.F.R. § 300.430 pursuant to the terms of a separate Administrative Order on Consent entered into with EPA on April 9, 2002, as amended (the “2002 AOC”). The Respondents to the 2002 AOC also have paid the EPA’s oversight costs for the RI/FS in the amount of \$1,147,651.19, which includes payment of \$86,127.40 in costs incurred by the Ohio Environmental Protection Agency that had been reimbursed by EPA. Based upon the estimate of certain Settling

Defendants, Settling Non-Performing Defendants that participated in the RI/FS under the 2002 AOC paid approximately \$961,372 for the RI/FS.

I. Certain of the Settling Defendants and/or other PRPs at the Site completed a Remedial Investigation (“RI”) Report for the Lammers Barrel Factory Property in the fall of 2008, and completed a Feasibility Study (“FS”) Report for the Lammers Barrel Factory Property in June 2011.

J. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA published notice of the completion of the FS and of the proposed plan for remedial action on July 6, 2011, in a major local newspaper of general circulation. EPA provided an opportunity for written and oral comments from the public on the proposed plan for remedial action. A copy of the transcript of the public meeting is available to the public as part of the administrative record upon which the Superfund Division Director, EPA Region 5, based the selection of the response action.

K. On September 27, 2011, EPA selected the remedy for Operable Unit 1 (“OU1”) at the Lammers Barrel Factory Property portion of the Site, issuing a final Record of Decision (“ROD”) on that date. The State concurred with the selected remedy. The ROD includes a responsiveness summary to the public comments. Notice of the final plan was published in accordance with Section 117(b) of CERCLA, 42 U.S.C. § 9617(b). The OU1 remedial action is described in Paragraph 14.a. below. Because a ROD has been issued only for OU1, EPA may choose to select further response activities for the Site. Further anticipated response activities at the Site are referred to in this Consent Decree as Operable Unit 2 or (“OU2”). Pursuant to the 2002 AOC, certain of the Settling Defendants and/or other PRPs at the Site are currently conducting an RI/FS at the Site.

L. Based on the information presently available to EPA, EPA believes that the Work will be properly and promptly conducted by Settling Performing Defendants if conducted in accordance with the requirements of this Consent Decree and its appendices.

M. Solely for the purposes of Section 113(j) of CERCLA, 42 U.S.C. § 9613(j), the remedy set forth in the ROD and the Work to be performed by Settling Performing Defendants shall constitute a response action taken or ordered by the President for which judicial review shall be limited to the administrative record.

N. EPA has determined the following:

1. Prompt settlement with each Settling Non-Performing Defendant and each Settling Federal Agency is practicable and in the public interest within the meaning of Section 122(g)(1) of CERCLA, 42 U.S.C. § 9622(g)(1);

2. the payment to be made by each Settling Non-Performing Defendant and each Settling Federal Agency under this Consent Decree involves only a minor portion of the response costs at the Site within the meaning of Section 122(g)(1) of CERCLA, 42 U.S.C. § 9622(g)(1), based upon certain of the Settling Defendants' estimate that the total response costs incurred and to be incurred at or in connection with the Site by the EPA Hazardous Substance Superfund and by other persons is \$13,061,523. The parties recognize that the actual costs may be more or less than this estimate. The payment is also based upon premiums set by the parties as further discussed in Paragraph 6.c below; and

3. the amount of hazardous substances contributed to the Site by each Settling Non-Performing Defendant and each Settling Federal Agency, and the toxic or other hazardous effects of the hazardous substances contributed to the Site by each Settling Non-Performing Defendant and each Settling Federal Agency, are minimal in comparison to other hazardous substances at the Site within the meaning of Section 122(g)(1)(A) of CERCLA, 42 U.S.C. § 9622(g)(1)(A). This is because the amount of materials containing hazardous substances contributed to the Site by each Settling Non-Performing Defendant and each Settling Federal Agency does not exceed 1.25% of the materials containing hazardous substances at the Site as accepted by EPA based on the allocation approach submitted by certain of the Settling Defendants, and the hazardous substances contributed by each Settling Non-Performing Defendant and each Settling Federal Agency to the Site are not significantly more toxic or of significantly greater hazardous effect than other hazardous substances at the Site.

O. The Parties recognize, and the Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith and implementation of this

Consent Decree will expedite the cleanup of the Site and will avoid prolonged and complicated litigation between the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

NOW, THEREFORE, it is hereby Ordered, Adjudged, and Decreed:

II. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1345, and 42 U.S.C. §§ 9606, 9607, and 9613(b). This Court also has personal jurisdiction over Settling Defendants. Solely for the purposes of this Consent Decree and the underlying complaint, Settling Defendants waive all objections and defenses that they may have to jurisdiction of the Court or to venue in this District. Settling Defendants shall not challenge the terms of this Consent Decree or this Court's jurisdiction to enter and enforce this Consent Decree.

III. PARTIES BOUND

2. This Consent Decree applies to and is binding upon the United States and upon Settling Defendants, their heirs, successors, and assigns. Any change in ownership or corporate status of a Settling Defendant including, but not limited to, any transfer of assets or real or personal property, shall in no way alter such Settling Defendant's responsibilities under this Consent Decree.

3. Settling Performing Defendants shall provide a copy of this Consent Decree to each contractor hired to perform the Work required by this Consent Decree and to each person representing any Settling Performing Defendant with respect to the Site or the Work, and shall condition all contracts entered into hereunder upon performance of the Work in conformity with the terms of this Consent Decree. Settling Performing Defendants or their contractors shall

provide written notice of the Consent Decree to all subcontractors hired to perform any portion of the Work required by this Consent Decree. Settling Performing Defendants shall nonetheless be responsible for ensuring that their contractors and subcontractors perform the Work in accordance with the terms of this Consent Decree. With regard to the activities undertaken pursuant to this Consent Decree, each contractor and subcontractor shall be deemed to be in a contractual relationship with Settling Performing Defendants within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3).

IV. DEFINITIONS

4. Unless otherwise expressly provided in this Consent Decree, terms used in this Consent Decree that are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Consent Decree or its appendices, the following definitions shall apply solely for purposes of this Consent Decree:

“CERCLA” shall mean the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9601-9675.

“Consent Decree” shall mean this Consent Decree and all appendices attached hereto (listed in Section XXVIII). In the event of conflict between this Consent Decree and any appendix, this Consent Decree shall control.

“Day” or “day” shall mean a calendar day unless expressly stated to be a working day. The term “working day” shall mean a day other than a Saturday, Sunday, or federal or state holiday. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or federal or state holiday, the period shall run until the close of business of the next working day.

“DOJ” shall mean the United States Department of Justice and its successor departments, agencies, or instrumentalities.

“Effective Date” shall mean the date upon which this Consent Decree is entered by the Court as recorded on the Court docket, or, if the Court instead issues an order approving the Consent Decree, the date such order is recorded on the Court docket.

“EPA” shall mean the United States Environmental Protection Agency and its successor departments, agencies, or instrumentalities.

“EPA Hazardous Substance Superfund” shall mean the Hazardous Substance Superfund established by the Internal Revenue Code, 26 U.S.C. § 9507.

“Future Response Costs” shall mean all costs, including, but not limited to, direct and indirect costs, that the United States incurs in reviewing or developing plans, reports, and other deliverables submitted pursuant to this Consent Decree, in overseeing implementation of the Work, or otherwise implementing, overseeing, or enforcing this Consent Decree, including, but not limited to, payroll costs, contractor costs, travel costs, laboratory costs, the costs incurred pursuant to Paragraph 9 (Notice to Successors-in-Title and Transfers of Real Property), Sections VII (Remedy Review), IX (Access and Institutional Controls) (including, but not limited to, the cost of attorney time and any monies paid to secure access and/or to secure, implement, monitor, maintain, or enforce Institutional Controls including, but not limited to, the amount of just compensation), XV (Emergency Response), Paragraph 43 (Funding for Work Takeover), and Section XXIX (Community Involvement). Future Response Costs shall also include all Interim Response Costs.

“Institutional Controls” or “ICs” shall mean Proprietary Controls and state or local laws, regulations, ordinances, zoning restrictions, or other governmental controls or notices that: (a)

limit land, water, and/or resource use to minimize the potential for human exposure to Waste Material at or in connection with the Site; (b) limit land, water, and/or resource use to implement, ensure non-interference with, or ensure the protectiveness of the Remedial Action; and/or (c) provide information intended to modify or guide human behavior at or in connection with the Site.

“Institutional Control Implementation and Assurance Plan” or “ICIAP” shall mean the plan for implementing, maintaining, monitoring, and reporting on the Institutional Controls set forth in the ROD, prepared in accordance with the Statement of Work (“SOW”).

“Interim Response Costs” shall mean all costs, including, but not limited to, direct and indirect costs, (a) paid by the United States in connection with the Site between August 26, 2012 and the Effective Date, or (b) incurred prior to the Effective Date but paid after that date.

“Interest” shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year.

“Lammers Barrel Site Special Account” shall mean the special account, within the EPA Hazardous Substance Superfund, established for the Site by EPA pursuant to Section 122(b)(3) of CERCLA, 42 U.S.C. § 9622(b)(3).

“Lammers Barrel Site OU2 Special Account” shall mean the special account, within the EPA Hazardous Substance Superfund, to be created for the Site by EPA pursuant to Section 122(b)(3) of CERCLA, 42 U.S.C. § 9622(b)(3), for receipt of payments made for OU2 RD/RA costs pursuant to Paragraph 50.b. of this Consent Decree.

“Lammers Barrel Factory Property” shall mean the property encompassing approximately 2.5 acres, located at the northeast intersection of Grange Hall and East Patterson roads in Beavercreek, Greene County, Ohio, and depicted generally on the maps attached as Appendix C, which constitutes Operable Unit 1 (“OU1”) at the Site. (The ROD for OU1 at the Site addresses contamination at the Lammers Barrel Factory Property, including but not limited to, soil and groundwater contamination at that property.)

“National Contingency Plan” or “NCP” shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

“Operation and Maintenance” or “O&M” shall mean all activities required to maintain the effectiveness of the Remedial Action as required under the Operation and Maintenance Plan approved or developed by EPA pursuant to Section VI (Performance of the Work by Settling Defendants) and the SOW, and maintenance, monitoring, and enforcement of Institutional Controls as provided in the ICIAP.

“Owner Settling Defendant” shall mean Helen Gorby.

“Paragraph” shall mean a portion of this Consent Decree identified by an Arabic numeral or an upper or lower case letter.

“Parties” shall mean the United States and Settling Defendants.

“Past Response Costs” shall mean all costs, including, but not limited to, direct and indirect costs, that the United States paid at or in connection with the Site through August 25, 2012, plus Interest on all such costs that has accrued pursuant to 42 U.S.C. § 9607(a) through such date.

“Performance Standards” shall mean the cleanup standards and other measures of achievement of the goals of the Remedial Action, set forth in the ROD and the SOW and any modified standards established pursuant to this Consent Decree.

“Plaintiff” shall mean the United States.

“Proprietary Controls” shall mean easements or covenants running with the land that (a) limit land, water, or resource use and/or provide access rights and (b) are created pursuant to common law or statutory law by an instrument that is recorded by or on behalf of the owner in the appropriate land records office.

“RCRA” shall mean the Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992 (also known as the Resource Conservation and Recovery Act).

“Record of Decision” or “ROD” shall mean the EPA Record of Decision relating to OUI at the Site signed on September 27, 2011, by the Director of the Superfund Division, EPA Region 5, and all attachments thereto. The ROD is attached as Appendix A.

“Remedial Action” shall mean all activities Settling Performing Defendants are required to perform at OUI under the Consent Decree to implement the ROD, in accordance with the SOW, the final approved remedial design submission, the approved Remedial Action Work Plan, and other plans approved by EPA, including implementation of Institutional Controls, until the Performance Standards are met, and excluding performance of the Remedial Design, O&M, and the activities required under Section XXV (Retention of Records).

“Remedial Action Work Plan” shall mean the document developed pursuant to Paragraph 12 (Remedial Action) and approved by EPA, and any modifications thereto.

“Remedial Design” shall mean those activities to be undertaken by Settling Performing Defendants to develop the final plans and specifications for the Remedial Action pursuant to the Remedial Design Work Plan.

“Remedial Design Work Plan” shall mean the document developed pursuant to Paragraph 11 (Remedial Design) and approved by EPA, and any modifications thereto.

“Section” shall mean a portion of this Consent Decree identified by a Roman numeral.

“Settling Defendants” shall mean Settling Performing Defendants, Owner Settling Defendant, and Settling Non-Performing Defendants.

“Settling Federal Agencies” shall mean the United States Army and the United States Air Force and their successor departments, agencies, or instrumentalities.

“Settling Performing Defendants” shall mean those Parties identified in Appendix F.

“Settling Non-Performing Defendants” shall mean those Parties identified in Appendix G.

“Site” shall mean the Lammers Barrel Superfund Site, encompassing approximately 2.5 acres, located at the northeast intersection of Grange Hall and East Patterson roads in Beavercreek, Greene County, Ohio, and depicted generally on the maps attached as Appendix C, along with the areal extent of groundwater contamination migrating off that property.

“State” shall mean the State of Ohio.

“Statement of Work” or “SOW” shall mean the statement of work for implementation of the Remedial Design, Remedial Action, and O&M at OU1 of the Site, as set forth in Appendix B to this Consent Decree, and any modifications made in accordance with this Consent Decree.

“Supervising Contractor” shall mean the principal contractor retained by Settling Performing Defendants to supervise and direct the implementation of the Work under this Consent Decree.

“Transfer” shall mean to sell, assign, convey, lease, mortgage, or grant a security interest in, or where used as a noun, a sale, assignment, conveyance, or other disposition of any interest by operation of law or otherwise.

“United States” shall mean the United States of America and each department, agency, and instrumentality of the United States, including EPA.

“Waste Material” shall mean (1) any “hazardous substance” under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); (3) any “solid waste” under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); and (4) any “hazardous waste” under Ohio Admin. Code §§ 3745-50-10(A)(48) and 3745-51-03 (2004).

“Work” shall mean all activities and obligations Settling Performing Defendants are required to perform under this Consent Decree, except the activities required under Section XXV (Retention of Records).

V. GENERAL PROVISIONS

5. Objectives of the Parties. The objectives of the Parties in entering into this Consent Decree are to protect public health or welfare or the environment by the design and implementation of response actions at the Site by Settling Performing Defendants, to pay response costs of the Plaintiff by Settling Defendants, and to resolve the claims of Plaintiff against Settling Defendants as proposed in the Consent Decree. Further, this Consent Decree is

intended to reach a final settlement with the Settling Non-Performing Defendants and Settling Federal Agencies pursuant to Section 122(g) of CERCLA.

6. Commitments by Settling Defendants

a. Settling Performing Defendants shall finance, with the assistance of the cash payments from the Settling Non-Performing Defendants pursuant to Paragraph 50.a, and shall perform the Work in accordance with this Consent Decree, the ROD, the SOW, and all work plans and other plans, standards, specifications, and schedules set forth in this Consent Decree or developed by Settling Performing Defendants and approved by EPA pursuant to this Consent Decree. Settling Performing Defendants, with the assistance of the cash payments from Settling Non-Performing Defendants, shall reimburse the United States for Past Response Costs and Future Response Costs as provided in this Consent Decree. Settling Performing Defendants' obligations to the United States under this Consent Decree shall not be affected by the failure of any Settling Non-Performing Defendant to meet a payment term required by the Consent Decree. Settling Performing Defendants shall not be obligated to meet any Settling Non-Performing Defendant's payment term under this Consent Decree that has not been paid to the Settling Performing Defendants pursuant to Paragraph 50.b.

b. The obligations of Settling Performing Defendants to finance and perform the Work, including obligations to pay amounts due under this Consent Decree, are joint and several. In the event of the insolvency of any Settling Performing Defendant or the failure by any Settling Performing Defendant to implement any requirement of this Consent Decree, the remaining Settling Performing Defendants shall complete all such requirements.

c. Each Settling Non-Performing Defendant's payment made pursuant to Paragraphs 50.a. and b. of this Consent Decree includes an amount for: (a) past response costs

incurred at or in connection with the Site by the United States or other person; (b) projected future response costs and additional costs that may be incurred in the future in accordance with a future operable unit anticipated for the Site; and (c) a premium to cover the risks and uncertainties associated with this settlement, including but not limited to, the risk that total response costs incurred or to be incurred at or in connection with the Site by the EPA Hazardous Substance Superfund, or by any other person, will exceed the estimated total response costs upon which Settling Non-Performing Defendants' payments are based.

7. Compliance With Applicable Law. All activities undertaken by Settling Performing Defendants pursuant to this Consent Decree shall be performed in accordance with the requirements of all applicable federal and state laws and regulations. Settling Performing Defendants must also comply with all applicable or relevant and appropriate requirements of all federal and state environmental laws as set forth in the ROD and the SOW. The activities conducted pursuant to this Consent Decree, if approved by EPA, shall be deemed to be consistent with the NCP.

8. Permits.

a. As provided in Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), and Section 300.400(e) of the NCP, no permit shall be required for any portion of the Work conducted entirely on-site (i.e., within the areal extent of contamination or in very close proximity to the contamination and necessary for implementation of the Work). Where any portion of the Work that is not on-site requires a federal or state permit or approval, Settling Performing Defendants shall submit timely and complete applications and take all other actions necessary to obtain all such permits or approvals.

b. Settling Performing Defendants may seek relief under the provisions of Section XVIII (Force Majeure) for any delay in the performance of the Work resulting from a failure to obtain, or a delay in obtaining, any permit or approval referenced in Paragraph 8.a and required for the Work, provided that they have submitted timely and complete applications and taken all other actions necessary to obtain all such permits or approvals.

c. This Consent Decree is not, and shall not be construed to be, a permit issued pursuant to any federal or state statute or regulation.

9. Notice to Successors-in-Title and Transfers of Real Property.

a. Owner Settling Defendant shall, at least 60 days prior to any Transfer of any real property located at the Lammers Barrel Factory Property, give written notice: (1) to the transferee regarding the Consent Decree and any Institutional Controls regarding the real property; and (2) to EPA and the State regarding the proposed Transfer, including the name and address of the transferee and the date on which the transferee was notified of the Consent Decree and any Institutional Controls.

b. Owner Settling Defendant may Transfer any real property located at the Site only if: (1) any Proprietary Controls required by Paragraph 22.c have been recorded with respect to the real property; or (2) Owner Settling Defendant has obtained an agreement from the transferee, enforceable by Settling Defendants and the United States, to (i) allow access and restrict land/water use, pursuant to Paragraphs 23.a(1) and 23.a(2), (ii) record any Proprietary Controls on the real property, pursuant to Paragraph 23.a(3), and (iii) subordinate its rights to any such Proprietary Controls, pursuant to Paragraph 23.a(3), and EPA has approved the agreement in writing. If, after a Transfer of the real property, the transferee fails to comply with the agreement provided for in this Paragraph 9.b, Owner Settling Defendant shall take all reasonable

steps to obtain the transferee's compliance with such agreement. The United States may seek the transferee's compliance with the agreement and/or assist Owner Settling Defendant in obtaining compliance with the agreement after providing reasonable notice under the circumstances and an opportunity to the Settling Performing Defendants to perform such activities if time allows. Settling Performing Defendants shall reimburse the United States under Section XVI (Payments for Response Costs), for all costs incurred, direct or indirect, by the United States regarding obtaining compliance with such agreement, including, but not limited to, the cost of attorney time.

c. In the event of any Transfer of real property located at the Site, unless the United States otherwise consents in writing, Settling Performing Defendants shall continue to comply with their obligations under the Consent Decree, including, but not limited to, their obligation to provide and/or secure access, to implement, maintain, monitor, and report on Institutional Controls, and to abide by such Institutional Controls.

VI. PERFORMANCE OF THE WORK BY SETTLING PERFORMING DEFENDANTS

10. Selection of Supervising Contractor.

a. All aspects of the Work to be performed by Settling Performing Defendants pursuant to Sections VI (Performance of the Work by Settling Performing Defendants), VII (Remedy Review), VIII (Quality Assurance, Sampling, and Data Analysis), IX (Access and Institutional Controls), and XV (Emergency Response) shall be under the direction and supervision of the Supervising Contractor, the selection of which shall be subject to disapproval by EPA. Within ten days after the lodging of this Consent Decree, Settling Performing Defendants shall notify EPA in writing of the name, title, and qualifications of any contractor proposed to be the Supervising Contractor. With respect to any contractor proposed

to be Supervising Contractor, Settling Performing Defendants shall demonstrate that the proposed contractor has a quality assurance system that complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" (American National Standard, January 5, 1995), by submitting a copy of the proposed contractor's Quality Management Plan ("QMP"). The QMP should be prepared in accordance with "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-011002, March 2001, reissued May 2006) or equivalent documentation as determined by EPA. EPA will issue a notice of disapproval or an authorization to proceed regarding hiring of the proposed contractor. If at any time thereafter, Settling Performing Defendants propose to change a Supervising Contractor, Settling Performing Defendants shall give such notice to EPA and must obtain an authorization to proceed from EPA before the new Supervising Contractor performs, directs, or supervises any Work under this Consent Decree.

b. If EPA disapproves a proposed Supervising Contractor, EPA will notify Settling Performing Defendants in writing. Settling Performing Defendants shall submit to EPA a list of contractors, including the qualifications of each contractor that would be acceptable to them within 30 days after receipt of EPA's disapproval of the contractor previously proposed. EPA will provide written notice of the names of any contractor(s) that it disapproves and an authorization to proceed with respect to any of the other contractors. Settling Performing Defendants may select any contractor from that list that is not disapproved and shall notify EPA of the name of the contractor selected within 21 days after EPA's authorization to proceed.

c. If EPA fails to provide written notice of its authorization to proceed or disapproval as provided in this Paragraph and this failure prevents Settling Performing Defendants from meeting one or more deadlines in a plan approved by EPA pursuant to this

Consent Decree, Settling Performing Defendants may seek relief under Section XVIII (Force Majeure).

11. Remedial Design.

a. Within 60 days after EPA's issuance of an authorization to proceed pursuant to Paragraph 10 (Selection of Supervising Contractor), Settling Performing Defendants shall submit to EPA and the State a work plan for the design of the Remedial Action at the Site ("Remedial Design Work Plan"). The Remedial Design Work Plan shall provide for design of the remedy set forth in the ROD, in accordance with the SOW, and for achievement of the Performance Standards and other requirements set forth in the ROD, this Consent Decree, and/or the SOW. The Remedial Design Work Plan shall include the overall management strategy for performing the design and pre-design activities associated with the Remedial Actions for U.S. EPA review and approval. The Remedial Design Work Plan shall document the responsibility and authority of all organizations and key personnel involved with the implementation and shall include a description of qualifications of key personnel directing the Remedial Design, including contractor personnel. Upon its approval by EPA, the Remedial Design Work Plan shall be incorporated into and enforceable under this Consent Decree.

b. The Remedial Design Work Plan shall include plans and schedules for implementation of all remedial design and pre-design tasks identified in the SOW, including, but not limited to, plans and schedules for the completion of: (1) a Pre-Design Investigation Work Plan developed in accordance with the SOW to fully delineate the extent of contamination in soil at the Lammers Barrel Factory Property and to develop appropriate additive dosing rates to achieve successful contaminant destruction; (2) a Health and Safety Plan for field design activities that conforms to the applicable Occupational Safety and Health Administration and

EPA requirements including, but not limited to, 29 C.F.R. § 1910.120; (3) a preliminary design submission; (4) an intermediate design submission; and (5) a pre-final/final design submission. In addition, the Remedial Design Work Plan shall include a schedule for completion of the Remedial Action Work Plan. Settling Performing Defendants may incorporate the previously approved Site Health and Safety Plan by reference into the Remedial Design Work Plan.

c. Upon approval of the Remedial Design Work Plan by EPA, after a reasonable opportunity for review and comment by the State, Settling Performing Defendants shall implement the Remedial Design Work Plan. Settling Performing Defendants shall submit to EPA and the State all plans, reports, and other deliverables required under the approved Remedial Design Work Plan in accordance with the approved schedule for review and approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables). Unless otherwise directed by EPA, Settling Performing Defendants shall not commence further Remedial Design activities at the Site prior to approval of the Remedial Design Work Plan.

d. The Pre-Design Investigation Work Plan shall include, at a minimum, all of those items identified in Task 2.A. of the SOW, including, at a minimum, the following: (1) a Field Sampling Plan for the Pre-Design Investigation; (2) a Pre-Design Quality Assurance Project Plan developed in accordance with Section VIII (Quality Assurance, Sampling, and Data Analysis); (3) A soil additive Dosing Test Plan to determine appropriate additive dosing rates; and (4) a schedule for delivery of a draft Pre-Design Investigation Report for EPA review and approval. Upon approval of the Pre-Design Investigation Work Plan by EPA, after a reasonable opportunity for review and comment by the State, Settling Performing Defendants shall implement the Pre-Design Investigation Work Plan.

e. The preliminary design submission shall include all of those items identified in Task 2.B. of the SOW, including, at a minimum, the following: (1) design criteria; (2) results of treatability studies and/or results of additional field sampling conducted during pre-design Work; (3) a project delivery strategy; (4) preliminary plans, drawings, and sketches; (5) required specifications in outline form; (6) a preliminary construction schedule; (7) proposed locations for all remedial action construction activity; (8) long-term operation and maintenance requirements for the remedial action; (9) real estate, easement and permit requirements; and (10) a draft Institutional Control Implementation and Assurance Plan (ICIAP).

f. The intermediate design submission shall be a continuation and expansion of the preliminary design. The intermediate design shall include all of those items identified in Task 2.C. of the SOW, including, at a minimum, the following: (1) a draft Performance Standard Verification Plan; (2) a draft Construction Quality Assurance Plan (CQAP); (3) a draft Field Sampling Plan for Remedial Action; (4) a draft Quality Assurance Project Plan (QAPP) Addendum developed in accordance with Section VIII (Quality Assurance, Sampling, and Data Analysis); (5) a draft Health and Safety Plan for Remedial Action; and (6) a draft Contingency Plan. The Settling Performing Defendants may incorporate any of these plans that have been approved previously for the Site by reference into the Remedial Design.

g. The pre-final/final design submission shall include all of those items identified in Task 2.D. of the SOW, including, at a minimum, the following: (1) final plans, drawings and specifications; (2) a Final Performance Standard Verification Plan; (3) a Final QAPP Addendum; (4) a Final Construction Quality Assurance Plan (CQAP); (5) a Final Health and Safety Plan for Remedial Action; (6) a Final Contingency Plan; (7) a draft Operation and Maintenance Plan for the Remedial Action; and (8) a Pre-Final Project Schedule for the

construction and implementation of the remedial action. The CQAP, which shall detail the approach to quality assurance during construction activities at the Site, shall specify a quality assurance official, independent of the Supervising Contractor, to conduct a quality assurance program during the construction phase of the project.

12. Remedial Action.

a. Within 45 days after the approval of the final design submission, Settling Performing Defendants shall submit to EPA and the State a work plan for the performance of the Remedial Action at the Site ("Remedial Action Work Plan"). The Remedial Action Work Plan shall provide for construction and implementation of the remedy set forth in the ROD and achievement of the Performance Standards, in accordance with this Consent Decree, the ROD, the SOW, and the design plans and specifications developed in accordance with the Remedial Design Work Plan and approved by EPA. Upon its approval by EPA, the Remedial Action Work Plan shall be incorporated into and enforceable under this Consent Decree. At the same time as they submit the Remedial Action Work Plan, Settling Performing Defendants shall submit to EPA and the State a Health and Safety Plan for field activities required by the Remedial Action Work Plan that conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120.

b. The Remedial Action Work Plan shall include the following: (1) an overall schedule for completion of the Remedial Action; (2) a method for selection of the contractor; (3) a schedule for developing and submitting other required Remedial Action plans; (4) a groundwater monitoring plan for assessing performance of the Remedial Action; (5) methods for satisfying permitting requirements; (6) a final Operation and Maintenance Plan; (7) a methodology for implementing the Contingency Plan, if necessary; (8) a CQAP; (9) procedures

and plans for the decontamination of equipment and the disposal of contaminated materials; (10) a schedule for completion of the Soil Mixing Completion Report; and (11) a schedule for completion of the Completion of Work Report. The Remedial Action Work Plan also shall include the methodology for implementing the CQAP and a schedule for implementing all Remedial Action tasks identified in the final design submission and shall identify the initial formulation of Settling Performing Defendants' Remedial Action project team (including, but not limited to, the Supervising Contractor). Within 30 days of the Settling Performing Defendant's award of the contract to perform the Remedial Action, Settling Performing Defendants shall submit a final project schedule for the construction and implementation of the remedial action that includes specific dates for completion of the project and major milestones.

c. Upon approval of the Remedial Action Work Plan by EPA, after a reasonable opportunity for review and comment by the State, Settling Performing Defendants shall implement the activities required under the Remedial Action Work Plan. Settling Performing Defendants shall submit to EPA and the State all reports and other deliverables required under the approved Remedial Action Work Plan in accordance with the approved schedule for review and approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables). Unless otherwise directed by EPA, Settling Performing Defendants shall not commence physical Remedial Action activities at the Site prior to approval of the Remedial Action Work Plan.

13. Settling Performing Defendants shall continue to implement the Remedial Action until the Performance Standards are achieved. Settling Performing Defendants shall implement O&M for so long thereafter as is required by this Consent Decree.

14. Modification of SOW or Related Work Plans.

a. If EPA determines that it is necessary to modify the work specified in the SOW and/or in work plans developed pursuant to the SOW to achieve and maintain the Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the ROD, and such modification is consistent with the scope of the remedy set forth in the ROD, then EPA may issue such modification in writing and shall notify Settling Performing Defendants of such modification. For the purposes of this Paragraph and Paragraph 45 (Completion of the Work) only, the "scope of the remedy set forth in the ROD" is: In situ biological treatment of impacted soils using soil mixing to treat principal threat wastes; in situ groundwater treatment using enhanced reductive dechlorination to address contaminated water; institutional controls in accordance with the Ohio Uniform Environmental Covenant Act to prohibit residential use of the Lammers Barrel Factory Property and prohibit the installation of wells on the Lammers Barrel Factory Property other than those installed as part of the remedial action; and O&M. If Settling Performing Defendants object to the modification they may, within 45 days after EPA's notification, seek dispute resolution under Paragraph 64 (Record Review).

b. The SOW and/or related work plans shall be modified: (1) in accordance with the modification issued by EPA; or (2) if Settling Performing Defendants invoke dispute resolution, in accordance with the final resolution of the dispute. The modification shall be incorporated into and enforceable under this Consent Decree, and Settling Performing Defendants shall implement all work required by such modification. Settling Performing Defendants shall incorporate the modification into the Remedial Design or Remedial Action

Work Plan under Paragraph 11 (Remedial Design) or Paragraph 12 (Remedial Action), as appropriate.

c. Nothing in this Paragraph shall be construed to limit EPA's authority to require performance of further response actions as otherwise provided in this Consent Decree.

15. Nothing in this Consent Decree, the SOW, or the Remedial Design or Remedial Action Work Plans constitutes a warranty or representation of any kind by Plaintiff that compliance with the work requirements set forth in the SOW and the Work Plans will achieve the Performance Standards.

16. Off-Site Shipment of Waste Material.

a. Settling Performing Defendants may ship Waste Material from the Site to an off-Site facility only if they verify, prior to any shipment, that the off-Site facility is operating in compliance with the requirements of Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), and 40 C.F.R. § 300.440, by obtaining a determination from EPA that the proposed receiving facility is operating in compliance with 42 U.S.C. § 9621(d)(3) and 40 C.F.R. § 300.440.

b. Settling Performing Defendants may ship Waste Material from the Site to an out-of-state waste management facility only if, prior to any shipment, they provide written notice to the appropriate state environmental official in the receiving facility's state and to the EPA Project Coordinator. This notice requirement shall not apply to any off-Site shipments when the total quantity of all such shipments will not exceed ten cubic yards. The written notice shall include the following information, if available: (1) the name and location of the receiving facility; (2) the type and quantity of Waste Material to be shipped; (3) the schedule for the shipment; and (4) the method of transportation. Settling Performing Defendants also shall notify the state environmental official referenced above and the EPA Project Coordinator of any major

changes in the shipment plan, such as a decision to ship the Waste Material to a different out-of-state facility. Settling Performing Defendants shall provide the written notice after the award of the contract for Remedial Action construction and before the Waste Material is shipped.

VII. REMEDY REVIEW

17. Periodic Review. Settling Performing Defendants shall conduct any studies and investigations that EPA requests in order to permit EPA to conduct reviews of whether the Remedial Action is protective of human health and the environment at least every five years as required by Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), and any applicable regulations.

VIII. QUALITY ASSURANCE, SAMPLING, AND DATA ANALYSIS

18. Quality Assurance.
- a. Settling Performing Defendants shall use quality assurance, quality control, and chain of custody procedures for all [treatability, design, compliance, and monitoring] samples in accordance with “EPA Requirements for Quality Assurance Project Plans (QA/R5)” (EPA/240/13-01/003, March 2001, reissued May 2006), “Guidance for Quality Assurance Project Plans (QA/G-5)” (EPA/240/R-02/009, December 2002), and subsequent amendments to such guidelines upon notification by EPA to Settling Performing Defendants of such amendment. Amended guidelines shall apply only to procedures conducted after such notification.
 - b. Prior to the commencement of any monitoring project under this Consent Decree, Settling Performing Defendants shall submit to EPA for approval, after a reasonable opportunity for review and comment by the State, an Addendum to the existing Quality Assurance Project Plan (“QAPP”) approved by EPA on May 8, 2003 that is consistent with the SOW, the NCP, and applicable guidance documents. If relevant to the proceeding, the Parties

agree that validated sampling data generated in accordance with the QAPP(s) and reviewed and approved by EPA shall be admissible as evidence, without objection, in any proceeding under this Consent Decree. Settling Performing Defendants shall ensure that EPA and State personnel and their authorized representatives are allowed access at reasonable times to all laboratories utilized by Settling Performing Defendants in implementing this Consent Decree. In addition, Settling Performing Defendants shall ensure that such laboratories shall analyze all samples submitted by EPA pursuant to the QAPP for quality assurance monitoring. Settling Performing Defendants shall ensure that the laboratories they utilize for the analysis of samples taken pursuant to this Consent Decree perform all analyses according to accepted EPA methods. Accepted EPA methods consist of those methods that are documented in the "USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILM05.4," and the "USEPA Contract Laboratory Program Statement of Work for Organic Analysis, SOM01.2," and any amendments made thereto during the course of the implementation of this Consent Decree; however, upon approval by EPA, after opportunity for review and comment by the State, Settling Performing Defendants may use other analytical methods that are as stringent as or more stringent than the CLP-approved methods. Settling Performing Defendants shall ensure that all laboratories they use for analysis of samples taken pursuant to this Consent Decree participate in an EPA or EPA-equivalent quality assurance/quality control ("QA/QC") program. Settling Performing Defendants shall use only laboratories that have a documented Quality System that complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" (American National Standard, January 5, 1995), and "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01/002, March 2001, reissued May 2006) or equivalent documentation as

determined by EPA. EPA may consider laboratories accredited under the National Environmental Laboratory Accreditation Program ("NELAP") as meeting the Quality System requirements. Settling Performing Defendants shall ensure that all field methodologies utilized in collecting samples for subsequent analysis pursuant to this Consent Decree are conducted in accordance with the procedures set forth in the QAPP approved by EPA.

19. Upon request, Settling Performing Defendants shall allow split or duplicate samples to be taken by EPA or its authorized representatives. Settling Performing Defendants shall notify EPA and the State not less than 15 days in advance of any sample collection activity unless shorter notice is agreed to by EPA. In addition, EPA shall have the right to take any additional samples that EPA deems necessary. Upon request, EPA shall allow Settling Performing Defendants to take split or duplicate samples of any samples it takes as part of Plaintiffs oversight of Settling Performing Defendants' implementation of the Work.

20. Settling Performing Defendants shall submit one paper copy and an electronic copy each to EPA and the State of the results of all sampling and/or tests or other data obtained or generated by or on behalf of Settling Performing Defendants with respect to the Site and/or the implementation of this Consent Decree unless EPA agrees otherwise.

21. Notwithstanding any provision of this Consent Decree, the United States shall retain all of its information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

IX. ACCESS AND INSTITUTIONAL CONTROLS

22. If the Site, or any other real property where access or land/water use restrictions are needed, is owned or controlled by any of Settling Defendants, such persons shall:

a. commencing on the date of lodging of the Consent Decree, provide the United States, the State, and the other Settling Defendants, and their representatives, contractors, and subcontractors, with access at all reasonable times to the Site, or such other real property, to conduct any activity regarding the Consent Decree including, but not limited to, the following activities:

- (1) Monitoring the Work;
- (2) Verifying any data or information submitted to the United States or the State;
- (3) Conducting investigations regarding contamination at or near the Site;
- (4) Obtaining samples;
- (5) Assessing the need for, planning, or implementing additional response actions at or near the Site;
- (6) Assessing implementation of quality assurance and quality control practices as defined in the approved CQAP;
- (7) Implementing the Work pursuant to the conditions set forth in Paragraph 81 (Work Takeover);
- (8) Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Settling Performing Defendants or their agents, consistent with Section XXIV (Access to Information);
- (9) Assessing Settling Performing Defendants' compliance with the Consent Decree;

(10) Determining whether the Site or other real property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted under the Consent Decree; and

(11) Implementing, monitoring, maintaining, reporting on, and enforcing any Institutional Controls and the requirements of the ICIAP.

b. commencing on the date of lodging of the Consent Decree, not use the Site, or such other real property, in any manner that EPA determines will pose an unacceptable risk to human health or to the environment due to exposure to Waste Material or interfere with or adversely affect the implementation, integrity, or protectiveness of the Remedial Action or O&M. The restrictions shall include, but not be limited to: institutional controls in accordance with the Ohio Uniform Environmental Covenant Act to prohibit residential use of the Lammers Barrel Site property and to prohibit the installation of wells on the Lammers Barrel Factory Property other than those installed as part of the remedial action; and

c. Such Settling Defendants shall:

(1) Execute and record in the appropriate land records office Proprietary Controls that: (i) grant a right of access to conduct any activity regarding the Consent Decree including, but not limited to, those activities listed in Paragraph 22.a; and (ii) grant the right to enforce the land/water use restrictions set forth in Paragraph 22.b, including, but not limited to, the specific restrictions listed therein and any land/water use restrictions listed in the ICIAP, as further specified in this Paragraph 22.c. The Proprietary Controls shall be granted to one or more of the following persons, as determined by EPA: (i) the United States, on behalf of EPA, and its representatives; (ii) the State and its representatives; (iii) the other Settling Defendants and their

representatives; and/or (iv) other appropriate grantees. The Proprietary Controls shall meet the requirements of the Ohio Uniform Environmental Covenant Act and allow EPA to maintain the right to enforce the Proprietary Controls without acquiring an interest in real property. If any Proprietary Controls are granted to any Settling Performing Defendants pursuant to this Paragraph 22.c(1), then such Settling Performing Defendants shall monitor, maintain, report on, and enforce such Proprietary Controls.

(2) In accordance with the schedule set forth in the ICIAP, submit to EPA for review and approval regarding such real property: (i) draft Proprietary Controls, in substantially the form attached hereto as Appendix D, that are enforceable under state law; and (ii) a current title insurance commitment or other evidence of title acceptable to EPA, that shows title to the land affected by the Proprietary Controls to be free and clear of all prior liens and encumbrances (except when EPA waives the release or subordination of such prior liens or encumbrances or when, despite best efforts, Settling Defendants are unable to obtain release or subordination of such prior liens or encumbrances).

(3) Within 15 days after EPA's approval and acceptance of the Proprietary Controls and the title evidence, update the title search and, if it is determined that nothing has occurred since the effective date of the commitment, or other title evidence, to affect the title adversely, record the Proprietary Controls with the appropriate land records office. Within 30 days after recording the Proprietary Controls, such Settling Defendants shall provide EPA with a final title insurance policy, or other final evidence of title acceptable to EPA, and a certified copy of the original recorded Proprietary Controls showing the clerk's recording stamps. If the Proprietary Controls are to be conveyed to the United States, the Proprietary Controls and title evidence

(including final title evidence) shall be prepared in accordance with the U.S. Department of Justice Title Standards 2001, and approval of the sufficiency of title shall be obtained as revised by 40 U.S.C. § 3111.

23. If the Site, or any other real property where access and/or land/water use restrictions are needed, is owned or controlled by persons other than any Settling Defendant:

a. Settling Performing Defendants shall use best efforts to secure from such persons:

(1) an agreement to provide access thereto for the United States, the State, and Settling Performing Defendants, and their representatives, contractors, and subcontractors, to conduct any activity regarding the Consent Decree including, but not limited to, the activities listed in Paragraph 22.a;

(2) an agreement, enforceable by Settling Performing Defendants and the United States, to refrain from using the Site, or such other real property, in any manner that EPA determines will pose an unacceptable risk to human health or to the environment due to exposure to Waste Material or interfere with or adversely affect the implementation, integrity, or protectiveness of the Remedial Action or O&M to be performed pursuant to this Consent Decree. The agreement shall include, but not be limited to, the land/water use restrictions listed in Paragraph 22.b; and

(3) the execution and recordation in the appropriate land records office of Proprietary Controls, that (i) grant a right of access to conduct any activity regarding the Consent Decree including, but not limited to, those activities listed in Paragraph 22.a, and (ii) grant the right to enforce the land/water use restrictions set forth in Paragraph 22.b, including, but not limited to, the specific restrictions listed therein and any

land/water use restrictions listed in the ICIAP. The Proprietary Controls shall be granted to one or more of the following persons, as determined by EPA: (i) the United States, on behalf of EPA, and its representatives, (ii) the State and its representatives, (iii) Settling Performing Defendants and their representatives, and/or (iv) other appropriate grantees. The Proprietary Controls shall meet the requirements of the Ohio Uniform Environmental Covenant Act and allow EPA to maintain the right to enforce the Proprietary Controls without acquiring an interest in real property. If any Proprietary Controls are granted to any Settling Performing Defendants pursuant to this Paragraph 23.a(3), then such Settling Performing Defendants shall monitor, maintain, report on, and enforce such Proprietary Controls.

b. In accordance with the schedule set forth in the ICIAP, Settling Performing Defendants shall submit to EPA for review and approval regarding such property: (i) draft Proprietary Controls, in substantially the form attached hereto as Appendix D, that are enforceable under state law; and (ii) a current title insurance commitment, or other evidence of title acceptable to EPA, that shows title to the land affected by the Proprietary Controls to be free and clear of all prior liens and encumbrances (except when EPA waives the release or subordination of such prior liens or encumbrances or when, despite best efforts, Settling Performing Defendants are unable to obtain release or subordination of such prior liens or encumbrances).

c. Within 15 days of EPA's approval and acceptance of the Proprietary Controls and the title evidence, Settling Performing Defendants shall update the title search and, if it is determined that nothing has occurred since the effective date of the commitment, or other title evidence, to affect the title adversely, record the Proprietary Controls with the appropriate

land records office. Within 30 days after the recording of the Proprietary Controls, Settling Performing Defendants shall provide EPA with a final title insurance policy, or other formal evidence of title acceptable to EPA, and a certified copy of the original recorded Proprietary Controls showing the clerk's recording stamps. If the Proprietary Controls are to be conveyed to the United States, the Proprietary Controls and title evidence (including formal title evidence) shall be prepared in accordance with the U.S. Department of Justice Title Standards 2001, and approval of the sufficiency of title shall be obtained as required by 40 U.S.C. § 3111.

24. For purposes of Paragraphs 22.c(2), 23.a and 23.b, "best efforts" includes the payment of reasonable sums of money to obtain access, an agreement to restrict land/water use, Proprietary Controls, and/or an agreement to release or subordinate a prior lien or encumbrance. If, within 30 days after EPA's approval of the ICIAP, Settling Performing Defendants have not: (a) obtained agreements to provide access, restrict land/water use, or record Proprietary Controls, as required by Paragraph 23.a(1), 23.a(2), or 23.a(3); or (b) obtained, pursuant to Paragraph 22.c(2) or 23.b, agreements from the holders of prior liens or encumbrances to release or subordinate such liens or encumbrances to the Proprietary Controls, Settling Performing Defendants shall promptly notify the United States in writing, and shall include in that notification a summary of the steps that Settling Performing Defendants have taken to attempt to comply with Paragraph 22 or 23. The United States may, as it deems appropriate, assist Settling Performing Defendants in obtaining access, agreements to restrict land/water use, Proprietary Controls, or the release or subordination of a prior lien or encumbrance. Settling Performing Defendants shall reimburse the United States under Section XVI (Payments for Response Costs) for all costs incurred, direct or indirect, by the United States in obtaining such access, agreements to restrict land/water use, Proprietary Controls, and/or the release/subordination of prior liens or

encumbrances including, but not limited to, the cost of attorney time and the amount of monetary consideration paid or just compensation.

25. If EPA determines that Institutional Controls in the form of state or local laws, regulations, ordinances, zoning restrictions, or other governmental controls are needed at or in connection with the Site, Settling Performing Defendants shall cooperate with EPA's and the State's efforts to secure and ensure compliance with such governmental controls.

26. Notwithstanding any provision of the Consent Decree, the United States and the State retain all of their access authorities and rights, as well as all of their rights to require Institutional Controls, including enforcement authorities related thereto, under CERCLA, RCRA, and any other applicable statute or regulations.

X. REPORTING REQUIREMENTS

27. In addition to any other requirement of this Consent Decree, Settling Performing Defendants shall submit to EPA and the State an electronic copy of written monthly progress reports that: (a) describe the actions that have been taken toward achieving compliance with this Consent Decree during the previous month; (b) include a summary of all results of sampling and tests and all other data received or generated by Settling Performing Defendants or their contractors or agents in the previous month; (c) identify all plans, reports, and other deliverables required by this Consent Decree completed and submitted during the previous month; (d) describe all actions, including, but not limited to, data collection and implementation of work plans, that are scheduled for the next six weeks and provide other information relating to the progress of construction, including, but not limited to, critical path diagrams, Gantt charts and Pert charts; (e) include information regarding percentage of completion, unresolved delays encountered or anticipated that may affect the future schedule for implementation of the Work,

and a description of efforts made to mitigate those delays or anticipated delays; (f) include any modifications to the work plans or other schedules that Settling Performing Defendants have proposed to EPA or that have been approved by EPA; and (g) describe all activities undertaken in support of the Community Involvement Plan during the previous month and those to be undertaken in the next six weeks. Settling Performing Defendants shall submit these progress reports to EPA and the State by the tenth day of every month following the lodging of this Consent Decree until EPA notifies Settling Performing Defendants pursuant to Paragraph 45.b of Section XIV (Certification of Completion). If requested by EPA or the State, Settling Performing Defendants shall also provide briefings for EPA and the State to discuss the progress of the Work. If no significant action is occurring, the frequency of the reports may be revised by EPA, or upon approval by EPA, the reports may not be required.

28. Settling Performing Defendants shall notify EPA of any change in the schedule described in the monthly progress report for the performance of any activity, including, but not limited to, data collection and implementation of work plans, no later than seven days prior to the performance of the activity.

29. Upon the occurrence of any event during performance of the Work that Settling Performing Defendants are required to report pursuant to Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-know Act ("EPCRA"), 42 U.S.C. § 11004, Settling Performing Defendants shall within 24 hours of the onset of such event orally notify the EPA Project Coordinator or the Alternate EPA Project Coordinator (in the event of the unavailability of the EPA Project Coordinator), or, in the event that neither the EPA Project Coordinator nor Alternate EPA Project Coordinator is available, the Emergency Response Section, Region 5, United States Environmental Protection Agency.

These reporting requirements are in addition to the reporting required by CERCLA Section 103 or EPCRA Section 304.

30. Within 20 days after the onset of such an event, Settling Performing Defendants shall furnish to EPA and the State a written report, signed by Settling Performing Defendants' Project Coordinator, setting forth the events that occurred and the measures taken, and to be taken, in response thereto. Within 30 days after the conclusion of such an event, Settling Performing Defendants shall submit a report setting forth all actions taken in response thereto.

31. Settling Performing Defendants shall submit two paper copies of all plans, reports, data, and other deliverables required by the SOW, the Remedial Design Work Plan, the Remedial Action Work Plan, or any other approved plans to EPA in accordance with the schedules set forth in such plans. Settling Performing Defendants shall simultaneously submit one paper copy of all such plans, reports, data, and other deliverables to the State. Settling Performing Defendants shall submit in electronic form all or any portion of any deliverables Settling Performing Defendants are required to submit pursuant to the provisions of this Consent Decree.

32. All deliverables submitted by Settling Performing Defendants to EPA that purport to document Settling Performing Defendants' compliance with the terms of this Consent Decree shall be signed by an authorized representative of Settling Performing Defendants.

XI. EPA APPROVAL OF PLANS, REPORTS, AND OTHER DELIVERABLES

33. Initial Submissions.

a. After review of any plan, report, or other deliverable that is required to be submitted for approval pursuant to this Consent Decree, EPA, after reasonable opportunity for review and comment by the State, shall: (1) approve, in whole or in part, the submission; (2)

approve the submission upon specified conditions; (3) disapprove, in whole or in part, the submission; or (4) any combination of the foregoing.

b. EPA also may modify the initial submission to cure deficiencies in the submission if: (1) EPA determines that disapproving the submission and awaiting a resubmission would cause substantial disruption to the Work; or (2) previous submission(s) have been disapproved due to material defects and the deficiencies in the initial submission under consideration indicate a bad faith lack of effort to submit an acceptable plan, report, or deliverable.

34. Resubmissions. Upon receipt of a notice of disapproval under Paragraph 33.a(3) or (4), or if required by a notice of approval upon specified conditions under Paragraph 33.a(2), Settling Performing Defendants shall, within 30 days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the plan, report, or other deliverable for approval. After review of the resubmitted plan, report, or other deliverable, EPA may: (a) approve, in whole or in part, the resubmission; (b) approve the resubmission upon specified conditions; (c) modify the resubmission; (d) disapprove, in whole or in part, the resubmission, requiring Settling Performing Defendants to correct the deficiencies; or (e) any combination of the foregoing.

35. Material Defects. If an initially submitted or resubmitted plan, report, or other deliverable contains a material defect, and the plan, report, or other deliverable is disapproved or modified by EPA under Paragraph 33.b(2) or 34 due to such material defect, then the material defect shall constitute a lack of compliance for purposes of Paragraph 67. The provisions of Section XIX (Dispute Resolution) and Section XX (Stipulated Penalties) shall govern the accrual

and payment of any stipulated penalties regarding Settling Performing Defendants' submissions under this Section.

36. Implementation. Upon approval, approval upon conditions, or modification by EPA under Paragraph 33 (Initial Submissions) or Paragraph 34 (Resubmissions), of any plan, report, or other deliverable, or any portion thereof: (a) such plan, report, or other deliverable, or portion thereof, shall be incorporated into and enforceable under this Consent Decree; and (b) Settling Performing Defendants shall take any action required by such plan, report, or other deliverable, or portion thereof, subject only to their right to invoke the Dispute Resolution procedures set forth in Section XIX (Dispute Resolution) with respect to the modifications or conditions made by EPA. The implementation of any non-deficient portion of a plan, report, or other deliverable submitted or resubmitted under Paragraph 33 or 34 shall not relieve Settling Performing Defendants of any liability for stipulated penalties under Section XX (Stipulated Penalties).

XII. PROJECT COORDINATORS

37. Within 30 days after lodging this Consent Decree, Settling Performing Defendants, the State and EPA will notify each other, in writing, of the name, address, telephone number, and email address of their respective designated Project Coordinators and Alternate Project Coordinators. If a Project Coordinator or Alternate Project Coordinator initially designated is changed, the identity of the successor will be given to the other Parties at least five working days before the change occurs, unless impracticable, but in no event later than the actual day the change is made. Settling Performing Defendants' Project Coordinator shall be subject to disapproval by EPA and shall have the technical expertise sufficient to adequately oversee all aspects of the Work. Settling Performing Defendants' Project Coordinator shall not be an

attorney for any Settling Performing Defendant in this matter. He or she may assign other representatives, including other contractors, to serve as a Site representative for oversight of performance of daily operations during remedial activities.

38. Plaintiff may designate other representatives, including, but not limited to, EPA and State employees, and federal and State contractors and consultants, to observe and monitor the progress of any activity undertaken pursuant to this Consent Decree. EPA's Project Coordinator and Alternate Project Coordinator shall have the authority lawfully vested in a Remedial Project Manager ("RPM") and an On-Scene Coordinator ("OSC") by the NCP, 40 C.F.R. Part 300. EPA's Project Coordinator or Alternate Project Coordinator shall have authority, consistent with the NCP, to halt any Work required by this Consent Decree and to take any necessary response action when he or she determines that conditions at the Site constitute an emergency situation or may present an immediate threat to public health or welfare or the environment due to release or threatened release of Waste Material.

39. EPA's Project Coordinator and Settling Performing Defendants' Project Coordinator will meet as appropriate.

XIII. PERFORMANCE GUARANTEE

40. In order to ensure the full and final completion of the Work, Settling Performing Defendants shall establish and maintain a performance guarantee, initially in the amount of \$3.4 million for the benefit of EPA (hereinafter "Estimated Cost of the Work"). The performance guarantee, which must be satisfactory in form and substance to EPA, shall be in the form of one or more of the following mechanisms (provided that, if Settling Performing Defendants intend to use multiple mechanisms, such multiple mechanisms shall be limited to surety bonds guaranteeing payment, letters of credit, trust funds, and insurance policies):

a. A surety bond unconditionally guaranteeing payment and/or performance of the Work that is issued by a surety company among those listed as acceptable sureties on federal bonds as set forth in Circular 570 of the U.S. Department of the Treasury;

b. One or more irrevocable letters of credit, payable to or at the direction of EPA, that is issued by one or more financial institution(s) (1) that has the authority to issue letters of credit and (2) whose letter-of-credit operations are regulated and examined by a federal or state agency;

c. A trust fund established for the benefit of EPA that is administered by a trustee (1) that has the authority to act as a trustee and (2) whose trust operations are regulated and examined by a federal or state agency;

d. A policy of insurance that (1) provides EPA with acceptable rights as a beneficiary thereof; and (2) is issued by an insurance carrier (i) that has the authority to issue insurance policies in the applicable jurisdiction(s) and (ii) whose insurance operations are regulated and examined by a federal or state agency;

e. A demonstration by one or more Settling Performing Defendants that each such Settling Performing Defendant meets the financial test criteria of 40 C.F.R. § 264.143(f) with respect to the Estimated Cost of the Work (plus the amount(s) of any other federal or any state environmental obligations financially assured through the use of a financial test or guarantee), provided that all other requirements of 40 C.F.R. § 264.143(f) are met to EPA's satisfaction; or

f. A written guarantee to fund or perform the Work executed in favor of EPA by one or more of the following: (1) a direct or indirect parent company of a Settling Performing Defendant, or (2) a company that has a "substantial business relationship" (as

defined in 40 C.F.R. § 264.141(h)) with at least one Settling Performing Defendant; provided, however, that any company providing such a guarantee must demonstrate to the satisfaction of EPA that it satisfies the financial test and reporting requirements for owners and operators set forth in subparagraphs (1) through (8) of 40 C.F.R. § 264.143(f) with respect to the Estimated Cost of the Work (plus the amount(s) of any other federal or any state environmental obligations financially assured through the use of a financial test or guarantee) that it proposes to guarantee hereunder.

41. Settling Performing Defendants have selected, and EPA has found satisfactory, as an initial performance guarantee a Surety Bond, Trust Fund, and a Letter of Credit pursuant to Paragraph 40, in the forms attached hereto as Appendix E. Within 30 days after the Effective Date, Settling Performing Defendants shall execute or otherwise finalize all instruments or other documents required in order to make the selected performance guarantee(s) legally binding in a form substantially identical to the documents attached hereto as Appendix E, and such performance guarantee(s) shall thereupon be fully effective. Within 45 days after the Effective Date, Settling Performing Defendants shall submit copies of all executed and/or otherwise finalized instruments or other documents required in order to make the selected performance guarantee(s) legally binding to Dale Meyer, Regional Comptroller, Mail Code MF-IOJ, Resource Management Division, U.S. EPA Region 5, 77 West Jackson Blvd., Chicago, Illinois 60604 in accordance with Section XXVI (Notices and Submissions), with a copy to Cynthia Mack-Smeltzer, Accountant, Program Accounting and Analysis Section, Mail Code MF-10J, Resource Management Division, U.S. EPA Region 5, 77 West Jackson Blvd., Chicago, Illinois 60604, and to the United States and EPA and the State as specified in Section XXVI.

If, at any time after the Effective Date and before issuance of the Certification of Completion of the Work pursuant to Paragraph 45, Settling Performing Defendants provide a performance guarantee for completion of the Work by means of a demonstration or guarantee pursuant to Paragraph 40.e or 40.f, the relevant Settling Performing Defendants shall also comply with the other relevant requirements of 40 C.F.R. § 264.143(f) relating to these mechanisms unless otherwise provided in this Consent Decree, including but not limited to: (a) the initial submission of required financial reports and statements from the relevant entity's chief financial officer ("CFO") and independent certified public accountant ("CPA"), in the form prescribed by EPA in its financial test sample CFO letters and CPA reports available at: <http://www.epa.gov/compliance/resources/policies/cleanup/superfund/fa-test-samples.pdf>; (b) the annual resubmission of such reports and statements within 90 days after the close of each such entity's fiscal year; and (c) the prompt notification of EPA after each such entity determines that it no longer satisfies the financial test requirements set forth at 40 C.F.R. § 264.143(f)(1) and in any event within 90 days after the close of any fiscal year in which such entity no longer satisfies such financial test requirements. For purposes of the performance guarantee mechanisms specified in this Section XIII, references in 40 C.F.R. Part 264, Subpart H, to "closure," "post-closure," and "plugging and abandonment" shall be deemed to include the Work; the terms "current closure cost estimate," "current post-closure cost estimate," and "current plugging and abandonment cost estimate" shall be deemed to include the Estimated Cost of the Work; the terms "owner" and "operator" shall be deemed to refer to each Settling Performing Defendant making a demonstration under Paragraph 40.e; and the terms "facility" and "hazardous waste facility" shall be deemed to include the Lammers Barrel Factory Property.

42. In the event that EPA determines at any time that a performance guarantee provided by any Settling Performing Defendant pursuant to this Section is inadequate or otherwise no longer satisfies the requirements set forth in this Section, whether due to an increase in the estimated cost of completing the Work or for any other reason, or in the event that any Settling Performing Defendant becomes aware of information indicating that a performance guarantee provided pursuant to this Section is inadequate or otherwise no longer satisfies the requirements set forth in this Section, whether due to an increase in the estimated cost of completing the Work or for any other reason, Settling Performing Defendants, within 30 days after receipt of notice of EPA's determination or, as the case may be, within 30 days after any Settling Performing Defendant becoming aware of such information, shall obtain and present to EPA for approval a proposal for a revised or alternative form of performance guarantee listed in Paragraph 40 that satisfies all requirements set forth in this Section XIII; provided, however, that if any Settling Performing Defendant cannot obtain such revised or alternative form of performance guarantee within such 30-day period, and provided further that the Settling Performing Defendant shall have commenced to obtain such revised or alternative form of performance guarantee within such 30-day period, and thereafter diligently proceeds to obtain the same, EPA shall extend such period for such time as is reasonably necessary for the Settling Performing Defendant in the exercise of due diligence to obtain such revised or alternative form of performance guarantee, such additional period not to exceed 30 days. In seeking approval for a revised or alternative form of performance guarantee, Settling Performing Defendants shall follow the procedures set forth in Paragraph 44.b(2). Settling Performing Defendants' inability to post a performance guarantee for completion of the Work shall in no way excuse performance of any other requirements of this Consent Decree, including, without limitation, the obligation of

Settling Performing Defendants to complete the Work in strict accordance with the terms of this Consent Decree

43. Funding for Work Takeover. The commencement of any Work Takeover pursuant to Paragraph 81 shall trigger EPA's right to receive the benefit of any performance guarantee(s) provided pursuant to Paragraphs 40.a, 40.b, 40.c, 40.d, or 40.f, and at such time EPA shall have immediate access to resources guaranteed under any such performance guarantee(s), whether in cash or in kind, as needed to continue and complete the Work assumed by EPA under the Work Takeover. Upon the commencement of any Work Takeover, if (a) for any reason EPA is unable to promptly secure the resources guaranteed under any such performance guarantee(s), whether in cash or in kind, necessary to continue and complete the Work assumed by EPA under the Work Takeover, or (b) in the event that the performance guarantee involves a demonstration of satisfaction of the financial test criteria pursuant to Paragraph 40.e or Paragraph 40.f(2), Settling Performing Defendants (or in the case of Paragraph 40.f(2), the guarantor) shall immediately upon written demand from EPA deposit into the Lammers Barrel Site Special Account or such other account as EPA may specify, in immediately available funds and without setoff, counterclaim, or condition of any kind, a cash amount up to but not exceeding the estimated cost of completing the Work as of such date, as determined by EPA. In addition, if at any time EPA is notified by the issuer of a performance guarantee that such issuer intends to cancel the performance guarantee mechanism it has issued, then, unless Settling Performing Defendants provide a substitute performance guarantee mechanism in accordance with this Section XIII no later than 30 days prior to the impending cancellation date, EPA shall be entitled (as of and after the date that is 30 days prior to the impending cancellation) to draw fully on the funds guaranteed under the then-existing performance guarantee. All EPA Work Takeover costs not

reimbursed under this Paragraph shall be reimbursed under Section XVI (Payments for Response Costs).

44. Modification of Amount and/or Form of Performance Guarantee.

a. Reduction of Amount of Performance Guarantee. If Settling Performing Defendants believe that the estimated cost of completing the Work has diminished below the amount set forth in Paragraph 40, Settling Performing Defendants may, on any anniversary of the Effective Date, or at any other time agreed to by the Parties, petition EPA in writing to request a reduction in the amount of the performance guarantee provided pursuant to this Section so that the amount of the performance guarantee is equal to the estimated cost of completing the Work. Settling Performing Defendants shall submit a written proposal for such reduction to EPA that shall specify, at a minimum, the estimated cost of completing the Work and the basis upon which such cost was calculated. In seeking approval for a reduction in the amount of the performance guarantee, Settling Performing Defendants shall follow the procedures set forth in Paragraph 44.b(2) for requesting a revised or alternative form of performance guarantee, except as specifically provided in this Paragraph 44.a. If EPA decides to accept Settling Performing Defendants' proposal for a reduction in the amount of the performance guarantee, either to the amount set forth in Settling Performing Defendants' written proposal or to some other amount as selected by EPA, EPA will notify the petitioning Settling Performing Defendants of such decision in writing. Upon EPA's acceptance of a reduction in the amount of the performance guarantee, the Estimated Cost of the Work shall be deemed to be the estimated cost of completing the Work set forth in EPA's written decision. After receiving EPA's written decision, Settling Performing Defendants may reduce the amount of the performance guarantee in accordance with and to the extent permitted by such written acceptance and shall submit

copies of all executed and/or otherwise finalized instruments or other documents required in order to make the selected performance guarantee(s) legally binding in accordance with Paragraph 44.b(2). In the event of a dispute, Settling Performing Defendants may reduce the amount of the performance guarantee required hereunder only in accordance with a final administrative or judicial decision resolving such dispute pursuant to Section XIX (Dispute Resolution). No change to the form or terms of any performance guarantee provided under this Section, other than a reduction in amount, is authorized except as provided in Paragraphs 42 or 44.b.

b. Change of Form of Performance Guarantee.

(1) If, after the Effective Date, Settling Performing Defendants desire to change the form or terms of any performance guarantee(s) provided pursuant to this Section, Settling Performing Defendants may, on any anniversary of the Effective Date, or at any other time agreed to by the Parties, petition EPA in writing to request a change in the form or terms of the performance guarantee provided hereunder. The submission of such proposed revised or alternative performance guarantee shall be as provided in Paragraph 44.b(2). Any decision made by EPA on a petition submitted under this Paragraph shall be made in EPA's sole and unreviewable discretion, and such decision shall not be subject to challenge by Settling Performing Defendants pursuant to the dispute resolution provisions of this Consent Decree or in any other forum.

(2) Settling Performing Defendants shall submit a written proposal for a revised or alternative performance guarantee to EPA that shall specify, at a minimum, the estimated cost of completing the Work, the basis upon which such cost was calculated, and the proposed revised performance guarantee, including all proposed

instruments or other documents required in order to make the proposed performance guarantee legally binding. The proposed revised or alternative performance guarantee must satisfy all requirements set forth or incorporated by reference in this Section. Settling Performing Defendants shall submit such proposed revised or alternative performance guarantee to Dale Meyer, Regional Comptroller, Mail Code MF-10J, Resource Management Division, U.S. EPA Region 5, 77 West Jackson Blvd., Chicago, Illinois 60604 in accordance with Section XXVI (Notices and Submissions), with a copy to Cynthia Mack-Smeltzer, Accountant, Program Accounting and Analysis Section, Mail Code MF-10J, Resource Management Division, U.S. EPA Region 5, 77 West Jackson Blvd., Chicago, Illinois 60604. EPA will notify Settling Performing Defendants in writing of its decision to accept or reject a revised or alternative performance guarantee submitted pursuant to this Paragraph. Within ten days after receiving a written decision approving the proposed revised or alternative performance guarantee, Settling Performing Defendants shall execute and/or otherwise finalize all instruments or other documents required in order to make the selected performance guarantee(s) legally binding in a form substantially identical to the documents submitted to EPA as part of the proposal, and such performance guarantee(s) shall thereupon be fully effective. Settling Performing Defendants shall submit copies of all executed and/or otherwise finalized instruments or other documents required in order to make the selected performance guarantee(s) legally binding to Dale Meyer, Regional Comptroller, Mail Code MF-10J, Resource Management Division, U.S. EPA Region 5, 77 West Jackson Blvd., Chicago, Illinois 60604 within 30 days after receiving a written decision approving the proposed revised or alternative performance guarantee in accordance with

Section XXVI (Notices and Submissions), with a copy to Cynthia Mack-Smeltzer, Accountant, Program Accounting and Analysis Section, Mail Code MF-10J, Resource Management Division, U.S. EPA Region 5, 77 West Jackson Blvd., Chicago, Illinois 60604 and to the United States and EPA and the State as specified in Section XXVI.

c. Release of Performance Guarantee. Settling Performing Defendants shall not release, cancel, or discontinue any performance guarantee provided pursuant to this Section except as provided in this Paragraph. If Settling Defendants receive written notice from EPA in accordance with Paragraph 45 that the Work has been fully and finally completed in accordance with the terms of this Consent Decree, or if EPA otherwise so notifies Settling Performing Defendants in writing, Settling Performing Defendants may thereafter release, cancel, or discontinue the performance guarantee(s) provided pursuant to this Section. In the event of a dispute, Settling Performing Defendants may release, cancel, or discontinue the performance guarantee(s) required hereunder only in accordance with a final administrative or judicial decision resolving such dispute pursuant to Section XIX (Dispute Resolution).

XIV. CERTIFICATION OF COMPLETION

45. Completion of the Work.

a. Within 90 days after Settling Performing Defendants conclude that all phases of the Work, other than any remaining activities required under Section VII (Remedy Review), have been fully performed, Settling Performing Defendants shall schedule and conduct a pre-final inspection as set forth at Section VI of the SOW to be attended by Settling Performing Defendants and EPA. Notice of such inspection shall also be provided to the State at least 14 days before the pre-final inspection is to take place. If, after the inspection, Settling Performing Defendants still believe that the Work has been fully performed, Settling Performing Defendants

shall submit a written report by a registered professional engineer as set forth at Section VI of the SOW stating that the Work has been completed in full satisfaction of the requirements of this Consent Decree. The report shall contain the following statement, signed by a responsible corporate official of a Settling Performing Defendant or Settling Performing Defendants' Project Coordinator:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If, after review of the written report, EPA, after reasonable opportunity for review and comment by the State, determines that any portion of the Work has not been completed in accordance with this Consent Decree, EPA will notify Settling Performing Defendants in writing of the activities that must be undertaken by Settling Performing Defendants pursuant to this Consent Decree to complete the Work, provided, however, that EPA may only require Settling Performing Defendants to perform such activities pursuant to this Paragraph to the extent that such activities are consistent with the "scope of the remedy set forth in the ROD," as that term is defined in Paragraph 14.a. EPA will set forth in the notice a schedule for performance of such activities consistent with the Consent Decree and the SOW or require Settling Performing Defendants to submit a schedule to EPA for approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables). Settling Performing Defendants shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to their right to invoke the dispute resolution procedures set forth in Section XIX (Dispute Resolution),

conduct a final inspection and submit the final Completion of Work Report for approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables) as set forth in Section VI of the SOW.

b. If EPA concludes, based on the initial or any subsequent request for Certification of Completion of the Work by Settling Performing Defendants and after a reasonable opportunity for review and comment by the State, that the Work has been performed in accordance with this Consent Decree, EPA will so notify Settling Performing Defendants in writing.

XV. EMERGENCY RESPONSE

46. If any action or occurrence during the performance of the Work causes or threatens a release of Waste Material from the Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Settling Performing Defendants shall, subject to Paragraph 47, immediately take all appropriate action to prevent, abate, or minimize such release or threat of release, and shall immediately notify the EPA's Project Coordinator, or, if the Project Coordinator is unavailable, EPA's Alternate Project Coordinator. If neither of these persons is available, Settling Defendants shall notify the EPA Emergency Response Branch, Region 5. Settling Performing Defendants shall take such actions in consultation with EPA's Project Coordinator or other available authorized EPA officer and in accordance with all applicable provisions of the Health and Safety Plans, the Contingency Plans, and any other applicable plans or documents developed pursuant to the SOW. In the event that Settling Performing Defendants fail to take appropriate response action as required by this Section, and EPA takes such action instead, Settling Performing Defendants shall reimburse EPA all costs of the response action under Section XVI (Payments for Response Costs).

47. Subject to Section XXI (Covenants by Plaintiff), nothing in the preceding Paragraph or in this Consent Decree shall be deemed to limit any authority of the United States (a) to take all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site, or (b) to direct or order such action, or seek an order from the Court, to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site.

XVI. PAYMENTS FOR RESPONSE COSTS

48. Reimbursement by Settling Performing Defendants for Past Response Costs.

a. Within 60 days after the Effective Date, Settling Performing Defendants shall pay to EPA \$1,496,689.04 in payment for Past Response Costs. Payment shall be made in accordance with Paragraph 51.a (Instructions for Past Response Cost Payments).

b. The total amount to be paid by Settling Performing Defendants pursuant to Paragraph 48.a shall be deposited by EPA in the Lammers Barrel Site Special Account to be retained and used to conduct or finance response actions at or in connection with the Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund.

49. Reimbursement by Settling Performing Defendants for Future Response Costs.

Settling Performing Defendants shall pay to EPA all Future Response Costs not inconsistent with the NCP.

a. On a periodic basis, EPA will send Settling Performing Defendants a bill requiring payment that includes an Itemized Cost Summary, which includes direct and indirect costs incurred by EPA, EPA's contractors, and DOJ. Settling Performing Defendants shall make all payments within 45 days after Settling Defendants' receipt of each bill requiring payment,

except as otherwise provided in Paragraph 52, in accordance with Paragraph 51.b (Instructions for Future Response Cost Payments).

b. The total amount to be paid by Settling Performing Defendants pursuant to Paragraph 49.a shall be deposited by EPA in the Lammers Barrel Site Special Account to be retained and used to conduct or finance response actions at or in connection with the Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund.

c. After EPA issues the Certification of Completion of the Work pursuant to Paragraph 45 and a final accounting of Future Response Costs, EPA will apply any unused amount paid by Settling Performing Defendants pursuant to Paragraph 49 to any other unreimbursed response costs or response actions remaining at the Site. Any decision by EPA to apply unused amounts to unreimbursed response costs or response actions remaining at the Site shall not be subject to challenge by Settling Performing Defendants pursuant to the dispute resolution provisions of this Consent Decree or in any other forum.

50. Payment by Settling Non-Performing Defendants

a. Payments for OU1 and for OU2 RI/FS. As negotiated between Settling Performing Defendants and Settling Non-Performing Defendants, each Settling Non-Performing Defendant shall pay to Settling Performing Defendants, no later than forty-five (45) days after Settling Performing Defendants have notified Settling Non-Performing Defendants that this Consent Decree has been entered by the Court, all monies necessary to satisfy the claims of the Settling Performing Defendants against the Settling Non-Performing Defendants for OU1 arising pursuant to this Consent Decree. The amounts to be paid by Settling Non-Performing Defendants for OU1 and for OU2 RI/FS are set forth in Appendix G. The monies paid by the Settling Non-Performing Defendants under this Paragraph 50.a. (except for the payment of any

stipulated penalties required under this Consent Decree, all of which shall be paid directly to the United States as set forth in Section XX) shall be deposited into a trust account and used exclusively to pay for the Work, and for the RI/FS at the Site. These monies from the Settling Non-Performing Defendants cannot be used to pay penalties incurred by the Settling Performing Defendants. The amount to be paid and the instructions for payment have been the subject of an invoice submitted to each Settling Non-Performing Defendant by the Settling Performing Defendants. At the time of payment of the invoiced amount to the Settling Performing Defendants in accordance with the invoice instructions for payment, each Settling Non-Performing Defendant shall send notice that payment has been made to the United States and to EPA in accordance with Section XXVI (Notices and Submissions). In the event a Settling Non-Performing Defendant fails to make timely payment under this Paragraph, such Settling Non-Performing Defendant shall pay Interest on the unpaid balance to Settling Performing Defendants. Interest shall begin to accrue on the date payment was due. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to Plaintiff or Settling Performing Defendants by virtue of Settling Non-Performing Defendants' failure to make timely payment under this Consent Decree.

b. Payments for OU2 RD/RA.

(1) Within 45 days of the Effective Date, each Settling Non-Performing Defendant shall pay to Settling Performing Defendants the amount for estimated OU2 RD/RA costs set forth in Appendix G. Each Settling Non-Performing Defendant's payment under this Paragraph includes an amount for: (a) projected total future response costs anticipated to be incurred by the United States or by any other person at or in connection with OU2 other than the projected RI/FS costs for OU2; (b) a

premium to cover the risks and uncertainties associated with this settlement, including but not limited to, the risk that total response costs incurred or to be incurred at or in connection with the Site by the United States or by any other person, will exceed the estimated total response costs upon which Settling Defendants' payments are based; and (c) the deduction of a 25 percent "orphan share" of \$528,624 applied to the Settling Defendants' OU2 RD/RA remedy cost estimate of \$2,114,496.

(2) The Settling Performing Defendants shall deposit the monies paid by the Settling Non-Performing Defendants pursuant to Paragraph 50.b(1) into a trust account for payment to EPA. The amount to be paid under Paragraph 50.b(1) has been the subject of an invoice submitted to each Settling Non-Performing Defendant by the Settling Performing Defendants. At the time of payment of the invoiced amount to the Settling Performing Defendants, each Settling Non-Performing Defendant shall send notice that payment has been made, indicating the amount, to the United States in accordance with Section XXVI (Notices and Submissions).

(3) Within 60 days of the Effective Date, Settling Performing Defendants shall pay the monies received from Settling Non-Performing Defendants under Paragraph 50.b(1) to EPA. If they receive late payments from Settling Non-Performing Defendants under Paragraph 50.b(1), Settling Performing Defendants shall pay the late payments plus Interest from Settling Non-Performing Defendants under Paragraph 50.b(1) within 30 days of the Settling Performing Defendants' receipt of the payments. Payment to EPA under Paragraph 50.b(3) shall be made in accordance with Paragraph 51.b. When making payments under Paragraph 50.b(3), Settling Performing Defendants shall also comply with Paragraph 51.c and reference OU2 RD/RA.

(4) The total amount EPA receives pursuant to Paragraph 50.b. shall be deposited by EPA in the Lammers Barrel Site OU2 Special Account to be created by EPA and retained and used to conduct or finance response actions at or in connection with OU2 at the Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund.

(5) If full payment to EPA has not been made for any Settling Non-Performing Defendant within 60 days of the Effective Date, that Settling Non-Performing Defendant shall pay Interest on the unpaid balance. In addition, if full payment to EPA has not been made for any Settling Non-Performing Defendant as required by Paragraph 50.b, the United States may, in addition to any other available remedies or sanctions, bring an action against that Settling Non-Performing Defendant seeking injunctive relief to compel payment and/or seeking civil penalties under Section 122(l) of CERCLA, 42 U.S.C. § 9622(l), for failure to make timely payment.

51. Payment Instructions for Settling Performing Defendants.

a. Instructions for Past Response Costs Payments. All payments required elsewhere in this Consent Decree to be made in accordance with this Paragraph 51.a shall be made at <https://www.pay.gov> to the U.S. Department of Justice account, in accordance with instructions provided to Settling Performing Defendants by the Financial Litigation Unit (“FLU”) of the United States Attorney’s Office for the Southern District of Ohio after the Effective Date. The payment instructions provided by the Financial Litigation Unit shall include a Consolidated Debt Collection System (“CDCS”) number, which shall be used to identify all payments required to be made in accordance with this Consent Decree. The FLU shall provide the payment instructions to:

Susan M. Franzetti
Nijman Franzetti, LLP
10 S. LaSalle St., Suite 3600
Chicago, IL 60603
(312) 251-5590

on behalf of Settling Performing Defendants. Settling Performing Defendants may change the individual to receive payment instructions on their behalf by providing written notice of such change in accordance with Section XXVI (Notices and Submissions). When making payments under this Paragraph 51.a, Settling Performing Defendants shall also comply with Paragraph 51.c.

b. Instructions for Future Response Costs Payments and Stipulated Penalties.

All payments required, elsewhere in this Consent Decree, to be made in accordance with this Paragraph 51.b shall be made by Fedwire EFT to:

Federal Reserve Bank of New York
ABA = 021030004
Account = 68010727
SWIFT address = FRNYUS33
33 Liberty Street
New York NY 10045
Field Tag 4200 of the Fedwire message should read "D 68010727
Environmental Protection Agency"

When making payments under this Paragraph 51.b, Settling Performing Defendants shall also comply with Paragraph 51.c.

c. Instructions for All Payments. All payments made under Paragraphs 50.b. (Payment by Settling Non-Performing Defendants for OU2 RD/RA), 51.a (Instructions for Past Response Cost Payments) or 51.b. (Instructions for Future Response Cost Payments) shall reference the CDCS Number, Site/Spill ID Number 05BX, and DOJ Case Number 90-11-3-07706. At the time of any payment required to be made in accordance with Paragraphs 50.b, 51.a. or 51.b, Settling Performing Defendants shall send notice that payment has been made to

the United States, and to EPA, in accordance with Section XXVI (Notices and Submissions), and to the EPA Cincinnati Finance Office by email at acctsreceivable.cinwd@epa.gov, or by mail at 26 Martin Luther King Drive, Cincinnati, Ohio 45268. Such notice shall also reference the CDCS Number, Site/Spill ID Number, and DOJ Case Number.

52. Settling Performing Defendants may contest any Future Response Costs billed under Paragraph 49 (Reimbursement by Settling Performing Defendants for Future Response Costs) if they determine that EPA has made a mathematical error or included a cost item that is not within the definition of Future Response Costs, or if they believe EPA incurred excess costs as a direct result of an EPA action that was inconsistent with a specific provision or provisions of the NCP. Such objection shall be made in writing within 30 days after receipt of the bill and must be sent to the United States pursuant to Section XXVI (Notices and Submissions). Any such objection shall specifically identify the contested Future Response Costs and the basis for objection. In the event of an objection, Settling Performing Defendants shall pay all uncontested Future Response Costs to the United States within 45 days after Settling Defendants' receipt of the bill requiring payment. Simultaneously, Settling Performing Defendants shall establish, in a duly chartered bank or trust company, an interest-bearing escrow account that is insured by the Federal Deposit Insurance Corporation ("FDIC"), and remit to that escrow account funds equivalent to the amount of the contested Future Response Costs. Settling Performing Defendants shall send to the United States, as provided in Section XXVI (Notices and Submissions), a copy of the transmittal letter and check paying the uncontested Future Response Costs, and a copy of the correspondence that establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account.

Simultaneously with establishment of the escrow account, Settling Performing Defendants shall initiate the Dispute Resolution procedures in Section XIX (Dispute Resolution). If the United States prevails in the dispute, Settling Performing Defendants shall pay the sums due (with accrued interest) to the United States within five days after the resolution of the dispute. If Settling Performing Defendants prevail concerning any aspect of the contested costs, Settling Performing Defendants shall pay that portion of the costs (plus associated accrued interest) for which they did not prevail to the United States within five days after the resolution of the dispute. Settling Performing Defendants shall be disbursed any balance of the escrow account. All payments to the United States under this Paragraph shall be made in accordance with Paragraph 51.b (Instructions for Future Response Cost Payments). The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XIX (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding Settling Performing Defendants' obligation to reimburse the United States for its Future Response Costs.

53. Interest. In the event that any payment for Past Response Costs or for Future Response Costs required under this Section is not made by the date required, Settling Performing Defendants shall pay Interest on the unpaid balance. The Interest to be paid on Past Response Costs under this Paragraph shall begin to accrue on the Effective Date. The Interest on Future Response Costs shall begin to accrue on the date of the bill. The Interest shall accrue through the date of Settling Performing Defendants' payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to Plaintiff by virtue of Settling Performing Defendants' failure to make timely payments under this Section including, but not limited to, payment of stipulated penalties pursuant to Paragraph 67.

XVII. INDEMNIFICATION AND INSURANCE

54. Settling Performing Defendants' Indemnification of the United States and the State.

a. The United States does not assume any liability by entering into this Consent Decree or by virtue of any designation of Settling Performing Defendants as EPA's authorized representatives under Section 104(e) of CERCLA, 42 U.S.C. § 9604(e). Settling Performing Defendants shall indemnify, save and hold harmless the United States and the State and their officials, agents, employees, contractors, subcontractors, and representatives for or from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Settling Performing Defendants, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Consent Decree, including, but not limited to, any claims arising from any designation of Settling Performing Defendants as EPA's authorized representatives under Section 104(e) of CERCLA. Further, Settling Performing Defendants agree to pay the United States and the State all costs they incur including, but not limited to, attorneys' fees and other expenses of litigation and settlement arising from, or on account of, claims made against the United States or the State based on negligent or other wrongful acts or omissions of Settling Performing Defendants, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Consent Decree. Neither the United States nor the State shall be held out as a party to any contract entered into by or on behalf of Settling Performing Defendants in carrying out activities pursuant to this Consent Decree.

Neither Settling Performing Defendants nor any such contractor shall be considered an agent of the United States or the State.

b. The United States and the State shall give Settling Performing Defendants notice of any claim for which the United States or the State plans to seek indemnification pursuant to this Paragraph 54, and shall consult with Settling Performing Defendants prior to settling such claim.

55. Settling Performing Defendants covenant not to sue and agree not to assert any claims or causes of action against the United States and the State for damages or reimbursement or for setoff of any payments made or to be made to the United States or the State, arising from or on account of any contract, agreement, or arrangement between any one or more of Settling Performing Defendants and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays. In addition, Settling Performing Defendants shall indemnify and hold harmless the United States with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between any one or more of Settling Performing Defendants and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays.

56. No later than 15 days before commencing any on-site Work, Settling Performing Defendants shall secure, and shall maintain until the first anniversary after the Remedial Action has been performed in accordance with this Consent Decree and the Performance Standards have been achieved, commercial general liability insurance with limits of \$3.5 million dollars, for any one occurrence, and automobile liability insurance with limits of \$3.5 million dollars, combined single limit, naming the United States as an additional insured with respect to all liability arising

out of the activities performed by or on behalf of Settling Performing Defendants pursuant to this Consent Decree. In addition, for the duration of this Consent Decree, Settling Performing Defendants shall satisfy, or shall ensure that their contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing the Work on behalf of Settling Performing Defendants in furtherance of this Consent Decree. Prior to commencement of the Work under this Consent Decree, Settling Performing Defendants shall provide to EPA certificates of such insurance and a copy of each insurance policy. Settling Performing Defendants shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. If Settling Performing Defendants demonstrate by evidence satisfactory to EPA and the State that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then, with respect to that contractor or subcontractor, Settling Performing Defendants need provide only that portion of the insurance described above that is not maintained by the contractor or subcontractor.

XVIII. FORCE MAJEURE

57. "Force majeure," for purposes of this Consent Decree, is defined as any event arising from causes beyond the control of Settling Defendants, of any entity controlled by Settling Defendants, or of Settling Defendants' contractors that delays or prevents the performance of any obligation under this Consent Decree despite Settling Defendants' best efforts to fulfill the obligation. The requirement that Settling Defendants exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure and best efforts to address the effects of any potential force majeure (a) as it is occurring and (b) following the potential force majeure such that the delay and any adverse effects of the delay are

minimized to the greatest extent possible. "Force majeure" does not include financial inability to complete the Work or a failure to achieve the Performance Standards.

58. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree for which Settling Defendants intend or may intend to assert a claim of force majeure, Settling Defendants shall notify EPA's Project Coordinator orally or, in his or her absence, EPA's Alternate Project Coordinator or, in the event both of EPA's designated representatives are unavailable, the Director of the Superfund Division, EPA Region 5, within five days of when Settling Defendants first knew that the event might cause a delay. Within 14 days thereafter, Settling Defendants shall provide in writing to EPA an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Settling Defendants' rationale for attributing such delay to a force majeure; and a statement as to whether, in the opinion of Settling Defendants, such event may cause or contribute to an endangerment to public health or welfare, or the environment. Settling Defendants shall include with any notice all available documentation supporting their claim that the delay was attributable to a force majeure. Settling Defendants shall be deemed to know of any circumstance of which Settling Defendants, any entity controlled by Settling Defendants, or Settling Defendants' contractors knew or should have known. Failure to comply with the above requirements regarding an event shall preclude Settling Defendants from asserting any claim of force majeure regarding that event, provided, however, that if EPA, despite the late notice, is able to assess to its satisfaction whether the event is a force majeure under Paragraph 57 and whether Settling Defendants have exercised their best efforts under Paragraph 57, EPA may, in its unreviewable

discretion, excuse in writing Settling Defendants' failure to submit timely notices under this Paragraph.

59. If EPA agrees that the delay or anticipated delay is attributable to a force majeure, the time for performance of the obligations under this Consent Decree that are affected by the force majeure will be extended by EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure shall not, of itself, extend the time for performance of any other obligation. If EPA does not agree that the delay or anticipated delay has been or will be caused by a force majeure, EPA will notify Settling Defendants in writing of its decision. If EPA agrees that the delay is attributable to a force majeure, EPA will notify Settling Defendants in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure.

60. If Settling Defendants elect to invoke the dispute resolution procedures set forth in Section XIX (Dispute Resolution), they shall do so no later than 15 days after receipt of EPA's notice. In any such proceeding, Settling Defendants shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Settling Defendants complied with the requirements of Paragraphs 57 and 58. If Settling Defendants carry this burden, the delay at issue shall be deemed not to be a violation by Settling Defendants of the affected obligation of this Consent Decree identified to EPA and the Court.

XIX. DISPUTE RESOLUTION

61. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes regarding this Consent Decree. However, the procedures set forth in this Section shall not apply to actions by the United States to enforce obligations of Settling Defendants that have not been disputed in accordance with this Section.

62. Any dispute regarding this Consent Decree shall in the first instance be the subject of informal negotiations between the parties to the dispute. The period for informal negotiations shall not exceed 20 days from the time the dispute arises, unless it is modified by written agreement of the parties to the dispute. The dispute shall be considered to have arisen when one party sends the other parties a written Notice of Dispute.

63. Statements of Position.

a. In the event that the parties cannot resolve a dispute by informal negotiations under the preceding Paragraph, then the position advanced by EPA shall be considered binding unless, within 45 days after the conclusion of the informal negotiation period, Settling Defendants invoke the formal dispute resolution procedures of this Section by serving on the United States a written Statement of Position on the matter in dispute, including, but not limited to, any factual data, analysis, or opinion supporting that position and any supporting documentation relied upon by Settling Defendants. The Statement of Position shall specify Settling Defendants' position as to whether formal dispute resolution should proceed under Paragraph 64 (Record Review) or 65.

b. Within 45 days after receipt of Settling Defendants' Statement of Position, EPA will serve on Settling Defendants its Statement of Position, including, but not limited to,

any factual data, analysis, or opinion supporting that position and all supporting documentation relied upon by EPA. EPA's Statement of Position shall include a statement as to whether formal dispute resolution should proceed under Paragraph 64 (Record Review) or Paragraph 65. Within 20 days after receipt of EPA's Statement of Position, Settling Defendants may submit a Reply.

c. If there is disagreement between EPA and Settling Defendants as to whether dispute resolution should proceed under Paragraph 64 (Record Review) or 65, the parties to the dispute shall follow the procedures set forth in the paragraph determined by EPA to be applicable. However, if Settling Defendants ultimately appeal to the Court to resolve the dispute, the Court shall determine which paragraph is applicable in accordance with the standards of applicability set forth in Paragraphs 64 and 65.

64. Record Review. Formal dispute resolution for disputes pertaining to the selection or adequacy of any response action and all other disputes that are accorded review on the administrative record under applicable principles of administrative law shall be conducted pursuant to the procedures set forth in this Paragraph. For purposes of this Paragraph, the adequacy of any response action includes, without limitation, the adequacy or appropriateness of plans, procedures to implement plans, or any other items requiring approval by EPA under this Consent Decree, and the adequacy of the performance of response actions taken pursuant to this Consent Decree. Nothing in this Consent Decree shall be construed to allow any dispute by Settling Defendants regarding the validity of the ROD's provisions.

a. An administrative record of the dispute shall be maintained by EPA and shall contain all statements of position, including supporting documentation, submitted pursuant

to this Section. Where appropriate, EPA may allow submission of supplemental statements of position by the parties to the dispute.

b. The Director of the Superfund Division, EPA Region 5, will issue a final administrative decision resolving the dispute based on the administrative record described in Paragraph 64.a. This decision shall be binding upon Settling Defendants, subject only to the right to seek judicial review pursuant to Paragraphs 64.c and 64.d.

c. Any administrative decision made by EPA pursuant to Paragraph 64.b shall be reviewable by this Court, provided that a motion for judicial review of the decision is filed by Settling Defendants with the Court and served on all Parties within ten days after receipt of EPA's decision. The motion shall include a description of the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Decree. The United States may file a response to Settling Defendants' motion.

d. In proceedings on any dispute governed by this Paragraph, Settling Defendants shall have the burden of demonstrating that the decision of the Superfund Division Director is arbitrary and capricious or otherwise not in accordance with law. Judicial review of EPA's decision shall be on the administrative record compiled pursuant to Paragraph 64.a.

65. Formal dispute resolution for disputes that neither pertain to the selection or adequacy of any response action nor are otherwise accorded review on the administrative record under applicable principles of administrative law shall be governed by this Paragraph.

a. Following receipt of Settling Defendants' Statement of Position submitted pursuant to Paragraph 63, the Director of the Superfund Division, EPA Region 5, will issue a final decision resolving the dispute. The Superfund Division Director's decision shall be

binding unless, within ten days after receipt of the decision, Settling Defendants, as applicable, file with the Court and serve on the parties a motion for judicial review of the decision setting forth the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of the Consent Decree. The United States may file a response to Settling Defendants' motion.

b. Notwithstanding Paragraph M (CERCLA Section 113(j) Record Review of ROD and Work) of Section I (Background), judicial review of any dispute governed by this Paragraph shall be governed by applicable principles of law.

66. The invocation of formal dispute resolution procedures under this Section shall not extend, postpone, or affect in any way any obligation of Settling Defendants under this Consent Decree, not directly in dispute, unless EPA or the Court agrees otherwise. Stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute as provided in Paragraph 75. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Consent Decree. In the event that Settling Defendants do not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XX (Stipulated Penalties).

XX. STIPULATED PENALTIES

67. Settling Performing Defendants shall be liable for stipulated penalties in the amounts set forth in Paragraphs 68 and 69 to the United States for failure to comply with the requirements of this Consent Decree specified below, unless excused under Section XVIII (Force Majeure). Settling Non-Performing Defendants shall be liable for stipulated penalties in the

amounts set forth in Paragraphs 68.a. to the United States for failure to comply with the requirements of Paragraph 50 of the Consent Decree. "Compliance" by Settling Performing Defendants shall include completion of all payments and activities required under this Consent Decree, or any plan, report, or other deliverable approved under this Consent Decree, in accordance with all applicable requirements of law, this Consent Decree, the SOW, and any plans, reports, or other deliverables approved under this Consent Decree and within the specified time schedules established by and approved under this Consent Decree.

68. Work (Including Payments and Performance Guarantee and Excluding Plans, Reports, and Other Deliverables).

a. The following stipulated penalties shall accrue per violation per day for any noncompliance identified in Paragraph 68.b.:

Penalty Per Violation Per Day Period of Noncompliance

\$2,000	Up to 30 days
\$4,000	31st through 60 th day
\$5,000	61st day and beyond

b. Compliance Milestones.

- (1) Award RA contract(s);
- (2) Pre-construction inspection and meeting;
- (3) Initiate construction of RA;
- (4) Completion of Soil Remedy Component in accordance with schedule set forth in the approved RA Work Plan;
- (5) Completion of construction of monitoring and injection wells in accordance with the schedule set forth in the approved RA Work Plan;

- (6) Conduct groundwater sampling in accordance with the schedule set forth in the approved RA Work Plan;
- (7) Conduct final inspection, for the Soil Remedy Component and for the Work, in accordance with the schedule set forth in the SOW;
- (8) Payment For Past Response Costs and Future Response Costs pursuant to Section XVI (Payment for Response Costs);
- (9) Provision of Performance Guarantee pursuant to Section XIII (Performance Guarantee); and
- (10) Perform activities to complete the Work in accordance with EPA's notice issued pursuant to Paragraph 45 (not including those matters identified in Paragraph 69 below).

69. Stipulated Penalty Amounts — Plans, Reports, and other Deliverables. The following stipulated penalties shall accrue per violation per day for failure to submit timely or adequate reports or other plans or deliverables pursuant to the Consent Decree:

<u>Penalty Per Violation Per Day</u>	<u>Period of Noncompliance</u>
\$1,000	Up to 30 days
\$3,000	31 st through 60th day
\$5,000	61st day and beyond

70. In the event that EPA assumes performance of a portion or all of the Work pursuant to Paragraph 81 (Work Takeover), Settling Performing Defendants shall be liable for a stipulated penalty in the amount of \$750,000. Stipulated penalties under this Paragraph are in addition to the remedies available under Paragraphs 43 (Funding for Work Takeover) and 81 (Work Takeover).

71. All penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: (a) with respect to a deficient submission under Section XI (EPA Approval of Plans, Reports, and Other Deliverables), during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies Settling Performing Defendants of any deficiency; (b) with respect to a decision by the Director of the Superfund Division, EPA Region 5, under Paragraph 64.b or 65.a of Section XIX (Dispute Resolution), during the period, if any, beginning on the 21st day after the date that Settling Performing Defendants' reply to EPA's Statement of Position is received until the date that the Director issues a final decision regarding such dispute; or (c) with respect to judicial review by this Court of any dispute under Section XIX (Dispute Resolution), during the period, if any, beginning on the 31st day after the Court's receipt of the final submission regarding the dispute until the date that the Court issues a final decision regarding such dispute. Nothing in this Consent Decree shall prevent the simultaneous accrual of separate penalties for separate violations of this Consent Decree.

72. Following EPA's determination that Settling Defendants have failed to comply with a requirement of this Consent Decree, EPA may give Settling Defendants written notification of the same and describe the noncompliance. EPA may send Settling Defendants a written demand for the payment of the penalties. However, penalties shall accrue as provided in the preceding Paragraph regardless of whether EPA has notified Settling Defendants of a violation.

73. All penalties accruing under this Section shall be due and payable to the United States within 30 days after Settling Defendants' receipt from EPA of a demand for payment of the penalties, unless Settling Defendants invoke the Dispute Resolution procedures under Section XIX (Dispute Resolution) within the 30-day period. All payments to the United States under this Section shall indicate that the payment is for stipulated penalties and shall be made in accordance with Paragraph 51.b (Instructions for Future Response Cost Payments).

74. Penalties shall continue to accrue as provided in Paragraph 71 during any dispute resolution period, but need not be paid until the following:

a. If the dispute is resolved by agreement of the Parties or by a decision of EPA that is not appealed to this Court, accrued penalties determined to be owed shall be paid to EPA within 30 days after the agreement or the receipt of EPA's decision or order;

b. If the dispute is appealed to this Court and the United States prevails in whole or in part, Settling Defendants shall pay all accrued penalties determined by the Court to be owed to EPA within 60 days after receipt of the Court's decision or order, except as provided in Paragraph 74.c;

c. If the District Court's decision is appealed by any Party, Settling Defendants shall pay all accrued penalties determined by the District Court to be owed to the United States into an interest-bearing escrow account, established at a duly chartered bank or trust company that is insured by the FDIC, within 60 days after receipt of the Court's decision or order. Penalties shall be paid into this account as they continue to accrue, at least every 60 days. Within 15 days after receipt of the final appellate court decision, the escrow agent shall pay the balance of the account to EPA or to Settling Defendants to the extent that they prevail.

75. If Settling Defendants fail to pay stipulated penalties when due, Settling Defendants shall pay Interest on the unpaid stipulated penalties as follows: (a) if Settling Defendants have timely invoked dispute resolution such that the obligation to pay stipulated penalties has been stayed pending the outcome of dispute resolution, Interest shall accrue from the date stipulated penalties are due pursuant to Paragraph 74 until the date of payment; and (b) if Settling Defendants fail to timely invoke dispute resolution, Interest shall accrue from the date of demand under Paragraph 73 until the date of payment. If Settling Defendants fail to pay stipulated penalties and Interest when due, the United States may institute proceedings to collect the penalties and Interest.

76. The payment of penalties and Interest, if any, shall not alter in any way Settling Performing Defendants' obligation to complete the performance of the Work required under this Consent Decree.

77. Nothing in this Consent Decree shall be construed as prohibiting, altering, or in any way limiting the ability of the United States to seek any other remedies or sanctions available by virtue of Settling Defendants' violation of this Consent Decree or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Section 122(l) of CERCLA, 42 U.S.C. § 9622, provided, however, that the United States shall not seek civil penalties pursuant to Section 122(l) of CERCLA for any violation for which a stipulated penalty is provided in this Consent Decree, except in the case of a willful violation of this Consent Decree.

78. Notwithstanding any other provision of this Section, the United States may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Consent Decree.

XXI. COVENANTS BY PLAINTIFF

79. Covenants for Settling Defendants by United States.

a. In consideration of the actions that will be performed and the payments that will be made by Settling Performing Defendants and the Owner Settling Defendant under this Consent Decree, and except as specifically provided in Paragraph 80 (General Reservations of Rights) of this Section, the United States covenants not to sue or to take administrative action against Settling Performing Defendants and the Owner Settling Defendant pursuant to Sections 106 and 107(a) of CERCLA for the Work, Past Response Costs, and Future Response Costs. These covenants shall take effect upon the receipt by EPA of the payments required by Paragraph 48.a (Payments for Past Response Costs) and any Interest or stipulated penalties due thereon under Paragraph 53 (Interest) or Section XX (Stipulated Penalties). These covenants are conditioned upon the satisfactory performance by Settling Performing Defendants and the Owner Settling Defendant of their obligations under this Consent Decree. These covenants not to sue extend only to the Settling Performing Defendants and the Owner Settling Defendant and their heirs, successors and assigns, but only to the extent that the liability of such heirs, successors and assigns is based on the liability of the Settling Performing Defendants or the Owner Settling Defendant and not to the extent that the liability arose independently of the liability of the Settling Performing Defendants or the Owner Settling Defendant, and do not extend to any other person.

b. In consideration of the payments that will be made by the Settling Non-Performing Defendants under the terms of this Consent Decree, and except as specifically provided in Paragraph 80 of this Section, the United States covenants not to sue or to take administrative action against Settling Non-Performing Defendants pursuant to Sections 106 and

107(a) of CERCLA relating to the Site. These covenants not to sue shall take effect as to each Settling Non-Performing Defendant upon both the receipt by the Settling Performing Defendants of the payments required by Paragraph 50.a (Payment by Settling Non-Performing Defendants -- Payments for OU1 and OU2 RI/FS) and the receipt by the EPA of the payments required by Paragraph 50.b. (Payment by Settling Non-Performing Defendants -- Payments for OU2 RD/RA). These covenants not to sue are conditioned upon (a) the satisfactory performance by each individual Settling Non-Performing Defendant of all of its obligations under this Consent Decree and (b) the veracity of the information provided to EPA by the Settling Non-Performing Defendant relating to its involvement with the Site. These covenants not to sue extend only to the Settling Non-Performing Defendants and their successors and assigns, but only to the extent that the liability of such successors and assigns is based on the liability of the Settling Non-Performing Defendants and not to the extent that the liability arose independently of the liability of the Settling Non-Performing Defendants, and do not extend to any other person.

c. Except as specifically provided in Paragraph 80 (General Reservations of Rights), EPA covenants not to take administrative action against any of the Settling Federal Agencies pursuant to Sections 106 and 107(a) of CERCLA, 42 U.S.C. §§ 9606 and 9607 relating to the Site. With respect to present and future liability, these covenants shall take effect for each Settling Federal Agency upon the Effective Date. With respect to each Settling Federal Agency, individually, these covenants are conditioned upon: (a) the satisfactory performance by the Settling Federal Agency of all obligations under this Consent Decree; and (b) the veracity of the information provided to EPA by the Settling Federal Agency relating to the Settling Federal Agency's involvement with the Site. These covenants extend only to Settling Federal Agencies and do not extend to any other person.

80. General Reservations of Rights The United States reserves, and this Consent Decree is without prejudice to, all rights against Settling Defendants with respect to all matters not expressly included within Plaintiff's covenants.

a. Notwithstanding any other provision of this Consent Decree, the United States reserves all rights against Settling Performing Defendants and Owner Settling Defendant with respect to:

- i. liability for failure by Settling Performing Defendants or Owner Settling Defendant to meet a requirement of this Consent Decree;
- ii. liability arising from the past, present, or future disposal, release, or threat of release of Waste Material outside of the Site;
- iii. liability based on the ownership of the Site by Settling Performing Defendants or Owner Settling Defendant when such ownership or operation commences after signature of this Consent Decree by Settling Performing Defendants;
- iv. liability based on the operation of the Site by Settling Performing Defendants or Owner Settling Defendant when such operation commences after signature of this Consent Decree by Settling Performing Defendants or Owner Settling Defendant and does not arise solely from Settling Performing Defendants' or Owner Settling Defendant's performance of the Work;
- v. liability based on Settling Performing Defendants' or Owner Settling Defendant's transportation, treatment, storage, or disposal, or arrangement for transportation, treatment, storage, or disposal of Waste Material at or in connection with the Site, other than as provided in the ROD, the Work, or otherwise ordered by EPA, after signature of this Consent Decree by Settling Performing Defendants or Owner Settling Defendant;

vi. liability for damages for injury to, destruction of; or loss of natural resources, and for the costs of any natural resource damage assessments;

vii. criminal liability;

viii. liability for violations of federal or state law that occur during or after implementation of the Work;

ix. liability of Settling Performing Defendants or Owner Settling Defendant, prior to achievement of Performance Standards in accordance with Paragraph 13, for additional response actions that EPA determines are necessary to achieve and maintain Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the ROD, but that cannot be required pursuant to Paragraph 14 (Modification of SOW or Related Work Plans);

x. liability of Settling Performing Defendants and Owner Settling Defendant for additional operable units at the Site or the final response action; and

xi. liability of Settling Performing Defendants and Owner Settling Defendant for costs that the United States will incur regarding the Site but that are not within the definition of Future Response Costs.

b. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, all rights against Settling Non-Performing Defendants, and EPA and the federal natural resource trustees reserve, and this Consent Decree is without prejudice to all rights against Settling Federal Agencies with respect to:

i. liability for failure to meet a requirement of this Consent Decree;

ii. criminal liability;

iii. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;

iv. liability based on the ownership or operation of the Site by the Settling Non-Performing Defendants or Settling Federal Agencies; and

v. liability based on the Settling Non-Performing Defendants or Settling Federal Agencies' transportation, treatment, storage, or disposal, or the arrangement for transportation, treatment, storage, or disposal, of Waste Material at or in connection with the Site, after signature of this Consent Decree by Settling Non-Performing Defendants or Settling Federal Agencies.

c. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to institute proceedings against any individual Settling Non-Performing Defendant in this action or in a new action or to issue an administrative order to any individual Settling Non-Performing Defendant or individual Settling Federal Agency seeking to compel that Settling Non-Performing Defendant or any individual Settling Federal Agency to perform response actions relating to the Site, and/or to reimburse the United States for additional costs of response, if information is discovered which indicates that such Settling Non-Performing Defendant or Settling Federal Agency contributed hazardous substances to the Site in such greater amount or of such greater toxic or other hazardous effects that such Settling Non-Performing Defendant or Settling Federal Agency no longer qualifies as a de minimis party at the Site because such Settling Non-Performing Defendant or Settling Federal Agency contributed greater than 1.25% of materials containing hazardous substances at the Site or contributed hazardous substance which are significantly more toxic or are of significantly greater hazardous effect than other hazardous substances at the Site.

81. Work Takeover.

a. In the event EPA determines that Settling Performing Defendants have (1) ceased implementation of any portion of the Work, or (2) are seriously or repeatedly deficient or late in their performance of the Work, or (3) are implementing the Work in a manner that may cause an endangerment to human health or the environment, EPA may issue a written notice ("Work Takeover Notice") to Settling Performing Defendants. Any Work Takeover Notice issued by EPA will specify the grounds upon which such notice was issued and will provide Settling Performing Defendants a period of ten days within which to remedy the circumstances giving rise to EPA's issuance of such notice.

b. If, after expiration of the ten-day notice period specified in Paragraph 81.a, Settling Performing Defendants have not remedied to EPA's satisfaction the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, EPA may at any time thereafter assume the performance of all or any portion(s) of the Work as EPA deems necessary ("Work Takeover"). EPA will notify Settling Performing Defendants in writing (which writing may be electronic) if EPA determines that implementation of a Work Takeover is warranted under this Paragraph 81.b. Funding of Work Takeover costs is addressed under Paragraph 43.

c. Settling Performing Defendants may invoke the procedures set forth in Paragraph 64 (Record Review) to dispute EPA's implementation of a Work Takeover under Paragraph 81.b. However, notwithstanding Settling Performing Defendants' invocation of such dispute resolution procedures, and during the pendency of any such dispute, EPA may in its sole discretion commence and continue a Work Takeover under Paragraph 81.b until the earlier of (1) the date that Settling Performing Defendants remedy, to EPA's satisfaction, the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, or (2) the date that a final

decision is rendered in accordance with Paragraph 64 (Record Review) requiring EPA to terminate such Work Takeover.

82. Notwithstanding any other provision of this Consent Decree, the United States and the State retain all authority and reserve all rights to take any and all response actions authorized by law.

XXII. COVENANTS BY SETTLING DEFENDANTS AND SETTLING FEDERAL AGENCIES

83. Covenants by Settling Performing Defendants and Owner Settling Defendant.

Settling Performing Defendants and Owner Settling Defendant covenant not to sue and agree not to assert any claims or causes of action against the United States with respect to the Work, past response actions regarding the Site, Past Response Costs, and Future Response Costs, and this Consent Decree, including, but not limited to:

a. Any direct or indirect claim for reimbursement from the EPA Hazardous Substance Superfund through CERCLA Sections 106(b)(2), 107, 111, 112 or 113, or any other provision of law; any claims under CERCLA Sections 107 or 113, RCRA Section 7002(a), 42 U.S.C. § 6972(a), or state law regarding the Work, past response actions regarding the Site, Past Response Costs, Future Response Costs, State Past Response Costs, State Future Response Costs, Settling Defendants' Past Response Costs, Settling Defendants' Future Response Costs, and this Consent Decree;

b. any claims arising out of response actions at or in connection with the Site, including any claim under the United States Constitution, the State of Ohio Constitution, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, or at common law; and

c. any direct or indirect claim for return of unused amounts from the Lammers Barrel Site Future Response Costs Special Account, except for unused amounts that EPA determines shall be returned to Settling Defendants in accordance with Paragraph 49.c.

84. Covenants by Settling Non-Performing Defendants. Settling Non-Performing Defendants covenant not to sue and agree not to assert any claims or causes of action against the United States or its contractors or employees with respect to the Site or this Consent Decree, including, but not limited to:

a. any direct or indirect claim for reimbursement from the EPA Hazardous Substance Superfund based on Sections 106(b)(2), 107, 111, 112, or 113 of CERCLA, 42 U.S.C. §§ 9606(b)(2), 9607, 9611, 9612, or 9613, or any other provision of law;

b. any claims arising out of response actions at or in connection with the Site, including any claim under the United States Constitution, the Constitution of the State of Ohio, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, or at common law; and

c. any claim against the United States pursuant to Sections 107 and 113 of CERCLA, 42 U.S.C. §§ 9607 and 9613, relating to the Site.

85. Except as provided in Paragraph 96 (Res Judicata and Other Defenses), the covenants in this Section shall not apply if the United States brings a cause of action or issues an order pursuant to any of the reservations in Section XXI (Covenants by Plaintiffs), other than in Paragraphs 80.a.i and 80.b.i (liability for failure to meet a requirement of the Consent Decree), 80.a.vii and 80.b.ii (criminal liability), and 80.a.viii (violations of federal/state law during or after implementation of the Work), but only to the extent that Settling Defendants' claims arise

from the same response action, response costs, or damages that the United States is seeking pursuant to the applicable reservation.

86. Covenant by Settling Federal Agencies. Settling Federal Agencies agree not to assert any direct or indirect claim for reimbursement from the Hazardous Substance Superfund through CERCLA Sections 106(b)(2), 107, 111, 112, 113 or any other provision of law with respect to the Site and this Consent Decree. This covenant does not preclude demand for reimbursement from the Superfund of costs incurred by a Settling Federal Agency in the performance of its duties (other than pursuant to this Consent Decree) as lead or support agency under the National Contingency Plan (40 C.F.R. Part 300).

87. Settling Performing Defendants reserve, and this Consent Decree is without prejudice to: claims against the United States, subject to the provisions of Chapter 171 of Title 28 of the United States Code, and brought pursuant to any statute other than CERCLA or RCRA and for which the waiver of sovereign immunity is found in a statute other than CERCLA or RCRA, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States, as that term is defined in 28 U.S.C. § 2671, while acting within the scope of his or her office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, the foregoing shall not include any claim based on EPA's selection of response actions, or the oversight or approval of Settling Performing Defendants' plans, reports, other deliverables or activities.

88. Nothing in this Consent Decree shall be deemed to constitute preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. § 300.700(d).

89. Claims Against De Micromis Parties. Settling Defendants and Owner Settling Defendant agree not to assert any claims and to waive all claims or causes of action (including but not limited to claims or causes of action under Sections 107(a) and 113 of CERCLA) that they may have for all matters relating to the Site against any person where the person's liability to Settling Defendants or Owner Settling Defendant with respect to the Site is based solely on having arranged for disposal or treatment, or for transport for disposal or treatment, of hazardous substances at the Site, or having accepted for transport for disposal or treatment of hazardous substances at the Site, if all or part of the disposal, treatment, or transport occurred before April 1, 2001, and the total amount of material containing hazardous substances contributed by such person to the Site was less than 110 gallons of liquid materials or 200 pounds of solid materials.

90. The waiver in Paragraph 89 (Claims Against De Micromis Parties) shall not apply with respect to any defense, claim, or cause of action that a Settling Defendant or Owner Settling Defendant may have against any person meeting the criteria in Paragraph 89 if such person asserts a claim or cause of action relating to the Site against such Settling Defendant or Owner Settling Defendant. This waiver also shall not apply to any claim or cause of action against any person meeting the criteria in Paragraph 89 if EPA determines:

a. that such person has failed to comply with any EPA requests for information or administrative subpoenas issued pursuant to Section 104(e) or 122(e) of CERCLA, 42 U.S.C. § 9604(e) or 9622(e), or Section 3007 of RCRA, 42 U.S.C. § 6927, or has impeded or is impeding, through action or inaction, the performance of a response action or

natural resource restoration with respect to the Site, or has been convicted of a criminal violation for the conduct to which this waiver would apply and that conviction has not been vitiated on appeal or otherwise; or

b. that the materials containing hazardous substances contributed to the Site by such person have contributed significantly, or could contribute significantly, either individually or in the aggregate, to the cost of response action or natural resource restoration at the Site.

91. Claims Against De Minimis and Ability to Pay Parties. Settling Defendants and Owner Settling Defendant agree not to assert any claims or causes of action and to waive all claims or causes of action (including but not limited to claims or causes of action under Sections 107(a) and 113 of CERCLA) that they may have for response costs relating to the Site against any person that has entered or in the future enters into a final CERCLA Section 122(g) *de minimis* settlement, including the Settling Non-Performing Defendants and Settling Federal Agencies, or a final settlement based on limited ability to pay, with EPA with respect to the Site. This waiver shall not apply with respect to any defense, claim, or cause of action that a Settling Defendant or Owner Settling Defendant may have against any person if such person asserts a claim or cause of action relating to the Site against such Settling Defendant or Owner Settling Defendant.

XXIII. EFFECT OF SETTLEMENT; CONTRIBUTION

92. Except as provided in Paragraphs 89 (Claims Against De Micromis Parties) and 91 (Claims Against De Minimis and Ability to Pay Parties), nothing in this Consent Decree shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Consent Decree. Except as provided in Paragraphs 89 (Claims Against De Micromis Parties)

and Paragraph 91 (Claims Against *De Minimis* and Ability to Pay Parties), each of the Parties expressly reserves any and all rights (including, but not limited to, pursuant to Section 113 of CERCLA, 42 U.S.C. § 9613), defenses, claims, demands, and causes of action that each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto. Nothing in this Consent Decree diminishes the right of the United States, pursuant to Section 113(f)(2) and (3) of CERCLA, 42 U.S.C. § 9613(f)(2)-(3), to pursue any such persons to obtain additional response costs or response action and to enter into settlements that give rise to contribution protection pursuant to Section 113(f)(2).

93. The Parties agree, and by entering this Consent Decree this Court finds, that this Consent Decree constitutes a judicially approved settlement for purposes of Section 113(f)(2) of CERCLA, 42 U.S.C. § 9613(f)(2), and, with respect to the Settling Non-Performing Defendants and Settling Federal Agencies, Section 122 (g)(5) of CERCLA, 42 U.S.C. § 9622(g)(5), and that each Settling Defendant is entitled, as of the Effective Date, to protection from contribution actions or claims as provided by Section 113(f)(2) of CERCLA, 42 U.S.C. § 9613(f)(2), and, with respect to the Settling Non-Performing Defendants and Settling Federal Agencies, Section 122(g)(5) of CERCLA, 42 U.S.C. § 9622(g)(5), or as may be otherwise provided by law, for “matters addressed” in this Consent Decree. The “matters addressed” in this Consent Decree are, with respect to the Settling Performing Defendants and Owner Settling Defendant, the Work, Past Response Costs, and Future Response Costs. The “matters addressed” in this Consent Decree are, with respect to the Settling Non-Performing Defendants and Settling Federal Agencies, all response actions taken or to be taken and all response costs incurred or to be incurred at, or in connection with, the Site, by the United States or any other person, except for the State; provided, however, that if the United States exercises rights under the reservations in

Paragraph 80 (General Reservations of Rights), other than in Paragraph 80.b.i (liability for failure to meet a requirement of the Consent Decree) or 80.b.ii (criminal liability), the “matters addressed” in this Consent Decree will no longer include those response costs or response actions that are within the scope of the exercised reservation.

94. Each Settling Defendant shall, with respect to any suit or claim brought by it for matters related to this Consent Decree, notify the United States in writing no later than 60 days prior to the initiation of such suit or claim.

95. Each Settling Defendant shall, with respect to any suit or claim brought against it for matters related to this Consent Decree, notify in writing the United States within ten days after service of the complaint on such Settling Defendant. In addition, each Settling Defendant shall notify the United States within ten days after service or receipt of any Motion for Summary Judgment and within ten days after receipt of any order from a court setting a case for trial.

96. Res Judicata and Other Defenses. In any subsequent administrative or judicial proceeding initiated by the United States for injunctive relief, recovery of response costs, or other appropriate relief relating to the Site, Settling Defendants shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States in the subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the covenants not to sue set forth in Section XXI (Covenants by Plaintiff).

XXIV. ACCESS TO INFORMATION

97. Settling Defendants shall provide to EPA, upon request, copies of all records, reports, documents, and other information (including records, reports, documents, and other

information in electronic form) (hereinafter referred to as "Records") within their possession or control or that of their contractors or agents relating to activities at the Site or to the implementation of this Consent Decree, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information regarding the Work. Settling Defendants shall also make available to EPA for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

98. Business Confidential and Privileged Documents.

a. Settling Defendants may assert business confidentiality claims covering part or all of the Records submitted to Plaintiff under this Consent Decree to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Records determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies Records when they are submitted to EPA and the State, or if EPA has notified Settling Defendants that the Records are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such Records without further notice to Settling Defendants.

b. Settling Defendants may assert that certain Records are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Settling Defendants assert such a privilege in lieu of providing Records, they shall provide Plaintiff with the following: (1) the title of the Record; (2) the date of the Record; (3) the name, title, affiliation (e.g., company or firm), and address of the author of the Record; (4) the name and title of each

addressee and recipient; (5) a description of the contents of the Record; and (6) the privilege asserted by Settling Defendants. If a claim of privilege applies only to a portion of a Record, the Record shall be provided to the United States in redacted form to mask the privileged portion only. Settling Defendants shall retain all Records that they claim to be privileged until the United States has had a reasonable opportunity to dispute the privilege claim and any such dispute has been resolved in the Settling Defendants' favor.

c. No Records created or generated pursuant to the requirements of this Consent Decree shall be withheld from the United States on the grounds that they are privileged or confidential.

99. No claim of confidentiality or privilege shall be made with respect to any data, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, or engineering data, or any other documents or information evidencing conditions at or around the Site.

XXV. RETENTION OF RECORDS

100. Until ten years after Settling Performing Defendants' receipt of EPA's notification pursuant to Paragraph 45.b (Completion of the Work), each Settling Performing Defendant and Owner Settling Defendant shall preserve and retain all non-identical copies of Records (including Records in electronic form) now in its possession or control or that come into its possession or control that relate in any manner to its liability under CERCLA with respect to the Site, provided, however, that Settling Performing Defendants and Owner Settling Defendant who are potentially liable as owners or operators of the Site must retain, in addition, all Records that relate to the liability of any other person under CERCLA with respect to the Site. Each Settling Performing Defendant and Owner Settling Defendant must also retain, and instruct its

contractors and agents to preserve, for the same period of time specified above all non-identical copies of the last draft or final version of any Records (including Records in electronic form) now in its possession or control or that come into its possession or control that relate in any manner to the performance of the Work, provided, however, that each Settling Performing Defendant (and its contractors and agents) and Owner Settling Defendant must retain, in addition, copies of all data generated during the performance of the Work and not contained in the aforementioned Records required to be retained. Each of the above record retention requirements shall apply regardless of any corporate retention policy to the contrary.

101. At the conclusion of this record retention period, Settling Performing Defendants and Owner Settling Defendant shall notify the United States at least 90 days prior to the destruction of any such Records, and, upon request by the United States, Settling Performing Defendants and Owner Settling Defendant shall deliver any such Records to EPA. Settling Performing Defendants and Owner Settling Defendant may assert that certain Records are privileged under the attorney-client privilege or any other privilege recognized by federal law. If Settling Performing Defendants and/or Owner Settling Defendant assert such a privilege, they shall provide Plaintiff with the following: (a) the title of the Record; (b) the date of the Record; (c) the name, title, affiliation (e.g., company or firm), and address of the author of the Record; (d) the name and title of each addressee and recipient; (e) a description of the subject of the Record; and (f) the privilege asserted by Settling Performing Defendants and/or Owner Settling Defendant. If a claim of privilege applies only to a portion of a Record, the Record shall be provided to the United States in redacted form to mask the privileged portion only. Settling Performing Defendants and Owner Settling Defendant shall retain all Records that they claim to be privileged until the United States has had a reasonable opportunity to dispute the privilege

claim and any such dispute has been resolved in the Settling Performing Defendants' and Owner Settling Defendant's favor. However, no Records created or generated pursuant to the requirements of this Consent Decree shall be withheld on the grounds that they are privileged or confidential.

102. Each Settling Defendant certifies individually that, to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed, or otherwise disposed of any Records (other than identical copies) relating to its potential liability regarding the Site since the earlier of notification of potential liability by the United States or the State or the filing of suit against it regarding the Site and that it has fully complied with any and all EPA requests for information regarding the Site pursuant to Sections 104(e) and 122(e) of CERCLA, 42 U.S.C. §§ 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. § 6927.

XXVI. NOTICES AND SUBMISSIONS

103. Whenever, under the terms of this Consent Decree, written notice is required to be given or a report or other document is required to be sent by one Party to another, it shall be directed to the individuals at the addresses specified below, unless those individuals or their successors give notice of a change to the other Parties in writing. All notices and submissions shall be considered effective upon receipt, unless otherwise provided. Written notice as specified in this Section shall constitute complete satisfaction of any written notice requirement of the Consent Decree with respect to the United States, EPA, the State, and Settling Defendants respectively. Notices required to be sent to EPA, and not to the United States, under the terms of this Consent Decree should not be sent to the U.S. Department of Justice.

As to the United States: Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
Attn: DOJ Case No. 90-11-3-07706

And Chief, Environmental Defense Section
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
Attn: DOJ Case No. 90-11-6-19228

As to EPA: Director, Superfund Division
United States Environmental Protection Agency, Region 5
77 West Jackson Blvd.
Chicago, Illinois 60604

Timothy Fischer (Mail Code SR-6J)
EPA Project Coordinator
U.S. Environmental Protection Agency, Region 5
77 West Jackson Blvd.
Chicago, Illinois 60604

Maria Gonzalez (Mail Code C-14J)
Associate Regional Counsel
U.S. Environmental Protection Agency, Region 5
77 West Jackson Blvd.
Chicago, Illinois 60604

and

As to the EPA Regional Resource Management Division Dale Meyer (Mail Code MF-10J)
Regional Comptroller
Resource Management Division
U.S. Environmental Protection Agency, Region 5
77 West Jackson Blvd.
Chicago, Illinois 60604

and

As to the State: Scott Glum
 Site Coordinator
 Ohio Environmental Protection Agency
 Southwest District Office
 Division of Environmental Response and
 Revitalization
 401 East Fifth Street
 Dayton, OH 45402-2911

and

As to Settling Susan M. Franzetti
Defendants: Nijman Franzetti, LLP
 10 S. LaSalle St., Suite 3600
 Chicago, IL 60603

XXVII. RETENTION OF JURISDICTION

104. This Court retains jurisdiction over both the subject matter of this Consent Decree and Settling Defendants for the duration of the performance of the terms and provisions of this Consent Decree for the purpose of enabling any of the Parties to apply to the Court at any time for such further order, direction, and relief as may be necessary or appropriate for the construction or modification of this Consent Decree, or to effectuate or enforce compliance with its terms, or to resolve disputes in accordance with Section XIX (Dispute Resolution).

XXVIII. APPENDICES

105. The following appendices are attached to and incorporated into this Consent Decree:

“Appendix A” is the ROD.

“Appendix B” is the SOW.

“Appendix C” are maps of the Lammers Barrel Factory Property.

“Appendix D” is the draft form of Proprietary Controls.

“Appendix E” contains the performance guarantee forms.

“Appendix F” is a list of Settling Performing Defendants.

“Appendix G” is a list of Settling Non-Performing Defendants and their payments.

XXIX. COMMUNITY INVOLVEMENT

106. If requested by EPA, Settling Performing Defendants shall participate in community involvement activities pursuant to the community involvement plan to be developed by EPA. EPA will determine the appropriate role for Settling Performing Defendants under the Plan. Settling Performing Defendants shall also cooperate with EPA in providing information regarding the Work to the public. As requested by EPA, Settling Performing Defendants shall participate in the preparation of such information for dissemination to the public and in public meetings that may be held or sponsored by EPA to explain activities at or relating to the Site.

107. Within 60 days after a request by EPA, Settling Performing Defendants also shall provide EPA with a Technical Assistance Plan (“TAP”) for arranging (at Settling Performing Defendants’ own expense, up to \$50,000) for a qualified community group: (a) to receive services from (an) independent technical advisor(s) who can help group members understand Site cleanup issues; and (b) to share this information with others in the community during the Work conducted pursuant to this Consent Decree. The TAP shall state that Settling Performing Defendants will provide and arrange for any additional assistance needed if the selected community group demonstrates such a need as provided in the SOW. Upon its approval by EPA, the TAP shall be incorporated into and enforceable under this Consent Decree.

108. Costs incurred by the United States under this Section, including the costs of any technical assistance grant under Section 117(e) of CERCLA, 42 U.S.C. § 9617(e), shall be

considered Future Response Costs that Settling Performing Defendants shall pay pursuant to Section XVI (Payments for Response Costs).

XXX. MODIFICATION

109. Except as provided in Paragraph 14 (Modification of SOW or Related Work Plans), material modifications to this Consent Decree, including the SOW, shall be in writing, signed by the United States and Settling Defendants, and shall be effective upon approval by the Court. Except as provided in Paragraph 14, non-material modifications to this Consent Decree, including the SOW, shall be in writing and shall be effective when signed by duly authorized representatives of the United States and Settling Defendants. A modification to the SOW shall be considered material if it fundamentally alters the basic features of the selected remedy within the meaning of 40 C.F.R. § 300.435(c)(2)(ii). Before providing its approval to any modification to the SOW, the United States will provide the State with a reasonable opportunity to review and comment on the proposed modification.

110. Modifications (non-material or material) that do not affect the obligations of or the protections afforded to the Settling Non-Performing Defendants may be executed without the signatures of the Settling Non-Performing Defendants.

111. Nothing in this Consent Decree shall be deemed to alter the Court's power to enforce, supervise, or approve modifications to this Consent Decree.

XXXI. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

112. This Consent Decree shall be lodged with the Court for a period of not less than 30 days for public notice and comment in accordance with Section 122(d)(2) of CERCLA, 42 U.S.C. § 9622(d)(2), and 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or

considerations that indicate that the Consent Decree is inappropriate, improper, or inadequate. Settling Defendants consent to the entry of this Consent Decree without further notice.

113. If for any reason the Court should decline to approve this Consent Decree in the form presented, this agreement is voidable at the sole discretion of any Party and the terms of the agreement may not be used as evidence in any litigation between the Parties.

XXXII. SIGNATORIES/SERVICE

114. Each undersigned representative of a Settling Defendant to this Consent Decree and the undersigned Deputy Chief of the Environment Enforcement Section of the Environment and Natural Resources Division of the Department of Justice certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind such Party to this document.

115. Each Settling Defendant agrees not to oppose entry of this Consent Decree by this Court or to challenge any provision of this Consent Decree unless the United States has notified Settling Defendants in writing that it no longer supports entry of the Consent Decree.

116. Each Settling Defendant shall identify, on the attached signature page, the name, address, and telephone number of an agent who is authorized to accept service of process by mail on behalf of that Party with respect to all matters arising under or relating to this Consent Decree. Settling Defendants agree to accept service in that manner and to waive the formal service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any applicable local rules of this Court, including, but not limited to, service of a summons. Settling Defendants need not file an answer to the complaint in this action unless or until the Court expressly declines to enter this Consent Decree.

XXXIII. FINAL JUDGMENT

117. This Consent Decree and its appendices constitute the final, complete, and exclusive agreement and understanding among the Parties regarding the settlement embodied in the Consent Decree. The Parties acknowledge that there are no representations, agreements, or understandings relating to the settlement other than those expressly contained in this Consent Decree.

118. Upon entry of this Consent Decree by the Court, this Consent Decree shall constitute a final judgment between and among the United States and Settling Defendants. The Court finds that there is no just reason for delay and therefore enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58.

SO ORDERED THIS 21st DAY OF April, 2014.



UNITED STATES DISTRICT JUDGE
Southern District of Ohio

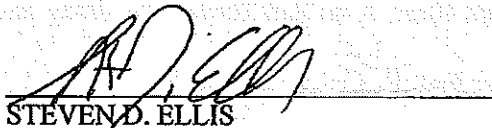
Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR THE UNITED STATES OF AMERICA:

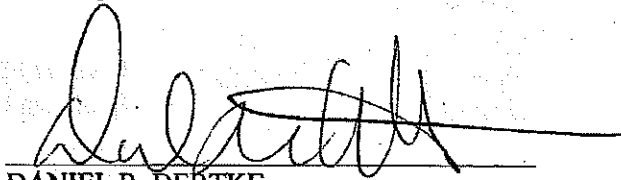
Jan 30, 2014
Date



THOMAS A. MARIANI
Deputy Chief
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
Washington, D.C. 20530



STEVEN D. ELLIS
Senior Counsel
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P. O. Box 7611
Washington, D.C. 20044-7611



DANIEL R. DERTKE
Senior Attorney
Environmental Defense Section
Environment and Natural Resources Division
U.S. Department of Justice
P. O. Box 7611
Washington, D.C. 20044-7611

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

CARTER M. STEWART

United States Attorney

Southern District of Ohio



MARGARET SCHUTTE

Bar No. 0078968

Assistant United States Attorney

Southern District of Ohio

200 West Second Street

Dayton, Ohio 45402

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

Date

7/31/2013


RICHARD C. KARL

fe Director, Superfund Division
U.S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd.
Chicago, Illinois 60604



MARIA GONZALEZ

Associate Regional Counsel
U.S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd.
Chicago, Illinois 60604

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR 3M Company
[Name of Settling Defendant (Please Print)]

June 13, 2013
Date

Signature: 

Name (print): Robert A. Paschke
Title: Manager, Corporate Environmental Program

Address: 3M Center
Bldg. 224-5W-17
St. Paul, MN 55144

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Nancy K. Peterson
Title: Partner
Address: 411 E. Wisconsin Ave.
Suite 2350
Milwaukee, WI 53202
Phone: 414-277-5515
Email: nancy.peterson@quarles.com

[NOTE: A separate signature page must be signed by each settler.]

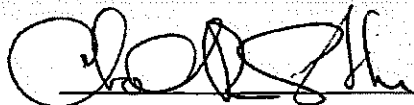
Signature Page for Consent Decree regarding the Lammers Barrel Superfund Site

FOR: Akzo Nobel Coatings Inc., successor-in-interest to Hanna Chemical Coatings Company and Reliance Universal, Inc.

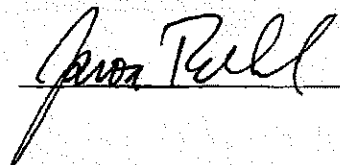
[Name of Settling Defendant (Please Print)]

Date July 3rd, 2013

Signature:



Signature:



Name (print):

Charles S. Scudder

Name (print):

Jason Pollack

Title:

Vice President & Secretary

Title:

Assistant Secretary

Address:

120 White Plains Rd
Suite 300
Tarrytown, NY 10591

Address:

120 White Plains Rd
Suite 300
Tarrytown, NY 10591

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

CT Corporation

Title:

Address:

111 Eighth Avenue
13th Floor

New York, NY 10011

Phone:

212-590-9245

Email:

[NOTE: A separate signature page must be signed by each settler.]

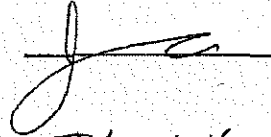
Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Alcoa Inc.

[Name of Settling Defendant (Please Print)]

JUNE 17, 2013
Date

Signature:



Name (print):

John A. Kenna

Title:

Vice President Tax

Address:

201 Isabella St.

Pittsburgh, PA

15212-5858

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

Karyllan Mack

Title:

Counsel

Address:

K&L Gates LLP

One Newark Center, 10th Fl

Newark, NJ

07102

Phone:

973-848-4043

Email:

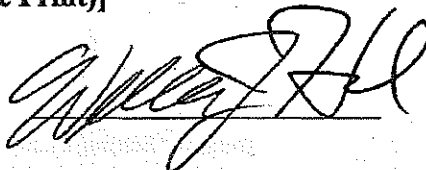
karyllan.mack@klgates.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Arkema Inc. (For M & T Chemicals, Inc.)
[Name of Settling Defendant (Please Print)]

June 12, 2013
Date

Signature: 

Name (Print): William J. Hamel

Title: Sr. Vice President, General Counsel

Address: 900 First Avenue
King of Prussia, PA 19406

Agent Authorized to Accept Services on behalf of Above-signed Party

Name (print): Corporation Service Company

Title: N/A

Address: 801 Adlai Stevenson Drive
Springfield, IL 62703

Phone: 800-858-5294

Email: N/A

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR ASHLAND, Inc.
[Name of Settling Defendant (Please Print)]

July 2, 2013
Date

Signature: R L Williams

Name (print): Richmond L. Williams
Chief Counsel

Title: Environmental Litigation

Address: 500 Hercules Road
Research Center
Wilmington, DE 19808

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Richmond L. Williams
Chief Counsel
Title: Environmental Litigation

Address: 500 Hercules Road
Research Center
Wilmington, DE 19808

Phone: 302-594-7020

Email: rwilliams@ashland.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR BP PRODUCTS NORTH AMERICA INC.
[Name of Settling Defendant (Please Print)]

June 18, 2013
Date

Signature: Cynthia D. Kezos

Name (print): Cynthia D. Kezos

Title: Strategy Manager

Address: 4 Centerpointe

LPR 2-232

La Palma, CA 90623

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Cynthia D. Kezos

Title: Strategy Manger

Address: 4 Centerpointe

LPR 2-232

La Palma, CA 90632

Phone: 714-228-6708

Email: cindy.kezos@bp.com

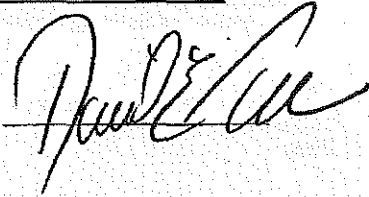
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR CLOPAY CORPORATION
[Name of Settling Defendant (Please Print)]

June 25, 2013
Date

Signature:



Name (print):

David E. Troller

Title:

Vice President, Secretary
and Chief Legal Counsel

Address:

8585 Duke Blvd.

Mason, OH 45040

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

David E. Troller

Title:

Vice President, Secretary
and Chief Legal Counsel

Address:

8585 Duke Blvd.

Mason, OH 45040

Phone:

513/770-3935

Email:

dtroller@clipay.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR COPELAND CORPORATION LLC
[Name of Settling Defendant (Please Print)]

June 21, 2013
Date

Signature:

Christine E. Carney

Name (print):

Christine E. Carney

Title:

Authorized Signatory

Address:

8000 West Florissant Avenue
St. Louis, MO
63136-8506

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

Stephen L. Clarke

Title:

Director Real Estate and Environmental Affairs

Address:

[Same as above]

Phone:

314-553-1953

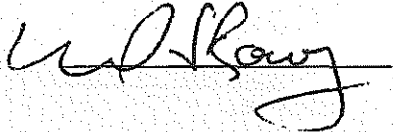
Email:

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree regarding the Lammers Barrel Superfund Site

FOR Crown Beverage Packaging, LLC (on Behalf of Continental Can Company)
[Name of Settling Defendant (Please Print)]

JUNE 11, 2013
Date

Signature: 

Name (print): Michael J. Rowley

Title: Assistant General Counsel

Address: Crown Beverage Packaging, LLC
One Crown Way
Philadelphia, PA 19154

Agent Authorized to Accept Service
on behalf of Above-signed Party:

Name (print): Robert P. Harris

Title: Attorney

Address: 180 N. Michigan Ave.
Suite 2105
Chicago, IL 60601

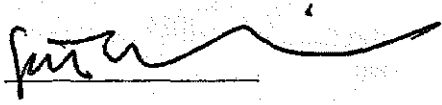
Phone: 312-236-7587

Email: rpharrislaw@aol.com

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR C. P. INC.
[Name of Settling Defendant (Please Print)]

JUNE 10, 2013
Date

Signature: 

Name (print): SCOTT FINDLEY

Title: VICE PRESIDENT

Address: C. P. INC.
Box 1049 South 2nd & Water St.
Connersville, IN 47331

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): E. SEAN GRIGGS

Title: LEGAL COUNSEL

Address: Barnes & Thornburg LLP
11 So. Meridian St
Indianapolis, IN
46204

Phone: (317) 231-7793


Email: sgriggs@btlaw.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR CUMMINS INC.
[Name of Settling Defendant (Please Print)]

June 10, 2013
Date

Signature: 
Name (print): Natalie J. Stuckey
Title: Senior Counsel
Address: One American Square
Suite 1800
Indianapolis, IN 46282

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Natalie J. Stuckey
Title: Senior Counsel
Address: One American Square
Suite 1800
Indianapolis IN
46282
Phone: (317) 610-2462
Email: natalie.stuckey@cummins.com

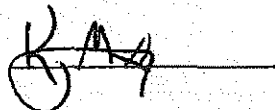
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR EGYPTIAN LACQUER MFG. CO., INC.
[Name of Settling Defendant (Please Print)]

JUNE 18, 2013
Date

Signature:



Name (print):

KERRY MATTOX

Title:

PRESIDENT

Address:

113 FORT GRANGER DR
FRANKLIN, TN 37064

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

WILLIAM L PENNY

Title:

ATTORNEY FOR ELMCO

Address:

STATES & HARDISON PLLC
401 COMMERCE ST
SUITE 800
NASHVILLE, TN 37219

Phone:

615-782-2308

Email:

WILLIAM.PENNY@STATES.COM

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Ford Motor Company
[Name of Settling Defendant (Please Print)]

June 18, 2013
Date

Signature: 

Name (print): Louis J. Ghilardi

Title: Assistant Secretary

Address: FORD MOTOR COMPANY
ONE AMERICAN ROAD
DEARBORN, MI 48126

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): CT Corporation

Title: _____

Address: 1300 E. 9th St.
Cleveland, OH 44114

Phone: 216-802-2121

Email: _____

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR GATX Corporation
[Name of Settling Defendant (Please Print)]

July 1, 2013
Date

Signature: Marland O. Webb

Name (print): Marland O. Webb

Title: Assistant General Counsel

Address: GATX Corporation
222 W. Adams
Chicago IL 60606

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): The Prentice-Hall Corporation
System, Inc.

Title: _____

Address: 50 West Broad Street
Suite 1800
Columbus, OH 43215

Phone: (800) 877-2556

Email: info@cscinfo.com

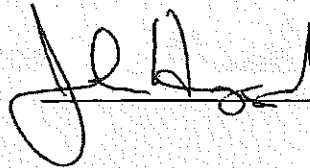
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR General Electric Company
[Name of Settling Defendant (Please Print)]

June 10, 2013
Date

Signature:



Name (print):

John G. Haggard

Title:

Executive Director

Address:

319 Great Oaks Blvd.
Albany, NY 12203

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

Steven Meier

Title:

Project Manager

Address:

319 Great Oaks Blvd.
Albany, NY 12203

Phone:

518-862-2711

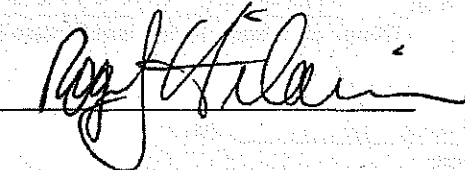
Email:

Steven.meier@ge.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Georgia-Pacific LLC
[Name of Settling Defendant (Please Print)]

June 25, 2013 Signature: 
Date

Name (print): Roger J. Hilarides

Title: Senior Vice President-Compliance & Ethics

Address: 133 Peachtree Street, NE

Atlanta, GA 30303

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Alison J. Lathrop

Title: Senior Counsel – Environmental

Address: 133 Peachtree Street, NE

Atlanta, GA 30303

Phone: 404-652-4532

Email: Alison.lathrop@gapac.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR The Goodyear Tire & Rubber Company
[Name of Settling Defendant (Please Print)]

June 28, 2013
Date

Signature: Donald E. Stanley

Name (print): Donald E. Stanley

Title: V.P., Prod. Qual. & Plant Tech.

Address: 200 Innovation Way
Akron, OH 44316

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Steven C. Bardenkircher

Title: Senior Legal Counsel

Address: The Goodyear Tire & Rubber Co.
200 Innovation Way
Akron, OH 44316

Phone: 330-796-6738

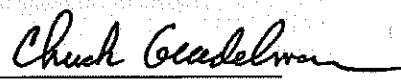
Email: steven.bardenkircher@goodyear.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Honeywell International Inc.
[Name of Settling Defendant (Please Print)]

7/12/2013, 2013
Date

Signature: 

Name (print): Chuck Geadelmann

Title: Corporate Remediation Manager

Address: 1985 Douglas Drive N, MN10-132B
Golden Valley, MN 55422

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Brett E Marston

Title: Counsel for Honeywell International Inc.

Address: Arnold & Porter LLP
555 Twelfth St. NW
Washington DC 2004-1206

Phone: 202-942-6836

Email: brett.marston@aporter.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Illinois Tool Works Inc.
[Name of Settling Defendant (Please Print)]

July 2nd, 2013
Date

Signature: 

Name (print): Christopher A. O'Herlihy

Title: Executive Vice President

Address: Illinois Tool Works inc.
3600 West Lake Avenue
Glenview, IL 60026

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Ken Brown, CHMM

Title: Manager of Env. & Chem. Compliance

Address: Illinois Tool Works Inc.
3600 West Lake Avenue
Glenview, IL 60026

Phone: 847-657-4843

Email: kbrown@itw.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR International Paper Company
[Name of Settling Defendant (Please Print)]

7/8, 2013
Date

Signature: Brian E. Heim

Name (print): Brian E. Heim

Title: Chief Counsel

Address: 6400 Poplar Ave
Memphis, TN
38197

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Brian E. Heim

Title: Chief Counsel, Environment

Address: 6400 Poplar Ave
Memphis, TN
38197

Phone: 901-419-3824

Email: brian.heim@ipaper.com

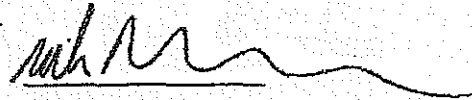
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR I.V.C. Industrial Coatings, Inc.
[Name of Settling Defendant (Please Print)]

July 3, 2013
Date

Signature:



Name (print):

Michael S. McCracken

Title:

President

Address:

I.V.C. Industrial Coatings, Inc.
2831 East Industrial Park Drive
Brazil, IN 47834

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

Philip B. McKiernan

Title:

Attorney

Address:

Hackman Hulett & Cracraft, LLP
111 Monument Circle
Suite 3500
Indianapolis, IN 46204

Phone:

317-636-5401

Email:

PMcKiernan@hhclaw.com

[NOTE: A separate signature page must be signed by each settler.]

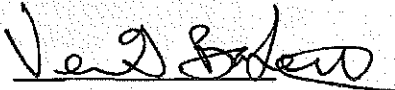
Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

Meritor, Inc., for itself and on behalf of its current and former affiliates and predecessors and their affiliates and predecessors including, without limitation, the entities designated by U.S. EPA as "Arvin Industries" and "Roll Coater" that did business at various times under the following names:

FOR ArvinMeritor, Inc.; Arvin Industries, Inc.; and Roll Coater, Inc.

[Name of Settling Defendant (Please Print)]

7-3, 2013
Date

Signature: 

Name (print): Vernon G. Baker, II
Title: Senior Vice President and General Counsel

Address: 2135 W. Maple Rd.
Troy, MI 48084

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): CT Corporation
Title: _____
Address: 1300 East 9th Street
Cleveland, OH 44114
Phone: 614-621-1919
Email: _____

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Momentive Specialty Chemicals Inc.
[Name of Settling Defendant (Please Print)]

June 11, 2013
Date

Signature: K E Koster

Name (print): Karen E Koster

Title: Executive Vice-President - EHS

Address: 180 E. Broad St.
Columbus, OH 43215

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Stephanie S. Couhig

Title: Senior EHS Counsel

Address: 180 E. Broad St.
Columbus, OH 43215

Phone: (614) 225-3369

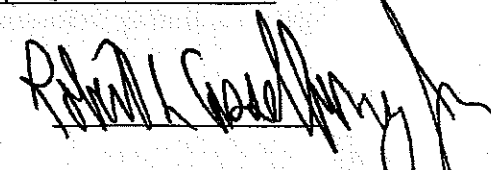
Email: stephanie.couhig@momentive.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR MORTON INTERNATIONAL, LLC
[Name of Settling Defendant (Please Print)]

JUNE 26, 2013
Date

Signature: 
Name (print): ROBERT L CASSELBERRY JR
Title: AUTHORIZED REPRESENTATIVE
Address: 3100 STATE ROAD
CROYDON, PA 19021

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): CT CORPORATION
Title: _____
Address: 150 WEST MARKET ST.
SUITE 200
INDIANAPOLIS, IN 46204
Phone: 317-352-3500
Email: _____

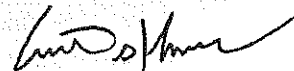
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree regarding the Lammers Barrel Superfund Site

FOR Navistar, Inc. on behalf of Navistar International Corp. f/k/a International Harvester

July 2, 2013
Date

Signature:



Name (print):

Curt Kramer

Title:

Associate General Counsel

Address:

2701 Navistar Drive

Lisle, IL 60532

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

Christopher P. Perzan

Title:

Senior Counsel

Address:

2701 Navistar Drive

Lisle, IL 60532

Phone:

3313323524

Email:

chris.perzan@navistar.com

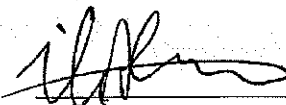
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR OXY USA Inc.

[Name of Settling Defendant (Please Print)]

6-7, 2013
Date

Signature: 

Name (print): Mike Anderson

Title: Vice President

Address: Glenn Springs Holdings, Inc.
5005 LBJ Freeway, Suite 1350
Dallas, Texas 75244

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Frank A. Parigi

Title: General Counsel

Address: Glenn Springs Holdings, Inc.
5005 LBJ Freeway, Suite 1350
Dallas, Texas 75244

Phone: (972) 687-7503

Email: Frank_Parigi@oxy.com

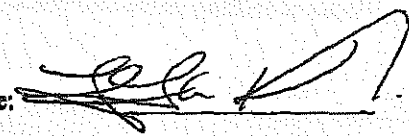
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR PHARMACIA LLC
[Name of Settling Defendant (Please Print)]

WMS

June 10, 2013
Date

Signature: 

Name (print): L. Glen Kurowski

Title: Director, Environmental Affairs

Address: Monsanto Company, Attorney-in-Fact
for Pharmacia LLC
800 N. Lindbergh Blvd, LC1B
St. Louis, MO 63167

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print): Randy J. White

Title: Environmental Manager

Address: Monsanto Company
800 N. Lindbergh Blvd, LC1B
St. Louis, MO 63167

Phone: 314-694-4722

Email: randy.j.white@monsanto.com

[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR PPG Industries, Inc.
[Name of Settling Defendant (Please Print)]

July 9, 2013
Date

Signature:



Name (print):

Diane M. Kappas

Title:

Vice President EHS

Address:

One PPG Place
Pittsburgh, PA 15272

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

Steven F. Faeth

Title:

Corporate Counsel EHS

Address:

One PPG Place
Pittsburgh, PA 15272

Phone:

412.434.3799

Email:

sfaeth@ppg.com

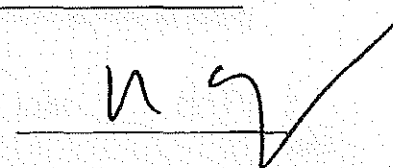
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Robbins & Myers, Inc.
[Name of Settling Defendant (Please Print)]

June 7, 2013
Date

Signature:



Name (print):

Raymond W. Chang

Title:

VP, Assistant General Counsel & Assistant Corporate Secretary

Address:

7909 Parkwood Circle
Houston, Texas
77036

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

Raymond W. Chang

Title:

VP, Assistant General Counsel & Assistant Corporate Secretary

Address:

7909 Parkwood Circle
Houston, Texas
77036

Phone:

713-346-7607

Email:

Raymond.Chang@nov.com

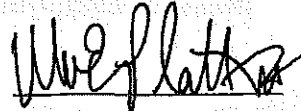
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Shell Oil Company
[Name of Settling Defendant (Please Print)]

6-17-13, 2013
Date

Signature:



Name (print):

William E. Platt III

Title:

Senior Manager, Discontinued
Operations, Downstream US and Canada

Address:

Shell Oil Products US
One Shell Plaza, St. 2974
910 Louisiana Street
Houston, Texas 77002

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

CT Corporation System

Title:

Address:

1300 E. 9th Street
Cleveland, OH 44114

Phone:

216-802-2121

Email:

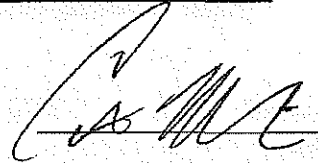
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR The Sherwin-Williams Company
[Name of Settling Defendant (Please Print)]

June 17, 2013
Date

Signature:



Name (print):

Catherine M. Kilbane

Title:

Exec VP Sr. Sec & Gen Counsel

Address:

101 Prospect Avenue

Cleveland, Ohio 44115

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

Allen J. Danzig

Title:

Associate Gen Counsel-Environmental

Address:

101 Prospect Avenue

Cleveland, Ohio 44115

Phone:

(216) 566-2482

Email:

allen.j.danzig@sherwin.com

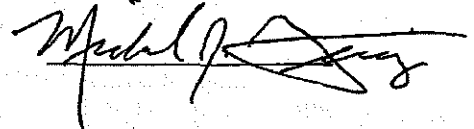
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Thomas + Betts Corp., as successor to Lamson + Sessions Co., a s
[Name of Settling Defendant (Please Print)] successor to Angell Manufacturing

June 14, 2013
Date

Signature:



Name (print):

Michael J. Geiger

Title:

Assistant General Counsel

Address:

Thomas + Betts Corp
8155 T+B Blvd
Memphis, TN 38125

Agent Authorized to Accept Service on behalf of Above-signed Party

Name (print):

Michael J. Geiger

Title:

Assistant General Counsel

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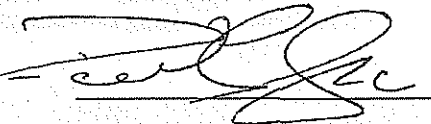
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[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

United States Steel Corporation and its subsidiaries for _____
FOR USS Chemicals Division Lincoln Molded Plastics
[Name of Settling Defendant (Please Print)]

June 12, 2013
Date

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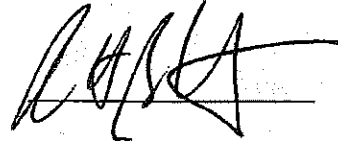
[NOTE: A separate signature page must be signed by each settler.]

Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

United Technologies Corporation on behalf of Lear Corporation
FOR Automotive Systems, f/k/a Sheller-Globe Corporation
[Name of Settling Defendant (Please Print)]

June 26, 2013
Date

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Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Univar USA Inc.

[Name of Settling Defendant (Please Print)]

June 11, 2013
Date

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Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR The Valspar Corporation
[Name of Settling Defendant (Please Print)]

July 3, 2013
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Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR Whittaker Corporation

[Name of Settling Defendant (Please Print)]

July 8, 2013
Date

Signature: 

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Signature Page for Consent Decree Regarding the Lammers Barrel Superfund Site

FOR HELEN GORBY
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7-18, 2013
Date

Signature: Helen Gorby

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[NOTE: A separate signature page must be signed by each settler.]

United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Appendix A

Record of Decision

Appendix A
To Consent Decree, *United States v. 3M Company,*
et al.(S.D. Ohio)
Record of Decision

Lammers Barrel Superfund Site

Operable Unit 1

Beavercreek, Greene County, Ohio

Record of Decision



U.S. Environmental Protection Agency Region 5

77 W Jackson Blvd
Chicago, IL 60604

September 2011

Table of Contents

Section	Page
Part 1 – Declaration	
1.1 Site Name and Location	3
1.2 Statement of Basis and Purpose	3
1.3 Assessment of Site	3
1.4 Description of Selected Remedy	3
1.5 Statutory Determinations	4
1.6 Data Certification Checklist	4
1.7 Authorizing Signatures	5
Part 2 – Decision Summary	
2.1 Site Name, Location, and Brief Description	6
2.2 Site History and Enforcement Activities	7
2.3 Community Participation	8
2.4 Scope and Role of Operable Unit or Response Action	8
2.5 Site Characteristics	8
2.6 Current and Potential Future Site and Resource Uses	12
2.7 Summary of Site Risks	12
2.8 Remedial Action Objectives	15
2.9 Description of Alternatives	17
2.10 Comparative Analysis of Alternatives	23
2.11 Principal Threat Waste	33
2.12 Selected Remedy	34
2.13 Statutory Determinations	36
2.14 Documentation of Significant Changes	38
Part 3 – Responsiveness Summary	
3.1 Stakeholder Comments and Lead Agency Responses	39
3.2 Technical and Legal Issues	40
Attachments	
Attachment 1 – Site Base Map with RI Sample Locations	
Attachment 2 – Extent of Proposed Soil Excavation or Treatment Areas	
Attachment 3 – Extent of Engineered Impermeable Cover System	
Attachment 4 – Detailed Cost Estimate for RA-4	
Attachment 5 – Risk Tables	
Attachment 6 – List of ARARs for Selected Remedy	
Attachment 7 – Concurrence Letter from the State of Ohio	

Part 1 – Declaration

1.1 – Site Name and Location

Lammers Barrel Factory Site
CERCLIS ID# OHD981537582
Beavercreek, Greene County, Ohio

1.2 – Statement of Basis and Purpose

This decision document presents the Selected Remedy for Operable Unit 1 (OU1) at the Lammers Barrel Site in Beavercreek, Greene County, Ohio, which was chosen in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the NCP. This decision is based on the Administrative Record file for this site.

The State of Ohio concurs with the Selected Remedy.

1.3 - Assessment of Site

The response action selected in this *Record of Decision* is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 - Description of Selected Remedy

The Environmental Protection Agency's Selected Remedy for Operable Unit 1 at the Lammers Barrel Site consists of:

- Institutional Controls in accordance with the Ohio Uniform Environmental Covenant Act to prohibit residential use of the Lammers Barrel site property and to prohibit the installation of potable wells on the Lammers Barrel property until all groundwater cleanup standards have been achieved.
- In-Situ Biological Treatment of impacted soils using soil mixing to treat principal threat wastes, including chlorinated volatile organic compounds and BTEX, at the Lammers Barrel Site.
- In-Situ Groundwater Treatment using Enhanced Reductive Dechlorination to address contaminated groundwater under the Lammers Barrel Site.

This Selected Remedy will be the first of two remedial decisions and remedial actions for the Lammers Barrel Site. An ongoing off-property groundwater investigation is being conducted to address Operable Unit 2 (OU2), which consists of the off-property groundwater plume to the east of the site. When that investigation is complete, a

Feasibility Study, Proposed Plan and Record of Decision will be developed to select a final remedy for OU2.

1.5 - Statutory Determinations

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action (unless justified by a waiver), is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 – Data Certification Checklist


The following information is included in the *Decision Summary* section of this *Record of Decision*. Additional information can be found in the Administrative Record file for this site.

Information Item	Page Numbers in Record of Decision
Chemicals of concern and their respective concentrations	10-12, 14, 33 and 34
Baseline risk represented by the chemicals of concern	12-15, Attachment 5
Cleanup levels established for chemicals of concern and the basis for these levels	15-17, 34-37
How source materials constituting principal threats are addressed	33-34
Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater use in the baseline risk assessment and the <i>Record of Decision</i>	12-17

<p>Potential land and groundwater use that will be available at the site as a result of the Selected Remedy</p>	<p>15-17, 34-36</p>
<p>Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected</p>	<p>20-21, 30, 36-37, Attachment 4</p>
<p>Key factor(s) that led to selecting the remedy (that is, describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision)</p>	<p>24-31</p>

1.7 - Authorizing Signatures

The U.S. Environmental Protection Agency (EPA), as the Lead Agency for the Lammers Barrel Superfund Site (OHD981537582) formally authorizes this *Record of Decision*.


 Richard C. Karl, Director
 Superfund Division
 EPA Region 5

9.27.11
 Date

The State of Ohio Environmental Protection Agency (OEPA), as the Supporting Agency for the Lammers Barrel Superfund Site (OHD981537582), formally concurs with this *Record of Decision*. OEPA has prepared a separate concurrence letter, which is attached to the *Record of Decision* as **Attachment 7**.

Part 2 – Decision Summary

2.1 - Site Name, Location, and Brief Description

The Lammers Barrel Site (OHD981537582) (Site) occupies approximately 2.5 acres at the northeast corner of the intersection of Grange Hall and East Patterson Roads, in the City of Beavercreek, Greene County, Ohio. The Site is zoned for industrial use and is located in a mixed urban, commercial, industrial, and residential area. The property is bordered on the north by an abandoned railroad right-of-way and several industrial facilities. The Site is bordered on the west by Grange Hall Road, and on the south by East Patterson Road. Further to the south are a gas station, an automotive repair facility, and a residential area (Woodhaven Subdivision). To the southeast is a strip mall (Woodhaven Shopping Center). To the east, the Site is bordered by a parking lot and property owned by the Fraternal Order of Eagles (FOE). The nearest residences to the Site are located approximately 400 feet to the east and southeast. Little Beaver Creek flows from west to east across the Site. The Montgomery County Eastern Regional Wastewater Treatment Plant (WWTP), a wastewater treatment plant with a design flow of approximately 13 million gallons per day, is located approximately 1 mile upstream and discharges directly to Little Beaver Creek. The WWTP discharges an average of 8.5 million gallons per day of treated wastewater and comprises approximately 90 percent of the total flow of Little Beaver Creek in the summer months.

The aquifer beneath the site is designated as a Sole Source Aquifer because it is the principal source of drinking water for the population in the region. Several properties in the area are also on public water supply. These properties include nine residential properties which the EPA connected to an 8-inch diameter water main along East Patterson Road in January 1986 and four additional area residential properties that EPA connected to that same water main in February 2000. The public water supply to which these thirteen residences are connected also draws its drinking water from the Sole Source Aquifer. The south Beavercreek well field is located approximately 2.75 miles east/southeast of the Site, and supplies approximately one million gallons of water per day. The north Beavercreek well field is located approximately 3.25 miles east of the Site, and supplies two million gallons of water per day. Both well fields operate to provide water to the residents of Greene County.

EPA is serving as the lead agency for all environmental response actions taken at the site by the Lammers Barrel Site Group (LBSG), the group of potentially responsible parties (PRPs) who undertook the Remedial Investigation and Feasibility Study at the Site. The Ohio Environmental Protection Agency (OEPA) is serving as the support agency for Site activities. It is anticipated that the Selected Remedy will be implemented by the LBSG as well.

2.2 - Site History and Enforcement Activities

The Lammers Barrel Site is the former location of the Dayton-Xenia Railway Company, the Moran Paint Company, the Dayton Oil Company, Lammers Barrel, and the Kohnen and Lammers Chemical Company. The Dayton-Xenia Railway Company owned the Site property from 1926 to 1944. During that time, they operated a railroad car maintenance and repair facility at the Site. The repair facility included an underground maintenance bay beneath the service tracks where repairs could be made to the undercarriages of the cars.

The Moran Paint Company operated at the Site from 1948 to 1952. The company reportedly manufactured paint, lacquers, paint removers and esterified tall oil at the Site.¹ Subsequently, the Dayton Oil Company conducted operations at the Site beginning in 1952, following the closure of the Moran Paint Company.

A solvent recovery facility and a barrel reconditioning facility operated at the Site from 1953 until 1969 under various company names (e.g., Kohnen Lammers, Inc., Lammers Barrel). Chemicals, including chlorinated volatile organic compounds (CVOCs) and aromatic hydrocarbons, were stored in aboveground storage tanks at the Site. Historical aerial photographs indicate that operations, including chemical storage, were conducted on both the northern and southern portions of the Site.

The solvent recovery facility was destroyed in a fire that began on September 30, 1969. The quantity and specific chemicals released during the fire are unknown. Site restoration activities completed after the fire reportedly included debris removal and placement of an unspecified depth of cover material.

In 1985, contamination was discovered in area residential drinking water wells when the OEPA was conducting groundwater sampling in the region. As a result of these findings, nine residences were connected to an existing water main along East Patterson Road in January 1986. An additional four homes were connected to the County water supply in February 2000, due to well contaminaton. In September 2002, EPA published a notice in the Federal Register proposing that the Lammers Barrel site be added to the National Priorities List (NPL). A year later, the proposal was finalized and Lammers Barrel became an EPA Superfund Site.

EPA signed an Administrative Order on Consent in 2002, which required a group of 21 PRPs to conduct a Remedial Investigation (RI) and a Feasibility Study (FS) for the Site. In 2008, the Order was amended to include an additional 20 PRPs, to bring the total to 41 PRPs. RI sampling was conducted at the Site from the spring of 2003 to the spring of 2004. In addition, a supplemental investigation and Early Action Pilot Test (EAPT) was

¹ The Moran Paint Company was also a customer of the subsequent solvent recovery facility that operated at the site under the Kohnen Lammers name.

conducted at the site from 2004 to 2006. The RI Report was completed and approved by EPA in the fall of 2008. The FS Report was approved by EPA in June 2011.

2.3 – Community Participation Activities

The RI/FS Report and the Proposed Plan for the Lammers Barrel Site were made available to the public in early July 2011. They can be found in the Administrative Record File and in the information repository maintained at the EPA Docket Room in Region 5 and the Beavercreek Community Library. The notice of the availability of these two documents was published in the *Beavercreek News-Current* on July 6, 2011 and in the *Dayton Daily News* on July 10, 2011. A public comment period was held from July 1 to August 5, 2011. In addition, a public meeting was held on July 14, 2011 to present the Proposed Plan to a broader community audience than those that had already been involved at the site. At this meeting, representatives from EPA and OEPA answered questions about problems at the site and the remedial alternatives. EPA's response to the comments received during this period is included in the *Responsiveness Summary*, which is part of this *Record of Decision*.

2.4 - Scope and Role of Operable Unit or Response Action

As with many Superfund Sites, the problems at the Lammers Barrel Site are complex. As a result, EPA has organized the work into two Operable Units (OUs).

- Operable Unit 1 – The Lammers Barrel property, including all soil and groundwater contamination within the property boundary.
- Operable Unit 2 – The Lammers Barrel off-property groundwater plume that has migrated away from the property to the east.

This Record of Decision describes the Selected Remedy for OU1, which will be the first of two remedial decisions and remedial actions for the Lammers Barrel Site. An ongoing off-property groundwater investigation is being conducted to address OU2. When that investigation is complete in a few years, a Feasibility Study, Proposed Plan and Record of Decision will be developed to select a final remedy for OU2.

The Selected Remedy for OU1 will address the principal threats at the site by treating the contaminated soil at the site that serves as an ongoing source to groundwater contamination in OU1 and OU2.

2.5 – Site Characteristics

The site is 2.5 acres in size and is divided by the Little Beaver Creek, which flows west to east across the site. This divides the site into a northern portion and a southern portion. The significant findings and conclusions from the site characterization activities completed during the RI are summarized below. Additional detail about site characteristics is provided in the Final RI Report (ARCADIS, 2005) and the RI Report

Addendum (ARCADIS, 2008). An overall base map of the Site is shown in Attachment 1 (Figure 2).

Geologic/Hydrogeologic Setting

The uppermost soils at the Site are low permeability silts and clays, known as the Upper Till Unit. The thickness of the Upper Till Unit is variable, ranging from about 15 feet thick in the northern portion of the Site to 30 feet thick south of Little Beaver Creek. Permeable deposits of sand and gravel exist within portions of the Upper Till Unit and are present beneath it.

The RI identified two groundwater zones that have been characterized in the study area, a shallow perched groundwater zone and the area-wide upper aquifer (as described below – the perched zone exists in the unsaturated zone south of Little Beaver Creek and is separated from the upper aquifer, which is the saturated zone):

- The Upper Till Unit (unsaturated zone) contains a perched groundwater zone ranging from 2 feet to 10 feet in thickness south of Little Beaver Creek. The perched groundwater zone extends off-property in a southerly direction but ends at a point further to the south. The perched groundwater zone is also present east of the Site. There is not a prominent perched groundwater zone north of Little Beaver Creek.
- The primary water-bearing unit at the Site is the upper aquifer (saturated zone) which averages about 30 feet in thickness and is located at a depth of 13-18 feet below land surface (ft bls) north of Little Beaver Creek and at approximately 30 ft bls south of Little Beaver Creek. The upper aquifer is underlain by a Lower Till Unit comprised of low-permeability silts and clays. The perched groundwater zone and upper aquifer merge to form one hydrogeologic unit (the upper aquifer) to the east/southeast of the Site. Private water supply wells in the area are screened within the upper aquifer downgradient of the Site.
- The direction of groundwater flow in the upper aquifer is to the southeast north of Little Beaver Creek and in an eastward direction south of the creek. Further east of the Site, the direction of flow in the upper aquifer becomes more northerly. The direction of groundwater flow in the perched zone is south-southeast.

Groundwater levels in the upper aquifer north of, and near, Little Beaver Creek are slightly higher than surface water levels in Little Beaver Creek. However, since the creek is underlain by low-permeability silts and clays, the hydraulic connection between the upper aquifer north of the creek and the creek is poor. On the south side of Little Beaver Creek, groundwater levels in the perched groundwater zone are lower than water levels in

the creek; however, the low-permeability soils underlying Little Beaver Creek minimize recharge from the creek into the perched zone.

Soil Investigation Results

Soil contamination was characterized through the analysis of 27 onsite soil samples. In general, samples were collected from a shallow depth (0 to 2 feet below land surface), an intermediate depth (between 2 and 10 feet below land surface) and from a deep location, immediately above the uppermost saturated zone.

The results of soil sampling completed during the RI have indicated two primary areas of the Site where residual concentrations of volatile organic compounds (VOCs) are present. These two areas are both former chemical storage areas and are located north and south of Little Beaver Creek. The distribution of residual concentrations of VOCs in soil is predominantly in the central and eastern portions of the site on both sides of Little Beaver Creek.

A summary of the RI findings for soil is presented below. The locations of the soil borings and monitoring well locations referenced in the following summary are shown in Attachment 1 (Figure 2).

- In *shallow* soils north of Little Beaver Creek, VOCs were detected at low concentrations at all of the sampling locations and semi-volatile organic compounds (SVOCs) were detected at low concentrations at four of the five sampling locations. Detections of pesticides, polychlorinated biphenyls (PCBs) and metals were also generally low.
- In *subsurface* soils north of Little Beaver Creek, benzene, toluene, ethylbenzene, and xylenes (BTEX) and chlorinated volatile organic compounds (CVOCs) were detected at elevated concentrations in wells AMW-5D and AMW-2D. SVOCs were generally detected at low concentrations except at BH-01. Detections of pesticides, PCBs and metals were generally low.
- In *shallow* soils south of Little Beaver Creek, concentrations of BTEX were elevated at AMW-4S, BH-02 and BH-04. CVOCs were detected at several shallow soil sample locations including BH-02, AMW-4S, AMW-6D, and BH-04. SVOCs were detected with the highest detections at AMW-3D and AMW-4S.
- In *subsurface* soils south of Little Beaver Creek, BTEX was detected in each of the six subsurface soil samples with the highest detections at AMW-7D, BH-02, AMW-4S, and AMW-3D. CVOCs were also detected in subsurface soil samples at all six locations with the highest concentrations detected at AMW-7D, BH-02 and AMW-4S.

It is anticipated that contamination in soil at the Site will continue to serve as a source of groundwater contamination unless some remedial action is taken to eliminate this source.

Groundwater Investigation Results

A summary of the RI findings for groundwater is presented below. In general, the data collected during the RI show that VOC concentrations onsite are generally much greater within the perched groundwater zone than in the underlying upper aquifer because groundwater in the perched zone is closer to the potential points of chemical release at the Site. The locations of the monitoring wells referenced in the summary are shown in Attachment 1 (Figure 2).

- Groundwater in the upper aquifer north of Little Beaver Creek is minimally impacted. The impacts to the upper aquifer are primarily confined to the Monitoring Well AMW-2S area. At this location, groundwater samples contained elevated concentrations of BTEX, naphthalene, and arsenic. Groundwater samples in Monitoring Wells MW-2 and AMW-2D located short distances northwest and southeast of Monitoring Well AMW-2S contained little to none of these constituents.
- BTEX was not detected in groundwater onsite in the upper aquifer south of Little Beaver Creek. CVOCs were detected in groundwater sampled from Monitoring Well AMW-7D which contained elevated concentrations of Trichloroethylene (TCE) and its degradation product cis-1,2-Dichloroethene (DCE). SVOCs, pesticides, PCBs, and cyanide were not detected above their detection levels.
- Groundwater in the perched zone, south of the creek, contained elevated concentrations of VOCs. The highest concentrations of BTEX were detected in groundwater sampled from Observation Well OW-3 and Monitoring Wells AMW-4S and AMW-7S. The highest CVOCs detected include: 1,1,1-Trichloroethane (TCA); cis-1,2-DCE; 1,1,2,2- TCA; 1,1-Dichloroethane (DCA); and Vinyl Chloride (VC).
- Elevated concentrations of arsenic were detected in groundwater samples collected from wells near the southern property line. SVOCs, PCBs and pesticides were generally not detected. It appears that the arsenic is a result of groundwater chemistry changes due to anaerobic reductive dechlorination caused by the presence of BTEX and the implementation of the ERD pilot test conducted in 2005-2006. A reducing environment can sometimes cause naturally-occurring arsenic, iron and manganese to be mobilized into groundwater. The elevated levels tend to dissipate very quickly just downgradient of the Site due to precipitation in a more oxygenated environment.

- Evaluation of the biogeochemical data indicates that conditions in the perched zone and upper aquifer are favorable for continued anaerobic biodegradation of BTEX and CVOCs. The presence of reducing conditions favorable for anaerobic biodegradation is further supported by the presence of CVOC daughter products and the non-toxic end products ethane and ethene. CVOC degradation products such as cis-1,2-DCE, 1,1-DCA, chloroform, VC, ethene, and ethane have also been detected in onsite monitoring wells, indicating that natural attenuation processes, likely dominated by biodegradation, are occurring at the site.

2.6 – Current and Potential Future Land and Resource Uses

The Site is currently a vacant lot enclosed by fencing to restrict access to the site. According to the zoning board of Beavercreek, Ohio, the Site is zoned for commercial/industrial usage. Therefore, this is the reasonably anticipated future land use for the Site itself. In 2009, EPA conducted a reuse assessment for the Lammers Barrel property. The assessment, which included interviews and consultation with Beavercreek zoning and planning officials and the Site owners, evaluated potential uses of the property as a commercial site, an industrial facility, and a “pocket park” connected to the existing bike trail running alongside the Site. The resulting report is available in the information repository for the Site. In any event, institutional controls will be required as part of the Selected Remedy for the Site which will prohibit residential use of the Site in the future.

The groundwater at the Site is not currently used and there are no potable wells installed on the property. The groundwater under the Site has been federally designated as a Sole Source Aquifer, therefore the future use of groundwater will be as a potential drinking water source for the community once safe cleanup levels have been achieved. Institutional controls will be required as part of the Selected Remedy that prohibit the installation of potable wells on the Lammers Barrel property until groundwater cleanup objectives have been achieved in approximately five years.

2.7 – Summary of Site Risks

Human Health Risk

A baseline Human Health Risk Assessment (HHRA) was completed for the Site that evaluated the potential risks and hazards associated with exposure to Site-related COPCs. The baseline risk assessment estimates what risks the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessment for this site.

For carcinogens, risks are generally expressed as the incremental probability of an individual’s developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$\text{Risk} = \text{CDI} \times \text{SF}$$

where:

Risk = a unitless probability (e.g., 2×10^{-5}) of an individual's developing cancer

CDI = chronic daily intake averaged over 70 years (mg/kg-day)

SF = slope factor, expressed as (mg/kg-day)⁻¹

These risks are probabilities that usually are expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site-related exposures is 10^{-4} to 10^{-6} . In addition Ohio EPA maintains a 10^{-5} "Target Level" of risk as a remedial action objective for sites in the state of Ohio.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., life-time) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ < 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI < 1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. An HI > 1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

$$\text{Non-cancer HQ} = \text{CDI}/\text{RfD}$$

where:

CDI = Chronic daily intake

RfD = reference dose.

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

Five potential onsite exposure scenarios were considered in the HHRA: onsite trespassers, onsite recreators, onsite construction and utility workers, and onsite commercial workers. The HHRA determined that cancer risks for a future commercial worker exposed to surface and subsurface soils, and a future recreator exposed to surface soils exceeded the acceptable benchmark (i.e., 1 in 100,000 or 1×10^{-5}). In addition, the predicted risks to a hypothetical future onsite resident exposed to soil and groundwater exceeded the 10^{-5} target level for cancer risk and the non-cancer hazard quotient of 1. The risks to onsite trespassers, onsite construction workers, and onsite utility workers did not exceed acceptable benchmarks.

The results of the HHRA indicated that under current Site conditions, there is little potential for exposure to Site-related COPCs because the Site is vacant, fenced, and zoned for industrial use. The HHRA concluded that no unacceptable non-cancer hazards or cancer risks exist under current conditions, even in the assumed scenario of an unauthorized trespasser entering onto the property. However, it is the lead agency's current judgment that the Selected Remedy is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment in the future.

EPA's statistical analysis of soil sampling data indicates that probable exposure concentrations for soil at the Lammers Barrel Site in parts per million (ppm) are:

• TCE	78 ppm
• cis-1,2 DCE	22 ppm
• benzene	11 ppm
• toluene	640 ppm
• ethylbenzene	140 ppm
• xylenes	720 ppm

These concentrations are associated with excess lifetime cancer risk levels due to contaminated surface and subsurface soil of 1.0×10^{-4} for a resident child and 3.0×10^{-5} for a resident adult. In addition, these concentrations result in a 2.0×10^{-5} risk to an onsite child recreator and 4.0×10^{-5} for an onsite commercial/industrial worker.

Similarly, EPA's statistical analysis of groundwater sampling data found that the exposure concentrations of contaminants in the groundwater at the Site in parts per million (ppm) are:

• TCE	11.000 ppm
• cis-1,2 DCE	1.600 ppm
• benzene	0.390 ppm
• toluene	70.000 ppm
• ethylbenzene	4.600 ppm
• xylenes	0.480 ppm

These concentrations are associated with excess lifetime cancer risk levels due to contaminated groundwater of 2.0×10^{-1} for a resident child and 5.0×10^{-2} for a resident

adult. In addition, these concentrations result in a 4.0×10^{-6} risk for an onsite construction worker. Further, the National Contingency Plan (NCP) sets the expectation that contaminated groundwater will be returned to its beneficial use whenever practicable. In the case of the Lammers Barrel Site, the beneficial use is drinking water.

These risks and hazard levels indicate that there is significant potential risk to children and adults from direct exposure to contaminated soil and groundwater. These risk estimates are based on current reasonable maximum exposure scenarios and were developed by taking into account various conservative assumptions about the frequency and duration of an individual's exposure to the soil and groundwater, as well as the toxicity of the various Site contaminants.

A complete set of risk tables listing detections of contaminants, development of COCs, risk exposure assumptions, toxicity information, risk calculations and vapor intrusion screening is included as **Attachment 5**.

It is the EPA's current judgment, as lead agency, that the Selected Remedy is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment from the Lammers Barrel Site.

Ecological Risk

A screening level ecological risk assessment was conducted using sampling data obtained from Little Beaver Creek and other off-property areas. Although it is known that some disposal of Site COCs took place in the creek when the Site was in operation, these contaminants were apparently long ago diluted, evaporated, or carried away from the Site. None of the samples collected from sediment in Little Beaver Creek showed elevated levels of Site contaminants. The screening level ecological assessment indicated that the potential for significant ecological impacts to occur was small. The results of the study indicated there was little potential for significant exposure of wildlife to Site contaminants. The concentrations of contaminants found in Little Beaver Creek were below the sediment and freshwater screening levels.

2.8 – Remedial Action Objectives

Remedial Action Objectives (RAOs) are general descriptions of the goals established for protecting human health and the environment, to be accomplished through remedial actions. RAOs identify the medium of concern, contaminants of potential concern (COPCs), allowable risk levels, potential exposure routes, and potential receptors.

The following RAOs have been identified for OUI at the Lammers Barrel Site based on the summary of receptor risks and hazards for the exposure scenarios presented in the baseline HHRA.

- Prevent the potential exposure of an onsite young child recreator to COPCs in surface soil that presents a cumulative lifetime cancer risk greater than the target cancer risk of 1×10^{-5} or a non-cancer hazard of 1.
- Prevent the potential exposure of an onsite commercial/industrial worker to COPCs in surface and subsurface soils that present a cumulative lifetime cancer risk greater than the target cancer risk of 1×10^{-5} or a non-cancer hazard of 1.
- Prevent human exposure to COPCs in OU1 groundwater that exceed MCLs, where applicable, or that present a cumulative lifetime cancer risk greater than the target cancer risk of 1×10^{-5} or a non-cancer hazard of 1.
- Minimize the potential leaching and migration of soil contaminants to groundwater that would result in exceedances of groundwater criteria (MCLs) beneath the Site.
- Restore contaminated groundwater to its beneficial use within a reasonable time frame. Beneficial use of the designated Sole Source Aquifer is potable water.
- Minimize further migration of the groundwater plume.

This proposed action will reduce the excess cancer risk associated with exposure to contaminated soil to 1×10^{-5} . This will be achieved by reducing the concentrations of the soil contaminants to the following target levels in parts per million (ppm):

• Benzo(a)pyrene	0.16 ppm
• Dibenzo(a,h)anthracene	0.36 ppm
• Indeno(1,2,3-cd)pyrene	0.93 ppm
• Tetrachloroethene	1.70 ppm
• Trichloroethylene	5.60 ppm
• Vinyl Chloride	0.33 ppm
• Total PCBs	1.10 ppm
• Arsenic	3.40 ppm

Because there are no Federal or State cleanup standards for soil contamination, EPA established these targets, or Preliminary Remediation Goals (PRGs), based on the baseline risk assessment. Targets were selected that would both reduce the risk associated with exposure to soil contaminants to an acceptable level, and ensure minimal migration of contaminants into the groundwater.

The following Remediation Goals will be achieved for groundwater at OU1:

• Trichloroethylene	0.005 ppm
• Cis-1,2-DCE	0.070 ppm
• Vinyl Chloride	0.002 ppm
• Ethylbenzene	0.070 ppm
• Benzene	0.005 ppm
• Xylenes	10.0 ppm
• Arsenic	0.010 ppm

These RGs are based upon the Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act. Final concentrations of contaminants must also achieve the protective risk level of 1×10^{-5} for cumulative exposure after MCLs have been met.

2.9 – Description of Alternatives

Remedial alternatives for the Lammers Barrel Site are presented below. The alternatives are numbered to correspond with the numbers in the FS Report.

Common Elements.

All of the alternatives require institutional controls (e.g., deed restrictions such as an easement or covenant) to limit the use of the property and to ensure that Site groundwater is not used for drinking water purposes. These institutional controls will be implemented in accordance with the Ohio Uniform Environmental Covenant to restrict residential development of the Site. Consistent with expectations set out in the Superfund regulations, none of the remedies rely exclusively on institutional controls to achieve protectiveness. Monitoring to ensure the effectiveness of the remedy, including deed restrictions, is also a component of each alternative except the “no-action” alternative.

Alternative RA-1:

- **NO ACTION**

Estimated Capital Cost: \$0

Estimated Total O&M Cost: \$0

Estimated Present Worth Cost: \$0

Estimated Construction Timeframe: None

Regulations governing the Superfund program generally require that the “no action” alternative be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no action at the Site to prevent exposure to the soil and groundwater contamination.

Alternative RA-2:

- **INSTITUTIONAL CONTROLS**
- **EXCAVATION OF IMPACTED SOIL WITH OFFSITE DISPOSAL**
- **GROUNDWATER EXTRACTION AND TREATMENT USING AIR STRIPPING**

Estimated Capital Cost: \$4,842,800

Estimated Total O&M Cost: \$2,516,000

Estimated Present Worth Cost: \$6,350,000

Estimated Construction Timeframe: 3-6 months

This alternative combines institutional controls with excavation of VOC-impacted soil and offsite disposal, onsite groundwater extraction and treatment using air stripping technology and surface water discharge to Little Beaver Creek, and groundwater monitoring. Institutional controls would also be implemented in the form of an Ohio Uniform Environmental Covenant to restrict residential development of the site.

Pre-construction delineation sampling may be conducted to more precisely define the lateral extent of VOC-impacted soil requiring excavation. Current estimates place the volume of soil to be excavated at 8,345 cubic yards. A pre-design investigation will be conducted to further refine the extent of soil contamination before the selected remedial alternative is implemented. The locations of soil contamination discovered during the RI and from previous U.S Army Corps of Engineers test pits will be evaluated as part of these activities and will be included in the soil remedial action, as appropriate. Prior to excavation activities, the remaining building slabs in the south-central area of the Site would be demolished and consolidated with the impacted soil. The excavated material would be transported to an offsite land disposal facility for disposal. The excavation activities would take from 3 to 6 months to complete. A site plan that shows the location and extent of the excavation areas is provided on **Attachment 2 (Figure 11)**. Post-excavation sidewall sampling and domain averaging would be conducted to confirm that impacted surface soil was removed during excavation.

Alternative RA-2 also includes extraction of onsite groundwater from both the perched zone and the upper aquifer. The extracted groundwater would be treated ex-situ using an air stripper prior to discharge to Little Beaver Creek. Groundwater would be pumped from the perched zone from a new horizontal well located along the southern property line and from three extraction wells screened in the upper aquifer located along the eastern property line at an estimated total combined extraction rate of 120 gallons per minute. It is estimated that groundwater remediation objectives would be achieved after eight (8) to ten (10) years of operation of the groundwater extraction and treatment system.

Selected wells from the existing monitoring well network would be monitored to assess the effectiveness of the groundwater extraction and treatment system. Additional monitoring wells could be readily installed, as necessary. Groundwater monitoring

would continue until the RAOs have been achieved. Groundwater would be monitored for CVOCs and BTEX following a long-term schedule that may decrease in sampling frequency based on monitoring results as time progresses. For cost estimating purposes, it was estimated that long-term groundwater monitoring would be required for ten years.

Alternative RA-3:

- **INSTITUTIONAL CONTROLS**
- **EXCAVATION OF IMPACTED SOIL WITH OFFSITE DISPOSAL**
- **IN-SITU GROUNDWATER TREATMENT USING ENHANCED REDUCTIVE DECHLORINATION (ERD)**

Estimated Capital Cost: \$4,426,600

Estimated Total O&M Cost: \$994,000

Estimated Present Worth Cost: \$5,230,000

Estimated Construction Timeframe: 3-6 months

Alternative RA-3 includes the institutional controls and soil excavation and offsite disposal components of Alternative RA-2, but utilizes in-situ biological groundwater treatment in place of conventional groundwater pumping and treatment.

The in-situ groundwater treatment component of Alternative RA-3 consists of in-situ biological treatment of onsite groundwater using the ERD technology that was demonstrated to be effective during the Early Action Pilot Test (EAPT) and Extended ERD Pilot Study conducted at the site from 2004 to 2006. In-situ treatment of onsite groundwater would include the installation of three (3) additional introduction wells in the perched zone to supplement the existing network of four (4) introduction wells, and approximately six (6) new introduction wells in the Upper Sand Aquifer. Based on the results of the Extended ERD pilot study, the groundwater remediation objectives would be achieved after two (2) to four (4) years of operation of the in-situ ERD treatment system.

During the two-year period of the Extended ERD Pilot Study, the concentrations of TCE, cis-1,2 DCE and vinyl chloride (VC) declined from an initial total concentration of 5,260 micrograms per liter ($\mu\text{g/L}$ or parts per billion) to 2.5 $\mu\text{g/L}$, which consisted entirely of cis-1,2 DCE. The concentrations of TCE and VC at the end of the two-year study were less than the laboratory reporting limit of 1 $\mu\text{g/L}$. In addition, the reductive dechlorination end products, ethene and ethane, were also detected in groundwater samples collected from the Performance Monitoring Well AMW-4S, indicating that the reductive dechlorination processes at the Site were continuing to completion.

Selected wells from the existing monitoring well network would be monitored to assess the effectiveness of the in-situ groundwater remediation using ERD. Groundwater would be monitored for VOCs following a long-term schedule that may decrease the sampling frequency based on monitoring results as time progresses. It is assumed that the long-term monitoring program would be conducted for a period of ten years.

Alternative RA-4:

- **INSTITUTIONAL CONTROLS**
- **IN-SITU BIOLOGICAL TREATMENT OF IMPACTED SOIL USING SOIL MIXING**
- **IN-SITU GROUNDWATER TREATMENT USING ENHANCED REDUCTIVE DECHLORINATION (ERD)**

Estimated Capital Cost: \$2,596,000

Estimated Total O&M Cost: \$994,000

Estimated Present Worth Cost: \$3,400,000

Estimated Construction Timeframe: 4-6 weeks

Alternative RA-4 includes institutional controls, in-situ biological treatment of impacted soils, and in-situ biological treatment of onsite groundwater. Similar to Alternatives RA-2 and RA-3, institutional controls under Alternative RA-4 would consist of an Ohio Uniform Environmental Covenant to restrict access to groundwater until it is remediated and to restrict residential development of the site. Access to the Site would also be restricted during the remedial actions (security fence and warning signs) to reduce the likelihood of unauthorized and illegal entry onto the Site property until after treatment of the impacted on-site soils has been completed. A pre-design investigation will be conducted to further refine the extent of soil contamination before the remedial alternative is implemented. The locations of soil contamination discovered during the RI and from previous U.S. Army Corps of Engineers test pits will be evaluated as part of these activities and will be included in the soil remedial action, as appropriate.

In-situ biological treatment of impacted soils would be implemented using soil mixing to amend the soil with DARAMEND®. DARAMEND® is a controlled-release organic carbon substrate that also contains zero valent iron (ZVI). The amendment will produce the strongly reducing conditions in the unsaturated zone required to biologically reductively dechlorinate CVOCs and also promote abiotic destruction of CVOCs through contact with the ZVI. Soil mixing is a technology that mixes amendments into the unsaturated zone to remediate COCs in the soil matrix. Sufficient mixing of the soils must be achieved to break down the soil particles and allow good contact between the soil particles and the DARAMEND® additive. Under this alternative, the soils would be mixed using large diameter augers, typically 6-feet in diameter, to break down the soil matrix and introduce the DARAMEND® soil amendment; however, as a contingency other mixing methods (e.g., Lang tool, excavator) may be used where necessary to achieve the desired degree of mixing. The DARAMEND® additive dosing will be developed for each treatment area based on the CVOC concentrations present. Pre-design geotechnical and dosing tests will be performed to confirm the appropriate additive loading rates. The zones of contamination targeted for treatment are displayed on Attachment 2 (Figure 11).

Alternative RA-4 includes the same in-situ ERD treatment of onsite groundwater that was described for Alternative RA-3. In-situ treatment of onsite groundwater would include

the installation of three (3) additional injection wells in the perched zone to supplement the existing network of four (4) injection wells, and approximately six (6) new injection wells in the Upper Sand Aquifer. Based on the findings from the ERD pilot study, periodic injections of a carbon source into the introduction wells would result in groundwater remediation objectives being achieved after two (2) to four (4) years of operation of the in-situ ERD treatment system.

Selected wells from the existing monitoring well network would be monitored, as well as additional wells, as needed to monitor the effectiveness of the in-situ groundwater remediation using ERD. Groundwater would be monitored for VOCs following a long-term schedule that may decrease the sampling frequency based on monitoring results as time progresses. It is assumed that the long-term monitoring program would be conducted for a period of ten years.

Alternative RA-5:

- **INSTITUTIONAL CONTROLS**
- **LOW-PERMEABILITY ENGINEERED COVER SYSTEM**
- **IN-SITU GROUNDWATER TREATMENT USING ENHANCED REDUCTIVE DECHLORINATION (ERD)**

Estimated Capital Cost: \$1,232,200

Estimated Total O&M Cost: \$1,254,700

Estimated Present Worth Cost: \$2,100,000

Estimated Construction Timeframe: 3-4 weeks

Alternative RA-5 combines institutional controls with a low-permeability MatCon[®] high-performance asphalt cover system, in-situ treatment of onsite groundwater with ERD, and groundwater monitoring. Similar to the other alternatives, institutional controls under Alternative RA-5 would consist of an Ohio Uniform Environmental Covenant to restrict access to groundwater until it is remediated and to restrict residential development of the site. In addition, restrictions on excavation in areas where the cover system is installed would be required to provide adequate protection for the engineered cover.

The MatCon[®] (Modified Asphalt Technology for Waste Containment) cover system is a polymer modified asphalt system. The system consists of a proprietary binder that is mixed with a selected aggregate type and gradation. The MatCon[®] cover system would be applied with conventional paving equipment. The extent of the engineered cover system is shown on Attachment 3 (Figure 12). A pre-design investigation will be conducted to further refine the extent of soil contamination before the cover system is constructed. The locations of soil contamination discovered during the RI and from previous U.S. Army Corps of Engineers test pits will be evaluated as part of these activities. Construction of the MatCon[®] cover system would be completed in three (3) to four (4) weeks.

EPA has evaluated the MatCon[®] asphalt cover system as part of its Superfund Innovative Technology Evaluation (SITE) Program. The results of EPA's evaluation indicate that the MatCon[®] cover system would provide adequate hydraulic conductivity results to prevent site contaminants from migrating into groundwater.

During the FS, the MatCon[®] asphalt cover system was evaluated using the Hydraulic Evaluation of Landfill Performance (HELP) model and was determined to be effective in reducing infiltration of precipitation. The MatCon[®] cover system would include the following:

- 4-inch Matcon[®] asphalt layer [1 inch vertical percolation layer, hydraulic conductivity or permeability (K) = 10-8 cm/sec]; [3 inches barrier layer; K = 10-8 cm/sec] (from published Matcon information) – two component asphalt layer arrangement required for modeling purposes.
- 12-inch structural fill layer (vertical percolation layer, K = 10-4 cm/sec);
- Geotextile drainage layer (lateral drainage layer K = .03 cm/sec); and
- 12-inch clay layer (barrier layer; K = 10-6 cm/sec).

Selected wells from the existing monitoring well network would be monitored, as well as additional wells, as needed, to monitor the effectiveness of the in-situ groundwater remediation system. Groundwater would be monitored for VOCs following a long-term schedule that may decrease the sampling frequency based on monitoring results as time progresses.

An engineered cover would be a reliable and long-term solution for preventing direct contact with or ingestion of soil with proper maintenance of the cover system. The MatCon[®] cover system would also be effective in reducing the amount of surface water infiltration, which would minimize further spreading of impacts to the groundwater.

Alternative RA-6:

- **INSTITUTIONAL CONTROLS**
- **LOW-TEMPERATURE THERMAL DESORPTION**
- **IN-SITU GROUNDWATER TREATMENT USING ENHANCED REDUCTIVE DECHLORINATION (ERD)**

Estimated Capital Cost: \$3,038,000

Estimated Annual O&M Cost: \$994,000

Estimated Present Worth Cost: \$4,032,000

Estimated Construction Timeframe: 3-6 months

Alternative RA-6 would include the same institutional controls, in-situ groundwater treatment and groundwater monitoring components as Alternatives RA-3, RA-4 and RA-5. Alternative RA-6 would differ from these other alternatives in the method used to address impacted soils. Under Alternative RA-6, impacted soils would be excavated and then treated onsite using Low-Temperature Thermal Desorption (LTTD). A pre-

design investigation will be conducted to further refine the extent of soil contamination before the remedial alternative is implemented. The locations of soil contamination discovered during the RI and from previous U.S. Army Corps of Engineers test pits will be evaluated as part of these activities and will be included in the soil remedial action, as appropriate.

Low-temperature thermal desorption is an ex-situ soil treatment technology. This technology would operate by heating excavated soil in thermal desorbers and removing VOCs by volatilizing them from the soil. Off-gas vapors from the soil would be captured in the desorbers, treated using activated carbon, and discharged to the atmosphere. Soil treated by this technology would be placed back into the excavation areas. Excavation under Alternative RA-6 would require engineering measures to control air emissions, fugitive dust, surface water run-off, erosion and sedimentation and site access. Real-time perimeter air monitoring tied to a contingency plan would also be needed to protect the surrounding community during excavation. Low-temperature Thermal Desorption is a technology that permanently removes VOC impacts from soil. Excavation and ex-situ treatment of impacted soils using LTDD under Alternative RA-4 would be completed in three (3) to six (6) months.

2.10 – Comparative Analysis of Alternatives

As required by CERCLA, nine criteria were used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the *Record of Decision* profiles the relative performance of each alternative against the nine criteria, noting how they compare to the other options under consideration. The nine evaluation criteria are discussed below.

1. Overall Protection of Human Health and the Environment

This evaluation criterion assesses whether each remedial alternative protects human health and the environment. This assessment focuses on how an alternative achieves protection over time and indicates how each source of contamination would be minimized, reduced, or controlled through treatment, engineering, or institutional controls. The evaluation of the degree of overall protection associated with each alternative is based largely on the exposure pathways and scenarios set forth in the baseline human health risk assessment (HHRA).

Potential human exposure pathways identified in the HHRA that pose unacceptable risks at the Site include direct contact with surface and/or subsurface soils for the future on-site resident, the future on-site young child recreator, a future on-site commercial worker, and ingestion of on-site groundwater for the future on-site resident. In addition, remedial actions at the Site are intended to meet the RAO of minimizing the potential leaching and migration of residual soil constituents to on-site groundwater and restoring groundwater to its beneficial use within a reasonable time frame.

All of the remedial alternatives, except RA-1 (No Action) provide adequate protection of human health and the environment and would meet RAOs. Risks through direct contact with soil and groundwater ingestion are reduced to acceptable levels for each of the exposure pathways identified above by all alternatives except RA-1. Alternatives RA-2, RA-3, RA-4, RA-5 and RA-6 are expected to restore groundwater to Maximum Contaminant Levels (MCLs) in a reasonable time frame by addressing the release of VOCs from on-property soils and by treatment of on-property groundwater.

Each of the remedial alternatives relies on institutional controls to address the potential risks identified for the hypothetical, future on-site resident. An institutional control in the form of an Ohio Uniform Environmental Covenant would be implemented as part of each of the alternatives to restrict residential development of the Site, thereby minimizing the risks associated with the on-site residential exposure pathway.

All of the Remedial Alternatives except RA-1 provide comparable overall protection of human health and the environment from impacted soils. These alternatives would all meet RAOs and protect human health by preventing exposure to impacted soil through treatment (RA-4 and RA-6), the use of a low-permeability MatCon[®] engineered cover (RA-5) or through excavation and offsite disposal (RA-2 and RA-3). Only RA-5 would result in some degree of uncertainty in terms of protectiveness over the long-term, since higher levels of contamination would be left in place at the site.

The use of carbon substrates in RA-4 to achieve CVOC destruction, and the use of the DARAMEND[®] additive (ERD + ZVI to promote both biological and abiotic degradation) to enhance and accelerate biological dechlorination of VOCs in the vadose zone is proven. Both ERD and ZVI are well proven remedial technologies that can successfully treat chlorinated compounds, as documented within literature, case studies, and, in the case of ERD, with the successful pilot testing at the Lammers Barrel Site. It is only the soil mixing method in the unsaturated zone that was not specifically tested at the Site during the RI. As discussed earlier, because the use of the soil mixing approach should achieve sufficient reagent contact, ERD is expected to be an effective technology at this Site. The use of DARAMEND[®] will also promote the abiotic destruction of contaminants, thereby increasing the degradation rate of the VOCs present within the soil. A pre-design dosing test will be performed to confirm the DARAMEND[®] dose loading and effectiveness of the soil mixing technique. By using this approach, in-situ biological treatment would meet the soil RAOs.

For impacted groundwater, Remedial Alternatives RA-2, RA-3, RA-4, RA-5, and RA-6 would all meet RAOs and provide comparable overall protection of human health through groundwater treatment. Alternative RA-2 incorporates groundwater extraction and treatment of onsite groundwater to both reduce and control further migration of VOC impacted groundwater. Alternatives RA-3, RA-4, RA-5, and RA-6 all rely on in-situ ERD treatment of groundwater. The ERD technology was demonstrated to be effective in achieving chemical-specific ARARs for groundwater at the Site during the Extended ERD Pilot Study.

Because the "no action" Alternative RA-1 is not protective of human health and the environment, it was eliminated from consideration under the remaining eight criteria.

2. Compliance with ARARs

Section 121(d) of CERCLA and the NCP at 40 C.F.R. § 300.430(f)(1)(ii)(B) requires that remedial activities at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA Section 121(d)(8). All of the remedial alternatives would meet their respective ARARs from Federal and State laws. Alternatives RA-2, RA-3, RA-4, RA-5 and RA-6 all achieve chemical-specific ARARs for groundwater over time by addressing the release of VOCs from on-property soils and by treatment of on-property groundwater. The key ARARs for each alternative are discussed below. The full list of ARARs and TBC criteria evaluated for the alternatives is provided in Appendix B of the FS.

Alternative RA-2

ARARs for this alternative include Ohio Rev. Code Ann. § 6111.04 and Ohio Admin. Code § 3745-1, which regulate discharges to surface waters. These requirements would be met if extracted groundwater is discharged to Little Beaver Creek following treatment. Storm water run-off from remedial activities and construction will comply with Ohio Admin. Code § 3745-39. Excavation work would comply with Ohio Admin. Code § 3745-17 which regulates emissions of particulates and fugitive dust, Ohio Admin. Code § 3745-15 which prohibits air pollution nuisances, and Ohio Admin. Code § 3745-25 which establishes air quality standards. VOC emissions from groundwater treatment using air stripping would meet Ohio Admin. Code § 3745-21-09, which establishes limits for VOC emissions from stationary sources. Maximum Contaminant Levels (MCLs) established under Ohio Admin. Code § 3745-81 are relevant and appropriate requirements that would be met throughout the groundwater plume. Off-site transportation of excavated soil would meet Ohio Admin. Code § 3745-52, which establishes waste characterization requirements, and Ohio Admin. Code § 3745-53 which establishes standards for waste transport. Use restrictions for the property would comply with Ohio Rev. Code Ann. § 5301.80 to 5301.92, the Ohio Uniform Environmental Covenants Act.

Alternative RA-3

ARARs for this alternative include Ohio Admin. Code § 3745-17 which regulates emissions of particulates and fugitive dust, Ohio Admin. Code § 3745-15 which prohibits air pollution nuisances, and Ohio Admin. Code § 3745-25 which establishes air quality standards. These requirements would be met during all excavation work. Storm water run-off from remedial activities and construction will comply with Ohio Admin. Code § 3745-39. Off-site transportation of excavated soil would meet Ohio Admin. Code § 3745-52, which establishes waste characterization requirements, and Ohio Admin. Code § 3745-53 which establishes standards for waste transport. Subsurface injections for in-situ groundwater remediation would meet the requirements of Ohio Admin. Code § 3745-34, which is Ohio's underground injection control program. Maximum

Contaminant Levels (MCLs) established under Ohio Admin. Code § 3745-81 are relevant and appropriate requirements that would be met throughout the groundwater plume. Use restrictions for the property would comply with Ohio Rev. Code Ann. § 5301.80 to 5301.92, the Ohio Uniform Environmental Covenants Act.

Alternative RA-4

ARARs for this alternative include Ohio Admin. Code § 3745-17, which regulates emissions of particulates and fugitive dust, and Ohio Admin. Code § 3745-15 which prohibits air pollution nuisances. These requirements would be met during clearing and grubbing, removal of concrete foundations at the site, and soil mixing. Storm water run-off from remedial activities and construction will comply with Ohio Admin. Code § 3745-39. Subsurface injections for in-situ soil and groundwater remediation would meet the requirements of Ohio Admin. Code § 3745-34, which is Ohio's underground injection control program. Maximum Contaminant Levels (MCLs) established under Ohio Admin. Code § 3745-81 are relevant and appropriate requirements that would be met throughout the groundwater plume. Use restrictions for the property would comply with Ohio Rev. Code Ann. § 5301.80 to 5301.92, the Ohio Uniform Environmental Covenants Act. Since the Site predates the Resource Conservation and Recovery Act (RCRA) and the impacted soils are being treated in-situ within the area of contamination, hazardous wastes are not being generated and land disposal restrictions and minimum technology requirements are not ARARs.

Alternative RA-5

ARARs for this alternative include Ohio Admin. Code § 3745-17, which regulates emissions of particulates and fugitive dust, and Ohio Admin. Code § 3745-15 which prohibits air pollution nuisances. These requirements would be met during clearing and grubbing, removal of concrete foundations at the site, grading activities, and cover installation. Storm water run-off from remedial activities and construction will comply with Ohio Admin. Code § 3745-39. The RCRA requirements at Ohio Admin. Code § 3745-57-10, which establishes permeability requirements for a cover system, and Ohio Admin. Code § 3745-54-18, which regulates construction in a floodplain, are relevant and appropriate requirements for the engineered cover system and would be met. Subsurface injections for in-situ groundwater remediation would meet the requirements of Ohio Admin. Code § 3745-34, which is Ohio's underground injection control program. Maximum Contaminant Levels (MCLs) established under Ohio Admin. Code § 3745-81 are relevant and appropriate requirements that would be met throughout the groundwater plume. Use restrictions for the property would comply with Ohio Rev. Code Ann. § 5301.80 to 5301.92, the Ohio Uniform Environmental Covenants Act.

Alternative RA-6

ARARs for this alternative include Ohio Admin. Code § 3745-17 which regulates emissions of particulates and fugitive dust, Ohio Admin. Code § 3745-15 which prohibits air pollution nuisances, and Ohio Admin. Code § 3745-25 which establishes air quality standards. These requirements would be met during excavation activities and during all work associated with Low-Temperature Thermal Desorption. Air emissions from the thermal desorption unit would also meet Ohio Admin. Code § 3745-21-09, which

establishes limits for VOC emissions from stationary sources. As impacted soils are being excavated and then treated on-property, land disposal restrictions and soil treatment standards under the RCRA requirements at Ohio Admin. Code § 3745-270 are relevant and appropriate requirements for the treated soil and would be met by this alternative. Storm water run-off from remedial activities and construction will comply with Ohio Admin. Code § 3745-39. Subsurface injections for in-situ groundwater remediation would meet the requirements of Ohio Admin. Code § 3745-34, which is Ohio's underground injection control program. Maximum Contaminant Levels (MCLs) established under Ohio Admin. Code § 3745-81 are relevant and appropriate requirements that would be met throughout the groundwater plume. Use restrictions for the property would comply with Ohio Rev. Code Ann. § 5301.80 to 5301.92, the Ohio Uniform Environmental Covenants Act.

3. Long-term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of the risk remaining at the site after response objectives have been met.

Alternatives RA-2, RA-3, RA-4 and RA-6 provide the highest degree of long-term effectiveness for soils because impacted soils are excavated and disposed offsite (RA-2 and RA-3) or treated onsite (RA-4 and RA-6), thereby eliminating the direct contact pathway and preventing the leaching of contaminants to groundwater. Remedial Alternative RA-4 is ranked the highest for these criteria because the in-situ biological treatment under Alternative RA-4 would destroy contaminant mass in-situ, reducing the volume and toxicity of impacted soils. RA-6 would also reduce the contaminant mass by desorption of VOCs from the soil matrix. However, the resultant vapors will require treatment and materials generated in vapor treatment would require management in accordance with RCRA requirements and any materials generated during vapor treatment would be disposed off-site.

Alternative RA-5 relies on a MatCon® low-permeability cover system to prevent direct contact and control infiltration, a reliable technology if properly maintained. Alternative RA-5 would eliminate the public health risks from direct contact and minimize infiltration through impacted soils to the same levels as Alternatives RA-3, RA-6 and RA-2 in the short term; however, because the impacted soils would be left in place it has less long-term reliability.

For groundwater, Alternative RA-2 ranks below Alternatives RA-3, RA-4, RA-5 and RA-6 because the ability to achieve MCLs with conventional groundwater pumping and treatment under this alternative is less certain than with the ERD technology used to treat groundwater in alternatives RA-3, RA-4, RA-5 and RA-6. The results of pilot tests conducted during the RI showed in-situ ERD to be an effective groundwater treatment technology that could achieve remediation objectives in two (2) to four (4) years. Long-term management requirements for RA-2 would also be greater because Alternative RA-2 would require operation and maintenance of the groundwater pump and treat

system for the longer period of time it is estimated it would take this alternative to achieve groundwater clean-up goals (i.e., eight (8) to ten (10) years).

Reviews at least every five years, as required, would be necessary to evaluate the effectiveness of any of these alternatives because hazardous substances would remain on-site in concentrations above health-based levels for unrestricted use.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

This evaluation criterion addresses the statutory requirement for selecting remedial actions that employ treatment technologies that reduce the toxicity, volume, or mobility of the hazardous constituents present in the impacted media.

The soil remediation components of Alternatives RA-2, RA-3, and RA-5 do not satisfy the statutory preference for treatment as a principal element of the remedial action. The toxicity of impacted soil would not be reduced through treatment under Alternatives RA-2 and RA-3. Alternative RA-5 (MatCon® asphalt cover system) is primarily a containment alternative for soil, and does not reduce constituent mobility, toxicity, or volume through treatment.

The soil remediation components of Alternatives RA-4 and RA-6 rank the highest with regard to the preference for treatment as a principal element of the remedy. The in-situ biological treatment under Alternative RA-4 would destroy VOCs in-situ, reducing the toxicity, volume, and mobility of the VOC constituents in soil. Alternative RA-6 would reduce the toxicity, volume, and mobility of the soil contaminants by removing contaminants from the soil matrix through thermal desorption.

The groundwater remediation components of Alternatives RA-2 (extraction and treatment), RA-3, RA-4, RA-5, and RA-6 (In-Situ ERD) treat the principal threats posed by groundwater and would reduce the mobility, toxicity, and volume of contaminants in the aquifer.

5. Short-term Effectiveness

This evaluation criterion addresses the effects of the alternatives during the construction and implementation phases (i.e., remediation risks) until the remedial exposure objectives are met.

The soil remedial components of Alternatives RA-4 and RA-5 would have the greatest short-term effectiveness. Alternatives RA-4 (In-Situ Biological Treatment) and RA-5 (MatCon® cover system) present the least amount of health and safety risk to remediation workers and the local community. Alternative RA-4 has the lowest potential for impacts to human health and the environment during the construction and implementation phase because in-situ technologies would be used to treat impacted soils. The reagents required for treatment would be introduced to the subsurface using soil mixing equipment. Alternative RA-4 would require one to two passes with soil mixing

equipment, with the second pass occurring within a few days of the first pass. The use of in-situ technologies eliminates the potential risks associated with handling the soil and potentially creating fugitive dust and VOC emissions.

Alternative RA-5 could also be implemented with minimal disturbance of the impacted soils thereby minimizing short-term impacts. The MatCon® low-permeability asphalt cap can be placed directly onto a prepared coarse aggregate subbase following grading of the surface in the areas to be capped. Installation of the MatCon® cover system would be completed within an estimated three (3) to four (4) weeks from the start of construction. Once installed, the cap would protect against direct contact risks and control infiltration, thereby reducing the potential migration of soil constituents to groundwater.

The soil remedial components of Alternatives RA-2 and RA-3 would have the lowest short-term effectiveness, because they would have the highest potential for impacts to human health and the environment during the construction and implementation phase of the remedy due to increased risks to construction workers and the potential for community exposure to VOC emissions and dust generated by the excavation activities. To mitigate the potential short-term risks associated with remediation, Alternatives RA-2 and RA-3 would require engineering measures to control air emissions, fugitive dust, surface water run-off, erosion and sedimentation, and site access such as surface water run-off controls, clean diesel technologies, and real-time perimeter air monitoring tied to a contingency plan to protect the surrounding community during excavation.

Alternatives RA-2 and RA-3 also present potential short-term risk to the community from heavy truck traffic associated with the off-site disposal of the excavated soils, which will be mitigated with measures such as transportation during off-peak hours. It is anticipated that the excavation activities under Alternatives RA-2 and RA-3 would be completed in four (4) to six (6) months.

Alternative RA-6 (Ex-Situ LTTD) would require the same engineering and health and safety controls as Alternatives RA-2 and RA-3 to minimize the potential for construction worker and nearby resident exposure to VOC emissions, but there would be less disruption and potential for community exposure due to heavy truck traffic for off-site disposal because the excavated soil would be treated and remain onsite. Short-term environmental impacts are also possible for Alternatives RA-2, RA-3, and RA-6 due to storm water run-off during soils excavation, particularly adjacent to Little Beaver Creek.

Alternative RA-4 has the lowest site worker and community risk because soils and groundwater would be treated using in-situ technologies, and impacted soils or treatment residuals would not be transported offsite for disposal in a landfill.

Alternative RA-2 will result in the highest levels of Greenhouse Gas (GHG) emissions associated with excavation and offsite soils disposal and construction of the groundwater extraction and treatment system. Alternative RA-3 will result in lower GHG emissions than RA-2 because groundwater would be treated using less energy intensive in-situ technologies. GHG emissions associated with Alternatives RA-2 and RA-3 may be

mitigated with the use of clean diesel technology. Alternative RA-6 will create less GHG emissions than RA-2 and RA-3 because the excavated soils that are treated ex-situ would remain onsite. The GHG emissions for Alternative RA-4 are significantly less than the excavation alternatives RA-2, RA-3 and RA-6 because impacted soil and groundwater would be treated using in-situ technologies. Alternative RA-5 would have higher GHG emissions than Alternative RA-4 because of the construction associated with installation of the MatCon® asphalt cover system.

Groundwater treatment under Alternatives RA-3, RA-4, RA-5, and RA-6 would be provided using in-situ ERD. The in-situ reactive zone required to treat the groundwater contaminants would form relatively quickly, within the first three (3) to four (4) months following the initial carbon reagent injections and groundwater clean-up goals would be met in two (2) to four (4) years.

Alternatives RA-3, RA-4, RA-5 and RA-6 also have a higher degree of short-term effectiveness for groundwater remediation since the in-situ ERD treatment technology requires only site worker personal protective equipment, and the technology is expected to be implemented over a shorter period of time (2 to 4 years) than the conventional groundwater extraction and treatment under Alternative RA-2 (8 to 10 years).

6. Implementability

The soil component of Alternative RA-5 (MatCon® cover system) would be the simplest alternative to construct and operate. Periodic maintenance of the cap would control its reliability in the future. The materials, necessary equipment and skilled workers to install the MatCon® asphalt cover system are commercially available. MatCon® binder material can be added directly to the hot-mix at a local asphalt plant. MatCon® can be rapidly installed on a prepared subgrade by local paving contractors.

The in-situ biological treatment of soils under Alternative RA-4 would offer fast implementation through the use of soil mixing using large diameter augers to break down the soil matrix and provide sufficient contact between the introduced soil amendment and the subsurface soils. A pre-design dosing test will provide confirmation of reagent dosing levels and soil mixing effectiveness.

Construction requirements for the soil components of Alternatives RA-2, RA-3, and RA-6 are more complex, and would require additional construction techniques and engineering controls during construction than Alternatives RA-4 and RA-5.

Alternatives RA-2, RA-3, and RA-6 would require shoring of the excavation areas, and engineering measures to control air emissions, fugitive dust, surface water run-off, erosion and sedimentation, site access and transportation. Real time perimeter air monitoring tied to a contingency plan would also be needed to protect the surrounding community during excavation.

The LTTD treatment component of RA-6 would be more difficult to operate during implementation. Under Alternative RA-6, a mobile LTTD unit would have to be located and brought onsite. Operation of the LTTD would require monitoring and adjustments to the operating parameters and process controls.

In evaluating the groundwater remedial components, Alternative RA-2 would be more difficult to operate during implementation because of the groundwater extraction and treatment components of the alternative. Operation of the groundwater extraction and treatment system used under Alternative RA-2 is more complex than the in-situ ERD groundwater treatment system employed for Alternatives RA-3, RA-4, RA-5 and RA-6, and would require operation for a longer period of time (8 to 10 years) than the in-situ ERD system (2 to 4 years).

7. Cost

The estimated present worth cost of Alternative RA-4 is less than that of Alternatives RA-2, RA-3, and RA-6. Even though Alternative RA-5 is the least costly of the remedial alternatives, the time frame required to achieve final cleanup levels is longer, higher levels of contaminants would remain on-site, and RA-5 does not satisfy CERCLA's preference for reducing toxicity, mobility or volume through treatment of site contaminants.

A detailed cost estimate for the Selected Remedy can be found in Attachment 4. Detailed Cost Summaries for all remedial alternatives can be found in the FS Report for the Site, which is part of the Administrative Record.

8. State/Support Agency Acceptance

The State of Ohio supports the Selected Remedy, RA-4, for Operable Unit 1.

9. Community Acceptance

During the public comment period, the community expressed its support for alternatives RA-4 and RA-6.

The next page provides a table summary of the comparative analysis of alternatives for the Lammers Barrel Site.

Evaluation Criteria	Alternative RA-1 No Action	Alternative RA-2 Excavation, Air Stripping	Alternative RA-3 Excavation, ERD	Alternative RA-4 Soil Mixing, ERD*	Alternative RA-5 Cover System, ERD	Alternative RA-6 Thermal Treatment, ERD
Overall Protection of Human Health and the Environment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Compliance with ARARs	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Long-Term Effectiveness and Permanence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Reduction of Toxicity, Mobility, or Volume Through Treatment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Short-Term Effectiveness	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Implementability	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cost	\$0	\$6.4 million	\$5.2 million	\$3.4 million	\$2.1 million	\$4 million
State Acceptance	Will be evaluated after public comment period					
Community Acceptance	Will be evaluated after public comment period					
<input type="checkbox"/> -- Meet Criteria <input checked="" type="checkbox"/> - Partially Meets Criteria <input type="checkbox"/> - Does Not Meet Criteria						
*EPA's Recommended Alternative						

2.11 – Principal Threat Waste

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

Wastes that generally will be considered to constitute principal threats include, but are not limited to, the following:

- **Liquid source material** - waste contained in drums, lagoons or tanks, free product in the subsurface (i.e., NAPLs) containing contaminants of concern (generally excluding groundwater).
- **Mobile source material** - surface soil or subsurface soil containing high concentrations of chemicals of concern that are (or potentially are) mobile due to wind entrainment, volatilization (e.g., VOCs), surface runoff, or subsurface transport.
- **Highly-toxic source material** - buried drummed non-liquid wastes, buried tanks containing non-liquid wastes, or soils containing significant concentrations of highly toxic materials.

Wastes that generally will not constitute principal threats include, but are not limited to, the following:

- **Non-mobile contaminated source material of low to moderate toxicity** - surface soil containing chemicals of concern that generally are relatively immobile in air or groundwater (i.e., non-liquid, low volatility, low leachability contaminants such as high molecular weight compounds) in the specific environmental setting.
- **Low toxicity source material** - soil and subsurface soil concentrations not greatly above reference dose levels or that present an excess cancer risk near the acceptable risk range were exposure to occur.

At the Lammers Barrel Site, chlorinated VOCs, including TCE and DCE, and fuel contaminants, such as BTEX, represent a principal threat as they are very mobile in subsurface soil at the Site. This is apparent since groundwater at the Site is contaminated

with these same compounds and the contaminants in soil continue to serve as a source for groundwater contamination migrating away from the Site.

The soil remediation components of Alternatives RA-4 and RA-6 will best address the principal threat wastes at the Site by destroying these compounds in-situ and eliminating the direct contact risk and source of ongoing groundwater contamination. These alternatives also rank the highest with regard to the preference for treatment as a principal element of the remedy. The in-situ biological treatment under Alternative RA-4 would destroy VOCs in-situ, reducing the toxicity, volume, and mobility of the VOC constituents in soil. Alternative RA-6 would reduce the toxicity, volume, and mobility of the soil contaminants by removing contaminants from the soil matrix through thermal desorption after the soils have been excavated.

2.12 – Selected Remedy

The Selected Remedy for cleaning up the Lammers Barrel Site is Remedial Alternative RA-4 (Institutional Controls, In-Situ Biological Treatment of Impacted Soils, and In-Situ Treatment of On-Site Groundwater using Enhanced Reductive Dechlorination (ERD)).

The Selected Remedy was selected over other alternatives because it is expected to achieve substantial and long-term risk reduction through treatment, it is expected to prevent future exposure to currently contaminated groundwater, and it is expected to allow the property to be used for the reasonably anticipated future land use, which is recreational or commercial. The Selected Remedy also reduces the risk within a reasonable time frame at less cost than the excavation alternatives and provides for long-term reliability of the remedy.

Based on the information available at this time, EPA and the State of Ohio believe the Selected Remedy will be protective of human health and the environment, will comply with ARARs, will be cost-effective, and will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Because it will treat the source materials constituting principal threats, the remedy also will meet the statutory preference for the selection of a remedy that involves treatment as a principal element.

The institutional controls required in this Selected Remedy will be implemented by the LBSG in accordance with the Ohio Uniform Environmental Covenants Act and will include:

- A prohibition on the use of the Lammers Barrel Site property for residential use
- A prohibition on the installation of any wells on the Lammers Barrel Site property without the permission of the EPA and OEPA.
- A requirement to provide access to EPA and OEPA to conduct sampling and oversight of all remedial actions until cleanup objectives have been met.

Access to the Site will also be restricted during the remedial action phase (security fence and warning signs) to reduce the likelihood of unauthorized and illegal entry onto the Site property until after treatment of the impacted on-site soils has been completed. These controls are being established to prevent exposures to site-users that could result in an unacceptable risk in the future. The prohibition on wells is being established to prevent exposure to groundwater contamination at the site until drinking water standards are achieved. An annual IC review will be conducted by the LBSG to verify that no unacceptable uses of the Lammers Barrel site property are being observed.

In-situ biological treatment of impacted soils will be implemented using soil mixing to amend the soil with DARAMEND®. DARAMEND® is a controlled-release organic carbon substrate that also contains zero valent iron (ZVI). The amendment will produce the strongly reducing conditions in the unsaturated zone required to biologically reductively dechlorinate CVOCs and also promote abiotic destruction of CVOCs through contact with the ZVI. It is likely that destruction of PAH compounds, although they represent less risk at the Lammers site, will be achieved along with CVOC destruction. Soil mixing is a technology that mixes amendments into the unsaturated zone to remediate COCs in the soil matrix. Sufficient mixing of the soils must be achieved to break down the soil particles and allow good contact between the soil particles and the DARAMEND® additive. Under the Selected Remedy, the soils will be mixed using large diameter augers, typically 6-feet in diameter, to break down the soil matrix and introduce the DARAMEND® soil amendment. As a contingency, other mixing methods (e.g., Lang tool, excavator) may be used where necessary to achieve the desired degree of mixing.

The DARAMEND® additive dosing will be developed for each treatment area based on the CVOC concentrations present. A pre-design investigation will be conducted to further refine the extent of known soil contamination before the remedial alternative is implemented. The locations of soil contamination discovered during the RI and from previous U.S Army Corps of Engineers test pits will be evaluated as part of these activities and will be included in the soil remedial action, as appropriate. Dosing tests will also be performed to confirm the appropriate additive loading rates. The zones of contamination targeted for treatment are displayed on **Attachment 2 (Figure 11)**.

The in-situ treatment of onsite groundwater using ERD will include the installation of three (3) additional injection wells in the perched zone to supplement the existing network of four (4) injection wells, and approximately six (6) new injection wells in the Upper Sand Aquifer. Based on the findings from the ERD pilot study, periodic injections of a carbon source into the introduction wells will result in groundwater remediation objectives being achieved in less than five years of operation of the in-situ ERD treatment system.

Selected wells from the existing monitoring well network will be monitored, as well as any required additional wells, as needed to monitor the effectiveness of the in-situ groundwater remediation using ERD. Groundwater will be monitored for VOCs following a long-term schedule that may decrease the sampling frequency based on

monitoring results as time progresses. Groundwater will also be monitored for arsenic to ensure that unacceptable levels of arsenic are not migrating away from the reducing groundwater treatment zone and affecting downgradient residents. The cost estimate for the Selected Remedy assumes groundwater monitoring will be conducted for ten years.

The estimated cost of implementing the Selected Remedy at the Site is \$3.4 million. This is based upon anticipated capital costs of \$2.6 million and operation and monitoring costs on the order of \$1 million. A detailed cost estimate for the Selected Remedy is included in Attachment 4. The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

ARARs for the Selected Remedy are included as Attachment 6 to this ROD.

2.13 – Statutory Determinations

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

Protection of Human Health and the Environment

The Selected Remedy, RA-4, provides overall protection of human health and the environment from impacted soils and groundwater. The Selected Remedy will meet RAOs and protect human health by preventing exposure to impacted soil and groundwater through in-situ treatment and destruction of Site contaminants. The use of carbon substrates in RA-4 to achieve CVOC destruction, and the use of the DARAMEND® additive (ERD + ZVI to promote both biological and abiotic degradation) to enhance and accelerate biological dechlorination of VOCs in the vadose zone is proven. Both ERD and ZVI are well proven remedial technologies that can successfully treat chlorinated compounds, as documented within literature, case studies, and, in the case of ERD, with the successful pilot testing at the Lammers Barrel Site.

The maximum current potential cancer risks associated with soil (4.0×10^{-5}) and groundwater (2.0×10^{-1}) exceed the statutory and target levels of acceptable risk at the Site. The Selected Remedy will reduce the cancer risks from their current levels to 1×10^{-5} and the Hazard Index to less than 1.0. There are no short-term threats associated

with the Selected Remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the Selected Remedy.

Compliance with Applicable or Relevant and Appropriate Requirements

The Selected Remedy of institutional controls, in-situ biological treatment of soils using soil mixing and in-situ biological treatment of Site groundwater using ERD will comply with all ARARs. The ARARs are presented in Attachment 6.

Cost-Effectiveness

In the lead agency's judgment, the Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent.

The estimated present worth cost of the Selected Remedy is \$3,400,000. Although Alternative 5 is less expensive (\$2,100,000), principal threat wastes would remain onsite and potentially create a problem in the future. Therefore the Selected Remedy is cost-effective. EPA believes that the Selected Remedy's additional cost for treatment of Site contaminants provides a significant increase in protection of human health and the environment and is cost-effective. EPA also believes that the Selected Remedy's combination of in-situ biological treatment for soil and in-situ ERD for groundwater will provide an overall level of protection comparable to Alternative 6 (low-temperature thermal desorption) at a significantly lower cost.

Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance.

The Selected Remedy treats the source materials constituting principal threats at the site, achieving significant reductions in CVOC and BTEX concentrations in soil and groundwater. The Selected Remedy satisfies the criteria for long-term effectiveness by removing CVOC and BTEX contamination from soil. The Selected Remedy does not present short-term risks different from the other treatment alternatives. There are no special implementability issues that set the Selected Remedy apart from any of the other alternatives evaluated.

Preference for Treatment as a Principal Element

By treating the contaminated soils by in-situ soil mixing and treating contaminated groundwater by in-situ ERD, the Selected Remedy addresses principal threats posed by the site through the use of treatment technologies. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

2.14 – Documentation of Significant Changes

The Proposed Plan for the Lammers Barrel Site was released for public comment in July 2011. The Proposed Plan identified Remedial Alternative 4, institutional controls, in-situ biological treatment for soils using soil mixing, and in-situ treatment for groundwater using Enhanced Reductive Dechlorination, as the Preferred Alternative. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

Part 3 – Responsiveness Summary

The Proposed Plan for the Lammers Barrel Site was released for public comment on July 5, 2011. Public comments were accepted by EPA until August 5, 2011, and a public meeting was held in Beavercreek, Ohio on July 14, 2011 to describe the Proposed Plan, answer questions about the different cleanup alternatives, and to provide an opportunity for public comments on the Proposed Alternative. Several general comments and a few technical comments were received at the public meeting. In addition, one set of comments was provided in writing to EPA during the comment period. These comments and responses are divided into two parts in this Responsiveness Summary. Part 1 includes general Stakeholder Issues and Lead Agency responses, and Part 2 includes specific technical comments related to the alternatives evaluated in the Proposed Plan.

3.1 – Stakeholder Comments and Lead Agency Responses

Several Commentors living in or near the Woodhaven Subdivision communicated their concern with potential contamination in their private wells, specifically along Brookview Drive and Firewood Drive and along River Hills Road south of the Lammers Barrel site. In addition, concern was expressed for the Beavercreek Community Pool, as there was uncertainty regarding where its water came from.

EPA and Ohio EPA have overseen many sampling efforts to collect samples from private residential wells in the Woodhaven Subdivision since the Lammers Barrel site was identified in 1985. To date, thirteen homes have been connected to a public water supply by EPA due to contamination above acceptable levels in private wells. These homes are all north of East Patterson Road or just southeast of the Lammers Barrel site within a very short distance. Homes along Brookview Drive and Firewood Drive, along with others in the Woodhaven Subdivision, have been sampled repeatedly, including as part of the Remedial Investigation for the Site, and all of the wells at this distance from the site and south of East Patterson Road have exhibited clean groundwater. The contaminated groundwater plume north of East Patterson Road will continue to be evaluated in the Operable Unit 2 ongoing investigation.

With respect to the Valleywood Swim and Tennis Club, this pool is almost a mile beyond the extent of the Lammers Barrel site plume. The club is not in the area that would be impacted by site contamination in any way.

One commentor asked if EPA had conducted sampling for 1,4-dioxane in groundwater.

EPA has identified 1,4-dioxane an “emerging contaminant” at many Superfund sites around the country. To date, Lammers Barrel groundwater samples have not been analyzed for 1,4-dioxane. Although there is no specific evidence that 1,4-dioxane was used at Lammers Barrel or released, EPA plans to require at least one round of groundwater sampling and analysis for 1,4-dioxane in order to be responsive to community concerns. This sampling will be conducted as part of Operable Unit 1 remedy monitoring and Operable Unit 2 ongoing investigation. If the single

round of sampling and analysis does not indicate that 1,4-dioxane is present, then no other sampling for 1,4-dioxane will be conducted.

One commentor expressed support for treating the contamination in place, rather than excavating contaminated soil and taking it somewhere else for disposal. The commentor suggested that disruption to community traffic would be minimized and by treating the material in place, "we don't have to distribute it to anyone else."

EPA agrees with this assessment. These are factors that were evaluated in the nine criteria analysis that EPA performed in reaching a decision on the Selected Remedy. EPA determined that treatment conducted in-situ would be just as effective as ex-situ treatment/disposal options and it would result in fewer short-term impacts to the surrounding community. In addition, EPA guidance expresses a preference for remedies that "utilize treatment as a significant portion of the remedy," rather than remedies that transport the contaminated material to other locations for treatment and/or disposal.

3.2 – Technical and Legal Issues

A commentor expressed concern that EPA was not following the "presumptive remedy" guidance for VOCs in soil and groundwater at Superfund sites.

EPA agrees that the presumptive remedies for VOCs in soil and groundwater are not being utilized at the Lammers Barrel site. According to the EPA guidance document OSWER 9355.0-48FS, *Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds in Soils*, and OSWER Directive No. 9355.0-63FS, *User's Guide to the Soils Presumptive Remedy*, "presumptive remedies are expected to be used at all appropriate sites except under unusual site-specific circumstances." According to the guidance, Soil Vapor Extraction (SVE) should be used at sites with VOC contamination in soil. In the case of Lammers Barrel, the soil at the site is an extremely tight clay matrix. This would prevent the use of any technology which required the blowing or suction of air moving through the soil. It also prevents the use of technologies that require the injection of a liquid substance through the soil matrix.

EPA did require the evaluation of low-temperature thermal desorption (LTTD) in the FS. LTTD is considered a "backup" presumptive remedy in situations where SVE is not feasible. After considering the merits of LTTD and evaluating it using the nine CERCLA criteria, EPA determined that using in-situ treatment technologies would result in the same effectiveness at less cost and implementation time. It should also be noted that in-situ soil mixing and ERD treatment are relatively new treatment technologies. Although they have been demonstrated to be effective at many sites, including at Lammers Barrel specifically in the Early Action Pilot Test, these technologies have come into more routine use since the development of the EPA presumptive remedy guidance.

A commentor expressed concern that the use of ERD in the saturated zone and DARAMEND in the vadose zone would not address the BTEX contamination (particularly benzene, the most hazardous of the BTEX compounds, and the compound that's most resistant to anaerobic degradation). The commentor disagreed with the statement on page 10 of the FS that says

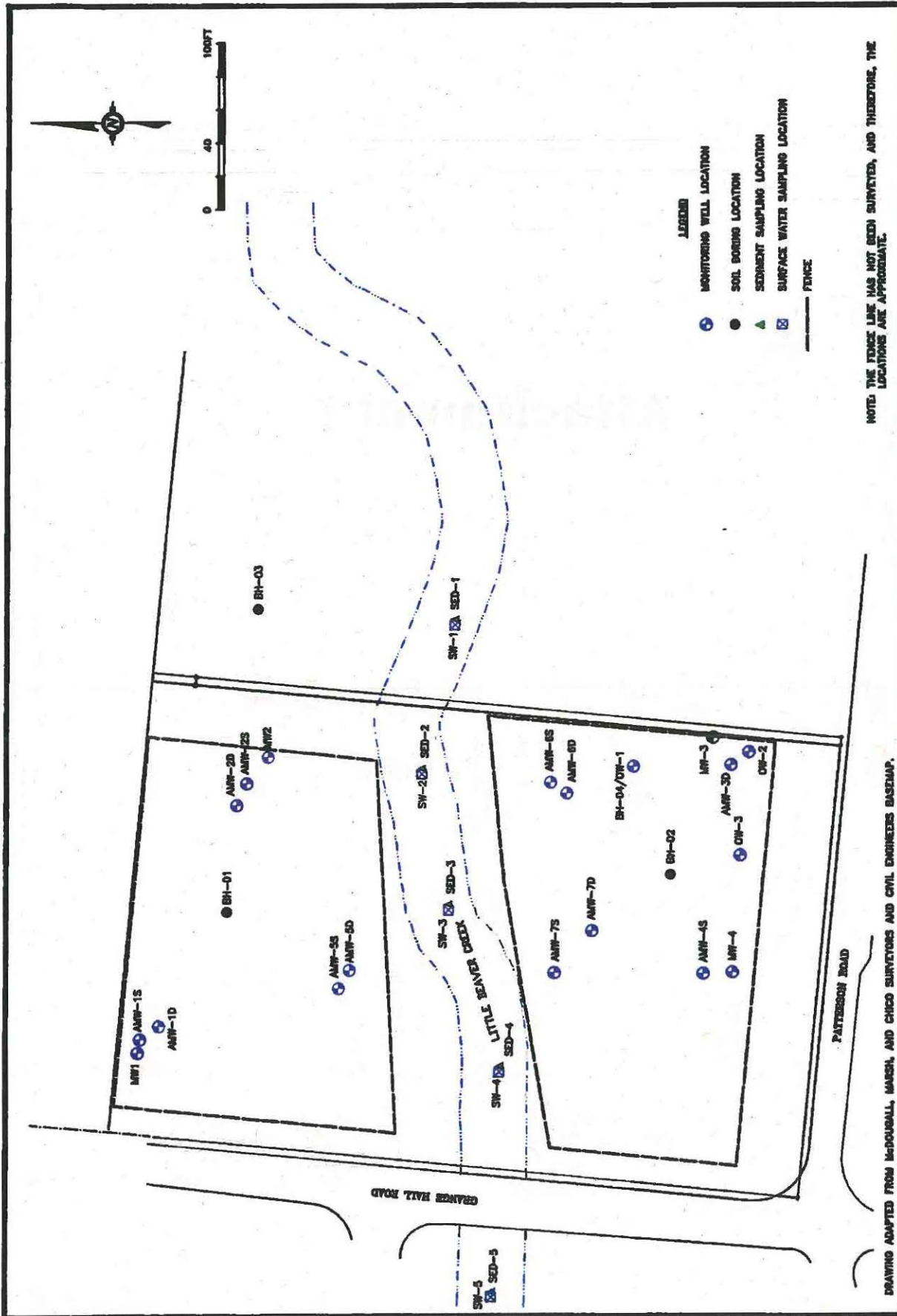
"...conditions...are favorable for anaerobic biodegradation of BTEX..." The BTEX concentration reductions observed during the ERD pilot testing were not convincing. Note the results at performance monitoring well AMW-4S reported in Appendix A, Table 1 of the FS. While the CVOCs showed extensive concentration reductions, as would be expected as a result of reductive dehalogenation, BTEX reductions were modest (and arguably, insignificant), as also would be expected.

EPA respectfully disagrees that the BTEX concentration reductions were insignificant. Actually, the table in Appendix A of the FS shows that concentrations of BTEX in monitoring well AMW-4S declined from 79 parts per billion (ppb) in May 2004 to 9.2 ppb in December 2006 – an 89% reduction in concentration. Although you are correct that BTEX compounds generally degrade more readily in more oxygenated environments, the ERD pilot study conducted at the Lammers Barrel site demonstrated that in-situ treatment resulted in significant overall reductions in both chlorinated volatile organic compound concentrations and BTEX concentrations. In addition, the presence of zero valent iron (ZVI) in the DARAMEND additive will also provide abiotic degradation of BTEX in the soil, reducing the source to groundwater. EPA also believes that the BTEX compounds are being consumed to a great extent by the naturally-occurring bacteria as they catalyze the anaerobic degradation of chlorinated VOCs.

A commentor suggested that when using the biological reduction technologies (ERD and DARAMEND), EPA needs to ensure that the potential for heavy metal mobilization (arsenic in particular) is carefully monitored.

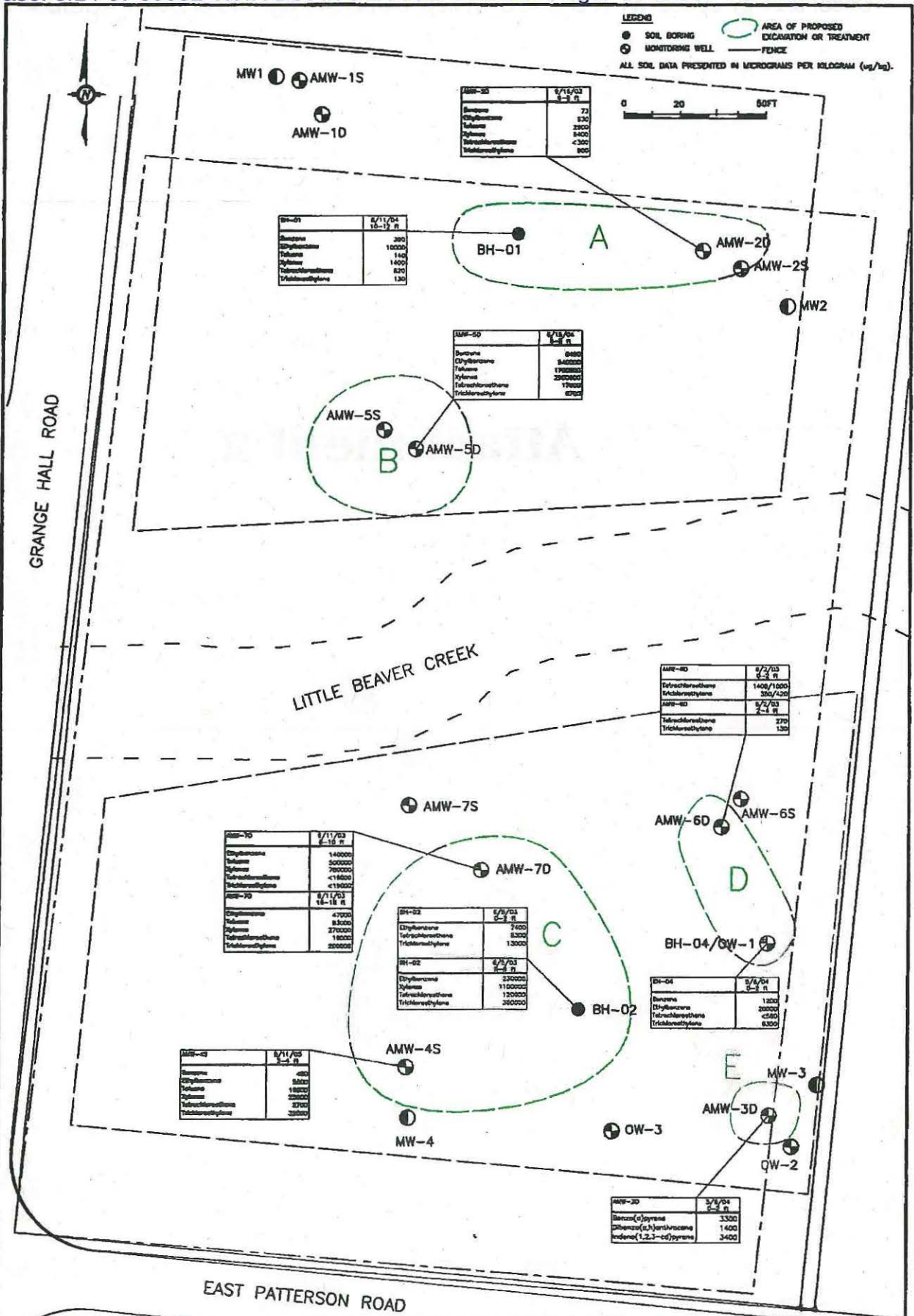
EPA agrees. In fact, language is included in the Record of Decision describing how anaerobic environments contain the potential to mobilize naturally-occurring metals, such as arsenic, manganese and iron. EPA will carefully monitor downgradient wells to ensure that the remedy does not result in a plume of metals contamination moving offsite to the east.

Attachment 1



<p>DRAWING ADAPTED FROM McDUGALL, MARSH, AND CHICO SURVEYORS AND CIVIL ENGINEERS BASEMAP.</p>		<p>ARCADIS</p>	
<p>SITE BASE MAP LAMMERS BARREL FACILITY BEAVERCREEK, OHIO</p>		<p>PROJECT NUMBER C1001228.0003</p>	
DATE	PROJECT MANAGER	DRAWING NAME	CHECKED
3/24/2010	J. KRATZMEYER	LAMMERS-VR-01	A. PENNINGTON
DRAWN	LEAD DESIGN PROF.		FIGURE NUMBER
R. SMITH	N. GILLOTTI		2

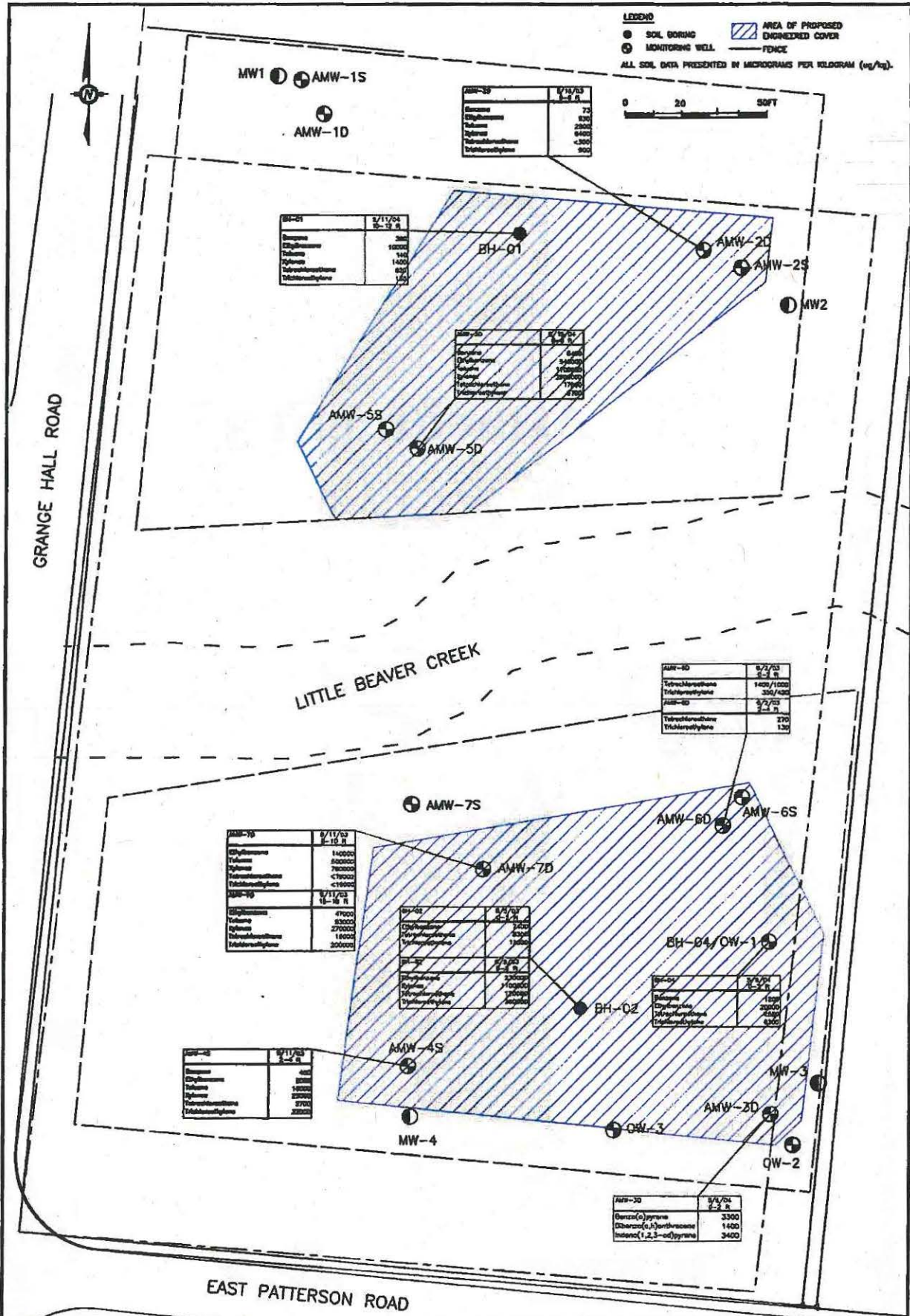
Attachment 2



EXTENT OF PROPOSED SOIL EXCAVATION OR TREATMENT AREAS
 REMEDIAL ALTERNATIVES RA-2, RA-3 AND RA-6
 LAMMERS BARREL FACILITY, BEAVERCREEK, OHIO

DATE 7/23/2010	PROJECT MANAGER A. KRATZDORFER	DRAWING NAME EXCAVATION/ZONE
DRAWN BY R. SMITH	LEAD DESIGN PRP. A. KRATZDORFER	CHECKED A. KRATZDORFER
PROJECT NUMBER C100122B.0003		PLOTTED NUMBER 11

Attachment 3



Attachment 4

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Table C-4. Option of Probable Costs for Remedial Alternative Analysis RA-4: Institutional Controls, Soil Mixing, and In Situ Groundwater Treatment, Lowermer Benzal Site, Beaver Creek, Ohio.

	UNIT COST	UNIT	REQD	SUBTOTAL
IN-SITU SOIL MIXING (1 BARRIEND APPLICATION)				
Pre-Design Investigation	\$20,000	LS	1	\$20,000
Treatability Study	\$30,000	LS	1	\$30,000
Site Management Facilities & Utilities	\$7,000	LS	1	\$7,000
Decontamination Areas & Activities	\$3,500	LS	1	\$3,500
Mobilization/Demobilization	\$37,500	LS	1	\$37,500
Removal of Concrete	\$200	CY	240	\$48,000
Clearing & Grubbing	\$10,000	Acres	2	\$20,000
In-situ Mixing (0-18" bgs, first pass)	\$82	CY	8,944	\$654,528
In-situ Mixing (0-15" bgs, second pass for 75% of volume)	\$52	CY	6,708	\$415,896
Dewatering	\$1,200	ton	533	\$639,600
Confirmation Sampling	\$25,000	LS	1	\$25,000
Air Monitoring	\$10,000	LS	1	\$10,000
Dust Suppression/Re-Watering	\$6,000	LS	1	\$6,000
Regrading/Restoration	\$12,000	Acres	2	\$24,000
			Construction Subtotal	\$1,841,000
			Contingency (10%)	\$184,100
			Institutional Controls	\$25,000
			Health & Safety Controls (3%)	\$55,200
			Engineering Design (10%)	\$184,100
			Construction Management (10%)	\$184,100
			Subtotal	\$2,393,500
SOIL MIXING CAPITAL COSTS: Annual				
IN SITU GROUNDWATER TREATMENT				
Mobilization/Demobilization	\$5,000	LS	1	\$5,000
Upper Aquifer Well Installation and Development	\$4,000	EA	6	\$24,000
Patched Zone Well Installation and Development	\$5,000	EA	3	\$15,000
Waste Disposal (includes drums, purge water)	\$5,000	LS	1	\$5,000
			Construction Subtotal	\$49,000
			Contingency (25% of Construction Costs)	\$12,250
			Construction Total	\$61,250
			Health & Safety/Air Monitoring/Security (3%)	\$1,838
			Engineering Design and Permitting (20%)	\$9,850
			Installation Management (20%)	\$9,850
			Subtotal	\$81,100
BATCH CARBON INJECTIONS				
Injections for Year 1 through Year 4				
Carbon Source Injection Labor	\$3,300	event	8	\$26,400
Water for Dblton & Electrical	\$200	event	8	\$1,600
Molasses	\$750	event	8	\$6,000
Molasses Injection Unit	\$1,000	event	8	\$8,000
Pre-injection sampling & analysis carbon	\$400	event	8	\$3,200
Spot Injection (Patched Zone)	\$25,000	LS	1	\$25,000
Process monitoring & data evaluation	\$1,000	Only	4	\$4,000
Performance Monitoring for Year 1 through Year 4				
Sampling (8 wells Quarterly)	\$300	well	32	\$6,400
Field Monitoring Equipment Rental	\$1,000	event	4	\$4,000
Laboratory Analyses	\$500	sample	36	\$18,000
Well Maintenance - Annual	\$1,000	LS	1	\$1,000
PM & Reporting	\$25,000	LS	1	\$25,000
			Subtotal	\$128,000
			Contingency (25%)	\$32,150
			ANNUAL INJECTION COSTS: Years 1-4	\$160,150
ANNUAL INJECTION COSTS: Years 1-4				

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Page 2

GROUNDWATER MONITORING PROGRAM

Mobilization/Demobilization	\$2,000	LS	1	\$2,000
Well Installation and Development (50 foot depth)	\$4,000	each	5	\$20,000
Waste Disposal (includes drums, purge water)	\$2,000	LS	1	\$2,000
				\$24,000
				\$6,000
Contingency (25%)				
				\$30,000
				Health & Safety/Air Monitoring/Security (5%)
				\$700
				Engineering Design and Permitting (20%)
				\$4,800
				Construction Management (20%)
				\$4,800
				Subtotal
				\$10,000

GROUNDWATER MONITORING CAPITAL COSTS

GROUNDWATER MONITORING ANNUAL COSTS

For Years 1 and 2

Sampling (10 wells Quarterly)	\$200	well	40	\$8,000
Laboratory Analyses	\$500	sample	44	\$22,000
Well Maintenance	\$1,000	LS	1	\$1,000
Database Management and Evaluation	\$2,500	Only	4	\$10,000
PM & Reporting	\$15,000	LS	1	\$15,000
				Subtotal
				\$56,000
				Contingency (25%)
				\$14,000
				ANNUAL COSTS: Years 1-2
				\$70,000
				GROUNDWATER MONITORING (Years 1 and 2)
				\$112,000

For Years 3 and 4

Sampling (10 wells Semi-Annually)	\$200	well	20	\$4,000
Laboratory Analyses	\$500	sample	22	\$11,000
Well Maintenance - Annual	\$1,000	LS	1	\$1,000
Database Management and Evaluation	\$2,500	Semi	2	\$5,000
PM & Reporting	\$12,000	LS	1	\$12,000
				Subtotal
				\$33,000
				Contingency (25%)
				\$8,250
				ANNUAL COSTS: Years 3-4
				\$41,250
				GROUNDWATER MONITORING (Years 3 through 4)
				\$82,500

For Year 5 through Year 10

Sampling (10 wells Annually)	\$200	well	10	\$2,000
Laboratory Analyses	\$500	sample	11	\$5,500
Well Maintenance - Annual	\$1,000	LS	1	\$1,000
Database Management and Evaluation	\$2,500	LS	1	\$2,500
PM & Reporting	\$10,000	LS	1	\$10,000
				Subtotal
				\$21,000
				Contingency (25%)
				\$5,250
				ANNUAL COSTS: Years 5-10
				\$26,250
				GROUNDWATER MONITORING (Years 5 through 10)
				\$131,250

	CAPITAL COST	\$2,500,000
	OPERATION AND MAINTENANCE COSTS	\$894,000
	TOTAL PROJECT COST	\$3,394,000
7% Discount rate	PRESENT VALUE	\$3,400,000

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Assumptions:

Soil Mixing

1. Water line is available to tap within 100 feet of the site.
2. Daramend is an appropriate carbon source and the costs do not increase significantly over time.

In Situ Groundwater Treatment

1. Duration of ERD is 2-4 years.
2. Carbon solution will be injected in 12 wells - 3 existing wells in the perched zone, 3 new wells in the perched zone, and 6 new wells in the upper aquifer.
3. Average well depth for the 6 new wells in the upper aquifer is 50 ft.
4. Average well depth for the 3 new wells in the perched zone is 30 ft.
5. Assumed costs: \$50/ft for drilling and installing the well, \$150/hr for well development with 4 hrs per well, \$500/well for well completion.
6. Molasses is used as the source of carbon.
7. Water for dilution of the molasses solution will be taken from the fire hydrant located opposite to the Lawrence's Barrel site.
8. Spot injections to address localized areas in the perched zone.
9. There will be quarterly sampling from 8 wells for 4 years.
10. Parameters to be analyzed are VOCs, biogeochemical parameters (TOC, iron, manganese, and arsenic), and light hydrocarbons.

Groundwater Monitoring

1. Duration of Groundwater Monitoring is 10 years.
2. There will be quarterly sampling for the first 2 years, semi-annual sampling during the next 2 years, and annual sampling during the next 6 years.
3. A total of 10 wells will be monitored.
4. Average well depth for the 5 new wells in the upper aquifer is 50 ft.
5. Parameters to be analyzed are VOCs, biogeochemical parameters (TOC, iron, manganese, and arsenic), and light hydrocarbons.
6. Assumed costs: \$50/ft for drilling and installing the well, \$150/hr for well development with 4 hrs per well, \$500/well for well completion.

Attachment 5

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Table 3-1. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Surface Soil (0-2 feet)
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Soil
Exposure Point: On-site Surface

CAS #	Chemical	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration ^a	Screening Toxicity Value ^b	COPC Flag	Rationale for Selection or Deletion
Metals												
7429-90-5	Aluminum	3.2E+03	1.4E+04 J	mg/kg	MW-5D	10 / 10		1.4E+04	1.9E+04	7.8E+03 nc	N	BKG
7440-36-0	Antimony	1.0E+00 J	5.5E+00	mg/kg	MW-4D	5 / 10	1.1 - 1.2	5.5E+00	NA	3.1E+00 nc	Y	ASL
7782-49-2	Selenium	8.2E-01 B	1.5E+00 B	mg/kg	MW-6D	3 / 10	0.55 - 0.80	1.5E+00	ND	3.9E+01 nc	N	BSL
7440-22-4	Silver	7.1E-01 B	7.1E-01 B	mg/kg	BH-03	1 / 10	0.50 - 0.80	7.1E-01	5.2E+00	3.9E+01 nc	N	BSL
7440-23-5	Sodium	5.1E+01 B	3.8E+02	mg/kg	OW-1	10 / 10		3.8E+02	2.3E+03	nut	N	NUT
7440-62-2	Vanadium	1.1E+01	3.5E+01	mg/kg	MW-5D	10 / 10		3.5E+01	2.7E+01	7.8E+00 nc	Y	ASL
7440-66-6	Zinc	4.6E+01 E	1.1E+03	mg/kg	OW-1	10 / 10		1.1E+03	1.9E+02	2.3E+03 nc	N	BSL
57-12-5	Cyanide (total)	8.1E-01	2.0E+00	mg/kg	MW-4D	4 / 10	0.26 - 0.32	2.0E+00	ND	1.2E+02 nc	N	BSL
PAHs												
91-57-8	2-Methylnaphthalene	1.2E-01 J	6.6E+00	mg/kg	MW-4D	3 / 10	0.18 - 0.21	6.6E+00	ND	3.1E+01 nc, R3	N	BSL
83-32-9	Acenaphthene	2.8E-01 J	2.8E-01 J	mg/kg	MW-5D	1 / 10	0.18 - 0.90	2.8E-01	ND	3.7E+02 nc	N	BSL
208-96-8	Acenaphthylene	1.8E-01 J	7.4E-01 J	mg/kg	MW-3D	2 / 10	0.18 - 0.90	7.4E-01	ND	3.7E+02 nc, SA	N	BSL
120-12-7	Anthracene	1.0E-01 J	2.3E-01 J	mg/kg	MW-3D	3 / 10	0.18 - 0.90	2.3E-01	ND	2.2E+03 nc	N	BSL
56-55-3	Benzo(a)anthracene	5.2E-02 J	5.6E-01 J	mg/kg	MW-3D	7 / 10	0.20 - 0.90	5.8E-01	9.6E-01	6.2E-01 ca	N	BSL
50-32-8	Benzo(a)pyrene	6.2E-02 J	3.3E+00 J	mg/kg	MW-3D	6 / 10	0.18 - 0.90	3.3E+00	1.8E+00	6.2E-02 ca	Y	ASL
205-99-2	Benzo(b)fluoranthene	6.9E-02 J	4.0E-01 J	mg/kg	OW-1	7 / 10	0.19 - 0.90	4.0E-01	2.1E+00	6.2E-01 ca	N	BSL
191-24-2	Benzo(g,h,i)perylene	3.2E-02 J	5.2E+00 J	mg/kg	MW-3D	8 / 10	0.21 - 0.90	5.2E+00	1.2E+00	2.3E+02 nc, SP	N	BSL
207-08-9	Benzo(k)fluoranthene	3.5E-02 J	3.6E+00 J	mg/kg	MW-3D	8 / 10	0.20 - 0.90	3.6E+00	1.3E+00	6.2E+00 ca	N	BSL
216-01-9	Chrysene	4.6E-02 J	8.3E-01 J	mg/kg	MW-3D	8 / 10	0.21 - 0.90	8.3E-01	1.9E+00	6.2E+01 ca	N	BSL
53-70-3	Dibenzo(a,h)anthracene	5.1E-02 J	1.4E+00 J	mg/kg	MW-3D	2 / 10	0.18 - 0.90	1.4E+00	ND	6.2E-02 ca	Y	ASL
206-44-0	Fluoranthene	4.7E-02 J	8.2E-01 J	mg/kg	OW-1	9 / 10	0.90 - 0.90	8.2E-01	3.8E+00	2.3E+02 nc	N	BSL
86-73-7	Fluorene	6.6E-02 J	3.2E-01 J	mg/kg	MW-5D	2 / 10	0.18 - 0.90	3.2E-01	ND	2.7E+02 nc	N	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	4.7E-02 J	3.4E+00 J	mg/kg	MW-3D	7 / 10	0.20 - 0.90	3.4E+00	1.3E+00	6.2E-01 ca	Y	ASL
91-20-3	Naphthalene	4.4E-02 J	2.0E+01	mg/kg	MW-4D	7 / 10	0.18 - 0.21	2.0E+01	ND	5.6E+00 nc	Y	ASL
85-01-8	Phenanthrene	7.4E-02 J	1.6E+00	mg/kg	MW-5D	7 / 10	0.20 - 0.21	1.6E+00	2.0E+00	2.3E+02 nc, SP	N	BSL
129-00-0	Pyrene	5.3E-02 J	8.5E-01	mg/kg	MW-5D	10 / 10		8.5E-01	2.9E+00	2.3E+02 nc	N	BSL

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Table 3-1. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Surface Soil (0-2 feet)
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Soil
Exposure Point: On-site Surface

CAS #	Chemical	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration ^a	Screening Toxicity Value ^b	COPC Flag	Rationale for Selection or Deletion
TPCBS	PCBs											
	Total PCBs	4.9E-02 J	5.1E+00	mg/kg	MW-4D	6 / 10	0.020 - 0.040	5.1E+00	1.7E-01	2.2E-01 ca	Y	ASL
	Pesticides											
72-54-8	4,4'-DDD	2.4E-03 J	8.3E-01 J	mg/kg	MW-4D	3 / 10	0.0018 - 0.0022	8.3E-01	ND	2.4E+00 ca	N	BSL
72-55-9	4,4'-DDE	7.2E-04 J	1.9E-02	mg/kg	MW-5D	2 / 10	0.0018 - 0.0036	1.9E-02	ND	1.7E+00 ca	N	BSL
50-29-3	4,4'-DDT	1.4E-03 J	1.8E-01 J	mg/kg	MW-4D	6 / 10	0.0018 - 0.0022	1.8E-01	ND	1.7E+00 ca	N	BSL
309-00-2	Aldrin	5.7E-04 J	1.2E-03 J	mg/kg	MW-6D	2 / 10	0.00095 - 0.0018	1.2E-03	ND	2.9E-02 ca	N	BSL
60-57-1	Dieldrin	4.8E-03	1.2E-02	mg/kg	OW-1	2 / 10	0.0018 - 0.0036	1.2E-02	ND	3.0E-02 ca	N	BSL
7421-93-4	Endrin aldehyde	2.4E-02 J	2.4E-02 J	mg/kg	MW-3D	1 / 10	0.0018 - 0.0036	2.4E-02	ND	1.8E+00 nc, SN	N	BSL
1024-57-3	Heptachlor epoxide	1.3E-03 J	3.5E-02 J	mg/kg	MW-4D	2 / 10	0.00090 - 0.0011	3.5E-02	ND	5.3E-02 ca	N	BSL
12789-03-8	Total Chlordanes	1.6E-03 J	1.5E-01 JD	mg/kg	MW-3D	3 / 10	0.00090 - 0.0018	1.5E-01	4.8E-02	1.8E+00 ca	N	BSL
	SVOCs											
95-50-1	1,2-Dichlorobenzene	1.5E-01 J	1.5E-01 J	mg/kg	BH-02	1 / 10	0.18 - 0.90	1.5E-01	ND	6.0E+02 sat	N	BSL
108-44-5	3-Methylphenol/4-Methylphenol (m&p-Cresol)	9.9E-02 J	9.9E-02 J	mg/kg	OW-1	1 / 10	0.18 - 0.90	9.9E-02	8.4E-01	3.1E+01 nc	N	BSL
85-68-7	Benzyl butyl phthalate	5.8E+00 J	5.8E+00 J	mg/kg	MW-3D	1 / 10	0.18 - 0.90	5.8E+00	NA	1.2E+03 nc	N	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	7.8E-02 J	1.9E+01	mg/kg	MW-4D	6 / 10	0.060 - 0.21	1.9E+01	2.4E+00	3.5E+01 ca	N	BSL
86-74-8	Carbazole	4.4E-02 J	3.3E-01 J	mg/kg	MW-5D	3 / 10	0.18 - 0.90	3.3E-01	ND	2.4E+01 ca	N	BSL
132-84-9	Dibenzofuran	2.9E-01 J	2.9E-01 J	mg/kg	MW-5D	1 / 10	0.18 - 0.90	2.9E-01	ND	1.5E+01 nc	N	BSL
84-74-2	Di-n-butylphthalate	1.5E-01 J	8.4E-01 J	mg/kg	MW-4D	3 / 10	0.18 - 0.21	6.4E-01	ND	6.1E+02 nc	N	BSL
78-59-1	Isopharone	3.7E-02 J	3.7E-02 J	mg/kg	OW-1	1 / 10	0.18 - 0.90	3.7E-02	ND	5.1E+02 ca	N	BSL
	VOCs											
71-55-6	1,1,1-Trichloroethane	6.4E+00	6.4E+00	mg/kg	BH-02	1 / 10	0.0024 - 0.28	6.4E+00	ND	1.2E+03 sat	N	BSL
75-34-3	1,1-Dichloroethane	5.2E-01 J	1.0E+00	mg/kg	BH-02	3 / 10	0.0024 - 0.11	1.0E+00	ND	5.1E+01 nc	N	BSL
75-35-4	1,1-Dichloroethylene	1.2E-01 J	1.2E-01 J	mg/kg	MW-4D	1 / 10	0.0024 - 0.28	1.2E-01	NA	1.2E+01 nc	N	BSL
107-06-2	1,2-Dichloroethane	7.6E-03 J	6.2E-01	mg/kg	OW-1	2 / 10	0.0024 - 0.11	6.2E-01	ND	2.8E-01 ca	Y	ASL
78-93-3	2-Butanone (MEK)	2.0E-03 J	1.5E+01	mg/kg	OW-1	2 / 10	0.012 - 0.58	1.5E+01	ND	2.2E+03 nc	N	BSL
108-10-1	4-Methyl-2-pentanone (MIBK)	1.2E+01	1.2E+01	mg/kg	OW-1	1 / 10	0.012 - 0.58	1.2E+01	ND	5.3E+02 nc	N	BSL
67-64-1	Acetone	5.3E-03 J	8.6E-01 J	mg/kg	MW-4D	2 / 10	0.025 - 2.9	8.6E-01	7.4E-02	1.4E+03 nc	N	BSL
71-43-2	Benzene	1.8E-01 J	1.2E+00	mg/kg	OW-1	2 / 10	0.0024 - 0.11	1.2E+00	ND	6.4E-01 ca	Y	ASL

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Table 3-1. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Surface Soil (0-2 feet)
Lammers Barrel Facility, Beaver Creek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Soil
Exposure Point: On-site Surface

CAS #	Chemical	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration ^a	Screening Toxicity Value ^b	COPC Flag	Rationale for Selection or Deletion
75-15-0	Carbon disulfide	1.2E-03 J	1.2E-03 J	mg/kg	BH-03	1 / 10	0.0024 - 0.29	1.2E-03	ND	3.8E+01 nc	N	BSL
56-23-5	Carbon tetrachloride	1.2E+00	1.2E+00	mg/kg	BH-02	1 / 10	0.0024 - 0.29	1.2E+00	ND	2.5E-01 ca	Y	ASL
108-80-7	Chlorobenzene	1.4E-01 J	1.4E-01 J	mg/kg	OW-1	1 / 10	0.0024 - 0.11	1.4E-01	ND	1.5E+01 nc	N	BSL
540-59-0	cis/trans-1,2-Dichloroethene	5.2E-04 J	7.1E+00	mg/kg	BH-02	7 / 9	0.0050 - 0.0050	7.1E+00	ND	4.3E+00 nc	Y	ASL
156-59-2	cis-1,2-Dichloroethene	3.1E+00 J	3.1E+00 J	mg/kg	OW-1	1 / 1		3.1E+00	ND	4.3E+00 nc	N	BSL
100-41-4	Ethylbenzene	3.4E-04 J	1.4E+01 J	mg/kg	MW-4D	8 / 9	0.090 - 0.090	1.4E+01	ND	4.0E+02 sat	N	BSL
75-09-2	Methylene chloride	1.0E-03 J	2.7E+01 D	mg/kg	OW-1	3 / 10	0.0024 - 0.11	2.7E+01	ND	9.1E+00 ca	Y	ASL
100-42-5	Styrene	1.2E+00 J	1.2E+00 J	mg/kg	MW-5D	1 / 10	0.0024 - 0.29	1.2E+00	ND	1.7E+03 sat	N	BSL
127-18-4	Tetrachloroethene	1.3E-03 J	8.3E+00	mg/kg	BH-02	8 / 10	0.0028 - 0.29	8.3E+00	ND	4.8E-01 ca	Y	ASL
108-88-3	Toluene	1.5E-03 J	5.8E+01 J	mg/kg	OW-1	9 / 10	0.090 - 0.090	5.8E+01	ND	5.2E+02 sat	N	BSL
158-60-5	trans-1,2-Dichloroethene	2.3E-01 J	2.3E-01 J	mg/kg	OW-1	1 / 1		2.3E-01	ND	6.9E+00 nc	N	BSL
79-01-6	Trichloroethylene	1.0E-03 J	1.3E+01	mg/kg	BH-02	8 / 10	0.0025 - 0.0026	1.3E+01	ND	5.3E-02 ca	Y	ASL
75-01-4	Vinyl chloride	5.1E-03 J	5.0E-01	mg/kg	MW-4D	3 / 10	0.0024 - 0.11	5.0E-01	ND	7.9E-02 ca	Y	ASL
1330-20-7	Xylenes, Total	4.6E-04 J	1.6E+02 J	mg/kg	MW-4D	8 / 10	0.0050 - 0.18	1.6E+02	ND	2.7E+01 nc	Y	ASL

Notes:

- a. Background concentration calculated as two times the average value
- b. Region 9 residential soil PRGs, except as noted (USEPA 2004b)
- J = estimated concentration
- E = estimated concentration, value outside of instrument calibration range
- B = chemical detected in the blank associated with this sample for organics
- D = sample diluted for analysis
- COPC = chemical of potential concern
- mg/kg = milligrams per kilogram
- ca = carcinogenic
- nc = non carcinogenic
- sat = saturation
- nut = nutrient
- max = maximum
- R3 = Region 3 Risk Based Concentration
- SD = screening toxicity values for 2,4-dichlorophenol applied as a surrogate
- SN = screening toxicity values for endrin applied as a surrogate
- SP = screening toxicity values for pyrene applied as a surrogate
- SA = screening toxicity values for acenaphthene applied as a surrogate

- NA = not available
- ND = not detected in the background samples
- PAH = polycyclic aromatic hydrocarbon
- PCB = polychlorinated biphenyl
- SVOC = semi-volatile organic carbon
- VOC = volatile organic carbon

- Rationale:
- ASL = above screening level
 - BKG = below background
 - BSL = below screening level
 - NUT = nutrient

Table 3-2. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Surface and Subsurface Soil (0-16 feet)
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
 Exposure Medium: Soil
 Exposure Point: On-site Subsurface

CAS #	Chemical ^a	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration ^b	Screening Toxicity Value ^c	COPC Flag	Rationale for Selection or Deletion
Metals												
7429-90-5	Aluminum	2.7E+03	1.5E+04	mg/kg	MW-2D, MW-4D	26 / 26		1.5E+04	1.9E+04	7.6E+03 nc	N	BKG
7440-38-0	Antimony	1.0E+00 J	5.7E+01	mg/kg	MW-5D	8 / 26	0.95 - 1.4	5.7E+01	NA	3.1E+00 nc	Y	ASL
7440-38-2	Arsenic	1.7E+00	4.3E+01	mg/kg	OW-1	25 / 26	0.55 - 0.55	4.3E+01	9.4E+00	3.9E-01 ca	Y	ASL
7440-39-3	Barium	3.5E+01	7.5E+02	mg/kg	MW-5D	26 / 26		7.5E+02	2.0E+02	5.4E+02 nc	Y	ASL
7440-41-7	Beryllium	6.4E-02 B	1.3E+00	mg/kg	MW-5D	26 / 26		1.3E+00	9.0E-01	1.5E+01 nc	N	BSL
7440-43-9	Cadmium	1.0E-01 B	1.1E+02	mg/kg	MW-5D	25 / 26	0.28 - 0.28	1.1E+02	3.9E+00	3.7E+00 nc	Y	ASL
7440-70-2	Calcium	2.3E+03	2.2E+05	mg/kg	BH-03	26 / 26		2.2E+05	1.1E+05	nut	N	NUT
7440-47-3	Chromium	5.1E+00	7.2E+02 J	mg/kg	MW-5D	26 / 26		7.2E+02	6.2E+01	2.1E+02 ca	Y	ASL
7440-48-4	Cobalt	2.9E+00	1.3E+01	mg/kg	MW-5D	26 / 26		1.3E+01	5.0E+00	9.0E+02 ca	N	BSL
7440-50-8	Copper	3.5E+00	2.2E+02	mg/kg	MW-5D	26 / 26		2.2E+02	5.0E+01	3.1E+02 nc	N	BSL
7438-89-6	Iron	5.4E+03 E	5.2E+04	mg/kg	OW-1	26 / 26		5.2E+04	2.2E+04	2.3E+03 nc	Y	ASL
7438-92-1	Lead	4.3E+00	4.1E+03 J	mg/kg	MW-5D	26 / 26		4.1E+03	6.0E+01	4.0E+01 nc	Y	ASL
7438-95-4	Magnesium	1.9E+03	8.5E+04 J	mg/kg	BH-01	29 / 26		6.5E+04	4.5E+04	nut	N	NUT
7438-98-5	Manganese	9.5E+01 E	2.9E+03	mg/kg	MW-3D	26 / 26		2.9E+03	5.3E+02	1.8E+02 nc	Y	ASL
7439-97-6	Mercury	7.4E-03 B	1.6E+00	mg/kg	MW-5D	26 / 26		1.6E+00	7.8E-02	2.3E+00 nc	N	BSL
7440-02-0	Nickel	5.5E+00 E	2.8E+01 E	mg/kg	MW-4D	26 / 26		2.8E+01	2.5E+01	1.6E+02 nc	N	BSL
7440-07-7	Potassium	4.0E+02 J	2.8E+03	mg/kg	MW-4D	26 / 26		2.8E+03	3.8E+03	nut	N	NUT
7782-49-2	Selenium	8.2E-01 B	5.3E+00	mg/kg	MW-5D	5 / 26	0.48 - 0.70	5.3E+00	ND	3.9E+01 nc	N	BSL
7440-22-4	Silver	1.3E-01 B	4.9E+00	mg/kg	MW-5D	4 / 26	0.48 - 0.70	4.9E+00	5.2E+00	3.9E+01 nc	N	BSL
7440-23-5	Sodium	5.1E+01 B	1.7E+03	mg/kg	BH-02	26 / 26		1.7E+03	2.3E+03	nut	N	NUT
7440-28-0	Thallium	1.1E+00 B	1.1E+00 B	mg/kg	MW-3D, MW-4D	2 / 26	0.50 - 0.70	1.1E+00	ND	5.2E-01 nc	Y	ASL
7440-82-2	Vanadium	7.9E+00	3.5E+01	mg/kg	MW-5D	26 / 26		3.5E+01	2.7E+01	7.8E+00 nc	Y	ASL
7440-86-6	Zinc	1.4E+01 E	1.1E+03	mg/kg	OW-1	26 / 26		1.1E+03	1.9E+02	2.3E+03 nc	N	BSL
57-12-5	Cyanide (total)	3.8E-01 B	1.2E+01	mg/kg	MW-5D	8 / 26	0.26 - 0.80	1.2E+01	ND	1.2E+02 nc	N	BSL
PAHs												
91-57-6	2-Methylnaphthalene	3.2E-02 J	1.1E+01 J	mg/kg	MW-5D	12 / 26	0.18 - 0.21	1.1E+01	ND	3.1E+01 nc, R3	N	BSL
83-32-9	Acenaphthene	5.0E-02 J	7.1E+00 J	mg/kg	BH-01	5 / 26	0.18 - 0.90	7.1E+00	ND	3.7E+02 nc	N	BSL
208-98-6	Acenaphthylene	1.6E-01 J	7.4E-01 J	mg/kg	MW-3D	2 / 26	0.18 - 3.8	7.4E-01	ND	3.7E+02 nc, SA	N	BSL
120-12-7	Anthracene	5.1E-02 J	4.6E+00 J	mg/kg	BH-01	8 / 26	0.18 - 0.90	4.6E+00	ND	2.2E+03 nc	N	BSL
56-55-3	Benzo(a)anthracene	5.2E-02 J	3.4E+00 J	mg/kg	MW-5D	10 / 26	0.18 - 0.90	3.4E+00	9.8E-01	8.2E-01 ca	Y	ASL
50-32-8	Benzo(a)pyrene	6.2E-02 J	3.3E+00 J	mg/kg	MW-3D	8 / 26	0.18 - 0.90	3.3E+00	1.6E+00	6.2E-02 ca	Y	ASL
205-99-2	Benzo(b)fluoranthene	4.4E-02 J	3.1E+00 J	mg/kg	MW-5D	10 / 26	0.18 - 0.90	3.1E+00	2.1E+00	6.2E-01 ca	Y	ASL
191-24-2	Benzo(g,h,i)perylene	3.2E-02 J	5.2E+00 J	mg/kg	MW-3D	16 / 26	0.18 - 0.90	5.2E+00	1.2E+00	2.3E+02 nc, SP	N	BSL
207-08-9	Benzo(k)fluoranthene	2.4E-02 J	4.3E+00 J	mg/kg	MW-5D	13 / 26	0.18 - 0.90	4.3E+00	1.3E+00	6.2E+00 ca	N	BSL
218-01-8	Chrysene	4.6E-02 J	3.5E+00 J	mg/kg	MW-5D	11 / 26	0.18 - 0.90	3.5E+00	1.9E+00	6.2E+01 ca	N	BSL
53-70-3	Dibenzo(a,h)anthracene	5.1E-02 J	1.4E+00 J	mg/kg	MW-3D	2 / 26	0.18 - 3.8	1.4E+00	ND	6.2E-02 ca	Y	ASL
206-44-0	Fluoranthene	4.4E-02 J	1.4E+01 J	mg/kg	BH-01	14 / 26	0.18 - 0.90	1.4E+01	3.8E+00	2.3E+02 nc	N	BSL
86-73-7	Fluorene	3.2E-02 J	8.3E+00 J	mg/kg	BH-01	6 / 26	0.18 - 0.90	8.3E+00	ND	2.7E+02 nc	N	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	3.8E-02 J	3.4E+00 J	mg/kg	MW-3D	13 / 26	0.18 - 0.90	3.4E+00	1.3E+00	6.2E-01 ca	Y	ASL
91-20-3	Naphthalene	4.4E-02 J	4.0E+01 J	mg/kg	MW-5D	16 / 26	0.18 - 0.24	4.0E+01	ND	5.6E+00 nc	Y	ASL
85-01-8	Phenanthrene	4.8E-02 J	2.7E+01 J	mg/kg	BH-01	12 / 26	0.18 - 0.24	2.7E+01	2.0E+00	2.3E+02 nc, SP	N	BSL
129-00-0	Pyrene	2.1E-02 J	8.9E+00 J	mg/kg	BH-01	17 / 26	0.18 - 0.24	8.9E+00	2.9E+00	2.3E+02 nc	N	BSL

Table 3-2. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Surface and Subsurface Soil (0-16 feet)
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Soil
Exposure Point: On-site Subsurface

CAS #	Chemical ^a	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration ^b	Screening Toxicity Value ^c	COPC Flag	Rationale for Selection or Deletion
TPCBS	PCBs Total PCBs	1.4E-02	8.8E+00 J	mg/kg	MW-2D	12 / 28	0.018 - 0.24	8.8E+00	1.7E-01	2.2E-01 ca NA	Y	ASL
72-54-8	Pesticides 4,4'-DDD	1.2E-03 J	8.3E-01 J	mg/kg	MW-4D	4 / 28	0.0018 - 0.024	8.3E-01	ND	2.4E+00 ca	N	BSL
72-55-9	4,4'-DDE	7.2E-04 J	1.9E-02	mg/kg	MW-5D	3 / 28	0.0018 - 0.024	1.8E-02	ND	1.7E+00 ca	N	BSL
50-29-3	4,4'-DDT	6.4E-04 J	2.8E-01	mg/kg	MW-2D	8 / 28	0.0018 - 0.0075	2.8E-01	ND	1.7E+00 ca	N	BSL
309-00-2	Aldrin	5.7E-04 J	1.2E-03 J	mg/kg	MW-6D	2 / 28	0.00090 - 0.012	1.2E-03	ND	2.9E-02 ca	N	BSL
319-84-6	alpha-BHC	2.2E-02 J	2.2E-02 J	mg/kg	MW-2D	1 / 28	0.00080 - 0.012	2.2E-02	ND	9.0E-02 ca	N	BSL
80-57-1	Dieldrin	4.8E-03	1.2E-02	mg/kg	OW-1	2 / 28	0.0018 - 0.024	1.2E-02	ND	3.0E-02 ca	N	BSL
7421-93-4	Endrin aldehyde	2.4E-02 J	2.4E-02 J	mg/kg	MW-3D	1 / 28	0.0018 - 0.024	2.4E-02	ND	1.8E+00 nc, SN	N	BSL
76-44-8	Heptachlor	1.1E-03 J	1.1E-03 J	mg/kg	MW-3D	1 / 28	0.00090 - 0.012	1.1E-03	ND	1.1E-01 ca	N	BSL
1024-57-3	Heptachlor epoxide	1.3E-03 J	3.5E-02 J	mg/kg	MW-4D	2 / 28	0.00090 - 0.012	3.5E-02	ND	5.3E-02 ca	N	BSL
12789-03-8	Total Chlordanes SVOCs	6.8E-04 J	1.5E-01 JD	mg/kg	MW-3D	6 / 28	0.00090 - 0.012	1.5E-01	4.8E-02	1.6E+00 ca	N	BSL
95-50-1	1,2-Dichlorobenzene	2.9E-02 J	2.0E+00	mg/kg	BH-02	5 / 28	0.18 - 3.8	2.0E+00	ND	6.0E+02 sat	N	BSL
105-67-9	2,4-Dimethylphenol	5.0E-02 J	8.1E-02 J	mg/kg	OW-1	2 / 28	0.18 - 3.8	8.1E-02	ND	1.2E+02 nc	N	BSL
95-48-7	2-Methylphenol (o-Cresol)	9.4E-02 J	8.4E-02 J	mg/kg	MW-7D	1 / 28	0.18 - 3.8	8.4E-02	ND	3.1E+02 nc	N	BSL
105-44-5	3-Methylphenol/4-Methylphenol (m&p-Cresol)	8.4E-02 J	1.0E-01 J	mg/kg	MW-4D	5 / 28	0.18 - 3.8	1.0E-01	8.4E-01	3.1E+01 nc	N	BSL
85-68-7	Benzyl butyl phthalate	1.5E-01 J	5.8E+00 J	mg/kg	MW-3D	4 / 28	0.18 - 0.90	5.8E+00	NA	1.2E+03 nc	N	BSL
111-44-4	bis(2-Chloroethyl)ether	1.1E-01 J	2.9E-01 J	mg/kg	BH-02	2 / 28	0.18 - 3.8	2.9E-01	ND	2.2E-01 ca	Y	ASL
117-81-7	bis(2-Ethylhexyl)phthalate	5.9E-02 J	6.1E+01 J	mg/kg	MW-5D	14 / 28	0.060 - 0.24	6.1E+01	2.4E+00	3.5E+01 ca	Y	ASL
86-74-8	Carbazole	4.4E-02 J	1.1E+00 J	mg/kg	MW-5D	5 / 28	0.18 - 0.90	1.1E+00	ND	2.4E+01 ca	N	BSL
132-64-9	Dibenzofuran	2.8E-01 J	7.8E+00 J	mg/kg	BH-01	2 / 28	0.18 - 3.8	7.8E+00	ND	1.5E+01 nc	N	BSL
84-74-2	Di-n-butylphthalate	4.3E-02 J	7.8E+00 J	mg/kg	MW-5D	9 / 28	0.18 - 0.24	7.8E+00	ND	6.1E+02 nc	N	BSL
78-59-1	Isophorone	3.7E-02 J	3.7E-02 J	mg/kg	OW-1	1 / 28	0.18 - 3.8	3.7E-02	ND	5.1E+02 ca	N	BSL
108-95-2	Phenol	1.0E-01 J	1.0E-01 J	mg/kg	MW-4D	1 / 28	0.18 - 3.8	1.0E-01	ND	1.8E+03 nc	N	BSL
	VOCs											
71-55-6	1,1,1-Trichloroethane	2.0E-01	6.4E+01	mg/kg	BH-02	5 / 28	0.0018 - 4.9	6.4E+01	ND	1.2E+03 sat	N	BSL
79-34-5	1,1,2,2-Tetrachloroethane	3.2E-01	5.5E-01	mg/kg	MW-4D	2 / 28	0.0018 - 9.5	5.5E-01	ND	4.1E-01 ca	Y	ASL
79-00-5	1,1,2-Trichloroethane	2.8E-01	2.6E-01	mg/kg	MW-4D	1 / 28	0.0018 - 9.5	2.8E-01	ND	7.3E-01 ca	N	BSL
75-34-3	1,1-Dichloroethane	3.8E-02 J	1.7E+01	mg/kg	BH-02	8 / 28	0.0018 - 9.5	1.7E+01	ND	5.1E+01 nc	N	BSL
75-35-4	1,1-Dichloroethylene	1.2E-01 J	7.7E-01	mg/kg	MW-4D	3 / 28	0.0018 - 9.5	7.7E-01	NA	1.2E+01 nc	N	BSL
107-06-2	1,2-Dichloroethane	7.6E-03 J	6.2E-01	mg/kg	OW-1	2 / 28	0.0018 - 9.5	6.2E-01	ND	2.8E-01 ca	Y	ASL
78-93-3	2-Butanone (MEK)	2.0E-03 J	1.8E+01 J	mg/kg	MW-5D	8 / 28	0.0090 - 48	1.8E+01	ND	2.2E+03 nc	N	BSL
108-10-1	4-Methyl-2-pentanone (MIBK)	3.8E+00	7.1E+01 J	mg/kg	MW-5D	5 / 28	0.0090 - 48	7.1E+01	ND	5.3E+02 nc	N	BSL
67-64-1	Acetone	5.3E-03 J	5.2E+01 J	mg/kg	MW-5D	9 / 28	0.023 - 95	5.2E+01	7.4E-02	1.4E+03 nc	N	BSL
71-43-2	Benzene	3.7E-02 J	8.4E+00 J	mg/kg	MW-5D	10 / 28	0.0018 - 9.5	8.4E+00	ND	6.4E-01 ca	Y	ASL
75-15-0	Carbon disulfide	1.2E-03 J	1.2E-01 J	mg/kg	MW-4D	5 / 28	0.0018 - 9.5	1.2E-01	ND	3.6E+01 nc	N	BSL
56-23-5	Carbon tetrachloride	2.2E-01	1.2E+01	mg/kg	BH-02	3 / 28	0.0018 - 9.5	1.2E+01	ND	2.5E-01 ca	Y	ASL
108-90-7	Chlorobenzene	2.6E-03 J	1.4E-01 J	mg/kg	OW-1	2 / 28	0.0018 - 9.5	1.4E-01	ND	1.5E+01 nc	N	BSL
67-66-3	Chloroform	4.3E-02 J	4.3E-02 J	mg/kg	BH-01	1 / 28	0.0018 - 9.5	4.3E-02	ND	2.2E-01 ca	N	BSL
74-87-3	Chloromethane	2.2E-01	1.1E+01 J	mg/kg	MW-7D	3 / 28	0.0018 - 4.9	1.1E+01	ND	4.7E+00 nc	Y	ASL
75-00-3	Choroethane	9.8E-02 J	2.4E-01	mg/kg	MW-4D	3.9E+04	0.0018 - 9.5	2.4E-01	NA	3.0E+00 ca	N	BSL

Table 3-2. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Surface and Subsurface Soil (0-16 feet)
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Soil
Exposure Point: On-site Subsurface

CAS #	Chemical ^a	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration ^b	Screening Toxicity Value ^c	COPC Flag	Rationale for Selection or Deletion
640-59-0	cis/trans-1,2-Dichloroethene	5.2E-04 J	1.1E+02	mg/kg	BH-02	16 / 24	0.0050 - 0.30	1.1E+02	ND	4.3E+00 nc	Y	ASL
156-59-2	cis-1,2-Dichloroethene	3.1E+00 J	3.1E+00 J	mg/kg	QW-1	1 / 2	0.0023 - 0.0023	3.1E+00	ND	4.3E+00 nc	N	BSL
10061-01-5	cis-1,3-Dichloropropene	1.6E-01 J	1.6E-01 J	mg/kg	MW-4D	1 / 26	0.0018 - 9.5	1.6E-01	ND	NA	N	LFOD
100-41-4	Ethylbenzene	3.4E-04 J	5.4E+02 J	mg/kg	MW-5D	23 / 25	0.085 - 0.090	5.4E+02	ND	4.0E+02 sat	Y	ASL
591-78-6	Methyl N-butyl ketone	6.6E-01 J	5.0E+00	mg/kg	MW-4D	3 / 26	0.0090 - 46	5.0E+00	NA	5.3E+02 nc, SK	N	BSL
75-09-2	Methylene chloride	1.0E-03 J	2.7E+01 D	mg/kg	BH-02, QW-1	7 / 26	0.0018 - 9.5	2.7E+01	ND	9.1E+00 ca	Y	ASL
100-42-5	Styrene	1.1E-01 J	3.7E+01 J	mg/kg	MW-5D	4 / 26	0.0018 - 9.5	3.7E+01	ND	1.7E+03 sat	N	BSL
127-18-4	Tetrachloroethene	1.3E-03 J	1.2E+02	mg/kg	BH-02	16 / 26	0.0018 - 9.5	1.2E+02	ND	4.8E-01 ca	Y	ASL
108-88-3	Toluene	1.3E-03 J	2.1E+03 J	mg/kg	BH-02	21 / 26	0.0023 - 0.15	2.1E+03	ND	5.2E+02 sat	Y	ASL
158-80-5	trans-1,2-Dichloroethene	2.3E-01 J	2.3E-01 J	mg/kg	QW-1	1 / 2	0.0023 - 0.0023	2.3E-01	ND	6.9E+00 nc	N	BSL
10061-02-8	trans-1,3-Dichloropropene	1.8E-01 J	1.8E-01 J	mg/kg	MW-4D	1 / 26	0.0018 - 9.5	1.8E-01	ND	NA	N	LFOD
75-25-2	Tribromomethane	3.3E-01	3.3E-01	mg/kg	MW-4D	1 / 26	0.0018 - 9.5	3.3E-01	NA	6.2E+01 ca	N	BSL
78-01-6	Trichloroethylene	9.0E-04 J	3.8E+02	mg/kg	BH-02	19 / 26	0.0023 - 9.5	3.8E+02	ND	5.3E-02 ca	Y	ASL
75-01-4	Vinyl chloride	5.1E-03 J	5.0E+00 J	mg/kg	MW-5D	7 / 26	0.0018 - 9.5	5.0E+00	ND	7.9E-02 ca	Y	ASL
1330-20-7	Xylenes, Total	4.8E-04 J	2.9E+03 J	mg/kg	MW-5D	21 / 26	0.0050 - 0.18	2.9E+03	ND	2.7E+01 nc	Y	ASL

Notes:
a. COPC screen is for direct contact pathways only. All detected VOCs were retained for the vapor intrusion pathway
b. Background concentration calculated as two times the average value
c. Region 9 residential soil PRGs, except as noted (USEPA 2004b)
J = estimated concentration
E = estimated concentration, value outside of instrument calibration range
B = chemical detected in the blank associated with this sample
D = sample diluted for analysis
COPC = chemical of potential concern
mg/kg = milligrams per kilogram
ca = carcinogenic
nc = non carcinogenic
sat = saturation
nut = nutrient
max = maximum
R3 = Region 3 Risk Based Concentration
SN = screening toxicity values for atrazine applied as a surrogate
SP = screening toxicity values for pyrene applied as a surrogate
SA = screening toxicity values for acenaphthene applied as a surrogate
SK = screening toxicity value for methyl isobutyl ketone applied as a surrogate

NA = not available
ND = not detected in the background samples
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
SVOC = semi-volatile organic carbon
VOC = volatile organic carbon

Rationale:
ASL = above screening level
BKG = below background
BSL = below screening level
LFOD = low frequency of detection
NUT = nutrient

Table 3-3. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - On-site Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Groundwater
Exposure Point: On-site

CAS #	Chemical	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration	Screening Toxicity Value ^a	COPC Flag	Rationale for Selection or Deletion
Metals												
7429-90-5	Aluminum	2.1E-02 B	1.5E+00	mg/l	MW-3	14 / 17	0.10 - 0.10	1.5E+00	NA	3.6E+00 nc	N	BSL
7440-38-0	Antimony	4.9E-03 B	4.8E-03 B	mg/l	MW-7D	1 / 17	0.010 - 0.010	4.8E-03	NA	1.5E-03 nc	Y	ASL
7440-38-2	Arsenic	5.9E-03 B	4.8E-01	mg/l	OW-2	10 / 38	0.0050 - 0.0050	4.8E-01	NA	4.5E-05 ca	Y	ASL
7440-39-3	Barium	1.8E-03 B	1.9E+00	mg/l	MW-4S	17 / 17		1.9E+00	NA	2.6E-01 nc	Y	ASL
7440-41-7	Beryllium	1.0E-03 B	1.0E-03 B	mg/l	MW-6D	1 / 17	0.0020 - 0.0020	1.0E-03	NA	7.3E-03 nc	N	BSL
7440-43-9	Cadmium			mg/l		0 / 17	0.0025 - 0.0025		NA	1.8E-03 nc	N	LFOD
7440-70-2	Calcium (dissolved)	1.0E+02	1.8E+02	mg/l	MW-2S	18 / 18		1.8E+02	NA	nut	N	NUT
7440-47-3	Chromium	1.7E-03 B	2.6E-02	mg/l	MW-1	4 / 17	0.0050 - 0.0050	2.6E-02	NA	5.5E+00 nc	N	BSL
7440-48-4	Cobalt	1.8E-03 B	1.0E-02	mg/l	MW-2S	3 / 17	0.0050 - 0.0050	1.0E-02	NA	7.3E-02 nc	N	BSL
7440-50-8	Copper	3.4E-03 B	1.3E-02 B	mg/l	MW-2	4 / 17	0.010 - 0.010	1.3E-02	NA	1.5E-01 nc	N	BSL
7439-89-8	Iron (dissolved)	2.2E-02 B	9.5E+00	mg/l	OW-3	18 / 23	0.025 - 0.025	9.5E+00	NA	1.1E+00 nc	Y	ASL
7439-92-1	Lead	2.8E-03 B	6.5E-03 B	mg/l	MW-2	8 / 17	0.0025 - 0.0025	6.5E-03	NA	1.5E-02 USEPA	N	BSL
7439-95-4	Magnesium (dissolved)	2.4E+01	5.7E+01	mg/l	MW-7S	18 / 18		5.7E+01	NA	nut	N	NUT
7439-96-5	Manganese (dissolved)	3.4E-02	1.2E+00	mg/l	MW-2S	23 / 23		1.2E+00	NA	8.8E-02 nc	Y	ASL
7439-97-6	Mercury	1.0E-04 B	2.1E-04	mg/l	MW-1	5 / 17	0.000100 - 0.000100	2.1E-04	NA	1.1E-03 nc	N	BSL
7440-02-0	Nickel	2.2E-03 B	8.8E-02	mg/l	MW-1	8 / 17	0.020 - 0.020	8.8E-02	NA	7.3E-02 nc	Y	ASL
7440-07-7	Potassium	1.8E+00	7.5E+00	mg/l	MW-2S	18 / 17	0.50 - 0.50	7.5E+00	NA	nut	N	NUT
7440-23-5	Sodium	2.1E+01	2.0E+02	mg/l	MW-1	18 / 17	0.25 - 0.25	2.0E+02	NA	nut	N	NUT
7440-82-2	Vanadium	7.8E-04 B	6.3E-03 BU	mg/l	MW-4S	15 / 17	0.0050 - 0.0050	6.3E-03	NA	3.6E-03 nc	Y	ASL
PAHs												
91-57-8	2-Methylnaphthalene	5.7E-03 J	2.0E-02 J	mg/l	MW-7S	5 / 38	0.0050 - 0.025	2.0E-02	NA	2.4E-03 nc, R3	Y	ASL
91-20-3	Naphthalene	2.0E-03 J	4.5E-01	mg/l	MW-7S	8 / 38	0.0050 - 0.025	4.5E-01	NA	6.2E-04 nc	Y	ASL
SVOCs												
95-50-1	1,2-Dichlorobenzene	1.4E-03 J	1.4E-03 J	mg/l	MW-8S	1 / 38	0.0050 - 0.025	1.4E-03	NA	3.7E-02 nc	N	BSL
105-87-9	2,4-Dimethylphenol	5.0E-03 J	2.9E-02	mg/l	MW-2S	2 / 17	0.0050 - 0.025	2.9E-02	NA	7.3E-02 nc	N	BSL
95-48-7	2-Methylphenol (o-Cresol)	1.0E-02 J	1.0E-02 J	mg/l	MW-4S	1 / 17	0.0050 - 0.025	1.0E-02	NA	1.8E-01 nc	N	BSL
108-44-5	3-Methylphenol/4-Methylphenol (m&p-Cresol)	8.3E-03 J	1.8E-02	mg/l	MW-4S	2 / 17	0.0050 - 0.025	1.6E-02	NA	1.8E-02 nc	N	BSL
111-44-4	bis(2-Chloroethyl)ether	1.1E-03 J	6.8E-01	mg/l	OW-3	6 / 38	0.0050 - 0.025	6.8E-01	NA	1.0E-05 ca	Y	ASL
84-86-2	Diethyl phthalate	1.1E-03 J	1.1E-03 J	mg/l	MW-2S	1 / 38	0.0050 - 0.025	1.1E-03	NA	2.9E+00 nc	N	BSL
78-59-1	Isophorone	1.8E-02 J	1.8E-02 J	mg/l	MW-7S	1 / 38	0.0050 - 0.025	1.8E-02	NA	7.1E-02 ca	N	BSL
108-95-2	Phenol	2.8E-03 J	2.8E-03 J	mg/l	MW-2S	1 / 17	0.0050 - 0.025	2.8E-03	NA	1.1E+00 nc	N	BSL

Table 3-3. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - On-site Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Groundwater
Exposure Point: On-site

CAS #	Chemical	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration	Screening Toxicity Value ^a	COPC Flag	Rationale for Selection or Deletion
VOCs												
71-55-8	1,1,1-Trichloroethane	2.0E-03 J	7.3E+00 D	mg/l	OW-3	8 / 38	0.00050 - 0.025	7.3E+00	NA	3.2E-01 nc	Y	ASL
79-34-5	1,1,1,2-Tetrachloroethane	8.2E-04 J	9.4E+00	mg/l	MW-4S	5 / 38	0.00050 - 1.0	9.4E+00	NA	5.5E-05 ca	Y	ASL
79-00-6	1,1,2-Trichloroethane	1.9E-02 J	1.9E-02 J	mg/l	MW-4S	1 / 38	0.00050 - 0.60	1.9E-02	NA	2.0E-04 ca	N	LFOD
75-34-3	1,1-Dichloroethane	2.2E-03	2.2E+00	mg/l	OW-3	11 / 38	0.00050 - 0.025	2.2E+00	NA	8.1E-02 nc	Y	ASL
75-35-4	1,1-Dichloroethylene	7.5E-04 J	6.5E-02 J	mg/l	OW-3	8 / 38	0.00050 - 0.50	6.5E-02	NA	3.4E-02 nc	Y	ASL
107-08-2	1,2-Dichloroethane	3.4E-03	3.4E-03	mg/l	MW-6S	1 / 38	0.00050 - 0.50	3.4E-03	NA	1.2E-04 ca	N	LFOD
78-93-3	2-Butanone (MEK)	7.4E-04 J	1.6E-02 J	mg/l	MW-6S	6 / 38	0.0050 - 5.0	1.6E-02	NA	7.0E-01 nc	N	BSL
108-10-1	4-Methyl-2-pentanone (MIBK)	7.3E-04 J	1.8E-01 J	mg/l	OW-3	4 / 38	0.0050 - 5.0	1.8E-01	NA	2.0E-01 nc	N	BSL
67-64-1	Acetone	3.3E-03 J	2.0E-02 J	mg/l	MW-6S	3 / 38	0.012 - 12	2.0E-02	NA	5.5E-01 nc	N	BSL
71-43-2	Benzene	1.6E-04 J	3.8E-01 DJ	mg/l	MW-7S	14 / 38	0.00050 - 0.25	3.8E-01	NA	3.5E-04 ca	Y	ASL
58-23-5	Carbon tetrachloride	3.2E-01 DJ	3.2E-01 DJ	mg/l	MW-7S	1 / 38	0.00050 - 0.25	3.2E-01	NA	1.7E-04 ca	N	LFOD
108-90-7	Chlorobenzene	9.6E-04 J	6.0E-03 JB	mg/l	MW-2S	3 / 38	0.00050 - 0.50	6.0E-03	NA	1.1E-02 nc	N	BSL
67-66-3	Chloroform	1.6E-04 J	7.3E-01 DJ	mg/l	MW-7S	5 / 38	0.00050 - 0.050	7.3E-01	NA	1.7E-04 ca	Y	ASL
74-87-3	Chloromethane	7.1E-04 J	7.1E-04 J	mg/l	MW-2S	1 / 38	0.00050 - 0.50	7.1E-04	NA	1.6E-02 nc	N	BSL
75-00-3	Chloroethane	2.6E-02	1.3E-01	mg/l	OW-3	4 / 38	0.00050 - 0.50	1.3E-01	NA	4.6E-03 ca	Y	ASL
158-59-2	cis-1,2-Dichloroethene	8.2E-04 J	1.6E+01	mg/l	OW-3	17 / 35	0.00050 - 0.025	1.6E+01	NA	6.1E-03 nc	Y	ASL
100-41-4	Ethylbenzene	1.7E-04 J	4.6E+00	mg/l	MW-7S	22 / 38	0.00050 - 0.010	4.6E+00	NA	1.3E-01 nc	Y	ASL
591-78-6	Methyl N-Butyl Ketone	5.4E-04 J	1.0E+00 DJ	mg/l	MW-7S	5 / 38	0.0050 - 2.5	1.0E+00	NA	2.0E-01 nc, SK	Y	ASL
75-09-2	Methylene chloride	6.3E-04 J	8.3E-04 J	mg/l	MW-3D	1 / 38	0.0025 - 2.5	8.3E-04	NA	4.3E-03 ca	N	BSL
100-42-5	Styrene	5.0E-05 J	2.2E-01 J	mg/l	MW-7S	10 / 38	0.00050 - 0.25	2.2E-01	NA	1.6E-01 nc	Y	ASL
127-18-4	Tetrachloroethene	2.5E-03	1.1E-01	mg/l	MW-6S	3 / 38	0.00050 - 0.50	1.1E-01	NA	1.0E-04 ca	Y	ASL
108-88-3	Toluene	1.1E-04 J	7.0E+01 D	mg/l	MW-7S	14 / 38	0.00050 - 0.025	7.0E+01	NA	7.2E-02 nc	Y	ASL
156-60-5	trans-1,2-Dichloroethene	3.6E-04 J	4.7E+00	mg/l	MW-4S	8 / 38	0.00050 - 0.50	4.7E+00	NA	1.2E-02 nc	Y	ASL
75-25-2	Tribromomethane	1.0E-03 J	1.0E-03 J	mg/l	MW-6S	1 / 38	0.00050 - 0.50	1.0E-03	NA	6.5E-03 ca	N	BSL
78-01-6	Trichloroethylene	1.4E-04 J	1.1E+00 J	mg/l	MW-7D	16 / 38	0.00050 - 0.25	1.1E+00	NA	2.8E-05 ca	Y	ASL
75-01-4	Vinyl chloride	1.6E-04 J	7.1E+00 D	mg/l	MW-4S	15 / 38	0.00050 - 0.25	7.1E+00	NA	2.0E-05 ca	Y	ASL
1330-20-7	Xylenes, Total	2.7E-04 J	2.5E+01	mg/l	MW-7S	18 / 38	0.00100 - 0.020	2.5E+01	NA	2.1E-02 nc	Y	ASL

Notes:

- a. Region 8 residential tapwater PRGs, except as noted (USEPA 2004b)
- J = estimated concentration
- B = chemical detected in the blank associated with this sample for organics
- D = sample diluted for analysis
- COPC = chemical of potential concern
- mg/l = milligrams per liter
- ca = carcinogenic
- nc = non carcinogenic
- nut = nutrient
- R3 = Region 3 Risk Based Concentration
- SK = screening toxicity values for methyl isobutyl ketone applied as a surrogate
- NA = not available
- PAH = polycyclic aromatic hydrocarbon
- SVOC = semi-volatile organic compound
- USEPA = USEPA Action Level for lead
- VOC = volatile organic compound

Rationale:

- ASL = above screening level
- BKG = below background
- BSL = below screening level
- LFOD = low frequency of detection
- NUT = nutrient

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Table 3-4. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Off-site Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Groundwater
Exposure Point: Off-site

CAS #	Chemical	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration	Screening Toxicity Value ^a	COPC Flag	Rationale for Selection or Deletion
Metals												
7440-38-2	Arsenic	1.1E-02	6.1E-02	mg/l	OMW-16	2 / 19	0.005 - 0.005	6.1E-02	NA	4.5E-05 ca	Y	ASL
7439-89-8	Iron (dissolved)	3.4E-01	1.2E+01	mg/l	OMW-15	15 / 20	0.025 - 0.025	1.2E+01	NA	1.1E+00 nc	Y	ASL
7439-96-5	Manganese (dissolved)	1.5E-02	5.8E-01	mg/l	OMW-15	17 / 20	0.005 - 0.005	5.8E-01	NA	8.8E-02 nc	Y	ASL
VOCs												
75-34-3	1,1-Dichloroethane	6.5E-02	6.5E-02	mg/l	OMW-15	1 / 31	0.0005 - 0.005	6.5E-02	NA	8.1E-02 nc	N	BSL
75-35-4	1,1-Dichloroethylene	1.8E-03	5.2E-03	mg/l	OMW-17	2 / 31	0.0005 - 0.005	5.2E-03	NA	3.4E-02 nc	N	BSL
107-06-2	1,2-Dichloroethane	1.8E-03	1.8E-03	mg/l	OMW-18	1 / 31	0.0005 - 0.005	1.8E-03	NA	1.2E-04 ca	N	LFOD
78-93-3	2-Butanone (MEK)	1.4E-03	1.4E-03	mg/l	OMW-07	1 / 31	0.005 - 0.05	1.4E-03	NA	7.0E-01 nc	N	BSL
71-43-2	Benzene	1.1E-03	6.3E-03	mg/l	OMW-15	4 / 31	0.0005 - 0.005	6.3E-03	NA	3.5E-04 ca	Y	ASL
67-66-3	Chloroform	5.8E-04	5.8E-04	mg/l	OMW-10	1 / 31	0.0005 - 0.005	5.8E-04	NA	1.7E-04 ca	N	LFOD
75-00-3	Chloroethane	9.9E-03	9.9E-03	mg/l	OMW-15	1 / 31	2.0005 - 2.005	9.9E-03	NA	4.8E-03 ca	N	LFOD
156-59-2	cis-1,2-Dichloroethane	2.1E-03	8.0E-01	mg/l	OMW-17	8 / 31	0.0005 - 0.0025	8.0E-01	NA	6.1E-03 nc	Y	ASL
100-41-4	Ethylbenzene	1.8E-03	3.3E-01	mg/l	OMW-15	2 / 31	0.0005 - 0.005	3.3E-01	NA	1.3E-01 nc	Y	ASL
108-88-3	Toluene	1.1E-03	2.2E-02	mg/l	OMW-15	4 / 31	0.0005 - 0.0025	2.2E-02	NA	7.2E-02 nc	N	BSL
156-60-5	trans-1,2-Dichloroethane	2.0E-03	2.0E-03	mg/l	OMW-19	1 / 31	0.0005 - 0.005	2.0E-03	NA	1.2E-02 nc	N	BSL
79-01-6	Trichloroethylene	3.8E-04	2.0E-03	mg/l	OMW-03	2 / 31	0.0005 - 0.005	2.0E-03	NA	2.8E-05 ca	Y	ASL
75-01-4	Vinyl chloride	1.2E-03	1.8E-01	mg/l	OMW-19	13 / 31	0.0005 - 0.0025	1.8E-01	NA	2.0E-05 ca	Y	ASL
1330-20-7	Xylenes, Total	6.7E-03	1.1E+00	mg/l	OMW-15	2 / 31	0.00100 - 0.00100	1.1E+00	NA	2.1E-02 nc	Y	ASL

Notes:

a. Region 9 residential tapwater PRGs, except as noted (USEPA 2004b)

J = estimated concentration

COPC = chemical of potential concern

mg/l = milligrams per liter

ca = carcinogenic

nc = non carcinogenic

NA = not available

VOC = volatile organic compound

Rationale:

ASL = above screening level

BSL = below screening level

LFOD = low frequency of detection

Table 3-6. Occurrence, Distribution, and Selection of Chemicals of Potential Concern- Surface Water
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Surface Water
Exposure Point: On-site/Downgradient

CAS #	Chemical	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration ^a	Screening Toxicity Value ^b	COPC Flag	Rationale for Selection or Deletion
Metals												
7429-80-5	Aluminum	1.7E-02 B	2.4E-01	mg/l	RM 3.47	10 / 12	0.10 - 0.10	2.4E-01	1.8E-01	3.6E+00 nc	N	BSL
7440-38-0	Antimony	4.0E-03 B	1.3E-02 B	mg/l	SW-2	4 / 7	0.0064 - 0.010	1.3E-02	1.2E-02	1.5E-03 nc	Y	ASL
7440-38-2	Arsenic	8.6E-04 B	8.6E-04 B	mg/l	SW02	1 / 12	0.00055 - 0.0075	8.6E-04	8.1E-03	4.5E-05 ca	N	BKG
7440-39-3	Barium	6.4E-02 B	1.1E-01	mg/l	SW-4	12 / 12		1.1E-01	1.8E-01	2.6E-01 nc	N	BSL
7440-70-2	Calcium	5.5E+01	8.0E+01	mg/l	SW-2, SW-4	12 / 12		8.0E+01	1.5E+02	nut	N	NUT
7440-47-3	Chromium	1.4E-03 B	7.8E-03 B	mg/l	SW01	7 / 12	0.015 - 0.015	7.8E-03	7.8E-03	5.6E+00 nc	N	BSL
7440-48-4	Cobalt	1.8E-03 B	1.7E-03 B	mg/l	SW-1	2 / 7	0.00090 - 0.0075	1.7E-03	ND	7.3E-02 nc	N	BSL
7440-50-8	Copper	5.0E-03 B	5.9E-03 B	mg/l	SW-1, SW-4	5 / 12	0.0013 - 0.0050	5.9E-03	5.2E-03	1.5E-01 nc	N	BSL
7439-89-6	Iron	8.8E-02	3.2E-01	mg/l	RM 3.47	12 / 12		3.2E-01	3.3E-01	1.1E+00 nc	N	BSL
7439-92-1	Lead	1.4E-03 B	1.5E-03 B	mg/l	SW01	2 / 12	0.00100 - 0.0038	1.5E-03	3.6E-03	1.5E-02 USEPA	N	BSL
7439-95-4	Magnesium	2.8E+01	3.5E+01	mg/l	RM 3.47, SW-4	12 / 12		3.5E+01	6.2E+01	nut	N	NUT
7439-96-5	Manganese	1.9E-02	5.9E-02	mg/l	RM 3.47	12 / 12		5.9E-02	4.6E-02	8.8E-02 nc	N	BSL
7440-02-0	Nickel	3.2E-03 B	4.0E-02	mg/l	RM 3.47	9 / 12	0.020 - 0.020	4.0E-02	8.9E-03	7.3E-02 nc	N	BSL
7440-07-7	Potassium	7.8E+00	2.8E+01	mg/l	RM 3.47	12 / 12		2.8E+01	1.8E+01	nut	N	NUT
7440-22-4	Silver	2.8E-03 B	2.9E-03 B	mg/l	SW02	2 / 7	0.0050 - 0.0075	2.9E-03	7.8E-03	1.8E-02 nc	N	BSL
7440-23-5	Sodium	6.9E+01	1.2E+02	mg/l	RM 3.47	12 / 12		1.2E+02	1.8E+02	nut	N	NUT
7440-24-6	Strontium	2.8E-01	3.3E-01	mg/l	RM 3.47	5 / 5		3.3E-01	NA	2.2E+00 nc	N	BSL
7440-28-0	Thallium	8.0E-03 B	8.0E-03 B	mg/l	SW-2	1 / 7	0.00055 - 0.0050	8.0E-03	8.6E-03	2.4E-04 nc	N	BKG
7440-62-2	Vanadium	1.2E-03 J	2.9E-03 BJ	mg/l	SW-2	5 / 7	0.0038 - 0.0038	2.9E-03	8.6E-03	3.6E-03 nc	N	BSL
7440-66-8	Zinc	1.6E-02 B	4.3E-02	mg/l	RM 3.47	12 / 12		4.3E-02	3.8E-02	1.1E+00 nc	N	BSL
PAHs												
191-24-2	Benzo(g,h,i)perylene	2.9E-03 J	2.9E-03 J	mg/l	SW-2	1 / 7	0.0050 - 0.0050	2.9E-03	ND	1.8E-02 nc, SP	N	BSL
Pesticides												
58-89-9	gamma-BHC (Lindane)	8.2E-08 JP	6.0E-05 JP	mg/l	SW02	2 / 7	0.000025 - 0.000038	6.0E-05	3.4E-05	5.2E-05 ca	Y	ASL
VOCs												
67-64-1	Acetone	2.4E-03 J	2.7E-03 J	mg/l	SW-2	5 / 7	0.0050 - 0.0050	2.7E-03	7.9E-03	5.5E-01 nc	N	BSL
75-27-4	Bromodichloromethane	2.2E-04 J	2.6E-04 J	mg/l	SW-1	3 / 7	0.00050 - 0.0050	2.6E-04	ND	1.8E-04 ca	Y	ASL
67-66-3	Chloroform	4.8E-04 J	3.0E-03 J	mg/l	SW01	6 / 7	0.0050 - 0.0050	3.0E-03	5.8E-03	1.7E-04 ca	N	BKG
100-42-5	Styrene	5.0E-05 JB	2.8E-04 JB	mg/l	SW-2	2 / 7	0.00050 - 0.0050	2.8E-04	ND	1.6E-01 nc	N	BSL

Notes:

- a. Background concentration calculated as two times the average value
- b. Region 3 residential soil PRGs, except as noted (USEPA 2004b)
- J = estimated concentration
- B = chemical detected in the blank associated with this sample
- P = second column precision outside of laboratory QC limits
- COPC = chemical of potential concern
- mg/l = milligrams per liter
- ca = carcinogenic
- nc = non carcinogenic
- SN = Endrin applied as a surrogate to establish screening toxicity values
- R3 = Region 3 Risk Based Concentration
- SP = screening toxicity values for pyrene applied as a surrogate
- USEPA = USEPA Action Level for lead

- ND = not detected in the background samples
- PAH = polycyclic aromatic hydrocarbon
- VOC = volatile organic compound

Rationale:

- ASL = above screening level
- BKG = below background
- BSL = below screening level
- NUT = nutrient

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Table 3-6. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Sediment
Lammers Barrel Facility, Beaver Creek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Sediment
Exposure Point: On-site/Downgradient

CAS #	Chemical	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration ^a	Screening Toxicity Value ^b	COPC Flag	Rationale for Selection or Deletion
Metals												
7428-90-5	Aluminum	2.3E+03	1.2E+04	mg/kg	RM3.47	3 / 3		1.2E+04	1.9E+04	7.6E+03 nc	N	BKG
7440-38-2	Arsenic	2.1E+00 B	7.8E+00	mg/kg	SED2/SED3	7 / 7		7.8E+00	8.4E+00	3.9E-01 ca	N	BKG
7440-39-3	Barium	1.8E+01 B	9.5E+01	mg/kg	SD02/SD03	3 / 3		9.5E+01	2.0E+02	5.4E+02 nc	N	BSL
7440-41-7	Beryllium	2.8E-01 B	6.9E-01 B	mg/kg	SD02/SD03	2 / 2		6.9E-01	9.0E-01	1.6E+01 nc	N	BSL
7440-43-9	Cadmium	9.8E-01 B	3.1E+00	mg/kg	RM3.47	3 / 3		3.1E+00	3.6E+00	3.7E+00 nc	N	BSL
7440-70-2	Calcium	3.8E+04	8.0E+04	mg/kg	SD01	3 / 3		8.0E+04	1.1E+05	nut	N	NUT
7440-47-3	Chromium	9.4E+00	1.7E+01	mg/kg	RM3.47	3 / 3		1.7E+01	6.2E+01	2.1E+02 ca	N	BSL
7440-48-4	Cobalt	2.0E+00 B	6.3E+00 B	mg/kg	SD02/SD03	2 / 2		6.3E+00	5.0E+00	9.0E+02 ca	N	BSL
7440-50-8	Copper	1.1E+01	1.8E+01	mg/kg	SD02/SD03	3 / 3		1.8E+01	5.0E+01	3.1E+02 nc	N	BSL
7439-89-6	Iron	8.3E+03	1.5E+04	mg/kg	SD02/SD03	3 / 3		1.6E+04	2.2E+04	2.3E+03 nc	N	BKG
7439-92-1	Lead	1.1E+01	5.5E+01	mg/kg	RM3.47	3 / 3		5.5E+01	6.0E+01	4.0E+01 nc	N	BKG
7439-95-4	Magnesium	1.5E+04	3.4E+04	mg/kg	SD01	3 / 3		3.4E+04	4.5E+04	nut	N	NUT
7439-96-5	Manganese	1.5E+02	2.9E+02	mg/kg	RM3.47	3 / 3		2.9E+02	5.3E+02	1.6E+02 nc	N	BKG
7439-97-6	Mercury	3.6E-02	3.6E-02	mg/kg	RM3.47	1 / 3	0.015 - 0.020	3.6E-02	7.8E-02	2.3E+00 nc	N	BSL
7440-02-0	Nickel	5.0E+00 B	1.4E+01 J	mg/kg	SD02/SD03	2 / 3	9.8 - 9.8	1.4E+01	2.6E+01	1.6E+02 nc	N	BSL
7440-07-7	Potassium	3.2E+02 B	2.5E+03	mg/kg	RM3.47	3 / 3		2.5E+03	3.8E+03	nut	N	NUT
7782-49-2	Selenium	6.0E-01 B	6.0E-01 B	mg/kg	SD02/SD03	1 / 3	0.20 - 0.49	6.0E-01	ND	3.9E+01 nc	N	BSL
7440-22-4	Silver	1.4E+00 B	2.1E+00 B	mg/kg	SD01	2 / 2		2.1E+00	5.2E+00	3.9E+01 nc	N	BSL
7440-23-5	Sodium	2.0E+02 B	2.8E+02 B	mg/kg	SD02/SD03	2 / 3	1.225 - 1.225	2.8E+02	2.3E+03	nut	N	NUT
7440-24-6	Strontium	5.1E+01	5.1E+01	mg/kg	RM3.47	1 / 1		5.1E+01	1.3E+02	4.7E+03 nc	N	BSL
7440-28-0	Thallium	4.8E-01 B	4.8E-01 B	mg/kg	SD02/SD03	1 / 2	0.14 - 0.14	4.8E-01	ND	5.2E-01 nc	N	BSL
7440-62-2	Vanadium	9.7E+00 B	2.3E+01	mg/kg	SD02/SD03	2 / 2		2.3E+01	2.7E+01	7.8E+00 nc	N	BKG
7440-66-8	Zinc	2.9E+01 J	7.9E+01	mg/kg	RM3.47	3 / 3		7.9E+01	1.9E+02	2.3E+03 nc	N	BSL
PAHs												
91-57-6	2-Methylnaphthalene	4.3E-02 J	9.4E-01 J	mg/kg	SED2/SED3	4 / 7	0.20 - 0.46	9.4E-01	ND	3.1E+01 nc, R3	N	BSL
120-12-7	Anthracene	8.9E-02 J	8.6E-02 J	mg/kg	SED4/SED5	1 / 7	0.20 - 2.2	8.6E-02	ND	2.2E+03 nc	N	BSL
56-55-3	Benzo(a)anthracene	8.4E-02 J	4.7E-01 J	mg/kg	SED4/SED5	3 / 7	0.21 - 2.2	4.7E-01	9.6E-01	6.2E-01 ca	N	BSL
50-32-8	Benzo(a)pyrene	1.8E-01 J	6.2E-01	mg/kg	RM3.47	3 / 7	0.20 - 2.2	6.2E-01	1.6E+00	6.2E-02 ca	N	BKG
205-99-2	Benzo(b)fluoranthene	1.8E-01 J	8.0E-01 J	mg/kg	SED4/SED5	5 / 7	0.21 - 2.2	8.0E-01	2.1E+00	6.2E-01 ca	N	BKG
191-24-2	Benzo(g,h,i)perylene	1.0E-01 J	5.3E-01	mg/kg	RM3.47	4 / 7	0.21 - 2.2	5.3E-01	1.2E+00	2.3E+02 nc, SP	N	BSL
207-08-9	Benzo(k)fluoranthene	6.1E-01	6.1E-01	mg/kg	RM3.47	1 / 7	0.20 - 2.2	6.1E-01	1.3E+00	6.2E+00 ca	N	BSL
218-01-8	Chrysene	7.6E-02 J	7.5E-01	mg/kg	RM3.47	5 / 7	0.21 - 0.27	7.5E-01	1.9E+00	6.2E+01 ca	N	BSL
208-44-0	Fluoranthene	1.1E-01 J	1.6E+00	mg/kg	RM3.47	5 / 7	0.21 - 2.2	1.6E+00	3.8E+00	6.2E-01 nc	N	BSL
86-73-7	Fluorene	1.8E-01	1.8E-01	mg/kg	SD02/SD03	1 / 7	0.20 - 2.2	1.8E-01	ND	2.7E+02 nc	N	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	1.1E-01 J	5.7E-01	mg/kg	RM3.47	3 / 7	0.20 - 2.2	5.7E-01	1.3E+00	6.2E-01 ca	N	BSL
91-20-3	Naphthalene	4.8E-02	3.2E-01 J	mg/kg	SD02/SD03	4 / 7	0.20 - 2.2	3.2E-01	ND	5.6E+00 nc	N	BSL
85-01-6	Phenanthrene	5.7E-02 J	1.3E+00 J	mg/kg	SED2/SED3	6 / 7	0.21 - 0.21	1.3E+00	2.0E+00	2.3E+02 nc, SP	N	BSL
129-00-0	Pyrene	1.5E-01 J	1.4E+00 J	mg/kg	SED2/SED3	6 / 7	0.21 - 0.21	1.4E+00	2.9E+00	2.3E+02 nc	N	BSL
PCBs												
TCBS	Total PCBs	4.2E-01	4.2E-01	mg/kg	RM3.47	1 / 3	0.020 - 0.028	4.2E-01	1.7E-01	2.2E-01 ca	Y	ASL

Case: 3:14-cv-00032-WHR Doc #: 5-1 Filed: 04/22/14 Page: 64 of 144 PAGEID #: 593

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Table 3-6. Occurrence, Distribution, and Selection of Chemicals of Potential Concern - Sediment
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Sediment
Exposure Point: On-site/Downgradient

CAS #	Chemical	Minimum Detected Concentration	Maximum Detected Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Non-Detects	Concentration Used for Screening	Background Concentration ^a	Screening Toxicity Value ^b	COPC Flag	Rationale for Selection or Deletion
Pesticides												
12789-03-6	Total Chloroethanes	1.9E-03 JP	2.0E-02	mg/kg	RM3.47	3 / 3		2.0E-02	4.8E-02	1.8E+00 ca	N	BSL
53494-70-5	Endrin ketone	4.0E-04 JP	2.0E-03	mg/kg	SD02/SD03	2 / 2		2.0E-03	ND	1.8E+00 nc, SN	N	BSL
78-44-8	Heptachlor	8.4E-04 JP	8.4E-04 JP	mg/kg	SD01	1 / 3	0.0014 - 0.0025	8.4E-04	ND	1.1E-01 ca	N	BSL
SVOCs												
117-81-7	bis(2-Ethylhexyl)phthalate	1.4E-01 J	8.8E+00 J	mg/kg	SED2/SED3	4 / 7	0.20 - 0.27	8.8E+00	2.4E+00	3.5E+01 ca	N	BSL
84-74-2	Di-n-butylphthalate	7.2E-01 J	7.2E-01 J	mg/kg	SED2/SED3	1 / 7	0.20 - 0.48	7.2E-01	ND	6.1E+02 nc	N	BSL
VOCs												
95-63-8	1,2,4-Trimethylbenzene	4.4E-01	4.4E-01	mg/kg	RM3.47	1 / 1		4.4E-01	ND	5.2E+00 nc	N	BSL
108-87-8	1,3,5-Trimethylbenzene	1.4E-01	1.4E-01	mg/kg	RM3.47	1 / 1		1.4E-01	ND	2.1E+00 nc	N	BSL
67-64-1	Acetone	1.3E-02 JB	1.1E-01	mg/kg	SD02/SD03	3 / 7	0.0080 - 0.90	1.1E-01	7.4E-02	1.4E+03 nc	N	BSL
528-73-8	Benzene, 1,2,3-trimethyl-	2.0E+00 JN	2.0E+00 JN	mg/kg	RM3.47	1 / 1		2.0E+00	NA	2.1E+00 nc, SB	N	BSL
104-51-8	Benzene, butyl	5.4E-02	5.4E-02	mg/kg	RM3.47	1 / 1		5.4E-02	ND	2.4E+02 sat	N	BSL
98-08-8	Benzene, tert-butyl	8.3E-02	8.3E-02	mg/kg	RM3.47	1 / 1		8.3E-02	ND	3.9E+02 sat	N	BSL
540-59-0	cis/trans-1,2-Dichloroethene	2.8E-03 J	2.8E-03 J	mg/kg	SED-2	1 / 3	0.001 - 0.012	2.8E-03	ND	4.3E+00 nc	N	BSL
100-41-4	Ethylbenzene	5.0E-02	4.8E+00	mg/kg	SED4/SED5	5 / 7	0.0080 - 0.0070	4.8E+00	ND	4.0E+02 sat	N	BSL
103-65-1	n-Propylbenzene	8.7E-02	8.7E-02	mg/kg	RM3.47	1 / 1		8.7E-02	ND	2.4E+02 sat	N	BSL
108-88-3	Toluene	3.0E-03 J	3.0E-03 J	mg/kg	SED6	1 / 7	0.0080 - 0.90	3.0E-03	ND	5.2E+02 sat	N	BSL
1330-20-7	Xylenes, Total	3.4E-01	8.7E+01	mg/kg	SED2/SED3	5 / 7	0.0080 - 0.0070	6.7E+01	ND	2.7E+01 nc	Y	ASL

Notes:

- a. Background concentration calculated as two times the average value
- b. Region 9 residential soil PRGs, except as noted (USEPA 2004b)
- J = estimated concentration
- E = estimated concentration, value outside of instrument calibration range
- B = chemical detected in the blank associated with this sample
- P = second column precision outside of laboratory QC limits
- N = spike sample recovery outside laboratory QC limits
- D = sample diluted for analysis
- COPC = chemical of potential concern
- mg/kg = milligrams per kilogram
- ca = carcinogenic
- nc = non carcinogenic
- sat = saturation
- nut = nutrient
- max = maximum
- R3 = Region 3 Risk Based Concentration

- SB = screening toxicity values for 1,3,5-trimethylbenzene applied as a surrogate
- SN = screening toxicity values for endrin applied as a surrogate
- SP = screening toxicity values for pyrene applied as a surrogate
- ND = Not detected in the background samples
- PAH = polycyclic aromatic hydrocarbon
- PCB = polychlorinated biphenyl
- SVOC = semi-volatile organic carbon
- VOC = volatile organic compound

Rationale:

- ASL = above screening level
- BSL = below screening level
- BKG = below background
- NUT = nutrient

Table 4-1. Summary of Exposure Pathways
Lammers Barrel Facility, Beaver Creek, Ohio

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway	
Current	Soil	Surface Soil (0-2 feet bgs)	Surface Soil	Trespasser	Older Child	Dermal Ingestion Inhalation	On-site On-site On-site	Quant Quant Quant	Access to the Lammers Barrel site is not restricted Access to the Lammers Barrel site is not restricted Access to the Lammers Barrel site is not restricted	
		Subsurface Soil (0-16 feet bgs)	Subsurface Soil	Utility Worker	Adult	Dermal Ingestion Inhalation	On-site On-site On-site	Quant Quant Quant	Contact with soil possible during maintenance activities Contact with soil possible during maintenance activities Contact with soil possible during maintenance activities	
	Groundwater	Groundwater	Tap Water	Resident	Young and Older Child, Adult	Dermal Ingestion Inhalation	Off-site Off-site Off-site	None None None	All residents near the impacted groundwater are using municipal water supplies All residents near the impacted groundwater are using municipal water supplies All residents near the impacted groundwater are using municipal water supplies	
			Indoor Air	Resident	Young and Older Child, Adult	Inhalation	Off-site	Quant	Volatilization into homes located overlying groundwater is possible	
			Non-potable Water	Wader	Young Child	Dermal Ingestion Inhalation	Off-site Off-site Off-site	Quant Quant Quant	Residents with active wells could use them to fill a child wading pool Residents with active wells could use them to fill a child wading pool Inhalation of VOCs in ambient air is minimal	
	Surface Water	Surface Water	Little Beaver Creek	Trespasser	Older Child	Dermal Ingestion Inhalation	On-site On-site On-site	Quant Quant None	Access to Little Beaver Creek is not restricted Access to Little Beaver Creek is not restricted Any VOCs volatilizing from surface water would rapidly disperse in ambient air	
	Sediment	Sediment	Little Beaver Creek	Trespasser	Older Child	Dermal Ingestion Inhalation	On-site On-site On-site	Quant Quant None	Access to Little Beaver Creek is not restricted Access to Little Beaver Creek is not restricted Any VOCs in sediment would be discharged to surface water and then would rapidly disperse in ambient air upon volatilization from surface water	
	Future	Soil	Surface Soil (0-2 feet bgs)	Surface Soil	Recreator	Young and Older Child, Adult	Dermal Ingestion Inhalation	On-site On-site On-site	Quant Quant Quant	If Site is developed for recreational use, contact with surface soil is possible If Site is developed for recreational use, contact with surface soil is possible If Site is developed for recreational use, contact with surface soil is possible
			Subsurface Soil (0-16 feet bgs)	Subsurface Soil	Resident	Young and Older Child, Adult	Dermal Ingestion Inhalation	On-site On-site On-site	None None None	Residential development on-site is highly unlikely; quantitatively evaluated in the uncertainty section only Residential development on-site is highly unlikely; quantitatively evaluated in the uncertainty section only Residential development on-site is highly unlikely; quantitatively evaluated in the uncertainty section only
						Commercial/ Industrial Worker	Adult	Dermal Ingestion Inhalation	On-site On-site On-site	Quant Quant Quant
Utility Worker						Adult	Dermal Ingestion Inhalation	On-site On-site On-site	Quant Quant Quant	Contact with surface soil possible during maintenance activities Contact with surface soil possible during maintenance activities Contact with surface soil possible during maintenance activities
Construction Worker						Adult	Dermal Ingestion Inhalation	On-site On-site On-site	Quant Quant Quant	Contact with soil is possible during future construction activities Contact with soil is possible during future construction activities Contact with soil is possible during future construction activities

Table 4-1. Summary of Exposure Pathways
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Soil	Subsurface Soil (0-16 feet bgs)	Indoor Air	Commercial/ Industrial Worker	Adult	Inhalation	On-site	Quant	Volatilization from subsurface soil into future commercial/industrial facilities is possible, if vapor barrier is not installed on new construction
				Resident	Young and Older Child, Adult	Inhalation	On-site	None	Residential development on-site is highly unlikely; evaluated in the uncertainty section only
	Groundwater	Groundwater	Tap Water	Resident	Young and Older Child, Adult	Dermal	Off-site	Quant	Although future development will probably use municipal water, there are no legal restrictions on well development
						Ingestion	Off-site	Quant	Although future development will probably use municipal water, there are no legal restrictions on well development
Future	Groundwater	Groundwater	Tap Water	Resident	Young and Older Child, Adult	Dermal	On-site	None	Residential development on-site is highly unlikely; quantitatively evaluated in the uncertainty section only
						Ingestion	On-site	None	Residential development on-site is highly unlikely; quantitatively evaluated in the uncertainty section only
						Inhalation	On-site	None	Residential development on-site is highly unlikely; quantitatively evaluated in the uncertainty section only
				Recreator	Young and Older Child	Dermal	On-site	None	All future development will rely on municipal water
						Ingestion	On-site	None	All future development will rely on municipal water
						Inhalation	On-site	None	All future development will rely on municipal water
			Commercial/ Industrial Worker	Adult	Dermal	On-site	None	All future development will rely on municipal water	
					Inhalation	On-site	None	All future development will rely on municipal water	
			Indoor Air	Resident	Young and Older Child, Adult	Inhalation	On-site	None	Residential development on-site is highly unlikely; quantitatively evaluated in the uncertainty section only
						Inhalation	Off-site	Quant	Volatilization into residences overlying groundwater is possible
						Inhalation	On-site	None	Future recreational facilities are unlikely to include enclosed structures
						Inhalation	On-site	Quant	Volatilization into future commercial/industrial facilities overlying groundwater is possible if vapor barrier is not installed on new construction
			Groundwater	Utility Worker	Adult	Dermal	On-site	None	Depth to groundwater is greater than underground utilities
						Ingestion	On-site	None	Depth to groundwater is greater than underground utilities
Construction Worker	Adult	Dermal	Ingestion	On-site	Quant	Dermal contact with groundwater is possible during excavation in some locations			
			Inhalation	On-site	None	If groundwater is contacted during excavation, contact will be a single brief event			



Table 4-1. Summary of Exposure Pathways
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Surface Water	Surface Water	Little Beaver Creek	Recreator	Young and Older Child, Adult	Dermal Ingestion	On-site	Quant	Access to Little Beaver Creek may not be restricted in the future Access to Little Beaver Creek may not be restricted in the future Any VOCs volatilizing from surface water would rapidly disperse in ambient air
	Sediment	Sediment	Little Beaver Creek	Recreator	Young and Older Child, Adult	Dermal Ingestion	On-site	Quant	
						Inhalation	On-site	None	Access to Little Beaver Creek may not be restricted in the future Any VOCs in sediment would be discharged to surface water and then would rapidly disperse in ambient air upon volatilization from surface water

Notes:

- bgs = below ground surface
- None = no quantitative risk analysis
- Quant = quantitative risk analysis
- VOC = volatile organic compound

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Table 4-2. Exposure Point Concentration Summary - Surface Soil
Lammers Barrel Facility, Beaver Creek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Soil
Exposure Point: On-site Surface Soil

Chemical	Minimum Concentration	Units	95% UCL of Data	Maximum Concentration	EPC Units	Reasonable Maximum Exposure			Central Tendency		
						Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Metals											
Antimony	1.0E+00	mg/kg	2.6E+00	5.5E+00	mg/kg	2.5E+00	95% UCL	Lower of 95% UCL and Max	2.5E+00	95% UCL	Lower of 95% UCL and Max
Arsenic	5.3E+00	mg/kg	2.1E+01	4.3E+01	mg/kg	2.1E+01	95% UCL	Lower of 95% UCL and Max	2.1E+01	95% UCL	Lower of 95% UCL and Max
Cadmium	1.0E-01	mg/kg	3.6E+00	8.2E+00	mg/kg	3.6E+00	95% UCL	Lower of 95% UCL and Max	3.6E+00	95% UCL	Lower of 95% UCL and Max
Iron	8.0E+03	mg/kg	3.0E+04	5.2E+04	mg/kg	3.0E+04	95% UCL	Lower of 95% UCL and Max	3.0E+04	95% UCL	Lower of 95% UCL and Max
Lead	1.2E+01	mg/kg	2.5E+02	5.1E+02	mg/kg	2.5E+02	95% UCL	Lower of 95% UCL and Max	2.5E+02	95% UCL	Lower of 95% UCL and Max
Manganese	2.6E+02	mg/kg	6.5E+02	1.1E+03	mg/kg	6.5E+02	95% UCL	Lower of 95% UCL and Max	6.5E+02	95% UCL	Lower of 95% UCL and Max
Vanadium	1.1E+01	mg/kg	2.8E+01	3.5E+01	mg/kg	2.8E+01	95% UCL	Lower of 95% UCL and Max	2.8E+01	95% UCL	Lower of 95% UCL and Max
PAHs											
Benzo(a)pyrene	6.2E-02	mg/kg	1.1E+00	3.3E+00	J mg/kg	1.1E+00	95% UCL	Lower of 95% UCL and Max	1.1E+00	95% UCL	Lower of 95% UCL and Max
Dibenzo(a,h)anthracene	5.1E-02	mg/kg	NC	1.4E+00	J mg/kg	1.4E+00	Max	Lower of 95% UCL and Max	1.4E+00	Max	Lower of 95% UCL and Max
Indeno(1,2,3-cd)pyrene	4.7E-02	mg/kg	1.1E+00	3.4E+00	J mg/kg	1.1E+00	95% UCL	Lower of 95% UCL and Max	1.1E+00	95% UCL	Lower of 95% UCL and Max
Naphthalene	4.4E-02	mg/kg	2.2E+01	2.0E+01	mg/kg	2.0E+01	Max	Lower of 95% UCL and Max	2.0E+01	Max	Lower of 95% UCL and Max
PCBs											
Total PCBs	4.8E-02	mg/kg	1.7E+00	5.1E+00	mg/kg	1.7E+00	95% UCL	Lower of 95% UCL and Max	1.7E+00	95% UCL	Lower of 95% UCL and Max
VOCs											
1,2-Dichloroethane	7.6E-03	mg/kg	NC	6.2E-01	mg/kg	8.2E-01	Max	Lower of 95% UCL and Max	8.2E-01	Max	Lower of 95% UCL and Max
Benzene	1.6E-01	mg/kg	NC	1.2E+00	mg/kg	1.2E+00	Max	Lower of 95% UCL and Max	1.2E+00	Max	Lower of 95% UCL and Max
Carbon tetrachloride	1.2E+00	mg/kg	NC	1.2E+00	mg/kg	1.2E+00	Max	Lower of 95% UCL and Max	1.2E+00	Max	Lower of 95% UCL and Max
cis/trans-1,2-Dichloroethene	5.2E-04	mg/kg	5.3E+00	7.1E+00	mg/kg	5.3E+00	95% UCL	Lower of 95% UCL and Max	5.3E+00	95% UCL	Lower of 95% UCL and Max
Methylene chloride	1.0E-03	mg/kg	NC	2.7E+01	D mg/kg	2.7E+01	Max	Lower of 95% UCL and Max	2.7E+01	Max	Lower of 95% UCL and Max
Tetrachloroethene	1.3E-03	mg/kg	2.6E+00	8.3E+00	mg/kg	2.5E+00	95% UCL	Lower of 95% UCL and Max	2.5E+00	95% UCL	Lower of 95% UCL and Max
Trichloroethylene	1.0E-03	mg/kg	8.4E+00	1.3E+01	mg/kg	8.4E+00	95% UCL	Lower of 95% UCL and Max	8.4E+00	95% UCL	Lower of 95% UCL and Max
Vinyl chloride	5.1E-03	mg/kg	NC	5.0E-01	mg/kg	5.0E-01	Max	Lower of 95% UCL and Max	5.0E-01	Max	Lower of 95% UCL and Max
Xylenes, Total	4.6E-04	mg/kg	1.1E+02	1.6E+02	J mg/kg	1.1E+02	95% UCL	Lower of 95% UCL and Max	1.1E+02	95% UCL	Lower of 95% UCL and Max

Notes:
EPC = exposure point concentration
UCL = upper confidence limit of the mean
mg/kg = milligrams per kilogram
NC = Not calculated due to small sample size
J = estimated concentration
D = sample diluted for analysis
Max = maximum
NC = Not calculated
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyls
VOC = volatile organic compound

Table 4-3. Exposure Point Concentration Summary - Surface and Subsurface Soil (0-16 feet)
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Soil
Exposure Point: On-site Subsurface Soil

Chemical	Minimum Concentration	Units	95% UCL of Data	Maximum Concentration	EPC Units	Reasonable Maximum Exposure			Central Tendency			
						Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	
Metals												
Antimony	1.0E+00	mg/kg	8.088	5.7E+01		8.1E+00	95% UCL	Lower of 95% UCL and Max	8.1E+00	95% UCL	Lower of 95% UCL and Max	
Arsenic	1.7E+00	mg/kg	13.34	4.3E+01		1.3E+01	95% UCL	Lower of 95% UCL and Max	1.3E+01	95% UCL	Lower of 95% UCL and Max	
Barium	3.5E+01	mg/kg	236.2	7.5E+02		2.4E+02	95% UCL	Lower of 95% UCL and Max	2.4E+02	95% UCL	Lower of 95% UCL and Max	
Cadmium	1.0E-01	mg/kg	47.7	1.1E+02		4.8E+01	95% UCL	Lower of 95% UCL and Max	4.8E+01	95% UCL	Lower of 95% UCL and Max	
Chromium	5.1E+00	mg/kg	368.8	7.2E+02	J	3.7E+02	95% UCL	Lower of 95% UCL and Max	3.7E+02	95% UCL	Lower of 95% UCL and Max	
Iron	5.4E+03	mg/kg	19905	5.2E+04		2.0E+04	95% UCL	Lower of 95% UCL and Max	2.0E+04	95% UCL	Lower of 95% UCL and Max	
Lead	4.3E+00	mg/kg	1796	4.1E+03	J	1.8E+03	95% UCL	Lower of 95% UCL and Max	1.8E+03	95% UCL	Lower of 95% UCL and Max	
Manganese	9.5E+01	mg/kg	829.7	2.9E+03		6.3E+02	95% UCL	Lower of 95% UCL and Max	6.3E+02	95% UCL	Lower of 95% UCL and Max	
Thallium	1.1E+00	mg/kg	NC	1.1E+00	B	1.1E+00	Max	Lower of 95% UCL and Max	1.1E+00	Max	Lower of 95% UCL and Max	
Vanadium	7.8E+00	mg/kg	21.78	3.5E+01		2.2E+01	95% UCL	Lower of 95% UCL and Max	2.2E+01	95% UCL	Lower of 95% UCL and Max	
PAHs												
Benzo(a)anthracene	5.2E-02	mg/kg	0.539	3.4E+00	J	5.4E-01	95% UCL	Lower of 95% UCL and Max	5.4E-01	95% UCL	Lower of 95% UCL and Max	
Benzo(a)pyrene	6.2E-02	mg/kg	0.638	3.3E+00	J	6.4E-01	95% UCL	Lower of 95% UCL and Max	6.4E-01	95% UCL	Lower of 95% UCL and Max	
Benzo(b)fluoranthene	4.4E-02	mg/kg	0.443	3.1E+00	J	4.4E-01	95% UCL	Lower of 95% UCL and Max	4.4E-01	95% UCL	Lower of 95% UCL and Max	
Dibenzo(a,h)anthracene	5.1E-02	mg/kg	NC	1.4E+00	J	1.4E+00	Max	Lower of 95% UCL and Max	1.4E+00	Max	Lower of 95% UCL and Max	
Indeno(1,2,3-cd)pyrene	3.8E-02	mg/kg	0.532	3.4E+00	J	5.3E-01	95% UCL	Lower of 95% UCL and Max	5.3E-01	95% UCL	Lower of 95% UCL and Max	
Naphthalene	4.4E-02	mg/kg	19.85	4.0E+01	J	2.0E+01	95% UCL	Lower of 95% UCL and Max	2.0E+01	95% UCL	Lower of 95% UCL and Max	
PCBs												
Total PCBs	1.4E-02	mg/kg	5.513	8.8E+00	J	5.5E+00	95% UCL	Lower of 95% UCL and Max	5.5E+00	95% UCL	Lower of 95% UCL and Max	
SVOCs												
bis(2-Chloroethyl)ether	1.1E-01	mg/kg	NC	2.9E-01	J	2.9E-01	Max	Lower of 95% UCL and Max	2.9E-01	Max	Lower of 95% UCL and Max	
bis(2-Ethylhexyl)phthalate	5.9E-02	mg/kg	29.36	6.1E+01	J	2.9E+01	95% UCL	Lower of 95% UCL and Max	2.9E+01	95% UCL	Lower of 95% UCL and Max	
VOCs												
1,1,2,2-Tetrachloroethane	3.2E-01	mg/kg	NC	5.5E-01		5.5E-01	Max	Lower of 95% UCL and Max	5.5E-01	Max	Lower of 95% UCL and Max	
1,2-Dichloroethane	7.6E-03	mg/kg	NC	6.2E-01		6.2E-01	Max	Lower of 95% UCL and Max	6.2E-01	Max	Lower of 95% UCL and Max	
Benzene	3.7E-02	mg/kg	1.1E+00	8.4E+00	J	1.1E+00	95% UCL	Lower of 95% UCL and Max	1.1E+00	95% UCL	Lower of 95% UCL and Max	
Carbon tetrachloride	2.2E-01	mg/kg	NC	1.2E+01		1.2E+01	Max	Lower of 95% UCL and Max	1.2E+01	Max	Lower of 95% UCL and Max	
Chloromethane	2.2E-01	mg/kg	NC	1.1E+01	J	1.1E+01	Max	Lower of 95% UCL and Max	1.1E+01	Max	Lower of 95% UCL and Max	
cis/trans-1,2-Dichloroethene	5.2E-04	mg/kg	2.2E+01	1.1E+02		2.2E+01	95% UCL	Lower of 95% UCL and Max	2.2E+01	95% UCL	Lower of 95% UCL and Max	
Ethylbenzene	3.4E-04	mg/kg	1.4E+02	5.4E+02	J	1.4E+02	95% UCL	Lower of 95% UCL and Max	1.4E+02	95% UCL	Lower of 95% UCL and Max	
Methylene chloride	1.0E-03	mg/kg	5.1E+00	2.7E+01	D	5.1E+00	95% UCL	Lower of 95% UCL and Max	5.1E+00	95% UCL	Lower of 95% UCL and Max	
Tetrachloroethene	1.3E-03	mg/kg	1.8E+01	1.2E+02		1.8E+01	95% UCL	Lower of 95% UCL and Max	1.8E+01	95% UCL	Lower of 95% UCL and Max	
Toluene	1.3E-03	mg/kg	8.4E+02	2.1E+03	J	6.4E+02	95% UCL	Lower of 95% UCL and Max	6.4E+02	95% UCL	Lower of 95% UCL and Max	
Trichloroethylene	9.0E-04	mg/kg	7.8E+01	3.8E+02		7.8E+01	95% UCL	Lower of 95% UCL and Max	7.8E+01	95% UCL	Lower of 95% UCL and Max	
Vinyl chloride	5.1E-03	mg/kg	6.7E-01	5.0E+00	J	6.7E-01	95% UCL	Lower of 95% UCL and Max	6.7E-01	95% UCL	Lower of 95% UCL and Max	
Xylenes, Total	4.8E-04	mg/kg	7.3E+02	2.9E+03	J	7.3E+02	95% UCL	Lower of 95% UCL and Max	7.3E+02	95% UCL	Lower of 95% UCL and Max	

Notes:

EPC = exposure point concentration
UCL = upper confidence limit of the mean
mg/kg = milligrams per kilogram

J = estimated concentration
B = Analyte found in associated blank
D = sample diluted for analysis

Max = maximum
NC = Not calculated
PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyls
SVOC = semi-volatile organic compound
VOC = volatile organic compound

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Table 4-4. Exposure Point Concentration Summary - On-site Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Groundwater
Exposure Point: On-site Groundwater

Chemical	Minimum Concentration	Units	95% UCL of Data	Maximum Concentration	EPC Units	Reasonable Maximum Exposure			Central Tendency			
						Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	
Metals												
Antimony	4.9E-03	mg/l	NC	4.9E-03	B	mg/l	4.9E-03	Max	Max	4.9E-03	Max	Lower of 95% UCL and Max
Arsenic	5.8E-03	mg/l	7.4E-02	4.8E-01		mg/l	4.8E-01	Max	Max	7.4E-02	95% UCL	Lower of 95% UCL and Max
Barium	1.6E-03	mg/l	8.3E-01	1.9E+00		mg/l	1.9E+00	Max	Max	6.3E-01	95% UCL	Lower of 95% UCL and Max
Iron (dissolved)	2.2E-02	mg/l	3.3E+01	9.5E+00		mg/l	9.5E+00	Max	Max	9.5E+00	Max	Lower of 95% UCL and Max
Manganese (dissolved)	3.4E-02	mg/l	3.5E-01	1.2E+00		mg/l	1.2E+00	Max	Max	3.5E-01	95% UCL	Lower of 95% UCL and Max
Nickel	2.2E-03	mg/l	1.9E-02	8.8E-02		mg/l	8.6E-02	Max	Max	1.9E-02	95% UCL	Lower of 95% UCL and Max
Vanadium	7.9E-04	mg/l	2.2E-03	6.3E-03	B	mg/l	6.3E-03	Max	Max	2.2E-03	95% UCL	Lower of 95% UCL and Max
PAHs												
2-Methylnaphthalene	5.7E-03	mg/l	7.3E-03	2.0E-02	J	mg/l	2.0E-02	Max	Max	7.3E-03	95% UCL	Lower of 95% UCL and Max
Naphthalene	2.0E-03	mg/l	6.5E-02	4.5E-01		mg/l	4.5E-01	Max	Max	6.5E-02	95% UCL	Lower of 95% UCL and Max
SVOCs												
bis(2-Chloroethyl)ether	1.1E-03	mg/l	5.7E-02	6.8E-01		mg/l	6.8E-01	Max	Max	5.7E-02	95% UCL	Lower of 95% UCL and Max
VOCs												
1,1,1-Trichloroethane	2.0E-03	mg/l	8.3E-01	7.3E+00	D	mg/l	7.3E+00	Max	Max	8.3E-01	95% UCL	Lower of 95% UCL and Max
1,1,2,2-Tetrachloroethane	8.2E-04	mg/l	8.8E-01	9.4E+00		mg/l	9.4E+00	Max	Max	8.8E-01	95% UCL	Lower of 95% UCL and Max
1,1-Dichloroethane	2.2E-03	mg/l	1.5E+00	2.2E+00		mg/l	2.2E+00	Max	Max	1.5E+00	95% UCL	Lower of 95% UCL and Max
1,1-Dichloroethylene	7.5E-04	mg/l	7.8E-03	6.5E-02	J	mg/l	6.5E-02	Max	Max	7.8E-03	95% UCL	Lower of 95% UCL and Max
Benzene	1.5E-04	mg/l	3.9E-02	3.9E-01	DJ	mg/l	3.9E-01	Max	Max	3.9E-02	95% UCL	Lower of 95% UCL and Max
Chloroform	1.6E-04	mg/l	5.1E-02	7.3E-01	DJ	mg/l	7.3E-01	Max	Max	5.1E-02	95% UCL	Lower of 95% UCL and Max
Chloroethane	2.8E-02	mg/l	2.4E-02	1.3E-01		mg/l	1.3E-01	Max	Max	2.4E-02	95% UCL	Lower of 95% UCL and Max
cis-1,2-Dichloroethane	8.2E-04	mg/l	2.9E+00	1.6E+01		mg/l	1.6E+01	Max	Max	2.9E+00	95% UCL	Lower of 95% UCL and Max
Ethylbenzene	1.7E-04	mg/l	2.0E+00	4.6E+00		mg/l	4.6E+00	Max	Max	2.0E+00	95% UCL	Lower of 95% UCL and Max
Methyl N-butyl ketone	5.4E-04	mg/l	NC	1.0E+00	DJB	mg/l	1.0E+00	Max	Max	1.0E+00	Max	Lower of 95% UCL and Max
Styrene	5.0E-05	mg/l	0.0555	2.2E-01	J	mg/l	2.2E-01	Max	Max	5.6E-02	95% UCL	Lower of 95% UCL and Max
Tetrachloroethane	2.5E-03	mg/l	NC	1.1E-01		mg/l	1.1E-01	Max	Max	1.1E-01	Max	Lower of 95% UCL and Max
Toluene	1.1E-04	mg/l	5.6E-02	7.0E+01	D	mg/l	7.0E+01	Max	Max	5.6E-02	95% UCL	Lower of 95% UCL and Max
trans-1,2-Dichloroethane	3.8E-04	mg/l	2.7E+01	4.7E+00		mg/l	4.7E+00	Max	Max	4.7E+00	Max	Lower of 95% UCL and Max
Trichloroethylene	1.4E-04	mg/l	2.1E+00	1.1E+00	J	mg/l	1.1E+00	Max	Max	1.1E+00	Max	Lower of 95% UCL and Max
Vinyl chloride	1.8E-04	mg/l	9.8E-02	7.1E+00	D	mg/l	7.1E+00	Max	Max	9.8E-02	95% UCL	Lower of 95% UCL and Max
Xylenes, Total	2.7E-04	mg/l	2.5E+00	2.5E+01		mg/l	2.5E+01	Max	Max	2.5E+00	95% UCL	Lower of 95% UCL and Max

Notes:

EPC = exposure point concentration
UCL = upper confidence limit of the mean
mg/l = milligrams per liter

B = Analyte found in associated blank
J = estimated concentration
D = sample diluted for analysis

Max = maximum
NC = Not calculated
PAH = polycyclic aromatic hydrocarbon

SVOC = semi-volatile organic compound
VOC = volatile organic compound

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Table 4-5. Exposure Point Concentration Summary - Off-site Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Groundwater
Exposure Point: Off-site Groundwater

Chemical	Minimum Concentration	Units	95% UCL of Data	Maximum Concentration	EPC Units	Reasonable Maximum Exposure			Central Tendency			
						Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	
Metals												
Arsenic	0.011	mg/l	6.1E-02	0.061	mg/l	6.1E-02	Max	Max	6.1E-02	Max	Lower of 95% UCL and Max	
Iron (dissolved)	0.34	mg/l	3.7E+00	12	mg/l	1.2E+01	Max	Max	3.7E+00	95% UCL	Lower of 95% UCL and Max	
Manganese (dissolved)	0.015	mg/l	2.1E-01	0.58	mg/l	5.8E-01	Max	Max	2.1E-01	95% UCL	Lower of 95% UCL and Max	
VOCs												
Benzene	0.0011	mg/l	1.9E-03	0.0083	mg/l	6.3E-03	Max	Max	1.9E-03	95% UCL	Lower of 95% UCL and Max	
cis-1,2-Dichloroethane	0.0021	mg/l	1.4E-01	0.8	mg/l	8.0E-01	Max	Max	1.4E-01	95% UCL	Lower of 95% UCL and Max	
Ethylbenzene	0.0016	mg/l	1.8E-01	0.33	mg/l	3.3E-01	Max	Max	1.6E-01	95% UCL	Lower of 95% UCL and Max	
Trichloroethylene	0.00038	mg/l	NC	0.002	mg/l	2.0E-03	Max	Max	2.0E-03	Max	Lower of 95% UCL and Max	
Vinyl chloride	0.0012	mg/l	1.1E-03	0.175	mg/l	1.8E-01	Max	Max	1.1E-03	95% UCL	Lower of 95% UCL and Max	
Xylenes, Total	0.0067	mg/l	5.3E-01	1.1	mg/l	1.1E+00	Max	Max	5.3E-01	95% UCL	Lower of 95% UCL and Max	

Notes:
EPC = exposure point concentration
UCL = upper confidence limit of the mean
mg/l = milligrams per liter
Max = maximum
NC = Not calculated
VOC = volatile organic compound

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Table 4-6. Exposure Point Concentration Summary - Surface Water
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Surface Water
Exposure Point: On-site/Down Gradient Surface Water

Chemical	Minimum Concentration	Units	95% UCL of Data	Maximum Concentration	EPC Units	Reasonable Maximum Exposure			Central Tendency			
						Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	
Metals												
Antimony	4.0E-03	mg/l	NC	1.3E-02 B	mg/l	1.3E-02	Max	Lower of 95% UCL and Max	1.3E-02	Max	Lower of 95% UCL and Max	
Pesticides												
gamma-BHC (Lindane)	8.2E-06	mg/l	NC	6.0E-05 JP	mg/l	6.0E-05	Max	Lower of 95% UCL and Max	6.0E-05	Max	Lower of 95% UCL and Max	
VOCs												
Bromodichloromethane	2.2E-04	mg/l	NC	2.6E-04 J	mg/l	2.6E-04	Max	Lower of 95% UCL and Max	2.6E-04	Max	Lower of 95% UCL and Max	

Notes:
 EPC = exposure point concentration
 UCL = upper confidence limit of the mean
 mg/l = milligrams per liter
 NC = Not calculated
 B = Analyte found in associated blank
 J = estimated concentration
 P = second column precision outside of laboratory acceptance limits
 Max = maximum
 VOC = volatile organic compound

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Table 4-7. Exposure Point Concentration Summary - Sediment
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current/Future
Exposure Medium: Sediment
Exposure Point: On-site/Down Gradient Sediment

Chemical	Minimum Concentration	Units	95% UCL of Data	Maximum Concentration	EPC Units	Reasonable Maximum Exposure			Central Tendency			
						Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	
PCBs												
Total PCBs	4.2E-01	mg/kg	NC	4.2E-01	mg/kg	4.2E-01	Max	Lower of 95% UCL and Max	4.2E-01	Max	Lower of 95% UCL and Max	
VOCs												
Xylenes, Total	3.4E-01	mg/kg	NC	6.7E+01	mg/kg	6.7E+01	Max	Lower of 95% UCL and Max	6.7E+01	Max	Lower of 95% UCL and Max	

Notes:
EPC = exposure point concentration
UCL = upper confidence limit of the mean
mg/kg = milligrams per kilogram
NC = Not calculated
Max = maximum
PCB = polychlorinated biphenyls

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**Table 4-3. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Surface Soil
Lammers Barrel Facility, Beavercreek, Ohio**

Scenario Timeframe: Current and Future
 Medium: Soil
 Exposure Medium: Surface Soil (0-2 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Trespasser	Older child (Ages 7 through 17)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = Cs x IR x Ao x EF x ED x CF x FI x 1/BW x 1/AT
				IR	Ingestion Rate	100	mg/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	18	days/year	2 day/month, 9 months	
				ED	Exposure Duration	11	years	by definition	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				FI	Fraction Ingested from Source	0.25	unitless	assumption	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	4015	days	by definition	
	Recreator	Young child (Ages 1 through 6)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = Cs x IR x Ao x EF x ED x CF x FI x 1/BW x 1/AT
				IR	Ingestion Rate	200	mg/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	117	days/year	3 day/week, 9 months	
Older child (Ages 7 through 17)	On-site	ED	Exposure Duration	6	years	by definition			
		CF	Conversion Factor	1E-06	kg/mg	by definition			
		FI	Fraction Ingested from Source	0.5	unitless	assumption			
		BW	Body Weight	15	kg	USEPA 1997b			
		ATc	Averaging Time (cancer)	25550	days	USEPA 1989			
		ATnc	Averaging Time (non-cancer)	2190	days	by definition			
Older child (Ages 7 through 17)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = Cs x IR x Ao x EF x ED x CF x FI x 1/BW x 1/AT		
		IR	Ingestion Rate	100	mg/day	USEPA 1997b			
		Ao	Oral Absorption	1	unitless	assumption			
		EF	Exposure Frequency	117	days/year	3 day/week, 9 months			
		ED	Exposure Duration	11	years	by definition			
		CF	Conversion Factor	1E-06	kg/mg	by definition			
		FI	Fraction Ingested from Source	0.5	unitless	assumption			
		BW	Body Weight	45	kg	USEPA 1997b			
		ATc	Averaging Time (cancer)	25550	days	USEPA 1989			
		ATnc	Averaging Time (non-cancer)	4015	days	by definition			

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Table 4-8. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Surface Soil
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Surface Soil (0-2 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreator	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	100	mg/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	117	days/year	3 day/week, 9 months	
				ED	Exposure Duration	13	years	USEPA 1997b	
				CF	Conversion Factor	1E-08	kg/mg	by definition	
				FI	Fraction Ingested from Source	0.5	unitless	assumption	
				BW	Body Weight	70	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
ATnc	Averaging Time (non-cancer)	4745	days	by definition					
Dermal	Trespasser	Older child (Ages 7 through 17)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	5433	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.07	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	18	days/year	2 day/month, 9 months	
				ED	Exposure Duration	11	years	by definition	
				ABS	Absorption Factor	chemical-specific	unitless	USEPA 2004a	
				CF	Conversion Factor	1E-08	kg/mg	by definition	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
	ATnc	Averaging Time (non-cancer)	4015	days	by definition				
	Recreator	Young child (Ages 1 through 6)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	2800	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.2	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	117	days/year	3 day/week, 9 months	
				ED	Exposure Duration	6	years	by definition	
				ABS	Absorption Factor	chemical-specific	unitless	USEPA 2004a	
				CF	Conversion Factor	1E-08	kg/mg	by definition	
				BW	Body Weight	15	kg	USEPA 1997b	
ATc				Averaging Time (cancer)	25550	days	USEPA 1989		
ATnc	Averaging Time (non-cancer)	2190	days	by definition					
Recreator	Older child (Ages 7 through 17)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$	
			SA	Surface Area	4471	cm ²	USEPA 2004a		
			AF	Adherence Factor	0.07	mg/cm ² -day	USEPA 2004a		
			EF	Exposure Frequency	117	days/year	3 day/week, 9 months		
			ED	Exposure Duration	11	years	by definition		
			ABS	Absorption Factor	chemical-specific	unitless	USEPA 2004a		
			CF	Conversion Factor	1E-08	kg/mg	by definition		
			BW	Body Weight	45	kg	USEPA 1997b		
			ATc	Averaging Time (cancer)	25550	days	USEPA 1989		
ATnc	Averaging Time (non-cancer)	4015	days	by definition					

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**Table 4-8. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Surface Soil
Lammers Barrel Facility, Beavercreek, Ohio**

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Surface Soil (0-2 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Dermal	Recreator	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	6719	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.07	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	117	days/year	3 day/week, 9 months	
				ED	Exposure Duration	13	years	by definition	
				ABS	Absorption Factor	chemical-specific	unitless	USEPA 2004a	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	4745	days	by definition	
Inhalation	Trespasser	Older child (Ages 7 through 17)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times IHR \times ET \times EF \times ED \times (1/PEF) \times 1/BW \times 1/AT$
				IHR	Inhalation Rate	1.2	m ³ /hour	USEPA 1997b	
				ET	Exposure Time	2	hours/day	assumption	
				EF	Exposure Frequency	16	days/year	2 day/month, 9 months	
				ED	Exposure Duration	11	years	by definition	
				PEF	Particle Emission Factor	1.36E+09	m ³ /kg	USEPA 2002b	
				BW	Body Weight	45	kg	USEPA 1987b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
	ATnc	Averaging Time (non-cancer)	4015	days	by definition				
	Recreator	Young child (Ages 1 through 6)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	N/A	Intake (mg/kg-day) = $Cs \times IHR \times ET \times EF \times ED \times (1/PEF) \times 1/BW \times 1/AT$
				IHR	Inhalation Rate	1.2	m ³ /hour	USEPA 1997b	
				ET	Exposure Time	1	hours/day	assumption	
				EF	Exposure Frequency	117	days/year	USEPA 2002b	
				ED	Exposure Duration	6	years	by definition	
PEF				Particle Emission Factor	1.36E+09	m ³ /kg	USEPA 2002b		
BW	Body Weight	15	kg	USEPA 1987b					
ATc	Averaging Time (cancer)	25550	days	USEPA 1989					
ATnc	Averaging Time (non-cancer)	2180	days	by definition					

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Table 4-8. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Surface Soil
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Surface Soil (0-2 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name	
Inhalation	Recreator	Older child (Ages 7 through 17)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times IHR \times ET \times EF \times ED \times (1/PEF) \times 1/BW \times 1/AT$	
				IhR	Inhalation Rate	1.3	m ³ /hour	USEPA 1997b assumption		
				ET	Exposure Time	1	hours/day	3 day/week, 9 months by definition		
				EF	Exposure Frequency	117	days/year			
				ED	Exposure Duration	11	years	USEPA 2002b		
				PEF	Particle Emission Factor	1.36E+09	m ³ /kg	USEPA 1997b		
				BW	Body Weight	45	kg	USEPA 1988		
		ATc	Averaging Time (cancer)	25550	days	by definition				
		ATnc	Averaging Time (non-cancer)	4015	days					
		Adult	On-site		Cs	Concentration in Soil	chemical-specific	mg/kg		Table 4-2
					IhR	Inhalation Rate	1.8	m ³ /hour		USEPA 1997b assumption
					ET	Exposure Time	1	hours/day		3 day/week, 9 months by definition
					EF	Exposure Frequency	117	days/year		
					ED	Exposure Duration	13	years		USEPA 2002b
PEF	Particle Emission Factor				1.36E+09	m ³ /kg	USEPA 1997b			
BW	Body Weight				70	kg	USEPA 1988			
ATc	Averaging Time (cancer)	25550	days	by definition						
ATnc	Averaging Time (non-cancer)	4745	days							

Notes:

- bgs = below ground surface
- cm² = square centimeter
- kg = kilogram
- kg/mg = kilograms per milligram
- m³/hour = cubic meters per hour
- m³/kg = cubic meters per kilogram
- mg/cm²-day = milligrams per square centimeter per day
- mg/day = milligrams per day
- mg/kg = milligrams per kilogram
- USEPA = U.S. Environmental Protection Agency

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Table 4-9. Values Used for Daily Intake Calculations - Central Tendency Exposure to Surface Soil
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Surface Soil (0-2 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name				
Ingestion	Trespasser	Older child (Ages 7 through 17)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$				
				IR	Ingestion Rate	50	mg/day	USEPA 1997b					
				Ao	Oral Absorption	1	unitless	assumption					
				EF	Exposure Frequency	9	days/year	1 day/month, 9 months					
				ED	Exposure Duration	11	years	by definition					
				CF	Conversion Factor	1E-06	kg/mg	by definition					
				FI	Fraction Ingested from Source	0.25	unitless	assumption					
				BW	Body Weight	45	kg	USEPA 1997b					
				ATc	Averaging Time (cancer)	25550	days	USEPA 1988					
				ATnc	Averaging Time (non-cancer)	4015	days	by definition					
				Recreator	Young child (Ages 1 through 6)	On-site	Cs	Concentration in Soil		chemical-specific	mg/kg	N/A	Intake (mg/kg-day) = $Cs \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
							IR	Ingestion Rate		100	mg/day	USEPA 1997b	
Ao	Oral Absorption	1	unitless				assumption						
EF	Exposure Frequency	39	days/year				1 day/week, 9 months						
ED	Exposure Duration	8	years				by definition						
CF	Conversion Factor	1E-06	kg/mg				by definition						
FI	Fraction Ingested from Source	0.5	unitless				assumption						
BW	Body Weight	15	kg				USEPA 1997b						
ATc	Averaging Time (cancer)	25550	days				USEPA 1988						
ATnc	Averaging Time (non-cancer)	2190	days				by definition						
Recreator	Older child (Ages 7 through 17)	On-site	Cs				Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$		
			IR				Ingestion Rate	50	mg/day	USEPA 1997b			
			Ao	Oral Absorption	1	unitless	assumption						
			EF	Exposure Frequency	39	days/year	1 day/week, 9 months						
			ED	Exposure Duration	11	years	by definition						
			CF	Conversion Factor	1E-06	kg/mg	by definition						
			FI	Fraction Ingested from Source	0.5	unitless	assumption						
			BW	Body Weight	45	kg	USEPA 1997b						
			ATc	Averaging Time (cancer)	25550	days	USEPA 1988						
			ATnc	Averaging Time (non-cancer)	4015	days	by definition						

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**Table 4-8. Values Used for Daily Intake Calculations - Central Tendency Exposure to Surface Soil
Lammers Barrel Facility, Beavercreek, Ohio**

Scenario Timeframe: Current and Future
 Medium: Soil
 Exposure Medium: Surface Soil (0-2 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Recreator	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = Cs x IR x Ao x EF x ED x CF x FI x 1/BW x 1/AT
				IR	Ingestion Rate	50	mg/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	39	days/year	1 day/week, 9 months	
				ED	Exposure Duration	13	years	USEPA 2004	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				FI	Fraction Ingested from Source	0.5	unitless	assumption	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	4745	days	by definition	
Dermal	Trespasser	Older child (Ages 7 through 17)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = x 1/BW x 1/AT
				SA	Surface Area	5433	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.01	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	9	days/year	1 day/month, 9 months	
				ED	Exposure Duration	11	years	by definition	
				ABS	Absorption Factor	chemical-specific	unitless	USEPA 2004	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
	BW	Body Weight	45	kg	USEPA 1987b				
	ATc	Averaging Time (cancer)	25550	days	USEPA 1989				
	ATnc	Averaging Time (non-cancer)	4015	days	by definition				
	Recreator	Young child (Ages 1 through 6)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = x 1/BW x 1/AT
				SA	Surface Area	2800	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.04	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	39	days/year	1 day/week, 9 months	
ED				Exposure Duration	6	years	by definition		
ABS				Absorption Factor	chemical-specific	unitless	USEPA 2004a		
CF				Conversion Factor	1E-06	kg/mg	by definition		
BW	Body Weight	15	kg	USEPA 1987b					
ATc	Averaging Time (cancer)	25550	days	USEPA 1989					
ATnc	Averaging Time (non-cancer)	2190	days	by definition					

Table 4-8. Values Used for Daily Intake Calculations - Central Tendency Exposure to Surface Soil
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Surface Soil (0-2 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreator	Older child (Ages 7 through 17)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2 USEPA 2004a USEPA 2004a 1 day/week, 8 months USEPA 2004a USEPA 2004a by definition USEPA 1987b USEPA 1989 by definition	Intake (mg/kg-day) = x 1/BW x 1/AT
				SA	Surface Area	4471	cm ²		
				AF	Adherence Factor	0.01	mg/cm ² -day		
				EF	Exposure Frequency	38	days/year		
				ED	Exposure Duration	11	years		
				ABS	Absorption Factor	chemical-specific	unitless		
				CF	Conversion Factor	1E-06	kg/mg		
		BW	Body Weight	45	kg				
		ATc	Averaging Time (cancer)	25550	days				
		ATnc	Averaging Time (non-cancer)	4015	days				
		Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2 USEPA 2004a USEPA 2004a USEPA 2004a USEPA 1987b USEPA 2004a by definition USEPA 1989 by definition	Intake (mg/kg-day) = x 1/BW x 1/AT
				SA	Surface Area	6719	cm ²		
				AF	Adherence Factor	0.01	mg/cm ² -day		
				EF	Exposure Frequency	38	days/year		
ED	Exposure Duration			13	years				
ABS	Absorption Factor			chemical-specific	unitless				
CF	Conversion Factor			1E-06	kg/mg				
BW	Body Weight	70	kg						
ATc	Averaging Time (cancer)	25550	days						
ATnc	Averaging Time (non-cancer)	4745	days						
Inhalation	Trespasser	Older child (Ages 7 through 17)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2 USEPA 1997b assumption 1 day/month, 9 months by definition USEPA 2002b USEPA 1997b USEPA 1989 by definition	Intake (mg/kg-day) = Cs x I _h R x ET x EF x ED x (1/PEF) x 1/BW x 1/AT
				I _h R	Inhalation Rate	1.2	m ³ /hour		
				ET	Exposure Time	1	hr/day		
				EF	Exposure Frequency	9	days/year		
				ED	Exposure Duration	11	years		
				PEF	Particle Emission Factor	1.38E+08	m ³ /kg		
				BW	Body Weight	45	kg		
				ATc	Averaging Time (cancer)	25550	days		
ATnc	Averaging Time (non-cancer)	4015	days						

**Table 4-9. Values Used for Daily Intake Calculations - Central Tendency Exposure to Surface Soil
Lammers Barrel Facility, Beavercreek, Ohio**

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Surface Soil (0-2 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Inhalation	Recreator	Young child (Ages 1 through 6)	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times IHR \times ET \times EF \times ED \times (1/PEF) \times 1/BW \times 1/AT$
				IhR	Inhalation Rate	1.2	m ³ /hour	USEPA 1997b assumption	
				ET	Exposure Time	1	hr/day		
				EF	Exposure Frequency	39	days/year	1 day/week, 9 months	
				ED	Exposure Duration	8	years	by definition	
				PEF	Particle Emission Factor	1.38E+09	m ³ /kg	USEPA 2002b	
				BW	Body Weight	15	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	2190	days	by definition	
	Older child (Ages 7 through 17)	On-site	Older child (Ages 7 through 17)	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times IHR \times ET \times EF \times ED \times (1/PEF) \times 1/BW \times 1/AT$
				IhR	Inhalation Rate	1.3	m ³ /hour	N/A	
				ET	Exposure Time	1	hr/day	assumption	
				EF	Exposure Frequency	39	days/year	1 day/week, 9 months	
				ED	Exposure Duration	11	years	USEPA 1997b	
				PEF	Particle Emission Factor	1.38E+09	m ³ /kg	USEPA 2002b	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	4015	days	by definition	
Adult	On-site	Adult	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-2	Intake (mg/kg-day) = $Cs \times IHR \times ET \times EF \times ED \times (1/PEF) \times 1/BW \times 1/AT$	
			IhR	Inhalation Rate	1.8	m ³ /hour	USEPA 1997b assumption		
			ET	Exposure Time	1	hr/day			
			EF	Exposure Frequency	39	days/year	1 day/week, 9 months		
			ED	Exposure Duration	13	years	USEPA 1997b		
			PEF	Particle Emission Factor	1.38E+09	m ³ /kg	USEPA 2002b		
			BW	Body Weight	70	kg	USEPA 1989		
			ATc	Averaging Time (cancer)	25550	days	USEPA 1989		
			ATnc	Averaging Time (non-cancer)	4745	days	by definition		

Notes:
 bgs = below ground surface
 cm² = square centimeter
 kg = kilogram
 kg/mg = kilograms per milligram
 m³/hour = cubic meters per hour
 m³/kg = cubic meters per kilogram
 mg/cm²-day = milligrams per square centimeter per day
 mg/day = milligrams per day
 mg/kg = milligrams per kilogram
 USEPA = U.S. Environmental Protection Agency

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Table 4-10. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Subsurface Soil
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Subsurface Soil (0-16 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Utility Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $Cs \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	100	mg/day	USEPA 2002b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	9	days/year	1 day/month, 9 months	
				ED	Exposure Duration	25	year	USEPA 2002b	
				CF	Conversion Factor	1E-08	kg/mg	by definition	
				FI	Fraction Ingested from Source	1	unitless	assumption	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	365	days	by definition	
	Construction Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $Cs \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	330	mg/day	USEPA 2002b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	125	days/year	5 days/wk for 6 months	
				ED	Exposure Duration	1	years	assumption	
				CF	Conversion Factor	1E-08	kg/mg	by definition	
				FI	Fraction Ingested from Source	1	unitless	assumption	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	365	days	by definition	
	Commercial/ Industrial Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $Cs \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	100	mg/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	250	days/year	USEPA 2002b	
				ED	Exposure Duration	25	years	USEPA 2002b	
				CF	Conversion Factor	1E-08	kg/mg	by definition	
				FI	Fraction Ingested from Source	1.0	unitless	assumption	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	365	days	by definition	

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Table 4-10. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Subsurface Soil
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Subsurface Soil (0-16 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Dermal	Utility Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3 USEPA 2004a USEPA 2004a 1 day/month, 9 months USEPA 2004a USEPA 2004a by definition USEPA 1989 USEPA 1989 by definition	Intake (mg/kg-day) = $C_s \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	3300	cm ²		
				AF	Adherence Factor	0.2	mg/cm ² -day		
				EF	Exposure Frequency	9	days/year		
				ED	Exposure Duration	25	years		
				ABS	Absorption Factor	chemical-specific	unitless		
				CF	Conversion Factor	1E-06	kg/mg		
				BW	Body Weight	70	kg		
				ATc	Averaging Time (cancer)	25550	days		
				ATnc	Averaging Time (non-cancer)	9125	days		
	Construction Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3 USEPA 2004a USEPA 2004a 5 days/wk for 6 months assumption USEPA 2004a by definition USEPA 1989 USEPA 1989 by definition	Intake (mg/kg-day) = $C_s \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	3300	cm ²		
				AF	Adherence Factor	0.2	mg/cm ² -day		
				EF	Exposure Frequency	125	days/year		
				ED	Exposure Duration	1	years		
				ABS	Absorption Factor	chemical-specific	unitless		
				CF	Conversion Factor	1E-06	kg/mg		
				BW	Body Weight	70	kg		
				ATc	Averaging Time (cancer)	25550	days		
				ATnc	Averaging Time (non-cancer)	365	days		
	Commercial/ Industrial Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3 USEPA 2004a USEPA 2004a USEPA 2004a USEPA 2004a by definition USEPA 1989 USEPA 1989 by definition	Intake (mg/kg-day) = $C_s \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	3300	cm ²		
				AF	Adherence Factor	0.2	mg/cm ² -day		
				EF	Exposure Frequency	250	days/year		
				ED	Exposure Duration	25	years		
				ABS	Absorption Factor	chemical-specific	unitless		
				CF	Conversion Factor	1E-06	kg/mg		
				BW	Body Weight	70	kg		
				ATc	Averaging Time (cancer)	25550	days		
				ATnc	Averaging Time (non-cancer)	9125	days		

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Table 4-10. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Subsurface Soil
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Subsurface Soil (0-16 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Inhalation	Utility Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $Cs \times IHR \times ET \times EF \times ED \times (1/PEF) \times 1/BW \times 1/AT$
				IhR	Inhalation Rate	1.3	m ³ /hour	USEPA 1997b assumption	
				ET	Exposure Time	8	hours/day		
				EF	Exposure Frequency	9	days/year	1 day/month, 9 months assumption	
				ED	Exposure Duration	25	years		
				PEF	Particle Emission Factor	1.38E+09	m ³ /kg	USEPA 2002b	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	9125	days	by definition	
					Construction Worker	Adult	On-site	Cs	
IhR	Inhalation Rate	1.3	m ³ /hour					USEPA 1997b assumption	
ET	Exposure Time	8	hours/day						
EF	Exposure Frequency	125	days/year					5 days/wk for 6 months	
ED	Exposure Duration	25	years					USEPA 1989	
PEF	Particle Emission Factor	1.38E+09	m ³ /kg					USEPA 2002b	
BW	Body Weight	70	kg					USEPA 1989	
ATc	Averaging Time (cancer)	25550	days					USEPA 1989	
ATnc	Averaging Time (non-cancer)	9125	days					by definition	
	Commercial/Industrial Worker	Adult	On-site					Cs	Concentration in Soil
				IhR	Inhalation Rate	1.3	m ³ /hour	USEPA 1997b assumption	
				ET	Exposure Time	1	hours/day		
				EF	Exposure Frequency	250	days/year	USEPA 2002b	
				ED	Exposure Duration	25	years	USEPA 2002b	
				PEF	Particle Emission Factor	1.38E+09	m ³ /kg	USEPA 2002b	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	9125	days	by definition	
					Commercial/Industrial Worker	Adult	On-site	Inhalation of subsurface soil vapors migrating into indoor air is evaluated using the Johnson and Ettinger Model. See Table 4-24	

Notes:

bgs = below ground surface
cm² = square centimeter
kg = kilogram
kg/mg = kilograms per milligram
m³/hour = cubic meters per hour

m³/kg = cubic meters per kilogram
mg/cm²-day = milligrams per square centimeter per day
mg/day = milligrams per day
mg/kg = milligrams per kilogram
USEPA = U.S. Environmental Protection Agency

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Table 4-11. Values Used for Daily Intake Calculations - Central Tendency Exposure to Subsurface Soil
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Subsurface Soil (0-18 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Utility Worker	Adult	On-site	Ca	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $C_s \times IR \times A_o \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	100	mg/day	USEPA 2002b assumption	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	3	days/year	1 day/quarter, 9 months	
				ED	Exposure Duration	9	years	USEPA 1997b	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				FI	Fraction Ingested from Source	1	unitless	assumption	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	3285	days	by definition	
Ingestion	Construction Worker	Adult	On-site	Ca	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $C_s \times IR \times A_o \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	330	mg/day	USEPA 2002b assumption	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	63	days/year	assumption	
				ED	Exposure Duration	1	years	assumption	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				FI	Fraction Ingested from Source	1	unitless	assumption	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	365	days	by definition	
Ingestion	Commercial/ Industrial Worker	Adult	On-site	Ca	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $C_s \times IR \times A_o \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	50	mg/day	USEPA 1997b assumption	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	219	days/year	USEPA 2004a	
				ED	Exposure Duration	9	years	USEPA 2004a	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				FI	Fraction Ingested from Source	1.0	unitless	assumption	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	3285	days	by definition	

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Table 4-11. Values Used for Daily Intake Calculations - Central Tendency Exposure to Subsurface Soil
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Subsurface Soil (0-16 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Dermal	Utility Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $C_s \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	3300	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.02	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	3	days/year	1 day/quarter, 9 months	
				ED	Exposure Duration	9	years	USEPA 1997b	
				ABS	Absorption Factor	chemical-specific	unitless	USEPA 2004	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	3285	days	by definition	
	Construction Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $C_s \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	3300	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.02	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	63	days/year	assumption	
				ED	Exposure Duration	1	years	assumption	
				ABS	Absorption Factor	chemical-specific	unitless	USEPA 2004a	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	365	days	by definition	
	Commercial/ Industrial Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $C_s \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	3300	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.02	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	219	days/year	USEPA 2004a	
				ED	Exposure Duration	9	years	USEPA 1997b	
				ABS	Absorption Factor	chemical-specific	unitless	USEPA 2004a	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	3285	days	by definition	

**Table 4-11. Values Used for Daily Intake Calculations - Central Tendency Exposure to Subsurface Soil
Lammers Barrel Facility, Beaver Creek, Ohio**

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Subsurface Soil (0-16 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Inhalation	Utility Worker	Adult	On-site	Cs	Concentration in Soil	chemical-specific	mg/kg	Table 4-3	Intake (mg/kg-day) = $Cs \times IHR \times ET \times EF \times ED \times (1/PEF) \times 1/BW \times 1/AT$
				IhR	Inhalation Rate	1.3	m ³ /hour	USEPA 1997b	
				ET	Exposure Time	4	hours/day	assumption	
				EF	Exposure Frequency	3	days/year	1 day/quarter, 9 months	
				ED	Exposure Duration	9	years	assumption	
				PEF	Particle Emission Factor	1.36E+09	m ³ /kg	USEPA 2002b	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	3285	days	by definition	
				Inhalation	Construction Worker	Adult	On-site	Cs	
IhR	Inhalation Rate	1.3	m ³ /hour					USEPA 1997b	
ET	Exposure Time	4	hours/day					assumption	
EF	Exposure Frequency	63	days/year					assumption	
ED	Exposure Duration	1	years					USEPA 1989	
PEF	Particle Emission Factor	1.36E+09	m ³ /kg					USEPA 2002b	
BW	Body Weight	70	kg					USEPA 1989	
ATc	Averaging Time (cancer)	25550	days					USEPA 1989	
ATnc	Averaging Time (non-cancer)	365	days					by definition	
Inhalation	Commercial/Industrial Worker	Adult	On-site					Cs	Concentration in Soil
				IhR	Inhalation Rate	1.3	m ³ /hour	USEPA 1997b	
				ET	Exposure Time	1	hours/day	assumption	
				EF	Exposure Frequency	219	days/year	USEPA 1997b	
				ED	Exposure Duration	9	years	USEPA 1997b	
				PEF	Particle Emission Factor	1.36E+09	m ³ /kg	USEPA 2002b	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	3285	days	by definition	

Notes:

bgs = below ground surface
cm² = square centimeter
kg = kilogram
kg/mg = kilograms per milligram
m³/hour = cubic meters per hour

m³/kg = cubic meters per kilogram
mg/cm²-day = milligrams per square centimeter per day
mg/day = milligrams per day
mg/kg = milligrams per kilogram
USEPA = U.S. Environmental Protection Agency

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**Table 4-12. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio**

Scenario Timeframe: Current and Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Resident	Young child (Ages 0 through 6)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = Cw x IR x Ao x EF x ED x 1/BW x 1/AT
				IR	Ingestion Rate	1.5	L/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	350	days/year	USEPA 1997b	
				ED	Exposure Duration	7	years	by definition	
				BW	Body Weight	15	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	2555	days	by definition	
				Older child (Ages 7 through 17)	Off-site	Cw	Concentration in Groundwater	chemical-specific	
	IR	Ingestion Rate	1.7			L/day	USEPA 1997b		
	Ao	Oral Absorption	1			unitless	assumption		
	EF	Exposure Frequency	350			days/year	USEPA 1997b		
	ED	Exposure Duration	11			years	by definition		
	BW	Body Weight	45			kg	USEPA 1997b		
	ATc	Averaging Time (cancer)	25550			days	USEPA 1989		
	ATnc	Averaging Time (non-cancer)	4015			days	by definition		
	Adult	Off-site	Cw			Concentration in Groundwater	chemical-specific	mg/L	Table 4-5
			IR	Ingestion Rate	2.3	L/day	USEPA 1997b		
			Ao	Oral Absorption	1	unitless	assumption		
			EF	Exposure Frequency	350	days/year	USEPA 1997b		
			ED	Exposure Duration	12	years	by definition		
BW			Body Weight	70	kg	USEPA 1989			
ATc			Averaging Time (cancer)	25550	days	USEPA 1989			
ATnc			Averaging Time (non-cancer)	4380	days	by definition			
Construction Worker			Adult	On-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-4
	IR	Ingestion Rate			0.05	L/hr	USEPA 1989		
	Ao	Oral Absorption			1	unitless	assumption		
	EF	Exposure Frequency			14	days/year	assumption		
	ED	Exposure Duration			1	years	assumption		
	ET	Exposure Time			1	hours/day	assumption		
	BW	Body Weight			70	kg	USEPA 1989		
	ATc	Averaging Time (cancer)			25550	days	USEPA 1989		
	ATnc	Averaging Time (non-cancer)			365	days	by definition		
Dermal	Resident	Young child (Ages 0 through 6)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = Cw x SA x EF x ED x EV x DA _{event} x 1/BW x 1/AT
				SA	Surface Area	8560	cm ²	USEPA 2004a	
				DA _{event}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA, 2004a	
				EV	Event Frequency	1	events/day	USEPA 2004a	
				EF	Exposure Frequency	350	days/year	USEPA 1997b	
				ED	Exposure Duration	7	years	by definition	
				BW	Body Weight	15	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	2555	days	USEPA 1997b	

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Table 4-12. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name	
Dermal	Resident	Older child (Ages 7 through 17)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = $Cw \times SA \times EF \times ED \times EV \times DA_{event} \times 1/BW \times 1/AT$	
				SA	Surface Area	13120	cm ²	USEPA 2004a		
				DA _{event}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a		
				EV	Event Frequency	1	events/day	USEPA 2004a		
				EF	Exposure Frequency	350	days/year	USEPA 1997b		
				ED	Exposure Duration	11	years	by definition		
				BW	Body Weight	45	kg	USEPA 1997b		
	ATc	Averaging Time (cancer)	25550	days	USEPA 1989					
	ATnc	Averaging Time (non-cancer)	4016	days	USEPA 1997b					
	Adult	Off-site	Adult	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L		Table 4-5
					SA	Surface Area	18150	cm ²		USEPA 2004a
					DA _{event}	Absorbed Dose per Event	calculated	L/cm ² -event		USEPA 2004a
					EV	Event Frequency	1	events/day		USEPA 2004
					EF	Exposure Frequency	350	days/year		USEPA 1997b
ED					Exposure Duration	12	years	by definition		
BW					Body Weight	70	kg	USEPA 1989		
ATc	Averaging Time (cancer)	25550	days	USEPA 1989						
ATnc	Averaging Time (non-cancer)	4745	days	USEPA 1997b						
Construction Worker	Adult	Adult	On-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-4		
				SA	Surface Area	3300	cm ²	USEPA 2004a		
				DA _{event}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a		
				EV	Event Frequency	1	events/day	USEPA 2004a		
				EF	Exposure Frequency	14	days/year	assumption		
				ED	Exposure Duration	1	units	USEPA 1989		
				BW	Body Weight	70	kg	USEPA 1989		
ATc	Averaging Time (cancer)	25550	days	USEPA 1989						
ATnc	Averaging Time (non-cancer)	365	days	by definition						
Inhalation	Resident	Young child (Ages 0 through 6)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5		
				IhR	Inhalation Rate	1.2	m ³ /hour	USEPA 1997b		
				ET	Exposure Time	1	hours/day	USEPA 1997b		
				EF	Exposure Frequency	350	days/year	USEPA 1997b		
				ED	Exposure Duration	7	years	by definition		
				K	Volatilization Constant	0.5	L/m ³	USEPA 1991		
				BW	Body Weight	15	kg	USEPA 1997b		
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989		
				ATnc	Averaging Time (non-cancer)	2555	days	by definition		

Case: 3:14-cv-00032-WHR Doc #: 5-1 Filed: 04/22/14 Page: 90 of 144 PAGEID #: 619

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Table 4-12. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name	
Inhalation	Resident	Older child (Ages 7 through 17)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = $C_w \times I_hR \times ET \times EF \times ED \times K \times 1/BW \times 1/AT$	
				IhR	Inhalation Rate	1.2	m ³ /hour	USEPA 1997b		
				ET	Exposure Time	1	hours/day	USEPA 1997b		
				EF	Exposure Frequency	350	days/year	USEPA 2004a		
				ED	Exposure Duration	11	years	by definition		
				K	Volatilization Constant	0.5	L/m ³	USEPA 1991		
				BW	Body Weight	45	kg	USEPA 1997b		
		ATc		Averaging Time (cancer)	25550	days	USEPA 1988			
		ATnc		Averaging Time (non-cancer)	4015	days	by definition			
		Adult		Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L		Table 4-5
					IhR	Inhalation Rate	1.6	m ³ /hour		USEPA 1997b
					ET	Exposure Time	0.58	hours/day		USEPA 1997b
					EF	Exposure Frequency	350	days/year		USEPA 2004a
					ED	Exposure Duration	12	years		by definition
K	Volatilization Constant		0.5		L/m ³	USEPA 1991				
BW	Body Weight		70		kg	USEPA 1988				
ATc	Averaging Time (cancer)	25550	days	USEPA 1988						
ATnc	Averaging Time (non-cancer)	4380	days	by definition						
Ingestion (Wading)	Resident	Young child (Ages 1 through 6)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-23	Intake (mg/kg-day) = $C_w \times I_R \times A_o \times ET \times EF \times ED \times 1/BW \times 1/AT$	
				I _R	Ingestion Rate	0.05	L/hour	USEPA 1988		
				A _o	Oral Absorption	1	unitless	assumption		
				ET	Exposure Time	1	hours/day	assumption		
				EF	Exposure Frequency	48	days/year	4 day/week, 3 months		
				ED	Exposure Duration	6	years	by definition		
				BW	Body Weight	15	kg	USEPA 1997b		
				ATc	Averaging Time (cancer)	25550	days	USEPA 1988		
				ATnc	Averaging Time (non-cancer)	2190	days	by definition		
Dermal (Wading)	Resident	Young child (Ages 1 through 6)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-23	Intake (mg/kg-day) = $C_w \times SA \times EF \times ED \times EV \times DA_{event} \times 1/BW \times 1/AT$	
				SA	Surface Area	6580	cm ²	USEPA 2004a		
				DA _{EVENT}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a		
				EV	Event Frequency	1	events/day	assumption		
				EF	Exposure Frequency	48	days/year	4 day/week, 3 months		
				ED	Exposure Duration	6	years	by definition		
				BW	Body Weight	15	kg	USEPA 1997b		
				ATc	Averaging Time (cancer)	25550	days	USEPA 1988		
				ATnc	Averaging Time (non-cancer)	2190	days	by definition		

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Table 4-12. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation (Wading)	Resident	Young child (Ages 1 through 6)	Off-site	Cw	Concentration in Air	chemical-specific	mg/m ³	Table 4-23	Intake (mg/kg-day) = Cw x InR x ET x EF x ED x K x 1/BW x 1/AT
				InR	Inhalation Rate	1.2	m ³ /hour	USEPA 1997b	
				ET	Exposure Time	1	hours/day	assumption	
				EF	Exposure Frequency	48	days/year	4 day/week, 3 months	
				ED	Exposure Duration	6	years	by definition	
				BW	Body Weight	15	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days/year	USEPA 1999	
ATnc	Averaging Time (non-cancer)	2190	days	by definition					

Notes:

- cm² = square centimeter
- cm/hour = centimeters per hour
- kg = kilogram
- L/cm³ = liters per cubic centimeter
- L/day = liters per day
- L/m³ = liters per cubic meter
- m³/hour = cubic meters per hour
- mg/L = milligrams per Liter
- USEPA = U.S. Environmental Protection Agency

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Table 4-13. Values Used for Daily Intake Calculations - Central Tendency Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Resident	Young child (Ages 0 through 6)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = $Cw \times IR \times Ao \times EF \times ED \times 1/BW \times 1/AT$
				IR	Ingestion Rate	0.87	L/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	350	days/year	USEPA 1997b	
				ED	Exposure Duration	7	years	by definition	
				BW	Body Weight	15	kg	USEPA 1997b	
		ATc		Averaging Time (cancer)	25550	days	USEPA 1989		
		ATnc		Averaging Time (non-cancer)	2555	days	by definition		
		Older child (Ages 7 through 17)		Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	
	IR		Ingestion Rate	0.87	L/day	USEPA 1997b			
	Ao		Oral Absorption	1	unitless	assumption			
	EF		Exposure Frequency	350	days/year	USEPA 1997b			
	ED		Exposure Duration	11	years	by definition			
	BW		Body Weight	45	kg	USEPA 1997b			
	Adult	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = $Cw \times IR \times Ao \times EF \times ED \times 1/BW \times 1/AT$		
		IR	Ingestion Rate	1.4	L/day	USEPA 1997b			
		Ao	Oral Absorption	1	unitless	assumption			
		EF	Exposure Frequency	350	days/year	USEPA 1997b			
ED		Exposure Duration	8	years	USEPA 1997b				
BW		Body Weight	70	kg	USEPA 1989				
Dermal	Resident	Young child (Ages 0 through 6)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = $Cw \times SA \times EF \times ED \times EV \times DA_{EVENT} \times 1/BW \times 1/AT$
				SA	Surface Area	6580	cm ²	USEPA 2004a	
				DA _{EVENT}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a	
				EV	Event Frequency	1	events/day	USEPA 2004a	
				EF	Exposure Frequency	350	days/year	USEPA 1997b	
				ED	Exposure Duration	7	years	by definition	
		BW		Body Weight	15	kg	USEPA 1997b		
		ATc		Averaging Time (cancer)	25550	days	USEPA 1989		
		ATnc		Averaging Time (non-cancer)	2555	days	USEPA 1997b		

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Table 4-13. Values Used for Daily Intake Calculations - Central Tendency Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Dermal	Resident	Older child (Ages 7 through 17)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = $C_w \times SA \times EF \times ED \times EV \times DA_{event} \times 1/BW \times 1/AT$
				SA	Surface Area	13120	cm ²	USEPA 2004a	
				DA _{event}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a	
				EV	Event Frequency	1	events/day	USEPA 2004a	
				EF	Exposure Frequency	350	days/year	USEPA 1997b	
				ED	Exposure Duration	11	years	USEPA 1989	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	3285	days	USEPA 1997b	
	Adult	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = $C_w \times SA \times EF \times ED \times EV \times DA_{event} \times 1/BW \times 1/AT$	
			SA	Surface Area	18150	cm ²	USEPA 2004a		
			DA _{event}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a		
			EV	Event Frequency	1	events/day	USEPA 2004a		
			EF	Exposure Frequency	350	days/year	USEPA 1997b		
			ED	Exposure Duration	9	years	USEPA 1989		
			BW	Body Weight	70	kg	USEPA 1989		
			ATc	Averaging Time (cancer)	26550	days	USEPA 1989		
			ATnc	Averaging Time (non-cancer)	3285	days	by definition		
Construction Worker	Adult	On-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-4	Intake (mg/kg-day) = $C_w \times SA \times EF \times ED \times EV \times DA_{event} \times 1/BW \times 1/AT$	
			SA	Surface Area	3300	cm ²	USEPA 2004a		
			DA _{event}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a		
			EV	Event Frequency	1	events/day	USEPA 2004a		
			EF	Exposure Frequency	5	days	assumption		
			ED	Exposure Duration	1	units	Table 4-5		
			BW	Body Weight	70	kg	USEPA 1989		
			ATc	Averaging Time (cancer)	25550	days	USEPA 1989		
			ATnc	Averaging Time (non-cancer)	365	days	by definition		
Inhalation	Resident	Young child (Ages 0 through 6)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = $C_w \times I_{hR} \times ET \times EF \times ED \times K \times 1/BW \times 1/AT$
				I _{hR}	Inhalation Rate	1.2	m ³ /hour	USEPA 1997b	
				ET	Exposure Time	1	hours/day	USEPA 2004a	
				EF	Exposure Frequency	350	days/year	USEPA 1997b	
				ED	Exposure Duration	7	years	by definition	
				K	Volatilization Constant	0.5	L/m ³	USEPA 2002b	
				BW	Body Weight	15	kg	USEPA 1987b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	2555	days	by definition	

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Table 4-13. Values Used for Daily Intake Calculations - Central Tendency Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Inhalation	Resident	Older child (Ages 7 through 17)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = $Cw \times I_hR \times ET \times EF \times ED \times K \times 1/BW \times 1/AT$
				IhR	Inhalation Rate	1.2	m ³ /hour	USEPA 1997b	
				ET	Exposure Time	1	hours/day	USEPA 2004a	
				EF	Exposure Frequency	350	days/year	USEPA 2004a	
				ED	Exposure Duration	11	years	by definition	
				K	Volatilization Constant	0.5	L/m ³	USEPA 2002b	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
		ATnc	Averaging Time (non-cancer)	4015	days	by definition			
		Adult	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-5	Intake (mg/kg-day) = $Cw \times I_hR \times ET \times EF \times ED \times K \times 1/BW \times 1/AT$
				IhR	Inhalation Rate	1.8	m ³ /hour	USEPA 1997b	
				ET	Exposure Time	0.58	hours/day	USEPA 2004a	
				EF	Exposure Frequency	350	days/year	USEPA 2004a	
				ED	Exposure Duration	9	years	USEPA 1997b	
K	Volatilization Constant			0.5	L/m ³	USEPA 2002b			
BW	Body Weight	70	kg	USEPA 1989					
ATc	Averaging Time (cancer)	25550	days	USEPA 1989					
ATnc	Averaging Time (non-cancer)	3285	days	by definition					
Dermal (Wading)	Resident	Young child (Ages 1 through 6)	Off-site	Cw	Concentration in Groundwater	chemical-specific	mg/L	Table 4-23	Intake (mg/kg-day) = $Cw \times SA \times EF \times ED \times EV \times DA_{event} \times 1/BW \times 1/AT$
				SA	Surface Area	6560	cm ²	USEPA 2004a	
				DA _{event}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a	
				EV	Event Frequency	1	events/day	USEPA 2004a	
				EF	Exposure Frequency	24	days/year	3 day/week, 2 months	
				ED	Exposure Duration	6	years	by definition	
				BW	Body Weight	15	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	2190	days	by definition	
				Ingestion (Wading)	Resident	Young child (Ages 1 through 6)	Off-site	Csw	
IR	Ingestion Rate	0.05	L/hour					USEPA 1989	
A _o	Oral Absorption	1	unitless					assumption	
ET	Exposure Time	1	hours/day					assumption	
EF	Exposure Frequency	24	days/year					3 day/week, 2 months	
ED	Exposure Duration	6	years					by definition	
BW	Body Weight	15	kg					USEPA 1997b	
ATc	Averaging Time (cancer)	25550	days					USEPA 1989	
ATnc	Averaging Time (non-cancer)	2190	days					by definition	

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Table 4-13. Values Used for Daily Intake Calculations - Central Tendency Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Inhalation (Wading)	Resident	Young child (Ages 1 through 6)	Off-site	Cw	Concentration in Air	chemical-specific	mg/m ³	by definition	Intake (mg/kg-day) = Cw x IHR x ET x EF x ED x K x 1/BW x 1/AT
				IHR	Inhalation Rate	1.2	m ³ /hour	USEPA 1997b	
				ET	Exposure Time	1	hours/day	assumption	
				EF	Exposure Frequency	24	days/year	3 day/week, 2 months	
				ED	Exposure Duration	6	years	by definition	
				BW	Body Weight	15	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	mg/L	USEPA 1988	
ATnc	Averaging Time (non-cancer)	2190	days	by definition					

Notes:

- cm² = square centimeter
- cm³/hour = centimeters per hour
- kg = kilogram
- L/cm³ = liters per cubic centimeter
- L/day = liters per day
- L/m³ = liters per cubic meter
- m³/hour = cubic meters per hour
- mg/L = milligrams per Liter
- USEPA = U.S. Environmental Protection Agency

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Table 4-14. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Surface Water
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Trespasser	Older child (Ages 7 through 17)	On-site	Csw	Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_{sw} \times IR \times A_o \times ET \times EF \times ED \times 1/BW \times 1/AT$
				IR	Ingestion Rate	0.05	L/hour	USEPA 1989 assumption	
				Ao	Oral Absorption	1	unitless	assumption	
				ET	Exposure Time	1	hours/day	assumption	
				EF	Exposure Frequency	18	unitless	2 day/month, 9 months	
				ED	Exposure Duration	11	years	by definition	
				BW	Body Weight	45	kg	USEPA 1987b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
	ATnc	Averaging Time (non-cancer)	4015	days	by definition				
	Recreator	Young child (Ages 1 through 6)	On-site	Csw	Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_{sw} \times IR \times A_o \times ET \times EF \times ED \times 1/BW \times 1/AT$
				IR	Ingestion Rate	0.05	L/hour	USEPA 1989 assumption	
				Ao	Oral Absorption	1	unitless	assumption	
				ET	Exposure Time	1	hours/day	assumption	
				EF	Exposure Frequency	39	days/year	3 day/week, 3 months	
				ED	Exposure Duration	6	years	by definition	
				BW	Body Weight	15	kg	USEPA 1987b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
		ATnc	Averaging Time (non-cancer)	2190	days	by definition			
		Older child (Ages 7 through 17)	On-site	Csw	Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_{sw} \times IR \times A_o \times ET \times EF \times ED \times 1/BW \times 1/AT$
				IR	Ingestion Rate	0.05	L/hour	USEPA 1989 assumption	
				Ao	Oral Absorption	1	unitless	assumption	
	ET			Exposure Time	1	hours/day	assumption		
	Adult	On-site	Csw	Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_{sw} \times IR \times A_o \times ET \times EF \times ED \times 1/BW \times 1/AT$	
			IR	Ingestion Rate	0.05	L/hour	USEPA 1989 assumption		
			Ao	Oral Absorption	1	unitless	assumption		
			ET	Exposure Time	1	hours/day	assumption		
					EF	Exposure Frequency	39	days/year	3 day/week, 3 months
					ED	Exposure Duration	13	years	by definition
BW					Body Weight	70	kg	USEPA 1989	
ATc					Averaging Time (cancer)	25550	days	USEPA 1989	
ATnc					Averaging Time (non-cancer)	4745	days	by definition	

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Table 4-14. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Surface Water
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser	Older child (Ages 7 through 17)	On-site	Csw	Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $Cw \times SA \times EF \times ED \times EV \times DA_{EVENT} \times 1/BW \times 1/AT$
				SA	Surface Area	3259	cm ²	USEPA 2004a	
				DA _{EVENT}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a assumption	
				EV	Event Frequency	1	events/day	2 day/month, 8 months by definition	
				EF	Exposure Frequency	18	days/year	USEPA 1997b	
				ED	Exposure Duration	11	years	USEPA 1989	
	BW	Body Weight	45	kg	by definition				
	ATc	Averaging Time (cancer)	25550	days					
	ATnc	Averaging Time (non-cancer)	4015	days					
	Recreator	Young child (Ages 1 through 6)	On-site	Csw	Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $Cw \times SA \times EF \times ED \times EV \times DA_{EVENT} \times 1/BW \times 1/AT$
				SA	Surface Area	1459	cm ²	USEPA 2004a	
				DA _{EVENT}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a assumption	
EV				Event Frequency	1	events/day	3 day/week, 3 months by definition		
EF				Exposure Frequency	39	days/year	USEPA 1997a		
ED				Exposure Duration	6	years	USEPA 1989		
BW	Body Weight	15	kg	by definition					
ATc	Averaging Time (cancer)	25550	days						
ATnc	Averaging Time (non-cancer)	2190	days						
Recreator	Older child (Ages 7 through 17)	On-site	Csw	Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $Cw \times SA \times EF \times ED \times EV \times DA_{EVENT} \times 1/BW \times 1/AT$	
			SA	Surface Area	3259	cm ²	USEPA 2004a		
			DA _{EVENT}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a assumption		
			EV	Event Frequency	1	events/day	3 day/week, 3 months by definition		
			EF	Exposure Frequency	39	days/year	USEPA 1997b		
			ED	Exposure Duration	11	years	USEPA 1989		
BW	Body Weight	45	kg	by definition					
ATc	Averaging Time (cancer)	25550	days						
ATnc	Averaging Time (non-cancer)	4015	days						

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Table 4-14. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Surface Water
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreator	Adult	On-site	Csw	Water	chemical-specific	mg/L	Table 4-8	Intake (mg/kg-day) = $C_w \times SA \times EF \times ED \times EV \times DA_{\text{EVENT}} \times$ $1/BW \times 1/AT$
				SA	Surface Area	4489	cm ²	USEPA 2004a	
				DA _{EVENT}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a	
				EV	Event Frequency	1	events/day	assumption	
				EF	Exposure Frequency	39	days/year	3 day/week, 3 months	
				ED	Exposure Duration	13	years	by definition	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
ATnc	Averaging Time (non-cancer)	4745	days	by definition					

Notes:

- cm² = square centimeter
- cm/hour = centimeters per hour
- kg = kilogram
- L/cm³ = liters per cubic centimeter
- L/hour = liters per hour
- mg/L = milligrams per Liter
- USEPA = U.S. Environmental Protection Agency

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Table 4-15. Values Used for Daily Intake Calculations - Central Tendency Exposure to Surface Water
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Trespasser	Older child (Ages 7 through 17)	On-site	Csw	Concentration in Surface Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_{sw} \times IR \times A_o \times ET \times EF \times ED \times 1/BW \times 1/AT$
				IR	Ingestion Rate	0.05	L/hour	USEPA 1989 assumption	
				Ao	Oral Absorption	1	unitless	assumption	
				ET	Exposure Time	0.5	hours/day	assumption	
				EF	Exposure Frequency	9	unitless	1 day/month, 9 months	
				ED	Exposure Duration	11	years	by definition	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
	ATnc	Averaging Time (non-cancer)	4015	days	by definition				
	Recreator	Young child (Ages 1 through 6)	On-site	Csw	Concentration in Surface Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_{sw} \times IR \times A_o \times ET \times EF \times ED \times 1/BW \times 1/AT$
				IR	Ingestion Rate	0.05	L/hour	USEPA 1989 assumption	
				Ao	Oral Absorption	1	unitless	assumption	
				ET	Exposure Time	1	hours/day	assumption	
				EF	Exposure Frequency	13	days/year	1 day/week, 3 months	
				ED	Exposure Duration	6	years	by definition	
				BW	Body Weight	15	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
		ATnc	Averaging Time (non-cancer)	2190	days	by definition			
		Older child (Ages 7 through 17)	On-site	Csw	Concentration in Surface Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_{sw} \times IR \times A_o \times ET \times EF \times ED \times 1/BW \times 1/AT$
				IR	Ingestion Rate	0.05	L/hour	USEPA 1989 assumption	
				ET	Exposure Time	1	hours/day	assumption	
	EF			Exposure Frequency	13	days/year	1 day/week, 3 months		
	Adult	On-site	Csw	Concentration in Surface Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_{sw} \times IR \times A_o \times ET \times EF \times ED \times 1/BW \times 1/AT$	
			IR	Ingestion Rate	0.05	L/hour	USEPA 1989 assumption		
			ET	Exposure Time	1	hours/day	assumption		
			EF	Exposure Frequency	13	days/year	1 day/week, 3 months		
			ED	Exposure Duration	9	years	USEPA 1997b		
			BW	Body Weight	70	kg	USEPA 1989		
ATc			Averaging Time (cancer)	25550	days	USEPA 1989			
ATnc			Averaging Time (non-cancer)	3285	days	by definition			

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**Table 4-15. Values Used for Daily Intake Calculations - Central Tendency Exposure to Surface Water:
Lammers Barrel Facility, Beavercreek, Ohio**

Scenario Timeframe: Current and Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Dermal	Trespasser	Older child (Ages 7 through 17)	On-site	Csw	Concentration in Surface Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_w \times SA \times EF \times ED \times EV \times DA_{EVENT} \times 1/BW \times 1/AT$
				SA	Surface Area	3259	cm ²	USEPA 2004a	
				DA _{EVENT}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a	
				EV	Event Frequency	1	events/day	USEPA 2004a	
				EF	Exposure Frequency	9	unitless	1 day/month, 9 months	
				ED	Exposure Duration	11	years	USEPA 1997b	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	4015	days	by definition	
	Recreator	Young child (Ages 1 through 6)	On-site	Csw	Concentration in Surface Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_w \times SA \times EF \times ED \times EV \times DA_{EVENT} \times 1/BW \times 1/AT$
				SA	Surface Area	1459	cm ²	USEPA 2004a	
				DA _{EVENT}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a	
				EV	Event Frequency	1	events/day	USEPA 2004a	
				EF	Exposure Frequency	13	days/year	1 day/week, 3 months	
				ED	Exposure Duration	6	years	by definition	
				BW	Body Weight	15	kg	USEPA 1997a	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	2190	days	by definition	
	Older child (Ages 7 through 17)	On-site	Csw	Concentration in Surface Water	chemical-specific	mg/L	Table 4-6	Intake (mg/kg-day) = $C_w \times SA \times EF \times ED \times EV \times DA_{EVENT} \times 1/BW \times 1/AT$	
			SA	Surface Area	3259	cm ²	USEPA 2004a		
			DA _{EVENT}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a		
			EV	Event Frequency	1	events/day	USEPA 2004a		
			EF	Exposure Frequency	13	days/year	1 day/week, 3 months		
			ED	Exposure Duration	11	years	USEPA 1997b		
			BW	Body Weight	45	kg	USEPA 1997b		
			ATc	Averaging Time (cancer)	25550	days	USEPA 1989		
			ATnc	Averaging Time (non-cancer)	4015	days	by definition		

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Table 4-15. Values Used for Daily Intake Calculations - Central Tendency Exposure to Surface Water
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Dermal	Recreator	Adult	On-site	Csw	Concentration in Surface Water	chemical-specific	mg/L	Table 4-6	$\text{Intake (mg/kg-day)} = \text{Cw} \times \text{SA} \times \text{EF} \times \text{ED} \times \text{EV} \times \text{DA}_{\text{EVENT}} \times 1/\text{BW} \times 1/\text{AT}$
				SA	Surface Area	4489	cm ²	USEPA 2004a	
				DA _{EVENT}	Absorbed Dose per Event	calculated	L/cm ² -event	USEPA 2004a	
				EV	Event Frequency	1	events/day	USEPA 2004a	
				EF	Exposure Frequency	13	days/year	1 day/week, 3 months	
				ED	Exposure Duration	9	years	USEPA 1997b	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
ATnc	Averaging Time (non-cancer)	3285	days	by definition					

Notes:
 cm² = square centimeter
 cm/hour = centimeters per hour
 kg = kilogram
 L/cm³ = liters per cubic centimeter
 L/hour = liters per hour
 mg/L = milligrams per Liter
 USEPA = U.S. Environmental Protection Agency

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Table 4-16. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Sediment
Lammers Barrel Facility, Beaver Creek, Ohio

Scenario Timeframe: Current and Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Trespasser	Older child (Ages 7 through 17)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = $Csd \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	50	mg/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	18	unitless	2 day/month, 8 months	
				ED	Exposure Duration	11	years	by definition	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				FI	Fraction Ingested from Source	0.25	unitless	assumption	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	4015	days	by definition	
	Recreator	Young child (Ages 1 through 8)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	
				IR	Ingestion Rate	200	mg/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	39	days/year	3 day/week, 3 months	
Older child (Ages 7 through 17)	On-site	ED	Exposure Duration	6	years	by definition			
		CF	Conversion Factor	1E-06	kg/mg	by definition			
		FI	Fraction Ingested from Source	0.5	unitless	assumption			
		BW	Body Weight	15	kg	USEPA 1997b			
		ATc	Averaging Time (cancer)	25550	days	USEPA 1989			
		ATnc	Averaging Time (non-cancer)	2180	days	by definition			
Ingestion	Trespasser	Older child (Ages 7 through 17)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = $Csd \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	50	mg/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	39	days/year	3 day/week, 3 months	
				ED	Exposure Duration	11	years	by definition	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				FI	Fraction Ingested from Source	0.5	unitless	assumption	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	4015	days	by definition	

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Table 4-16. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Sediment
Lammers Barrel Facility, Beavercreek, Ohio

Scenario Timeframe: Current and Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreator	Adult	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = $Csd \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	50	mg/day	USEPA 1997b	
				Ao	Oral Absorption	1	unitless	assumption	
				EF	Exposure Frequency	39	days/year	3 day/week, 3 months	
				ED	Exposure Duration	12	years	by definition	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				FI	Fraction Ingested from Source	0.5	unitless	assumption	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
				ATnc	Averaging Time (non-cancer)	4380	days	by definition	
Dermal	Trespasser	Older child (Ages 7 through 17)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = $Csd \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	3259	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.2	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	18	days/year	3 day/week, 8 months	
				ED	Exposure Duration	11	years	by definition	
				ABS	Absorption Factor	chemical-specific	unitless	Table 4-18	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
	BW	Body Weight	45	kg	USEPA 1997b				
	ATc	Averaging Time (cancer)	25550	days	USEPA 1989				
	ATnc	Averaging Time (non-cancer)	4015	days	by definition				
	Recreator	Young child (Ages 1 through 6)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = $Csd \times SA \times AF \times EF \times ED \times ABS \times CF \times 1/BW \times 1/AT$
				SA	Surface Area	1459	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.2	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	39	days/year	3 day/week, 3 months	
ED				Exposure Duration	8	years	by definition		
ABS				Absorption Factor	chemical-specific	unitless	Table 4-18		
CF				Conversion Factor	1E-06	kg/mg	by definition		
BW	Body Weight	15	kg	USEPA 1997b					
ATc	Averaging Time (cancer)	25550	days	USEPA 1989					
ATnc	Averaging Time (non-cancer)	2190	days	by definition					

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Table 4-16. Values Used for Daily Intake Calculations - Reasonable Maximum Exposure to Sediment
Lammers Barrel Facility, Beaver Creek, Ohio

Scenario Timeframe: Current and Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name					
Dermal	Recreator	Older child (Ages 7 through 17)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = Csd x SA x AF x EF x ED x ABS x CF x 1/BW x 1/AT					
				SA	Surface Area	3258	cm ²	USEPA 2004a						
				AF	Adherence Factor	0.2	mg/cm ² -day	USEPA 2004a						
				EF	Exposure Frequency	39	days/year	3 day/week, 3 months						
				ED	Exposure Duration	11	years	by definition						
				ABS	Absorption Factor	chemical-specific	unitless	Table 4-16						
				CF	Conversion Factor	1E-06	kg/mg	by definition						
				BW	Body Weight	45	kg	USEPA 1987b						
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989						
				ATnc	Averaging Time (non-cancer)	4015	days	by definition						
				Dermal	Recreator	Adult	On-site	Csd		Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = Csd x SA x AF x EF x ED x ABS x CF x 1/BW x 1/AT
								SA		Surface Area	4499	cm ²	USEPA 2004a	
								AF		Adherence Factor	0.2	mg/cm ² -day	USEPA 2004a	
								EF		Exposure Frequency	39	days/year	3 day/week, 3 months	
ED	Exposure Duration	12	years					by definition						
ABS	Absorption Factor	chemical-specific	unitless					Table 4-16						
CF	Conversion Factor	1E-06	kg/mg					by definition						
BW	Body Weight	70	kg					USEPA 1989						
ATc	Averaging Time (cancer)	25550	days					USEPA 1989						
ATnc	Averaging Time (non-cancer)	4380	days					by definition						

Notes:
 cm² = square centimeter
 kg = kilogram
 kg/mg = kilograms per milligram
 mg/cm²-day = milligrams per square centimeter per day
 mg/day = milligrams per day
 mg/kg = milligrams per kilogram
 USEPA = U.S. Environmental Protection Agency

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Table 4-17. Values Used for Daily Intake Calculations - Central Tendency Exposure to Sediment
Lammers Barrel Facility, Beaver Creek, Ohio

Scenario Timeframe: Current and Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Ingestion	Trespasser	Older child (Ages 7 through 17)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = $Csd \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	50	mg/day	USEPA 1997b assumption	
				Ao	Oral Absorption	1	unitless		
				EF	Exposure Frequency	9	unitless	1 day/month, 9 months	
				ED	Exposure Duration	11	years	USEPA 1997b by definition	
				CF	Conversion Factor	1E-06	kg/mg	assumption	
				FI	Fraction Ingested from Source	0.25	unitless	assumption	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
	ATnc	Averaging Time (non-cancer)	4015	days	by definition				
	Recreator	Young child (Ages 1 through 6)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = $Csd \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$
				IR	Ingestion Rate	100	mg/day	USEPA 1997b assumption	
				Ao	Oral Absorption	1	unitless		
EF				Exposure Frequency	13	days/year	1 day/week, 3 months		
ED				Exposure Duration	6	years	by definition		
CF				Conversion Factor	1E-06	kg/mg	by definition		
FI				Fraction Ingested from Source	0.5	unitless	assumption		
BW				Body Weight	15	kg	USEPA 1997b		
ATc				Averaging Time (cancer)	25550	days	USEPA 1989		
ATnc	Averaging Time (non-cancer)	2190	days	by definition					
	Older child (Ages 7 through 17)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = $Csd \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$	
			IR	Ingestion Rate	50	mg/day	USEPA 1997b assumption		
			Ao	Oral Absorption	1	unitless			
			EF	Exposure Frequency	13	days/year	1 day/week, 3 months		
			ED	Exposure Duration	11	years	USEPA 1997b by definition		
			CF	Conversion Factor	1E-06	kg/mg	assumption		
			FI	Fraction Ingested from Source	0.5	unitless	assumption		
			BW	Body Weight	45	kg	USEPA 1997b		
			ATc	Averaging Time (cancer)	25550	days	USEPA 1989		
ATnc	Averaging Time (non-cancer)	4015	days	by definition					
	Adult	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = $Csd \times IR \times Ao \times EF \times ED \times CF \times FI \times 1/BW \times 1/AT$	
			IR	Ingestion Rate	50	mg/day	USEPA 1997b assumption		
			Ao	Oral Absorption	1	unitless			
			EF	Exposure Frequency	13	days/year	1 day/week, 3 months		
			ED	Exposure Duration	9	years	USEPA 1997b by definition		
			CF	Conversion Factor	1E-06	kg/mg	assumption		
			FI	Fraction Ingested from Source	0.5	unitless	assumption		
			BW	Body Weight	70	kg	USEPA 1989		
			ATc	Averaging Time (cancer)	25550	days	USEPA 1989		
ATnc	Averaging Time (non-cancer)	3295	days	by definition					

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**Table 4-17. Values Used for Daily Intake Calculations - Central Tendency Exposure to Sediment
Lammers Barrel Facility, Beavercreek, Ohio**

Scenario Timeframe: Current and Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Dermal	Trespasser	Older child (Ages 7 through 17)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = Csd x SA x AF x EF x ED x ABS x CF x 1/BW x 1/AT
				SA	Surface Area	3259	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.04	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	9	days/year	1 day/week, 9 months	
				ED	Exposure Duration	11	years	USEPA 1997b	
				ABS	Absorption Factor	chemical-specific	unitless	Table 4-18	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				BW	Body Weight	45	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
	ATnc	Averaging Time (non-cancer)	4015	days	by definition				
	Recreator	Young child (Ages 1 through 6)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = Csd x SA x AF x EF x ED x ABS x CF x 1/BW x 1/AT
				SA	Surface Area	1459	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.04	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	13	days/year	1 day/week, 3 months	
				ED	Exposure Duration	6	years	by definition	
				ABS	Absorption Factor	chemical-specific	unitless	Table 4-18	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				BW	Body Weight	15	kg	USEPA 1997b	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
	ATnc	Averaging Time (non-cancer)	2190	days	by definition				
		Older child (Ages 7 through 17)	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = Csd x SA x AF x EF x ED x ABS x CF x 1/BW x 1/AT
				SA	Surface Area	3259	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.04	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	13	days/year	3 day/week, 3 months	
ED				Exposure Duration	11	years	USEPA 1997b		
ABS				Absorption Factor	chemical-specific	unitless	Table 4-18		
CF				Conversion Factor	1E-06	kg/mg	by definition		
BW				Body Weight	45	kg	USEPA 1997b		
ATc				Averaging Time (cancer)	25550	days	USEPA 1989		
ATnc	Averaging Time (non-cancer)	4015	days	by definition					

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Table 4-17. Values Used for Daily Intake Calculations - Central Tendency Exposure to Sediment
Lammers Barrel Facility, Beaver Creek, Ohio

Scenario Timeframe: Current and Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Intake Equation/Model Name
Dermal	Recreator	Adult	On-site	Csd	Concentration in Sediment	chemical-specific	mg/kg	Table 4-7	Intake (mg/kg-day) = Csd x SA x AF x EF x ED x ABS x CF x 1/BW x 1/AT
				SA	Surface Area	4499	cm ²	USEPA 2004a	
				AF	Adherence Factor	0.04	mg/cm ² -day	USEPA 2004a	
				EF	Exposure Frequency	13	days/year	3 day/week, 3 months	
				ED	Exposure Duration	9	years	USEPA 1997b	
				ABS	Absorption Factor	chemical-specific	unitless	Table 4-18	
				CF	Conversion Factor	1E-06	kg/mg	by definition	
				BW	Body Weight	70	kg	USEPA 1989	
				ATc	Averaging Time (cancer)	25550	days	USEPA 1989	
ATnc	Averaging Time (non-cancer)	3285	days	by definition					

Notes:

cm² = square centimeter

kg = kilogram

kg/mg = kilograms per milligram

mg/cm²-day = milligrams per square centimeter per day

mg/day = milligrams per day

mg/kg = milligrams per kilogram

USEPA = U.S. Environmental Protection Agency

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Table 4-18. Chemical Specific Factors
Lammers Barrel Facility, Beavercreek, Ohio

Chemical Name	Dermal Absorption (a) (unitless)	Molecular Weight (g/mol)	Vapor Pressure (mm Hg 25 °C)	Henry's Law Constant (atm-m ³ /mol) (25 °C)
Metals				
Antimony	NA	1.25E+02	NA	1.00E+00
Arsenic	0.03	7.49E+01 [b]	NA	NA
Barium	NA	1.37E+02	NA	1.00E+00
Cadmium	0.001	1.12E+02	8.88E-16	1.00E+00
Chromium	NA	5.20E+01	NA	1.00E+00
Iron	NA	5.58E+01 [b]	NA	NA
Lead	0.01	2.07E+02 [b]	NA	NA
Manganese	NA	5.49E+01 [b]	NA	NA
Nickel	NA	5.87E+01	4.24E-09	1.00E+00
Thallium	NA	2.04E+02	1.81E-36	1.00E+00
Vanadium	NA	5.09E+01	4.24E-09	1.00E+00
PAHs				
2-Methylnaphthalene	0.13	1.42E+02	5.50E-02	2.12E-02
Benzo(a)anthracene	0.13	2.28E+02 [c]	1.10E-07 [c]	3.35E-06 [c]
Benzo(a)pyrene	0.13	2.52E+02 [c]	5.49E-09 [c]	1.13E-06 [c]
Benzo(b)fluoranthene	0.13	2.52E+02 [c]	5.00E-07 [c]	1.11E-04 [c]
Dibenzo(a,h)anthracene	0.13	3.81E+02 [b]	5.89E-06 [b]	1.51E-05 [b]
Indeno(1,2,3-cd)pyrene	0.13	2.80E+02 [b]	1.00E-10 [b]	1.60E-06 [b]
Naphthalene	0.13	1.30E+02 [b]	8.50E-02 [b]	4.80E-04 [b]
PCBs				
Total PCBs	0.14	2.25E+02 [c]	8.00E-05 [c]	1.11E-02 [c]
Pesticides				
gamma-BHC (Lindane)	0.04	2.90E+02 [b]	4.10E-04 [b]	1.40E-05 [b]
SVOCs				
bis(2-Chloroethyl)ether	0.1	1.43E+02 [b]	1.55E+00 [b]	1.80E-05 [c]
bis(2-Ethylhexyl)phthalate	0.1	3.81E+02	1.24E-07	1.10E-05
VOCs				
1,1,1-Trichloroethane	NA	1.30E+02 [b]	1.20E+02 [b]	1.70E-02 [b]
1,1,2,2-Tetrachloroethane	NA	1.70E+02 [b]	4.60E+00 [b]	3.40E-04 [b]
1,1-Dichloroethane	NA	9.90E+01	2.19E+02 [b]	2.34E-01 [b]
1,1-Dichloroethylene	NA	9.69E+01	6.00E+02	1.07E+00
1,2-Dichloroethane	NA	9.90E+01 [b]	7.80E+01 [b]	9.80E-04 [b]
Benzene	NA	7.81E+01 [b]	9.50E+01 [b]	6.55E-03 [b]
Bromodichloromethane	NA	1.60E+02 [b]	6.00E+01 [b]	1.60E-03 [b]
Carbon Tetrachloride	NA	1.60E+02 [b]	1.20E+02 [b]	3.00E-02 [b]
Chloroform	NA	1.20E+02 [b]	2.00E+02 [b]	3.70E-03 [b]
Chloromethane	NA	8.50E+01 [b]	4.30E+02 [b]	2.20E-03 [b]
cis-1,2-Dichloroethene	NA	8.88E+01	2.54E+02	1.87E-01
cis/trans-1,2-Dichloroethene	NA	8.88E+01	2.54E+02	1.87E-01
Ethylbenzene	NA	1.06E+02 [b]	9.80E+00 [b]	7.88E-03 [c]
Methylene chloride	NA	8.49E+01	4.35E+02	1.35E-01
Methyl N-Butyl Ketone	NA	1.00E+02 [e]	1.18E+01 [e]	8.32E-05 [e]
Methylene chloride	NA	8.49E+01 [b]	4.33E+02 [b]	2.18E-03 [b]
Tetrachloroethene	NA	1.66E+02 [c]	1.90E+01 [c]	1.84E-02 [d]
Toluene	NA	9.20E+02 [b]	2.80E+01 [b]	6.60E-03 [b]
trans-1,2-Dichloroethene	NA	9.69E+01	3.31E+02	3.85E-01
Trichloroethylene	NA	1.31E+02 [b]	7.35E+01 [b]	1.03E-02 [b]
Vinyl chloride	NA	6.25E+01 [b]	2.98E+03 [b]	2.70E-02 [b]
Xylenes, Total	NA	1.06E+02 avg	6.6 - 6.8 [c]	6.30E-03 [d]

Notes

- a. USEPA 2004a
- b. Superfund Chemical Data Matrix (1997) www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm
- c. Montgomery and Welton (1990)
- d. RAIS database
- e. SRC PhysProp Database <http://www.syrres.com/esc/physdemo.htm>
- avg = average
- atm-m³/mol = atmospheres-cubic meters per mole
- °C = degrees Celsius
- cm/hour = centimeters per hour
- g/mol = grams per mole
- mm Hg = millimeters mercury
- NA = not available
- PAH = polycyclic aromatic hydrocarbon
- PCB = polychlorinated biphenyl
- SVOC = semi-volatile organic compound
- VOC = volatile organic compound

Table 4-19. Derivation of DA_{event} for On-Site Trespasser and Recreator Exposure to Surface Water
Lammers Barrel Facility, Beavercreek, Ohio

Chemicals of Potential Concern	K _p (cm/hr)	B (unitless)	Tau (hr/event)	t* (hr)	FA (unitless)	t _{event} (hr/event)	DA if t _{event} ≤ t* (L/cm ² -event)	DA if t _{event} > t* (L/cm ² -event)	DA _{event} Factor (1) (L/cm ² -event)
Metals									
Antimony	1.0E-03	—	—	—	1.0E+00	1.0E+00	—	—	1.0E-06
Volatile Organic Compounds									
Bromodichloromethane	4.6E-03	2.3E-02	8.7E-01	2.1E+00	1.0E+00	1.0E+00	1.2E-05	1.3E-05	1.2E-05
Pesticides									
gamma-BHC	2.8E-02	1.8E-01	4.5E+00	1.1E+01	1.0E+00	1.0E+00	1.6E-04	3.2E-04	1.6E-04

K_p - Dermal permeability coefficient
 B - Ratio of the permeability coefficient through the stratum corneum relative to its permeability coefficient across the viable epidermis
 Tau - Lag time per event
 t* - Time to reach steady-state
 FA - Fraction absorbed (USEPA, 2004a)
 t_{event} - Exposure time per event
 DA - Dermal absorption
 L/cm²-event - liters per square centimeter per event

(1) For inorganic COPCs, DA_{event} Factor = K_p * t_{event} * CF
 where conversion factor (CF) is 0.001 L/cm³
 For organic COPCs, DA_{event} Factor is calculated by the following method:
 If t_{event} ≤ t*, the DA_{event} Factor = 2 * FA * K_p * (6 * Tau * t_{event}/π)^{0.2} * CF
 If t_{event} > t*, the DA_{event} Factor = FA * K_p * [(t_{event}/(1 + B)) + 2 * Tau * ((1 + 3B + 3B²)/(1 + B)²)] * CF
 where CF is 0.001 L/cm³

Table 4-20. Derivation of DA_{event} for Off-Site Younger Child Resident Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Chemicals of Potential Concern	K _p (cm/hr)	B (unitless)	Tau (hr/event)	t* (hr)	FA (unitless)	t _{event} (hr/event)	DA if t _{event} ≤ t* (L/cm ² -event)	DA if t _{event} > t* (L/cm ² -event)	DA _{event} Factor (1) (L/cm ² -event)
Volatile Organic Compounds									
Benzene	1.5E-02	5.1E-02	2.9E-01	8.9E-01	1.0E+00	1.0E+00	2.2E-05	2.3E-05	2.3E-05
cis-1,2-Dichloroethene	1.5E-02	5.6E-02	3.7E-01	8.8E-01	1.0E+00	1.0E+00	2.5E-05	2.6E-05	2.6E-05
Ethylbenzene	4.9E-02	1.9E-01	4.1E-01	9.9E-01	1.0E+00	1.0E+00	8.7E-05	9.8E-05	9.8E-05
Trichloroethene	1.2E-02	5.3E-02	5.7E-01	1.4E+00	1.0E+00	1.0E+00	2.5E-05	2.6E-05	2.6E-05
Vinyl chloride	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	1.0E+00	7.5E-06	8.2E-06	8.2E-06
Xylenes, Total	7.0E-02	2.8E-01	4.1E-01	9.9E-01	1.0E+00	1.0E+00	1.3E-04	1.5E-04	1.5E-04
Metals									
Arsenic	1.0E-03	—	—	—	1.0E+00	1.0E+00	—	—	1.0E-06
Iron (dissolved)	2.5E-04	—	—	—	1.0E+00	1.0E+00	—	—	2.5E-07
Manganese (dissolved)	1.0E-03	—	—	—	1.0E+00	1.0E+00	—	—	1.0E-06

K_p - Dermal permeability coefficient
 B - Ratio of the permeability coefficient through the stratum corneum relative to its permeability coefficient across the viable epidermis
 Tau - Lag time per event
 t* - Time to reach steady-state
 FA - Fraction absorbed (USEPA, 2004a)
 t_{event} - Exposure time per event
 DA - Dermal absorption
 L/cm²-event - liters per square centimeter per event

(1) For inorganic COPCs, DA_{event} Factor = K_p * t_{event} * CF
 where conversion factor (CF) is 0.001 L/cm³
 For organic COPCs, DA_{event} Factor is calculated by the following method:
 If t_{event} ≤ t*, the DA_{event} Factor = 2 * FA * K_p * (B * Tau * t_{event} / π)^{1/2} * CF
 If t_{event} > t*, the DA_{event} Factor = FA * K_p * [(t_{event} / (1 + B)) + 2 * Tau * ((1 + 3B + 3B²) / (1 + B)²)] * CF
 where CF is 0.001 L/cm³

Table 4-21. Derivation of DA_{event} for Off-Site Child and Adult Resident Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Chemicals of Potential Concern	K _p (cm/hr)	B (unitless)	Tau (hr/event)	t* (hr)	FA (unitless)	t _{event} (hr/event)	DA if t _{event} ≤ t* (L/cm ² -event)	DA if t _{event} > t* (L/cm ² -event)	DA _{event} Factor (1) (L/cm ² -event)
Volatile Organic Compounds									
Benzene	1.5E-02	5.1E-02	2.9E-01	6.9E-01	1.0E+00	5.8E-01	1.7E-05	1.7E-05	1.7E-05
cis-1,2-Dichloroethene	1.5E-02	5.6E-02	3.7E-01	8.8E-01	1.0E+00	5.8E-01	1.9E-05	2.0E-05	1.9E-05
Ethylbenzene	4.9E-02	1.9E-01	4.1E-01	9.9E-01	1.0E+00	5.8E-01	6.8E-05	7.8E-05	6.8E-05
Trichloroethene	1.2E-02	5.3E-02	5.7E-01	1.4E+00	1.0E+00	5.8E-01	1.9E-05	2.1E-05	1.9E-05
Vinyl chloride	5.8E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	5.8E-01	5.7E-06	5.9E-06	5.9E-06
Xylenes, Total	7.0E-02	2.8E-01	4.1E-01	9.9E-01	1.0E+00	5.8E-01	9.5E-05	1.2E-04	9.5E-05
Metals									
Arsenic	1.0E-03	—	—	—	1.0E+00	5.8E-01	—	—	5.8E-07
Iron (dissolved)	2.5E-04	—	—	—	1.0E+00	5.8E-01	—	—	1.4E-07
Manganese (dissolved)	1.0E-03	—	—	—	1.0E+00	5.8E-01	—	—	5.8E-07

K_p - Dermal permeability coefficient

B - Ratio of the permeability coefficient through the stratum corneum relative to its permeability coefficient across the viable epidermis

Tau - Lag time per event

t* - Time to reach steady-state

FA - Fraction absorbed (USEPA, 2004e)

t_{event} - Exposure time per event

DA - Dermal absorption

L/cm²-event - liters per square centimeter per event

(1) For inorganic COPCs, DA_{event} Factor = K_p * t_{event} * CF

where conversion factor (CF) is 0.001 L/cm³

For organic COPCs, DA_{event} Factor is calculated by the following method:

If t_{event} ≤ t*, the DA_{event} Factor = 2 * FA * K_p * (6 * Tau * t_{event}/π)^{1/2} * CF

If t_{event} > t*, the DA_{event} Factor = FA * K_p * [(t_{event}/(1 + B)) + 2 * Tau * ((1 + 3B + 3B²)/(1 + B)²)] * CF

where CF is 0.001 L/cm³

Table 4-22. Derivation of DA_{event} for On-Site Construction Worker Exposure to Groundwater
Lammers Barrel Facility, Beavercreek, Ohio

Chemicals of Potential Concern	K _p (cm/hr)	B (unitless)	Tau (hr/event)	t* (hr)	FA (unitless)	t _{event} (hr/event)	DA if t _{event} ≤ t* (L/cm ² -event)	DA if t _{event} > t* (L/cm ² -event)	DA _{event} Factor (1) (L/cm ² -event)
Volatile Organic Compounds									
1,1,1-Trichloroethane	1.3E-02	5.8E-02	5.8E-01	1.4E+00	1.0E+00	2.0E+00	3.8E-05	4.1E-05	4.1E-05
1,1,2,2-Tetrachloroethane	9.0E-03	4.5E-02	9.2E-01	2.2E+00	1.0E+00	2.0E+00	3.4E-05	3.5E-05	3.4E-05
1,1-Dichloroethane	8.9E-03	3.4E-02	3.8E-01	9.0E-01	1.0E+00	2.0E+00	2.1E-05	2.4E-05	2.4E-05
1,1-Dichloroethylene	1.2E-02	4.5E-02	3.7E-01	8.8E-01	1.0E+00	2.0E+00	2.8E-05	3.2E-05	3.2E-05
Benzene	1.5E-02	5.1E-02	2.8E-01	6.8E-01	1.0E+00	2.0E+00	3.1E-05	3.8E-05	3.8E-05
Chloroform	6.8E-03	2.8E-02	4.9E-01	1.2E+00	1.0E+00	2.0E+00	1.9E-05	2.0E-05	2.0E-05
Chloroethane	6.1E-03	1.9E-02	2.4E-01	5.8E-01	1.0E+00	2.0E+00	1.2E-05	1.5E-05	1.5E-05
cis-1,2-Dichloroethane	1.5E-02	5.6E-02	3.7E-01	8.8E-01	1.0E+00	2.0E+00	3.5E-05	4.0E-05	4.0E-05
Ethylbenzene	4.9E-02	1.9E-01	4.1E-01	9.8E-01	1.0E+00	2.0E+00	1.2E-04	1.4E-04	1.4E-04
Methyl N-butyl ketone	1.4E+00	5.3E+00	3.8E-01	1.7E+00	1.0E+00	2.0E+00	3.3E-03	7.6E-03	7.6E-03
Styrene	5.5E-02	2.2E-01	4.0E-01	9.7E-01	1.0E+00	2.0E+00	1.4E-04	1.5E-04	1.5E-04
Tetrachloroethane	3.3E-02	1.6E-01	8.9E-01	2.1E+00	1.0E+00	2.0E+00	1.2E-04	1.3E-04	1.2E-04
Toluene	4.5E-02	1.7E-01	3.5E-01	8.3E-01	1.0E+00	2.0E+00	1.0E-04	1.2E-04	1.2E-04
trans-1,2-Dichloroethane	7.7E-03	2.9E-02	3.7E-01	8.8E-01	1.0E+00	2.0E+00	1.8E-05	2.1E-05	2.1E-05
Trichloroethylene	1.2E-02	5.3E-02	5.7E-01	1.4E+00	1.0E+00	2.0E+00	3.5E-05	3.7E-05	3.7E-05
Vinyl chloride	5.6E-03	1.7E-02	2.4E-01	5.7E-01	1.0E+00	2.0E+00	1.1E-05	1.4E-05	1.4E-05
Xylenes, Total	7.0E-02	2.8E-01	4.1E-01	9.8E-01	1.0E+00	2.0E+00	1.8E-04	2.0E-04	2.0E-04
Semivolatile Organic Compounds									
bis(2-Chloroethyl)ether	2.1E-03	9.7E-03	6.6E-01	1.6E+00	1.0E+00	2.0E+00	6.7E-06	7.0E-06	7.0E-06
Polycyclic Aromatic Hydrocarbons									
2-Methylnaphthalene	1.4E-01	6.5E-01	6.6E-01	2.6E+00	1.0E+00	2.0E+00	4.5E-04	6.4E-04	4.5E-04
Naphthalene	4.7E-02	2.0E-01	5.5E-01	1.3E+00	1.0E+00	2.0E+00	1.4E-04	1.5E-04	1.5E-04
Metals									
Antimony	1.0E-03	—	—	—	1.0E+00	2.0E+00	—	—	2.0E-06
Arsenic	1.0E-03	—	—	—	1.0E+00	2.0E+00	—	—	2.0E-06
Barium	1.0E-03	—	—	—	1.0E+00	2.0E+00	—	—	2.0E-06
Iron (dissolved)	2.5E-04	—	—	—	1.0E+00	2.0E+00	—	—	4.8E-07
Manganese (dissolved)	1.0E-03	—	—	—	1.0E+00	2.0E+00	—	—	2.0E-06
Nickel	2.0E-04	—	—	—	1.0E+00	2.0E+00	—	—	4.0E-07
Vanadium	1.0E-03	—	—	—	1.0E+00	2.0E+00	—	—	2.0E-06

K_p - Dermal permeability coefficient

B - Ratio of the permeability coefficient through the stratum corneum relative to its permeability coefficient across the viable epidermis

Tau - Lag time per event

t* - Time to reach steady-state

FA - Fraction absorbed (USEPA, 2004a)

t_{event} - Exposure time per event

DA - Dermal absorption

L/cm²-event - liters per square centimeter per event

(1) For Inorganic COPCs, DA_{event} Factor = K_p * t_{event} * CF

where conversion factor (CF) is 0.001 L/cm³

For organic COPCs, DA_{event} Factor is calculated by the following method:

if t_{event} ≤ t*, the DA_{event} Factor = 2 * FA * K_p * (B * Tau + t_{event}/m)^{1/2} * CF

if t_{event} > t*, the DA_{event} Factor = FA * K_p * [(t_{event}/(1 + B)) + 2 * Tau * ((1 + 3B + 3B²)/(1 + B)³)] * CF

where CF is 0.001 L/cm³

Table 4-23. Estimated Ambient Air Concentration at Wading Pool
Lammers Barrel Facility, Beavercreek, Ohio

Constituent	Overall Mass Transfer Coefficient (K) (m/s)	Maximum Off-Site Groundwater Concentration (mg/L)	Average Water Concentration in Pool Over One Day (a) (mg/L)	WATERS	SCREENS	
				Air emissions from pool (b) (g/m ² -s)	Concentration at 1m from center of pool (d) (ug/m ³) (mg/m ³)	
1,1-Dichloroethane	0.0191	0.085	9.0E-06	3.8E-08	1.10E-03	1.1E-06
1,1-Dichloroethylene	0.031	0.0052	4.4E-07	6.24E-10	1.90E-05	1.9E-08
1,2-Dichloroethane	0.0081	0.0018	5.9E-07	3.74E-09	1.10E-04	1.1E-07
2-Butanone (MEK)	0.00034	0.0014	1.1E-05	5.86E-09	1.80E-04	1.8E-07
Benzene	0.0188	0.0083	8.4E-07	3.1E-09	9.2E-05	9.2E-08
Chloroform	0.0194	0.00056	7.6E-08	2.8E-10	8.5E-08	8.5E-08
Choroethane	0.0323	0.0098	8.1E-07	1.1E-09	3.3E-05	3.3E-08
cis-1,2-Dichloroethane	0.0016	0.8	1.3E-03	3.5E-06	1.1E-01	1.1E-04
Ethylbenzene	0.0196	0.33	4.4E-05	1.5E-07	4.5E-03	4.5E-06
Toluene	0.0197	0.022	3.0E-06	1.0E-08	3.0E-04	3.0E-07
trans-1,2-Dichloroethene	0.0253	0.002	2.0E-07	5.0E-10	1.5E-05	1.5E-08
Trichloroethylene	0.0231	0.002	2.3E-07	8.2E-10	1.9E-05	1.9E-08
Vinyl chloride	NA	0.175	2.8E-04 (c)	1.0E-07	3.7E-03	3.7E-06
Xylenes, Total	0.0027	1.1	1.1E-03	4.4E-06	1.3E-01	1.3E-04

Notes:

(a) Equation for Average Water Concentration Over Time

$$\bar{C}_w = C_{w,0} \frac{d}{K \cdot t} (1 - e^{-K \cdot t / d})$$

Where:

- C_w = average water concentration in mg/L
- C_{w,0} = initial water concentration in mg/L
- d = depth in meters
- t = time in seconds
- K = overall mass transfer coefficient in meters per second

(b) WATERS emission factor

(c) Estimated using lowest attenuation calculated for other volatiles (0.00161)

(d) Stack height (pool surface) = 9 inches; receptor height = 1.8 feet

m/s = meters per second

mg/L = milligrams per liter

mg/m³ = milligram per meter cubed

NA = not available, vinyl chloride not include in WATERS model

ug/m³ = micrograms per cubic meter

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Table 4-24. Johnson and Ettinger Vapor Intrusion Modal Input Parameters
Lammers Barrel Facility, Beavercreek, Ohio

Input Parameters	Symbol	Units	USEPA (2003d) Default Value	Site-Specific Values			Notes [a]
				Groundwater		Subsurface Soil	
				On-site Worker	Off-site Resident	On-site Worker	
Initial Groundwater Concentration	C _w	ug/L	Site-Specific	Chemical-specific	Chemical-specific	Chemical-specific	EPCs for groundwater presented in Tables 4-5 and 4-9
Geology/Hydrogeology							
Average Temperature	T _w	°C	11	NA	NA	NA	
Depth below grade to top of contamination	L _t	cm	Site-Specific	N/A	N/A	183	
Depth below grade to bottom of contamination	L _b	cm	Site-Specific	N/A	N/A	305	
Stratum A							
Soil Thickness	h _A	cm	Site-Specific	330	400	183	Determined from soil boring logs
Soil Type			Site-Specific	Loam	Loam	Loam	Determined from grain size analysis
Soil Vapor Permeability	k _v	cm ²	1 x 10 ⁻⁶	2.85x10 ⁻¹¹	2.85x10 ⁻¹¹	2.85x10 ⁻¹¹	Site-specific average
Soil Dry Bulk Density	ρ _b ^A	g/cm ³	1.49	1.84	1.84	1.84	Site-specific average
Soil Total Porosity	n ^A	cm ³ /cm ³	0.439	0.336	0.336	0.336	Site-specific average
Soil Water-filled Porosity	q _w ^A	cm ³ /cm ³	0.18	0.275	0.275	0.275	Site-specific average
Soil Organic Carbon Fraction	f _{oc}	unitless	0.002	NA	NA	0.0045	Site-specific average
Stratum B							
Soil Thickness	h _B	cm	Site-Specific	250	200	NA	Determined from soil boring logs
Soil Type			Site-Specific	Sand	Sand	NA	Determined from soil boring logs
Soil Dry Bulk Density	ρ _b ^B	g/cm ³	1.49	1.66	1.66	NA	Default from EPA 2004
Soil Total Porosity	n ^B	cm ³ /cm ³	0.439	0.375	0.375	NA	Default from EPA 2004
Soil Water-filled Porosity	q _w ^B	cm ³ /cm ³	0.18	0.054	0.054	NA	Default from EPA 2004
Soil Organic Carbon Fraction	f _{oc}	unitless	0.002	NA	NA	NA	
Building Dimensions							
Depth Below Grade To Bottom of Enclosed Space Floor	L _f	cm	15 / 200	NA	NA	NA	[b]
Depth Below Grade To Water Table	L _w	cm	Site-Specific	580	700	N/A	Determined from soil boring logs
Enclosed Space Floor Thickness	L _{crack}	cm	10	10	10	10	
Soil-Building Pressure Differential	P	g/cm-s ²	40	40	40	40	
Enclosed Space Floor Length	L _b	cm	1,000	1,928	NA	1,928	MESB (2001)/field observation
Enclosed Space Floor Width	W _b	cm	1,000	1,928	NA	1,928	MESB (2001)/field observation
Enclosed Space Height	H _b	cm	244 / 368	244	336	244	[b]
Floor-wall Seam Crack Width	w	cm	0.1	0.15	0.12	0.15	Includes floor seams and wall crack
Indoor Air Exchange Rate	ER	1/h	0.25	0.83	0.25	0.83	ATSM (2000)
Ave. Vapor Flow Rate into Building	Q _{ind}	L/m	5	Calculated	Calculated	Calculated	Based on intrinsic soil properties
Exposure Parameters							
Averaging Time for Carcinogens	AT _c	years	70	70	70	70	
Averaging Time for Noncarcinogens	AT _{nc}	years	30	25	30	25	USEPA (2002b)
Exposure Duration	ED	years	30	25	30	25	USEPA (2002b)
Exposure Frequency	EF	days/year	350	250	350	250	USEPA (1997b)

Notes:

a. References and notes for those values different than default

b. Slab on grade construction assumed for on-site building; basement construction assumed for off-site residential home

cm = centimeter

°C = Degrees Celsius

cm³/cm³ = cubic centimeters per cubic centimeter

EPC = exposure point concentration

g/cm³ = grams per cubic centimeter

g/cm-s² = grams per centimeter second squared

h = hour

L/m = liters per minute

NA = not available, default value used as input

N/A = not applicable

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Table 5-1. Noncancer Toxicity Data - Oral/Dermal
Lammers Barrel Facility, Beavercreek, Ohio

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal [a]	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined U/M Factors	RfD Source(s)	
		Value	Units		Value	Units				
Metals										
Antimony	Chronic	4.0E-04	mg/kg-day	2E-01	8.0E-05	mg/kg-day	longevity, blood	low/1000	IRIS	
Arsenic	Chronic	3.0E-04	mg/kg-day	1E+00	3.0E-04	mg/kg-day	Hyperpigmentation, keratosis	3E+00	IRIS	
Barium	Chronic	2.0E-01	mg/kg-day	7E-02	1.4E-02	mg/kg-day	cardiovascular	medium/300	IRIS	
Cadmium (diet)	Chronic	1.0E-03	mg/kg-day	3E-02	2.5E-05	mg/kg-day	kidney	high/10	IRIS	
Chromium	Chronic	3.0E-03	mg/kg-day	3E-02	7.5E-05	mg/kg-day	NR	low/300	IRIS	
Iron	Chronic	3.0E-01	mg/kg-day	1E+00	3.0E-01	mg/kg-day	NA	NA	NCEA	
Lead	Chronic	NA	mg/kg-day	1E+00	NA	-	N/A	N/A	N/A	
Manganese	Chronic	4.7E-02	mg/kg-day	4E-02	1.9E-03	mg/kg-day	CNS effects	1E+03	IRIS	
Nickel	Chronic	2.0E-02	mg/kg-day	4E-02	8.0E-04	mg/kg-day	whole body	medium/300	IRIS	
Thallium	Chronic	8.0E-05	mg/kg-day	1E+00	8.0E-05	mg/kg-day	liver, blood, hair	low/3000	IRIS	
Vanadium	Chronic	7.0E-03	mg/kg-day	3E-02	1.8E-04	mg/kg-day	liver	low/100	HEAST	
PAHs										
2-Methylnaphthalene	Chronic	4.0E-03	mg/kg-day	1E+00	4.0E-03	mg/kg-day	Lungs	low/1000	IRIS	
Benzo(a)anthracene	Chronic	NA	-	1E+00	NA	-	N/A	N/A	N/A	
Benzo(a)pyrene	Chronic	NA	-	1E+00	NA	-	N/A	N/A	N/A	
Benzo(b)fluoranthene	Chronic	NA	-	1E+00	NA	-	N/A	N/A	N/A	
Dibenzo(a,h)anthracene	Chronic	NA	-	1E+00	NA	-	N/A	N/A	N/A	
Indeno(1,2,3-cd)pyrene	Chronic	NA	-	1E+00	NA	-	N/A	N/A	N/A	
Naphthalene	Chronic	2.0E-02	mg/kg-day	1E+00	2.0E-02	mg/kg-day	Body weight	3E+03	IRIS	
PCBs										
Total PCBs	Chronic	2.0E-05	mg/kg-day	1E+00	2.0E-05	mg/kg-day	Immune System	3E+02	IRIS	
Pesticides										
gamma-BHC (Lindane)	Chronic	3.0E-04	mg/kg-day	1E+00	3.0E-04	mg/kg-day	Liver, kidney toxicity	1E+03	IRIS	
SVOCs										
bis(2-Chloroethyl)ether	Chronic	NA	-	1E+00	NA	-	N/A	N/A	IRIS	
bis(2-Ethylhexyl)phthalate	Chronic	2.0E-02	mg/kg-day	1E+00	2.0E-02	mg/kg-day	liver	medium/1000	IRIS	
VOCs										
1,1,1-Trichloroethane	Chronic	2.8E-01	mg/kg-day	1E+00	2.8E-01	mg/kg-day	NA	NA	USEPA Region 9	
1,1,2,2-Tetrachloroethane	Chronic	6.0E-02	mg/kg-day	1E+00	6.0E-02	mg/kg-day	Liver	3E+02	PPRTV	
1,1-Dichloroethane	Chronic	1.0E-01	mg/kg-day	1E+00	1.0E-01	mg/kg-day	None	1E+03	HEAST	
1,1-Dichloroethylene	Chronic	5.0E-02	mg/kg-day	1E+00	5.0E-02	mg/kg-day	liver	medium/100	IRIS	
1,2-Dichloroethane	Chronic	3.0E-02	mg/kg-day	1E+00	3.0E-02	mg/kg-day	NA	NA	USEPA Region 9	
Benzene	Chronic	4.0E-03	mg/kg-day	1E+00	4.0E-03	mg/kg-day	Decreased lymphocyte count	3E+02	IRIS	
Bromodichloromethane	Chronic	2.0E-02	mg/kg-day	1E+00	2.0E-02	mg/kg-day	Renal cytomegaly	1E+03	IRIS	
Carbon Tetrachloride	Chronic	7.0E-04	mg/kg-day	1E+00	7.0E-04	mg/kg-day	Liver lesions	1E+03	IRIS	
Chloroform	Chronic	1.0E-02	mg/kg-day	1E+00	1.0E-02	mg/kg-day	Cyst formation in liver	1E+03	IRIS	
Chloromethane	Chronic	NA	-	1E+00	NA	-	N/A	NA	IRIS	
cis-1,2-Dichloroethane	Chronic	9.0E-03	mg/kg-day	1E+00	9.0E-03	mg/kg-day	liver	NA/1000	HEAST	
cis/trans-1,2-Dichloroethene	Chronic	9.0E-03	mg/kg-day	1E+00	9.0E-03	mg/kg-day	liver	NA/1000	HEAST	
Ethylbenzene	Chronic	1.0E-01	mg/kg-day	1E+00	1.0E-01	mg/kg-day	Liver and kidney	1E+03	IRIS	
Methylene chloride	Chronic	6.0E-02	mg/kg-day	1E+00	6.0E-02	mg/kg-day	liver	medium/100	IRIS	
Methyl N-Butyl Ketone	Chronic	NA	-	1E+00	NA	-	N/A	N/A	N/A	
Methylene chloride	Chronic	8.0E-02	mg/kg-day	1E+00	6.0E-02	mg/kg-day	Liver Toxicity	1E+02	IRIS	
Tetrachloroethane	Chronic	1.0E-02	mg/kg-day	1E+00	1.0E-02	mg/kg-day	Hepatotoxicity	1E+03	IRIS	
Styrene	Chronic	2.0E-01	mg/kg-day	1E+00	2.0E-01	mg/kg-day	Blood and Liver	1E+03	IRIS	
Toluene	Chronic	8.0E-02	mg/kg-day	1E+00	8.0E-02	mg/kg-day	Liver and kidney	3E+03	IRIS	
trans-1,2-Dichloroethene	Chronic	2.0E-02	mg/kg-day	1E+00	2.0E-02	mg/kg-day	blood	low/1000	IRIS	
Trichloroethylene	Chronic	3.0E-04	mg/kg-day	1E+00	3.0E-04	mg/kg-day	Liver and kidney	NA	NCEA	
Vinyl chloride	Chronic	3.0E-03	mg/kg-day	1E+00	3.0E-03	mg/kg-day	Liver	3E+01	IRIS	
Xylenes, Total	Chronic	2.0E-01	mg/kg-day	1E+00	2.0E-01	mg/kg-day	Body weight	1E+03	IRIS	

Notes:

- a. USEPA 2004a
- b. Chronic value used for subchronic exposures in the absence of data
- CNS = central nervous system
- HEAST = USEPA Health Effects Assessment Summary Table
- IRIS = USEPA Integrated Risk Information Service (www.epa.gov/iris)
- mg/kg-day = milligrams per kilogram bodyweight per day
- N/A = not applicable
- NA = no data available
- NCEA = National Center for Environmental Assessment

- PAH = polycyclic aromatic hydrocarbon
- PCB = polychlorinated biphenyl
- PPRTV = Provisional Peer Reviewed Toxicity Values for Superfund (<http://hhpprtv.ornl.gov/pprtv.shtml>)
- RfD = reference dose
- SVOC = semi-volatile organic compound
- U/M = uncertainty/modifying
- USEPA = U.S. Environmental Protection Agency
- VOC = volatile organic compound

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Table 5-2. Noncancer Toxicity Data - Inhalation
Lammers Barrel Facility, Beaver Creek, Ohio

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD [a]		Primary Target Organ(s)	Combined U/M Factors	RfD Source(s)
		Value	Units	Value	Units			
Metals								
Antimony	Chronic	NA	--	NA	--	longevity, blood	NA	NA
Arsenic	Chronic	NA	--	NA	--	N/A	NA	N/A
Barium	Chronic	5.0E-04	mg/m ³	1.4E-04	mg/kg-day	cardiovascular	NA/1000	HEAST
Cadmium (diet)	Chronic	NA	--	NA	--	kidney	NA	NA
Chromium	Chronic	1.0E-04	mg/m ³	2.9E-05	mg/kg-day	NR	medium/300	IRIS
Iron	Chronic	NA	--	NA	--	N/A	N/A	N/A
Lead	Chronic	NA	--	NA	--	N/A	N/A	N/A
Manganese	Chronic	5.0E-05	mg/m ³	1.4E-05	mg/kg-day	Impairment of neurobehavioral function	1E+03	IRIS
Nickel	Chronic	NA	--	NA	--	whole body	NA	NA
Thallium	Chronic	NA	--	NA	--	liver, blood, hair	NA	NA
Vanadium	Chronic	NA	--	NA	--	liver	NA	NA
PAHs								
2-Methylnaphthalene	Chronic	NA	--	NA	--	NA	NA	NA
Benzo(a)anthracene	Chronic	NA	--	NA	--	N/A	N/A	N/A
Benzo(a)pyrene	Chronic	NA	--	NA	--	N/A	N/A	N/A
Benzo(b)fluoranthene	Chronic	NA	--	NA	--	N/A	N/A	N/A
Dibenzo(a,h)anthracene	Chronic	NA	--	5.0E-03	mg/kg-day	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	Chronic	NA	--	NA	--	N/A	N/A	IRIS
Naphthalene	Chronic	3.0E-03	mg/m ³	8.8E-04	mg/kg-day	Nasal effects	3E+03	IRIS
PCBs								
Total PCBs	Chronic	NA	--	2.0E-05	mg/kg-day	NA	NA	USEPA Region 9
Pesticides								
gamma-BHC (Lindane)	Chronic	NA	--	3.0E-04	mg/kg-day	NA	NA	EPA Region 9
SVOCs								
bis(2-Chloroethyl)ether	Chronic	NA	--	NA	--	N/A	N/A	IRIS
bis(2-Ethylhexyl)phthalate	Chronic	NA	--	NA	--	liver	NA	NA
VOCs								
1,1,1-Trichloroethane	Chronic	2.2E+00	mg/m ³	6.3E-01	mg/kg-day	Liver, brain	9E+01	PPRTV
1,1,2,2-Tetrachloroethane	Chronic	NA	--	6.0E-02	mg/kg-day	NA	NA	USEPA Region 9
1,1-Dichloroethane	Chronic	NA	--	1.4E-01	mg/kg-day	NA	NA	USEPA Region 9
1,1-Dichloroethylene	Chronic	2.0E-01	mg/m ³	5.7E-02	mg/kg-day	liver	medium/30	IRIS
1,2-Dichloroethane	Chronic	NA	--	1.4E-03	mg/kg-day	NA	NA	USEPA Region 9
Benzene	Chronic	3.0E-02	mg/m ³	8.6E-03	mg/kg-day	Decreased lymphocyte count	3E+02	IRIS
Bromodichloromethane	Chronic	NA	--	2.0E-02	mg/kg-day	NA	NA	USEPA Region 9
Carbon Tetrachloride	Chronic	NA	--	7.0E-04	mg/kg-day	NA	NA	USEPA Region 9
Chloroform	Chronic	NA	--	8.8E-04	mg/kg-day	NA	NA	USEPA Region 9
Chloromethane	Chronic	9.0E-02	mg/m ³	2.6E-02	mg/kg-day	Cerebellar lesions	1E+03	IRIS
cis-1,2-Dichloroethene	Chronic	NA	--	NA	--	liver	NA	NA
cis/trans-1,2-Dichloroethene	Chronic	NA	--	NA	--	liver	NA	NA
Ethylbenzene	Chronic	1.0E+00	mg/m ³	2.9E-01	mg/kg-day	Developmental	3E+02	IRIS
Methylene chloride	Chronic	3.0E+00	mg/m ³	8.8E-01	mg/kg-day	liver	NA	HEAST
Methyl N-Butyl Ketone	Chronic	NA	--	NA	--	N/A	N/A	N/A
Methylene chloride	Chronic	NA	--	6.0E-02	mg/kg-day	Liver Toxicity	1E+02	IRIS
Styrene	Chronic	1.0E+00	mg/m ³	2.9E-01	mg/kg-day	Central Nervous System	3E+01	IRIS
Tetrachloroethene	Chronic	NA	--	1.7E-01	mg/kg-day	Liver, kidney	NA	USEPA Region 9
Toluene	Chronic	4.0E-01	mg/m ³	1.1E-01	mg/kg-day	Neurological effects	3E+02	IRIS
trans-1,2-Dichloroethene	Chronic	NA	--	1.7E-02	mg/kg-day	blood	NA	NA
Trichloroethylene	Chronic	NA	--	1.0E-02	mg/kg-day	Liver, kidney	NA	NCEA
Vinyl chloride	Chronic	1.0E-01	mg/m ³	2.9E-02	mg/kg-day	Liver	3E+01	IRIS
Xylenes, Total	Chronic	1.0E-01	mg/m ³	2.9E-02	mg/kg-day	Body weight	1E+03	IRIS

Notes:

- a. If available, calculated from inhalation RfC as: $RfC \times 20 \text{ m}^3/\text{day} \div 70 \text{ kg}$
- b. Chronic value used for subchronic exposures in the absence of data
- IRIS = USEPA Integrated Risk Information Service (www.epa.gov/iris)
- kg = kilogram
- m³/day = cubic meters per day
- mg/kg-day = milligrams per kilogram bodyweight per day
- mg/m³ = milligrams per cubic meter
- N/A = not applicable
- NA = no data available
- NCEA = National Center for Environmental Assessment

- PAH = polycyclic aromatic hydrocarbon
- PCB = polychlorinated biphenyl
- PPRTV = Provisional Peer Reviewed Toxicity Values for Superfund (<http://hhpprtv.ornl.gov/pprtv.shtml>)
- RfC = reference concentration
- RfD = reference dose
- SVOC = semi-volatile organic compound
- U/M = uncertainty/modifying
- USEPA = U.S. Environmental Protection Agency
- VOC = volatile organic compound

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Table 5-3. Cancer Toxicity Data - Oral/Dermal
Lammers Barrel Facility, Beavercreek, Ohio

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal [a]	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF Source(s)
	Value	Units		Value	Units		
Metals							
Antimony	NA	—	0.2	NA	—	NA	NA
Arsenic	1.5E+00	(mg/kg-day) ⁻¹	1.0	1.5E+00	(mg/kg-day) ⁻¹	A	IRIS
Barium	NA	—	0.1	NA	—	D	IRIS
Cadmium (diet)	NA	—	0.0	NA	—	B1	IRIS
Chromium	NA	—	0.0	NA	—	A	NA
Iron	NA	—	1.0	NA	—	NA	NA
Lead	NA	—	1.0	NA	—	B2	IRIS
Manganese	NA	—	0.0	NA	—	D	IRIS
Nickel	NA	—	0.0	NA	—	NA	NA
Thallium	NA	—	1.0	NA	—	D	IRIS
Vanadium	NA	—	0.0	NA	—	NA	NA
PAHs							
2-Methylnaphthalene	NA	—	1.0	NA	—	NA	NA
Benzo(a)anthracene	7.3E-01	(mg/kg-day) ⁻¹	1.0	7.3E-01	(mg/kg-day) ⁻¹	B2	[b]
Benzo(a)pyrene	7.3E+00	(mg/kg-day) ⁻¹	1.0	7.3E+00	(mg/kg-day) ⁻¹	B2	IRIS
Benzo(b)fluoranthene	7.3E-01	(mg/kg-day) ⁻¹	1.0	7.3E-01	(mg/kg-day) ⁻¹	B2	[b]
Dibenzo(a,h)anthracene	7.3E+00	(mg/kg-day) ⁻¹	1.0	7.3E+00	(mg/kg-day) ⁻¹	B2	[b]
Indeno(1,2,3-cd)pyrene	7.3E-01	(mg/kg-day) ⁻¹	1.0	7.3E-01	(mg/kg-day) ⁻¹	B2	[b]
Naphthalene	NA	—	1.0	NA	—	C	IRIS
PCBs							
Total PCBs	2.0E+00	(mg/kg-day) ⁻¹	1.0	2.0E+00	(mg/kg-day) ⁻¹	B2	IRIS [c]
Pesticides							
gamma-BHC (Lindane)	1.3E+00	(mg/kg-day) ⁻¹	1.0	1.3E+00	(mg/kg-day) ⁻¹	NA	HEAST
SVOCs							
bis(2-Chloroethyl)ether	1.1E+00	(mg/kg-day) ⁻¹	1.0	1.1E+00	(mg/kg-day) ⁻¹	B2	IRIS
bis(2-Ethylhexyl)phthalate	1.4E-02	(mg/kg-day) ⁻¹	1.0	1.4E-02	(mg/kg-day) ⁻¹	NA	IRIS
VOCs							
1,1,1-Trichloroethane	NA	—	1.0	NA	—	D	IRIS
1,1,2,2-Tetrachloroethane	2.0E-01	(mg/kg-day) ⁻¹	1.0	2.0E-01	(mg/kg-day) ⁻¹	C	IRIS
1,1-Dichloroethane	NA	—	1.0	NA	—	C	IRIS
1,1-Dichloroethylene	NA	—	1.0	NA	—	C	NA
1,2-Dichloroethane	9.1E-02	(mg/kg-day) ⁻¹	1.0	9.1E-02	(mg/kg-day) ⁻¹	B2	IRIS
Benzene	5.5E-02	(mg/kg-day) ⁻¹	1.0	5.5E-02	(mg/kg-day) ⁻¹	A	IRIS
Bromodichloromethane	6.2E-02	(mg/kg-day) ⁻¹	1.0	6.2E-02	(mg/kg-day) ⁻¹	B2	IRIS
Carbon Tetrachloride	1.3E-01	(mg/kg-day) ⁻¹	1.0	1.3E-01	(mg/kg-day) ⁻¹	B2	IRIS
Chloroform	NA	—	1.0	NA	—	B2	IRIS
Chloromethane	1.3E-02	(mg/kg-day) ⁻¹	1.0	1.3E-02	(mg/kg-day) ⁻¹	D	USEPA Region 9
cis-1,2-Dichloroethene	NA	—	1.0	NA	—	NA	NA
cis/trans-1,2-Dichloroethene	NA	—	1.0	NA	—	NA	NA
Ethylbenzene	NA	—	1.0	NA	—	D	IRIS
Methylene chloride	7.5E-03	(mg/kg-day) ⁻¹	1.0	7.5E-03	(mg/kg-day) ⁻¹	B2	IRIS
Methyl N-Butyl Ketone	NA	—	1.0	NA	—	NA	NA
Methylene chloride	7.5E-03	(mg/kg-day) ⁻¹	1.0	7.5E-03	(mg/kg-day) ⁻¹	B2	IRIS
Styrene	NA	—	1.0	NA	—	NA	NA
Tetrachloroethene	5.4E-01	(mg/kg-day) ⁻¹	1.0	5.4E-01	(mg/kg-day) ⁻¹	NA	CALEPA
Toluene	NA	—	1.0	NA	—	D	IRIS
trans-1,2-Dichloroethene	NA	—	1.0	NA	—	NA	NA
Trichloroethylene	4.0E-01	(mg/kg-day) ⁻¹	1.0	4.0E-01	(mg/kg-day) ⁻¹	Highly Likely	NCEA
Vinyl chloride - child	1.4E+00	(mg/kg-day) ⁻¹	1.0	1.4E+00	(mg/kg-day) ⁻¹	A	IRIS
Vinyl chloride - adult	7.2E-01	(mg/kg-day) ⁻¹	1.0	7.2E-01	(mg/kg-day) ⁻¹	A	IRIS
Xylenes, Total	NA	—	1.0	NA	—	NA	IRIS

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Table 6-3. Cancer Toxicity Data - Oral/Dermal
Lammers Barrel Facility, Beavercreek, Ohio

Notes:

a. USEPA 2004a

b. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA 1993)

c. $1.0 \text{ (mg/kg-day)}^{-1}$ used for central tendency calculations

CALEPA = California Environmental Protection Agency

CSF = cancer slope factor

HEAST = Health Effects Assessment Tables

IRIS = Integrated Risk Information Service (www.epa.gov/iris)

$(\text{mg/kg-day})^{-1}$ = milligrams per kilogram bodyweight per day

N/A = not applicable

NA = no data available

NCEA = National Center for Environmental Assessment

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

SVOC = semi-volatile organic compound

VOC = volatile organic compound

USEPA = U.S. Environmental Protection Agency

USEPA Weight of Evidence Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

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Table 5-4. Cancer Toxicity Data - Inhalation
Lammers Barrel Facility, Beavercreek, Ohio

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor [a]		Weight of Evidence/ Cancer Guideline Description	Inhalation CSF Source(s)
	Value	Units	Value	Units		
Metals						
Antimony	NA	--	NA	--	NA	NA
Arsenic	4.3E+00	(mg/m ³) ⁻¹	1.5E+01	(mg/kg-day) ⁻¹	IRIS	IRIS
Barium	NA	--	NA	--	D	IRIS
Cadmium (diet)	1.8E+00	(mg/m ³) ⁻¹	8.3E+00	(mg/kg-day) ⁻¹	B1	IRIS
Chromium	1.2E+01	(mg/m ³) ⁻¹	4.2E+01	(mg/kg-day) ⁻¹	A	IRIS
Iron	NA	--	NA	--	NA	NA
Lead	NA	--	NA	--	IRIS	IRIS
Manganese	NA	--	NA	--	D	IRIS
Nickel	NA	--	NA	--	NA	NA
Thallium	NC	--	NA	--	D	IRIS
Vanadium	NA	--	NA	--	NA	NA
PAHs						
2-Methylnaphthalene	NA	--	NA	--	NA	NA
Benzo(a)anthracene	NA	--	7.3E-01	(mg/kg-day) ⁻¹	B2	USEPA Region 9
Benzo(a)pyrene	NA	--	7.3E+00	(mg/kg-day) ⁻¹	B2	USEPA Region 9
Benzo(b)fluoranthene	NA	--	7.3E-01	(mg/kg-day) ⁻¹	B2	USEPA Region 9
Dibenzo(a,h)anthracene	NA	--	NA	--	B2	USEPA Region 9
Indeno(1,2,3-cd)pyrene	NA	--	7.3E-01	(mg/kg-day) ⁻¹	B2	USEPA Region 9
Naphthalene	NA	--	NA	--	C	IRIS
PCBs						
Total PCBs	1.0E-01	(mg/m ³) ⁻¹	2.0E+00	(mg/kg-day) ⁻¹	B2	IRIS
Pesticides						
gamma-BHC (Lindane)	NA	(mg/m ³) ⁻¹	1.3E+00	(mg/kg-day) ⁻¹	NA	USEPA Region 9
SVOCs						
bis(2-Chloroethyl)ether	3.3E-01	(mg/m ³) ⁻¹	1.2E+00	(mg/kg-day) ⁻¹	B2	IRIS
bis(2-Ethylhexyl)phthalate	NA	--	NA	--	NA	NA
VOCs						
1,1,1-Trichloroethane	NA	--	NA	--	D	IRIS
1,1,2,2-Tetrachloroethane	5.0E-02	(mg/m ³) ⁻¹	1.8E-01	(mg/kg-day) ⁻¹	C	IRIS
1,1-Dichloroethane	NA	--	NA	--	C	IRIS
1,1-Dichloroethylene	5.0E-02	(mg/m ³) ⁻¹	1.8E-01	(mg/kg-day) ⁻¹	C	IRIS
1,2-Dichloroethane	2.6E-02	(mg/m ³) ⁻¹	9.1E-02	(mg/kg-day) ⁻¹	B2	IRIS
Benzene	7.8E-03	(mg/m ³) ⁻¹	2.7E-02	(mg/kg-day) ⁻¹	A	IRIS
Bromodichloromethane	NA	--	8.2E-02	--	B2	USEPA Region 9
Carbon Tetrachloride	1.3E-01	(mg/m ³) ⁻¹	1.3E-01	(mg/kg-day) ⁻¹	B2	IRIS
Chloroform	2.3E-02	(mg/m ³) ⁻¹	8.1E-02	(mg/kg-day) ⁻¹	B2	IRIS
Chloromethane	NA	--	8.3E-03	(mg/kg-day) ⁻¹	D	USEPA Region 9
cis-1,2-Dichloroethane	NA	--	NA	--	NA	NA
cis/trans-1,2-Dichloroethane	NA	--	NA	--	NA	NA
Ethylbenzene	NA	--	NA	--	D	IRIS
Methylene chloride	4.7E-04	(mg/m ³) ⁻¹	1.6E-03	(mg/kg-day) ⁻¹	B2	IRIS
Methyl N-Butyl Ketone	NA	--	NA	--	NA	NA
Methylene chloride	4.7E-04	--	1.8E-03	(mg/kg-day) ⁻¹	B2	IRIS
Styrene	NA	--	NA	--	NA	NA
Tetrachloroethene	NA	--	1.0E-02	(mg/kg-day) ⁻¹	NA	USEPA Region 9
Toluene	NA	--	NA	--	D	IRIS
trans-1,2-Dichloroethane	NA	--	NA	--	NA	NA
Trichloroethylene	NA	--	4.0E-01	(mg/kg-day) ⁻¹	Highly Likely	NCEA
Vinyl chloride - child	4.4E-03	(mg/m ³) ⁻¹	1.5E-02	(mg/kg-day) ⁻¹	A	IRIS
Vinyl chloride - adult	4.4E-03	(mg/m ³) ⁻¹	1.5E-02	(mg/kg-day) ⁻¹	A	IRIS
Xylenes, Total	NA	--	NA	--	NA	IRIS

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Table 6-4. Cancer Toxicity Data - Inhalation
Lammers Barrel Facility, Beavercreek, Ohio

Notes:

a. If available, calculated from UR as: $UR \times 70 \text{ kg} \div 20 \text{ m}^3/\text{day}$

CSF = Cancer Slope Factor

IRIS = Integrated Risk Information Service (www.epa.gov/iris)

m^3/day = cubic meters per day

$(\text{mg}/\text{kg}\text{-day})^{-1}$ = milligrams per kilogram body weight per day

$(\text{mg}/\text{m}^3)^{-1}$ = milligrams per cubic meter

N/A = not applicable

NA = not available

NCEA = National Center for Environmental Assessment

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

SVOC = semi-volatile organic carbon

VOC = volatile organic carbon

USEPA = U.S. Environmental Protection Agency

USEPA Weight of Evidence Group:

A - Human carcinogen

B1 - Probable human carcinogen - Indicates that limited human data are available

B2 - Probable human carcinogen - Indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

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Table 6-1. Summary of Cancer Risks and Noncancer Hazards
Lammies Barrel Facility, Beaverbrook, Ohio

Receptor	Age	Media	Central Tendency Exposure		Reasonable Maximum Exposure	
			Noncancer Hazards	Cancer Risks	Noncancer Hazards	Cancer Risks
On-site Trespasser	Older Child	Surface soil	0.003	1E-07	0.03	5E-07
		Surface water	0.0008	4E-09	0.003	8E-08
		Sediment	0.0004	2E-09	0.002	2E-08
		Total	0.004	1E-07	0.03	5E-07
On-site Recreator	Young Child	Surface soil	0.1	2E-06	0.8	2E-05
		Surface water	0.004	6E-09	0.01	1E-08
		Sediment	0.003	5E-09	0.02	7E-08
		Total	0.007	1E-08	0.04	8E-08
	Older Child	Surface soil	0.02	6E-07	0.2	5E-07
		Surface water	0.001	6E-10	0.008	2E-08
		Sediment	0.0007	5E-09	0.006	4E-08
		Total	0.002	5E-09	0.01	5E-08
	Adult	Surface soil	0.01	5E-07	0.1	6E-06
		Surface water	0.001	4E-09	0.002	1E-09
		Sediment	0.0005	3E-09	0.005	4E-08
		Total	0.001	7E-09	0.01	4E-08
	Recreator (sum of all ages)	Surface soil	0.2	3E-06	1	2E-05
		Surface water	0.008	1E-08	0.02	3E-08
		Sediment	0.004	1E-08	0.03	1E-07
		Total	0.01	2E-08	0.05	2E-07
On-site Commercial/ Industrial Worker	Adult	Subsurface soil	6.5	5E-06	1	4E-05
		Total	6.5	5E-06	1	4E-05
On-site Construction Worker	Adult	Subsurface soil	0.7	1E-06	2	2E-06
		Total	0.1	3E-07	0.3	4E-06
On-site Utility Worker	Adult	Subsurface soil	0.9	1E-06	2	7E-06
		Total	0.9	1E-06	2	7E-06
Off-site Resident	Young Child	Groundwater	15	5E-04	44	3E-03
		Groundwater	7.9	3E-04	17	2E-03
	Adult	Groundwater	5.1	2E-04	14	1E-03
		Total Resident (sum of all ages)	28	1E-03	75	6E-03
	Young Child (Wading Pool)	Groundwater	0.08	2E-06	0.1	4E-06

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Table 6-2. Summary of Population Cancer Risks
Lammers Barrel Facility, Beavercreek, Ohio

Receptor	Age	Media	Percentage of Population	Population Size ^a	Central Tendency Exposure	
					Individual Cancer Risks	Population Cancer Risks
Off-site Residents	Young Child	Groundwater	25%	177	5E-04	0.09
	Older Child	Groundwater	25%	177	3E-04	0.05
	Adult	Groundwater	50%	353	2E-04	0.08
	Total			706		0.2

a. Based on a total population size of 706 for Area A, as documented in Section 2.1

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Table 6-3. Summary of Cancer Risks and Noncancer Hazards from the Groundwater to Indoor Air Pathway
Lammers Barrel Facility, Beavercreek, Ohio

Exposure Medium	Exposure Scenario	Chemical	Maximum Concentration Exposure Estimate				Reasonable Maximum Exposure (b)				
			Initial Groundwater Concentration (mg/L)	Infinite Source Building Concentration (µg/m ³)	Hazard Quotient (unitless)	Cancer Risk (unitless)	Initial Groundwater Concentration (mg/L)	Infinite Source Building Concentration (µg/m ³)	Hazard Quotient (unitless)	Cancer Risk (unitless)	
On-site Groundwater	Commercial/Industrial Worker	1,1,1-Trichloroethane	7.3E+00	7.4E-01	5.1E-04	NA	8.3E-01	8.4E-02	5.8E-05	NA	
		1,1,2,2-Tetrachloroethane	9.4E+00	1.7E-02	5.4E-05	2.3E-07	8.6E-01	1.5E-03	4.9E-08	2.1E-08	
		1,1-Dichloroethane	2.2E+00	7.6E-02	1.0E-04	NA	1.5E+00	5.1E-02	6.9E-05	NA	
		1,1-Dichloroethylene	6.6E-02	1.1E-02	3.9E-05	NA	7.8E-03	1.4E-03	4.7E-08	NA	
		Benzene	3.9E-01	1.3E-02	2.9E-04	2.4E-08	3.9E-02	1.2E-03	2.8E-05	2.4E-09	
		Chloroform	7.3E-01	1.7E-02	NA	9.3E-08	5.1E-02	1.1E-03	NA	6.5E-09	
		Chloroethane	1.3E-01	8.6E-03	5.9E-07	1.8E-09	2.4E-02	1.8E-03	1.1E-07	3.3E-10	
		cis-1,2-Dichloroethane	1.8E+01	3.9E-01	7.7E-03	NA	2.9E+00	7.2E-02	1.4E-03	NA	
		Ethylbenzene	4.6E+00	1.8E-01	1.2E-04	NA	2.0E+00	7.8E-02	5.2E-05	NA	
		Methyl N-butyl ketone	1.0E+00	8.7E-04	2.0E-07	NA	1.0E+00	8.7E-04	2.0E-07	NA	
		Styrene	2.2E-01	2.9E-03	2.0E-08	NA	5.8E-02	7.3E-04	5.0E-07	NA	
		Tetrachloroethane	1.1E-01	1.0E-02	2.6E-05	1.5E-08	1.1E-01	1.0E-02	2.6E-05	1.5E-08	
		Toluene	7.0E+01	2.5E+00	4.3E-03	NA	5.6E-02	2.0E-03	3.4E-08	NA	
		trans-1,2-Dichloroethane	4.7E+00	2.7E-01	3.1E-03	NA	4.7E+00	2.7E-01	3.1E-03	NA	
		Trichloroethene	1.1E+00	6.3E-02	7.2E-05	3.1E-08	1.1E+00	6.3E-02	7.2E-05	3.1E-08	
		Vinyl Chloride	7.1E+00	1.5E+00	1.0E-02	3.1E-06	8.8E-02	2.0E-02	1.4E-04	4.3E-08	
		Xylene, Total (p-)	2.5E+01	9.3E-01	6.4E-03	NA	2.5E+00	9.3E-02	6.4E-04	NA	
		1,1,2-Trichloroethane	1.9E-02	9.2E-08	4.5E-08	3.6E-13	1.8E-02	9.2E-08	4.5E-08	3.6E-13	
		1,2-Dichloroethane	3.4E-03	1.9E-06	NA	1.2E-13	3.4E-03	1.9E-06	NA	1.2E-13	
		2-Butanone (MEK)	4.5E-03	2.9E-09	2.0E-12	NA	1.6E-02	1.0E-08	7.1E-12	NA	
		4-Methyl-2-pentanone (MIBK)	1.6E-02	1.6E-09	3.6E-12	NA	1.8E-01	1.6E-07	3.8E-11	NA	
		Acetone	5.2E-03	3.5E-09	7.7E-14	NA	2.0E-02	1.3E-08	3.0E-13	NA	
		Carbon tetrachloride	2.8E-02	5.0E-06	NA	1.8E-11	3.2E-01	5.7E-05	NA	2.1E-10	
		Chlorobenzene	9.7E-04	1.8E-08	2.1E-10	NA	8.0E-03	1.1E-07	1.3E-09	NA	
		Chloromethane	7.1E-04	4.9E-08	3.7E-10	1.2E-14	7.1E-04	4.9E-08	3.7E-10	1.2E-14	
		Methylene chloride	6.3E-04	8.0E-09	2.0E-12	1.0E-15	8.3E-04	9.0E-09	2.0E-12	1.0E-15	
		2-Methylnaphthalene	7.3E-03	1.2E-08	1.2E-10	NA	2.0E-02	3.9E-08	3.2E-10	NA	
		Naphthalene	6.5E-02	1.3E-07	2.9E-08	NA	4.5E-01	8.9E-07	2.0E-07	NA	
						3E-02	4E-06			6E-03	1E-07
		Off-site Groundwater	Resident	Chloroform	5.6E-04	4.1E-05	NA	3.8E-10	5.6E-04	4.1E-05	NA
Trichloroethene	2.0E-03			3.6E-04	5.8E-07	3.0E-10	2.0E-03	3.6E-04	5.8E-07	3.0E-10	
Vinyl Chloride	1.8E-01			1.1E-01	1.1E-03	4.1E-07	1.1E-03	6.9E-04	6.7E-06	2.5E-09	
1,1-Dichloroethane	6.5E-02			7.0E-06	1.3E-08	NA	8.5E-02	7.0E-06	1.3E-08	NA	
1,1-Dichloroethylene	5.2E-03			2.9E-06	1.4E-08	NA	2.2E-03	1.2E-06	5.8E-09	NA	
1,2-Dichloroethane	1.8E-03			3.3E-09	NA	3.5E-13	1.8E-03	3.3E-09	NA	3.5E-13	
2-Butanone (MEK)	1.4E-03			1.8E-09	1.5E-12	NA	1.4E-03	1.6E-09	1.5E-12	NA	
Benzene	6.3E-03			6.5E-07	2.1E-08	2.1E-12	1.9E-03	1.9E-07	6.1E-09	6.1E-13	
Chloroethane	9.9E-03			2.1E-08	2.0E-10	7.1E-13	9.9E-03	2.1E-08	2.0E-10	7.1E-13	
cis-1,2-Dichloroethane	8.0E-01			6.2E-05	1.7E-06	NA	1.4E-01	1.1E-05	2.9E-07	NA	
Ethylbenzene	3.3E-01			4.0E-05	3.8E-08	NA	1.6E-01	1.9E-05	1.8E-08	NA	
Toluene	2.2E-02			2.5E-08	5.9E-09	NA	3.6E-03	4.1E-07	8.8E-10	NA	
trans-1,2-Dichloroethane	2.0E-03			3.6E-07	5.7E-09	NA	2.0E-03	3.6E-07	5.7E-09	NA	
Xylene, Total (a)	1.1E+00			1.3E-04	1.2E-08	NA	5.3E-01	6.2E-05	5.9E-07	NA	
						1E-03	4E-07			8E-06	3E-09

Notes:

- a. P-xylene was used as a surrogate for total xylenes
 - b. The 95% Upper Confidence Limit on the mean was used to represent the reasonable maximum exposure scenario for vapor intrusion
- µg/m³ = micrograms per cubic meter
 mg/L = milligrams per liter
 NA = Not available due to lack of appropriate toxicity values

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Table 6-4. Summary of Cancer Risks and Noncancer Hazards from the Subsurface Soil to Indoor Air Pathway
Lammers Barrel Facility, Beavercreek, Ohio

Exposure Medium	Exposure Scenario	Chemical	Reasonable Maximum Exposure			
			Initial Subsurface Soil Concentration (mg/kg)	Infinite Source Building Concentration (µg/m ³)	Hazard Quotient (unitless)	Cancer Risk (unitless)
On-site Subsurface Soil	On-site Worker	1,1,1-Trichloroethane	8.2E+00	1.3E+00	0.00041	NA
		1,1,2,2-Tetrachloroethane	5.5E-01	1.8E-03	0.0000060	2.6E-08
		1,1,2-Trichloroethane	2.8E-01	3.7E-03	0.00018	1.5E-08
		1,1-Dichloroethane	2.3E+00	2.8E-01	0.00039	NA
		1,1-Dichloroethylene	7.7E-01	3.2E-01	0.0011	NA
		1,2-Dichloroethane	8.2E-01	1.6E-02	NA	1.0E-07
		2-Butanone (a)	3.0E+00	1.7E-02	0.0000023	NA
		2-Methylnaphthalene	6.8E+00	8.3E-03	0.000081	NA
		4-Methyl-2-pentanone (MIBK)	1.2E+01	8.4E-02	0.000015	NA
		Acetone	6.7E+00	4.2E-02	0.000081	NA
		Benzene	1.1E+00	8.4E-02	0.0019	1.6E-07
		Carbon Disulfide	3.6E-02	1.6E-02	0.000018	NA
		Carbon Tetrachloride	1.2E+01	2.3E+00	NA	8.6E-06
		Chlorobenzene	1.4E-01	2.4E-03	0.000027	NA
		Chloroform	4.3E-02	3.0E-03	NA	1.7E-08
		Methyl chloride (chloromethane)	1.1E+01	4.7E+00	0.036	1.1E-06
		Chloroethane	2.4E-01	9.8E-02	0.000067	2.0E-08
		cis/trans-1,2-Dichloroethene	2.2E+01	1.8E+00	0.036	NA
		cis-1,2-Dichloroethene	3.1E+00	2.5E-01	0.0049	NA
		cis-1,2-Dichloropropene	1.8E-01	N/A	N/A	N/A
		Ethylbenzene	1.4E+02	3.1E+00	0.0021	NA
		Methyl N-butyl ketone	5.0E+00	2.7E-02	0.000063	NA
		Methylene Chloride	5.1E+00	3.6E-01	0.000083	4.2E-09
		Naphthalene	2.0E+01	4.5E-03	0.0010	NA
		Styrene	3.7E+01	1.4E-01	0.000095	NA
		Tetrachloroethene	1.6E+01	1.8E+00	0.0020	2.5E-06
		Toluene	8.4E+02	2.4E+01	0.041	NA
		trans-1,2-Dichloroethene	2.3E-01	3.6E-02	0.00035	NA
		trans-1,2-Dichloropropene	1.8E-01	N/A	N/A	N/A
		Tribromomethane	3.3E-01	1.8E-03	0.000017	4.8E-10
Trichloroethene	7.8E+01	5.1E+00	0.0059	2.5E-08		
Vinyl Chloride	8.7E-01	5.5E-01	0.0038	1.2E-06		
Xylene, Total (b)	7.3E+02	1.5E+01	0.10	NA		
					0.2	2E-05

Notes:

a. MIBK used as a surrogate for 2-butanone

b. P-xylene was used as a surrogate for total xylenes

µg/m³ = micrograms per cubic meter

mg/kg = milligrams per kilogram

NA = Not available due to lack of appropriate toxicity values

N/A = Not applicable, input parameters not available to run the Johnson & Ettinger Model

Table 6-5. Calculation of Fetal Blood Lead Concentration (PbB) for Older Child (Adolescent) Recreator^{1,2}
Lammers Barrel Facility, Beavercreek, Ohio

USEPA Adult Lead Model (ALM)

ALM Version Date 05/19/05

Exposure Variable	Description of Exposure Variable	Units	Value ^{3,4,5}
PbS	Soil lead concentration (arithmetic mean)	ug/g or ppm	100
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD ₁	Geometric standard deviation PbB	--	2.0
PbB ₀	Baseline PbB	ug/dL	1.1
IR _s	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR _{s+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W _s	Weighting factor; fraction of IR _{s+D} ingested as outdoor soil	--	--
K _{SD}	Mass fraction of soil in dust	--	--
AF _{s,D}	Absorption fraction (same for soil and dust)	--	0.12
EF _{s,D}	Exposure frequency (same for soil and dust)	days/yr	117
AT _{s,D}	Averaging time (same for soil and dust)	days/yr	365
PbB _{adult}	PbB of adolescent recreator, geometric mean	ug/dL	1.2
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adolescent recreators	ug/dL	3.3
PbB _t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	Probability that fetal PbB > PbB _t , assuming lognormal distribution	%	0.1%

Notes:

- ¹ Fetal PbB for exposure of adolescent recreator exposed to on-site subsurface soils (0 - 16 feet bgs)
- ² Older child ages 7 - 17 years.
- ³ Soil concentration represents arithmetic mean of soils data for 0 - 16 feet below surface (bas).
- ⁴ Source of GSD₁ and PbB₀: USEPA (2002) Blood Lead Concentrations of U.S. Adult Females: Summary Statistics From Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9285.7-52. March 2002. Represents GSD and PbB for non-Hispanic whites, age group 17 - 25 (Table 3b).
- ⁵ Exposure frequency represents a Reasonable Maximum Exposure (RME) scenario based on professional judgment (3 days/week for 9 months).

Table 6-6. Calculation of Fetal Blood Lead Concentration (PbB) for Adult Recreator¹
 Lammers Barrel Facility, Beavercreek, Ohio

USEPA Adult Lead Model (ALM)
 ALM Version Date 05/19/05

Exposure Variable	Description of Exposure Variable	Units	Value ^{2,3,4}
PbS	Soil lead concentration (arithmetic mean)	ug/g or ppm	100
$R_{\text{fetal/maternal}}$	Fetal/maternal PbB ratio	–	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD _i	Geometric standard deviation PbB	–	2.1
PbB ₀	Baseline PbB	ug/dL	1.5
IR _s	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR _{s+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	–
W _s	Weighting factor, fraction of IR _{s+D} ingested as outdoor soil	–	–
K _{SD}	Mass fraction of soil in dust	–	–
AF _{s,D}	Absorption fraction (same for soil and dust)	–	0.12
EF _{s,D}	Exposure frequency (same for soil and dust)	days/yr	117
AT _{s,D}	Averaging time (same for soil and dust)	days/yr	365
PbB _{adult}	PbB of adult recreator, geometric mean	ug/dL	1.6
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult recreators	ug/dL	4.8
PbB _i	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(\text{PbB}_{\text{fetal}} > \text{PbB}_i)$	Probability that fetal PbB > PbB _i , assuming lognormal distribution	%	0.4%

Notes:

- ¹ Fetal PbB for exposure of adult recreator exposed to on-site subsurface soils (0 - 16 feet bgs)
- ² Soil concentration represents arithmetic mean of soils data for 0 - 16 feet below ground surface (bgs).
- ³ Source of GSD_i and PbB₀: USEPA (2002) Blood Lead Concentrations of U.S. Adult Females: Summary Statistics From Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9285.7-52. March 2002. Represents GSD and PbB for non-Hispanic whites, age group 26 - 35 (Table 3b).
- ⁴ Exposure frequency represents a Reasonable Maximum Exposure (RME) scenario based on professional judgment (3 days/week for 9 months).

Table 6-7. Calculation of Fetal Blood Lead Concentration (PbB) for Older Child (Adolescent) Trespasser^{1,2}
Lammers Barrel Facility, Beavercreek, Ohio

USEPA Adult Lead Model (ALM)

ALM Version Date 05/19/05

Exposure Variable	Description of Exposure Variable	Units	Value ^{2,3,4}
PbS	Soil lead concentration (arithmetic mean)	ug/g or ppm	100
$R_{\text{fetal/maternal}}$	Fetal/maternal PbB ratio	—	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD ₁	Geometric standard deviation PbB	—	2.0
PbB ₀	Baseline PbB	ug/dL	1.1
IR _s	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR _{s+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	—
W _s	Weighting factor, fraction of IR _{s+D} ingested as outdoor soil	—	—
K _{SD}	Mass fraction of soil in dust	—	—
AF _{s, D}	Absorption fraction (same for soil and dust)	—	0.12
EF _{s, D}	Exposure frequency (same for soil and dust)	days/yr	18
AT _{s, D}	Averaging time (same for soil and dust)	days/yr	365
PbB _{adult}	PbB of adolescent trespasser, geometric mean	ug/dL	1.1
PbB _{total, 0.95}	95th percentile PbB among fetuses of adolescent trespassers	ug/dL	3.1
PbB _t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(\text{PbB}_{\text{total}} > \text{PbB}_t)$	Probability that fetal PbB > PbB _t , assuming lognormal distribution	%	0.04%

Notes:

- ¹ Fetal PbB for exposure of adolescent trespasser exposed to on-site surface soils (0 - 2 feet bgs).
- ² Older child ages 7 - 17 years.
- ³ Soil concentration represents arithmetic mean of soils data for 0 - 2 feet below ground surface (bgs).
- ⁴ Source of GSD₁ and PbB₀: USEPA (2002) Blood Lead Concentrations of U.S. Adult Females: Summary Statistics From Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9285.7-52. March 2002. Represents GSD and PbB for non-Hispanic whites, age group 17 - 25 (Table 3b).
- ⁵ Exposure frequency represents a Reasonable Maximum Exposure (RME) scenario based on professional judgment (2 days/month for 9 months).

**Table 6-8. Calculation of Fetal Blood Lead Concentration (PbB) for Commercial/Industrial Worker¹
Lammers Barrel Facility, Beavercreek, Ohio**

**USEPA Adult Lead Model (ALM)
ALM Version Data 05/19/05**

Exposure Variable	Description of Exposure Variable	Units	Value ^{2,3,4}
PbS	Soil lead concentration (arithmetic mean)	ug/g or ppm	230
$R_{\text{fetal/maternal}}$	Fetal/maternal PbB ratio	—	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD _i	Geometric standard deviation PbB	—	2.1
PbB ₀	Baseline PbB	ug/dL	1.4
IR _s	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR _{s+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	—
W _s	Weighting factor; fraction of IR _{s+D} ingested as outdoor soil	—	—
K _{so}	Mass fraction of soil in dust	—	—
AF _{s,D}	Absorption fraction (same for soil and dust)	—	0.12
EF _{s,D}	Exposure frequency (same for soil and dust)	days/yr	250
AT _{s,D}	Averaging time (same for soil and dust)	days/yr	365
PbB _{adult}	PbB of adult worker, geometric mean	ug/dL	1.8
PbB _{total, 0.95}	95th percentile PbB among fetuses of adult workers	ug/dL	5.4
PbB _i	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(\text{PbB}_{\text{total}} > \text{PbB}_i)$	Probability that fetal PbB > PbB _i , assuming lognormal distribution	%	0.7%

Notes:

- ¹ Fetal PbB for exposure of commercial/industrial worker exposed to on-site subsurface soils (0 - 16 feet bgs)
- ² Soil concentration represents arithmetic mean of soils data for 0 - 16 feet below ground surface (bgs).
- ³ Source of GSD_i and PbB₀: USEPA (2002) Blood Lead Concentrations of U.S. Adult Females: Summary Statistics From Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9265.7-52. March 2002. Represents GSD and PbB for Midwest Region, non-Hispanic whites (Table 3e).
- ⁴ Exposure frequency represents the USEPA default for a Reasonable Maximum Exposure (RME) scenario.

Table 6-9. Calculation of Fetal Blood Lead Concentration (PbB) for Utility Worker¹
Lammers Barrel Facility, Beavercreek, Ohio

USEPA Adult Lead Model (ALM)
ALM Version Date 05/19/05

Exposure Variable	Description of Exposure Variable	Units	Value ^{2,3,4}
PbS	Soil lead concentration (arithmetic mean)	ug/g or ppm	230
$R_{\text{fetal/maternal}}$	Fetal/maternal PbB ratio	—	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD _i	Geometric standard deviation PbB	—	2.1
PbB ₀	Baseline PbB	ug/dL	1.4
IR _s	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR _{s+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	—
W _s	Weighting factor; fraction of IR _{s+D} ingested as outdoor soil	—	—
K _{sD}	Mass fraction of soil in dust	—	—
AF _{s,D}	Absorption fraction (same for soil and dust)	—	0.12
EF _{s,D}	Exposure frequency (same for soil and dust)	days/yr	9
AT _{s,D}	Averaging time (same for soil and dust)	days/yr	365
PbB _{adult}	PbB of adult worker, geometric mean	ug/dL	1.4
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult workers	ug/dL	4.4
PbB _t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(\text{PbB}_{\text{fetal}} > \text{PbB}_t)$	Probability that fetal PbB > PbB _t , assuming lognormal distribution	%	0.3%

Notes:

- ¹ Fetal PbB for exposure of utility worker exposed to on-site subsurface soils (0 - 16 feet bgs)
- ² Soil concentration represents arithmetic mean of soils data for 0 - 16 feet below ground surface (bgs).
- ³ Source of GSD_i and PbB₀: USEPA (2002) Blood Lead Concentrations of U.S. Adult Females: Summary Statistics From Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9285.7-52. March 2002. Represents GSD and PbB for Midwest Region, non-Hispanic whites (Table 3a).
- ⁴ Exposure frequency represents a Reasonable Maximum Exposure (RME) scenario based on professional judgment (1 day/month for 9 months).

Table 6-10. Calculation of Fetal Blood Lead Concentration (PbB) for Construction Worker¹
Lammers Barrel Facility, Beavercreek, Ohio

USEPA Adult Lead Model (ALM)
ALM Version Date 03/19/05

Exposure Variable	Description of Exposure Variable	Units	Value ^{2,3,4}
PbS	Soil lead concentration (arithmetic mean)	ug/g or ppm	230
$R_{\text{fetal/maternal}}$	Fetal/maternal PbB ratio	—	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD _B	Geometric standard deviation PbB	—	2.1
PbB ₀	Baseline PbB	ug/dL	1.4
IR _a	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.330
IR _{B+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	—
W _a	Weighting factor, fraction of IR _{B+D} ingested as outdoor soil	—	—
K _{soil}	Mass fraction of soil in dust	—	—
AF _{a, D}	Absorption fraction (same for soil and dust)	—	0.12
EF _{a, D}	Exposure frequency (same for soil and dust)	days/yr	125
AT _{a, D}	Averaging time (same for soil and dust)	days/yr	365
PbB _{adult}	PbB of adult worker, geometric mean	ug/dL	2.6
PbB _{total, 0.05}	95th percentile PbB among fetuses of adult workers	ug/dL	8.1
PbB _t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(\text{PbB}_{\text{total}} > \text{PbB}_t)$	Probability that fetal PbB > PbB _t , assuming lognormal distribution	%	2.7%

Notes:

- ¹ Fetal PbB for exposure of construction worker exposed to on-site subsurface soils (0 - 16 feet bgs)
- ² Soil concentration represents arithmetic mean of soils data for 0 - 16 feet below ground surface (bgs).
- ³ Source of GSD_B and PbB₀: USEPA (2002) Blood Lead Concentrations of U.S. Adult Females: Summary Statistics From Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9285.7-52. March 2002. Represents GSD and PbB for Midwest Region, non-Hispanic whites (Table 3a).
- ⁴ Exposure frequency represents a Reasonable Maximum Exposure (RME) scenario based on professional judgment.

ARCADIS

Table 6-11. Model Output for Evaluation of Recreational Young Child Exposed to Surface Soils
Lammers Barrel Facility, Beaver Creek, Ohio

LEAD MODEL FOR WINDOWS Version 1.0

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=====
Model Version: 1.0 Build 264
User Name: smarotta
Date: 1/16/08
Site Name: Lammers Barrel Facility
Operable Unit:
Run Mode: Research
=====

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The time step used in this model run: 1 - Every 4 Hours (6 times a day).

***** Air *****

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m ³ /day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m ³)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

***** Diet *****

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	8.240
4-5	6.010
5-6	8.340
6-7	7.000

***** Drinking Water *****

Water Consumption:
Age Water (L/day)

.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 ug Pb/L

***** Soil & Dust *****

Multiple Source Analysis Used
Average multiple source concentration: 80.000 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No



**Table 6-11. Model Output for Evaluation of Recreational Young Child Exposed to Surface Soils
Lammers Barrel Facility, Beavercreek, Ohio**

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	100.000	80.000
1-2	100.000	80.000
2-3	100.000	80.000
3-4	100.000	80.000
4-5	100.000	80.000
5-6	100.000	80.000
6-7	100.000	80.000

***** Alternate Intake *****

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

***** Maternal Contribution: Infant Model *****

Maternal Blood Concentration: 2.500 ug Pb/dL

CALCULATED BLOOD LEAD AND LEAD UPTAKES:

Year	Air (ug/day)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
.5-1	0.021	2.608	0.000	0.377
1-2	0.034	2.717	0.000	0.840
2-3	0.062	3.070	0.000	0.884
3-4	0.067	2.976	0.000	1.011
4-5	0.067	2.900	0.000	1.061
5-6	0.083	3.071	0.000	1.124
6-7	0.083	3.387	0.000	1.145

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	2.141	5.148	2.8
1-2	3.389	7.080	3.0
2-3	3.410	7.525	2.8
3-4	3.439	7.493	2.6
4-5	2.576	6.604	2.3
5-6	2.328	6.617	2.1
6-7	2.202	6.838	1.9

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**Table 6-12. Summary of Cancer Risks and Noncancer Hazards for the Hypothetical On-Site Resident
Lammers Barrel Facility, Beavercreek, Ohio**

Receptor	Age	Media	Central Tendency Exposure		Reasonable Maximum Exposure		
			Noncancer Hazards	Cancer Risks	Noncancer Hazards	Cancer Risks	
On-Site Resident	Young Child	Surface and subsurface soil	3	3E-05	13	1E-04	
		Groundwater	328	7E-03	1308	2E-01	
	Older Child	Surface and subsurface soil	0.5	9E-08	2	3E-05	
		Groundwater	126	4E-03	480	9E-02	
	Adult	Surface and subsurface soil	0.4	5E-06	1	3E-05	
		Groundwater	109	2E-03	409	5E-02	
	Total Resident (sum of all ages)	Surface and subsurface soil	4	5E-05	17	2E-04	
		Groundwater	563	1E-02	2207	3E-01	
			Total	567	1E-02	2224	3E-01

Attachment 6

Lammers Barrel Site Federal ARARs

Media	Requirement	Requirement Synopsis
Soil	U.S. EPA Region 9 Human Health Preliminary Remediation Goals (PRGs) for Commercial/Industrial Land Use TO BE CONSIDERED	These values are non-promulgated guidance to be used as guidelines for evaluating Site investigation data. PRGs are based on potential adult worker exposure to soil contaminants through incidental ingestion of soil, dermal absorption, and inhalation of vapors and airborne particles from the soil. PRGs correspond to a lifetime 1 cancer risk of 1.0×10^{-6} for carcinogens (i.e., one person in one million), or a hazard quotient of 1 for noncarcinogens.
	Risk Assessment Guidance for Superfund (RAGS) - Parts A, B, D, and E (U.S. EPA 1989, 1991, 2001 a,b, 2004) TO BE CONSIDERED	RAGS provides a basis for determining levels of chemicals that can remain onsite and still be protective of public health, taking into account Site conditions and land use.
	U.S. EPA Soil Screening Levels TO BE CONSIDERED	These levels are non-promulgated guidance that represent concentrations in soil that may pose a migration risk to groundwater used as a drinking water source.
Groundwater	Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) (40 CFR 141.11 - 141.16) RELEVANT AND APPROPRIATE Comply with State Standards	MCLs have been promulgated for a number of common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies based on health effects and technical capabilities. MCLs may also be considered relevant and appropriate for groundwater aquifers potentially used for drinking water sources.
	Risk Assessment Guidance for Superfund (RAGS) - Parts A, B, D, and E (U.S. EPA 1989, 1991, 2001 a,b, 2004) TO BE CONSIDERED	RAGS provides a basis for determining levels of chemicals that can remain onsite and still be protective of public health, taking into account Site conditions and land use.

	National Secondary Drinking Water Standards (40 CFR 143) RELEVANT AND APPROPRIATE Comply with State Standards	These are welfare-based standards established to protect aesthetic quality (e.g., taste, odor, color) of public water supplies (Secondary MCLs).
	Clean Water Act (33 CFR 1314), Federal Ambient Water Quality Criteria (40 CFR 131) RELEVANT AND APPROPRIATE	Ambient water quality criteria are developed for protection of freshwater and marine aquatic life and for protection of human health from the ingestion of water and/or organisms.
	Underground Injection Control (40 CFR 144 - 147) RELEVANT AND APPROPRIATE	These regulations protect groundwater sources of drinking water by imposing restrictions to underground injections. Groundwater remedial action may require injections.
Wetlands/ Floodplains	40 CFR 6.302(b) Executive Order No. 11988 RELEVANT AND APPROPRIATE	Avoid, to the extent possible, or minimize long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development if a practicable alternative exists. Evaluate potential effects of actions that may be taken in floodplains and ensure that planning and budgeting reflect consideration of flood hazards and floodplain management.
	40 CFR 6 Appendix A RELEVANT AND APPROPRIATE	Provide leadership and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains.
General	Occupational Safety & Health Administration (29 CFR 1926) RELEVANT AND APPROPRIATE	These regulations specify the type of safety equipment and procedures to be followed during construction activities, including earthwork construction.

Attachment 6. ARARs for the Selected Remedy (RA-4)

Requirement	Regulatory Authority	Description and Action(s) to Attain Requirement	Status	Category
ORC 5301.80 to 5301.92 Uniform Environmental Covenants Act	State	Standards for environmental covenants. Institutional controls and use restrictions will comply with these standards.	Applicable	Location-specific
OAC 3745-15-07 Air Pollution Nuisances Prohibited	State	Defines air pollution nuisance as the emission or escape into the air from any sources(s) of smoke, ashes, dust, dirt, grime, acids, fumes, gases, vapors, odors and combinations of the above that endanger health, safety or welfare of the public or cause personal injury or property damage. Such nuisances are prohibited. Air emissions will be monitored and mitigated as needed during implementation of the remedy.	Applicable	Chemical-specific
OAC 3745-17 Particulate Matter Standards	State	All emissions of fugitive dust shall be controlled. Pertains to sites which may have fugitive emissions (non-stack) of dust. Air emissions will be monitored and mitigated as needed during implementation of the remedy. These requirements would be met during clearing and grubbing, removal of concrete foundations, and soil mixing.	Applicable	Chemical-specific
OAC 3745-9 Ohio Division of Drinking and Ground Waters	State	Standards for design, installation, and closure of wells, compliance with DDAGW guidance, including construction requirements, requirements for wells in specific aquifers, and grouting procedures. The remedy will comply with these requirements during installation of groundwater monitoring wells and compliance monitoring.	Applicable	Action-specific

Attachment 6. ARARs for the Selected Remedy (RA-4)

<p>OAC 3745-34 Underground Injection Control</p>	<p>State</p>	<p>These regulations establish requirements for underground injection, including well construction requirements. Underground injection is prohibited without authorization from the Director.</p> <p>Injections associated with the soil mixing and groundwater treatment components of the remedy will comply with these requirements.</p>	<p>Applicable</p>	<p>Action-specific</p>
<p>OAC 3745-81-11, 12 Maximum Contaminant Levels (MCLs) for inorganics and organics</p>	<p>State</p>	<p>Presents MCLs for inorganics and organics. Pertains to any site which has contaminated ground or surface water that is either being used, or has the potential for use, as a drinking water source.</p> <p>MCLs will be met throughout the groundwater plume.</p>	<p>Relevant and Appropriate</p>	<p>Chemical -specific</p>
<p>OAC 3745-1-04 Ohio Division of Surface Water</p>	<p>State</p>	<p>All surface waters of the state shall be free from: a) objectionable suspended solids. b) floating debris, oil and scum. c) materials that create a nuisance. d) toxic, harmful or lethal substances. e) nutrients that create nuisance growth.</p> <p>Potential run-off to Little Beaver Creek during implementation of the remedy will be mitigated.</p>	<p>Relevant and Appropriate</p>	<p>Chemical -specific</p>
<p>ORC 6111.04 Ohio Division of Surface Water</p>	<p>State</p>	<p>Pollution of waters of the State is prohibited.</p> <p>Compliance with this rule will be achieved by preventing discharge of run-off to Little Beaver Creek during implementation of the selected remedy.</p>	<p>Relevant and Appropriate</p>	<p>Action-specific</p>
<p>OAC 3745-39 Storm Water Program</p>	<p>State</p>	<p>Establishes requirements and best management practices for storm water discharges from municipalities, industrial activity, and construction sites.</p> <p>Best management practices will be implemented to mitigate storm water impacts during implementation of the remedy.</p>	<p>Relevant and Appropriate</p>	<p>Action-specific</p>

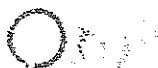
Attachment 6. ARARs for the Selected Remedy (RA-4)

<p>OAC 3745-54-18 Location Standards for Hazardous Waste T/S/D Facilities</p>	<p>State</p>	<p>Outlines requirements for locating a hazardous waste treatment, storage, disposal facility within a 100-year floodplain. Facility must be designed, constructed, operated, and maintained to avoid washout by a 100-year flood.</p> <p>The soil treatment areas within the 100-year floodplain on the northern portion of the site will be protected during treatment to prevent erosion in the event of flooding.</p>	<p>Relevant and Appropriate</p>	<p>Location- specific</p>
<p>Executive Order 11988 - Floodplain Management</p>	<p>Federal</p>	<p>Activities taking place within floodplains must be done to avoid adverse impacts and preserve beneficial values in floodplains.</p> <p>Floodplains disturbed during implementation of the remedy will be restored to their original or an improved condition or function.</p>	<p>To Be Considered</p>	
<p>Policy on Flood plains and Wetlands Assessments for CERCLA Actions</p>	<p>Federal</p>	<p>Guidance for implementing EO 11988 to avoid adverse impacts on floodplains.</p> <p>Floodplains disturbed during implementation of the remedy will be restored to their original or an improved condition or function.</p>	<p>To Be Considered</p>	
<p>U.S. EPA Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites</p>	<p>Federal</p>	<p>RSLs are generic, risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data. RSLs are considered by EPA to be protective for humans (including sensitive groups) over a lifetime and correspond to a lifetime cancer risk of 1E-06 for carcinogens (i.e., one person in one million), or a hazard quotient of 1 for noncarcinogens. RSLs are used for site screening and as initial cleanup goals.</p>	<p>To Be Considered</p>	
<p>Risk Assessment Guidance for Superfund (RAGS) - Parts A, B, D, and E</p>	<p>Federal</p>	<p>RAGS provides a basis for determining levels of chemicals that can remain onsite and still be protective of public health, taking into account Site conditions and land use.</p>	<p>To Be Considered</p>	

Attachment 6. ARARs for the Selected Remedy (RA-4)

(U.S. EPA 1989, 1991, 2001 a,b, 2004)				
U.S. EPA Soil Screening Levels	Federal	These levels are non-promulgated guidance that represent concentrations in soil that may pose a migration risk to groundwater used as a drinking water source.	To Be Considered	

Attachment 7



**Environmental
Protection Agency**

John R. Kasich, Governor

Mary Taylor, Lt. Governor

Scott J. Nally, Director

September 16, 2011

Richard C. Karl, Director
Superfund Division
U.S. EPA, Region 5
77 West Jackson Blvd (S-6J)
Chicago, IL 60604-3507

RE: Record of Decision
Lammers Barrel Factory Site, Operable Unit 1, Beavercreek, Ohio

Dear Mr. Karl:

The Ohio Environmental Protection Agency has reviewed the Record of Decision (ROD) for the Lammers Barrel Superfund Site, Operable Unit 1 (OU1), in Beavercreek, Greene County, Ohio. Ohio EPA concurs with the selected remedial alternative for this site, Alternative RA-4. The selected remedy includes the following major components:

- In-situ enhanced biological treatment of impacted soils in OU1 using soil mixing to treat volatile organic compounds;
- In-situ groundwater treatment using enhanced reductive dechlorination (ERD) to treat contaminated groundwater in OU1;
- Institutional Controls in accordance with the Ohio Uniform Environmental Covenants Act to prohibit residential use of the Lammers Barrel property and to prohibit the installation of potable wells on the Lammers Barrel property until all groundwater cleanup standards have been achieved.

The ROD specifies that the soils will be mixed using large diameter augers, typically 6-feet in diameter, and that sufficient mixing of the soils must be achieved to break down the soil particles and allow good contact with the DARAMEND® additive. Further, other mixing methods (e.g., Lang tool, excavator) may be used where necessary to achieve the desired degree of mixing, as a contingency. It is our understanding that the remedial design work plan will establish procedures for assessing the effectiveness of the soil mixing during treatment.

The ROD also states that a pre-design investigation will be conducted to further refine the extent of soil contamination requiring treatment before the remedy is implemented. The locations of soil contamination discovered during the remedial investigation and from previous U.S. Army Corps of Engineers test pits will be evaluated as part of these activities and included in the OU1 soil remedial action, as appropriate. Further, dosing tests will be

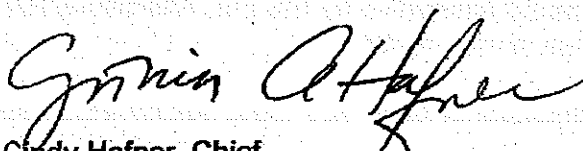
Richard Karl
September 16, 2011
Page 2 of 2

performed to confirm the appropriate additive loading rates of DARAMEND® for each treatment area based on the concentrations of volatile organic compounds present. It is our understanding that the pre-design investigation will be defined in the remedial design work plan.

Finally, the ROD states that the effectiveness of the in-situ groundwater remediation using ERD will be monitored using selected wells from the existing monitoring well network, as well as any required additional wells. Groundwater will also be monitored for arsenic to ensure that unacceptable levels of arsenic are not migrating away from the reducing groundwater treatment zone during treatment. It is our understanding that the remedial design work plan will outline methods for monitoring the ERD component of the remedy, including contingency measures.

We look forward to working with U.S. EPA on the design and implementation of the remedy for OU1, and are ready to assist with the RI/FS for Operable Unit 2. If you have any questions, please contact Scott Glum at (937) 285-6065.

Sincerely,



Cindy Hafner, Chief
Division of Environmental Response and Revitalization

cc: Peter Whitehouse, DERR, Ohio EPA
Tiffani Kavalec, DERR, Ohio EPA
Mark Allen, DERR, Ohio EPA
Scott Glum, DERR, Ohio EPA
Timothy Fischer, RPM, U.S. EPA

United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Appendix B

Statement of Work

To Consent Decree, *United States v. 3M Company,*
et al.(S.D. Ohio)
Statement of Work

**STATEMENT OF WORK FOR
THE REMEDIAL DESIGN AND REMEDIAL ACTION
AT
LAMMERS BARREL SITE – OPERABLE UNIT 1
GREENE COUNTY, OHIO**

I. PURPOSE

The purpose of this Statement of Work (SOW) is to set forth requirements for implementation of the Remedial Action set forth in the Record of Decision (ROD), which was signed by the Director of the Superfund Division of the United States Environmental Protection Agency (U.S. EPA) Region 5 on September 27, 2011, for the Lammers Barrel Site – Operable Unit 1 (OU 1). The Settling Performing Defendants shall follow the ROD, the SOW, the approved Remedial Design Work Plan, the approved Remedial Action Work Plan, U.S. EPA Superfund Remedial Design and Remedial Action Guidance and any additional guidance provided by U.S. EPA in submitting deliverables for designing and implementing the Remedial Action at the Lammers Barrel OU 1 Site.

II. DESCRIPTION OF THE REMEDIAL ACTION/PERFORMANCE STANDARDS

The Settling Performing Defendants shall design and implement the Remedial Action to meet the performance standards and specifications set forth in the ROD and this SOW. Performance standards shall include cleanup standards, standards of control, quality criteria and other substantive requirements, criteria or limitations including all Applicable or Relevant and Appropriate Requirements (ARARs) set forth in the ROD, SOW and/or Consent Decree. The Performance Standards include the following:

1. **Site Security**

The Settling Performing Defendants shall maintain the existing fence at the Site to prevent access and vandalism to the Site until the soil mixing component of the Remedial Action is successfully completed.

2. **Restrictive Covenants/Deed Restrictions and Institutional Control Implementation Assurance Plan (ICIAP)**

Owner Settling Defendants and other Settling Defendants who own or control any real property that are part of the Site or where access or land/water use restrictions are needed shall execute, and record deed restrictions in compliance with the Ohio Uniform Environmental Covenants Act, Ohio Rev. Code Ann. § 5301.80 to 5301.92, to be implemented at the Site. The purpose of the covenant shall be to implement land use restrictions at the Site that prohibit residential development on the Site and prohibit the installation of any wells on the Site – other than those installed as part of the ongoing Remedial Action until the cleanup standards for groundwater at the Site have been met. U.S. EPA must provide written permission for the installation of any well at the Site. The covenant shall also provide for access to the property for U.S. EPA and

Ohio EPA to conduct routine inspections and monitoring to assess the performance of the Remedial Action at the Site. The Settling Performing Defendants shall develop an Institutional Control Implementation and Assurance Plan (ICIAP) for maintaining and enforcing the land use restrictions described in the covenant. The Settling Performing Defendants and the Owner Settling Defendant shall submit to EPA for review a preliminary ICIAP as part of their Preliminary Design submission. The final ICIAP shall be submitted to EPA for approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables) of the Consent Decree prior to the pre-final inspection for completion of the soil remedy component. The ICIAP shall be effective upon EPA's approval, and shall become an enforceable requirement of the Consent Decree. The ICIAP shall comply with EPA ICIAP guidance. The ICIAP shall include, at a minimum: (1) access requirements and activity and use limitations set forth in Section IX of the Consent Decree; (2) a schedule for the preparation and recordation of such requirements and limitations; (3) a schedule for title commitment and final title insurance policy in accordance with Section IX of the Consent Decree; (4) inspections and reviews of site activities to occur at least annually to assure that protection of human health is maintained at the Site; (5) a description of the proposed duration of each institutional control and an explanation for such duration; (6) a description of all prior liens and encumbrances existing on any real property that may affect the proprietary controls or the protectiveness of the remedy, and a plan for the release or subordination of any such liens and encumbrances (unless EPA waives the release or subordination of such liens or encumbrances); (7) a plan for monitoring, maintaining, reporting on, and ensuring the continued efficacy of the institutional controls and a contingency plan in the event institutional controls are ineffective; and (8) a schedule for annual certifications regarding whether the institutional controls remain in place and have been complied with, and regarding enforcement of the institutional controls. The ICIAP shall demonstrate that institutional controls cover all physical areas that do not support an unlimited use and unrestricted exposure use classification (UU/UE) based on current conditions for the entire Site. The ICIAP shall include a methodology for mapping of all non-UU/UE areas during and after completion of construction, including preparing final survey maps and legal descriptions of non-UU/UE areas.

3. Construction and Implementation of an In-Situ Biological Treatment Remedy Component

The Settling Performing Defendants shall design an in-situ biological treatment remedy component to address contaminated soils at the Site. That soil remedy component shall include removal of the existing concrete pad at the Site and soil mixing to amend contaminated soils with DARAMEND®, a controlled-release organic carbon substrate that also contains zero valent iron (ZVI), or another comparable carbon amendment approved by U.S. EPA. The purpose of this amendment will be to produce the strongly reducing conditions in the unsaturated zone required to biologically reductively dechlorinate chlorinated volatile organic compounds (CVOCs) and degrade BTEX (Benzene, Toluene, Ethylbenzene and Xylenes) compounds via co-metabolic processes. Sufficient mixing of the soils shall be achieved to break down the soil particles and allow good contact between the soil particles and the amendment. The Settling Performing Defendants shall conduct a Pre-design Investigation to further refine the extent of known soil contamination discovered during the Remedial Investigation at the Site and from previous U.S. Army Corps of Engineers test pits, as

more specifically described in Table 2-3 and Figure 11 of the OU 1 Feasibility Study Report ("FS Report"). The Settling Performing Defendants shall conduct pre-design geotechnical and dosing tests to confirm the appropriate additive loading rates to achieve successful contaminant destruction.

The carbon amendment dosing rates shall be developed for each treatment area (Areas A, B, C, D and E as described in the FS Report) based on the CVOC concentrations present. The Settling Performing Defendants shall design the soil remedy component to treat Site soils that contain hazardous substances that exceed the Preliminary Remediation Goals (PRGs) based on cancer risk listed below and in the ROD for the Site. The soil remedy component shall be designed to achieve the following residual concentrations of soil contaminants in parts per million (ppm) or to achieve such concentrations that the total excess cancer risk associated with potential cumulative exposure to impacted soils at the Site is demonstrated to be less than 1×10^{-5} (one in ten thousand) in a U.S. EPA-approved risk assessment, as provided in the OU 1 ROD.

• Benzo(a)pyrene	0.16 ppm
• Dibenzo(a,h)anthracene	0.36 ppm
• Indeno(1,2,3-cd)pyrene	0.74 ppm
• Tetrachloroethene	1.70 ppm
• Trichloroethylene	5.60 ppm
• Vinyl Chloride	0.33 ppm
• Total PCBs	1.10 ppm
• Arsenic	3.40 ppm

The Settling Performing Defendants shall design the Remedial Action at the Site to comply with all Applicable or Relevant and Appropriate Requirements (ARARs) as required by law. ARARs for this Remedial Action include Ohio Admin. Code § 3745-17, which regulates emissions of particulates and fugitive dust, and Ohio Admin. Code § 3745-15, which prohibits air pollution nuisances. These requirements shall be met during clearing and grubbing, removal of concrete foundations at the Site, and soil mixing. Storm water run-off from remedial activities and construction shall comply with Ohio Admin. Code § 3745-39. Subsurface injections for in-situ soil and groundwater remediation shall meet the requirements of Ohio Admin. Code § 3745-34, which is Ohio's underground injection control program.

4. Construction and Implementation of an Enhanced Reductive Dechlorination (ERD) In-Situ Groundwater Treatment Remedy Component for Remedial Action

The Settling Performing Defendants shall design an Enhanced Reductive Dechlorination (ERD) remedy component to address contaminated groundwater at the Site. The groundwater remedy component shall include the installation of injection wells at the Site to introduce a readily degradable carbon amendment, consistent with the successful Early Action Pilot Test previously conducted at the Site. It is expected that the injection of this carbon amendment will result in the destruction of CVOCs in the groundwater beneath the Site. The Settling Performing Defendants shall design the groundwater remedy component to achieve the following cleanup standards in groundwater beneath the Site.

• Trichloroethylene	0.005 ppm
• Cis-1,2-DCE	0.070 ppm
• Vinyl Chloride	0.002 ppm
• Ethylbenzene	0.070 ppm
• Benzene	0.005 ppm
• Xylenes	10.0 ppm
• Arsenic	0.010 ppm

These standards are based upon the Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act for each of these constituents. Final concentrations of contaminants must also achieve the protective risk level of 1×10^{-5} for cumulative exposure after MCLs have been met. If additional compounds are found to be above MCLs or health-based standards as identified in the ROD during any monitoring event, those compounds shall be added to the list above with appropriate EPA-approved groundwater performance standards.

The Settling Performing Defendants shall design the Remedial Action at the Site to comply with all ARARs as required by law. Subsurface injections for in-situ soil and groundwater remediation shall meet the requirements of Ohio Admin. Code § 3745-34, which is Ohio's underground injection control program. Maximum Contaminant Levels (MCLs) established under Ohio Admin. Code § 3745-81 shall be met throughout the groundwater plume beneath the Site.

5. Installation and Operation of Monitoring Program for Remedial Action

Settling Performing Defendants shall implement monitoring program(s) to evaluate and ensure that the construction and implementation of the Remedial Action comply with approved plans and design documents and performance standards. Settling Performing Defendants shall submit monitoring programs as part of the Remedial Design Work Plan, which shall address the specific aspects of the Remedial Action listed below. Each sample shall be analyzed for a list of parameters approved by U.S. EPA during the Remedial Design phase.

A. Soil Verification

The Settling Performing Defendants shall develop and submit to U.S. EPA for its approval, a soil verification sampling plan to propose sampling locations and sampling parameters to demonstrate that the PRGs in Section II, Paragraph 3 have been achieved, or that the cumulative excess carcinogenic risk from exposure to Site soils does not exceed 1×10^{-5} (one in ten thousand) in a U.S. EPA-approved risk assessment. The verification sampling plan shall include, at a minimum, sampling for all contaminants listed in Section II, Paragraph 3 and representative sampling locations throughout the lateral and vertical extent of the soil treatment zones at the Site.

B. Groundwater Monitoring

The Settling Performing Defendants shall implement a groundwater monitoring program as

identified in the approved Remedial Action Work Plan. The Settling Performing Defendants shall design a groundwater monitoring program to detect changes in the chemical concentrations of the groundwater at and adjacent to the site and to monitor the effectiveness of the in-situ ERD groundwater remediation. This network shall include selected wells from the existing monitoring well network, as well as the installation of additional wells, as needed and identified in the approved Remedial Action Work Plan.

Upon commencement of the Remedial Action and thereafter during the Remedial Action, the Settling Performing Defendants shall sample the monitoring wells identified in the approved Remedial Action Work Plan on a quarterly basis, and analyze the samples for, at a minimum, the parameters listed in Section II, Paragraph 4. The Settling Performing Defendants shall collect quarterly samples for at least two years to assess the performance of the Remedial Action. The Settling Performing Defendants may petition U.S. EPA to reduce the sampling frequency, following a demonstration that quarterly sampling is no longer necessary to demonstrate that the remedy is operating successfully and that human health protectiveness is maintained. The Settling Performing Defendants shall also design the monitoring well network to demonstrate that no arsenic concentrations above the groundwater cleanup standard are migrating away from the Site and potentially reaching off-property receptors.

Groundwater monitoring shall continue until none of the contaminants listed in Section II, Paragraph 4 exceeds any performance standard in any of the wells in the monitoring network. After that time, the Settling Performing Defendants shall continue sampling and analysis of groundwater at and adjacent to the Site, in accordance with a long-term groundwater monitoring plan to be developed following completion of the active phase of the groundwater remedy component, to demonstrate continued compliance with the cleanup standards for a minimum of three consecutive sampling events.

If, at any time, additional information indicates that the groundwater monitoring program in place at the Site is inadequate, U.S. EPA may require additional groundwater monitoring wells and laboratory analysis of additional parameters.

III. SCOPE OF REMEDIAL DESIGN AND REMEDIAL ACTION

The Remedial Design/Remedial Action shall consist of five tasks. All plans are subject to EPA approval.

Task 1: Remedial Design Work Plan

Task 2: Remedial Design Phases

A. Pre-Design Investigation Work Plan

B. Preliminary Design

- C. Intermediate Design
- D. Pre-final Design/ Final Design

Task 3: Remedial Action/Construction

- A. Preconstruction Meeting
- B. Pre-final Inspection
- C. Final Inspection
- D. Reports
 - 1. Final Construction Report
 - 2. Soil Mixing Completion Report
 - 3. Completion of Work Report

Task 4: Operation and Maintenance

Task 5: Performance Monitoring

- A. Soil Verification Sampling Plan
- B. Groundwater Monitoring Plan

Task 1: Remedial Design Work Plan

The Settling Performing Defendants shall submit a Work Plan which shall document the overall management strategy for performing the design, construction, operation, maintenance and monitoring of the Remedial Action for U.S. EPA review and approval. The plan shall document the responsibility and authority of all organizations and key personnel involved with the implementation and shall include a description of qualifications of key personnel directing the Remedial Design, including contractor personnel. The Work Plan shall also contain a schedule of Remedial Design activities. The Settling Performing Defendants shall submit a Remedial Design Work Plan in accordance with § VI and paragraph 11 of the Consent Decree and Section III of this SOW.

This Remedial Design will require a pre-design investigation to provide information necessary to fully implement the Remedial Design and Remedial Action. The Settling Performing Defendants shall submit plans and a schedule for completion of a Pre-Design Investigation Work Plan, described in Task 2.A., below; a Health and Safety Plan for field design activities that conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120; a preliminary design submission; an intermediate design submission; and a pre-final/final design submission. The Settling Performing Defendants may incorporate any of these plans that have been approved previously for the Site by reference into the Pre-Design Investigation Work Plan.

The Settling Performing Defendants shall implement the pre-design work in accordance with the final RD Work Plan. The results of the pre-design studies shall be presented in a Pre-Design Investigation Report.

Task 2: Remedial Design Phases

1. Settling Performing Defendants shall prepare construction plans and specifications to implement the Remedial Action at the Site as described in the ROD and this SOW. Plans and specifications shall be submitted in accordance with the schedule set forth in Section V below. Subject to approval by U.S. EPA, Settling Performing Defendants may submit more than one set of design submittals reflecting different aspects of the Remedial Action. All plans and specifications shall be developed in accordance with U.S. EPA's Superfund Remedial Design and Remedial Action Guidance (OSWER Directive No. 9355.0-4A) and shall demonstrate that the Remedial Action shall meet all objectives of the ROD, the CD and this SOW, including all Performance Standards. Settling Performing Defendants shall meet regularly with U.S. EPA to discuss design issues.

A. Pre-Design Investigation Work Plan

Settling Performing Defendants shall submit a Pre-Design Investigation Work Plan to further delineate the extent of contamination in soil in the previously defined treatment areas (i.e., Treatment Areas A, B, C, D and E as described in the FS Report) and to determine appropriate carbon amendment dosing rates to achieve successful destruction of site contaminants. The Pre-Design Investigation Work Plan shall include or discuss, at a minimum, the following:

- A Field Sampling Plan describing, among other things, the proposed sampling locations and a list of analytes;
- A Pre-Design Quality Assurance Project Plan developed in accordance with Section VIII (Quality Assurance, Sampling, and Data Analysis) of the Consent Decree;
- A plan for developing and testing the appropriate additive dosing rates for optimal contaminant destruction at the Site;
- A Health and Safety Plan for the Pre-Design Investigation; and
- A schedule for delivery of a draft Pre-Design Investigation Report discussing the findings and recommendations for developing the Remedial Action.

Upon U.S. EPA approval of the Pre-Design Investigation Work Plan, the Settling Performing Defendants shall implement the Pre-Design Investigation and submit the draft Pre-Design Investigation Report within 90 days of U.S. EPA approval of the Pre-Design Investigation Work Plan.

B. Preliminary Design

Settling Performing Defendants shall submit the Preliminary Design when the design effort is approximately 30% complete, but no later than 45 days after U.S. EPA's approval of the Final Pre-Design Investigation Report. The Preliminary Design submittal shall include or discuss, at a minimum, the following:

- A description of all design criteria;
- Results of the pre-design investigation, any treatability studies, and additional field sampling;
- A project delivery strategy;
- Preliminary plans, drawings, and sketches, including design calculations;
- Outline of required design specifications;
- A preliminary construction schedule;
- Proposed siting/locations of processes/construction activity;
- Expected long-term monitoring and operation requirements;
- Real estate, easement, and permit requirements; and
- Draft ICIAP.

C. Intermediate Design

Settling Performing Defendants shall submit the Intermediate Design when the design effort is approximately 60 % complete, but no later than 45 days after receipt of U.S. EPA's comments on the Preliminary Design. The Intermediate Design shall fully address all comments made to the preceding design submittal. The Intermediate Design submittal shall include those elements listed for the Preliminary Design, as well as, the following:

- Draft Performance Standard Verification Plan;
- Draft Construction Quality Assurance Plan (CQAP);
- Draft Field Sampling Plan for Remedial Action;
- Draft Quality Assurance Project Plan (QAPP) Addendum;
- Draft Health and Safety Plan for Remedial Action; and
- Draft Contingency Plan.

D. Pre-final and Final Designs

Settling Performing Defendants shall submit the Pre-final Design when the design effort is 95% complete, but no later than 45 days after receipt of U.S. EPA's comments on the Intermediate Design, and shall submit the Final Design when the design effort is 100% complete, but no later than 45 days after receipt of U.S. EPA's comments on the Pre-final Design. The Pre-final Design shall fully address all comments made to the preceding design submittal. The Final Design shall fully address all comments made to the Pre-final Design. The Pre-final Design shall serve as the Final Design if U.S. EPA has no further comments and issues the notice to proceed.

The Pre-final and Final Design submittals shall include those elements listed for the Preliminary Design, as well as, the following:

- Final drawings and specifications suitable for bid advertisement;
- Final Performance Standard Verification Plan;
- Final Quality Assurance Project Plan (QAPP) Addendum;
- Final Construction Quality Assurance Plan (CQAP);
- Final Health and Safety Plan for Remedial Action;
- Final Contingency Plan;
- Draft Operation and Maintenance (O&M) Plan for the Remedial Action;
- Pre-final Project Schedule for the construction and implementation of the Remedial Action which identifies timing for initiation and completion of all critical path tasks.

Task 3: Remedial Action Construction

Within 45 days after the approval of the final design submission, Settling Performing Defendants shall submit a work plan for the performance of the Remedial Action at the Site ("Remedial Action Work Plan"). The Remedial Action Work Plan shall provide for construction and implementation of the remedy set forth in the ROD in accordance with the Remedial Design approved by EPA. The Remedial Action Work Plan shall include the following:

- The pre-final project schedule for Remedial Action from the final design;
- A method for selection of the Remedial Action contractor, the contract for which shall be awarded no later than 60 days following U.S. EPA's issuance of the Notice of Authorization to Proceed with Remedial Action;
- A schedule for developing and submitting other required Remedial Action plans;
- A groundwater monitoring plan for assessing the performance of the Remedial Action;

- Methods for satisfying permitting requirements;
- Final O&M;
- Procedures and plans for the decontamination of equipment and the disposal of contaminated materials;
- A schedule for completing the Soil Mixing Completion Report;
- A schedule for completing the Completion of Work Report.

The Remedial Action Work Plan also shall include the methodology for implementing the CQAP and a preliminary schedule for implementing all Remedial Action tasks identified in the final design submission and shall identify the initial formulation of Settling Performing Defendants' Remedial Action project team (including, but not limited to, the Supervising Contractor). A final project schedule that includes specific dates for completion of the project and major milestones shall be submitted following selection of the Remedial Action contractor. Upon approval of the Remedial Action Work Plan and notice to proceed with Remedial Action by EPA, Settling Performing Defendants shall implement the activities required under the Remedial Action Work Plan. Unless otherwise directed by EPA, Settling Performing Defendants shall not commence physical Remedial Action activities at the Site prior to approval of the Remedial Action Work Plan and notice to proceed with the Remedial Action.

The Settling Performing Defendants shall implement the Remedial Action as detailed in the approved Final Design and approved Remedial Action Work Plan. The following activities shall be completed in constructing the Remedial Action.

Pre-construction inspection and meeting:

Within 30 days after award of the Remedial Action contract in accordance with the approved Remedial Action Work Plan, the Settling Performing Defendants shall participate with the U.S. EPA and the State in a pre-construction inspection and meeting to:

- a. Review methods for documenting and reporting inspection data;
- b. Review methods for distributing and storing documents and reports;
- c. Review work area security and safety protocol;
- d. Discuss any appropriate modifications of the construction quality assurance plan to ensure that site-specific considerations are addressed; and,
- e. Conduct a Site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.

The pre-construction inspection and meeting shall be documented by a designated person and minutes shall be transmitted to all parties.

Within 30 days following the Pre-construction inspection and meeting, the Settling Performing Defendants shall implement the Remedial Action as detailed in the approved Final Design and approved Remedial Action Work Plan. The Settling Performing Defendants shall complete construction of the Remedial Action within 120 days after receipt of U.S. EPA's authorization to proceed with the Remedial Action or as approved by U.S. EPA in the Remedial Action construction schedule, whichever is later.

Task 4: Operation and Maintenance

The Settling Performing Defendants shall prepare an Operation and Maintenance (O&M) Plan to cover both implementation and long-term maintenance of the Remedial Action. An initial Draft O&M Plan shall be submitted as a Final Design Document submission. The final O&M Plan shall be submitted to U.S. EPA prior to the pre-final inspection for Completion of Soil Remedy Component, in accordance with the approved construction schedule. The plan shall be composed of the following elements:

- A. Description of normal operation and maintenance ;
 - 1. Description of tasks for operation;
 - 2. Description of tasks for maintenance;
 - 3. Description of prescribed treatment or operation conditions; and
 - 4. Schedule showing frequency of each O&M task.
- B. Description of potential operating problems;
 - 1. Description and analysis of potential operation problems;
 - 2. Sources of information regarding problems; and
 - 3. Common and/or anticipated remedies.
- C. Description of routine monitoring and laboratory testing;
 - 1. Description of monitoring tasks;
 - 2. Description of required data collection, laboratory tests and their interpretation;
 - 3. Required quality assurance, and quality control;
 - 4. Schedule of monitoring frequency and procedures for a petition to U.S. EPA to reduce the frequency of or discontinue monitoring; and
 - 5. Description of verification sampling procedures if Cleanup or Performance Standards are exceeded in routine monitoring.

D. Description of alternate O&M;

1. Should systems fail, alternate procedures to prevent release or threatened releases of hazardous substances, pollutants or contaminants which may endanger public health and the environment or exceed performance standards; and
2. Analysis of vulnerability and additional resource requirement should a failure occur.

E. Corrective Action;

1. Description of corrective action to be implemented in the event that cleanup or performance standards are exceeded; and
2. Schedule for implementing these corrective actions.

F. Safety plan;

1. Description of precautions, of necessary equipment, etc., for Site personnel; and
2. Safety tasks required in event of systems failure.

G. Description of equipment; and

1. Equipment identification;
2. Installation of monitoring equipment;
3. Maintenance of Site equipment; and
4. Replacement schedule for all installed equipment components.

H. Records and reporting mechanisms required.

1. Operating logs;
2. Laboratory records;
3. Records for operating costs;
4. Mechanism for reporting emergencies;
5. Personnel and maintenance records; and
6. Monthly/annual reports to State agencies.

Task 5: Performance Monitoring

Performance monitoring shall be conducted to ensure that all Performance Standards are met.

A. Performance Standard Verification Plan

The purpose of the Performance Standard Verification Plan is to provide a mechanism to ensure that both short-term and long-term Performance Standards for the Remedial Action are met. The Draft Performance Standards Verification Plan shall be submitted with the Intermediate Design. Once approved, the Performance Standards Verification Plan shall be implemented on the approved schedule. The Performance Standards Verification Plan shall include:

1. Field Sampling Plan Addendum for verification sampling;
2. Quality Assurance Project Plan Addendum for verification sampling; and
3. Health and Safety Plan Addendum.

The Settling Performing Defendants may incorporate previously approved Site plans by reference, if appropriate.

IV. CONTENT OF SUPPORTING PLANS

The documents listed in this section -- the Quality Assurance Project Plan, the Field Sampling Plan, the Health and Safety Plan, the Contingency Plan and the Construction Quality Assurance Plan -- are documents which must be prepared and submitted as outlined in Section III of this SOW. The following section describes the required contents of each of these supporting plans.

A. Quality Assurance Project Plan

The Settling Performing Defendants shall develop a Site-specific Quality Assurance Project Plan (QAPP), covering sample analysis and data handling for samples collected in all phases of future Site work, based upon the Consent Decree and guidance provided by U.S. EPA. The QAPP shall be consistent with the requirements of the EPA Contract Lab Program (CLP) for laboratories proposed outside the CLP. The QAPP shall at a minimum include:

1. Project Description
 - Facility Location History
 - Past Data Collection Activity
 - Project Scope
 - Sample Network Design
 - Parameters to be Tested and Frequency
 - Project Schedule
2. Project Organization and Responsibility
3. Quality Assurance Objective for Measurement Data
 - Level of Quality Control Effort
 - Accuracy, Precision and Sensitivity of Analysis
 - Completeness, Representativeness and Comparability

4. Sampling Procedures
5. Sample Custody
 - Field Specific Custody Procedures
 - Laboratory Chain of Custody Procedures
6. Calibration Procedures and Frequency
 - Field Instruments/Equipment
 - Laboratory Instruments
7. Analytical Procedures
 - Non-Contract Laboratory Program
 - Analytical Methods
 - Field Screening and Analytical Protocol
 - Laboratory Procedures
8. Internal Quality Control Checks
 - Field Measurements
 - Laboratory Analysis
9. Data Reduction, Validation, and Reporting
 - Data Reduction
 - Data Validation
 - Data Reporting
10. Performance and System Audits
 - Internal Audits of Field Activity
 - Internal Laboratory Audit
 - External Field Audit
 - External Laboratory Audit
11. Preventive Maintenance
 - Routine Preventative Maintenance Procedures and Schedules
 - Field Instruments/Equipment
 - Laboratory Instruments
12. Specific Routine Procedures to Assess Data Precision, Accuracy, and Completeness
 - Field Measurement Data
 - Laboratory Data

13. Corrective Action
 - Sample Collection/Field Measurement
 - Laboratory Analysis

14. Quality Assurance Reports to Management

The Settling Performing Defendants shall attend a pre-QAPP meeting with U.S. EPA. The Settling Performing Defendants shall submit a draft QAPP to U.S. EPA for review and approval.

If appropriate, the Settling Performing Defendants may incorporate a previously approved Site QAPP by reference.

B. Health and Safety Plan

The Settling Performing Defendants shall develop a health and safety plan which is designed to protect on-site personnel and area residents from physical, chemical and all other hazards posed by this Remedial Action. The safety plan shall develop the performance levels and criteria necessary to address the following areas.

1. Facility Description
2. Personnel
3. Levels of protection
4. Safe work practices and safe guards
5. Medical surveillance
6. Personal and environmental air monitoring
7. Personal protective equipment
8. Personal hygiene
9. Decontamination - personal and equipment
10. Site work zones
11. Contaminant control
12. Contingency and emergency planning
13. Logs, reports and record keeping

The safety plan shall follow U.S. EPA guidance and all OSHA requirements as outlined in 29 CFR 1910 and 1926.

If appropriate, the Settling Performing Defendants may incorporate a previously approved Site HASP by reference.

C. Contingency Plan

Settling Performing Defendants shall submit a Contingency Plan describing procedures to be used in the event of an accident or emergency at the site. The draft Contingency Plan shall be submitted

with the intermediate design and the final Contingency Plan shall be submitted with the final design. The Contingency Plan shall include, at a minimum, the following:

1. Name of the person or entity responsible for responding in the event of an emergency incident.
2. Plan and date(s) for meeting(s) with the local community, including local, State and Federal agencies involved in the cleanup, as well as local emergency squads and hospitals.
3. First aid medical information.
4. Air Monitoring Plan (if applicable).
5. Spill Prevention, Control, and Countermeasures (SPCC) Plan (if applicable), as specified in 40 CFR Part 109 describing measures to prevent and contingency plans for potential spills and discharges from materials handling and transportation.

D. Field Sampling Plan

The Settling Performing Defendants shall develop a field sampling plan (as described in "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA," October 1988). The Field Sampling Plan should supplement the QAPP and address all sample collection activities.

E. Construction Quality Assurance Plan

Settling Performing Defendants shall submit a Construction Quality Assurance Plan (CQAP) which describes the Site specific aspects of the quality assurance program which shall ensure that the completed project meets or exceeds all design criteria, plans, and specifications. The draft CQAP shall be submitted with the intermediate design and the final CQAP shall be submitted with the final design. The CQAP shall contain, at a minimum, the following elements:

1. Responsibilities and authorities of all organizations and key personnel involved in the design and construction of the Remedial Action.
2. Qualifications of the Quality Assurance Official to demonstrate he possesses the training and experience necessary to fulfill his identified responsibilities.
3. Protocols for sampling and testing used to monitor construction.
4. Identification of proposed quality assurance sampling activities including the sample size, locations, frequency of testing, acceptance and rejection data sheets, problem identification and corrective measures reports, evaluation reports, acceptance reports, and final documentation. A description of the provisions for final storage of all records consistent with the requirements of the Consent Decree shall be included.

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

V. APPROVAL OF COMPLETION OF SOIL REMEDY COMPONENT

A. Pre-final inspection for completion of the soil remedy component:

Within 90 days after Settling Performing Defendants conclude that the soil remedy component described in Section II, Paragraph 3 of this SOW has been fully performed, including, but not limited to, achievement of the performance standards for soil, Settling Performing Defendants shall schedule and conduct a pre-final inspection for completion of the soil remedy component to be attended by Settling Performing Defendants and EPA. Notice of such inspection shall also be provided to the State at least 14 days before the inspection is to take place. Settling Performing Defendants shall submit the final ICIAP prior to conducting the pre-final inspection for completion of the soil remedy component. The pre-final inspection for completion of the soil remedy component shall consist of a walk-through inspection of the entire Lammers Barrel Factory Property, with emphasis on the treatment zones, and other locations where all aspects of the soil remedy component have been performed. Settling Performing Defendants shall identify in writing to EPA any outstanding deficiencies discovered during the inspection.

B. Soil Mixing Completion Report

If, after the pre-final inspection for completion of the soil remedy component, Settling Performing Defendants still believe that the soil remedy component described in Section II, Paragraph 3 of this SOW has been fully performed, they shall submit a Soil Mixing Completion Report to EPA for approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables) of the Consent Decree, with a copy to the State, within 60 days after the inspection. In the Soil Mixing Completion Report, a registered professional engineer and Settling Performing Defendants' Project Coordinator shall state that the soil remedy component has been performed in full satisfaction of the requirements of the Consent Decree, including the achievement of all of the performance standards for soil on the Lammers Barrel Factory Property. The Soil Mixing Completion Report shall include as-built drawings signed and stamped by a professional engineer. The report shall contain the following statement, signed by a responsible corporate official of a Settling Performing Defendant or Settling Performing Defendants' Project Coordinator:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and

belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If EPA concludes, based on the initial or any subsequent Soil Mixing Completion Report, after a reasonable opportunity for review and comment by the State, that the soil remedy component has been performed and completed in accordance with this Consent Decree, including, but not limited to achievement of the performance standards for soil, EPA will approve the Soil Mixing Completion Report. Approval of the Soil Mixing Completion Report will not affect Settling Performing Defendant's other obligations or constitute any determination with respect to performance of the groundwater remedy component described in Section II, Paragraph 4 of this SOW.

If, after completion of the pre-final inspection for completion of the soil remedy component and receipt and review of the Soil Mixing Completion Report, EPA, after reasonable opportunity for review and comment by the State, determines that the soil remedy component or any portion thereof has not been completed in accordance with the Consent Decree and SOW, EPA will notify Settling Performing Defendants in writing of the activities that must be undertaken by Settling Performing Defendants pursuant to the Consent Decree and SOW to complete the soil remedy component, provided, however, that EPA may only require Settling Performing Defendants to perform such activities to the extent that such activities are consistent with the "scope of the remedy set forth in the ROD." EPA will set forth in the notice a schedule for performance of such construction activities or require Settling Performing Defendants to submit a schedule to EPA for approval. Settling Performing Defendants shall perform all activities described in the notice in accordance with the specifications and schedules, subject to their right to invoke the dispute resolution procedures set forth in Section XX (Dispute Resolution) of the Consent Decree. Within 45 days after the final inspection for completion of the soil remedy component, the Settling Performing Defendants shall submit for EPA approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables) of the Consent Decree a final Soil Mixing Completion Report that shall document the resolution of all outstanding activities required to achieve completion of the soil remedy component at the Lammers Barrel Factory Property.

C. Final inspection for completion of the soil remedy component:

Within 30 days after completion of any additional activities that are required to achieve completion of the soil remedy component that were identified during the pre-final inspection, in the Soil Mixing Completion Report, or by EPA, the Settling Performing Defendants shall schedule and conduct a final inspection for completion of the soil remedy component to be attended by the Settling Performing Defendants and EPA. Notice of such inspection shall also be provided to the State at least 14 days before the final inspection is to take place. The final inspection for completion of the soil remedy component shall consist of a document review and a walk-through inspection of the Lammers Barrel Factory Property, with emphasis on the treatment zones, and other locations where all aspects of the soil remedy component have been performed. A list of outstanding activities identified during the pre-final inspection, in the written Soil Mixing Completion Report, or by EPA,

and a schedule for their completion shall be used as a checklist for the final inspection for completion of the soil remedy component, as set forth in Section V, Paragraph B, above. Within 45 days after the final inspection for completion of the soil remedy component, the Settling Performing Defendants shall issue a final Soil Mixing Completion Report that shall document the resolution of all outstanding activities.

VI. CERTIFICATION OF COMPLETION OF WORK

A. Pre-final inspection for Completion of the Work:

Within 90 days after Settling Performing Defendants conclude that all phases of the Work, including, but not limited to, all Operation and Maintenance and monitoring activities (other than any remaining activities required under Section VII (Remedy Review) of the Consent Decree) and achievement and maintenance of all performance standards have been fully performed, Settling Performing Defendants shall schedule and conduct a pre-final inspection for Completion of the Work to be attended by Settling Performing Defendants and EPA. Notice of such inspection shall also be provided to the State at least 14 days before the pre-final inspection is to take place. The pre-final inspection for Completion of the Work shall consist of a walk-through inspection of the entire Lammers Barrel Factory Property and other locations where the Work has been performed. The pre-final inspection for Completion of the Work is to determine whether all phases of the Work are complete, including, but not limited to, the requirements of the Remedial Action Work Plan, achievement and maintenance of performance standards, and O&M.

B. Completion of Work Report

Within 60 days following completion of the pre-final inspection for Completion of the Work, Settling Performing Defendants shall submit to EPA for approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables) of the Consent Decree a pre-final inspection report for Completion of Work which shall identify any outstanding deficiencies in the Work discovered during the inspection, actions required to resolve any such deficiencies, and a completion date for these items. If, after the pre-final inspection, Settling Performing Defendants still believe that the Work has been fully performed, Settling Performing Defendants shall submit the pre-final inspection report with a written statement by a registered professional engineer or Settling Performing Defendants' Project Coordinator stating that the Work has been completed in full satisfaction of the requirements of this Consent Decree, including, but not limited to, achievement and maintenance of all performance standards. The written report shall include as-built drawings signed and stamped by a professional engineer. The report shall contain the following statement, signed by a responsible corporate official of a Settling Performing Defendant or Settling Performing Defendants' Project Coordinator:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of

the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If, after review of the written report, EPA, after reasonable opportunity for review and comment by the State, determines that any portion of the Work has not been completed in accordance with the Consent Decree, EPA will notify Settling Performing Defendants in writing of the activities that must be undertaken by Settling Performing Defendants pursuant to the Consent Decree to complete the Work, provided, however, that EPA may only require Settling Performing Defendants to perform such activities pursuant to this Paragraph to the extent that such activities are consistent with the "scope of the remedy set forth in the ROD." EPA will set forth in the notice a schedule for performance of such activities consistent with the Consent Decree and the SOW or require Settling Performing Defendants to submit a schedule to EPA for approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables) of the Consent Decree. Settling Performing Defendants shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to their right to invoke the dispute resolution procedures set forth in Section XX (Dispute Resolution) of the Consent Decree.

C. Final inspection for Completion of the Work:

Within 30 days after completion of any additional activities that are required to achieve Completion of the Work that were identified during the pre-final inspection, in the written Completion of Work Report, or by EPA, the Settling Performing Defendants shall schedule and conduct a final inspection for Completion of the Work to be attended by the Settling Performing Defendants and EPA. Notice of such inspection shall also be provided to the State at least 14 days before the final inspection is to take place. The final inspection of the Work shall consist of a document review and a walk-through inspection of the Lammers Barrel Factory Property and other locations where the Work has been performed. The list of outstanding activities and schedule for their completion shall be used as a checklist for the final inspection of the Work. Within 45 days after the final inspection for Completion of the Work, the Settling Performing Defendants shall submit a final Completion of Work Report to EPA for approval pursuant to Section XI (EPA Approval of Plans, Reports, and Other Deliverables) of the Consent Decree that shall document the resolution of all outstanding activities.

VII. SUMMARY OF MAJOR DELIVERABLES/SCHEDULE

A summary of the project schedule and reporting requirements contained in this SOW is presented below:

	<u>Submission</u>	<u>Due Date</u>
1.	Remedial Design Work Plan	Sixty (60) days after Notice of Authorization to Proceed
2.	Pre-Design Investigation Work Plan	As set in the Remedial Design Work Plan
3.	Pre-Design Investigation Report	Ninety (90) days after U.S. EPA's approval of the Pre-Design Investigation Work Plan
4.	Preliminary Design (30%)	Forty-five (45) days after U.S. EPA's approval of the Final Pre-Design Investigation Report
5.	Intermediate Design (60%)	Forty-five (45) days after receipt of U.S. EPA's comments on the Preliminary Design
6.	Pre-Final Design (95%)	Forty-five (45) days after receipt of U.S. EPA's comments on the Intermediate Design
7.	Final Design (100%)	Forty-five (45) days after receipt of U.S. EPA's comments on the Pre-Final Design
8.	Remedial Action Work Plan	Forty-five (45) days after U.S. EPA's approval of the Final Design
9.	Award Remedial Action Contract(s)	Sixty (60) days after receipt of U.S. EPA's Notice of Authorization to Proceed with Remedial Action
10.	Pre-Construction Inspection and Meeting	Thirty (30) days after Award of Remedial Action Contract(s)
11.	Initiate Construction of Remedial Action	Thirty (30) days after Pre-Construction Inspection and Meeting

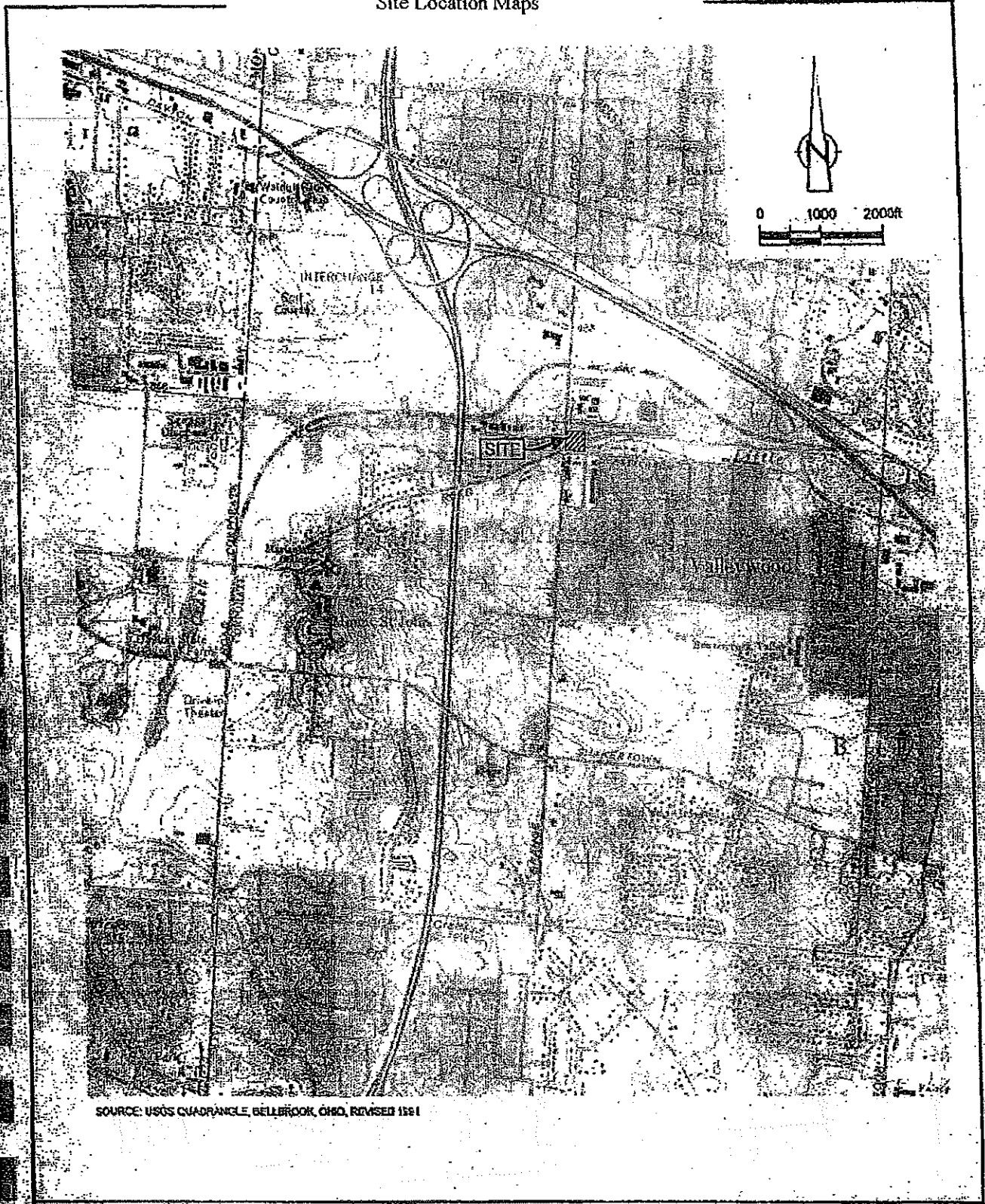
12.	Completion of Construction	One-hundred twenty (120) days after receipt of U.S. EPA's Authorization to Proceed with Remedial Action or as approved by U.S. EPA in the Remedial Action construction schedule
13.	Submit Final ICIAP	Prior to conducting the Pre-Final Inspection for completion of the soil remedy component
14.	Schedule and Conduct Pre-Final Inspection for completion of the soil remedy component	Ninety (90) days after Settling Performing Defendants conclude that the soil remedy component has been fully performed
15.	Soil Mixing Completion Report	Sixty (60) days after Pre-Final Inspection for completion of the soil remedy component
16.	Schedule and Conduct Final Inspection for completion of the soil remedy component (if applicable)	Thirty (30) days after completion of outstanding activities identified pursuant to Section V, Paragraph B of the SOW
17.	Revised Soil Mixing Completion Report	Forty-five (45) days after Final Inspection for completion of the soil remedy component
18.	Schedule and Conduct Pre-Final Inspection for Completion of the Work	Ninety (90) days after Settling Performing Defendants conclude that all phases of the Work have been fully performed
19.	Completion of Work Report	Sixty (60) days after Pre-Final Inspection for Completion of the Work
20.	Schedule and Conduct Final Inspection for Completion of the Work (if applicable)	Thirty (30) days after completion of outstanding activities identified pursuant to Section VI, Paragraph B of the SOW
21.	Revised Completion of Work Report	Forty-five (45) days after Final Inspection for Completion of the Work

United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Appendix C

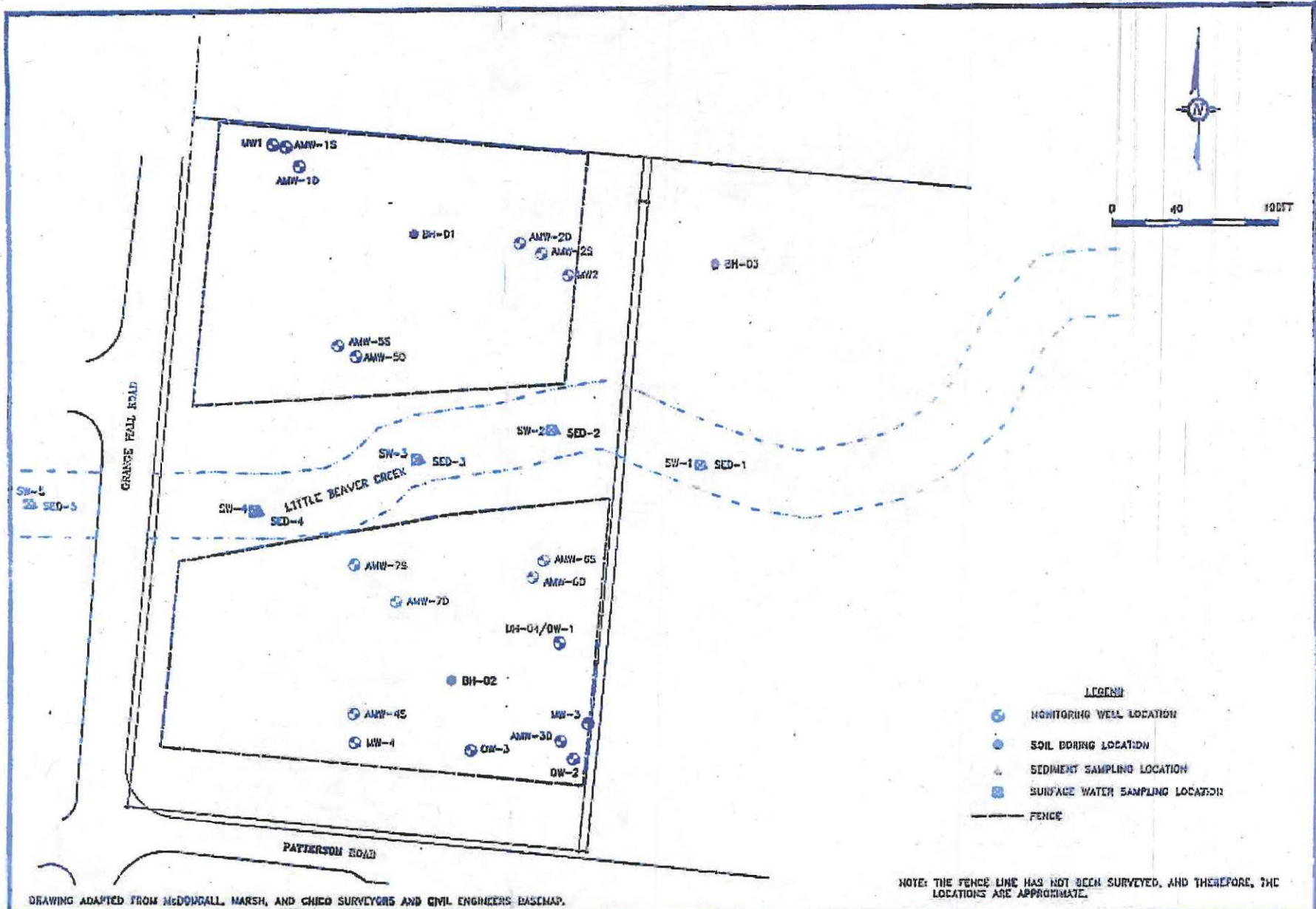
Site Location Maps

et al. (S.D. Ohio)
 Site Location Maps



SOURCE: USGS QUADRANGLE, BELLBROOK, OHIO, REVISED 1981

<p>ARCADIS</p> <p>1000 Independence Ave NW Washington, DC 20004 Tel: 202-462-3600 Fax: 202-462-3601</p>	SITE LOCATION MAP LAMMERS BARREL FACILITY BEAVERCREEK, OHIO		
	DATE: 1/24/2013	PROJECT MANAGER: J. PRADHUM	DRAWING NO.: 0001228.0003
	DRAWN BY: R. CHEN	LEAD DESIGN ENGINEER: M. GILBERT	CHECKED BY: A. PERRETTI



DRAWING ADAPTED FROM McDONNELL, MARSH, AND CHICO SURVEYORS AND CIVIL ENGINEERS BASEMAP.



SITE BASE MAP
LAMMERS BARREL FACILITY
BEAVERCREEK, OHIO

DATE 3/24/2010	PROJECT MANAGER J. KRATZLMEYER	DRAWING NAME LAMMERS-01
DRAWN BY R. SMITH	LEAD DESIGN PROF. N. GILLOTTI	CHECKED A. PENNINGTON
PROJECT NUMBER C1001228.0003		FIGURE NUMBER 2

United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree

Appendix D

Environmental Restrictive Covenant

To Consent Decree, *United States v. 3M Company*,
et al.(S.D. Ohio)
Environmental Restrictive Covenant

To be recorded with Deed
Records – ORC § 317.08

ENVIRONMENTAL RESTRICTIVE COVENANT

This Environmental Covenant is made this ___ day of ___ by and among Owner Helen Gorby, and Holder Helen Gorby (as further identified below, and referred to either as “Owner” or “Holder” herein) pursuant to Ohio Revised Code (“ORC”) §§ 5301.80 to 5301.92 for the purpose of subjecting the Property (described below) to the activity and use limitations and to the rights of access set forth herein.

WHEREAS, Owner is the owner of certain real property, encompassing approximately 2.5 acres, consisting of parcels of land located at the northeast corner of the intersection of Grange Hall and East Patterson Roads in the City of Beavercreek, Greene County, Ohio, where the treatment, storage, and/or disposal of hazardous substances may have occurred and legally described in Exhibit “A” hereto (collectively referred to herein as the “Property”);

WHEREAS, the Property comprises a significant portion of the Lammers Barrel Superfund Site (“Site”);

WHEREAS, certain entities that comprise the Lammers Barrel Site Group executed with the United States Environmental Protection Agency (“EPA”) an Administrative Order on Consent, issued on April 9, 2002, to conduct a remedial investigation and feasibility study (RI/FS) at the Site (the “2002 AOC”);

WHEREAS, pursuant to Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act (“CERCLA”), 42 U.S.C. §9605, the EPA, placed the Site on the National Priorities List, set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register, 68 Fed. Reg. 55875 (September 29, 2003);

WHEREAS, pursuant to the 2002 AOC, the Lammers Barrel Site Group completed a Remedial Investigation (“RI”) for the Property on August 8, 2008 and a Feasibility Study (“FS”) for the Property in June 2011; and the RI/FS found volatile organic chemicals (“VOCs”) and chlorinated volatile organic chemicals (“CVOCs”) in the groundwater and soil at the Site including: benzene, ethyl benzene, toluene, xylene, cis-1,2- dichloroethene, trans- 1,2- dichloroethene, 1,1-dichloroethane, chloroform, vinyl chloride, ethene, and ethane;

WHEREAS, EPA issued a Record of Decision (“ROD”) for Operable Unit 1 at the Property, on September 27, 2011, which provided for in situ biological treatment of impacted soils using soil mixing to treat principal threat wastes; in situ groundwater treatment using enhanced reductive dechlorination to address contaminated water; institutional controls in accordance with the Ohio Uniform Environmental Covenant Act to prohibit residential use of the Lammers Barrel Factory Property and to prohibit the installation of wells on the Property other than those installed as part of the remedial action, and for operation and maintenance (“O&M”) of the remedy; and

WHEREAS, as a current owner of the Property, the Owner is alleged to be liable as a potentially responsible party ("PRP") under CERCLA, as amended, 42 U.S.C. § 9601-9675 (2012) with respect to the Property;

WHEREAS, in order to implement the remedy that may be selected for the Site, including O&M of the remedy, it is necessary to impose certain activity and use limitations on the Property as stated herein for the purpose of protecting human health and the environment;

WHEREAS, on _____, 2013, a Remedial Design/Remedial Action Consent Decree was entered, which provided for the implementation of the remedy for Operable Unit 1 selected in the September 27, 2011 ROD, which was executed by the Owner, the "Settling Performing Defendants" as that term is defined in the Consent Decree, the United States and other persons. The Settling Performing Defendants are named on Exhibit "C" attached hereto; and

WHEREAS, the parties to this Covenant have agreed: 1) to grant a permanent right of access over the Property to the Access Grantees (as hereafter defined) for purposes of implementing, facilitating and monitoring the remedial action, and 2) to impose on the Property activity and use limitations as covenants that will run with the land for the purpose of protecting human health and the environment.

NOW THEREFORE, Owner and EPA agree to the following:

1. Environmental Covenant. This instrument is an environmental covenant developed and executed pursuant to ORC §§5301.80 to 5301.92.
2. Property. This Environmental Covenant concerns approximately 2.45 acres of real property in City of Beavercreek, Greene County, Ohio and more particularly described in Exhibit "A" and the location of which is shown in Exhibit "B" attached hereto and hereby incorporated by reference herein (the "Property").
3. Owner. Helen Gorby, an Ohio resident, whose address is 2854 Helen Gorby Way, Beavercreek, Ohio 45431, is the Owner of the Property.
4. Holder. Helen Gorby, whose address appears in paragraph 3, is the Holder of this Environmental Covenant.
5. Third Party Beneficiaries. Owner on behalf of herself and her successors, transferees and assigns intends that the provisions of this Environmental Covenant also be for the benefit of the Settling Performing Defendants, as third party beneficiaries hereof.
6. Activity and Use Limitations.
 - A. Owner covenants for herself and her successors and assigns, that construction of wells and activities that extract, consume, or otherwise use any groundwater are prohibited on the Property except as required as part of an EPA approved response activity. No remediation, monitoring, investigation or other non-potable wells shall be installed on any part of the Property without the prior written

consent of EPA. In no event shall any groundwater located at or underlying any part of the Property be used for any purpose, potable or otherwise, except for groundwater remediation, monitoring or investigation. Any contaminated groundwater removed from the Property shall be handled in accordance with all applicable laws and regulations and as required by the ROD and/or Consent Decree

B. Owner covenants for herself and her successors and assigns that there shall be no consumptive use of Site groundwater, either on or off the Site. No water wells for potable use shall be installed on any part of the Property. The groundwater under the Property shall not be used as a potable supply of water.

C. Owner covenants for herself and her successors and assigns, that the Property shall be used solely for Commercial/Industrial and Recreational Activities only in accordance with an EPA-approved plan for re-use of the Property as required under Paragraph 6.D., below, and the Property shall not be used for Residential and Other Prohibited Activities. Owner acknowledges and agrees that the Property Area is being remediated only for commercial/industrial and recreational activities. The term "Commercial/Industrial Activities" includes: (i) wholesale and retail sales and service activities including, but not limited to retail stores, and automotive fuel, sales and service facilities; (ii) governmental, administrative and general office activities, (iii) manufacturing, processing, and warehousing activities, including, but not limited to, production, storage and sales of durable goods and other non-food chain products; and (iv) activities which are consistent with or similar to the above listed activities; together with related parking areas and driveways, but excludes Residential and Other Prohibited Activities. The term "Residential and Other Prohibited Activities" includes: (i) single and multi-family dwellings and transient residential units; (ii) day care centers and preschools; (iii) public and private elementary and secondary schools; (iv) hospitals, assisted living facilities and other extended care medical facilities and medical and dental offices; (v) food preparation and food service facilities, including food stores, restaurants, banquet facilities and other food preparation or sales facilities; (vi) correctional facilities and detention centers; and (vii) agricultural use.

D. Owner agrees for herself and her successors in title not to permit the Property to be used in any manner that would interfere with or adversely affect the integrity or protectiveness of the remedial action which has been implemented or which will be implemented pursuant to the Consent Decree unless the written consent of the EPA to such use is first obtained. Owner's agreement to restrict the use of the Property shall include, but not be limited to, not permitting any drilling, digging, building, or the installation, construction, removal or use of any buildings, wells, pipes, roads, ditches, or any other structures on the Restricted Area unless the written consent of EPA to such use or activity is first obtained. Further, Owner agrees for herself and her successors in title to refrain from bringing, and to refuse to grant permission to any other person to bring, Waste Material or Scrap Metal onto the Property, except in accordance with any federal, state or local permit or the Consent Decree.

E. Owner agrees for herself and her successors in title that for any new structures constructed or other development activities on the Property, a vapor barrier shall be installed as part of any foundation construction to mitigate potential vapor intrusion. Prior to any soil excavation activity on the Property, a Soils Management Plan shall be prepared to mitigate potential construction worker exposure to impacted subsurface soils on the Property and shall be submitted and approved by the Ohio EPA and the EPA prior to the commencement of any soils excavation activities.

In the event that any action by or on behalf of a person who owns an interest in or holds an encumbrance on the Property constitutes a violation of these activity and use limitations, Owner or Transferee, as defined herein, shall notify the EPA within thirty (30) days of becoming aware of the event or action, and Owner or Transferee shall remedy the violation of the activity and use limitations within sixty (60) days of becoming aware of the event or action, or such other time frame as may be agreed to by the Owner or Transferee and EPA.

7. Running with the Land. This Environmental Covenant shall be binding upon the Owner and all assigns and successors in interest, including any Transferee, and shall run with the land, pursuant to ORC § 5301.85, subject to amendment or termination as set forth herein. The term "Transferee," as used in this Environmental Covenant, shall mean any future owner of any interest in the Property or any portion thereof, including, but not limited to, owners of an interest in fee simple, mortgagees, easement holders, and/or lessees.

8. Requirements for Notice to EPA Following Transfer of a Specified Interest in, or Concerning Proposed Changes in the Use of, Applications for Building Permits for, or Proposals for any Site Work Affecting Contamination on, the Property. Neither Owner or any holder shall transfer any interest in the Property, or make proposed changes in the use of the Property or make applications for building permits for, or proposals for any work in the Property without first providing notice to EPA and obtaining any approvals or consents thereto which are required under Sections V, IX, or XXVI of the Consent Decree. The term "Transferee" means any person or entity to whom any interest in the Property is transferred by operation of law or contract.

9. Compliance Enforcement. Compliance with this Environmental Covenant may be enforced pursuant to applicable law. Failure to timely enforce compliance with this Environmental Covenant or the activity and use limitations contained herein by any party shall not bar subsequent enforcement by such party and shall not be deemed a waiver of the party's right to take action to enforce any non-compliance. Nothing in this Environmental Covenant shall restrict the EPA from exercising any authority under applicable law.

10. Access to the Property. Pursuant to Section IX of the Consent Decree, Owner agrees that EPA, Ohio EPA and the Settling Performing Defendants, their successors and assigns, and their respective officers, employees, agents, contractors and other invitees (collectively, "Access Grantees") shall have and hereby grants to each of them an unrestricted right of access to the Property to undertake the Permitted Uses described in Paragraph 11 below and, in connection therewith, to use all roads, drives and paths, paved or unpaved, located on the Property or off the Property ("off-site") and rightfully used by Owner and Owner's invitees for ingress to or egress from portions of the Property (collectively, "Access Roads"). The right of

access granted under this Paragraph 10 shall be irrevocable while this Covenant remains in full force and effect. The Settling Performing Defendants are named on Exhibit C attached hereto.

11. Permitted Uses. The right of access granted under Paragraph 10 of this Environmental Covenant shall provide Access Grantees with access at all reasonable times to the Property for the purpose of conducting any activity related to the Consent Decree or purchase of the Property, including, but not limited to, the following activities:

- (a) Monitoring the Work;
- (b) Verifying any data or information submitted to the United States or the State;
- (c) Conducting investigations relating to contamination at or near the Site;
- (d) Obtaining samples;
- (e) Assessing the need for, planning, or implementing response actions at or near the Site;
- (f) Implementing the Work pursuant to the Consent Decree;
- (g) Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Owner or her agents, consistent with Section XXIV (Access to Information) of the Consent Decree;
- (h) Assessing Settling Performing Defendants' compliance with the Consent Decree;
- (i) Determining whether the Site or other property is being used in a manner that is prohibited or restricted or that may need to be prohibited or restricted by or pursuant to the Consent Decree;
- (j) Implementing, monitoring, maintaining, reporting on, and enforcing any Institutional Controls and the requirements of the Institutional Control Implementation and Assurance Plan (ICIAP); and
- (k) Surveying and making soil tests of the Property, locating utility lines, and assessing the obligations which may be required of a Prospective Purchaser by EPA under the Consent Decree.

11. Administrative Record.

- (a) Owner is a Defendant in an action filed by EPA under federal programs governing environmental remediation of the Site under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980,

42 U.S.C. § 9601 *et seq.* in the United States District Court for the Southern District of Ohio, Western Division, Civil Action No., and has executed and delivered a Consent Decree dated _____, (the "Consent Decree") settling such lawsuit. A certified copy of the Consent Decree has been recorded in the Office of the Greene County Recorder at OR Book _____, Pages - - _____. The Consent Decree constitutes an environmental response project as defined by ORC § 5301.80(E) and authorizes and requires certain remedial action to be taken by the Settling Performing Defendants. On September 27, 2011, EPA issued a Record of Decision (ROD) which set forth EPA's determination of the appropriate remedial action to be implemented at the Property to address Site contamination. EPA's ROD was based upon an administrative record. Copies of the EPA administrative record for the Lammers Barrel Site are maintained at the following locations: EPA Region 5; Superfund Records Center (7th Floor); 77 W. Jackson; Chicago, Illinois 60604; Beaver Creek Community Library, 3618 Dayton-Xenia Road, Beaver Creek, Ohio 45432.

- (b) Under Section IX, Paragraph 22 of the Consent Decree, Owner has agreed to provide the institutional controls with respect to the Property that are set forth in this Environmental Covenant. Owner has executed and delivered this Environmental Covenant to satisfy and implement her agreements to provide such institutional controls under the Consent Decree and as herein provided. All capitalized terms in this Environmental Covenant which are not defined herein shall have the same meaning as set forth in the Consent Decree or in ORC §§ 5301.80 to 5301.90.

12. Notice upon Conveyance. Each instrument hereafter conveying any interest in the Property or any portion of the Property shall contain a notice of the activity and use limitations, and grants of access set forth in the Environmental Covenant, and provide the recorded location of this Environmental Covenant. For instruments conveying any interest in the Property or any portion thereof, the notice shall be substantially in the form set forth in Exhibit "D".

Owner or any Transferee shall notify the Settling Performing Defendants and EPA within ten (10) days after each conveyance of an interest in any portion of the Property. Notice by the Owner or Transferee shall include the name, address, and telephone number of the Transferee of such Property interest, a copy of the deed or other documentation evidencing the conveyance, a legal description of the Property interest being transferred, a survey map of the Property interest being transferred, and the closing date of the transfer of ownership of the Property interest.

13. Representations and Warranties of Owner. Owner represents and warrants: that Owner is the sole owner of the Property; that Owner holds fee simple title to the Property which is free, clear and unencumbered except for the Consent Decree; that Owner has the power and authority to make and enter into this Agreement as Owner and Holder, to grant the rights and privileges herein provided and to carry out all obligations of Owner and Holder hereunder; that

this Agreement has been executed and delivered pursuant to the Consent Decree; and, that this Agreement will not materially violate or contravene or constitute a material default under any other agreement, document or instrument to which Owner is a party or by which Owner may be bound or affected.

14. Amendment: Early Termination. This Environmental Covenant may be modified or amended or terminated while Owner owns the property only by a writing signed by the Owner and EPA with the formalities required by the execution of a deed in Ohio which is recorded in the Greene County Recorder's Office. Upon transfer of all or any portion of the Property, Owner waives any rights that she might otherwise have under ORC § 5301.90 to withhold her consent to any amendments, modifications, or termination of the Environmental Covenant, to the extent that she has transferred her interest in that portion of the Property affected by said modification, amendment or termination. The rights of the Owner's successors in interest as to a modification, amendment or termination of this Environmental Covenant are governed by the provisions of ORC § 5301.90.

15. Right to Enforce Agreement Against Owner; Equitable Remedies. In the event that Owner, or any other person should attempt to deny the rights of access granted under Paragraphs 10-11 or should violate the restrictions on use of the Property set forth in Paragraph 6, then, in addition to any rights which EPA may have under the Consent Decree, EPA or any Settling Performing Defendant that is adversely affected by each denial (for example, any Settling Performing Defendant that is prevented from conducting its remedial obligations under the Consent Decree) or by such violation shall have the right to immediately seek an appropriate equitable remedy and any court having jurisdiction is hereby granted the right to issue a temporary restraining order and/or preliminary injunction prohibiting such denial of access or use in violation of restrictions upon application by EPA or by such adversely affected Settling Performing Defendant without notice or posting bond. Owner and each subsequent owner of the Property by accepting a deed thereto or to any part thereof waives all due process or other constitutional right to notice and hearing before the grant of a temporary restraining order and/or preliminary injunction pursuant to this Paragraph 15.

16. Future Cooperation; Execution of Supplemental Instruments. Owner agrees to cooperate fully with EPA and/or the Settling Performing Defendants and to assist them in implementing the rights granted them under this Environmental Covenant and, in furtherance thereof, agrees to execute and deliver such further documents as may be requested by EPA to supplement or confirm the rights granted hereunder.

17. Cumulative Remedies; No Waiver. All of the rights and remedies set forth in this Environmental Covenant or otherwise available at law or in equity are cumulative and may be exercised without regard to the adequacy of, or exclusion of, any other right, remedy or option available hereunder or under the Consent Decree or at law. The failure to exercise any right granted hereunder, to take action to remedy any violation by Owner or Transferee of the terms hereof or to exercise any remedy provided herein shall not be deemed to be a waiver of any such right or remedy and no forbearance on the part of EPA and/or the Settling Performing Defendants and no extension of the time for performance of any obligations of Owner or

Transferee hereunder shall operate to release or in any manner affect EPA's and/or the Settling Performing Defendants' rights hereunder.

18. Severability. If any provision of this Environmental Covenant is found to be unenforceable in any respect, the validity, legality, and enforceability of the remaining provisions shall not in any way be affected or impaired.

19. Governing Law. This Environmental Covenant shall be construed according to and governed by the laws of the State of Ohio and the United States of America.

20. Recordation. Within thirty (30) days after the date of the final required signature upon this Environmental Covenant, Owner shall file this Environmental Covenant for recording, in the same manner as a deed to the Property, with the Greene County Recorder. Within ten (10) days of the recording of this Environmental Covenant, Owner shall certify to EPA and the Settling Performing Defendants, that the Environmental Covenant has been filed for recording, and shall include with the certification a filed and date-stamped copy of the recorded Environmental Covenant.

21. Effective Date. The effective date of this Environmental Covenant shall be the date upon which the fully executed Environmental Covenant has been recorded as a deed record for the Property with the Greene County Recorder's Office.

22. Distribution of Environmental Covenant. The Owner shall distribute a file-stamped and date-stamped copy of the recorded Environmental Covenant to: EPA, Ohio EPA, the Settling Performing Defendants, any lessee, each person holding a recorded interest in the Property, Greene County, and the City of Beavercreek, Ohio. All notices, requests, demands or other communications required or permitted under this Environmental Covenant shall be given in the manner and with the effect set forth in the Consent Decree.

23. Notice. All notices, requests, demands or other communication required or permitted under this Environmental Covenant shall be given in the manner and with the effect set forth in the Consent Decree.

24. Captions. All paragraph captions are for convenience of reference only and shall not affect the construction of any provision of this Environmental Covenant.

25. Time of the Essence. Time is of the essence of each and every performance obligation of Owner or Transferee under this Environmental Covenant.

[SIGNATURE PAGE TO FOLLOW]

IN WITNESS WHEREOF, Owner, Helen Gorby, and EPA have executed and delivered this Environmental Covenant as of the date first above written.

OWNER

Helen Gorby

STATE OF OHIO)
) SS.
COUNTY OF _____)

The foregoing instrument was acknowledged before me this ____ day of _____, 2013, by Helen Gorby.

Notary Public

UNITED STATES OF AMERICA
On behalf of the Administrator of the
United States Environmental Protection Agency

By: _____
Richard C. Karl, Director,
Superfund Division, Region 5

STATE OF ILLINOIS)
) SS.
COUNTY OF COOK)

The foregoing instrument was acknowledged before me this ____ day of _____, 2013, by Richard C. Karl, Director, Superfund Division, Region 5 of the United States Environmental Protection Agency, on behalf of the United States of America.

Notary Public

United States v. 3M Company, et al. (S.D. Ohio)

Consent Decree
Exhibit A to Appendix D

Legal Descriptions

Exhibit A to Appendix D
To Consent Decree, *United States v. 3M Company*,
et al. (S.D. Ohio)
Legal Descriptions

Situated in the State of Ohio, County of Greene, Township of Beavercreek being more particularly described as follows:

Situate in the west half of Section Two (2), Town Two (2), Range Seven (7), M.R.S., Beavercreek Township, Greene County, and bounded and described as follows: Beginning at a point in the west line of said Section Two (2), at its intersection with the middle of Shakertown Road; thence with the west line of said Section Two (2), North 0° 33' East three hundred and ninety-four and one-fourth feet (394.25') to its intersection with the south line of the Cincinnati, Hamilton and Dayton R. R. right-of-way; thence along the south line of the Cincinnati, Hamilton and Dayton R. R. right-of-way, south 89° 15' East two hundred seventy-five feet (275.00) to a corner; thence parallel to the west line of said Section Two (2) South 0° 33' West three hundred ninety-four and one-fourth feet (394.25') to a corner in the middle of the Shakertown Road; thence along the middle of said Shakertown Road North 89° 15' West two hundred seventy-five feet (275.00) to the place of beginning, containing two and 488/1,000 (2.488) acres, and being part of the same premises conveyed to the Dayton Oil Company by Michael P. Moran and John A. Henehan, by deed dated January 16, 1952 and recorded in Volume 228, Page 451 of the Deed Records of Greene County, Ohio; together with the Grantor's exclusive right and easement, as owner of said premises, to take and use water from a certain well situated on a 1.193 acre tract of land adjoining on the south the tract hereby conveyed, including the use of any underground pipeline now in existence conveying water from said well to the premises hereby conveyed, and together with a perpetual right of access to said well, pump and pipeline for the purpose of inspection, maintenance, repairs and servicing as necessary.

PRIOR INSTRUMENT REFERENCE: Vol. 535 Page, 258 and Vol. 535 Page 260 of the Deed Records of Greene County, Ohio.

Situate in the Township of Beavercreek, in the County of Greene and State of Ohio, and in the west half of Section 2, Township 2, Range 7 of the lands between the Miamis, and a part of the lands transferred to Ethel R. Shouop, said Certificate for Transfer of Real Estate is of record in Deed Book 246, Page 215, Recorder's Office, Greene County, Ohio. More particularly bounded and described follows: Beginning at the northwest corner of the above mentioned Shouop lands and in the south line of the right of way of the Baltimore and Ohio Railway Company; thence from said beginning point S 01° 26' W a distance of 394.58 feet to a railroad spike in the center of Patterson Road; thence S 88° 37' E along the center line of Patterson Road, a distance of 5.0 feet to a point; thence N 01° 26' E five feet east of and parallel to the west line of said Shouop lands, a distance of 394.68 feet to a point in the north line of the Shouop lands and in the south right of way line of the Baltimore and Ohio Railway Company; thence N 88° 37' W along the north line of said Shouop lands, a distance of 5.0 feet to the place of beginning; containing 0.045 acres of land.

Being the same premises conveyed by Ethel R. Shouop, an unmarried widow, to Lawrence E. Prine and Robinette Prine by deed recorded in Vol. 304, Page 453, Deed Records of Greene County, Ohio.

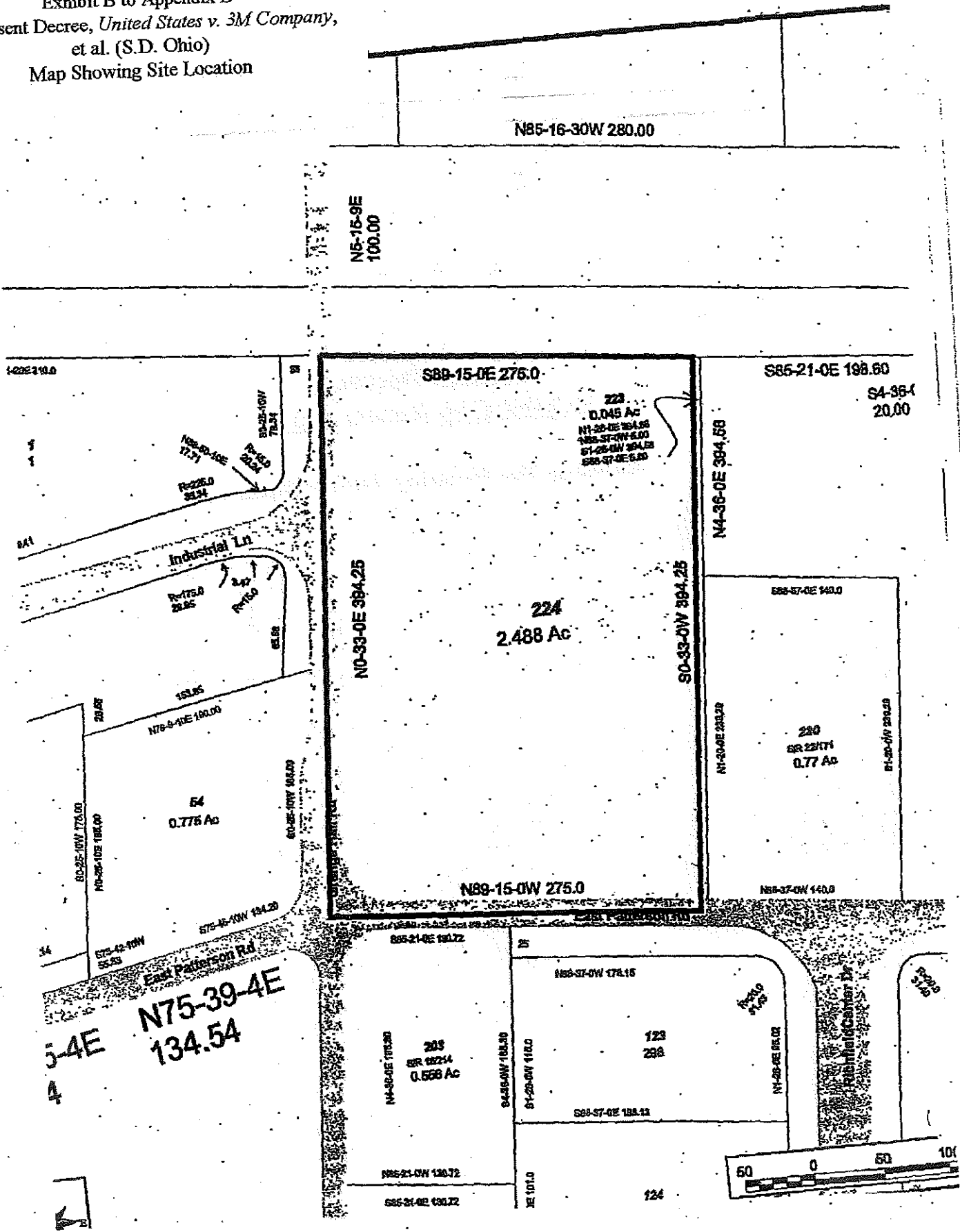
PRIOR INSTRUMENT REFERENCE; Vol. 539, Page 482 of the Deed Records of Green County, Ohio, and Vol. 363, Page 371 of the Deed Records of Greene County Ohio.

United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Exhibit B to Appendix D

Map Showing Site Location

Exhibit B to Appendix D
 To Consent Decree, *United States v. 3M Company,*
 et al. (S.D. Ohio)
 Map Showing Site Location



United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Exhibit C to Appendix D

Settling Performing Defendants

Exhibit C to Appendix D
To Consent Decree, *United States v. 3M Company,*
et al. (S.D. Ohio)
Settling Performing Defendants

Akzo Nobel Coatings Inc., successor-in-interest to
Hanna Chemical Coatings Company and Reliance
Universal, Inc.

Alcoa Inc.

Arkema Inc. (for M&T Chemicals Inc.)

C.P., Inc.

Ford Motor Company

GATX Corporation

Georgia-Pacific LLC

International Paper Company

I.V.C. Industrial Coatings, Inc., successor in interest to
Indianapolis Varnish, Inc.

Meritor, Inc., for itself and on behalf of its current and
former affiliates and predecessors and their affiliates
and predecessors including, without limitation, the
entities designated by U.S. EPA as "Arvin
Industries" and "Roll Coater" that did business at
various times under the following names:
ArvinMeritor, Inc.; Arvin Industries, Inc.; and Roll
Coater, Inc.

Momentive Specialty Chemicals Inc.

Morton International, LLC

Navistar, Inc. on behalf of Navistar International Corp.
f/k/a International Harvester

PPG Industries, Inc.

United Technologies Corporation on behalf of Lear
Corporation Automotive Systems, f/k/a Sheller-
Globe Corporation

Valspar Corporation

United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Exhibit D to Appendix D

Notice upon Conveyance of Property of any Portion thereof

Exhibit D to Appendix D
To Consent Decree, *United States v. 3M Company*,
et al.(S.D. Ohio)

Notice upon Conveyance of Property or any Portion thereof

THE INTEREST CONVEYED HEREBY IS SUBJECT TO A CONSENT DECREE DATED _____, 2013, WHICH WAS RECORDED IN THE OFFICE OF THE GREENE COUNTY RECORDER, IN BOOK _____, Pages _____, AND WHICH RESTRICTS THE INTEREST CONVEYED AS SET FORTH IN THIS NOTICE, AND AN ENVIRONMENTAL COVENANT, DATED _____, 2013, RECORDED IN THE OFFICIAL RECORDS OF THE GREENE COUNTY RECORDER ON _____, 2013, in BOOK _____, Page _____, THE ENVIRONMENTAL COVENANT CONTAINS THE FOLLOWING ACTIVITY AND USE LIMITATIONS AND ACCESS RIGHTS:

Activity and Use Limitations on the Property

A. Owner covenants for herself and her successors and assigns, that construction of wells and activities that extract, consume, or otherwise use any groundwater are prohibited on the Property except as required as part of an U.S. EPA approved response activity. No remediation, monitoring, investigation or other non-potable wells shall be installed on any part of the Property without the prior written consent of EPA. In no event shall any groundwater located at or underlying any part of the Property be used for any purpose, potable or otherwise, except for groundwater remediation, monitoring or investigation. Any contaminated groundwater removed from the Property shall be handled in accordance with all applicable laws and regulations and as required by the ROD and/or Consent Decree

B. Owner covenants for herself and her successors and assigns that there shall be no consumptive use of Site groundwater, either on or off the Site. No water wells for potable use shall be installed on any part of the Property. The groundwater under the Property shall not be used as a potable supply of water.

C. Owner covenants for herself and her successors and assigns, that the Property shall be used solely for Commercial/Industrial and Recreational Activities only in accordance with an EPA-approved plan for re-use of the Property as required under Paragraph 6.D. and the Property shall not be used for Residential and Other Prohibited Activities. Owner acknowledges and agrees that the Property is being remediated only for commercial/industrial and recreational activities. The term "Commercial/Industrial Activities" includes: (i) wholesale and retail sales and service activities including, but not limited to retail stores, and automotive fuel, sales and service facilities; (ii) governmental, administrative and general office activities, (iii) manufacturing, processing, and warehousing activities, including, but not limited to, production, storage and sales of durable goods and other non-food chain products; and (iv) activities which are consistent with or similar to the above listed activities; together with related parking areas and driveways, but excludes Residential and Other Prohibited Activities. The term "Residential and Other Prohibited Activities" includes: (i) single and multi-family

dwellings and transient residential units; (ii) day care centers and preschools; (iii) public and private elementary and secondary schools; (iv) hospitals, assisted living facilities and other extended care medical facilities and medical and dental offices; (v) food preparation and food service facilities, including food stores, restaurants, banquet facilities and other food preparation or sales facilities; (vi) correctional facilities and detention centers; and (vii) agricultural use.

D. Owner agrees for herself and her successors in title not to permit the Property to be used in any manner that would interfere with or adversely affect the integrity or protectiveness of the remedial action which has been implemented or which will be implemented pursuant to the Consent Decree unless the written consent of the EPA to such use is first obtained. Owner's agreement to restrict the use of the Property shall include, but not be limited to, not permitting any drilling, digging, building, or the installation, construction, removal or use of any buildings, wells, pipes, roads, ditches, or any other structures on the Restricted Area unless the written consent of EPA to such use or activity is first obtained. Further, Owner agrees for herself and her successors in title to refrain from bringing, and to refuse to grant permission to any other person to bring, Waste Material or Scrap Metal onto the Property, except in accordance with any federal, state or local permit or the Consent Decree.

E. Owner agrees for herself and her successors in title that for any new structures constructed or other development activities on the Property, a vapor barrier shall be installed as part of any foundation construction to mitigate potential vapor intrusion. Prior to any soil excavation activity on the Property, a Soils Management Plan shall be prepared to mitigate potential construction worker exposure to impacted subsurface soils on the Property and shall be submitted and approved by the Ohio EPA and the EPA prior to the commencement of any soils excavation activities.

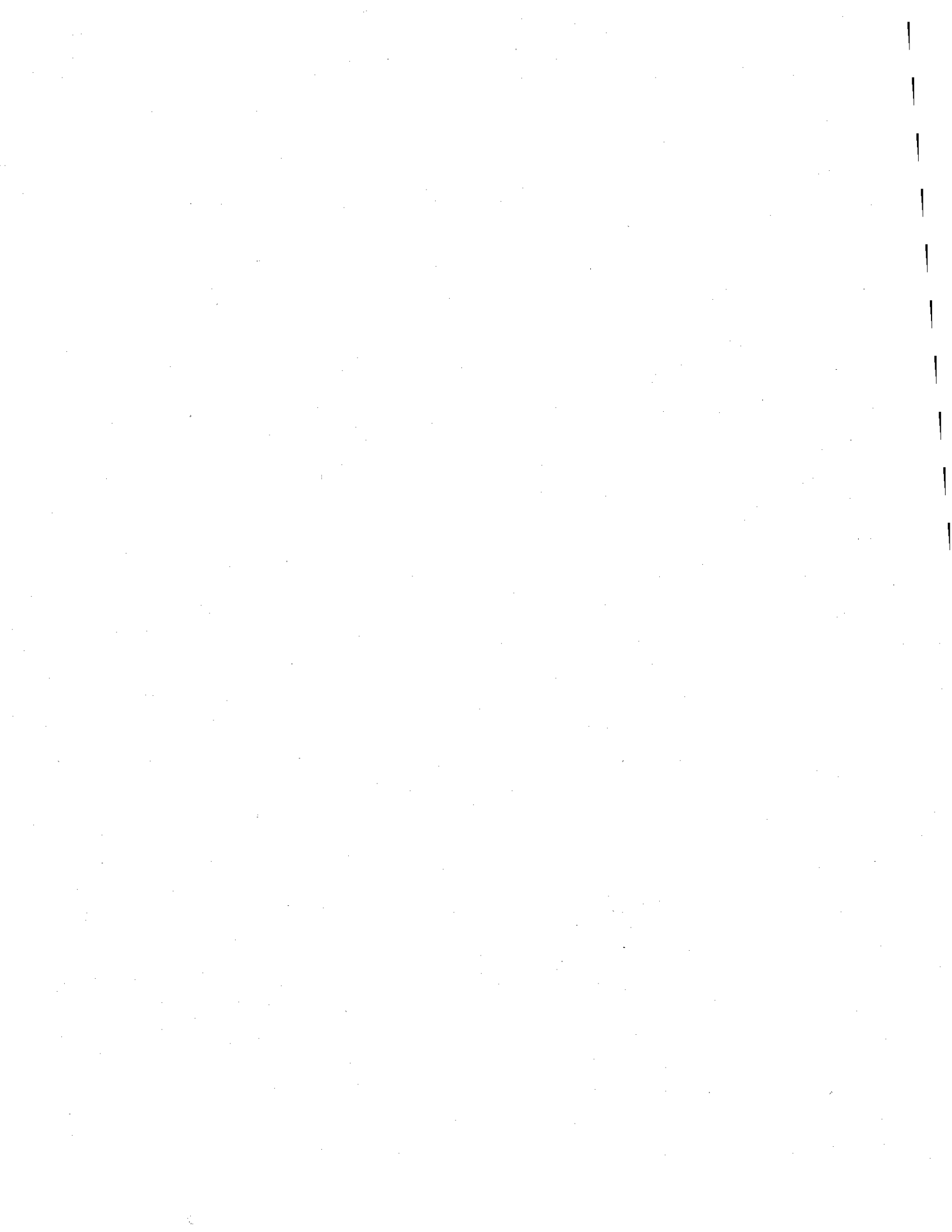
Requirements for Notice to EPA Following Transfer of a Specified Interest in, or Concerning Proposed Changes in the Use of, Applications for Building Permits for, or Proposals for any Site Work Affecting Contamination on, the Property. Neither Owner or any Holder shall transfer any interest in the Property or make proposed changes in the use of the Property, or make applications for building permits for, or proposals for any work in the Property without first providing notice to EPA and obtaining any approvals or consents thereto which are required under Sections V, IX or XXVI of the Consent Decree. The term "Transferee" means any person or entity to whom any interest in the Property is transferred by operation of law or contract.

Rights of Access. Pursuant to Section IX of the Consent Decree, Owner agrees that EPA, Ohio EPA, and the Settling Performing Defendants, their successors and assigns, and their respective officers, employees, agents, contractors and other invitees (collectively, "Access Grantees") shall have and hereby grants to each of them an unrestricted right of access to the Property to undertake the Permitted Uses described below and, in connection therewith, to use all roads, drives and paths, paved or unpaved, located on the Property or off the Property ("off-site") and rightfully used by Owner and Owner's invitees for ingress to or egress from portions of the Property (collectively, "Access Roads"). The right of access granted under this Paragraph 10

shall be irrevocable while this Covenant remains in full force and effect. The Settling Performing Defendants are named on Exhibit C attached hereto.

12. Permitted Uses. The right of access granted under the Environmental Covenant shall provide Access Grantees with access at all reasonable times to the Property for the purpose of conducting any activity related to the Consent Decree or purchase of the Property, including, but not limited to, the following activities:

- (a) Monitoring the Work;
- (b) Verifying any data or information submitted to the United States or the State;
- (c) Conducting investigations relating to contamination at or near the Site;
- (d) Obtaining samples;
- (e) Assessing the need for, planning, or implementing response actions at or near the Site;
- (f) Implementing the Work pursuant to the Consent Decree;
- (g) Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Owner or her agents, consistent with Section XXIV (Access to Information) of the Consent Decree;
- (h) Assessing Settling Performing Defendants' compliance with the Consent Decree;
- (ii) Determining whether the Site or other property is being used in a manner that is prohibited or restricted or that may need to be prohibited or restricted by or pursuant to the Consent Decree;
- (j) Implementing, monitoring, maintaining, reporting on, and enforcing any Institutional Controls and the requirements of the Institutional Control Implementation and Assurance Plan (ICIAP); and
- (k) Surveying and making soil tests of the Property, locating utility lines, and assessing the obligations which may be required of a Prospective Purchaser by EPA under the Consent Decree.



United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Appendix E, Exhibit 1

Performance Guaranty Forms

Exhibit 1 to Appendix E
To Consent Decree, *United States v. 3M Company*,
et al. (S.D. Ohio)
Performance Guaranty Forms

Lammers Barrel Site

[Letterhead of Issuing Bank]

IRREVOCABLE STANDBY LETTER OF CREDIT NUMBER: [_____]

ISSUANCE DATE: [_____]

MAXIMUM AMOUNT: [U.S.\$ _____]

BENEFICIARY:

U.S. Environmental Protection Agency
c/o Richard Karl
Director, Superfund Division,
EPA Region 5
77 West Jackson Blvd. (S-6J)
Chicago, IL 60604-3507

APPLICANT:

[Name of Settling Defendant]
[Title if applicable]
[Address]

Dear Sir or Madam:

We hereby establish our Irrevocable Standby Letter of Credit No. [_____] in your favor, at the request and for the account of the Applicant, [Insert name of Settling Defendant], in the amount of exactly [in words] U.S. dollars (\$XX.XX) (the "Maximum Amount"). We hereby authorize you, the U.S. Environmental Protection Agency (the "Beneficiary"), to draw at sight on us, [Insert name and address of issuing bank], an aggregate amount equal to the Maximum Amount upon presentation of:

(1) your sight draft, bearing reference to this Letter of Credit No. [_____] (which may, without limitation, be presented in the form attached hereto as Exhibit A); and

(2) your signed statement reading as follows: "I certify that the amount of the draft is payable pursuant to [that certain Consent Decree, dated _____, 20____, by and among the United States and _____], entered into by the parties thereto in accordance with the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)."

This letter of credit is effective as of [insert issuance date] and shall expire on [a date at least 1 year later], but such expiration date shall be automatically extended for a period of [at least 1 year] on [the date which is at least 1 year later] and on each successive expiration date, unless, at

least one hundred twenty (120) days before the current expiration date, we notify both you and [enter name of Settling Defendant posting the letter of credit] by certified mail that we have decided not to extend this letter of credit beyond the current expiration date. In the event you are so notified, any unused portion of the credit shall immediately thereupon be available to you upon presentation of your sight draft for a period of at least 120 days after the date of receipt by both you and [enter name of Settling Defendant posting the letter of credit] of such notification, as shown on signed return receipts.

Multiple and partial draws on this letter of credit are expressly permitted, up to an aggregate amount not to exceed the Maximum Amount. Whenever this letter of credit is drawn on, under, and in compliance with the terms hereof, we shall duly honor such draft upon presentation to us, and we shall deposit the amount of the draft in immediately available funds directly into such account or accounts as may be specified in accordance with your instructions.

All banking and other charges under this letter of credit are for the account of the Applicant.

This letter of credit is subject to the most recent edition of the Uniform Customs and Practice for Documentary Credits, published and copyrighted by the International Chamber of Commerce.

Very Truly Yours,

[Name and address of issuing institution]

[Signature(s), name(s), and title(s) of official(s) of issuing institution]

[Date]

Exhibit A - Form of Sight Draft

United States Environmental Protection Agency

Sight Draft

TO: [Insert name of Issuing Bank]
[Insert address of Issuing Bank]
[]
[]

RE: Letter of Credit No. []

DATE: [Insert date that draw is made]

TIME: [Insert time of day that draw is made]

This draft is drawn under your Irrevocable Letter of Credit No. []. Pay to the order of the United States Environmental Protection Agency, in immediately available funds, the amount of [in words] U.S. Dollars (U.S.\$[]) or, if no amount certain is specified, the total balance remaining available under your Irrevocable Letter of Credit No. [].

Pay such amount as is specified in the immediately preceding paragraph by FedWire Electronic Funds Transfer ("EFT") to the Lammers Barrel Site Special Account within the EPA Hazardous Substance Superfund in accordance with current EFT procedures, referencing File Number [], EPA Region and Site Spill ID Number 05BX, and DOJ Case Number 90-11-3-07706, as follows:

[Insert specific Special Account wiring instructions and information].

This Sight Draft has been duly executed by the undersigned, an authorized representative or agent of the United States Environmental Protection Agency, whose signature hereupon constitutes an endorsement.

By: _____ [signature]

_____ [name]

_____ [title]

United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Appendix E, Exhibit 2

Performance Guaranty Forms

Exhibit 2 to Appendix E
To Consent Decree, *United States v. 3M Company*,
et al. (S.D. Ohio)
Performance Guaranty Forms

Lammers Barrel Site

[Letterhead of Issuing Bank]

IRREVOCABLE STANDBY LETTER OF CREDIT NUMBER: [_____]

ISSUANCE DATE: [_____]

MAXIMUM AMOUNT: [U.S.\$ _____]

Date:
Our Ref.:
Amount: US\$
Issuance Date:

BENEFICIARY:
U.S. Environmental Protection Agency
c/o Mr. Richard Karl
Director, Superfund Division
EPA Region 5
77 Jackson Street
Chicago, IL 60604

APPLICANT:
Arkema Inc.
900 First Ave.
King of Prussia, PA 19406

Dear Sir or Madam:

We, Credit Industriel et Commercial, 520 Madison Avenue, New York, NY 10022, hereby establish our Irrevocable Standby Letter of Credit No. _____ in your favor, at the request and for the account of the Applicant, Arkema Inc. ("Arkema"), in the amount of exactly _____ [in words] U.S. dollars (\$ _____)(the "Maximum Amount"). We hereby authorize you, the U.S. Environmental Protection Agency (the "Beneficiary"), to draw at sight on Credit Industriel et Commercial, New York, NY 10022, an aggregate amount equal to the Maximum Amount upon presentation of:

1. Your sight draft, bearing reference to this Letter of Credit No. _____, [which may, without limitation, be presented in the form attached hereto as Exhibit A]; and
2. Your dated statement purportedly signed by your authorized representative reading as follows: "I certify that the amount of the draft is payable pursuant to [that certain Consent Decree, dated _____, 20____, by and among the United States and _____],

entered into by the parties thereto in accordance with the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)."

This Letter of Credit is effective as of _____ and shall expire on _____ (at least 1 year from issuance date), but such expiration date shall be automatically extended for a period of one year on _____ [the date which is at least 1 year from issuance date] and on each successive expiration date, unless, at least one hundred twenty (120) days before the then current expiration date, we notify both you and Arkema by certified mail or overnight courier that we have decided not to extend this Letter of Credit beyond the then current expiration date. In the event you are so notified, any unused portion of this Letter of Credit shall immediately thereupon be available to you upon presentation of your sight draft for a period of at least 120 days after the date of receipt by both you and Arkema of such notification, as shown on signed return receipts.

Multiple and partial draws on this Letter of Credit are expressly permitted, up to an aggregate amount not to exceed the Maximum Amount. Whenever this Letter of Credit is drawn on, under, and in compliance with the terms hereof, we shall duly honor such draft upon presentation to us, and we shall deposit the amount of the draft in immediately available funds directly into such account or accounts as may be specified in accordance with your instructions.

All banking and other charges under this Letter of Credit are for the account of the Applicant.

This Letter of Credit is subject to the Uniform Customs and Practice for Documentary Credits, 2007 Revision, International Chamber of Commerce Publication No. 600.

Please address all correspondence regarding this Letter of Credit to the attention of the Standby Letter of Credit Department located at 520 Madison Avenue, New York, NY 10022, referring to our Letter of Credit No. _____. For telephone assistance, please contact the Standby Letter of Credit Department at (212) 715-4690 and have this Letter of Credit number available.

Very Truly Yours,

[Signature(s), name(s) and title(s) of official(s) of issuing institution]

[Date]

Exhibit A - Form of Sight Draft

United States Environmental Protection Agency

Sight Draft

TO: Credit Industriel et Commercial
520 Madison Avenue
New York, NY 10022
Attn: Standby L/C Department

RE: Letter of Credit No. [_____]

DATE: [Insert date that draw is made]

TIME: [Insert time of day that draw is made]

This draft is drawn under your Irrevocable Letter of Credit No. [_____]. Pay to the order of the United States Environmental Protection Agency, in immediately available funds, the amount of _____ [in words] U.S. Dollars (U.S.\$[_____]) or, if no amount certain is specified, the total balance remaining available under your Irrevocable Letter of Credit No. [_____].

Pay such amount as is specified in the immediately preceding paragraph by FedWire Electronic Funds Transfer ("EFT") to the Lammers Barrel Site Special Account within the EPA Hazardous Substance Superfund in accordance with current EFT procedures, referencing File Number [_____], EPA Region and Site Spill ID Number 05BX, and DOJ Case Number 90-11-3-07706, as follows:

[Insert specific Special Account wiring instructions and information].

This Sight Draft has been duly executed by the undersigned, an authorized representative or agent of the United States Environmental Protection Agency, whose signature hereupon constitutes an endorsement.

By: _____ [signature]

_____ [name]

_____ [title]

United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Appendix E, Exhibit 3

Performance Guaranty Forms

To Consent Decree, *United States v. 3M Company*,
et al. (S.D. Ohio)
Performance Guaranty Forms

Lammers Barrel Site

[Letterhead of Issuing Bank]

IRREVOCABLE STANDBY LETTER OF CREDIT NUMBER: []

ISSUANCE DATE: []

MAXIMUM AMOUNT: [U.S.\$]

BENEFICIARY:

U.S. Environmental Protection Agency
c/o Richard Karl
Director, Superfund Division,
EPA Region 5
77 West Jackson Blvd. (S-6J)
Chicago, IL 60604-3507

APPLICANT:

[Name of Settling Defendant]
[Title if applicable]
[Address]

Dear Sir or Madam:

We hereby establish our Irrevocable Standby Letter of Credit No. [] in your favor, at the request and for the account of the Applicant, [Insert name of Settling Defendant], in the amount of exactly [in words] U.S. dollars (\$XX.XX) (the "Maximum Amount"). We hereby authorize you, the U.S. Environmental Protection Agency (the "Beneficiary"), to draw at sight on us, [Insert name and address of issuing bank], an aggregate amount up to the Maximum Amount upon presentation of:

(1) your sight draft, bearing reference to this Letter of Credit No. [] (which may, without limitation, be presented in the form attached hereto as Exhibit A); and

(2) your statement, signed by your authorized representative, reading as follows: "I certify that the amount of the draft is payable pursuant to [that certain Consent Decree, dated _____, 20__], by and among the United States and _____, entered into by the parties thereto in accordance with the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)."

This letter of credit is effective as of [insert issuance date] and shall expire on [a date at least 1

year later], but such expiration date shall be automatically extended for a period of [at least 1 year] on [the date which is at least 1 year later] and on each successive expiration date, unless, at least one hundred twenty (120) days before the current expiration date, we notify both you and [enter name of Settling Defendant posting the letter of credit] by certified mail or overnight courier that we have decided not to extend this letter of credit beyond the current expiration date. In the event you are so notified, any unused portion of the credit shall immediately thereupon be available to you upon presentation of your sight draft for a period of at least 120 days after the date of receipt by both you and [enter name of Settling Defendant posting the letter of credit] of such notification, as shown on signed return receipts.

Multiple and partial draws on this letter of credit are expressly permitted, up to an aggregate amount not to exceed the Maximum Amount. Whenever this letter of credit is drawn on, under, and in compliance with the terms hereof, we shall duly honor such draft upon presentation to us, and we shall deposit the amount of the draft in immediately available funds directly into such account or accounts as may be specified in accordance with your instructions.

All banking and other charges under this letter of credit are for the account of the Applicant.

This letter of credit is subject to the Uniform Customs and Practice for Documentary Credits, 2007 Revision, ICC Publication No. 600 published and copyrighted by the International Chamber of Commerce.

Very Truly Yours,

[Name and address of issuing institution]

[Signature(s), name(s), and title(s) of official(s) of issuing institution]

[Date]

Lammers Barrel Site

Exhibit A - Form of Sight Draft

United States Environmental Protection Agency

Sight Draft

TO: [Insert name of Issuing Bank]
[Insert address of Issuing Bank]
[]
[]

RE: Letter of Credit No. []

DATE: [Insert date that draw is made]

TIME: [Insert time of day that draw is made]

This draft is drawn under your Irrevocable Letter of Credit No. []. Pay to the order of the United States Environmental Protection Agency, in immediately available funds, the amount of [in words] U.S. Dollars (U.S.\$[]) or, if no amount certain is specified, the total balance remaining available under your Irrevocable Letter of Credit No. [].

Pay such amount as is specified in the immediately preceding paragraph by FedWire Electronic Funds Transfer ("EFT") to the Lammers Barrel Site Special Account within the EPA Hazardous Substance Superfund in accordance with current EFT procedures, referencing File Number [], EPA Region and Site Spill ID Number 05BX, and DOJ Case Number 90-11-3-07706, as follows:

[Insert specific Special Account wiring instructions and information].

This Sight Draft has been duly executed by the undersigned, an authorized representative or agent of the United States Environmental Protection Agency, whose signature hereupon constitutes an endorsement.

By: _____ [signature]

_____ [name]

_____ [title]

United States v. 3M Company, et al. (S.D. Ohio)

Consent Decree
Appendix E, Exhibit 4

Performance Guaranty Forms

Exhibit 4 to Appendix E
To Consent Decree, *United States v. 3M Company*,
et al. (S.D. Ohio)
Performance Guaranty Forms

Lammers Barrel Site

[Letterhead of Bond Issuer]

PAYMENT BOND

Surety's Payment Bond Number: _____
Date of Execution of Payment Bond: _____
Effective Date of Payment Bond: _____
Total Dollar Amount of Payment Bond: _____

Principal:

Legal Name and Address: [name and business address of PRP/Settling Defendant(s)]
Type of Organization: [insert "individual," "partnership," "limited liability company,"
"corporation," etc.]
State of Organization:

Surety:

Legal Name and Address: [name and business address of surety providing the bond]
Type of Organization: [insert "individual," "partnership," "limited liability
company," "corporation," etc.]
State of Organization:

Beneficiary:

Legal Name and Address: U.S. Environmental Protection Agency
c/o Mr. Richard Karl
Director, Superfund Division
EPA Region 5
77 West Jackson Blvd. (S-6J)
Chicago, IL 60604-3507

Site Information:

Name and Location of Site: Lammers Barrel Site 05BX, Beavercreek, Ohio
EPA Identification Number: CERCLIS ID OHD981537582
Agreement Governing Site Work: Remedial Design/Remedial Action (RD/RA) and
De Minimis Consent Decree dated _____,
20 , by and among the United States of America
and [certain PRPs] (the "Agreement")

KNOW ALL PERSONS BY THESE PRESENTS, THAT:

WHEREAS, said Principal is required, under the above-described Agreement entered pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended ("CERCLA"), to perform the "Work" as defined in such Agreement (hereinafter, the "Work") and to fulfill its other obligations as set forth therein; and

WHEREAS, said Principal is required by the Agreement to provide financial assurance securing its full and final completion of the Work.

NOW, THEREFORE, in consideration of the foregoing, and for other good and valuable consideration the receipt of which is hereby acknowledged, the parties hereto agree as follows:

1. The Principal and Surety hereto are firmly bound to the United States Environmental Protection Agency (hereinafter, "EPA"), in the above Total Dollar Amount, for the payment of which we, the Principal and Surety, bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, subject to and in accordance with the terms and conditions hereof. **[Add proviso if there are multiple sureties: ";provided that, where the Sureties are acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the Total Dollar Amount."]**
2. The conditions of the Surety's obligation hereunder are such that if the Principal shall promptly, faithfully, fully, and finally complete the Work in accordance with the terms of the Agreement, the Surety's obligation hereunder shall be null and void; otherwise it is to remain in full force and effect.
3. The Surety shall become liable on the obligation evidenced hereby only upon the commencement of any Work Takeover (as such term is defined in the Agreement) pursuant to and in accordance with the terms of the Agreement. At any time and from time to time upon notification by the EPA Regional Administrator or Regional Superfund Director for EPA Region 5 (or any of their designees) that a Work Takeover has commenced, the Surety shall promptly (and in any event within fifteen (15) days after receiving such notification) pay funds up to the Total Dollar Amount in such amounts and to such person(s), account(s), or otherwise as the EPA Regional Administrator or Regional Superfund Direction (or their designee) may direct. If the Surety does not render such payment within the specified 15-day period, the Surety shall be deemed to be in default of this Payment Bond and EPA shall be entitled to enforce any remedy available to it at law, in equity, or otherwise.

4. The liability of the Surety shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the Total Dollar Amount of this Payment Bond, but in no event shall the aggregate obligation of the Surety hereunder exceed the amount of said sum.

5. The Surety may cancel this Payment Bond only by sending notice of cancellation to the Principal and to the Superfund Division Director for EPA Region 5, provided, however, that no such cancellation shall be effective during the 120-day period beginning on the date of receipt of the notice of cancellation by both the Principal and the Superfund Division Director. If after ninety (90) days of such 120-day period, the Principal has not established a replacement financial assurance mechanism pursuant to and in accordance with the terms of the Agreement, EPA shall have the right to draw upon the full amount of this Payment Bond.

6. The Principal may terminate this Payment Bond only by sending written notice of termination to the Surety and to the Superfund Division Director for EPA Region 5, provided, however, that no such termination shall become effective unless and until the Surety receives written authorization for termination of this Payment Bond by the Superfund Division Director (or his or her designee).

7. Any modification, revision, or amendment which may be made in the terms of the Agreement or in the Work to be done thereunder, or any extension of the Agreement, or other forbearance on the part of either the Principal or EPA to the other, shall not in any way release the Principal and the Surety, or either of them, or their heirs, executors, administrators, successors or assigns from liability hereunder. The Surety hereby expressly waives notice of any change, revision, or amendment to the Agreement or to any related obligations between the Principal and EPA.

8. The Surety will immediately notify EPA of any of the following events: (a) the filing by the Surety of a petition seeking to take advantage of any laws relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts; (b) the Surety's consent to (or failure to contest in a timely manner) any petition filed against it in an involuntary case under such bankruptcy or other laws; (c) the Surety's application for (or consent to or failure to contest in a timely manner) the appointment of, or the taking of possession by, a receiver, custodian, trustee, liquidator, or the like of itself or of all or a substantial part of its assets; (d) the Surety's making a general assignment for the benefit of creditors; or (e) the Surety's taking any corporate action for the purpose of effecting any of the foregoing.

9. Any provision in this Payment Bond that conflicts with CERCLA or any other applicable statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or legal requirement shall be deemed incorporated herein.

10. All notices, consents, approvals and requests required or permitted hereunder shall be given in writing and shall be effective for all purposes if hand delivered or sent by (a)

certified or registered United States mail, postage prepaid, return receipt requested or (b) expedited prepaid delivery service, either commercial or United States Postal Service, with proof of attempted delivery, to the address shown on this first page of this Payment Bond.

All notices, elections, requests and demands under this Payment Bond shall be effective and deemed received upon the earliest of (a) the actual receipt of the same by personal delivery or otherwise, (b) one (1) business day after being deposited with a nationally recognized overnight courier service as required above, or (c) three (3) business days after being deposited in the United States mail as required above. Rejection or other refusal to accept or the inability to deliver because of changed address of which no notice was given as herein required shall be deemed to be receipt of the notice, election, request, or demand sent.

11. The Surety hereby agrees that the obligations of the Surety under this Payment Bond shall be in no way impaired or affected by any winding up, insolvency, bankruptcy or reorganization of the Principal or by any other arrangement or rearrangement of the Principal for the benefit of creditors.

12. No right of action shall accrue on this Payment Bond to or for the use of any person other than EPA or the executors, administrators, successors or assigns of EPA.

[SIGNATURES ON FOLLOWING PAGE]

IN WITNESS WHEREOF, the Principal and Surety have executed this Payment Bond and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby represent, warrant, and certify that they are authorized to execute this Payment Bond on behalf of the Principal and Surety, respectively.

PRINCIPAL:

[_____] ,
a [corporation/partnership/limited liability
company] organized and in good standing in
the State of [_____]

Attest: _____
Name: _____

By: _____
Name: _____
Title: _____

SURETY:

[_____] ,
a [corporation/partnership/limited liability
company] organized and in good standing in
the State of [_____]

Attest: _____
Name: _____

By: _____
Name: _____
Title: _____

CORPORATE ACKNOWLEDGMENTS

STATE OF _____)

SS:

COUNTY OF _____)

On _____, 20__, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person on behalf of which the individual(s) acted, executed the instrument.

Notary Public

STATE OF _____)

SS:

COUNTY OF _____)

On _____, 20__, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person on behalf of which the individual(s) acted, executed the instrument.

Notary Public

United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Appendix E, Exhibit 5

Performance Guaranty Forms

Exhibit 5 to Appendix E
To Consent Decree, *United States v. 3M Company*,
et al. (S.D. Ohio)
Performance Guaranty Forms

Lammers Barrel Site

[Letterhead of Bond Issuer]

PERFORMANCE BOND

Surety's Performance Bond Number: _____
Date of Execution of Performance Bond: _____
Effective Date of Performance Bond: _____
Total Dollar Amount of Performance Bond: _____

Principal:

Legal Name and Address: [name and business address of PRP/Settling Defendant(s)]
Type of Organization: [insert "individual," "partnership," "limited liability company," "corporation," etc.]
State of Organization:

Surety:

Legal Name and Address: [name and business address of surety providing the bond]
Type of Organization: [insert "individual," "partnership," "limited liability company," "corporation," etc.]
State of Organization:

Beneficiary:

Legal Name and Address: U.S. Environmental Protection Agency
c/o Mr. Richard Karl
Superfund Division Director
U.S. Environmental Protection Agency
Region 5
77 West Jackson Blvd. (S-6J)
Chicago, IL 60604-3507

Site Information:

Name and Location of Site: Lammers Barrel Site 05BX, Beavercreek, Ohio
EPA Identification Number: CERCLIS ID OHD981537582
Agreement Governing Site Work: Remedial Design/Remedial Action (RD/RA) and De Minimis Consent Decree dated _____, 2013, by and among the United States of America and [certain PRPs] (the "Agreement")

KNOW ALL PERSONS BY THESE PRESENTS, THAT:

WHEREAS, said Principal is required, under the above-described Agreement entered pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (“CERCLA”), to perform the “Work” as defined in such Agreement (hereinafter, the “Work”) and to fulfill its other obligations as set forth therein; and

WHEREAS, said Principal is required by the Agreement to provide financial assurance securing its full and final completion of the Work.

NOW, THEREFORE, in consideration of the foregoing, and for other good and valuable consideration the receipt of which is hereby acknowledged, the parties hereto agree as follows:

1. The Principal and Surety hereto are firmly bound to the United States Environmental Protection Agency (hereinafter, “EPA”)[, **in the above Total Dollar Amount,**] for the performance of the Work, which we, the Principal and Surety, bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, subject to and in accordance with the terms and conditions hereof. **[Add proviso if there are multiple sureties: “;provided that, where the Sureties are acting as co-sureties, we, the Sureties, bind ourselves in such [sum and] performance “jointly and severally” for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the performance of the Work only as is set forth in Schedule 1 attached hereto, but if no bifurcation of the Work is indicated, the limit of liability shall be the full performance of the Principal’s Work obligations under the Agreement”.]**

2. The conditions of the Surety’s obligation hereunder are such that if the Principal shall promptly, faithfully, fully, and finally complete the Work in accordance with the terms of the Agreement, the Surety’s obligation hereunder shall be null and void; otherwise it is to remain in full force and effect.

3. The Surety shall become liable on the obligation evidenced hereby only when the Principal fails to perform all or any part of the Work pursuant to and in accordance with the terms of the Agreement. At any time and from time to time upon notification by the EPA Regional Administrator or Regional Superfund Director for EPA Region 5 (or any of their designees) that the Principal has failed to perform all or any part of the Work, the Surety shall promptly (and in any event within fifteen (15) days after receiving such notification):

- (a) Commence to complete the Work to be done under the Agreement in accordance with its terms and conditions; or
- (b) Pay funds up to the Total Dollar Amount in such amounts and to such

person(s), account(s), or otherwise as the EPA Regional Administrator or Regional Superfund Director (or their designee) may direct.

If the Surety does not render such performance set forth above within the specified 15-day period, the Surety shall be deemed to be in default of this Performance Bond and EPA shall be entitled to enforce any remedy available to it at law, in equity, or otherwise; provided, however, that if such default is susceptible of cure but cannot reasonably be cured within such fifteen (15) day period and provided further that Surety shall have commenced to cure such default within such fifteen (15) day period and thereafter diligently proceeds to perform the same, such fifteen (15) day period shall be extended for such time as is reasonably necessary for Surety in the exercise of due diligence to cure such default, such additional period not to exceed ninety (90) days.

4. The liability of the Surety shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the Total Dollar Amount of this Performance Bond, but in no event shall the aggregate obligation of the Surety hereunder exceed the amount of said sum.

5. The Surety may cancel this Performance Bond only by sending notice of cancellation to the Principal and to the Superfund Division Director for EPA Region 5, provided, however, that no such cancellation shall be effective during the 120-day period beginning on the date of receipt of the notice of cancellation by both the Principal and the Superfund Division Director for EPA Region 5. If after ninety (90) days of such 120-day period, the Principal has not established a replacement financial assurance mechanism pursuant to and in accordance with the terms of the Agreement, EPA shall have the right to enforce performance and/or draw upon the full amount of this Performance Bond.

6. The Principal may terminate this Performance Bond only by sending written notice of termination to the Surety and to the Superfund Division Director for EPA Region 5, provided, however, that no such termination shall become effective unless and until the Surety receives written authorization for termination of this Performance Bond by the Superfund Division Director (or his or her designee).

7. Any modification, revision, or amendment which may be made in the terms of the Agreement or in the Work to be done thereunder, or any extension of the Agreement, or other forbearance on the part of either the Principal or EPA to the other, shall not in any way release the Principal and the Surety, or either of them, or their heirs, executors, administrators, successors or assigns from liability hereunder. The Surety hereby expressly waives notice of any change, revision, or amendment to the Agreement or to any related obligations between the Principal and EPA.

8. The Surety will immediately notify EPA of any of the following events: (a) the filing by the Surety of a petition seeking to take advantage of any laws relating to bankruptcy,

insolvency, reorganization, winding up or composition or adjustment of debts; (b) the Surety's consent to (or failure to contest in a timely manner) any petition filed against it in an involuntary case under such bankruptcy or other laws; (c) the Surety's application for (or consent to or failure to contest in a timely manner) the appointment of, or the taking of possession by, a receiver, custodian, trustee, liquidator, or the like of itself or of all or a substantial part of its assets; (d) the Surety's making a general assignment for the benefit of creditors; or (e) the Surety's taking any corporate action for the purpose of effecting any of the foregoing.

9. Any provision in this Performance Bond that conflicts with CERCLA or any other applicable statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or legal requirement shall be deemed incorporated herein.

10. All notices, consents, approvals and requests required or permitted hereunder shall be given in writing and shall be effective for all purposes if hand delivered or sent by (a) certified or registered United States mail, postage prepaid, return receipt requested or (b) expedited prepaid delivery service, either commercial or United States Postal Service, with proof of attempted delivery, to the address shown on this first page of this Performance Bond.

All notices, elections, requests and demands under this Performance Bond shall be effective and deemed received upon the earliest of (a) the actual receipt of the same by personal delivery or otherwise, (b) one (1) business day after being deposited with a nationally recognized overnight courier service as required above, or (c) three (3) business days after being deposited in the United States mail as required above. Rejection or other refusal to accept or the inability to deliver because of changed address of which no notice was given as herein required shall be deemed to be receipt of the notice, election, request, or demand sent.

11. The Surety hereby agrees that the obligations of the Surety under this Performance Bond shall be in no way impaired or affected by any winding up, insolvency, bankruptcy or reorganization of the Principal or by any other arrangement or rearrangement of the Principal for the benefit of creditors.

12. No right of action shall accrue on this Performance Bond to or for the use of any person other than EPA or the executors, administrators, successors or assigns of EPA.

[SIGNATURES ON FOLLOWING PAGE]

IN WITNESS WHEREOF, the Principal and Surety have executed this Performance Bond and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby represent, warrant, and certify that they are authorized to execute this Performance Bond on behalf of the Principal and Surety, respectively.

PRINCIPAL:

[_____] ,
a [corporation/partnership/limited liability
company] organized and in good standing in
the State of [_____]

Attest: _____
Name: _____

By: _____
Name: _____
Title: _____

SURETY:

[_____] ,
a [corporation/partnership/limited liability
company] organized and in good standing in
the State of [_____]

Attest: _____
Name: _____

By: _____
Name: _____
Title: _____

CORPORATE ACKNOWLEDGMENTS

STATE OF _____)

SS:

COUNTY OF _____)

On _____, 20__, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person on behalf of which the individual(s) acted, executed the instrument.

Notary Public

STATE OF _____)

SS:

COUNTY OF _____)

On _____, 20__, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person on behalf of which the individual(s) acted, executed the instrument.

Notary Public

United States v. 3MCompany, et al. (S.D. Ohio)

Consent Decree
Appendix F

List of Performing Settling Defendants

Appendix F

To Consent Decree, *United States v. 3M Company,*
et al. (S.D. Ohio)

List of Performing Settling Defendants

Akzo Nobel Coatings Inc., successor-in-interest to
Hanna Chemical Coatings Company and Reliance
Universal, Inc.

Alcoa Inc.

Arkema Inc. (for M&T Chemicals Inc.)

C.P., Inc.

Ford Motor Company

GATX Corporation

Georgia-Pacific LLC

International Paper Company

I.V.C. Industrial Coatings, Inc., successor in interest to
Indianapolis Varnish, Inc.

Meritor, Inc., for itself and on behalf of its current and
former affiliates and predecessors and their affiliates
and predecessors including, without limitation, the
entities designated by U.S. EPA as "Arvin
Industries" and "Roll Coater" that did business at
various times under the following names:

ArvinMeritor, Inc.; Arvin Industries, Inc.; and Roll
Coater, Inc.

Momentive Specialty Chemicals Inc.

Morton International, LLC

Navistar, Inc. on behalf of Navistar International Corp.
f/k/a International Harvester

PPG Industries, Inc.

United Technologies Corporation on behalf of Lear
Corporation Automotive Systems, f/k/a Sheller-
Globe Corporation

Valspar Corporation

United States v. 3M Company, et al. (S.D. Ohio)

**Consent Decree
Appendix G**

List of Settling Non-Performing Defendants

Appendix G
 To Consent Decree, *United States v. 3M Company*,
et al. (S.D. Ohio)
 List of Settling Non-Performing Defendants

NAME	PAYMENT FOR OU1 RD/RA AND OU2 RI/FS (a)	PAYMENT FOR OU2 RD/RA (b)	TOTAL PAYMENT (a) + (b)
3M Company	\$193,068.00	\$88,220.41	\$281,288.41
General Electric Company	\$177,498.00	\$81,105.86	\$258,603.86
Thomas & Betts Corporation, as successor to Lamson & Sessions Co., as successor to Angell Manufacturing	\$166,599.00	\$76,125.68	\$242,724.68
OXY USA Inc.	\$143,244.00	\$65,453.86	\$208,697.86
Pharmacia LLC	\$112,104.00	\$51,224.76	\$163,328.76
Whittaker Corporation	\$108,990.00	\$49,801.85	\$158,791.85
Shell Oil Company	\$94,977.00	\$43,398.75	\$138,375.75
Univar USA Inc.	\$93,420.00	\$42,687.30	\$136,107.30
Ashland Inc.	\$88,749.00	\$40,552.93	\$129,301.93
BP Products North America Inc.	\$74,736.00	\$34,149.84	\$108,885.84
The Goodyear Tire & Rubber Company	\$73,179.00	\$33,438.38	\$106,617.38
Egyptian Lacquer Manufacturing Co.	\$81,622.00	\$32,726.93	\$114,348.93
Robbins & Myers, Inc.	\$80,065.00	\$32,015.47	\$112,080.47
United States Steel Corporation and its subsidiaries for USS Chemicals Division Lincoln Molded Plastics	\$68,508.00	\$31,304.02	\$99,812.02
Illinois Tool Works Inc.	\$60,723.00	\$27,746.74	\$88,469.74
Clopay Corporation	\$59,166.00	\$27,035.29	\$86,201.29
The Sherwin-Williams Company	\$46,710.00	\$21,343.65	\$68,053.65
Cummins Inc.	\$46,710.00	\$21,343.65	\$68,053.65
Continental Can Corporation	\$55,153.00	\$20,632.19	\$75,785.19
Honeywell International Inc.	\$42,039.00	\$19,209.28	\$61,248.28
Copeland Corporation	\$38,925.00	\$17,786.37	\$56,711.37