

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION VII

Valley Park TCE
Valley Park, Missouri

Respondents

Docket No. CERCLA-07-2016-0016

ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY

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ADMINISTRATIVE SETTLEMENT AND ORDER ON CONSENT
FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY
WAINWRIGHT OPERABLE UNIT (OPERABLE UNITS 1 AND 3)

I. JURISDICTION AND GENERAL PROVISIONS

1. This Administrative Settlement Agreement and Order on Consent ("Settlement") is entered into voluntarily by the United States Environmental Protection Agency ("EPA"), Wainwright Industries, Inc., and Environmental Operations, Inc., ("Respondents"). This Settlement provides for the performance of a supplemental remedial investigation and feasibility study ("RI/FS") for the Wainwright Operable Unit (OU 1 and OU 3) by Respondents and the payment of certain response costs incurred by the United States at or in connection with the Wainwright Operable Unit of the Valley Park TCE Site (the "Site") located generally at 224 Benton Street in Valley Park, St. Louis County, Missouri.

2. This Settlement is issued under the authority vested in the President of the United States by Sections 104, 107, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9604, 9607, and 9622 ("CERCLA"). This authority was delegated to the Administrator of EPA on January 23, 1987, by Executive Order 12580, 52 Fed. Reg. 2923 (Jan. 29, 1987), and further delegated to Regional Administrators by EPA Delegation Nos. 14-14-C (Administrative Actions Through Consent Orders, Apr. 15, 1994) and 14-14-D (Cost Recovery Non-Judicial Agreements and Administrative Consent Orders, May 11, 1994). These authorities were further redelegated by the Regional Administrator of EPA Region 7 to the Director, Superfund Division by R7-14-014C and R7-14-14D.

3. EPA and Respondents recognize that this Settlement has been negotiated in good faith and that the actions undertaken by Respondents in accordance with this Settlement do not constitute an admission of any liability. Respondents do not admit, and retain the right to controvert in any subsequent proceedings other than proceedings to implement or enforce this Settlement, the validity of the findings of fact, conclusions of law, and determinations in Section IV (Finding of Fact) and V (Conclusions of Law and Determinations) of this Settlement. Respondents agree to comply with and be bound by the terms of this Settlement and further agrees that it will not contest the basis or validity of this Settlement or its terms.

II. PARTIES BOUND

4. This Settlement is binding upon EPA and upon Respondents and their successors and assigns. Any change in ownership or corporate status of Respondents including, but not limited to, any transfer of assets or real or personal property shall not alter Respondent's responsibilities under this Settlement.

5. Respondents shall ensure that their contractors, subcontractors, and representatives receive a copy of this Settlement and comply with this Settlement. Respondents shall be responsible for any noncompliance with this Settlement.

6. Each undersigned representative of Respondents certify that he or she is fully authorized to enter into the terms and conditions of this Settlement and to execute and legally bind Respondents to this Settlement.

7. Respondents shall provide a copy of this Settlement to each contractor hired to perform the Work required by this Settlement and to each person representing Respondents 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 Settlement. Respondents or their contractors shall provide written notice of the Settlement to all subcontractors hired to perform any portion of the Work required by this Settlement. Respondents shall nonetheless be responsible for ensuring that their contractors and subcontractors perform the Work in accordance with the terms of this Settlement.

III. DEFINITIONS

8. Unless otherwise expressly provided in this Settlement, terms used in this Settlement 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 Settlement or its appendices, the following definitions shall apply:

“Affected Property” shall mean all real property at the Site and any other real property where EPA determines, at any time, that access, land, water, or other resource use restrictions are needed to implement the RI/FS, including, but not limited to, the property at 224 Benton Street in Valley Park, St. Louis County, Missouri.

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

“Day” or “day” shall mean a calendar day. In computing any period of time under this Settlement, 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 effective date of this Settlement as provided in Section XXXII.

“Engineering Controls” shall mean constructed containment barriers or systems that control one or more of the following: downward migration, infiltration, or seepage of surface runoff or rain; or natural leaching migration of contaminants through the subsurface over time. Examples include caps, engineered bottom barriers, immobilization processes, and vertical barriers.

“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 Settlement, in overseeing implementation of the Work, or otherwise implementing, overseeing, or enforcing this Settlement, including but not limited to, payroll costs, contractor costs, travel costs, laboratory costs, the costs incurred pursuant to Section XI (Property Requirements) (including, but not limited to, the cost of attorney time and any monies paid to secure access, including, but not limited to, the amount of just compensation), Section XV (Emergency Response and Notification of Releases), Paragraph 98 (Work Takeover), Paragraph 118 (Access to Financial Assurance), Section XVII (Dispute Resolution), and all litigation costs. Future Response Costs shall also include Agency for Toxic Substances and Disease Registry (“ATSDR”) costs regarding the Site.

“Institutional Controls” or “ICs” shall mean Proprietary Controls and state or local laws, regulations, ordinances, zoning restrictions, or other governmental controls or notices that: (i) limit land, water, or other resource use to minimize the potential for human exposure to Waste Material at or in connection with the Site; (ii) limit land, water, or other resource use to implement, ensure non-interference with, or ensure the protectiveness of the response action pursuant to this Settlement; and/or (iii) provide information intended to modify or guide human behavior at or in connection with the Site.

“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. Rates are available online at http://www.epa.gov/ocfopage/finstatement/superfund/int_rate.htm.

“NCP” or “National Contingency Plan” 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.

“Non-Settling Owner” shall mean any person, other than Respondents, that owns or controls any Affected Property. The clause “Non-Settling Owner’s Affected Property” means Affected Property owned or controlled by Non-Settling Owner.

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

“Parties” shall mean EPA and Respondents.

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

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

“Respondents” shall mean Wainwright Industries, Inc., and Environmental Operations, Inc.

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

“Settlement” shall mean this Administrative Settlement Agreement and Order on Consent, the SOW, all appendices attached hereto (listed in Section XXIX (Integration/Appendices)) and all documents incorporated by reference into this document including without limitation EPA-approved submissions. EPA-approved submissions (other than progress reports) are incorporated into and become a part of the Settlement upon approval by EPA. In the event of conflict between this Settlement and any appendix or other incorporated documents, this Settlement shall control.

“Site” shall mean the Wainwright Operable Unit, of the Valley Park TCE Superfund Site, encompassing approximately 2 acres, located at 224 Benton Street in Valley Park, Missouri and depicted generally on the map attached as Appendix 1. The Valley Park TCE site is managed as three operable units (OUs): OU1 includes the contaminated soils on the property formerly owned by Wainwright Industries, Inc. (Wainwright); OU2 is called Valley Park Proper and includes contaminated soils at the property owned by Valley Technologies, Inc. (Valley Tech) and the area-wide contaminant plume; and OU3 is the contaminated groundwater beneath OU1. Due to their common location, OU1 and OU3 were combined and are referred to as the Wainwright Operable Unit.

“State” shall mean the State of Missouri.

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

“Wainwright Operable Unit” shall mean the source of soil and groundwater contamination in an area within and adjacent to the property formerly owned by Wainwright Industries, Inc. at 224 Benton Street, Valley Park, Missouri. The area comprising the Wainwright Operable Unit is bordered on the north by Vest Avenue, on the east by 3rd Street, on the South by Benton Street, and on the west by commercial property. It is shown on the map attached as Appendix 1. It includes the contaminated soils at the property and the contaminated ground water beneath the property.

“Waste Material” shall mean (a) any “hazardous substance” under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (b) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); (c) any “solid waste” under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); and (d) any “hazardous waste” under Section 260.360 (11) of Missouri Revised Statutes, § 260.360(11), RSMo 2015.

“Work” shall mean all activities Respondents are required to perform under this Settlement, except those required by Section XIII (Record Retention).

IV. FINDINGS OF FACT

9. The Valley Park TCE site is located in the downtown area of Valley Park, St. Louis County, Missouri. Valley Park is located on the western edge of a suburban area which is part of St. Louis, Missouri, just north of the Meramec River in St. Louis County. The Valley Park TCE site is managed as three OUs: OU1 includes the contaminated soils on the property formerly owned by Wainwright; OU2 is called Valley Park Proper and includes contaminated soils at the property owned by Valley Technologies, Inc. (Valley Tech) and the area-wide ground water contaminant plume; and OU3 is the contaminated groundwater beneath OU1. Due to their common location, OU1 and OU3 were combined and are referred to as the Wainwright Operable Unit (WOU). The WOU consists of the former Wainwright Industries, Inc. facility at 224 Benton Street, formerly "Benton Avenue" located within Block #20 of Valley Park, Missouri and as shown on the attached map as Appendix 1. The WOU is used for residential and industrial purposes. The WOU is located within the floodplain of the Meramec River which is 1/4 mile to the south. The Meramec River in this area flows from west to east.

10. Wainwright is a corporation and was incorporated under the laws of the State of Missouri and authorized to do business in Missouri in September 1947 with its purpose, among others, to transact a general manufacturing business, including the manufacture and sale of engines. Wainwright owned property which was located at 224 Benton Street, Valley Park, St. Louis County, Missouri.

11. From 1947 until 1979, Wainwright manufactured metal stamping, specializing in steel struts and inserts and operated as a contract tool and die shop at its facility at 224 Benton Street. Wainwright used trichloroethene (TCE) and tetrachloroethene (PCE) in its manufacturing process.

12. In 1980, Wainwright leased the facility to Imperial Ornamental Metal Company, which operated at that location until 1987. Imperial Ornamental Metal Company produced ornamental and structural metal fabrications for various industries.

13. Wainwright sold the property at 224 Benton Street to Ray's Tree Service who operated at the property for a few years. The property is currently leased to West County Landscaping, Ray's Tree Service is no longer in business.

14. In 1982, the Missouri Department of Natural Resources (MDNR), found chlorinated volatile organic compounds, including TCE and PCE in all three municipal water supply wells serving the community of Valley Park.

15. The Site was listed on the National Priorities List ("NPL") pursuant to CERCLA Section 105, 42 U.S.C. § 9605, and 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on June 10, 1986, 51 FR 21054.

16. Between May 4, 1987, and September 20, 1987, a consultant for the MDNR conducted a limited remedial investigation at the Site. As part of this investigation, the consultant installed 26 groundwater monitoring wells at 17 locations in and around Valley Park. The highest concentration of both TCE, at 646 parts per billion (ppb), and PCE, at 3,207 ppb, was

found in a monitoring well located at the southeast corner of Third Street and Benton Avenue, directly across the street to the south of the Wainwright property.

17. In 1988, a consultant for Wainwright conducted soil sampling from a depth of one to eight feet at 224 Benton Street. Sampling results showed PCE as high as 2,200,000 ppb and TCE as high as 540,000 ppb at a depth of one foot.

18. On July 13, 1989 and September 27 through 29, 1989, Wainwright performed subsurface sampling underneath the Wainwright's building. One soil sample taken at a depth of 10 feet showed PCE at 368,000 ppb and TCE at 6,340 ppb.

19. On September 10 and 11, 1990, MDNR conducted soil sampling of Wainwright's property to the north of the manufacturing building. Analytical results showed levels as high as 1,200,000 ppb for PCE at depth.

20. On August 7, 1990 EPA entered into an Administrative Order on Consent (AOC) with Wainwright to perform a removal action at 224 Benton Street. Approximately 330 cubic yards of contaminated soil were excavated and disposed off-site. Based on elevated levels of TCE and PCE remaining in verification samples, this order was suspended until Wainwright completed the remedial investigation/feasibility study (RI/FS) pursuant to an AOC for an RI/FS with MDNR entered on approximately May 22, 1991.

21. On April 30, 1992 and May 1, 1992 Wainwright analyzed water samples taken from monitoring wells immediately across the street to the south of Wainwright's property revealing levels of PCE in the ground water as high as 620 ppb.

22. As part of the required work under the RI/FS AOC with the State of Missouri, Wainwright's contractor sampled the Wainwright soils on August 20-21, 1992, and found levels of PCE as high as 2,500 ppb and levels of TCE as high as 6,100 ppb.

23. The RI dated April 21, 1994, conducted by Wainwright states that the major solvents found in the groundwater are PCE, TCE and 1,1,1 Trichloroethane (TCA). Analytical results of a monitoring well immediately south of the Wainwright property showed PCE at levels as high as 1,500 ppb and TCE at levels as high as 420 ppb. Analytical results from a second monitoring well immediately to the southwest of Wainwright property showed PCE up to 11 ppb and TCE at levels up to 22 ppb.

24. In 1994 the initial RI/FS was completed. A Record of Decision was finalized by EPA and MDNR and completed in September 1994.

25. In 1997, a consultant for Wainwright conducted additional studies, sampling soil and ground water at the Site. Levels in soils ranged from non detect to 110,000 ppb for PCE and from non detect to 330 ppb for TCE.

26. In 1999, an in-situ soil vapor extraction (SVE) and groundwater extraction and treatment system (GETS) were constructed at the Site. 600 cubic yards of contaminated soil were excavated and treated ex-situ using a steam-enhance mobile SVE system. The SVE and

GETS have operated intermittently at the Site, and several attempts have been made to enhance the systems including construction of a replacement extraction well.

27. MDNR collected soil samples in 2006 at the Site, from 4 locations in previously excavated or treated areas and found PCE as high as 38,000 ppb and TCE as high as 1,270 ppb.

28. In 2011 and 2012, a consultant for Wainwright performed a site investigation to define current soil concentrations in the source area. Soil borings were advanced at 11 locations in or near previously excavated or treated areas and beneath the warehouse floor. Concentrations of PCE were found as high as 2,360,000 ppb and concentrations of TCE were found as high as 54,800 ppb.

29. In 2015, an interim vapor intrusion mitigation system was installed in the WOU office building on the Site.

30. TCE is a known animal carcinogen and a suspected human carcinogen. Exposure to very high concentrations of TCE can cause dizziness, headaches, sleepiness, incoordination, confusion, nausea, unconsciousness, and even death. Eating or breathing high levels of TCE may damage some of the nerves in the face. Exposure to high levels can also result in changes in the rhythm of the heartbeat, liver damage, and evidence of kidney damage. Skin contact with concentrated solutions of TCE can cause skin rashes. The maximum contaminant level (MCL) for TCE is 5 ppb.

31. PCE is a probable human carcinogen. Breathing high levels of PCE for a brief period may cause dizziness or drowsiness, headache, and incoordination; higher levels may cause unconsciousness and even death. Exposure for longer periods to low levels of PCE may cause changes in mood, memory, attention, reaction time, and vision. The proposed MCL for PCE is 5 ppb.

V. CONCLUSIONS OF LAW AND DETERMINATIONS

32. Based on the Findings of Fact set forth above, and the administrative record, EPA has determined that:

a. The Wainwright Operable Unit of the Valley Park TCE Site is a “facility” as defined in Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

b. The contamination found at the Site, as identified in the Findings of Fact above, includes TCE and PCE which are “hazardous substances” as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

c. Wainwright Industries, Inc., is a “person” as defined in Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

d. Wainwright Industries, Inc. is a responsible party under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

(1) Wainwright Industries, Inc., was the “owner” and/or “operator” of the facility at the time of disposal of hazardous substances at the facility, as defined by Section 101(20) of CERCLA, 42 U.S.C. § 9601(20), and within the meaning of Section 107(a)(2) of CERCLA, 42 U.S.C. § 9607(a)(2).

e. The conditions described in Paragraphs 14 through 31 of the Findings of Fact above constitute an actual and/or threatened “release” of a hazardous substance from the facility as defined in Section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

f. The actions required by this Settlement are necessary to protect the public health, welfare, or the environment, are in the public interest, 42 U.S.C. § 9622(a), are consistent with CERCLA and the NCP, 42 U.S.C. §§ 9604(a)(1), 9622(a), and will expedite effective remedial action and minimize litigation, 42 U.S.C. § 9622(a).

g. EPA has determined that Respondents are qualified to conduct the RI/FS within the meaning of Section 104(a) of CERCLA, 42 U.S.C. § 9604(a), and will carry out the Work properly and promptly, in accordance with Sections 104(a) and 122(a) of CERCLA, 42 U.S.C. §§ 9604(a) and 9622(a), if Respondents comply with the terms of this Settlement.

VI. SETTLEMENT AGREEMENT AND ORDER

33. Based upon the foregoing Findings of Fact, Conclusions of Law, Determinations, and the administrative record it is hereby Ordered and Agreed that Respondents shall comply with all provisions of this Settlement, including, but not limited to, all appendices to this Settlement and all documents incorporated by reference into this Settlement.

VII. DESIGNATION OF CONTRACTORS AND PROJECT COORDINATORS

34. Selection of Contractors, Personnel. All Work performed under this Settlement shall be under the direction and supervision of qualified personnel. Respondents have notified EPA that Environmental Operations, Inc., of St. Louis, Missouri will be their contractor to perform the Work under this Settlement. EPA has not disapproved the use of this contractor.

35. Respondents have designated, and EPA has not disapproved, the following individual as Project Coordinator, who shall be responsible for administration of all actions by Respondents required by this Settlement: Jill Witts, Environmental Operations, Inc., 1530 South Second Street, St. Louis, Missouri 63104-0500, phone: 314-241-0900, email address: jillw@environmentalops.com.

36. EPA has designated Hoai Tran of the Missouri/Kansas Remedial Branch, Superfund Division, EPA Region 7, as its Remedial Project Manager (RPM). EPA will notify Respondents of a change of its designated RPM. Except as otherwise provided in this Settlement, Respondents shall direct all submissions required by this Settlement to the RPM at 11201 Renner Boulevard, Lenexa, Kansas 66219 via regular mail or express mail. If submissions are via electronic mail they should be sent to tran.hoi@epa.gov.

37. EPA’s RPM shall be responsible for overseeing Respondent’s implementation of this Settlement. EPA’s RPM shall have the authority vested in a Remedial Project Manager and

On-Scene Coordinator (OSC) by the NCP, including the authority to halt, conduct, or direct any Work required by this Settlement, or to direct any other response action undertaken at the Site. Absence of EPA's RPM from the Site shall not be cause for stoppage of work unless specifically directed by EPA's RPM.

38. EPA shall arrange for a qualified person to assist in its oversight and review of the conduct of the RI/FS, as required by Section 104(a) of CERCLA, 42 U.S.C. § 9604(a). Such person shall have the authority to observe Work and make inquiries in the absence of EPA, but not to modify the RI or FS Work Plans.

VIII. WORK TO BE PERFORMED

39. For any regulation or guidance referenced in the Settlement, the reference will be read to include any subsequent modification, amendment, or replacement of such regulation or guidance. Such modifications, amendments, or replacements apply to the Work only after Respondents receive notification from EPA of the modification, amendment, or replacement.

40. Activities and Deliverables.

a. Respondents shall conduct activities and submit plans, reports, or other deliverables as provided by the RI or FS Work Plans, which are incorporated by reference, for the development of the RI/FS. All such Work shall be conducted in accordance with the provisions of this Settlement, the Work Plans, CERCLA, the NCP, and EPA guidance, including, but not limited to, the "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" ("RI/FS Guidance") (OSWER Directive # 9355.3-01, October 1988), "Guidance for Data Useability in Risk Assessment" (OSWER Directive #9285.7-09A, April 1992), and guidance referenced therein, and guidance referenced in the Work Plans, as may be amended or modified by EPA. The general activities that Respondents are required to perform are identified below, followed by a list of deliverables. The tasks that Respondents must perform are described more fully in the Work Plans and guidance. The activities and deliverables identified below shall be developed as provided in the RI or FS Work Plans and the Sampling and Analysis Plan (SAP), and shall be submitted to EPA as provided therein. All Work performed under this Settlement shall be in accordance with the schedules in this Settlement or established in the Work Plans, and in full accordance with the standards, specifications, and other requirements of the RI or FS Work Plans and the SAP, as initially approved or modified by EPA, and as may be amended or modified by EPA from time to time. In accordance with the schedules established in this Settlement or in the Work Plans, Respondents shall submit to EPA and the State 2 paper copies and 1 exact pdf copy on a compact disk of all deliverables required under this Settlement, and the RI or FS Work Plans. In addition all deliverables shall be submitted electronically to the appropriate email addresses. All deliverables will be reviewed and approved by EPA pursuant to Section IX (Submission and Approval of Deliverables).

b. Scoping. EPA will determine the Site-specific objectives of the RI/FS and devise a general management approach for the Site, as stated in the Work Plans. Respondents shall conduct the remainder of scoping activities as described in the Work Plans and referenced guidance. During the project planning and implementation, Respondents shall provide EPA with the following deliverables:

(1) RI Work Plan. Attached hereto as Appendix 2 is an approved RI Work Plan. The Respondents have submitted a SAP, which consists of the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP), and a Site Health and Safety Plan (HASP). These documents have been reviewed or approved by EPA.

c. Site Characterization. Within sixty (60) days of the Effective Date, Respondents shall mobilize to characterize the Site. Respondents shall complete Site characterization and submit all deliverables in accordance with the schedules and deadlines established in the EPA-approved RI Work Plan.

d. Baseline Human Health Risk Assessment. Respondents will perform the Baseline Human Health Risk Assessment and Ecological Risk Assessment ("Risk Assessment") in accordance with the RI Work Plan, and applicable EPA guidance, including but not limited to: "Interim Final Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual (Part A)," RAGS, EPA-540-1-89-002, OSWER Directive 9285.7-01A (December 1989); (June 1997).

e. Draft Remedial Investigation Report. Within 30 days after EPA's approval of the Risk Assessments, Respondents shall submit to EPA for review and approval pursuant to Section IX (Submission and Approval of Deliverables), a Draft Remedial Investigation Report ("Draft RI Report") consistent with the RI Work Plan. The Draft RI Report shall also contain the Risk Assessments.

f. FS Work Plan. At the same time Respondents submit the Draft RI Report, Respondents shall submit an FS Work Plan. Upon its approval by EPA pursuant to Section IX (Submission and Approval of Deliverables), the FS Work Plan shall be incorporated into and become enforceable under this Settlement.

g. Treatability Studies. While not anticipated, Respondents shall conduct treatability studies as necessary. If treatability studies are necessary, in accordance with the schedules or deadlines established in this Settlement, the EPA-approved RI or FS Work Plans, Respondents shall provide EPA with the following plans, reports, and other deliverables for review and approval pursuant to Section IX (Submission and Approval of Deliverables):

(1) Identification of Candidate Technologies Memorandum. This memorandum shall be submitted as specified by EPA.

(2) Treatability Testing Work Plan. If EPA determines that treatability testing is required, within 30 days thereafter, Respondents shall submit a Treatability Testing Work Plan, including a schedule.

(3) Treatability Study Sampling. Within 30 days after identification of the need for a separate or revised QAPP or FSP, Respondents shall revise the FSP and QAPP approved by EPA as part of the RI Work Plan to include any necessary sampling for the treatability study and submit the revised document to EPA for review and approval pursuant to Section IX (Submission and Approval of Deliverables).

(4) Treatability Study Health and Safety. Within 30 days after the identification of the need for a revised HASP, Respondents shall revise the HASP submitted as part of the RI Work Plan to include those activities contemplated by the treatability study and submit the revised HASP to EPA for review and approval pursuant to Section IX (Submission and Approval of Deliverables).

(5) Treatability Study Evaluation Report. Within 30 days after completion of any treatability testing, Respondents shall submit a treatability study evaluation report as provided in the Treatability Testing Work Plan.

h. Development and Screening of Alternatives. Respondents shall develop an appropriate range of waste management options that will be evaluated through the development and screening of alternatives, as provided in the RI or FS Work Plans. In accordance with the schedules or deadlines established in this Settlement, and/or the EPA-approved RI and FS Work Plans, Respondents shall provide EPA with the following deliverables for review and approval pursuant to Section IX (Submission and Approval of Deliverables):

(1) Memorandum on Remedial Action Objectives. The Memorandum on Remedial Action Objectives shall include remedial action objectives for Engineering Controls as well as for Institutional Controls.

(2) Memorandum on Development and Screening of Alternatives. The Memorandum on Development and Screening of Alternatives shall summarize the development and screening of remedial alternatives.

(3) Applicable or Relevant and Appropriate Requirements (ARARs) Technical Memorandum. The ARARs technical memorandum shall summarize the review of all potential ARARs for the alternatives being considered.

i. Detailed Analysis of Alternatives. Respondents shall conduct a detailed analysis of remedial alternatives, as described in the RI or FS Work Plans. In accordance with the deadlines or schedules established in this Settlement, and the EPA-approved RI and FS Work Plans, Respondents shall provide EPA with the following deliverables and presentation for review and approval pursuant to Section IX (Submission and Approval of Deliverables):

(1) Report on Comparative Analysis and Presentation to EPA. Within 90 days after approval of the FS Work Plan, Respondents will submit a report on comparative analysis to EPA. Within 30 days after submitting the report on comparative analysis, Respondents will present to EPA a summary of the findings of the remedial investigation and remedial action objectives, and present the results of the nine criteria evaluation and comparative analysis, as described in the FS Work Plan.

(2) Alternatives Analysis for Institutional Controls and Screening. Respondents shall submit a memorandum on the Institutional Controls identified in the Memorandum on Development and Screening of Alternatives as potential remedial actions. The Alternatives Analysis for Institutional Controls and Screening shall (i) describe the restrictions needed on land, water, or other resources and their relationship to the remedial action objectives; (ii) determine the specific types of Institutional Controls that can be used to address and

implement the land, water, or other resource use restrictions; (iii) investigate when the Institutional Controls need to be implemented and how long they must remain in place; (iv) research, discuss, and document any agreement or other arrangements with the proper entities (e.g., state, local government, local landowners, conservation organizations, Respondents) on exactly who will be responsible for implementing, maintaining, and enforcing the Institutional Controls. The Alternatives Analysis for Institutional Controls and Screening shall also evaluate the Institutional Controls identified in the Memorandum on Development and Screening of Alternatives against the nine evaluation criteria outlined in the NCP (40 C.F.R. § 300.430(e)(9)(iii)) for CERCLA cleanups, including but not limited to costs to implement, maintain, and/or enforce the Institutional Controls. The Alternatives Analysis for Institutional Controls and Screening shall be submitted as an appendix to the Draft Feasibility Study Report.

(3) Draft Feasibility Study Report. Within 30 days after the presentation to EPA described in Paragraph 40.i(2), Respondents shall submit to EPA a Draft Feasibility Study Report ("Draft FS Report") which reflects the findings in the Risk Assessments. Respondents shall refer to Table 6-5 of the RI/FS Guidance for report content and format. The draft report as amended, and the administrative record, shall provide the basis for the proposed plan under Sections 113(k) and 117(a) of CERCLA, 42 U.S.C. §§ 9613(k) and 9617(a), by EPA, and shall document the development and analysis of remedial alternatives.

41. Upon receipt of the Draft FS Report, EPA will evaluate, as necessary, the estimates of the risk to the public and environment that are expected to remain after a particular remedial alternative has been completed and will evaluate the cost, implementability, and long-term effectiveness of any proposed Institutional Controls for that alternative.

42. Modification of the RI or FS Work Plans.

a. If at any time during the RI/FS process, Respondents identify a need for additional data, Respondents shall submit a memorandum documenting the need for additional data to the EPA RPM within 30 days after identification. EPA in its discretion will determine whether the additional data will be collected by Respondents and whether it will be incorporated into plans, reports, and other deliverables.

b. In the event of unanticipated or changed circumstances at the Site, Respondents shall notify the EPA RPM by telephone within 24 hours of discovery of the unanticipated or changed circumstances. In the event that EPA determines that the unanticipated or changed circumstances warrant changes in the RI or FS Work Plans, EPA shall modify or amend the RI or FS Work Plans in writing accordingly. Subject to Section XVII (Dispute Resolution) Respondents shall perform the RI or FS Work Plans as modified or amended.

c. EPA may determine that in addition to tasks defined in the initially approved RI or FS Work Plans, other additional Work may be necessary to accomplish the objectives of the RI/FS. Subject to Section XVII (Dispute Resolution) Respondents agree to perform these response actions in addition to those required by the initially approved RI or FS Work Plans, including any approved modifications, if EPA determines that such actions are necessary for a complete RI/FS.

d. Respondents shall confirm its willingness to perform the additional Work in writing to EPA within 7 days after receipt of the EPA request. If Respondents object to any modification determined by EPA to be necessary pursuant to this Paragraph, Respondents may seek dispute resolution pursuant to Section XVII (Dispute Resolution). The RI or FS Work Plans shall be modified in accordance with the final resolution of the dispute.

e. Respondents shall complete any additional Work according to the standards, specifications, and schedule set forth or approved by EPA in a written modification to the RI or FS Work Plans or written RI or FS Work Plan supplements. EPA reserves the right to conduct the Work itself at any point, to seek reimbursement from Respondents for the costs incurred in performing the Work, and/or to seek any other appropriate relief.

f. Nothing in this Paragraph shall be construed to limit EPA's authority to require performance of further response actions at the Site.

43. Off-Site Shipment.

a. Respondents may ship hazardous substances, pollutants and contaminants from the Site to an off-Site facility only if they comply with Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), and 40 C.F.R. § 300.440. Respondents will be deemed to be in compliance with CERCLA Section 121(d)(3) and 40 C.F.R. § 300.440 regarding a shipment if Respondents obtain a prior determination from EPA that the proposed receiving facility for such shipment is acceptable under the criteria of 40 C.F.R. § 300.440(b).

b. Respondents 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 EPA's RPM. This written 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 must 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. Respondents shall also notify the state environmental official referenced above and EPA's RPM of any major changes in the shipment plan, such as a decision to ship the Waste Material to a different out-of-state facility. Respondents shall provide the written notice after the award of the contract for the RI or FS and before the Waste Material is shipped.

c. Respondents may ship Investigation Derived Waste (IDW) from the Site to an off-Site facility only if it complies with Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3), 40 C.F.R. § 300.440, EPA's "Guide to Management of Investigation Derived Waste," OSWER 9345.3-03FS (Jan. 1992), and any IDW-specific requirements contained in the RI or FS Work Plans. Wastes shipped off-Site to a laboratory for characterization, and RCRA hazardous wastes that meet the requirements for an exemption from RCRA under 40 C.F.R. § 261.4(e) shipped off-Site for treatability studies, are not subject to 40 C.F.R. § 300.440.

44. Meetings. Respondents shall make presentations at, and participate in, meetings at the request of EPA during the initiation, conduct, and completion of the RI/FS. In addition to

discussion of the technical aspects of the RI/FS, topics will include anticipated problems or new issues. Meetings will be scheduled at EPA's discretion.

45. Progress Reports. In addition to the deliverables set forth in this Settlement, Respondents shall submit monthly progress reports to EPA by the 10th day of the following month. At a minimum, with respect to the preceding month, these progress reports shall:

- a. describe the actions that have been taken to comply with this Settlement;
- b. include all results of sampling and tests and all other data received by Respondents;
- c. describe Work planned for the next two months with schedules relating such Work to the overall project schedule for RI/FS completion; and
- d. describe all problems encountered in complying with the requirements of this Settlement and any anticipated problems, any actual or anticipated delays, and solutions developed and implemented to address any actual or anticipated problems or delays.

IX. SUBMISSION AND APPROVAL OF DELIVERABLES

46. Submission of Deliverables

a. General Requirements for Deliverables. Respondents shall submit all deliverables to EPA and the State in electronic form in addition to the requirements of Paragraph 40.a. Technical specifications for sampling and monitoring data and spatial data are addressed in Paragraph 46.b. All other deliverables shall be submitted to EPA in the form specified by EPA's RPM (see Paragraph 40.a). If any deliverable includes maps, drawings, or other exhibits that are larger than 8.5" by 11", Respondents shall also provide EPA and the State with paper copies of such exhibits (see Paragraph 40.a).

b. Technical Specifications for Deliverables.

(1) Sampling and monitoring data should be submitted in standard regional Electronic Data Deliverable (EDD) format. The data should be compatible with EQulS. Other delivery methods may be allowed if electronic direct submission presents a significant burden or as technology changes.

(2) Spatial data, including spatially-referenced data and geospatial data, should be submitted: (1) in the ESRI File Geodatabase format; and (2) as unprojected geographic coordinates in decimal degree format using North American Datum 1983 (NAD83) or World Geodetic System 1984 (WGS84) as the datum. If applicable, submissions should include the collection method(s). Projected coordinates may optionally be included but must be documented. Spatial data should be accompanied by metadata, and such metadata should be compliant with the Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata and its EPA profile, the EPA Geospatial Metadata Technical Specification. An add-on metadata editor for ESRI software, the EPA Metadata Editor (EME), complies with these FGDC and EPA metadata requirements and is available at <https://edg.epa.gov/EME/>.

(3) Each file must include an attribute name for each site unit or sub-unit submitted. Consult <http://www.epa.gov/geospatial/policies.html> for any further available guidance on attribute identification and naming.

(4) Spatial data submitted by Respondents does not, and is not intended to, define the boundaries of the Site.

47. Initial Submissions

a. After review of any deliverable that is required to be submitted for approval pursuant to this Settlement, in a notice to Respondents EPA shall: (1) approve, in whole or in part, the submission; (2) approve the submission upon specified conditions; (3) modify the submission to cure the deficiencies; (4) disapprove, in whole or in part, the submission, directing that Respondents modify the submission; or (5) any combination of the above. However, EPA shall not modify a submission without first providing Respondents at least one notice of deficiency and an opportunity to cure within 14 days, except where to do so would cause serious disruption to the Work or where previous submission(s) have been disapproved due to material defects.

b. In the event of approval, approval upon conditions, or modification by EPA, pursuant to Paragraphs 47.a(1), 47.a(2), 47.a(3), or 47.a(5), Respondents shall proceed to take any action required by the plan, report, or other deliverable, as approved or modified by EPA subject only to its right to invoke the Dispute Resolution procedures set forth in Section XVII (Dispute Resolution) with respect to the modifications or conditions made by EPA. Following EPA approval or modification of a submission or portion thereof, Respondents shall not thereafter alter or amend such submission or portion thereof unless directed by EPA. In the event that EPA modifies the submission to cure the deficiencies pursuant to Paragraph 47.a(3) and the submission had a material defect, EPA retains the right to seek stipulated penalties, as provided in Section XIX (Stipulated Penalties).

48. Resubmission.

a. Upon receipt of a notice of disapproval, Respondents 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. Any stipulated penalties applicable to the submission, as provided in Section XIX (Stipulated Penalties), shall accrue during the 30-day period or otherwise specified period but shall not be payable unless the resubmission is disapproved or modified due to a material defect as provided in Paragraphs 47 and 50, respectively.

b. Notwithstanding the receipt of a notice of disapproval, Respondents shall proceed to take any action required by any non-deficient portion of the submission, unless otherwise directed by EPA. Implementation of any non-deficient portion of a submission shall not relieve Respondents of any liability for stipulated penalties under Section XIX (Stipulated Penalties).

c. Respondents shall not proceed with any activities or tasks dependent on the following deliverables until receiving EPA approval, approval on condition, or modification

of such deliverables: RI or FS Work Plans and Sampling and Analysis Plan, Health and Safety Plan, Draft Remedial Investigation Report and Treatability Testing Work Plan (if necessary), and Draft Feasibility Study Report. While awaiting EPA approval, approval on condition, or modification of these deliverables, Respondents shall proceed with all other tasks and activities that may be conducted independently of these deliverables, in accordance with the schedule set forth under this Settlement.

d. For all remaining deliverables not listed above in Paragraph 48.c, Respondents shall proceed with all subsequent tasks, activities, and deliverables without awaiting EPA approval on the submitted deliverable. EPA reserves the right to stop Respondents from proceeding further, either temporarily or permanently, on any task, activity or deliverable at any point during the RI/FS.

49. If EPA disapproves a resubmitted plan, report, or other deliverable, or portion thereof, EPA may again direct Respondents to correct the deficiencies. EPA shall also retain the right to modify or develop the plan, report, or other deliverable. Respondents shall implement any such plan, report, or deliverable as corrected, modified, or developed by EPA, subject only to Respondent's right to invoke the procedures set forth in Section XVII (Dispute Resolution).

50. If upon resubmission, a plan, report, or other deliverable is disapproved or modified by EPA due to a material defect, Respondents shall be deemed to have failed to submit such plan, report, or other deliverable timely and adequately unless Respondents invoke the dispute resolution procedures in accordance with Section XVII (Dispute Resolution) and EPA's action is revoked or substantially modified pursuant to a Dispute Resolution decision issued by EPA or superseded by an agreement reached pursuant to that Section. The provisions of Section XVII (Dispute Resolution) and Section XIX (Stipulated Penalties) shall govern the implementation of the Work and accrual and payment of any stipulated penalties during Dispute Resolution. If EPA's disapproval or modification is not otherwise revoked, substantially modified, or superseded as a result of a decision or agreement reached pursuant to the Dispute Resolution process set forth in Section XVII (Dispute Resolution), stipulated penalties shall accrue for such violation from the date on which the initial submission was originally required, as provided in Section XIX (Stipulated Penalties).

51. In the event that EPA takes over some of the tasks, but not the preparation of the RI Report or the FS Report, Respondents shall incorporate and integrate information supplied by EPA into the final reports.

52. All plans, reports, and other deliverables submitted to EPA under this Settlement shall, upon approval or modification by EPA, be incorporated into and enforceable under this Settlement. In the event EPA approves or modifies a portion of a plan, report, or other deliverable submitted to EPA under this Settlement, the approved or modified portion shall be incorporated into and enforceable under this Settlement.

53. Neither failure of EPA to expressly approve or disapprove of Respondent's submissions within a specified time period, nor the absence of comments, shall be construed as approval by EPA. Whether or not EPA gives express approval for Respondent's deliverables, Respondents are responsible for preparing deliverables acceptable to EPA.

X. QUALITY ASSURANCE, SAMPLING, AND DATA ANALYSIS

54. Quality Assurance. Respondents shall assure that Work performed, samples taken, and analyses conducted conform to the requirements of the Work Plans, the QAPP, and guidance identified therein. Respondents shall assure that field personnel used by Respondents are properly trained in the use of field equipment and in chain of custody procedures. Respondents shall only use laboratories that have a documented quality system that complies with "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.

55. Sampling.

a. All results of sampling, tests, modeling, or other data (including raw data) generated by Respondents, or on Respondent's behalf, during the period that this Settlement is effective, shall be submitted to EPA in the next monthly progress report as described in Paragraph 45. EPA will make available to Respondents validated data generated by EPA unless it is exempt from disclosure by any federal or state law or regulation.

b. Upon request, Respondents shall provide split or duplicate samples to EPA and the State or their authorized representatives. Respondents shall notify EPA and the State not less than 14 days prior to conducting significant field events as described in the RI or FS Work Plans, or Sampling and Analysis Plan. In addition, EPA and the State shall have the right to take any additional samples that EPA or the State deem necessary. Upon request, EPA and the State shall provide to Respondents split or duplicate samples of any samples they take as part of EPA's oversight of Respondent's implementation of the Work.

c. Respondents shall submit to EPA and the State, in the next monthly progress report as described in Paragraph 45 copies of the results of all sampling and/or tests or other data obtained or generated by or on behalf of Respondents with respect to the Site and/or the implementation of this Settlement.

d. In entering into this Settlement, Respondents waive any objections to any data gathered, generated, or evaluated by EPA, the State or Respondents in the performance or oversight of the Work that has been verified according to the quality assurance/quality control (QA/QC) procedures required by the Settlement or any EPA-approved RI or FS Work Plans, including any Field Sampling Plans. If Respondents object to any other data relating to the RI/FS, Respondents shall submit to EPA a report that specifically identifies and explains its objections, describes the acceptable uses of the data, if any, and identifies any limitations to the use of the data. The report must be submitted to EPA within 15 days after the monthly progress report containing the data.

XI. PROPERTY REQUIREMENTS

56. Agreements Regarding Access and Non-Interference. Respondents shall, with respect to any Non-Settling Owner's Affected Property, use best efforts to secure from such Non-Settling Owner an agreement, enforceable by Respondents and the United States, providing that such Non-Settling Owner: (i) provide the United States, the State, Respondents, and their representatives, contractors, and subcontractors with access at all reasonable times to such

Affected Property to conduct any activity regarding the Settlement, including those activities listed in Paragraph 56.a (Access Requirements); and (ii) refrain from using such Affected 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 Work.

a. Access Requirements. The following is a list of activities for which access is required regarding the Affected Property:

- (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, implementing, or monitoring response actions;
- (6) Assessing implementation of quality assurance and quality control practices as defined in the approved QAPP;
- (7) Implementing the Work pursuant to the conditions set forth in Paragraph 98 (Work Takeover);
- (8) Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Respondents or its agents, consistent with Section XII (Access to Information);
- (9) Assessing Respondent's compliance with the Settlement;
- (10) Determining whether the Affected Property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted under the Settlement; and
- (11) Implementing, monitoring, maintaining, reporting on, and enforcing any land, water, or other resource use restrictions regarding the Affected Property.

57. Best Efforts. As used in this Section, "best efforts" means the efforts that a reasonable person in the position of Respondents would use so as to achieve the goal in a timely manner, including the cost of employing professional assistance and the payment of reasonable sums of money to secure access and/or use restriction agreements, as required by this Section. If Respondents are unable to accomplish what is required through "best efforts" in a timely manner, it shall notify EPA, and include a description of the steps taken to comply with the requirements. If EPA deems it appropriate, it may assist Respondents, or take independent

action, in obtaining such access and/or use restrictions. All costs incurred by the United States in providing such assistance or taking such action, including the cost of attorney time and the amount of monetary consideration or just compensation paid, constitute Future Response Costs to be reimbursed under Section XVI (Payment of Response Costs).

58. If EPA determines in a decision document prepared in accordance with the NCP that Institutional Controls in the form of state or local laws, regulations, ordinances, zoning restrictions, or other governmental controls or notices are needed, Respondents shall cooperate with EPA's and the State's efforts to secure and ensure compliance with such Institutional Controls.

59. In the event of any Transfer of the Affected Property, unless the United States otherwise consents in writing, Respondents shall continue to comply with its obligations under the Settlement, including its obligation to secure access and ensure compliance with any land, water, or other resource use restrictions regarding the Affected Property.

60. Notwithstanding any provision of this Settlement, EPA and the State retain all of their access authorities and rights, including enforcement authorities related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

XII. ACCESS TO INFORMATION

61. Respondents shall provide to EPA and the State, 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 a Respondent's possession or control or that of its contractors or agents relating to activities at the Site or to the implementation of this Settlement, 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. Respondents shall also make available to EPA and the State, for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

62. Privileged and Protected Claims.

a. Respondents may assert all or part of a Record requested by EPA or the State is privileged or protected as provided under federal law, in lieu of providing the Record, provided Respondents comply with Paragraph 62.b, and except as provided in Paragraph 62.c.

b. If Respondents assert such a privilege or protection, Respondents shall provide EPA and the State with the following information regarding such Record: its title; its date; the name, title, affiliation (e.g., company or firm), and address of the author, of each addressee, and of each recipient; a description of the Record's contents; and the privilege or protection asserted. If a claim of privilege or protection applies only to a portion of a Record, Respondents shall provide the Record to EPA and the State in redacted form to mask the privileged or protected portion only. Respondents shall retain all Records that it claims to be privileged or protected until EPA and the State has had a reasonable opportunity to dispute the privilege or protection claim and any such dispute has been resolved in Respondent's favor.

c. Respondents may make no claim of privilege or protection regarding: (1) any data regarding the Site, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, radiological, or engineering data, or the portion of any other Record that evidences conditions at or around the Site; or (2) the portion of any Record that Respondents are required to create or generate pursuant to this Settlement.

63. Business Confidential Claims. Respondents may assert that all or part of a Record provided to EPA and the State under this Section or Section XIII (Record Retention) is business confidential 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). Respondents shall segregate and clearly identify all Records or parts thereof submitted under this Settlement for which Respondents assert business confidentiality claims. Records submitted to EPA 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 Respondents 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 Respondents.

64. Notwithstanding any provision of this Settlement, EPA and the State retain all of their information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

XIII. RECORD RETENTION

65. Until ten (10) years after EPA provides Respondents with notice, pursuant to Section XXIX (Notice of Completion of Work), that all Work has been fully performed in accordance with this Settlement, Respondents shall preserve and retain all non-identical copies of Records (including Records in electronic form) now in their possession or control, or that come into their possession or control, that relate in any manner to their liability under CERCLA with regard to the Site, provided, however, that Respondents' who are potentially liable as an owner or operator 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. Respondents 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 their possession or control or that come into their possession or control that relate in any manner to the performance of the Work, provided, however, that Respondents (and its contractors and agents) 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.

66. At the conclusion of the document retention period, Respondents shall notify EPA and the State at least 90 days prior to the destruction of any such Records, and, upon request by EPA or the State, and except as provided in Paragraph 62 (Privileged and Protected Claims), Respondents shall deliver any such Records to EPA or the State.

67. Respondents certify that, to the best of their knowledge and belief, after thorough inquiry, they have not altered, mutilated, discarded, destroyed, or otherwise disposed of any Records (other than identical copies) relating to their potential liability regarding the Site since notification of potential liability by EPA or the State and that they have fully complied with any and all EPA and State 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, and state law.

XIV. COMPLIANCE WITH OTHER LAWS

68. Nothing in this Settlement limits Respondent's obligations to comply with the requirements of all applicable state and federal laws and regulations, except as provided in Section 121(e) of CERCLA, 42 U.S.C. § 6921(e), and 40 C.F.R. §§ 300.400(e) and 300.415(j). In accordance with 40 C.F.R. § 300.415(j), all on-site actions required pursuant to this Settlement shall, to the extent practicable, as determined by EPA, considering the exigencies of the situation, attain applicable or relevant and appropriate requirements (ARARs) under federal environmental or state environmental or facility siting laws. Respondents shall identify ARARs in the ARARs Technical Memorandum subject to EPA approval.

69. No local, state, or federal 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), including studies, if the action is selected and carried out in compliance with Section 121 of CERCLA, 42 U.S.C. § 9621. Where any portion of the Work that is not on-site requires a federal or state permit or approval, Respondents shall submit timely and complete applications and take all other actions necessary to obtain and to comply with all such permits or approvals. Respondents 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 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. This Settlement is not, and shall not be construed to be, a permit issued pursuant to any federal or state statute or regulation.

XV. EMERGENCY RESPONSE AND NOTIFICATION OF RELEASES

70. Emergency Response. If any event occurs during performance of the Work that causes or threatens to cause a release of Waste Material on, at, or from the Site that either constitutes an emergency situation or that may present an immediate threat to public health or welfare or the environment, Respondents shall immediately take all appropriate action to prevent, abate, or minimize such release or threat of release. Respondents shall take these actions in accordance with all applicable provisions of this Settlement, including, but not limited to, the HASP. Respondents shall also immediately notify EPA's RPM or, in the event of his/her unavailability, the Regional Duty Officer at 913-281-0991 of the incident or Site conditions. In the event that Respondents fail to take appropriate response action as required by this Paragraph, and EPA takes such action instead, Respondents shall reimburse EPA all costs of the response action not inconsistent with the NCP pursuant to Section XVI (Payment of Response Costs).

71. Release Reporting. In addition, in the event of any release of a hazardous substance from the Site, Respondents shall immediately notify EPA's RPM, the Regional Duty Officer at 913-281-0991, and the National Response Center at (800) 424-8802. Respondents shall submit a written report to EPA within 7 days after each release, setting forth the events that occurred and the measures taken or to be taken to mitigate any release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release. This reporting requirement is in addition to, and not in lieu of, reporting under Section 103(c) of CERCLA, 42 U.S.C. § 9603(c), and Section 304 of the Emergency Planning and Community Right-To-Know Act of 1986, 42 U.S.C. § 11004.

XVI. PAYMENT OF RESPONSE COSTS

72. Payments for Future Response Costs. Respondents shall pay to EPA all Future Response Costs not inconsistent with the NCP.

a. On a periodic basis, EPA will send Respondents a bill requiring payment that includes an Itemized Cost Summary, which includes direct and indirect costs incurred by EPA, its contractors, subcontractors, and the United States Department of Justice. Respondents shall make all payments within 30 days after Respondent's receipt of each bill requiring payment, except as otherwise provided in Paragraph 74 (Contesting Future Response Costs), and in accordance with Paragraphs 72.a and 72.b (Payments for Future Response Costs). Respondents shall make payment to EPA by Fedwire Electronic Funds Transfer (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"

and shall reference Site/Spill ID Number 077F and the EPA docket number for this action.

b. At the time of payment, Respondents shall send notice that payment has been made to the EPA RPM, the EPA, Region 7, Regional Financial Officer, 11201 Renner Boulevard, Lenexa, Kansas, 66219, and to the EPA Cincinnati Finance Office by email at cinwd_acctsreceivable@epa.gov, or by mail to

EPA Cincinnati Finance Office
26 W. Martin Luther King Drive
Cincinnati, Ohio 45268

Such notice shall reference Site/Spill ID Number 077F and the EPA docket number for this action.

c. Deposit of Future Response Costs Payments. The total amount to be paid by Respondents pursuant to Paragraph 72.a shall be deposited by EPA in the Valley Park TCE

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, provided, however, that EPA may deposit a Future Response Costs payment directly into the EPA Hazardous Substance Superfund if, at the time the payment is received, EPA estimates that the Valley Park TCE Special Account balance is sufficient to address currently anticipated future response actions to be conducted or financed by EPA at or in connection with the Site. Any decision by EPA to deposit a Future Response Costs payment directly into the EPA Hazardous Substance Superfund for this reason shall not be subject to challenge by Respondents pursuant to the dispute resolution provisions of this Settlement or in any other forum.

73. Interest. In the event that any payment for Future Response Costs is not made by the date required, Respondents shall pay Interest on the unpaid balance. The Interest on Future Response Costs shall begin to accrue on the date of the bill. The Interest shall accrue through the date of Respondent's payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to the United States by virtue of Respondent's failure to make timely payments under this Section, including but not limited to, payment of stipulated penalties pursuant to Section XIX (Stipulated Penalties).

74. Contesting Future Response Costs. Respondents may initiate the procedures of Section XVII (Dispute Resolution) regarding payment of any Future Response Costs billed under Paragraph 72 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. To initiate such a dispute, Respondents shall submit a Notice of Dispute in writing to EPA's RPM within 30 days after receipt of the bill. Any such Notice of Dispute shall specifically identify the contested Future Response Costs and the basis for objection. If Respondents submit a Notice of Dispute, Respondents shall within the 30-day period, also as a requirement for initiating the dispute, (a) pay all uncontested Future Response Costs to EPA in the manner described in Paragraph 72, and (b) 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. Respondents shall send to EPA's RPM 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. If EPA prevails in the dispute, within 5 days after the resolution of the dispute, Respondents shall pay the sums due (with accrued interest) to EPA in the manner described in Paragraph 72. If Respondents prevail concerning any aspect of the contested costs, Respondents shall pay that portion of the costs (plus associated accrued interest) for which they did not prevail to EPA in the manner described in Paragraph 72. Respondents shall be disbursed any balance of the escrow account. The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XVII (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding Respondent's obligation to reimburse EPA for its Future Response Costs.

XVII. DISPUTE RESOLUTION

75. Unless otherwise expressly provided for in this Settlement, the dispute resolution procedures of this Section shall be the exclusive mechanism for resolving disputes arising under this Settlement. The Parties shall attempt to resolve any disagreements concerning this Settlement expeditiously and informally.

76. Informal Dispute Resolution. If Respondents object to any EPA action taken pursuant to this Settlement, including billings for Future Response Costs, they shall send EPA a written Notice of Dispute describing the objection(s) within 30 days after such action. EPA and Respondents shall have 30 days from EPA's receipt of Respondent's Notice of Dispute to resolve the dispute through informal negotiations (the "Negotiation Period"). The Negotiation Period may be extended at the sole discretion of EPA. Any agreement reached by the Parties pursuant to this Section shall be in writing and shall, upon signature by the Parties, be incorporated into and become an enforceable part of this Settlement.

77. Formal Dispute Resolution. If the Parties are unable to reach an agreement within the Negotiation Period, Respondents shall, within 30 days after the end of the Negotiation Period, submit a statement of position to EPA's RPM. EPA may, within 30 days thereafter, submit a statement of position. Thereafter, an EPA management official at the Division level or higher will issue a written decision on the dispute to Respondents. EPA's decision shall be incorporated into and become an enforceable part of this Settlement. Respondents shall fulfill the requirement that was the subject of the dispute in accordance with the agreement reached or with EPA's decision, whichever occurs.

78. Except as provided in Paragraph 74 (Contesting Future Response Costs) or as agreed by EPA, the invocation of formal dispute resolution procedures under this Section does not extend, postpone, or affect in any way any obligation of Respondents under this Settlement. Except as provided in Section XIX (Stipulated Penalties), any stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Settlement. In the event that Respondents do not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XIX (Stipulated Penalties).

XVIII. FORCE MAJEURE

79. "Force Majeure" for purposes of this Settlement, is defined as any event arising from causes beyond the control of Respondents, of any entity controlled by Respondents, or of Respondent's contractors that delays or prevents the performance of any obligation under this Settlement despite Respondent's best efforts to fulfill the obligation. The requirement that Respondents 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 increased cost of performance.

80. If any event occurs or has occurred that may delay the performance of any obligation under this Settlement, Respondents shall notify EPA's RPM orally or, in his or her absence, the alternate EPA Project Coordinator, or, in the event both of EPA's designated representatives are unavailable, the Director of the Superfund Division, EPA Region 7, within 7 days of when Respondents first knew that the event might cause a delay. Within 7 days thereafter, Respondents 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; Respondent's rationale for attributing such delay to a force majeure; and a statement as to whether, in the opinion of Respondents, such event may cause or contribute to an endangerment to public health or welfare, or the environment. Respondents shall include with any notice all available documentation supporting their claim that the delay was attributable to a force majeure. Respondents shall be deemed to know of any circumstance of which Respondents, any entity controlled by Respondents, or Respondent's contractors knew or should have known. Failure to comply with the above requirements regarding an event shall preclude Respondents from asserting any claim of force majeure regarding that event, provided, however, that if EPA, despite the late or incomplete notice, is able to assess to its satisfaction whether the event is a force majeure under Paragraph 79 and whether Respondents has exercised their best efforts under Paragraph 79, EPA may, in its unreviewable discretion, excuse in writing Respondent's failure to submit timely or complete notices under this Paragraph.

81. If EPA agrees that the delay or anticipated delay is attributable to a force majeure, the time for performance of the obligations under this Settlement 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 Respondents in writing of its decision. If EPA agrees that the delay is attributable to a force majeure, EPA will notify Respondents in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure.

82. If Respondents elect to invoke the dispute resolution procedures set forth in Section XVII (Dispute Resolution), they shall do so no later than 15 days after receipt of EPA's notice. In any such proceeding, Respondents 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 Respondents complied with the requirements of Paragraphs 79 and 80. If Respondents carry this burden, the delay at issue shall be deemed not to be a violation by Respondents of the affected obligation of this Settlement identified to EPA.

83. The failure by EPA to timely complete any obligation under the Settlement is not a violation of the Settlement, provided, however, that if such failure prevents Respondents from meeting one or more deadlines under the Settlement, Respondents may seek relief under this Section.

XIX. STIPULATED PENALTIES

84. Respondents shall be liable to EPA for stipulated penalties in the amounts set forth in Paragraphs 85 and 86 for failure to comply with any of the requirements of this Settlement specified below, unless excused under Section XVIII (Force Majeure). "Compliance" by Respondents shall include completion of all activities and obligations, including payments, required under this Settlement, or any activities contemplated under any RI or FS Work Plan or other plan approved under this Settlement identified below, in accordance with all applicable requirements of law, this Settlement, any attached work plan, and any deliverables approved under this Settlement and within the specified time schedules established by and approved under this Settlement.

85. Stipulated Penalty Amounts - Work (Including Payments and Excluding Deliverables).

a. The following stipulated penalties shall accrue per violation per day for any noncompliance identified in Paragraph 85.b:

<u>Penalty Per Violation Per Day</u>	<u>Period of Noncompliance</u>
\$ 1,500	1st through 14th day
\$ 1,750	15th through 30th day
\$ 2,000	31st day and beyond

b. Compliance Milestones.

- (1) Completion of draft and final RI Report
- (2) Completion of draft and final Human Health Risk Assessment
- (3) Completion of Treatability Testing Work Plan, if necessary
- (4) Completion of Treatability Study Evaluation Report, if necessary
- (5) Completion of draft and final FS Work Plan
- (6) Completion of draft and final FS Report
- (7) Establishment and maintenance of financial assurance in compliance with the timelines and other substantive and procedural requirements of Section XXVII (Financial Assurance)

86. Stipulated Penalty Amounts - Deliverables. The following stipulated penalties shall accrue per violation per day for failure to submit timely or adequate deliverables pursuant to this Settlement:

<u>Penalty Per Violation Per Day</u>	<u>Period of Noncompliance</u>
\$ 750	1st through 14th day
\$ 1,000	15th through 30th day
\$ 1,500	31st day and beyond

87. In the event that EPA assumes performance of a portion or all of the Work pursuant to Paragraph 98 (Work Takeover), Respondents, subject to Section XVII (Dispute

Resolution) shall be liable for a stipulated penalty in the amount of \$50,000. Stipulated penalties under this Paragraph are in addition to the remedies available to EPA under Paragraphs 98 (Work Takeover) and 118 (Access to Financial Assurance).

88. 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. Penalties shall continue to accrue during any dispute resolution period, and shall be paid within 15 days after the agreement or the receipt of EPA's decision or order. However, stipulated penalties shall not accrue: (a) with respect to a deficient submission under Section IX (Submission and Approval of Deliverables), during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies Respondents of any deficiency; and (b) with respect to a decision by the EPA Management Official at the Division level or higher, under Paragraph 77 of Section XVII (Dispute Resolution), during the period, if any, beginning on the 21st day after the Negotiation Period begins until the date that the EPA Management Official issues a final decision regarding such dispute. Nothing in this Settlement shall prevent the simultaneous accrual of separate penalties for separate violations of this Settlement.

89. Following EPA's determination that Respondents have failed to comply with a requirement of this Settlement, EPA may give Respondents written notification of the failure and describe the noncompliance. EPA may send Respondents 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 Respondents of a violation.

90. All penalties accruing under this Section shall be due and payable to EPA within 30 days after Respondent's receipt from EPA of a demand for payment of the penalties, unless Respondents invoke the Dispute Resolution procedures under Section XVII (Dispute Resolution). All payments to EPA under this Section shall indicate that the payment is for stipulated penalties and shall be made in accordance with Paragraph 72 (Payments for Future Response Costs).

91. If Respondents fail to pay stipulated penalties when due, Respondents shall pay Interest on the unpaid stipulated penalties as follows: (a) if Respondents 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 88 until the date of payment; and (b) if Respondents fail to timely invoke dispute resolution, Interest shall accrue from the date of demand under Paragraph 90 until the date of payment. If Respondents fail to pay stipulated penalties and Interest when due, the United States may institute proceedings to collect the penalties and Interest.

92. The payment of penalties and Interest, if any, shall not alter in any way Respondent's obligation to complete performance of the Work required under this Settlement.

93. Nothing in this Settlement shall be construed as prohibiting, altering, or in any way limiting the ability of EPA to seek any other remedies or sanctions available by virtue of Respondent's violation of this Settlement or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Section 122(f) of CERCLA, 42 U.S.C.

§ 9622(l), and punitive damages pursuant to Section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3), provided however, that EPA shall not seek civil penalties pursuant to Section 122(l) of CERCLA or punitive damages pursuant to Section 107(c)(3) of CERCLA for any violation for which a stipulated penalty is provided in this Settlement, except in the case of willful violation of this Settlement or in the event that EPA assumes performance of a portion or all of the Work pursuant to Paragraph 98 (Work Takeover).

94. Notwithstanding any other provision of this Section, EPA may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Settlement.

XX. COVENANTS BY EPA

95. Except as provided in Section XXI (Reservations of Rights by EPA), EPA covenants not to sue or to take administrative action against Respondents pursuant to Sections 106 and 107(a) of CERCLA, 42 U.S.C. §§ 9606 and 9607(a), for the Work and Future Response Costs. These covenants shall take effect upon the Effective Date. These covenants are conditioned upon the complete and satisfactory performance by Respondents of their obligations under this Settlement. These covenants extend only to Respondents and do not extend to any other person.

XXI. RESERVATIONS OF RIGHTS BY EPA

96. Except as specifically provided in this Settlement, nothing in this Settlement shall limit the power and authority of EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants, or contaminants, or hazardous or solid waste on, at, or from the Site. Further, nothing in this Settlement shall prevent EPA from seeking legal or equitable relief to enforce the terms of this Settlement, from taking other legal or equitable action as it deems appropriate and necessary, or from requiring Respondents in the future to perform additional activities pursuant to CERCLA or any other applicable law.

97. The covenant not to sue set forth in Section XX (Covenants by EPA) above does not pertain to any matters other than those expressly identified therein. EPA reserves, and this Settlement is without prejudice to, all rights against Respondents with respect to all other matters, including, but not limited to:

- a. liability for failure by Respondents to meet a requirement of this Settlement;
- b. liability for costs not included within the definition of Future Response Costs;
- c. liability for performance of response action other than the Work;
- d. criminal liability;

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

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

g. liability arising from the past, present, or future disposal, release or threat of release of Waste Materials outside of the Site; and

h. liability for costs incurred or to be incurred by the Agency for Toxic Substances and Disease Registry related to the Site not paid as Future Response Costs under this Settlement.

98. Work Takeover.

a. In the event EPA determines that Respondents: (1) have ceased implementation of any portion of the Work; (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 Respondents. Any Work Takeover Notice issued by EPA (which writing may be electronic) will specify the grounds upon which such notice was issued and will provide Respondents a period of 7 days within which to remedy the circumstances giving rise to EPA's issuance of such notice.

b. If, after expiration of the 7-day notice period specified in Paragraph 98.a, Respondents 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 Respondents in writing (which writing may be electronic) if EPA determines that implementation of a Work Takeover is warranted under this Paragraph 98.b. Funding of Work Takeover costs is addressed under Paragraph 118 (Access to Financial Assurance).

c. Respondents may invoke the procedures set forth in Section XVII (Dispute Resolution) to dispute EPA's implementation of a Work Takeover under Paragraph 98.b. However, notwithstanding Respondent's 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 98.b until the earlier of (1) the date that Respondents 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 terminating such Work Takeover is rendered in accordance with Paragraph 77 (Formal Dispute Resolution).

d. Notwithstanding any other provision of this Settlement, EPA retains all authority and reserves all rights to take any and all response actions authorized by law.

XXII. COVENANTS BY RESPONDENTS

99. Respondents 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 Work, Future Response Costs, or this Settlement, including, but not limited to:

- a. any direct or indirect claim for reimbursement from the EPA Hazardous Substance Superfund through 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 claim arising out of response actions at or in connection with the Site, including any claim under the United States Constitution, the Missouri Constitution, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, or at common law; or
- c. any claims under Sections 107 and 113 of CERCLA, 42 U.S.C. §§ 9607 and 9613, Section 7002(a) of RCRA, 42 U.S.C. § 6972(a), or state law regarding the Work, Future Response Costs, and this Settlement.

100. Except as provided in Paragraph 103 (Waiver of Claims by Respondents) these covenants not to sue shall not apply in the event the United States brings a cause of action or issues an order pursuant to the reservations set forth in Section XXI (Reservations of Rights by EPA), other than in Paragraph 97.a (liability for failure to meet a requirement of the Settlement), 97.d (criminal liability), or 97.e (liability for violations of federal or state law), but only to the extent that Respondent's claim arises from the same response action, response costs, or damages that the United States is seeking pursuant to the applicable reservation.

101. Nothing in this Agreement shall be deemed to constitute approval or 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).

102. Respondents reserve, and this Settlement 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 Respondent's plans, reports, other deliverables, or activities.

103. Waiver of Claims by Respondents.

a. Respondents 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:

(1) De Micromis Waiver. For all matters relating to the Site against any person where the person's liability to Respondents 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.

b. Exceptions to Waiver.

(1) The waiver under this Paragraph 103 shall not apply with respect to any defense, claim, or cause of action that Respondents may have against any person otherwise covered by such waiver if such person asserts a claim or cause of action relating to the Site against Respondents.

(2) The waiver under Paragraph 103.a(1) (De Micromis Waiver) shall not apply to any claim or cause of action against any person otherwise covered by such waiver if EPA determines that: (i) the materials containing hazardous substances contributed to the Site by such person contributed significantly or could contribute significantly, either individually or in the aggregate, to the cost of the response action or natural resource restoration at the Site; or (ii) such person has failed to comply with any information request or administrative subpoena 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 if (iii) such person has been convicted of a criminal violation for the conduct to which the waiver would apply and that conviction has not been vitiated on appeal or otherwise.

XXIII. OTHER CLAIMS

104. By issuance of this Settlement, the United States and EPA assume no liability for injuries or damages to persons or property resulting from any acts or omissions of Respondents. The United States or EPA shall not be deemed a party to any contract entered into by Respondents or their directors, officers, employees, agents, successors, representatives, assigns, contractors, or consultants in carrying out actions pursuant to this Settlement.

105. Except as expressly provided in Paragraph 103 (Waiver of Claims by Respondents) and Section XX (Covenants by EPA), nothing in this Settlement constitutes a satisfaction of or release from any claim or cause of action against Respondents or any person not a party to this Settlement, for any liability such person may have under CERCLA, other statutes, or common law, including but not limited to any claims of the United States for costs, damages, and interest under Sections 106 and 107 of CERCLA, 42 U.S.C. §§ 9606 and 9607.

106. No action or decision by EPA pursuant to this Settlement shall give rise to any right to judicial review except as set forth in Section 113(h) of CERCLA, 42 U.S.C. § 9613(h).

XXIV. EFFECT OF SETTLEMENT/CONTRIBUTION

107. Except as provided in Paragraph 103 (Waiver of Claims by Respondents), nothing in this Settlement shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Settlement. Except as provided in Section XXII (Covenants by Respondents), 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 which 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 Settlement diminishes the right of the United States, pursuant to Section 113(f)(2) and (3) of CERCLA, 42 U.S.C. § 9613(f)(2) and (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).

108. The Parties agree that this Settlement constitutes an administrative settlement pursuant to which Respondents have, as of the Effective Date, resolved liability to the United States within the meaning of Sections 113(f)(2) and 122(h)(4) of CERCLA, 42 U.S.C. §§ 9613(f)(2) and 9622(h)(4), and is entitled, as of the Effective Date, to protection from contribution actions or claims as provided by Sections 113(f)(2) and 122(h)(4) of CERCLA, or as may be otherwise provided by law, for the “matters addressed” in this Settlement. The “matters addressed” in this Settlement are the Work and Future Response Costs.

109. The Parties further agree that this Settlement constitutes an administrative settlement pursuant to which Respondents have, as of the Effective Date, resolved liability to the United States within the meaning of Section 113(f)(3)(B) of CERCLA, 42 U.S.C. § 9613(f)(3)(B).

110. Respondents shall, with respect to any suit or claim brought by it for matters related to this Settlement, notify EPA in writing no later than 60 days prior to the initiation of such suit or claim. Respondents also shall, with respect to any suit or claim brought against it for matters related to this Settlement, notify EPA in writing within 10 days after service of the complaint or claim upon it. In addition, Respondents shall notify EPA within 10 days after service or receipt of any Motion for Summary Judgment and within 10 days after receipt of any order from a court setting a case for trial, for matters related to this Settlement.

111. In any subsequent administrative or judicial proceeding initiated by EPA, or by the United States on behalf of EPA, for injunctive relief, recovery of response costs, or other relief relating to the Site, Respondents 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 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 covenant by EPA set forth in Section XX (Covenants by EPA).

XXV. INDEMNIFICATION

112. The United States does not assume any liability by entering into this Settlement or by virtue of any designation of Respondents as EPA’s authorized representatives under Section

104(e) of CERCLA, 42 U.S.C. § 9604(e), and 40 C.F.R. 300.400(d)(3). Respondents shall indemnify, save, and hold harmless the United States, its 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 Respondents, their officers, directors, employees, agents, contractors, or subcontractors, and any persons acting on Respondent's behalf or under their control, in carrying out activities pursuant to this Settlement. Further, Respondents agree to pay the United States all costs it incurs, 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 based on negligent or other wrongful acts or omissions of Respondents, 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 Settlement. The United States shall not be held out as a party to any contract entered into by or on behalf of Respondents in carrying out activities pursuant to this Settlement. Neither Respondents nor any such contractor shall be considered an agent of the United States.

113. The United States shall give Respondents notice of any claim for which the United States plans to seek indemnification pursuant to this Section and shall consult with Respondents prior to settling such claim.

114. Respondents covenant not to sue and agree not to assert any claims or causes of action against the United States for damages or reimbursement or for set-off of any payments made or to be made to the United States, arising from or on account of any contract, agreement, or arrangement between Respondents 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, Respondents 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 Respondents and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays.

XXVI. INSURANCE

115. No later than 30 days before commencing any on-site Work, Respondents shall secure, and shall maintain until the first anniversary after issuance of Notice of Completion of Work pursuant to Section XXIX (Notice of Completion of Work), commercial general liability insurance with limits of \$1 million, for any one occurrence, and automobile insurance with limits of \$1 million, combined single limit, naming the EPA as an additional insured with respect to all liability arising out of the activities performed by or on behalf of Respondents pursuant to this Settlement. In addition, for the duration of the Settlement, Respondents shall provide EPA with certificates of such insurance and a copy of each insurance policy. Respondents shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. In addition, for the duration of the Settlement, Respondents 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 Respondents in furtherance of this Settlement. If Respondents demonstrate by evidence satisfactory to EPA that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering some or all of the same risks but in a lesser amount,

Respondents need provide only that portion of the insurance described above that is not maintained by the contractor or subcontractor.

XXVII. FINANCIAL ASSURANCE

116. Pursuant to their contract, Respondents have created an escrow account at Enterprise Bank & Trust (EB&T) to secure payment for work at the Site. Within thirty (30) days of the Effective Date, Respondents shall cause EB&T to certify to EPA that the escrow account contains \$500,000 dedicated solely to the Work and that EPA has access to the account in the event of a Work Takeover.

117. Respondents shall diligently monitor the adequacy of the financial assurance. If Respondents become aware of any information indicating that the financial assurance provided under this Section is inadequate or otherwise no longer satisfies the requirements of this Section, Respondents shall notify EPA of such information within 7 days. If EPA determines that the financial assurance provided under this Section is inadequate or otherwise no longer satisfies the requirements of this Section, EPA will notify Respondents of such determination. Respondents shall, within 30 days after notifying EPA or receiving notice from EPA under this Paragraph, secure and submit to EPA a letter from EB&T certifying that the required funds are in the escrow account dedicated to the Work.

118. Access to Financial Assurance.

a. If EPA issues a notice of implementation of a Work Takeover under Paragraph 98.b following the exhaustion of remedies by Respondents, then, in accordance with any applicable financial assurance mechanism, EPA is entitled to: (1) the performance of the Work; and/or (2) require that any funds guaranteed be paid in accordance with Paragraph 118.b.

b. If, upon issuance of a notice of implementation of a Work Takeover under Paragraph 98.b following the exhaustion of remedies by Respondents, then EPA may demand access to the funds in the escrow account in an amount, as determined by EPA, sufficient to cover the cost of the remaining Work to be performed. Respondents shall, within 30 days of such demand instruct EB&T to pay invoices submitted by EPA or its contractors for performance of the Work.

c. All EPA Work Takeover costs not paid under this Paragraph 118 must be reimbursed as Future Response Costs under Section XVI (Payment of Response Costs).

119. Release, Cancellation, or Discontinuation of Financial Assurance. Respondents may release, cancel, or discontinue any financial assurance provided under this Section only: (a) if EPA issues a Notice of Completion of Work under Section XXIX (Notice of Completion of Work); (b) in accordance with EPA's approval of such release, cancellation, or discontinuation; or (c) if there is a dispute regarding the release, cancellation or discontinuance of any financial assurance, in accordance with the agreement, final administrative decision, or final judicial decision resolving such dispute under to Section XVII (Dispute Resolution).

XXVIII. MODIFICATION

120. EPA's RPM may modify any plan or schedule or the Work Plans in writing or by oral direction. Any oral modification will be memorialized in writing by EPA promptly, but shall have as its effective date the date of EPA's RPM's oral direction. Any other requirements of this Settlement may be modified in writing by mutual agreement of the parties.

121. If Respondents seek permission to deviate from any approved work plan or schedule, Respondent's Project Coordinator shall submit a written request to EPA for approval outlining the proposed modification and its basis. Respondents may not proceed with the requested deviation until receiving oral or written approval from EPA's RPM pursuant to Paragraph 120.

122. No informal advice, guidance, suggestion, or comment by EPA's RPM or other EPA representatives regarding any deliverable submitted by Respondents shall relieve Respondents of their obligation to obtain any formal approval required by this Settlement, or to comply with all requirements of this Settlement, unless it is formally modified.

XXIX. NOTICE OF COMPLETION OF WORK

123. When EPA determines that all Work has been fully performed in accordance with this Settlement, with the exception of any continuing obligations required by this Settlement, including but not limited to, payment of Future Response Costs and record retention, EPA will provide written notice to Respondents. If EPA determines that such Work has not been completed in accordance with this Settlement, EPA will notify Respondents, provide a list of the deficiencies, and require that Respondents modify the RI or FS Work Plans if appropriate, in order to correct such deficiencies. Respondents shall implement the modified and approved RI or FS Work Plans and shall submit a modified draft FS Report in accordance with the EPA notice. Failure by Respondents to implement the approved modified RI or FS Work Plans shall be a violation of this Settlement.

XXX. INTEGRATION/APPENDICES

124. This Settlement and its appendices constitute the final, complete, and exclusive agreement and understanding among the Parties with respect to the settlement embodied in this Settlement. The parties acknowledge that there are no representations, agreements, or understandings relating to the settlement other than those expressly contained in this Settlement. The following appendices are attached to and incorporated into this Settlement:

- a. "Appendix 1" is the description and/or map of the Site.
- b. "Appendix 2" is the approved RI Work Plan.
- c. "Appendix 3" is the RI/FS Funds, Escrow Agreement with Enterprise Bank & Trust as Escrow Agent.

XXXI. ADMINISTRATIVE RECORD

125. EPA will determine the contents of the administrative record file for selection of the remedial action. Respondents shall submit to EPA documents developed during the course of the RI/FS upon which selection of the response action may be based. Upon request of EPA, Respondents shall provide copies of plans, task memoranda for further action, quality assurance memoranda and audits, raw data, field notes, laboratory analytical reports, and other reports. Upon request of EPA, Respondents shall additionally submit any previous studies conducted under state, local, or other federal authorities relating to selection of the response action, and all communications between Respondents and state, local, or other federal authorities concerning selection of the response action. At EPA's discretion, Respondents shall establish a community information repository at or near the Site, to house one copy of the administrative record.

XXXII. EFFECTIVE DATE

126. This Settlement shall be effective on the date it has been signed by all Parties.

The undersigned representative of Respondent certifies that he or she is fully authorized to enter into the terms and conditions of this Settlement and to bind the Respondent to this document.

Agreed this 15th day of September, 2016.

For Wainwright Industries, Inc.


A handwritten signature in black ink, appearing to read 'D. Robbins', written over a horizontal line.

David A. Robbins
President

The undersigned representative of Respondent certifies that he or she is fully authorized to enter into the terms and conditions of this Settlement and to bind the Respondent to this document.

Agreed this 8th day of September, 2016.

For Environmental Operations, Inc.



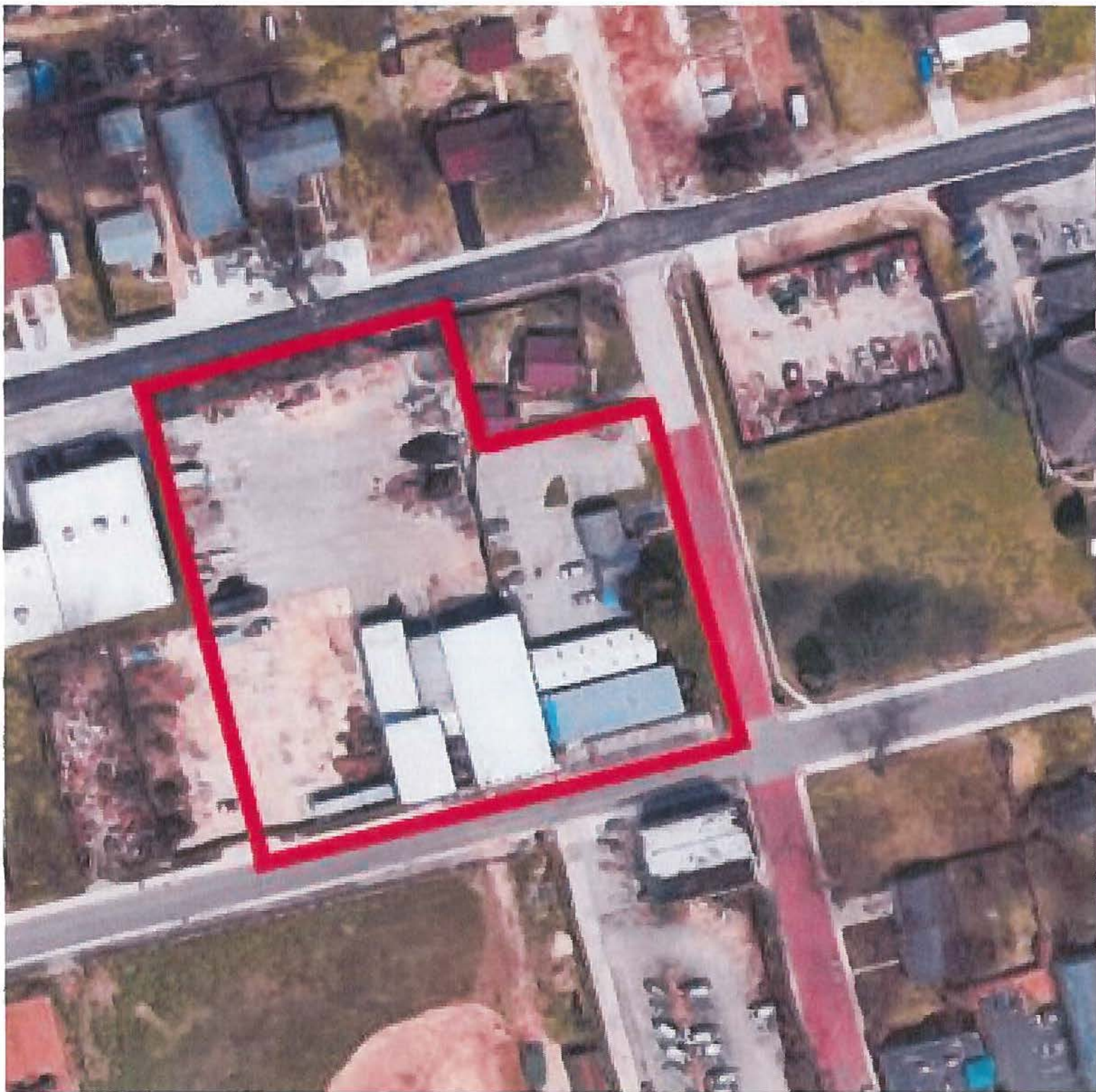
Stacy W. Hastie
Chairman and CEO

It is so ORDERED AND AGREED this 29th day of September, 2016.

Mary P. Peterson
Mary P. Peterson
Director
Superfund Division
U.S. Environmental Protection Agency, Region 7

EFFECTIVE DATE: 9/29/2016

APPENDIX 1



APPENDIX 2



**Environmental
Operations, Inc.**
CLEARING THE WAY

REMEDIAL INVESTIGATION WORK PLAN

**Wainwright Operable Unit (WOU)
Valley Park TCE Site
224 North Benton St.
Valley Park, Missouri**

May 27, 2016

Prepared for:
**Wainwright Industries, Inc.
St. Peters, MO**

Prepared by:
Environmental Operations, Inc.
1530 South Second Street, Suite 200
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EOI Project #5228

**Environmental Engineering, Consulting, Remediation & Demolition
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A Data Summary Tables from Past Reports

LIST OF ACRONYMS

ADAF	Age-dependent adjustment factor
ADD	Average daily dose
AF	Adherence factor
ABS _d	Absorption fraction, dermal
AOC	Administrative Orders on Consent
AT	Averaging time
BEHP	Bis(2-ethylhexyl)phthalate
BAP	Benzo(a)pyrene
BNA	Base neutral/acid extractables
BW	Body weight
CA	Chemical concentration in air
CF	Conversion factor
cm/sec	centimeter per second
COC	Chemical of concern
COPC	Chemical of potential concern
CR	Cancer Risk
Csat	soil saturation limit
CSM	Conceptual site model
DA _{event}	Absorbed dose per event
DAD	Dermal absorbed dose
DI	Daily Intake
DQO	Data quality objective
EC	Exposure concentration
ED	Exposure Duration
EF	Exposure Frequency
ELCR	Excess lifetime cancer risk
EOI	Environmental Operations, Inc.
ESD	Explanation of Significant Differences
ESE	Environmental Science and Engineering, Inc.
ET	Exposure Time
EPC	Exposure point concentration
EV	Event frequency
FA	Fraction of chemical absorbed
FI	Fraction Ingested
FS	Feasibility Study
FSP	Field Sampling Plan
FYR	Five-Year Report
GETS	Groundwater extraction and treatment system
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
HI	Hazard index
HQ	Hazard Quotients
IR	Ingestion rate

LIST OF ACRONYMS (CONT.)

IRIS	Integrated Risk Information System
IUR	Inhalation unit risk
Kp	Dermal permeability coefficient in water
L&S	Lafser & Schreiber, Inc.
MDHSS	Missouri Department of Health and Senior Services
NCEA	National Center for Environmental Exposure
NPL	National Priorities List
PAH	Polycyclic aromatic hydrocarbons
PCE	Tetrachloroethylene
PEF	Particle emission factor
PESC	Philip Environmental Services Corporation
PPRTV	Provisional Peer Reviewed Toxicity Value
PRP	Potentially responsible party
QAPP	Quality Assurance Project Plan
RAGS	Risk Assessment Guidance for Superfund
RD/RA SOW	Remedial Design/Remedial Action Statement of Work
RfC	Reference concentration
RfD	Reference Dose
RG	Remedial Goal
RGO	Remedial Goal Objectives
RI	Remedial investigation
RSL	Regional Screening Levels
SA	Skin surface area
SF	Slope Factor
SGY	Schreiber, Grana & Yonley
SOW	Scope of work
SSL	Soil screening level
SVE	Soil vapor extraction
SVOC	Semi-volatile Organic Compound
TCE	Trichloroethylene
TOC	Total organic carbon
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
VF	Volatility factor
VOC	Volatile Organic Compounds
WOU	Wainwright Operable Unit

1.0 INTRODUCTION

The purpose of this focused remedial investigation (RI) is to complete the characterization of the nature and extent of soil and groundwater contamination and to address data gaps at the Wainwright Operable Unit (WOU) of the Valley Park TCE Site (the Site). The Site is managed as three operable units (OUs): OU1 includes the contaminated soils on the Wainwright property; OU2 is the contaminated soil at the Valley Technologies, Inc. property and the area-wide contaminant groundwater plume; and OU3 is the contaminated groundwater beneath OU1. OU1 and OU3 together are referred to as the WOU, which is located at 224 Benton Avenue in Valley Park, Missouri.

The original Remedial Investigation and Feasibility Study (RI/FS) were completed for the WOU in 1994. Primary contaminants of concern in soil and groundwater were chlorinated volatile organic compounds (VOCs), mainly tetrachloroethylene (PCE) and trichloroethylene (TCE). A Consent Decree was signed with the Missouri Department of Natural Resources (MDNR) in 1996, which committed Wainwright to a remedial action to address soil and groundwater contamination for the WOU. Wainwright completed the remedial design for remedial actions at the site including the operation of a groundwater extraction and treatment system (GETS) and *in-situ* soil vapor extraction (SVE) system. However, the remedial goals (RGs) established in the Remedial Design/Remedial Action Statement of Work (RD/RA SOW) at the site have not been met and the remedial systems are not operating as intended.

The Second Five-year Review (FYR) Report completed by the United States Environmental Protection Agency (USEPA) in 2008 identified several issues including: "Asymptotic mass removal rates in the soil vapor extraction system and consistently high concentrations levels in the groundwater extraction wells above cleanup standards indicate the potential that a soil source has not be addressed and/or the effectiveness of the soil vapor extraction system requires improvement." Additional soil sampling was performed in 2011 and 2012, and results indicated that the soil source is larger than previously assumed, extending beneath the warehouse, and that the SVE system does not provide sufficient coverage to address the source area. The Third FYR Report identified as an issue that the nature and extent of soil contamination has not been adequately defined, and that an RI/FS should be performed at WOU. This RI work plan was prepared to address the issues identified by the USEPA and MDNR (Agencies).

Other potential exposure pathways include groundwater and indoor air (vapor intrusion). Groundwater has been investigated by sampling the groundwater beneath the site and in the downgradient monitoring wells; this sampling has been conducted by the MDNR and/or Wainwright consultants starting as early as 1987 (*Limited Remedial Investigation*, ESE, 1988). Co-mingled plumes and contaminants from OU2 and OU3 have been identified as part of the overall Valley Park TCE Site groundwater issue; area-wide groundwater in OU2 has been managed by the USEPA. On behalf of Wainwright, EOI assumed groundwater sampling at OU3 in 2014. A Quality Assurance Project Plan (QAPP) for Groundwater Sampling and Analysis

(EOI, 2014d), including a Field Sampling Plan, was prepared in November 2014, and approved by USEPA in a letter dated April 14, 2015. EOI conducted groundwater sample collection on August 17-18, 2015 at WOU and downgradient wells as required in the Consent Decree. A Groundwater Sampling Report was submitted to the Agencies dated September 8, 2015 (EOI, 2015c).

The overall strategy for groundwater at the site includes development of a groundwater ordinance to prevent installation of groundwater wells and use of groundwater for potable purposes in Valley Park. Valley Park currently does not use groundwater for the City water supply; the water is supplied by the Missouri American Water Company. City wells were abandoned in 1989. The approach to supplemental groundwater investigation is included in this RI work plan.

Sub-slab and indoor air vapor intrusion (VI) are being evaluated in a separate investigation conducted by EOI under MDNR and USEPA oversight. A QAPP for the Vapor Intrusion Air Pathway Sampling and Analysis including a FSP was completed by EOI in February 2014 (EOI, 2014a). Four quarters of sub-slab vapor and indoor air samples were collected in 2014 and 2015. The Agencies initially required installation of an interim vapor intrusion mitigation system in the residence on the WOU property, and after evaluating the data from the year of monitoring, the Agencies required installation of an interim VI mitigation system in the WOU office building. Post-installation performance evaluation monitoring has been initiated at the WOU office building (EOI, 2015d) and completed at the residence; residential results were reported with the sub-slab and indoor air reports (EOI 2014c, 2015a, 2015b). The interim mitigation systems will remain in operation until the clean-up goals are reached at the WOU. Indoor air monitoring will continue as per the plans, and data from the investigation and monitoring will be used as appropriate in site risk assessments.

2.0 SITE BACKGROUND AND PHYSICAL SETTING

There have been many work plans and reports completed since work began at the site. The original RI/FS Work Plan was completed in 1991 by Lafser & Schreiber, Inc. (L&S), and the RI/FS Report was completed in 1994 by Schreiber, Grana & Yonley (SGY). The Remedial Design Work Plan was completed in 1996 by Phillip Environmental Services Corporation (PESC). Detailed site setting and history can be found in these documents. A summary based on these documents and subsequent sampling reports is provided below.

2.1 Physical Setting of the Site

Valley Park is located north of the Meramec River in St. Louis County, Missouri. The site is located at 224 Benton Avenue in south central Valley Park, just east of Missouri Route 141. The area is mixed industrial and residential. Adjacent properties include a residence in the northeast corner of the block, and industrial/commercial facilities and warehouses northwest and west of the site, including the former Valcour Printing and Geldbach Petroleum. A park and apartment building are south of the site across Benton Avenue, and a residential area is north and east of the site. Several industries are located south of the site including Reichhold Chemical.

The WOU site includes connected warehouse, shop, and office buildings, a residence at 314 Third Street, and surrounding parking lots (Figure 1). Currently, the ground surface at the site is mainly covered by the buildings and asphalt or concrete paving. There are some limited areas of landscaping along the east side of the site, around the residence and east of the office.

Valley Park is located within the Meramec River floodplain, and the geology is typical alluvium of river basins, with fine-grained materials at the surface and coarser-grained materials at the base. Based on many soil borings in the area, there are three general horizons: upper silty clay and clay (5-50 feet thick); middle gravelly sands and sandy gravels (up to 46 feet thick); and, bedrock. The depth to bedrock ranges from 38 to 75 feet below ground surface (bgs) (PESC, 1996). The bedrock is part of the Burlington-Keokuk formation, a limestone formation with chert layers. Several cross-sections of the valley and the site have been presented in previous reports. Average vertical permeability of the upper silty clay was measured at 3.44×10^{-7} cm/sec (L&S, 1991).

Overall groundwater flow in the valley trends west-southwest following the direction of the Meramec River flow. Groundwater levels are also influenced by the Meramec River. During times of high river flow, the river acts as a recharge to the aquifer. During times of low flow, the aquifer may discharge to the river. The water table surface in the valley fluctuates but is generally found between 25 and 35 feet bgs within the sand and gravel unit.

On site, groundwater flow direction is south towards the river. Depth to water ranged from 22.12 to 29.36 feet bgs in the upgradient wells (MW-AAB and MW-AAC), and from 24.55 to

39.55 feet bgs in source area wells (MW-BBB and MW-BBC) (Table 1). The water level in the source area wells is also likely influenced by the GETS recovery well when it is operating.

2.2 Site History

Wainwright Industries formerly owned the property at 224 Benton Avenue but it was sold to the former Ray's Tree Service (the company is no longer in business). The site was used by Wainwright and others for metal stamping, tool and die, ornamental and structural metal fabrications, and repair/remodeling for emergency fire vehicles. Various processes included cutting, milling, grinding, drilling, welding, and painting. Solvents were used for degreasing, including TCE and PCE. Solvents were stored in a 1000-gallon above-ground storage tank outside of the warehouse to the north.

Other properties that have been included in the WOU site include the residential rental property located at 314 Third Street and the former residential lot to the north (house was demolished and area is now paved), and part of the former St. Louis Boat and Canoe property west of the warehouse (Figure 1).

In 1982, the MDNR found chlorinated VOCs in Valley Park municipal drinking water wells. The Valley Park TCE site was listed on the National Priorities list (NPL) in 1986. Wainwright was identified as a potentially responsible party (PRP). Administrative Orders on Consent (AOC) were signed in 1990 to conduct soil removal, and 1991 to conduct an RI/FS. The RI/FS was completed in 1994, and a Record of Decision was signed in 1994. A State Consent Decree was signed to conduct the remedy selected in 1996.

2.3 Summary of Investigative Work Completed

Results of investigations have been previously submitted in the reports for the sampling events listed below. [Note: Investigation and remediation chronologies are based on documents provided to Environmental Operations, Inc. (EOI) and may not include all work completed at the site.] EOI has reviewed the data to develop the scope of work for this focused RI. Soil data tables have been copied from various reports and are provided in Appendix A. In some cases, no data summary tables were prepared for a report, but the laboratory analytical reports were included. Analytical reports have not been copied herein due to the volume of pages. Groundwater data have been summarized from 1987 to 2015 and are presented on Table 1. Soil data have also been summarized on figures based on sampling event.

1987 – Limited Remedial Investigation [Environmental Science and Engineering Inc. (ESE)] – groundwater study of Valley Park area. Installed 26 groundwater monitoring wells at 17 locations in Valley Park, including MW-5B and 5C, and MW-17B and 17C, downgradient of the WOU site (Figure 2). No soil samples were analyzed.

1988-89 – Composite soil sampling (L&S and MDNR) – composited shallow soil samples from three depths across six “regions” north to south and east to west (18 total samples) in lot behind (north of) the Wainwright warehouse. Composite data were not included in this evaluation because compositing soil samples for volatile analysis is not an appropriate method. However, results of this initial soil sampling effort ranged from none detected (ND) to 2,200 mg/kg for PCE and from ND to 540 mg/kg for TCE. Samples from each composite area were collected from depths of 1, 4, and 8 feet; highest concentrations of PCE and TCE were reported in the 1-foot samples and concentrations decreased with depth.

1989 – Soil sampling (L&S) – advanced borings to 10 feet bgs with a hand auger beneath the warehouse floor and advanced three borings south of the building to 35 feet bgs. Only nine of the soil samples were submitted for laboratory analysis of VOCs based on portable infrared spectrometer (Miran 1B) readings for PCE; where the Miran 1B readings were ND, no samples were collected for laboratory analysis (except for samples 3 and 15E in the southeast corner). (Figure 3). L&S Table 11 is provided in Appendix A.

1990 – Removal Action (L&S) – 13 verification samples were collected from excavation walls and floor following removal of 330 cubic yards of contaminated soil (see next section). Four of the samples were from two horizontal borings underneath the building that extended 6 feet into the south wall of the excavation at a depth of 4 feet (Figure 4). L&S Table 7 is provided in Appendix A.

1992 – Remedial Investigation (SGY) – installed upgradient groundwater monitoring well cluster (MW-AAB and MW-AAC), advanced 16 soil borings (BH-AA through BH-PP) and collected soil samples, two rounds of samples from new monitoring wells and ESE wells MW-5B and 5C, and MW-17B and 17C. Soil samples were collected from three to five depth intervals from each boring. Most of the planned samples from 35 feet bgs were not collected because it was determined that they were located in the aquifer and would not be representative of unsaturated soil. Soil samples were analyzed for VOCs; select samples were also analyzed for SVOCs and metals (Figure 5). SGY Table 15 is provided in Appendix A.

1993– Off-site Shallow Soil Sampling (MDNR and SGY) – 15 surface soil samples analyzed for VOCs at residential properties east of the Wainwright facility (Figure 6). MDNR unnumbered table and SGY Table 1 are provided in Appendix A.

1997 – Soil sampling – RD/RA pilot studies (PESC) – 22 surface soil samples analyzed for bis(2-ethylhexyl) phthalate and benzo(a)pyrene, 13 surface soil samples analyzed for VOCs, 5 soil samples analyzed from SB-BBC and RW-1 for VOCs, select soil samples analyzed for grain size distribution, total organic carbon (TOC), porosity, moisture content, and hydraulic conductivity; installed and sampled deep monitoring well cluster (MW-BBB and MW-BBC) in source area and recovery well (RW-1) for the groundwater treatment system (Figure 7). Data summary tables were not prepared for this report.

1997 – Surface Soil Sampling (PESC) – 11 surface soil samples analyzed for bis(2-ethylhexyl) phthalate and benzo(a)pyrene (SS-27 through SS-37), 5 surface soil samples analyzed for VOCs (SS-33 through SS-37). No data summary tables in report. Data included on Figure 7.

2006 – Soil sampling (MDNR) – 4 sample locations in previously excavated or treated area analyzed for VOCs at various depths (Figure 8). Data summary tables were not prepared for this report.

2011 – Site investigation to define current soil concentrations in source area (AMEC) – soil borings advanced at 11 locations in or near previously excavated or treated area and beneath the warehouse floor, collected two to three samples per boring for analysis of chlorinated VOCs. At selected locations, full VOCs plus TOC were run. MDNR split samples with AMEC at seven locations (Figure 9). AMEC Table 2 is provided in Appendix A.

2012 – Soil sampling (AMEC and MDNR) – three soil borings advanced through the warehouse concrete floor slab and one boring advanced in parking lot, collected one to three samples per boring for analysis of VOCs, polycyclic aromatic hydrocarbons (PAHs), RCRA metals, and 1,4-dioxane. Four off-site shallow soil samples collected and two groundwater samples were collected from monitoring wells MW-BBC and MW-17C; samples were analyzed for the same suite of parameters (Figure 10). 1,4-dioxane was not detected in any of the soil or groundwater samples analyzed. AMEC Tables 2 and 3 are provided in Appendix A. MDNR report did not contain summary tables.

2014-15 – Vapor intrusion sampling (EOI) – seven sub-slab vapor samples plus one duplicate in the warehouse/office complex, seven indoor air samples in warehouse/office complex at corresponding locations, one background ambient air sample. Samples were collected in Summa canisters and analyzed by Method TO-15. Indoor air and crawlspace samples were collected at the residence. Results were reported in four quarterly air sampling reports (EOI, 2014b, 2014c, 2015a, 2015b). Indoor air samples were collected from the office building after installation of an interim vapor intrusion mitigation system; results were reported in EOI, 2015d.

2015 – Groundwater sampling (EOI) – ten groundwater samples plus one duplicated were collected from on-site and off-site monitoring wells. Samples were analyzed for VOCs and 1,4-dioxane. Results were reported in a groundwater sampling report (EOI, 2015c). 1,4-dioxane was not detected in any on- or off-site monitoring wells except for the farthest downgradient location, the Reichhold well.

2.4 Summary of Remedial Work Completed

Locations of remedial work discussed below have been summarized on Figure 11.

1990 – Removal Action (L&S) – 330 cubic yards of contaminated soil were excavated and disposed of at the United States Pollution Control Inc. Grassy Mountain hazardous waste landfill

facility located in Lakepoint, Utah. The excavation was conducted in several stages with interim verification sampling conducted after each stage. Based on elevated levels of TCE and PCE remaining in final verification samples from excavation sides and base, the removal was suspended until extent and magnitude of contamination could be determined.

The depth of the excavation varied, as shown on Figure 11. The north end was excavated to 4 feet bgs, sloping to 5.5 feet over a distance of 11.5 feet. The central part of the excavation was 11 feet deep on the west side, and 8.5 feet deep on the east side over a distance of 12 feet, and the south end of the excavation was 11 feet deep on the west side and 12.5 feet deep on the central and east side. The excavation was backfilled with pea gravel, 6 inches of rolled and compacted 2-inch minus gravel and 3 inches of asphalt. All sample locations shown within this area were either confirmation samples from the excavation floor or wall (Figure 4), or from below the excavated area (Figure 5, 7, 8, and 9), except for sample SB-4 (1-3) shown on Figure 8, which was in the backfill.

1999 – PESC excavated 2.5 to 3 feet of soil in St. Louis Canoe and Boat Yard in three stages, starting in the area of SS-17 and SS-36. Three confirmation samples were analyzed and one of the samples on the eastern excavation wall exceeded the clean-up levels; therefore additional soil was excavated to the east of the original excavation. Confirmation samples were not collected from that excavation, but PID readings were taken at the base of the excavation from a depth of 1.5 to 2 feet; PID readings ranged from 4 to 630 ppm. Additional PID readings were also taken from surficial soils to the south, west, and northeast of the second excavation. Elevated PID readings were found mainly to the south and northeast, so a third round of excavation was conducted to remove the top 1 foot of soil; this soil was placed in the original excavations, and the entire excavated area was capped with 1 foot of clean fill. SVE vertical wells were later installed in this area. One confirmation soil sample (10A) was collected from the floor of the second (eastern) excavation from the area with the highest PID reading. Surface soil samples from this area (Figure 7) that were excavated during this remedial action included SS-16, SS-17, and SS-36.

1999 – Ex-situ soil vapor extraction (SVE) – 600 cubic yards of contaminated soil were excavated to a depth of 10 feet and treated using a steam-enhanced mobile unit. The treated soil was returned to the excavation. Several soil samples were analyzed from within the area that was later excavated, treated and replaced; therefore those results are not representative of the existing conditions. These included BH-BB (1', 5'), BH-DD (1', 5'), and BB-GG (1', 5') shown on Figure 5; and SS-12 (0-6") and SS-13 (0-6") shown on Figure 7. After the remediation, other soil samples were collected from the treated area, including SB-1 and SB-3 (Figure 8); SB-102 (4'), SB-103 (8'), and SB-108 (8') (Figure 9); and SB-202 all depth (Figure 10). Those were also within the SVE treatment area, and are representative of soil conditions at the time of collection.

1999 – In-situ SVE and groundwater extraction and treatment system (GETS) constructed and started. Delays in running the GETS were caused by upgradient release of MTBE, resulting in breakthrough of MTBE through the system above allowable discharge limits. MDNR requested that the GETS be shut down to address the MTBE issue.

2003 – GETS and SVE redesigned and restarted.

2006-2007 – Attempts to increase extraction well pumping rate, including pump testing, well screen cleaning, and installation of new pump and motor. Measured water level in PZ-1 and low-water limit pump shutdowns were recorded at all water levels; it was then thought that the reduced flow rate was due to a gradual degradation of the water inflow across the well screens.

2007 – Institutional Control (deed restriction) placed on WOU by current property owner to prohibit installation and operation of groundwater supply wells.

2010 – Construction and development of replacement extraction well (RW-1).

2014 – Installation of interim vapor intrusion mitigation system in on-site residence at 314 Third Street.

2015 – Installation of interim vapor intrusion mitigation system in WOU office building.

Through current date (2015) – continued evaluation and repairs to GETS and SVE systems.

2.5 Validation of Historical Data

As summarized above, site investigations date back to the 1980s. Some soil sample locations have since been excavated, and the locations are represented by confirmation sampling from excavation floors and/or walls. Because remediation at the site has included SVE, it is to be expected that some maximum soil concentrations have declined due to the remediation. The most recent soil samples (2012) indicate that COCs still exceed clean-up levels in some areas. The most conservative approach is to treat older historical data as a qualitative indication of impact, and newer historical data as quantitative. Vertical and horizontal extent of COCs are discussed in detail in the next section.

All previous sampling has been conducted under the supervision of the USEPA and the MDNR under Agency-approved work plans and QAPPs. All previous sampling data has been presented and accepted by the regulators in reports prepared and submitted by other contractors. The quality and usability of historical data produced under these conditions has already been validated, and based on this history, data were previously accepted by the Agencies; no data has been rejected based on the data validations presented in previous reports. Nevertheless, additional data validation is required and data validation of existing and new data is further discussed in the QAPP for the RI.

3.0 SCOPE OF WORK

Types of waste present, potential pathways of contaminant migration and impacts, and identification of operable units and response objectives were completed in the initial RI Work Plan and RI Report. The scope of work of this focused RI is to complete the characterization of the extent of soil and groundwater contamination at the Wainwright Operable Unit, and to address potential data gaps. The study area is the WOU site located at 224 Benton, Valley Park, Missouri (Figure 1). The project goals include the collection and analysis of soil samples to delineate the remaining soil contamination horizontally and vertically, to further delineate on-site groundwater contamination (including DNAPL, if present), and to address data gaps so that current remedial systems can be evaluated and modified or new remedial systems can be proposed to achieve the Remedial Action Objectives.

The contaminants of concern identified in the 1994 ROD included VOCs, metals, and PAHs. The affected media included soil and groundwater. The RD/RA SOW listed RGs for TCE, PCE, bis(2-ethylhexyl)phthalate (BEHP), and benzo(a)pyrene (BAP) in surface soils; for TCE and PCE in subsurface soils; and groundwater MCLs and SMCLs for TCE, PCE, methylene chloride, barium, and manganese.

More recently, in the Third Five-Year Review Report dated September 17, 2013 prepared by the USEPA, the primary contaminants of concern in soil and groundwater were listed as tetrachloroethylene (PCE) and trichloroethylene (TCE). Methylene chloride and trichloroethane (TCA) were also listed as COCs in groundwater only for the WOU; however, neither TCAs nor methylene chloride have been detected in groundwater at the WOU since at least 2010. According to the Third Five-Year Review Report, benzo(a)pyrene, barium and manganese, previously identified as COCs, were eliminated subsequent to the issuance of the ROD. Benzo(a)pyrene was attributed to asphalt surfaces, and barium and manganese were thought to be natural background levels and attributed to sampling method error during the RI/FS.

Sub-slab vapors and indoor air have been recently evaluated as potentially affected media in a separate investigation, as mentioned in Section 1.0.

The media to be sampled include soil and groundwater. Samples will be analyzed for chlorinated volatile organic compounds using SW846 Method 8260B; a subset of samples will also be analyzed for total and chromium VI using methods 6010B and 7199, respectively, and 1,4-dioxane using Method 8270 SIM. Justification for the sample analyses is provided in Section 4.

There are no areas on the WOU site that are out of scope for the RI, but the main concentration of proposed soil sample locations is surrounding the area of the initial release and investigation

in order to define the remaining extent of soil contamination and to delineate the source area; samples will be stepped out from the initial proposed locations as required to define the extent of contamination.

The media that are out of the scope for this focused RI include sub-slab vapor and indoor air. Sub-slab vapor and indoor air media are being evaluated in a separate investigation conducted by EOI with oversight by MDNR and USEPA. Sampling and installation of interim vapor intrusion mitigation systems in the on-site residence and the WOU office building have been completed, and follow-up sampling will continue to be conducted as per the approved Vapor Intrusion QAPP and Indoor Air Work Plan for the WOU Office Building.

3.1 Roles and Responsibilities

The roles and responsibilities for the project are as follows:

USEPA Region VII – Primary representative is Hoai Tran, Project Manager. Responsibilities include: Reviews and grants final acceptance and approval of the project and system auditing. Reviews and approves all final documents to ensure project integrity is maintained. Has final authority for the project decisions. Has primary project oversight for RI and for interim vapor intrusion mitigation system installation in the WOU office building.

MDNR – Primary representative is Wane Roberts, Project Manager, Superfund Section, Hazardous Waste Program, Department of Environmental Quality. Responsibilities include: oversight of project. Reviews and approves QAPP and subsequent revisions, field sampling plans, and data reports.

EOI – Primary representatives are Eric Page, Vice President and Jill Witts, Project Manager. Responsibilities include overall project coordination. Prepares QAPP, field sampling plans, and reports. Reviews data collected and resolves QA issues that arise. Evaluates analytical data to ensure that the DQOs are met. Utilizes the data collected to evaluate remediation objectives.

Wainwright – Primary representative is David Robbins, President. Responsible party for the site. EOI will perform the RI on behalf of Wainwright.

4.0 INITIAL EVALUATION

Historical data was evaluated by compound groups including VOCs, PAHs, metals, and 1,4-dioxane. The results of the previous site investigations and remedial actions are discussed below.

4.1 Volatile Organic Compounds

The primary contaminants of concern at the WOU are chlorinated hydrocarbons, primarily PCE and TCE. Soil sample results for PCE and TCE have been plotted on site diagrams according to the sampling event in order to identify areas where PCE and TCE in soil have not been fully delineated horizontally and/or vertically. Figures 3 through 10 show the approximate sample locations, depths, and PCE and TCE concentrations in mg/kg (ppm).

Deeper sample depths were compared with depths to water on soil boring logs to ensure that soil sample concentrations were representative of soil conditions. While the water table is variable and is influenced by the close proximity to the river, in general it has been found between 24.55 and 39.55 feet bgs in the source area (Table 1). Several soil samples collected below 30 feet bgs were likely below the water table, although depth to water information was not always recorded on the boring logs. Soil samples considered to be below the water table were noted on the figures and included the following: AA and KK at 35', SB-BBC at 40-42', RW-1 at 58-60', and SB-107 at 38' (Table 6).

Health-based clean-up levels, i.e. Remedial Goals (RGs) were proposed in the RD/RA SOW/Consent Decree for PCE and TCE in surface and subsurface soil. Table 2 summarizes the RGs from the RD/RA SOW, along with the USEPA Regional Screening Levels (May 2016) (based on carcinogenic target risk of $1E-06$) and SSLs. Soil saturation limits (C_{sat}) are also included on Table 2.

Soil samples from the original sampling events in 1988 were limited to the lot directly behind (north of) the warehouse and were composite samples. The composites were collected from depths of 1, 4, and 8 feet bgs, and were composited by "regions" that ran north-south, and east-west. The results indicated the highest concentrations from the 1- and 4-foot samples, and from the central area closest to the warehouse. PCE concentrations ranged from not detected to 2,200 mg/kg, and TCE concentrations ranged from not detected to 540 mg/kg.

In 1989, soil samples were collected beneath the warehouse floor. PCE concentrations ranged from 0.011 to 368 mg/kg, and TCE ranged from not detected to 0.013 mg/kg beneath the warehouse floor (Figure 3).

Verification samples were collected from the excavation floor and walls in 1990 following soil excavation and disposal. Four samples were also collected beneath the warehouse floor from

horizontal borings. PCE concentrations ranged from 2.2 to 1,400 mg/kg, and TCE ranged from not detected to 88 mg/kg (Figure 4).

In 1992, the original remedial investigation sampling was conducted. PCE concentrations were greatest in the 1-foot-deep samples at locations BH-BB, BH-DD, and BH-GG, ranging from 1800 to 6800 mg/kg at those locations (Figure 5). TCE concentrations ranged from 51 to 420 mg/kg in the same samples. Those borings were within the area that was subsequently excavated and treated with SVE ex-situ by PESC in 1999. The treated soils were replaced in the excavation. The highest concentration outside of the PESC treatment area was 360 mg/kg at 25 feet in BH-FF, below the initial 1990 excavation.

In 1993 and 1994, surface soil samples were collected at the residential lots following a flood (Figure 6). Two of the samples collected by MDNR had PCE concentrations of 10 and 11 mg/kg (sample locations 3 and 4). PCE concentrations were less than 1 mg/kg in the 15 other surface soil samples collected, ranging from 0.033 to 0.41 mg/kg. TCE ranged from not detected to 0.08 mg/kg. None of these concentrations exceeded the health-based clean-up levels for surface soil from the RD/RA SOW (PCE – 10.64 mg/kg, TCE – 52.63 mg/kg), except for the one sample with a concentration of 11 mg/kg PCE.

In 1997, surface soil samples were collected from 0 to 6 inches deep. PCE concentrations were highest at locations SS-17, SS-21, SS-33, and SS-36, ranging from 31 to 110 mg/kg at those locations (Figure 7); TCE concentration was 0.33 mg/kg at SS-17, and not detected at the other three locations. SS-21 was at the eastern edge of the excavation/treatment area, and SS-17 and SS-36 were in the area that was subsequently excavated and capped at the former St. Louis Canoe and Boat Shop lot.

One confirmation soil sample collected in 1999 during the St. Louis Canoe and Boat Shop remediation had a PCE concentration of 1200 mg/kg at 3 feet bgs (Figure 7).

MDNR collected four samples in 2006 at various depths; the PCE concentrations ranged from 0.0644 to 38.3 mg/kg, while TCE ranged from 0.0152 to 1.27 mg/kg, (Figure 8).

AMEC conducted a site investigation in 2011, advancing 11 soil borings to depths up to 32 feet bgs. PCE concentrations in 2011 were greatest in the 24 to 28 foot samples at SB-104, SB-105, and SB-107 (Figure 9), with concentrations ranging from 1470 to 2360 mg/kg in those samples. MDNR split seven soil samples with AMEC. Four MDNR samples had lower concentrations than the AMEC samples, and two MDNR samples had considerably higher concentrations (SB-107 and SB-109). A comparison of the split sample results is provided in Table 3. Two of the borings (SB-101 and SB-107) were located under the concrete floor of the warehouse.

Additional samples were collected in 2012 from beneath the warehouse floor, and one boring was also advanced in the excavation/treatment area (SB-202) (Figure 10). The PCE concentrations beneath the warehouse ranged from not detected to 9.85 mg/kg, and the TCE

ranged from not detected to 1.39 mg/kg. PCE concentrations from SB-202 ranged from 11.8 (at 2 feet) to 15.1 (9 feet) mg/kg, and TCE ranged from 0.068 to 0.182 mg/kg at the same depths.

On Figure 12, all sample locations are overlaid (except for the surface samples which were left off so the figure is less cluttered) and the sampling depths are shown along with a color-coded indication of whether the sample concentration exceeded the health-based RGs (Table 2) from the RD/RA SOW. Depths shown in blue did not have concentrations of PCE or TCE that exceeded the RGs while depths shown in red had concentrations of PCE and/or TCE that exceeded the RGs. Sample locations that also exceeded at least one of the USEPA industrial RSLs are highlighted in yellow.

The soil samples collected in 2011 contained PCE concentrations that were in the same range as the pre-treatment concentrations from the original remedial investigation in 1992. However, most of the higher concentrations in 2011 were collected from greater depths (26-28 feet) compared to the 1992 samples where the higher concentrations were generally in the 1-5 foot range. Many of the 1992 borings were not sampled below 20 or 25 feet bgs, but the sample concentrations from those depths generally were lower compared to the shallower samples. Additional soil sampling to delineate the depth of contamination in soil may not be possible; the samples collected in 2011 were generally collected at the soil/water interface, and so deeper samples could be in the saturated zone and not representative of the soil conditions. However, the horizontal extent of the deeper zone of contamination has not been delineated; several of the 2011 borings at the perimeter of the excavation/treatment area were only sampled at depths of 7 or 8 feet bgs.

Several samples have been collected beneath the warehouse floor. The samples have generally been limited to near the northern wall, although three samples were collected from the middle and south sections and had no detections at 10 feet bgs. The contamination beneath the warehouse are not considered to be fully delineated horizontally or vertically.

Other areas outside of the main source area (i.e., north of the warehouse) had exceedances of the PCE or TCE clean-up levels, including east (BH-MM, BH-NN, BH-OO, BH-PP), northwest (BH-LL), and west (BH-EE, 10A).

Based on this summary, the following areas were identified as requiring additional investigation to delineate the extent of chlorinated VOCs horizontally and vertically:

- Under the former warehouse floor
- Eastern area - east of the excavation/warehouse area, in the residential lot
- Northwest area - north and west of the excavation area including former St. Louis Boat Shop area

Rationale for the proposed additional sampling locations (work plan) is discussed in Section 5.

Groundwater sampling has been conducted intermittently since 1987. Samples have mainly been collected from the following wells at or downgradient of the WOU site: MW-AAC (upgradient – WOU), MW-BBB and MW-BBC (source area – WOU), MW-5B and 5C (downgradient southwest of WOU), MW-17B and 17C (downgradient, south of WOU), and from the Reichhold Well (downgradient of WOU and MW-17B/C, south of WOU) (Figure 4). Groundwater concentrations of chlorinated VOCs have been highest at the source area wells, and lower concentrations were found at downgradient wells. The most recent sampling was conducted in 2015 and results were presented in the Groundwater Sampling Report (EOI, 2015).

Groundwater concentrations have increased compared to results from the last sampling conducted in 2011 or 2012 since the SVE and GETS have been turned off for evaluation of the recovery well and system repairs. However, groundwater concentrations at the WOU wells are still below the maximum concentrations found at each well. For example, at MW-BBC in 1996 PCE and TCE groundwater concentrations were 5.2 and 8.6 mg/L, respectively, and in 2015, PCE and TCE were 1.0 and 1.28 mg/L, respectively.

4.2 Semi-Volatile Organic Compounds

The SVOCs bis(2-ethylhexyl)phthalate [BEHP] and benzo(a)pyrene (BAP) were identified in the RA/RD SOW as contaminants of concern in soil at the WOU and health-based clean-up levels were identified for surficial soils only. The remedy selected was excavation and disposal off-site of polycyclic aromatic hydrocarbon (PAH)-contaminated surface soils. That was later changed to include treatment and on-site burial or off-site disposal. This change was documented in the Explanation of Significant Differences (ESD), April 1996.

SVOCs were analyzed in a selected subset of the RI soil samples in 1992 including BH CC, BH-DD, BH-FF, BH-MM, BH-NN, BH-OO, and BH-PP; however only BH-DD and BH-MM through –PP were collected from the surficial interval (0.5-1' bgs). PESC conducted two rounds of surface soil sampling for BEHP and BAP in 1997. Sample locations included six off-site locations and 23 locations within the WOU at depths of 0-6 inches bgs. The data from the first round were reported in the *Results of Pilot Testing Activities at the Wainwright Operable Unit* (PESC, 1997). Laboratory reports for samples SS-27 through SS-32 have not been located, although BAP concentrations exceeding the clean-up levels were plotted on a figure prepared by PESC.

AMEC and MDNR collected groundwater and soil samples in 2012 and analyzed them for PAHs or base neutral/acid extractable (BNA). Samples were collected on site and off site in areas surrounding the WOU and OU2 (by MDNR). Off-site samples were collected from 0-1 foot bgs, and on-site samples were collected at varying depth intervals from soil borings SB-201 and SB-202. According to the Field Report included in Attachment 1, the shallow sample from SB-201 was collected at 3.5 feet bgs because soil started at 2.5 feet bgs (i.e., no recovery above 2.5 feet), so that sample represented the top foot of material; that was approved by Wane Roberts of MDNR. The shallow sample from SB-202 was collected at 2' because the top 1' was missing

and fill started at 1' bgs. These shallow depths were apparently interpreted to correspond to the top foot of soil and so were included in surficial soil evaluations. The results were presented in the AMEC letter "Results of August 29, 2012 Groundwater and Soil Sampling" dated November 6, 2012, and the MDNR "Abbreviated Sampling Report, Wainwright/Valley Park TCE Operable Unit 2 Site Investigation" (undated).

In the Second FYR, it was stated that "Post ROD for WOU, benzo(a)pyrene in soil was determined to be attributed to asphalt surfaces and not due to waste disposal practices" (Page 8, Contaminants and Media). The Second FYR also recommended a review of historic data at WOU to determine if PAHs in soil and groundwater have been adequately addressed. The Third FYR stated that the recommendation has been addressed.

In a MDHSS letter dated March 5, 2013, they recommended "further evaluation of current and historical site data to determine if exceedances are related to the site or potentially attributable to background." They also stated that collection of additional samples may be needed.

PAH and BEHP soil data has been summarized and compared to the USEPA Regional Screening Levels, as per the Missouri Department of Health and Senior Services (MDHSS) letter dated March 5, 2013 (Table 4). Data were also compared to the RD/RA SOW health-based clean-up standards (clean-up standards).

4.2.1 Benzo(a)pyrene

In the 1992 dataset, the reporting limits for BAP were greater than the clean-up standard and the residential RSL, but generally did not exceed the industrial RSL (0.065, 0.015 and 0.21 mg/kg, respectively). Exceedances of the BAP clean-up standard and the residential RSL were found in two surface soil samples (BH-MM-1 and BH-NN-1); those samples also had exceedances of the benzo(a)anthracene and benzo(b)fluoranthene residential RSLs. There were no exceedances of the industrial RSLs for BAP or other PAHs in any 1992 surface soil samples.

In the 1992 subsurface soil samples, there were no detections of BAP. The clean-up standard was specifically for surface soils, and therefore not applicable to the subsurface samples. BAP did not exceed the industrial RSL in any of the 1992 subsurface soil samples. In addition, there were a few other PAHs and SVOCs detected in the 1992 samples including BEHP, which is discussed in the following section. None of the SVOCs detected in 1992 subsurface soil samples exceeded the industrial RSLs.

The 1997 surface soil samples were collected from 0 to 6 inches, and were only analyzed for BAP and BEHP. Most of the samples had exceedances of the BAP clean-up standard and residential RSL and many also exceeded the industrial RSL (Table 4). According to the 2008 Five-Year Review Report, it was determined that BAP in soil was attributed to asphalt surfaces and not due to waste disposal practices. Off-site (background) surface soil samples also had exceedances of the clean-up standard and residential and industrial RSLs for BAP.

In the 2012 samples, the off-site samples were collected from depths of 6 to 8 inches or 6 to 12 inches, and all four samples had exceedances of the clean-up standard and residential and industrial RSLs for BAP, as well as exceedances of residential RSLs for other PAHs including benzo(a)anthracene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. On-site samples were collected at three depths at two locations. One or more PAHs including BAP exceeded the residential RSLs only at SB-202, while SB-201 had detections of PAHs at 3.5 and 10.5 feet bgs, but no exceedances of either the residential or industrial RSLs.

PESC identified 1997 surface soil samples SS-01 through SS-08 as “background” samples. SS-01 and SS-02 are located on the WOU along the northern boundary, upgradient of the manufacturing area. SS-03 through SS-05 are located off site: SS-03 and SS-04 are located across Vest Avenue to the north, and SS-05 is located across Benton Avenue to the south. SS-06 through SS-08 are located in the southeast corner of the site, along Third Street (Figure 7). Samples SS-09 through SS-22 were considered on-site samples. PESC showed that the average of the “background” samples, 2.935 mg/kg, exceeded any single on-site concentration of BAP. They concluded that the background BAP was sufficiently evaluated (PESC, 1997).

Subsequently, the MDNR required additional surficial soil sample collection, and PESC collected surface soil samples from SS-27 through SS-37. In keeping with PESC’s classification, samples SS-27 through SS-32 would be considered “background” samples and samples SS-33 through SS-37 are on-site. The mean BAP concentration of the complete 1997 background dataset was 2.14 mg/kg, and the mean concentration for on-site samples was 0.45 mg/kg (Table 4).

The 2012 off-site samples also had higher concentrations of BAP than the on-site samples; however, the sample depths in the on-site samples were deeper and do not directly correspond to the surface soil samples. The 2012 off-site mean concentration of BAP was 0.485 mg/kg, and the on-site mean concentration was 0.051 mg/kg. Cumulatively, the mean BAP concentration for 1997 plus 2012 background/ off-site samples was 1.73 mg/kg, and the mean concentration for 1997 plus 2012 on-site “surficial” samples was 0.34 mg/kg (Table 4).

Groundwater samples were collected in 2012 from the source well MW-BBC and one downgradient well MW-17C and analyzed for PAHs. There were no PAHs detected in the groundwater samples.

Based on the review of this data, surficial soil samples contained concentrations of BAP that exceeded clean-up standards and RSLs on-site and off-site. The source of the BAP and other PAHs are likely related to degraded asphalt and/or other common urban sources such as vehicle exhaust.

Only one sample location (SB-202) out of 11 total borings sampled for PAHs had subsurface soil concentrations of PAHs that exceeded the residential RSLs; none of the concentrations exceeded the industrial RSLs (Table 4). Thirty-one subsurface soil samples from ten locations had no

exceedances of any RSLs, including samples in the source area (e.g. BH-FF and BH-HH), under the building slab (SB-201), and samples in more out-lying areas and closer to the residence (e.g., BH-CC, BH-OO, BH-PP, and BH-MM). Based on this subset of data, it does not appear that PAH contamination in subsurface soil is a concern.

4.2.2 Bis(2-ethylhexyl)phthalate

BEHP was detected at several locations at varying depths in the 1992 RI; only three samples at two locations exceeded the health-based surface soil clean-up level of 0.44 mg/kg. In the 1997 surface soil sampling, two samples also exceeded the clean-up level. Three of the locations were relatively close: BH-DD, BH-NN, and SS-21. The fourth location was at SS-13 (Figure 7). SS-21 is shown on the figures at the edge of the PESC excavation and SVE treatment area and was most likely included within the excavation/ treatment area. This area is also adjacent to the sewer line. BH-NN is located in the northwest corner of the residential lot and is currently covered with asphalt paving. SS-13 on the site is also covered with paving. The 2013 USEPA residential and industrial RSLs for BEHP are 35 and 120 mg/kg, respectively, and none of the sample concentrations at the site have exceeded the RSLs.

Based upon the above summary, PAHs and BEHP were found at the site at concentrations exceeding the health-based clean-up levels and/or the USEPA RSLs. Concentrations in surface soil samples, especially those collected from 0 to 6 inches, may show contamination from older degraded asphalt, urban sources, or uncontrolled off-site sources such as flooding or the sewer. For PAHs, the mean concentrations found in background and off-site surface samples were greater than the mean concentrations of on-site surface samples, indicating that it may be an area-wide or background issue. Subsurface exceedances were limited to one location with residential RSL exceedances only; there were no exceedances of industrial RSLs for PAHs in subsurface soil samples. Although a few BEHP samples exceeded the health-based clean-up levels, they did not exceed the USEPA residential or industrial RSLs.

Currently, exposure to BAP and BEHP in surface soils is limited due to the paving and buildings covering most of the area of the site. PAH data will be included when the risk assessment is updated.

4.3 Metals

Two metals, barium and manganese, were identified in the RI/FS as primary contaminants of concern in groundwater only at the WOU. The Second FYR stated that “post ROD for WOU, barium and manganese were thought to be natural background levels and attributed to sampling methods during the RI/FS” (Page 8, Contaminants and Media). The Second FYR also recommended a review of historic data to determine if metals contamination in soils and groundwater is adequately addressed. The Third FYR stated that the recommendation has been addressed.

In the MDHSS letter dated March 5, 2013, they recommended “further evaluation of current and historical site data to determine if exceedances are related to the site or potentially attributable to background.” They also stated that collection of additional samples may be needed. MDHSS specifically mentioned that aluminum, iron, and manganese were detected in groundwater above safe drinking water levels, but that these metals were not analyzed during the 2012 soil sampling event. Those three metals do not have MCLs, only secondary standards, which are non-enforceable standards based on cosmetic or aesthetic effects.

Metals were analyzed in selected soil samples during the 1992 RI and in samples collected by AMEC and MDNR in 2012. Eleven samples from three locations were analyzed for the full suite of metals in 1992. SG&Y compared the metals concentrations to the background concentration ranges for Missouri presented in “Geochemistry of Missouri” (Tidball, 1984). The RI stated that calcium, copper, lead, magnesium, selenium, and zinc were above the upper range of the background concentrations (SGY, 1994). However, none of the detected concentrations exceed the USEPA residential or industrial RSLs, with the possible exception of chromium, which was analyzed as total chromium and so exceeded of the chromium VI RSLs but not the chromium III RSLs. Four constituents were not detected in any of the samples: antimony, arsenic, mercury, and thallium. Aluminum, barium, iron, and manganese soil concentrations did not exceed the RSLs.

Samples analyzed in 2012 included four off-site surface soil samples and six on-site samples from two locations. All AMEC and MDNR samples were analyzed for RCRA metals. MDHSS compared the 2012 metals concentrations to the USEPA residential and industrial RSLs in their letter of March 5, 2013. The off-site and on-site sample concentrations for arsenic and chromium exceeded the residential and industrial RSLs (based on the RSLs for chromium VI). Detected arsenic concentrations ranged from 2.3 to 8.6 mg/kg. Average background arsenic concentration in St. Louis County from the USGS PLUTO database is 9.71 ppm, with a range of 6.7 to 19 ppm. None of the arsenic concentrations in soil exceeded 9.71 ppm.

The total chromium concentrations in 1992 samples ranged from 8.7 to 31.6 mg/kg, and in 2012 in on-site and off-site samples ranged from 8 to 17.9 mg/kg. These concentrations are fairly consistent and relatively low. Although they all exceed the chromium VI RSLs, it is considered unlikely that 100 percent of the chromium detected in the total chromium test is chromium VI. However, the USEPA Region 7 policy is that total chromium should be considered 100 percent chromium VI in the absence of valence-specific data. None of the concentrations exceeded the chromium III RSLs.

Groundwater samples collected in 2012 from a source area well (MW-BBC) and downgradient well (MW-17C) were analyzed for total and dissolved RCRA metals. Metals detected in groundwater sample from MW-BBC included arsenic, barium, chromium, and lead; only chromium exceeded the MCL and the USEPA RSL (tapwater) for chromium VI. At MW-17C,

only barium, lead, and mercury were detected, and there were no exceedances of MCLs or tapwater RSLs (Table 1 in Appendix A, AMEC sampling in 2012).

Based upon the above summary, it does not appear that metals contamination is a concern at the site or off-site. To resolve the chromium issue, EOI proposes to collect a subset of soil samples to analyze for total chromium and chromium VI to evaluate if chromium VI is a concern for the site – see Section 5.

4.4 1,4-Dioxane

The Third FYR stated that 1,4-dioxane has been identified at the site, and that the nature and extent of the 1,4-dioxane plume should be evaluated. The location or concentrations of the 1,4-dioxane were not identified in the Third FYR. In 2012, soil and groundwater samples were collected and analyzed for 1,4-dioxane. Several of the soil samples could not be analyzed for 1,4-dioxane because according to MDNR, if the soil was dry the compound could not be extracted (AMEC, 2012). No 1,4-dioxane was detected in any of the soil or groundwater samples collected at the WOU. The groundwater samples were from MW-BBC, the on-site well in the source area, and from MW-17C, the closest off-site well downgradient from WOU.

Groundwater sampling was conducted by EOI in 2015 (EOI, 2015), and sampled wells included MW-AAC, MW-BBB and BBC, MW-5B and 5C, MW-17B and 17C, MW-44BR, PZ-03, and the Reichhold well. 1,4-dioxane was not detected in any upgradient, source area, or downgradient WOU well; it was detected at a low concentration in the Reichhold well (0.0013 mg/L, reporting limit was 0.001 mg/L).

One groundwater sample collected by the MDNR in 2012, from monitoring well MW-56, had a 1,4-dioxane concentration of 219 ug/L (0.219 mg/L). Based on the location of MW-56, and the absence of 1,4-dioxane in any current soil or groundwater samples from WOU including the source area well, it appears that the 1,4-dioxane is not related to the WOU site. However, USEPA has requested that additional samples be collected and analyzed for 1,4-dioxane; therefore, a subset of soil samples collected over a wider area will be analyzed for 1,4-dioxane and groundwater samples collected will also be analyzed for 1,4-dioxane – see Section 5.

5.0 WORK PLAN RATIONALE

The main purpose of this focused RI is to complete the characterization of the nature and extent of contamination in soils at the site and to address data gaps. The main delineation concern is the extent of the soil source area of the PCE and TCE, which may be larger than previously assumed and therefore the SVE system may not provide sufficient coverage to address the entire contaminated source area. Soil and groundwater sampling will also be completed to address data gaps as identified by the Agencies.

5.1 Data Quality Objective (DQO) Needs

Laboratory analytical data are needed from various media, locations and depths to complete the site characterization, especially the extent of the source in the soil and to address data gaps. This additional data will be used for site characterization, risk assessment, and evaluation of remedial alternatives. Specific DQOs will be discussed in the Quality Assurance Project Plan (QAPP).

5.2 Work Plan Approach

5.2.1 Delineation Soil Sampling

Figure 12 summarizes the depths at which PCE/TCE exceeded the health-based Remedial Goals (RGs) from the RD/RA SOW, as well as the USEPA Industrial RSLs (Table 2) in the soil samples that have been collected at the site from 1992 through 2012. (Some surface samples were left off the excavation/treatment area so that the figures were less cluttered.) The horizontal and vertical extent of PCE/TCE was used to determine sample locations for the RI (Figure 13). In addition to the locations shown on Figure 13, EOI will apply an iterative approach to sampling, stepping out to collect additional samples based on the results of the initial samples. This approach is discussed below and in the Field Sampling Plan.

Soil samples with PCE and/or TCE exceedances of RGs within the excavation/treatment area extend throughout the area horizontally, and vertically extend to at least 32 feet deep on the east (SB-105 and SB-108), 28 feet deep on the west (SB-109 and SB-5), and 24 feet deep to the north (SB-103). Samples with no PCE or TCE exceedances of RGs were collected at 31 feet at SB-104 and 25 feet at BH-HH within the excavation area, and at 25 feet at BH-EE, west of the excavation area; and at 26 and 32 feet (SB-102 and SB-103, respectively) to the north. No samples with PCE or TCE exceedances of RGs have been collected below 32 feet on the eastern side of the excavation/treatment area; however, it may be difficult to get a sample below 32 feet that is not within the saturated zone. Soil samples at SB-312 and SB-314 are proposed along the west edge of the excavation/ treatment area to complete the vertical delineation of PCE and TCE in this area (Figure 13).

In the residential lot to the east, three sample locations had PCE and TCE concentrations that exceeded the RGs at 15 and 20 feet bgs (BH-MM, BH-NN, and BH-PP). BH-OO, north of the

residential lot, had an exceedance of the TCE RG at 15 feet but the sample at 20 feet had no exceedances of PCE or TCE RGs. TCE exceedances ranged from 0.51 to 3.5 mg/kg compared to the subsurface RG of 0.255 mg/kg; most of the concentrations also slightly exceeded the USEPA residential RSL of 0.91 mg/kg but did not exceed the USEPA industrial RSL of 6 mg/kg. PCE exceedances ranged from 1.3 to 2.5 mg/kg, compared to the subsurface RG of 0.737 mg/kg and the USEPA residential and industrial RSLs of 22 and 110 mg/kg, respectively. Eight sample locations are proposed in the Eastern Area to delineate horizontal extent and depth of TCE exceedances in the subsurface soils (SB-300 through SB-307). Proposed locations are shown on Figure 13.

South of the excavation/treatment area, under the concrete floor of the warehouse, soil samples with exceedances of PCE and/or TCE RGs were found in all samples just south of the northern warehouse wall, including 2, SB-101, A, 1A-1C and 2A-2C, SB-107, SB-201, SB-203, SB-204, and 13. The depths of the samples selected for analysis within each boring varied greatly, however two samples, SB-101 and SB-107 had exceedances of PCE and TCE RGs at 28 feet. Three samples to the south inside the warehouse, 3, 9 and 11, had low detections but no exceedances of RGs in samples at 10 feet (Figure 3). However, no deeper samples were collected in the southern part of the warehouse. Two borings located south of the warehouse found no exceedances of RGs down to 25 to 30 feet (borings 15 and BH-JJ). Five sample locations are proposed in the warehouse to delineate horizontal extent and depth of COCs in the subsurface soils (SB-308 through SB-312). Proposed locations are shown on Figure 13.

Only a few borings have been advanced west and north of the excavation/treatment area, and some of them have only been sampled at shallow depths. To the west, exceedances of PCE/TCE RGs have been found in the 2011 sample SB-109 at the edge of the excavation at 25 and 28 feet, and exceedance of the PCE RG was also found in BH-EE at 15 feet, with a sample with no PCE or TCE exceedances of RGs at 25 feet. Samples from BH-CC had detections of PCE and TCE, but no exceedances of the RGs down to 25 feet; that location is about 50 feet west of BH-EE. Sample SB-111 was only sampled at 7 feet. No other borings were advanced between BH-CC and BH-EE, so the western extent of the soil horizon with exceedances of RGs at 15 feet is unknown. Sample 10A, in the former St. Louis Boat and Canoe yard, had exceedances of PCE RGs at 3 feet with no samples collected below. PCE at concentrations exceeding of the RG were found in SB-102 at 12 feet and PCE/TCE exceedances of the RG were found at BH-BB at 15 feet, with no additional sampling beyond BH-BB to the west. TCE exceedances of the RG were found at BH-LL at 20 feet. Sample SB-106, north of SB-102, was only sampled at 8 feet, and Sample BH-KK had no samples with PCE or TCE exceedances of RGs down to 35 feet. Seven sample locations are proposed to the west and north of the excavation/treatment area to delineate horizontal extent and depths of PCE/TCE in the subsurface soils (SB-313 through SB-318). Six additional sample locations are proposed to delineate the area around sample 10A in the former boat yard. Proposed locations are shown on Figure 13.

Each probehole will be advanced to a depth of 30 to 40 feet bgs, depending on the depth to the water table. Monitoring well MW-BBC will be gauged prior to sampling to measure the depth to groundwater; this depth will be used as guidance, but the geologist's observations of soil moisture conditions will determine the deepest sample collected at each boring location. Soil samples will be collected at the following depth intervals: 0-1 feet, 10 feet, 20 feet, and 30 feet or at the soil/water interface. If deeper samples can be collected above the water table, additional samples will be collected at 35 or 40 feet bgs. In addition, field observations (primarily PID readings) will be used to estimate the zone(s) of greatest apparent contamination, and one or more additional samples may be collected, including one sample in the 1-10 foot range.

If elevated PID readings are found, selected soil samples may be submitted to the laboratory for one-day turnaround. Results of the expedited samples will be evaluated to determine if additional borings are needed to complete the delineation. Arrangements will be made with the laboratory for sample pick-up to expedite the analysis and evaluation of the results. A second mobilization may also be used to complete the delineation of the source area. Additional details on logging and sample collection are included in the Field Sampling Plan. All soil samples will be analyzed for PCE, TCE, and daughter products 1,2-dichloroethylene and vinyl chloride using SW-846 method 8260B.

5.2.2 Data Gap Soil Sampling

A subset of soil samples will be selected for analysis of chromium and 1,4-dioxane in subsurface soils. Six to eight soil boring locations will be selected for these additional analytes, spaced to provide site-wide coverage. Additional details of the soil sampling procedure will be included in the Field Sampling Plan.

5.2.3 Supplemental Groundwater Sampling

Two new groundwater monitoring wells will be installed to bedrock in the southeast and southwest corners of the WOU to further delineate on-site groundwater concentrations and investigate potential DNAPL at the bedrock surface. These wells will be installed to approximately 60 feet deep (estimated depth to bedrock). Proposed well locations are shown on Figure 2.

Monitoring wells will be installed with a 4.25-inch hollow-stem auger in accordance with Missouri Monitoring Well Construction Codes 10 CSR 23-4.010 through 23-4.080. Wells will be constructed of flush-threaded 2-inch ID Schedule 40 PVC riser with 0.010-inch slotted screen. The wells will be completed with flush-mount well protectors with waterproof locking caps.

After completion, monitoring wells will be developed to remove sediment fines from the filter pack and to promote the free flow of formation water into the well. Water level measurements will be taken using an oil/water interface probe to screen for potential dense non-aqueous phase liquid (DNAPL). Groundwater samples will be collected from the new wells, the other on-site

wells, and the downgradient wells located across Benton Avenue. Groundwater samples will be analyzed for chlorinated VOCs and 1,4-dioxane. Additional well installation and sampling procedures are provided in the Field Sampling Plan.

6.0 RISK ASSESSMENT

The purpose of the baseline risk assessment (RA) is to provide an analysis of the potential adverse health effects (current or future) caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases (i.e., under an assumption of no action). The Risk assessment contributes to the site characterization and subsequent development, evaluation, and selection of appropriate response alternatives. The results of the risk assessment are used to help determine whether additional response action is necessary at the site, modify preliminary remediation goals, help support selection of the "no- action" remedial alternative, where appropriate, and document the magnitude of risk at a site, and the primary causes of that risk (USEPA, 1989).

A baseline RA was previously conducted for the WOU during the original RI/FS process. Updated data from this focused RI will be included in this risk assessment. A Human Health Risk Assessment (HHRA) and an ecological risk screening will be conducted. Ecological risk has not been a primary driver of past remedy decisions. This section serves to provide a discussion of methods and procedures that are proposed for evaluating risks from exposure to chemicals present in environmental media at the WOU site.

6.1 Overview of the Human Health Risk Assessment

The purpose of the Human Health Risk Assessment (HHRA) is to evaluate the potential adverse effects to humans that may result from exposure to chemicals in the environment at the WOU Site. The overall risk assessment approach for the HHRA follows the US Environmental Protection Agency's (USEPA's) standard, four-step human health risk assessment paradigm, including: Hazard Identification, Exposure Assessment, Toxicity Assessment, and Risk Characterization. These steps are performed according to methodology and procedures published by USEPA in various guidance documents and databases, including (but not limited to):

- USEPA's *Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part A)*. (1989)
- USEPA's *RAGS Part E, Supplemental Guidance for Dermal Risk Assessment* (2004)
- USEPA's *RAGS Part F, Supplemental Guidance for Inhalation Risk Assessment* (2009)
- USEPA's *RAGS Part B, Development of Risk-Based Preliminary Remediation Goals* (1991)
- USEPA's *Exposure Factors Handbook* (1997)
- USEPA's *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (2002)
- USEPA's *Regional Screening Levels (RSLs)* (currently, June 2015a)
- USEPA's on-line toxicity database, *Integrated Risk Information System (IRIS)* (2015b)

- USEPA's *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposures to Carcinogens* (2005)

Specific subtasks that will be performed for this HHRA include:

- Data Collection, Evaluation, and Selection of Chemicals of Potential Concern
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization
- Uncertainty Analysis
- Derivation of Remedial Goal Objectives

Descriptions presented below summarize procedures and methodologies proposed to accomplish each of the subtasks of the bullet list above.

6.2 Data Collection, Evaluation, and Selection of Chemicals of Potential Concern

Soil and groundwater are the primary environmental media to be evaluated at the WOU Site during this RI. However, in order to adequately evaluate the vapor intrusion pathway, sub-slab vapor, crawlspace vapor, and indoor air data will also be collected (in a separate investigation). The chemicals to be analyzed in soil, groundwater, and vapor include VOCs.

Previously collected soil data, as well as new soil data to be collected during this RI, will be used to evaluate chemical intake and risk at the WOU Site. The approach to new data collection will be to characterize the site in such a way as to obtain data of sufficient quantity and quality to derive exposure point concentrations for each chemical that best represents the most likely exposure patterns for each receptor.

Chemical data will be summarized and tabulated to show pertinent sample statistics for each medium, including: the minimum and maximum concentrations; the appropriate upper confidence limit (UCL) about the mean; and frequency of detection. The USEPA software ProUCL version 5.0 (USEPA, 2013) will be utilized to determine the chemical data distributions to provide the most appropriate UCLs. Censored data (reported at concentrations below detection limits) will be retained and evaluated as described in ProUCL ver. 5.0.

Chemicals of potential concern (COPCs) are chemicals retained for quantitative evaluation as they may present health threats to receptors. COPCs will be selected using the screening criteria as described in RAGS Part A (USEPA, 1989) for all chemicals detected at least once. USEPA residential exposure Regional Screening Levels (RSLs) (USEPA, 2015a) criteria will be used to screen for COPCs by comparing the maximum detected chemical concentrations to the more conservative of the cancer effects RSL or the noncancer effects RSL computed at a Hazard Quotient (HQ) of 0.1, whichever is less. Noncancer screenings are typically performed at the

lower HQ of 0.1 as a means of accounting for the exposure to multiple chemicals. This screening approach ensures that a conservative approach to COPC selection has been performed.

HHRA results will be presented as a section of the RI report. A table will be presented in the HHRA section that shows the COPCs selected for quantitative evaluation.

6.3 Exposure Assessment

The objectives of the exposure assessment are to characterize potentially exposed human receptors at the Site, to identify actual or potential exposure pathways, and to quantify the potential exposure. Thus, the exposure assessment involves several elements, including:

- Identification of the potential receptors/exposure scenarios (as shown in the Conceptual Site Model [CSM])
- Identification of exposure routes (also in the CSM)
- Quantification of exposure point concentrations (EPCs)
- Identification of the exposure models and assumptions used to calculate daily intakes or doses

6.4 Receptors and Pathways to be Evaluated

Figure 14 presents the CSM for the WOU Site. This figure depicts the path a contaminant follows from its release in the environment to intake by the receptor. The results of the CSM illustrate which exposure pathways are complete and will be quantitatively evaluated, as discussed further below. Groundwater exposure pathways are not included due to the depth to groundwater at the site, as well as lack of groundwater use for potable purposes.

6.4.1 Current and Future Industrial/Commercial Workers

Current and future industrial/commercial workers are assumed to be adult, full-time workers who may be exposed to on-site contaminants. Industrial/commercial workers are assumed to be long-term employees who work at the facility 40 hours/week, 250 days/year, for a duration of 25 years, and may be exposed to chemicals in surface soil. Their exposure to soil may be through ingestion, dermal absorption, or inhalation of dust particles. Given the nature of organic contaminants in soil, these workers may also be exposed to volatiles in ambient air. Because most of the site is industrial, with asphalt, concrete, or structures covering the surface, the area available for exposure to current surface soil is limited. Even so, surface soil sample data will be utilized as available, to evaluate the current exposure scenario. In the future, surface impediments may be removed, exposing the upper layer of soil as surface soil. Because of this possibility, future surface soil exposure will be evaluated separately from current surface soil exposure for the Industrial/Commercial Worker.

Because VOCs are present in the subsurface, there may be a potential for the vapor intrusion pathway to be complete. If this is the case, industrial/commercial workers may be exposed to volatiles via the inhalation pathway while working indoors. Hence, the vapor intrusion pathway will be evaluated. Sub-slab and indoor air VOC data will be analyzed to derive the exposure point concentration in indoor air.

To summarize, the following pathways will be quantitatively evaluated for current and future industrial workers:

- Soil ingestion
- Soil dermal contact
- Inhalation of soil particles
- Inhalation of VOCs in ambient air
- Inhalation of VOCs inside buildings

6.4.2 Future Construction Workers

Construction activities may occur on-site, allowing a construction worker to be exposed to site contaminants. Construction workers may be exposed to chemicals in soil to the depth of a typical building excavation (10 feet). Construction workers may also be exposed to soil chemicals via dermal absorption or by the inhalation of contaminated dust or VOCs in ambient air.

Construction workers are not assumed to be employees of the facility. Instead, these receptors are assumed to be workers that only visit the site for a project. In this case, the construction project is assumed to have an exposure duration of one year, while working 40 hours/week.

To summarize, the following pathways are quantitatively evaluated for future construction workers:

- Soil ingestion
- Soil dermal contact
- Inhalation of soil particles
- Inhalation of VOCs in ambient air

6.4.3 Residents

Currently, there is one residence on the property. The resident may potentially be exposed to chemicals in surface soil, via ingestion, dermal absorption, and inhalation of dust or VOCs in ambient air. In addition, the resident may be exposed to VOCs inside the home via the vapor intrusion pathway. While there may be deed restrictions placed on the site to prevent residents in

the future, because there is a resident currently at the site, the residential pathway is deemed to be complete and warrants quantitative evaluation.

To summarize, the following pathways will be quantitatively evaluated for adult and child (0 – 6 years old) residents:

- Soil ingestion
- Soil dermal contact
- Inhalation of soil particles
- Inhalation of VOCs in ambient air
- Inhalation of VOCs inside a residence

Exposure parameters, including exposure frequencies and durations, for each receptor and pathway to be evaluated in this HHRA, are presented in Table 5. All guidance, software, and screening levels used to develop the risk assessment will be those most recently published.

6.5 Exposure Point Concentrations

An exposure point is a location where a receptor is reasonably assumed to move at random, throughout the duration of exposure, and where contact with an environmental medium is equally likely at all sub-locations. The chemical concentration developed to represent that exposure is termed the exposure point concentration (EPC). Because of the randomness assumed for exposure, an EPC is derived as an estimate of the true arithmetic mean concentration of a chemical in a medium at an exposure location. However, because the true arithmetic mean concentration cannot be calculated with certainty from a limited number of measurements, USEPA recommends that the upper confidence limit (UCL) of the arithmetic mean at each exposure point be used when calculating exposure and risk at that location (USEPA, 1992). In some instances, based on the number of data points and the data distribution, the appropriate UCL will be the 95% UCL; but this is not always the case. For this HHRA, data will be evaluated by ProUCL, and the recommended UCL of the ProUCL output file will be used as the EPC. If the UCL determined by ProUCL is shown to exceed the highest detected concentration of the data set, then the EPC selected will instead be the maximum detected concentration (USEPA, 1989).

A table will be presented in the HHRA section of the RI report which lists the EPCs selected for each COPC. ProUCL output pages will be included in an appendix.

6.6 Estimating Chemical Intake

Once the EPCs have been determined, they will be used to estimate intake. Methodology to estimate chemical intake from the various exposure pathways is described further below.

6.6.1 Intake of Chemicals from Exposure to Soil

6.6.1.1 Ingestion

Average daily chemical intake for the incidental ingestion of soil is calculated by use of the following formula (USEPA, 1989):

$$DI_{\text{Ingestion}} = \frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

where:

$DI_{\text{Soil-Ing}}$ = average daily chemical intake via soil ingestion (mg/kg-day)

CS = chemical concentration in soil (mg/kg)

IR = ingestion rate (mg soil/day)

CF = conversion factor (10^{-6} kg/mg)

FI = fraction ingested from contaminated source (unitless)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (period over which exposure is averaged, days)

Tables depicting the calculated chemical intake from ingestion of soil for all receptors will be presented in the HHRA section of the RI report.

6.6.1.2 Inhalation

For the purposes of evaluating a receptor's exposure to chemicals in ambient air, as either volatiles or adsorbed to dust particles, the development of the exposure concentration (EC) in air, as recommended by USEPA's *RAGS Part F, Guidance for Inhalation Risk Assessment* (USEPA, 2009), must be performed. The EC will be calculated by modeling the contaminant concentrations in air (CA) first, following the methodology presented in USEPA's *Soil Screening Guidance* (USEPA, 2002). EC will be determined by using the following equation:

$$EC = \frac{CA \times ET \times EF \times ED}{AT}$$

where:

- EC = exposure concentration ($\mu\text{g}/\text{m}^3$)
- CA = chemical concentration in air ($\mu\text{g}/\text{m}^3$)
- ET = exposure time (hours/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- AT = averaging time (period over which exposure is averaged, days)

The chemical concentration in air (CA) term will be calculated as follows:

$$CA = CS \times [(1 / PEF) + (1 / VF)]$$

where:

- PEF = Particle emission factor (m^3/kg); $5.70\text{E}+09 \text{ m}^3$ default value, to be used for residents and industrial/commercial workers; PEF for future construction workers will be developed as a site-specific parameter as described in USEPA, 2002.
- VF = Volatilization factor (m^3/kg).

Additionally, the following equation will be used to derive VF, as described by USEPA's *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (2002).

$$VF = [Q/C \times (3.14 \times D_A \times T)^{1/2} \times CF] / (2 \times \rho_b \times D_A)$$

where:

- Q/C = inverse of mean concentration at center of source ($\text{g}/\text{m}^2\text{-s}$ per kg/m^3)
- D_A = apparent diffusivity (cm^2/sec)
- T = exposure interval (sec)
- CF = conversion factor, $10^{-4} \text{ m}^2/\text{cm}^2$
- ρ_b = dry soil bulk density (g/cm^3) = $1.5 \text{ g}/\text{cm}^3$

Additionally, the following equation will be used to derive D_A (USEPA, 2002).

$$D_A = [(\theta_a^{10/3} \times D_i \times H') + (\theta_w^{10/3} \times D_w) / n^2] / [(\rho_b \times K_d) + \theta_w + (\theta_a \times H')]$$

where:

θ_a = air filled porosity (L_{air}/L_{soil}) = $n - \theta_w = 0.284$

D_i = diffusivity in air (cm^2/sec), chemical specific

H' = Henrys law constant, unitless, chemical specific

θ_w = water-filled porosity (L_{water}/L_{soil}) = 0.15

n = total soil porosity (L_{pore}/L_{soil}) = $1 - (\rho_b/\rho_s) = 0.434$

K_d = soil-water partition coefficient, cm^3/g

The following equation will be used to derive K_d (USEPA, 2002).

$$K_d = K_{OC} \times f_{OC}$$

where:

K_{OC} = soil organic carbon partition coefficient (cm^3/g), chemical specific

f_{OC} = fraction organic carbon in soil (g/g), 0.006

Tables will be presented in the HHRA presenting all of the calculations of the above equations for inhalation for each receptor.

6.6.1.3 Dermal Absorption

Average daily chemical intake for dermal absorption of chemicals in soil will be calculated by use of the following formula (USEPA, 2004):

$$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT}$$

where:

DAD = dermal absorbed dose (mg/kg-day)

DA_{event} = absorbed dose per event (mg/cm^2 -event)

EF = exposure frequency (days/year)

- ED = exposure duration (years)
- EV = event frequency (events/day)
- SA = skin surface area available for contact (cm²)
- BW = body weight (kg)
- AT = averaging time (period over which exposure is averaged, days)

The DA_{event} term will be calculated by use of the following formula (USEPA, 2004):

$$DA_{event} = CS \times CF \times AF \times ABS_d$$

where:

- DA_{event} = absorbed dose per event (mg/cm²-event)
- CS = chemical concentration in soil (mg/kg)
- CF = conversion factor (10⁻⁶kg/mg)
- AF = adherence factor of soil to skin (mg/cm²-event)
- ABS_d = dermal absorption fraction

Tables will be included in the HHRA presenting all of the calculations of the above equations for dermal absorption for each receptor.

6.6.2 Intake of Volatile Organic Chemicals via Vapor Intrusion

Because vapor and indoor air samples will be collected and analyzed for VOCs, there will be no need to perform any modeling to evaluate vapor intrusion. The VOC concentrations measured analytically will serve as the EC, as described above for the inhalation of VOCs in ambient air. Vapor intrusion will be evaluated for the industrial/commercial worker and for residents.

6.7 Toxicity Assessment

The toxicity assessment identifies the toxicity values (i.e. slope factors and reference doses) for COPCs. These toxicity values are applied to the estimated doses (intakes) calculated in the exposure assessment, in order to evaluate carcinogenic risk and noncarcinogenic hazard. USEPA's on-line Integrated Risk Information System (IRIS) (USEPA, 2015b) is the preferred source of toxicity values, as the Tier 1 option. If a toxicity value is not available through IRIS, USEPA's recommended hierarchy of toxicity databases (USEPA, 2003) will be followed which

suggests that the Tier 2 option should be the Provisional Peer Reviewed Toxicity Values (PPRTVs) developed by The Office of Research and Development(ORD)/National Center for Environmental Assessment (NCEA). For chemicals without toxicity factors in the Tier 1 and Tier 2 lists, Tier 3 will be consulted and utilized, if available.

6.7.1 Carcinogenicity Evaluation

Carcinogenic oral slope factors (SFs) will be presented in the HHRA section of the RI report, and will include the following information for each COPC: weight of evidence, tumor site(s), unit risk values, and SFs. References will be provided as to the source of the SFs.

Presently, toxicological data do not exist from which dermal SFs can be derived. To evaluate the dermal pathway, USEPA has adopted methodology to obtain dermal SFs by adjusting the oral SFs. The equation for extrapolation of a default dermal SF is as follows:

$$\text{Default Dermal SF} = \text{Oral SF} \div \text{Oral Absorption Factor (\%)}$$

Inhalation cancer risks are calculated by use of the Inhalation Unit Risk (IUR) Factors. Toxicity tables will also be presented in the HHRA section of the RI report to provide the IURs for each COPC, including the IUR reference source.

6.7.2 Noncarcinogenic Hazards Evaluation

Oral reference doses (RfDs) are derived from toxicological data and can be obtained from USEPA toxicological databases, such as IRIS. However, for the dermal pathway, oral RfDs are adjusted to derive dermal RfDs in an approach similar as that described above for the derivation of dermal SFs, and as follows:

$$\text{Dermal RfD} = \text{Oral RfD} \times \text{Oral Absorption Factor (\%)}$$

Noncarcinogenic oral RfDs will be presented on tables in the HHRA section of the RI report, and will also include the critical effect/target organ affected along with the reference source.

Inhalation noncancer hazards are calculated by use of the inhalation reference concentrations (RfCs). Toxicity tables will also be presented in the HHRA section of the RI report to provide the RfCs for each COPC, including the RfC reference source.

6.7.3 Mutagenic Evaluation

Some receptors are highly sensitive to chemicals that demonstrate a mutagenic mode of action. The most sensitive of such receptors are children. Because child residents will be evaluated in this risk assessment, an adjustment is required while calculating the excess lifetime cancer risks to account for the special case of mutagenicity.

Chemicals that may be selected as COPCs for this HHRA that are deemed to inherently possess mutagenic modes of action (USEPA, 2005) include TCE, VC, and some PAHs.

To make this necessary adjustment for mutagenicity, an Age-Dependent Adjustment Factor (ADAF) is applied. For the child (0-6 years) evaluated in this risk assessment, from the age of 0 to 2 years, the ADAF of 10 is used and from the age of 2 to 6, the ADAF of 3 is used (USEPA, 2005). All calculations will be presented in tables of the HHRA section of the RI report.

6.8 Risk Characterization

The objective of the risk characterization step is to integrate the information developed in the exposure assessment and the toxicity assessment into an evaluation of the potential current and future health risks associated with the COPCs at the WOU Site. Potential cancer risk will be calculated by multiplying the estimated lifetime-averaged daily intake that is calculated for a chemical through an exposure route by the exposure route-specific cancer slope factor, as described below.

$$ELCR = DI \times SF$$

where:

ELCR = Excess Lifetime Cancer Risk (unitless)

DI = Daily intake of chemical (mg/kg-day)

SF = Cancer slope factor (mg/kg-day)⁻¹

Excess cancer risk for the inhalation pathway will be estimated by utilizing the following formula (USEPA, 2009):

$$CR_{\text{Inhalation}} = IUR \times EC$$

where:

ELCR_{Inhalation} = cancer risk via the inhalation pathway (unitless)

IUR = inhalation unit risk [(μg/m³)⁻¹]

EC = exposure concentration (μg/m³)

Cancer risks are then summed to calculate total risks to a receptor from all chemicals and from all exposure routes.

The potential for noncarcinogenic health effects will be evaluated by the calculation of hazard quotients (HQs) and hazard indices (HIs) (which are essentially the sum of the HQs). An HQ is the ratio of the exposure duration-averaged estimated daily intake through a given exposure route to the chemical and route-specific reference dose, calculated as presented below.

$$HQ = DI \div RfD$$

where:

HQ = Hazard quotient (unitless)
DI = Daily chemical intake (mg/kg-day)
RfD = Noncancer reference dose (mg/kg-day)

The HQ for the inhalation pathway will be calculated by using the following formula (USEPA, 2009):

$$HQ_{\text{Inhalation}} = EC / [\text{Toxicity Value} \times 1000 \mu\text{g}/\text{m}^3]$$

where:

HQ = hazard quotient via the inhalation pathway (unitless)
EC = exposure concentration ($\mu\text{g}/\text{m}^3$)
Toxicity Value = inhalation toxicity value (e.g. RfC)

HQs are totaled to calculate HIs for each receptor scenario. Initially, HIs will be calculated based on all chemicals and exposure routes. Following the calculation of cumulative noncancer hazards, any chemicals with results greater than 1.0 are further evaluated to determine if multiple organ effects are demonstrated. If so, chemicals are segregated by organ effect and cumulative noncancer risks are reevaluated separately.

Tables showing all risk characterization calculations will be presented in the HHRA section of the RI report for each receptor and each pathway.

6.9 Uncertainty Analysis

There are a number of factors that contribute uncertainty to the estimates of exposure and risk presented above. The HHRA section of the RI report will include an uncertainty section to discuss the potential uncertainties, and will also include the likelihood that risks are overestimated or underestimated.

6.10 Remediation Goal Objectives

Remediation Goal Objectives (RGOs) will be calculated for every chemical resulting in an excess lifetime cancer risk of 1×10^{-6} (1E-06) or a hazard quotient of 1.0. These chemicals are also known as chemicals of concern (COCs), or risk drivers, as they are the chemicals which would be moved forward to the Feasibility Study phase to evaluate alternatives for clean-up to ensure protectiveness. In order to evaluate clean-up strategies, a clean-up level must first be established, hence the need to calculate RGOs for resulting COCs.

The process to calculate RGOs is essentially the risk calculation process in reverse (USEPA, 1991). To calculate RGOs, a target risk level is first determined, such as 1E-06, and then the concentration of the COC in soil, which would result in that level of risk, is determined. The same exposure parameters and pathways are utilized to calculate RGOs as were used to calculate risk. To provide more information for risk management decisions, RGOs will be calculated for three levels of target risk, 1E-06, 1E-05, and 1E-04, and three levels of noncancer hazard, 0.1, 1.0, and 3.0.

RGO calculations will be presented in tables of the HHRA Report.

6.11 Ecological Risk Assessment

An ecological risk screening will be conducted as part of the risk assessment. Ecological risks have not been a primary driver of past remedy decisions.

7.0 REMEDIAL INVESTIGATION TASKS

RI tasks include the following:

7.1 Project Planning

- Collection and evaluation of existing data
- Identification of data needs and DQOs
- Preparation of Work Plan
- Preparation of QAPP, health and safety plan (HASP), and field sampling plan (FSP)
- Initiation of coordination with analytical laboratory
- Task management and quality control

7.2 Community Relations

Community relations is the responsibility of the MDNR. EOI will assist if requested by the MDNR.

7.3 Field Investigation

Field investigation activities are detailed in the FSP. In general, field investigation activities will include:

- Procurement of drilling subcontractor
- Utility locate
- Mobilization
- Borehole logging
- Field screening (with PID)
- Soil sampling
- Installation of groundwater monitoring wells
- Well development and gauging
- Groundwater sampling
- Shipping samples to analytical laboratory with chain-of-custody
- RI waste disposal

7.4 Sample Analysis/Validation

Analysis and validation of samples and data are detailed in the Quality Assurance Project Plan.

7.5 Data Evaluation

New data collected will be incorporated with existing data to provide a comprehensive picture of COCs remaining in soil and groundwater at the site. Data evaluation activities include data reduction and tabulation.

7.6 Assessment of Risks

The HHRA will be conducted as outlined in Section 6. An ecological risk screening will also be conducted.

7.7 Treatability Studies

No treatability studies are anticipated at this time.

7.8 Remedial Investigation Report

A Remedial Investigation Report will be prepared incorporating and summarizing the new data with the existing body of data from the WOU. The report will include data tables, graphics, and text to support the evaluation of the data and conclusions. This task includes revising the report based on agency comments. Once the report is finalized, the feasibility study process will begin.

8.0 PROJECT SCHEDULE AND DELIVERABLES

Project deliverables will include the Sampling and Analysis Plan (QAPP and FSP), the Health and Safety Plan, and the RI Report. When the RI Work Plan scope is approved and finalized, additional project deliverables can be prepared. The field work will be scheduled after all plans are approved and finalized.

Field work will likely take two to three weeks, laboratory analysis will require 5 to 7 days (normal turnaround time) or 1 day for expedited turnaround, and preparation of the draft report will take 6 to 8 weeks following receipt of analytical reports.

EOI will submit monthly progress reports documenting project activities.

9.0 PROJECT MANAGEMENT

EOI will be the main contractor for the remedial investigation. EOI will select and oversee subcontractors including the driller and analytical laboratory.

EOI will coordinate all activities with Wainwright, the site owner and tenant, and USEPA and MDNR. USEPA and MDNR will review, comment, and approve the project deliverables, including work plans, sampling and analysis plan (QAPP and FSP), and investigation reports. MDNR will take the lead on community relations, with assistance from EOI if requested.

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FIGURES



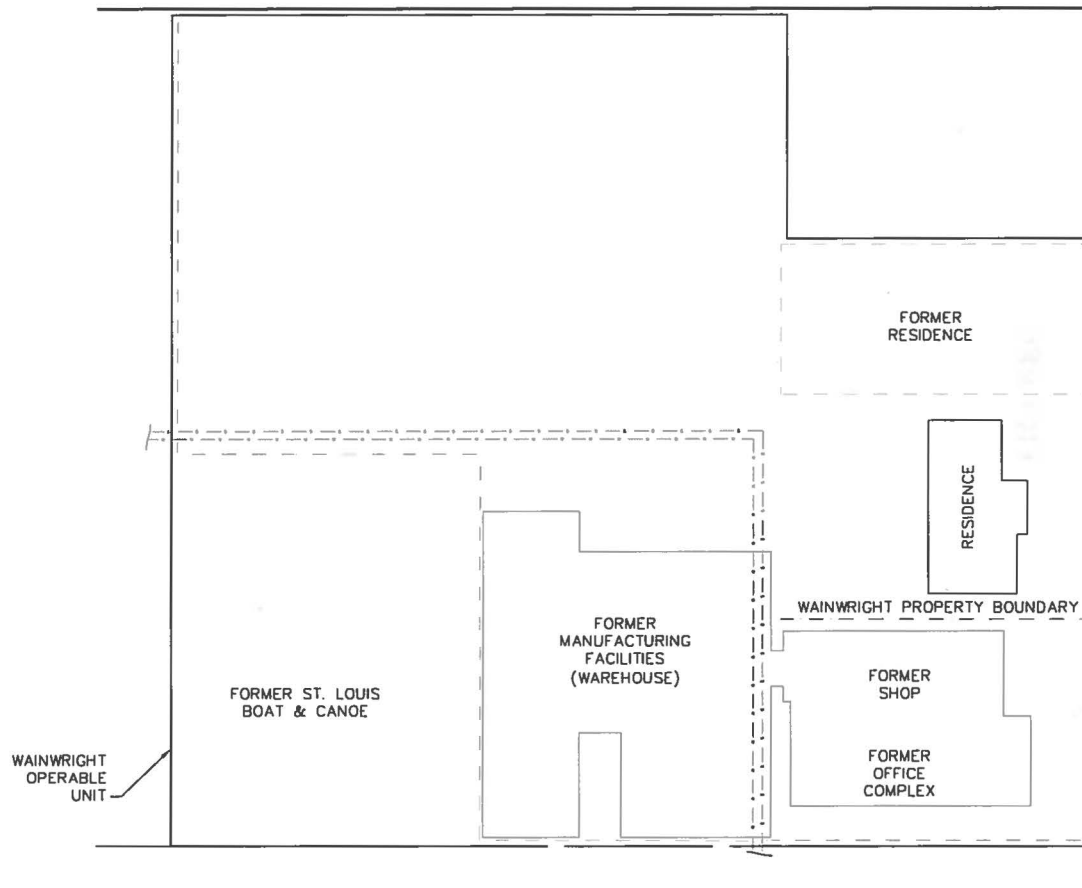
North



Approximate Scale, feet

Legend

- Approximate Existing Water Location
- Approximate Existing Sewer Location



Note: Figure based on Phillip Services Corporation Fig. 1
Map of Wells for Sparge and Vent Remediation (2002)

Wainwright Operable Unit
Site Layout
224 Benton Avenue
Valley Park, Missouri

Figure 1



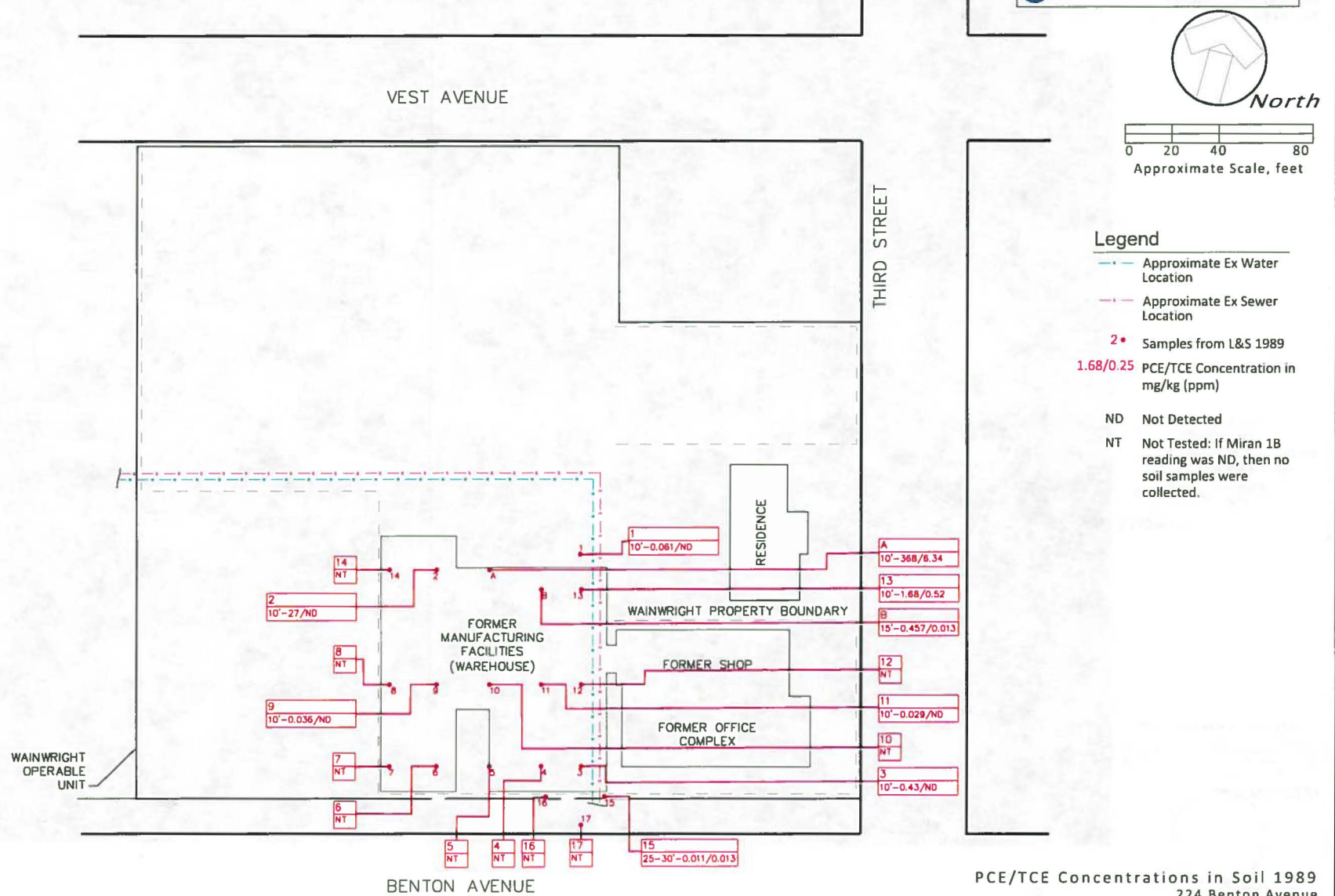
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Approximate Scale, feet

Legend

-  Groundwater Monitoring Well
-  * MW-AAB has been cut off below ground surface.
-  Proposed New Monitoring Well

Monitoring Well Locations
Valley Park TCE Site
Valley Park, Missouri

Figure 2



PCE/TCE Concentrations in Soil 1989
224 Benton Avenue
Valley Park, Missouri

Figure 3

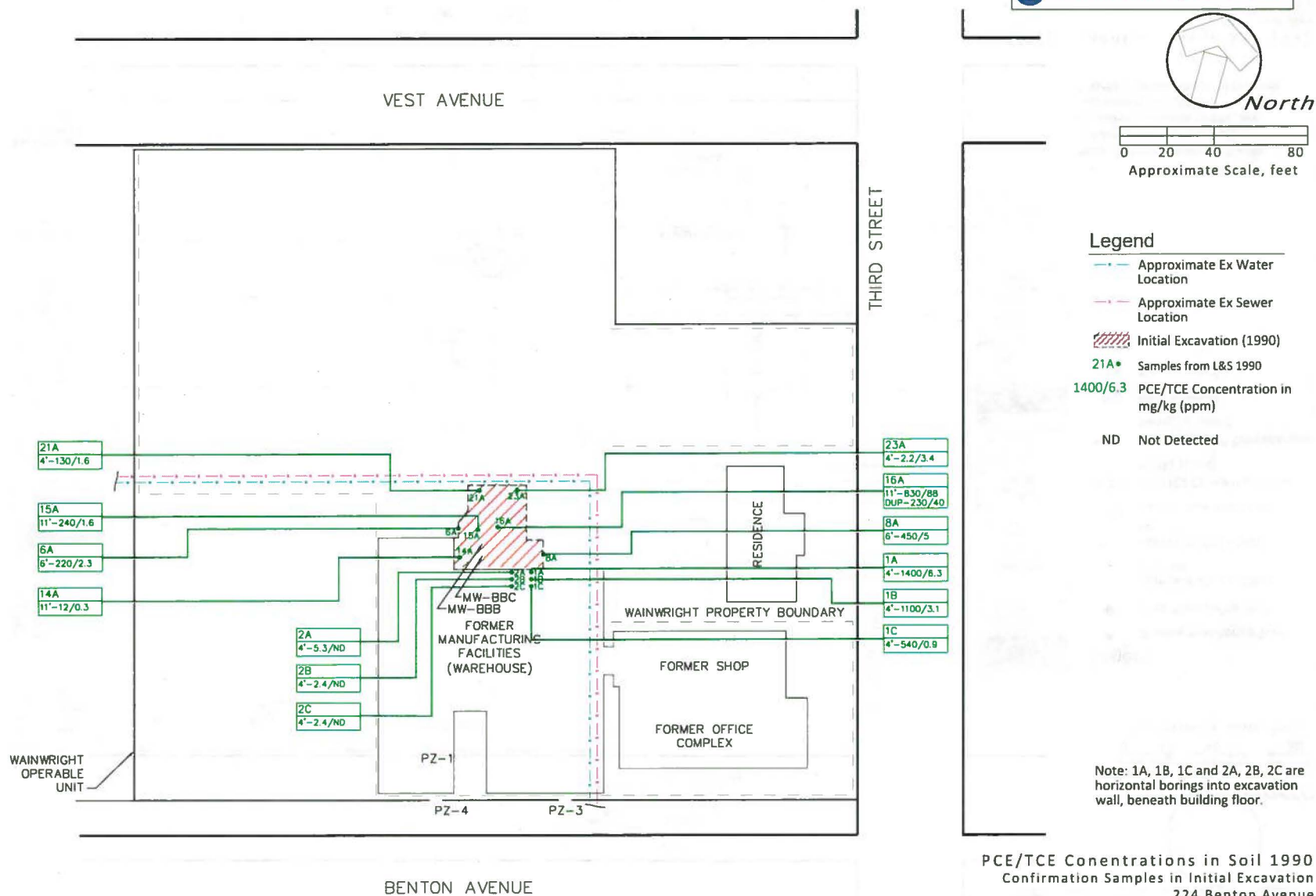


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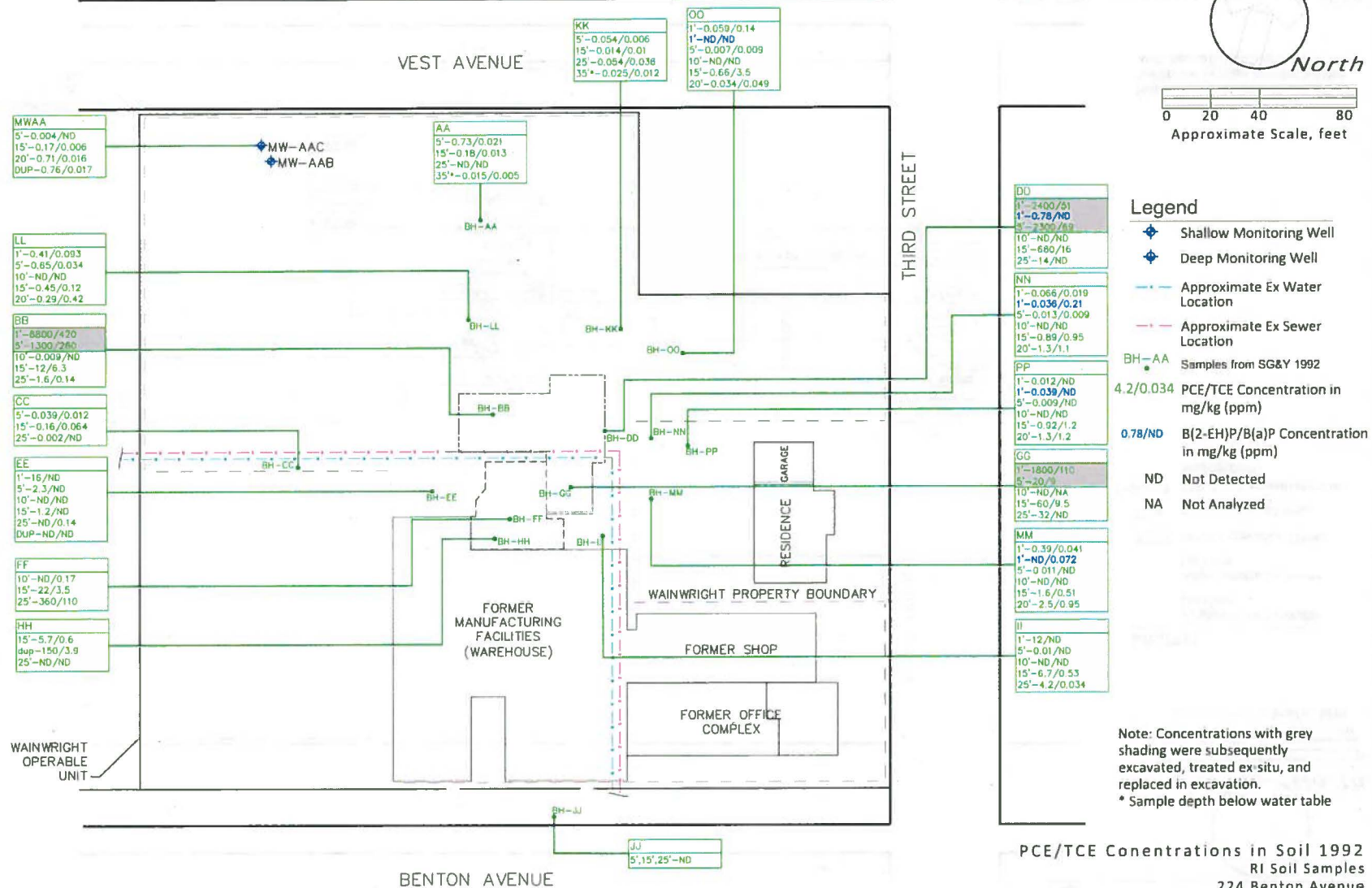


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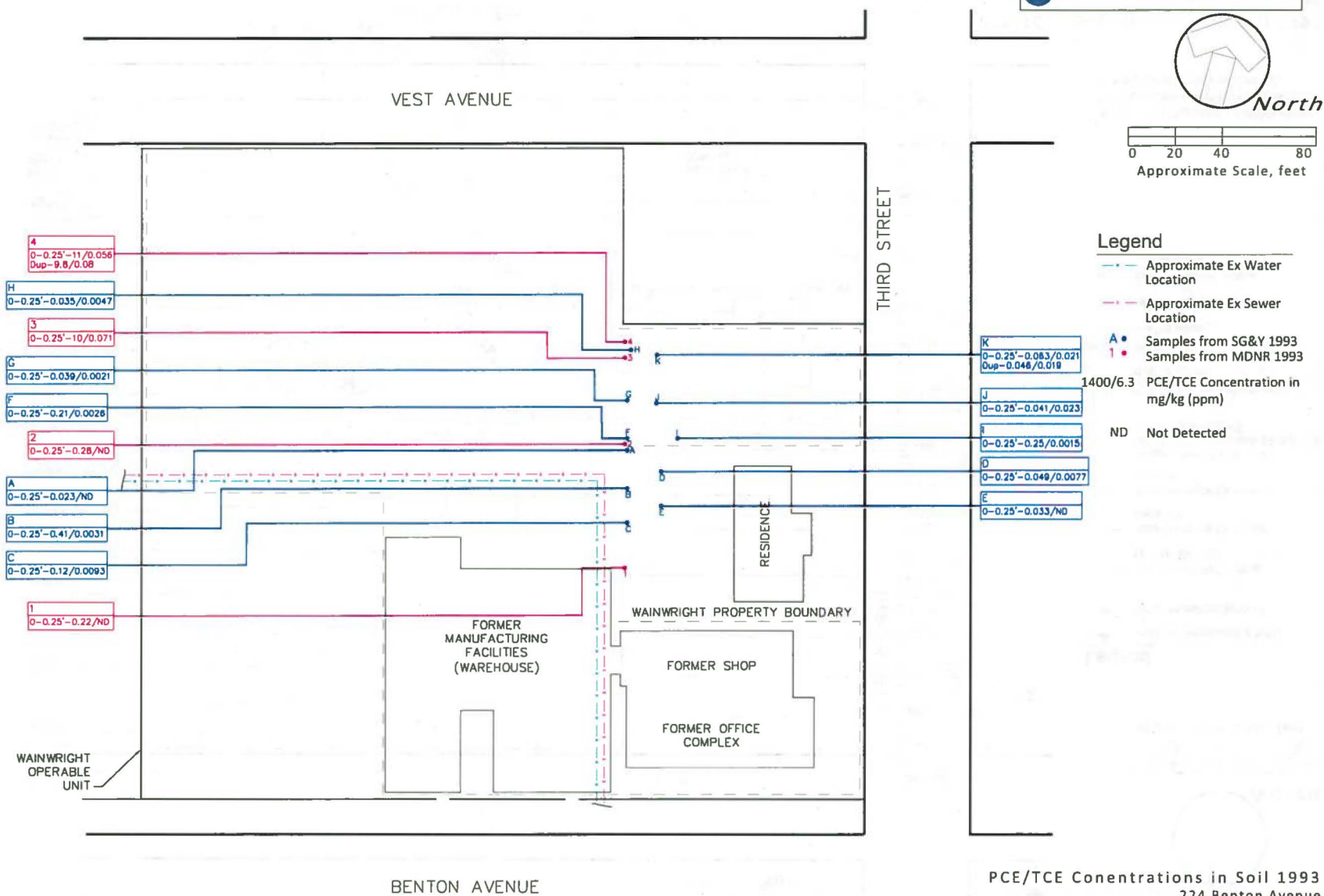


Figure 6

Project #5228

Environmental Operations, Inc.

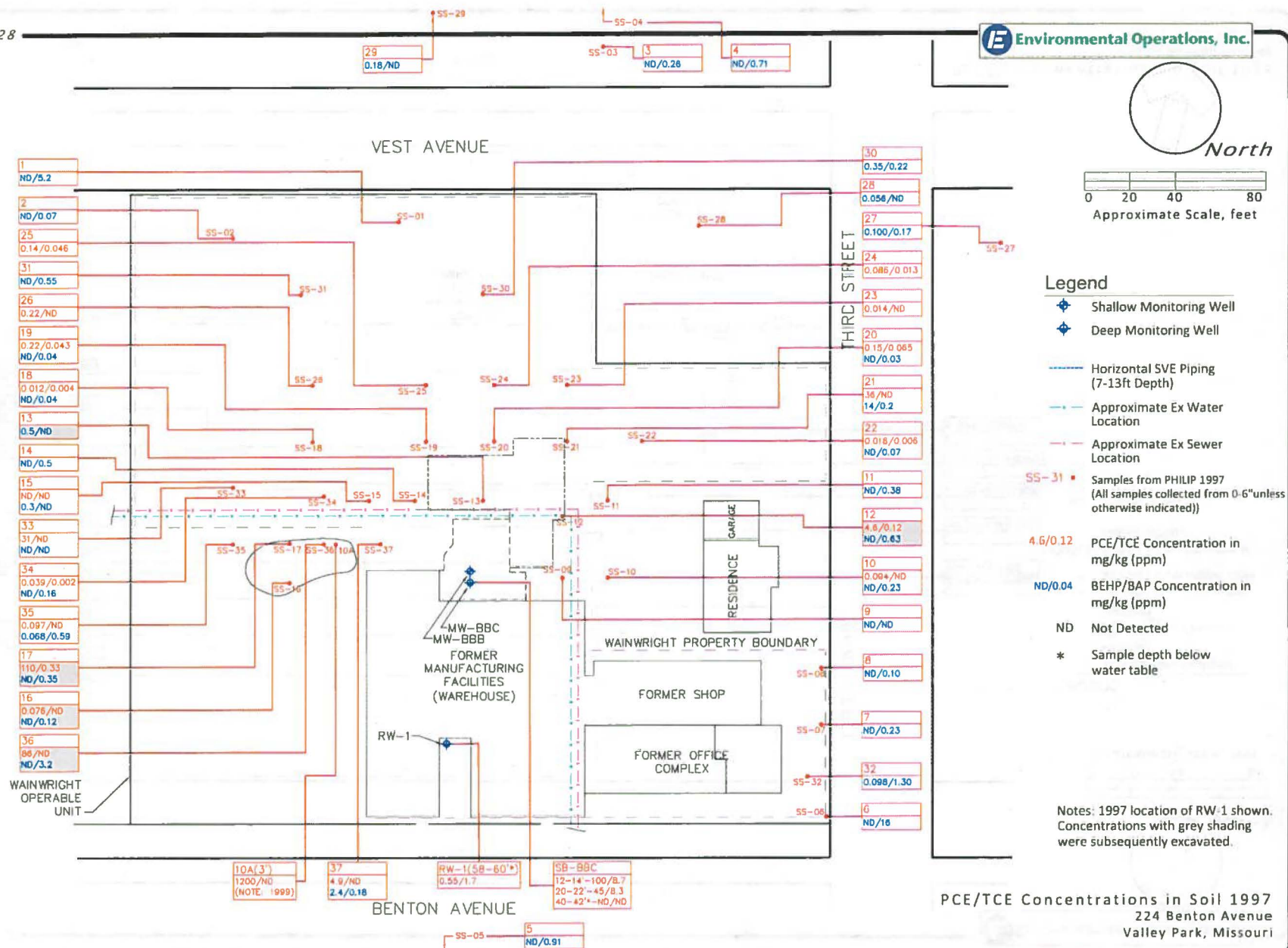


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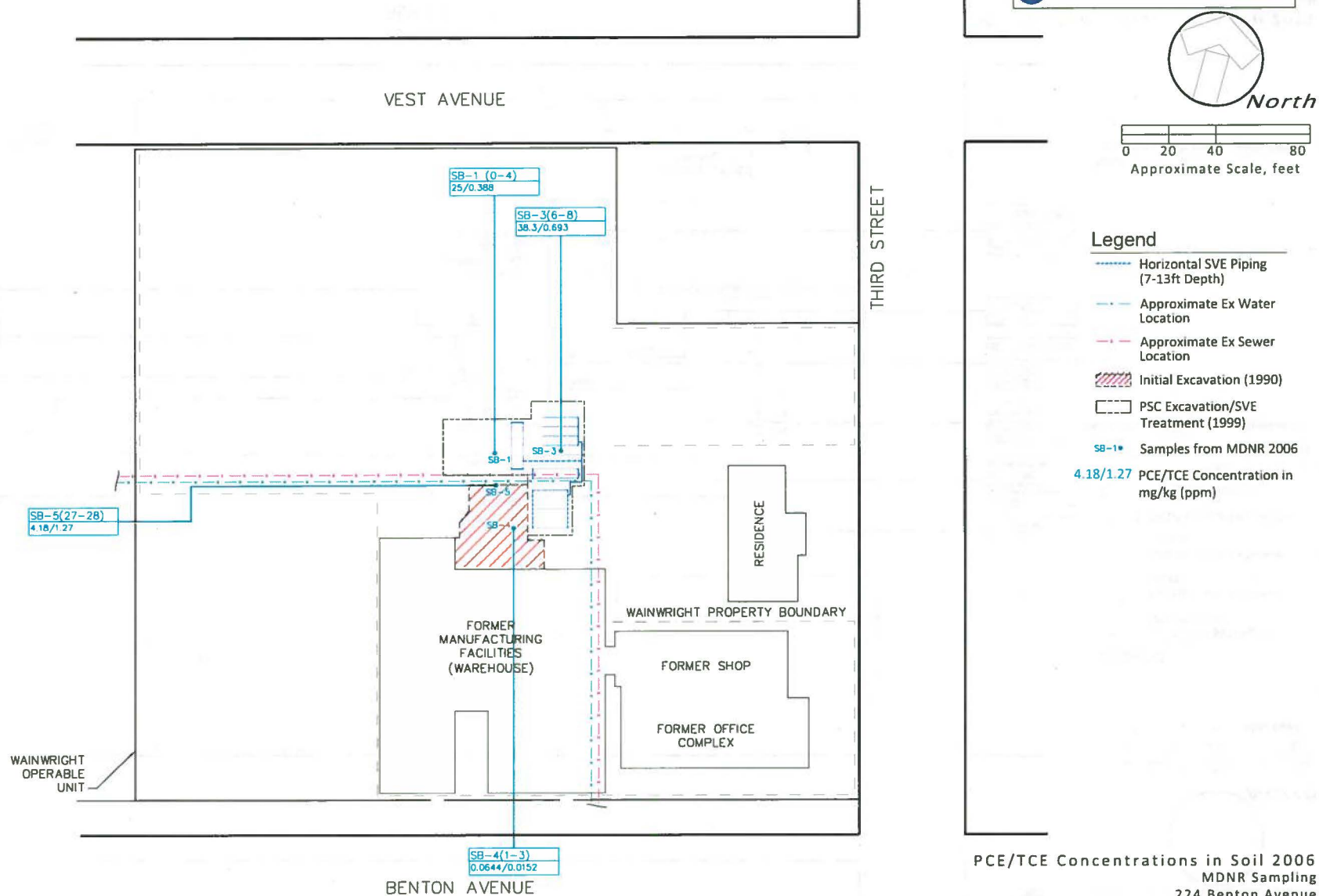


Figure 8



0 20 40 80
Approximate Scale, feet

Legend

- Horizontal SVE Piping (7-13ft Depth)
- Approximate Ex Water Location
- Approximate Ex Sewer Location
- Initial Excavation (1990)
- PSC Excavation/SVE Treatment (1999)
- SB-102 Samples from AMEC 2011
- 34.7/1.96 PCE/TCE Concentration in mg/kg (ppm)
- ND Not Detected

Note:
* Sample depth below water table

SB-102
4'-34.7/1.96
12'-2.16/ND
26'-0.124/0.0778

SB-104
16'-51.4/6.96
24'-2360/ND
31'-0.0376/ND

SB-111
7'-ND/ND

SB-109
24'-218/39.6
28'-1.04/ND

SB-101
20'-0.0619/0.0124
28'-56.5/0.364

SB-105

SB-102

SB-103

SB-111

SB-109

SB-104

SB-108

SB-105

SB-110

SB-107

SB-101

SB-106
6'-0.159/ND

SB-103
8'-19.2/2.94
24'-18/ND
32'-0.022/ND

SB-108
8'-425/1.57
32'-29/ND

SB-105
7'-331/ND
28'-1470/54.8
32'-0.854/0.0453

SB-110
7'-ND/ND

SB-107
7'-1330/7.84
28'-2170/48.2
36'-0.208/0.0035

WAINWRIGHT
OPERABLE
UNIT

VEST AVENUE

THIRD STREET

BENTON AVENUE

FORMER
MANUFACTURING
FACILITIES
(WAREHOUSE)

WAINWRIGHT PROPERTY BOUNDARY

FORMER SHOP

FORMER OFFICE
COMPLEX

RESIDENCE
GARAGE

PCE/TCE Concentrations in Soil 2011
224 Benton Avenue
Valley Park, Missouri

Figure 9

Project #5228

Environmental Operations, Inc.



0 20 40 80
Approximate Scale, feet

Legend

- Approximate Ex Water Location
- Approximate Ex Sewer Location
- SB-201 Samples from AMEC/MDNR 2012
- 11.8/0.068 PCE/TCE Concentration in mg/kg (ppm)
- ND/0.567 B(2-EH)P/B(a)P Concentration in mg/kg (ppm)
- ND Not Detected
- NA Not Analyzed

OSS-2
6-8"-ND/ND
NA/0.756

OSS-2

OSS-3
6-8"-ND/ND
NA/0.367

OSS-3

VEST AVENUE

THIRD STREET

WAINWRIGHT
OPERABLE
UNIT

OSS-1
6-8"-ND/ND
NA/0.248

OSS-1

BENTON AVENUE

FORMER
MANUFACTURING
FACILITIES
(WAREHOUSE)

RESIDENCE

WAINWRIGHT PROPERTY BOUNDARY

FORMER SHOP

FORMER OFFICE
COMPLEX

SB-202
2'-11.8/0.068
NA/0.120
5'-19.3/0.183
NA/0.147
9'-15.1/0.182
NA/0.0268

3rd St
Jrd St
6-12"-ND/0.567

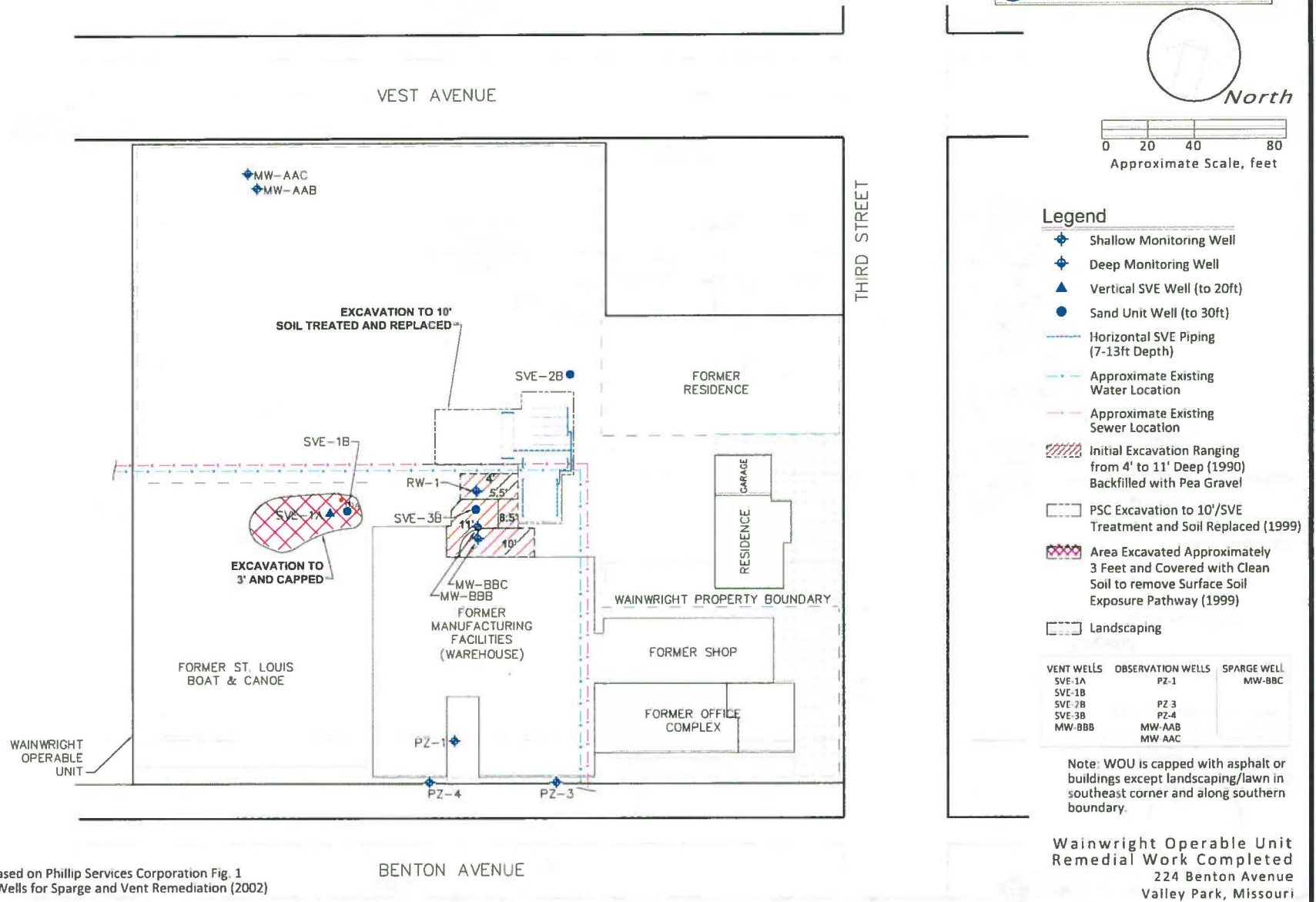
SB-201
3.5'-ND/ND
NA/0.0074
6.5'-0.616/0.232
NA/ND
10.5'-1.71/0.852
NA/ND

SB-203
16-17'-1.24/0.505

SB-204
5-8'-9.85/1.39

PCE/TCE Concentrations in Soil 2012
224 Benton Avenue
Valley Park, Missouri

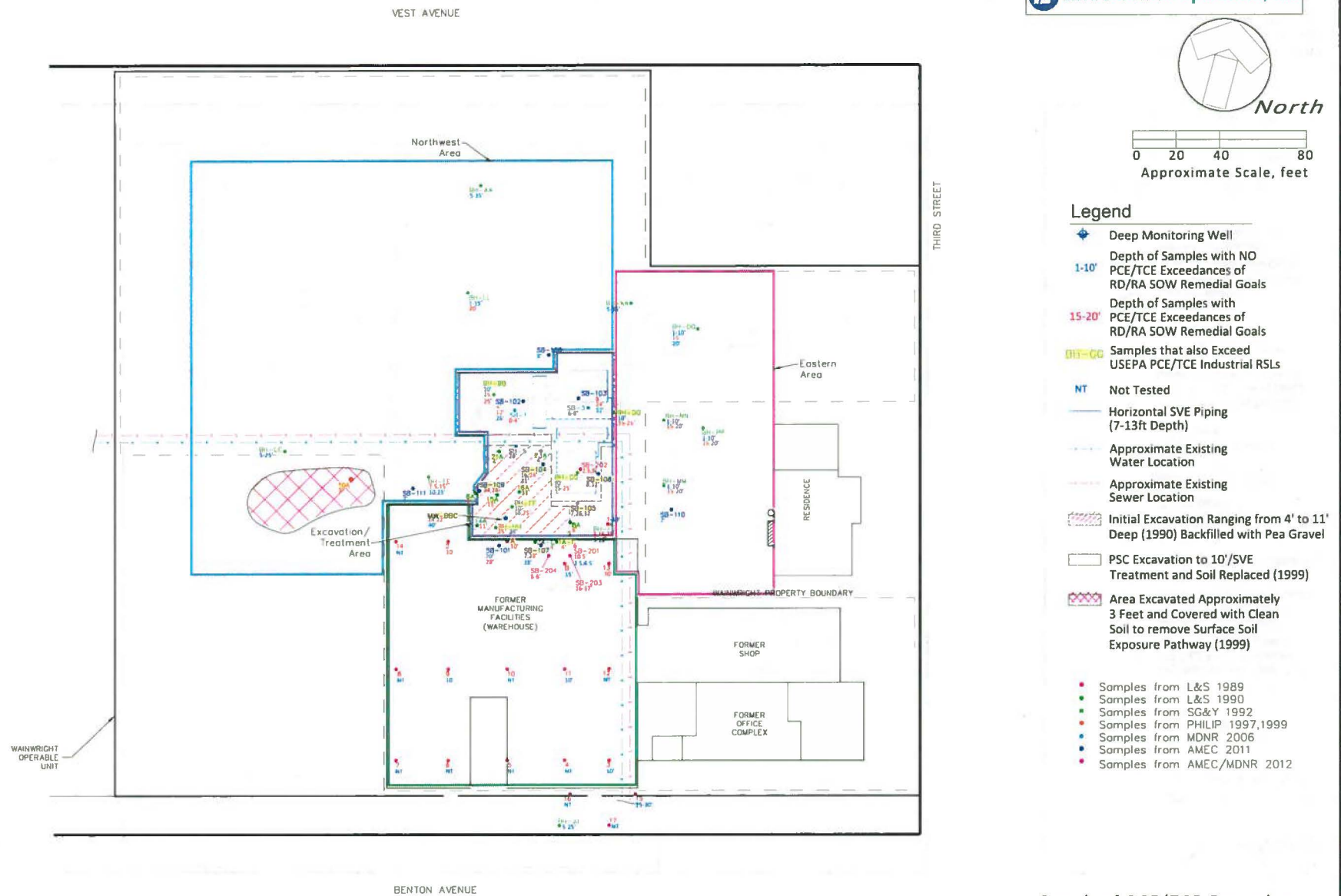
Figure 10



Note: Figure based on Phillip Services Corporation Fig. 1
Map of Wells for Sparge and Vent Remediation (2002)

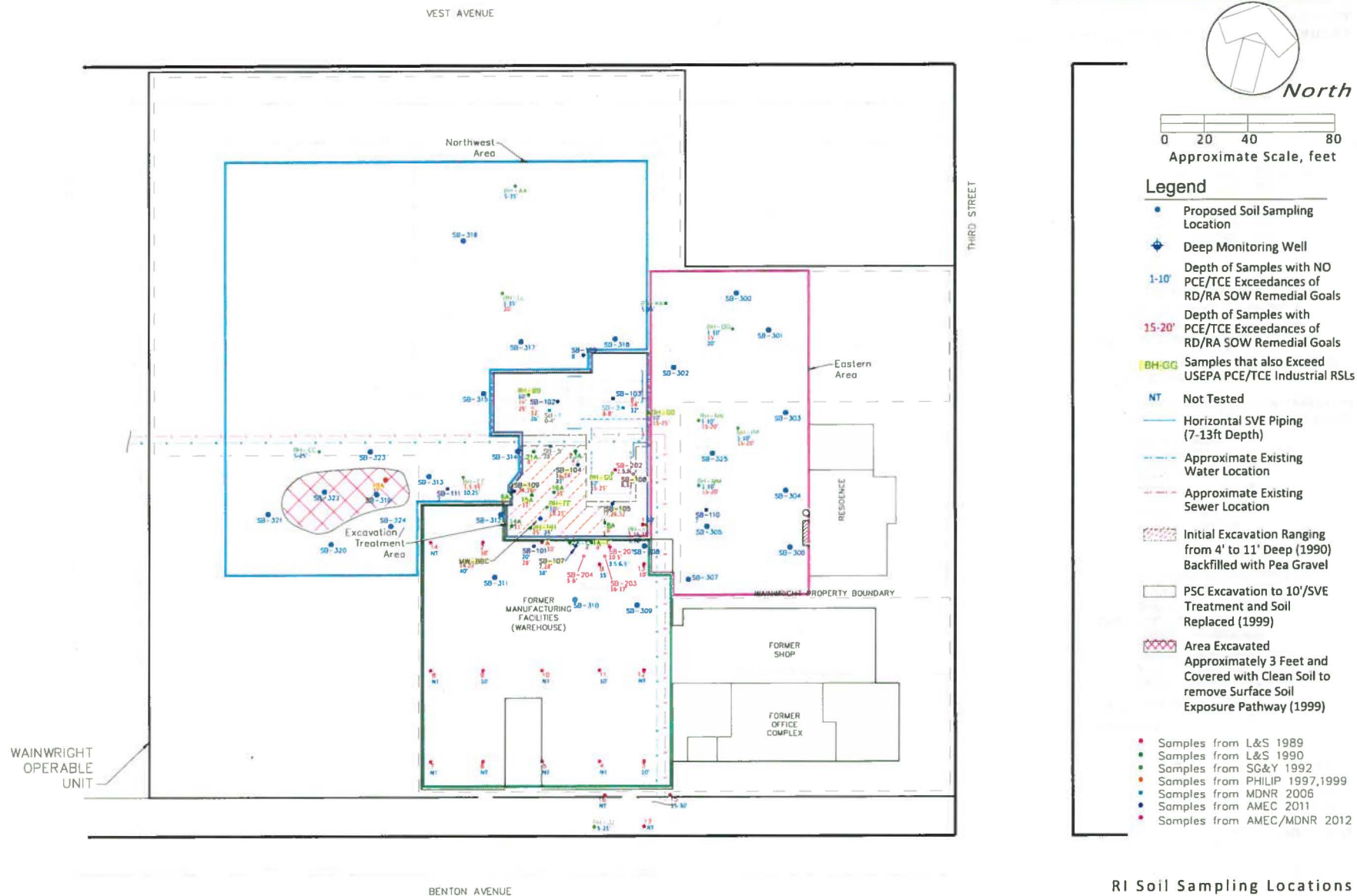
BENTON AVENUE

Figure 11



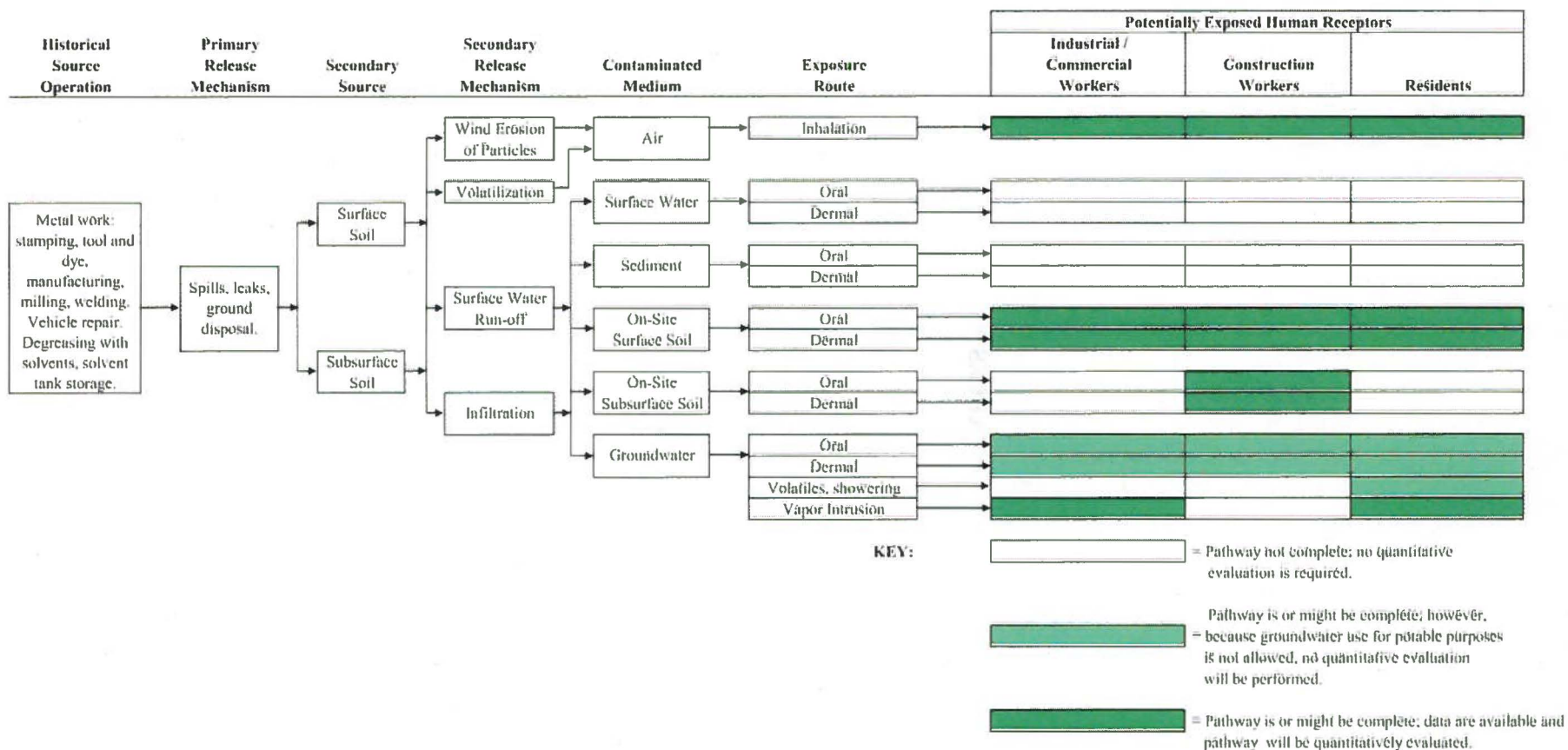
Depth of PCE/TCE Exceedances
224 Benton Avenue
Valley Park, Missouri

Figure 12



RI Soil Sampling Locations
224 Benton Avenue
Valley Park, Missouri

Figure 13



TABLES

TABLE I. The effect of the concentration of the solution on the rate of reaction.

TABLE II. The effect of the temperature on the rate of reaction.

TABLE III. The effect of the catalyst on the rate of reaction.

TABLE IV. The effect of the solvent on the rate of reaction.

TABLE V. The effect of the pH on the rate of reaction.

TABLE VI. The effect of the ionic strength on the rate of reaction.

TABLE VII. The effect of the dielectric constant on the rate of reaction.

TABLE VIII. The effect of the viscosity on the rate of reaction.

TABLE IX. The effect of the surface area on the rate of reaction.

TABLE X. The effect of the particle size on the rate of reaction.

Table 1. Groundwater Data Summary
Wainwright Operable Unit
224 Benton, Valley Park, Missouri

all units mg/L			Constituent	TCE	PCE	cis-DCE	VC	MTBE
Monitoring Well		Depth to Water	GW RG	0.005	0.005	0.07	0.002	0.128
Location	Well Depth	(feet BTOC)	Date					
MW-AAB	33.25	24.91	5/6/1999	n/a	n/a	n/a	n/a	n/a
upgradient		28.19	2/4/1997	n/a	n/a	n/a	n/a	n/a
(destroyed)		29.36	5/22/1992	<0.005	0.035	<0.005	<0.010	
		27.16	4/23/1992	0.001 J	0.092	<0.005	<0.010	
MW-AAC	46.89	28.77	8/17/2015	<0.005	<0.005	<0.005	<0.002	<0.002
upgradient		26.20	3/15/2011	0.00134	<0.0005	<0.0005	<0.0005	<0.0005
		22.12	4/24/2008	0.00262	<0.0005	0.00068	<0.0005	<0.0005
		***	6/12/2007	0.00192	<0.0005	0.00055	<0.0005	
		***	4/11/2006	0.00294	0.00053			
		24.71	5/6/1999	n/a	n/a	n/a	n/a	n/a
		28.81	2/4/1997	n/a	n/a	n/a	n/a	n/a
		n/a	5/22/1992	0.003 J	<0.005	<0.005	<0.010	
		n/a	4/23/1992	<0.050	<0.050	<0.050	<0.1	
MW-BBB	39	30.42	8/18/2015	0.239	0.477	0.0382	<0.002	<0.002
Source area		34.57	9/21/2011	0.0746	0.306	0.0654		
		26.35	5/30/2002	0.42	2.3	0.2		0.088
		n/a	12/1/1999	0.67	3.7			0.26
		26.82	5/6/1999	n/a	n/a	n/a	n/a	n/a
		32.10	2/4/1997	n/a	n/a	n/a	n/a	n/a
		31.36	12/5/1996	31	33	1	0.04	n/a
		31.36	dup 12/5/96	29	29	1.1	0.038	n/a
MW-BBC	57	31.45	8/18/2015	1.28	1	2.14	<0.002	<0.002
Source area		37.73	8/29/2012	0.0268	0.0904	0.0236	<0.001	
		35.50	9/15/2011	0.483	0.207	0.0747		
		35.50	dup 9/15/11	0.512	0.209	0.0726		
		28.89	3/15/2011	0.895	0.258	0.181	0.00174	<0.0005
		34.03	4/27/2010	0.242	0.228	0.137	<0.0005	
		24.55	4/24/2008	1.8	0.416	2.15	0.0606	0.00875
		***	6/12/2007	0.791	0.288	0.887	0.0124	
		***	4/11/2006	0.729	0.278			
		25.77	5/30/2002		0.4	0.5	0.0036	0.47
		39.55	12/1/1999	0.67	0.35	0.35		1.9
		26.74	5/6/1999	n/a	n/a	n/a	n/a	n/a
		32.06	2/4/1997	n/a	n/a	n/a	n/a	n/a
		31.36	12/5/1996	8.6	5.2	1	0.22	n/a
Influent GET Well	58.5	n/a	4/20/2015	0.466	0.617	0.785		
(RW-1)		n/a	1/3/2013	0.93	0.53	0.2		
Source area		n/a	4/27/2010	1.89	1.24	0.175	0.00071	
		n/a	4/24/2008	0.137	0.487	0.0998	<0.0005	0.00116
		n/a	6/12/2007	0.212	0.217	0.0755	0.00064	
PZ-01	40	35.73	9/15/2011	0.0804	0.291	0.0634	<0.002	<0.002
downgradient		32.31	2/4/1997	n/a	n/a	n/a	n/a	n/a
PZ-03	36	28.81	8/17/2015	0.112	0.488	0.0786	<0.002	<0.002
downgradient								
MW-17B	39.6	29.63	8/17/2015	0.0534	0.0144	0.0098	<0.002	<0.002
downgradient		29.63	8/17/2015 DUP	0.055	0.0147	0.0097	<0.002	<0.002
		26.80	3/15/2011	0.00156	0.00808	<0.0005	<0.0005	<0.0005
		24.77	5/6/1999	n/a	n/a	n/a	n/a	n/a
		30.32	2/4/1997	n/a	n/a	n/a	n/a	n/a
		32.18	5/22/1992	0.42	1.5	<0.050	<0.1	
		28.66	4/23/1992	0.17	0.55	0.005 J	<0.010	
		36.50	7/29/1987*	0.535	2.907	0.113		
		36.50	7/29/87* DUP	0.646	3.207	0.11		

Table 1. Groundwater Data Summary

Wainwright Operable Unit
224 Benton, Valley Park, Missouri

all units mg/L			Constituent	TCE	PCE	cis-DCE	VC	MTBE
Monitoring Well		Depth to Water	GW RG	0.005	0.005	0.07	0.002	0.128
Location	Well Depth	(feet BTOC)	Date					
MW-17C	59.25	29.48	8/18/2015	0.0945	0.231	0.123	<0.002	<0.002
downgradient		35.69	8/29/2012	0.0164	0.11	0.0095	<0.001	
		26.61	3/15/2011	0.0128	0.042	0.0094	<0.0005	<0.0005
		n/a	4/27/2010	0.0313	0.218	0.0297	<0.0005	
		22.46	4/24/2008	0.0217	0.042	0.0148	<0.0005	0.00115
		***	6/12/2007	0.0136	0.0478	0.0078	<0.0005	
		***	4/11/2006	ND	ND			
		24.51	5/6/1999	n/a	n/a	n/a	n/a	n/a
		30.08	2/4/1997	n/a	n/a	n/a	n/a	n/a
		n/a	4/23/1992	0.078	0.14	0.009	<0.010	
		36.14	7/28/1987*	0.311	0.815	0.0474		
MW-44BR	78	30.77	8/18/2015	<0.005	<0.005	<0.005	<0.002	<0.002
downgradient BR								
MW-5B	41.35	30.51	8/17/2015	<0.005	<0.005	<0.005	<0.002	<0.002
downgradient - west		27.79	3/15/2011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		29.90	4/27/2010	0.00055	0.00162	<0.0005	<0.0005	
		31.06	2/4/1997	n/a	n/a	n/a	n/a	n/a
		32.02	5/22/1992	0.002 J	0.019	<0.005	<0.010	
		29.90	4/23/1992	0.006	0.022	<0.005	<0.010	
		37.31	7/28/1987*	<0.002	0.0224	<0.0025		
MW-5C	59.9	30.71	8/17/2015	<0.005	<0.005	<0.005	<0.002	<0.002
downgradient - west		27.92	3/15/2011	0.00294	0.00055	<0.0005	<0.0005	<0.0005
		30.10	4/27/2010	0.00402	0.00108	<0.0005	<0.0005	
		23.68	4/24/2008	0.00546	0.00133	<0.0005	<0.0005	0.00194
		***	6/12/2007	0.00381	0.00091	<0.0005	<0.0005	
		25.81	5/6/1999	n/a	n/a	n/a	n/a	n/a
		31.30	2/4/1997	n/a	n/a	n/a	n/a	n/a
		n/a	5/22/1992	<0.050	<0.050	<0.050	<0.10	
		n/a	4/23/1992	0.011	0.004 J	<0.005	<0.010	
		37.50	7/28/1987*	0.00791	<0.0025	<0.0025		
Reichold Well	n/a	n/a	8/18/2015	0.0063	0.0217	<0.005	<0.002	<0.002
downgradient		n/a	3/15/2011	0.00542	0.00758	0.00642	<0.0005	<0.0005
		n/a	4/27/2010	0.00479	0.011	0.00437	<0.0005	
		n/a	4/24/2008	0.0112	0.0162	0.014	<0.0005	0.00068
MW-6C	62.15	25.00	3/15/2011	0.00885	0.011	0.0128	<0.0005	<0.0005
downgradient		22.85	4/24/2008	0.0186	0.0164	0.0276	<0.0005	<0.0005
		24.91	5/6/1999	n/a	n/a	n/a	n/a	n/a
		n/a	7/28/1987	0.0505	0.0638	0.00462		

Bold = detected concentration

Yellow highlight = exceeds groundwater remedial goal

n/a - data not available - well not gauged and/or recorded, or not sampled

BTOC - below top of casing

*** data requested from MDNR

TCE - Trichloroethylene

PCE - Tetrachloroethylene

DCE - Dichloroethylene

VC - Vinyl chloride

MTBE - Meth tert-butyl ether

RG - Remedial Goal

Table 2. Comparison of Soil Remedial Action Objectives and Regional Screening Levels

Wainwright Operable Unit
224 Benton Avenue, Valley Park, Missouri

Source		PCE	TCE	BEHP	BAP	1,4-Dioxane	Hex-Cr	Total Cr
RD/RA SOW	Surface	10.64	52.63	0.44	0.065	NC	NC	NC
1995 Health-based Remedial Goals (RGs)	Subsurface	0.737	0.255	NC	NC	NC	NC	NC
USEPA RSL	Industrial (10^{-6})	100	6	160	0.29	24	6.3	--
Regional Screening Levels	Residential (10^{-6})	24	0.94	39	0.016	5.3	0.3	--
Protection of Groundwater SSLs*	Risk-Based	0.102	0.0036	26	0.08	0.00188	0.0134	--
	MCL-Based	0.046	0.036	28	4.8	--	--	3600000
Soil Saturation Limit (USEPA RSL)		166	692	--	--	116000	--	--

PCE - tetrachloroethylene

TCE - trichloroethylene

BEHP - bis(2-ethylhexyl)phthalate

BAP - benzo(a)pyrene

Cr - chromium

Hex-Cr - hexavalent chromium

NC - not calculated

-- = not available or applicable (no MCL)

RD/RA SOW - Remedial Design/Remedial Action Statement of Work, 1995

RSL - USEPA Regional Screening Level (updated May 2016)

SSL - Soil Screening Level

*based on Dilution Attenuation Factor of 20

All units are mg/kg (parts per million)

Wainwright Operable Unit
224 Benton Avenue, Valley Park, Missouri

Units in mg/kg

Table 4.
Polycyclic Aromatic Hydrocarbon (PAH) Concentrations Compared to USEPA RSLs
Wainwright Operable Unit
224 Benton Avenue, Valley Park, Missouri

Analyte (mg/kg)	Health-based Remedial Action objectives (1995) (surficial)	EPA Residential Soil RSL	EPA Industrial Soil RSL	Sample ID	1992																	
					Depth	BH-CC-1	BH-CC-2	BH-CC-3	BH-DD-1	BH-DD-2	BH-DD-3	BH-DD-3A	BH-DD-4	BH-DD-5	BH-EE-6	BH-FF-1	BH-FF-2	BH-FF-3	BH-MM-1	BH-MM-2	BH-MM-3	BH-MM-4
						5'	15'	25'	0.5-1'	5'	10'	10'	15'	25'	25'	11'	15'	25'	0.5-1'	5'	10'	15'
bis(2-ethylhexyl)phthalate	0.44	39	160			< 0.16	< 0.16	< 0.16	0.74	2.20	0.11 J	0.13 J	0.072 J	0.13 J	< 0.16	< 0.16	0.13 J	0.10 J	< 0.33	< 0.17	< 0.17	< 0.16
Acenaphthene		3,400	33,000			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.33	< 0.17	< 0.17	< 0.16
Acenaphthylene						< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.33	< 0.17	< 0.17	< 0.16
Anthracene		17,000	170,000			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	0.068	< 0.17	< 0.17	< 0.16
Benzo(a)anthracene		0.15	2.1			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	0.28 R	< 0.17	< 0.17	< 0.16
Benzo(a)pyrene	0.065	0.015	0.21			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	0.072 R	< 0.17	< 0.17	< 0.16
Benzo(b)fluoranthene		0.15	2.1			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	0.32 R	< 0.17	< 0.17	< 0.16
Benzo(g,h,i)perylene						< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.33	< 0.17	< 0.17	< 0.16
Benzo(k)fluoranthene		1.5	21			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	0.18	< 0.17	< 0.17	< 0.16
Chrysene		15	210			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	0.3	< 0.17	< 0.17	< 0.16
Dibenzo(a,h)anthracene		0.015	0.21			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.33	< 0.17	< 0.17	< 0.16
Fluoranthene		2,300	22,000			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	0.039	0.76	0.052	< 0.17
Fluorene		2,300	22,000			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.33	< 0.17	< 0.17	< 0.16
Indeno(1,2,3-cd)pyrene		0.15	2.1			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.33	< 0.17	< 0.17	< 0.16
Naphthalene		3.6	18			< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.33	< 0.17	< 0.17	< 0.16
Phenanthrene						< 0.16	< 0.16	< 0.16	< 0.66	< 0.66	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	0.098	0.5	< 0.17	< 0.16
Pyrene		1,700	17,000			< 0.16	< 0.16	< 0.16	0.16 J	0.14 J	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	0.077	0.73	0.034	< 0.17

RSL - Regional Screening Level based on
Carcinogenic Target Risk = 1E-06
Yellow highlight = concentration exceeds at least one RSL
R = exceeds Residential Soil RSL
I = exceeds Industrial Soil RSL
ND - not detected
NA - not analyzed
*Where ND was reported, 1/2 detection limit was
used in mean calculations.

Table 4.
Polycyclic Aromatic Hydrocarbon (PAH) Concentrations Compared to USEPA RSLs
Wainwright Operable Unit
224 Benton Avenue, Valley Park, Missouri

Analyte (mg/kg)	Health-based Remedial Action objectives (1995) (surficial)	EPA Residential Soil RSL	EPA Industrial Soil RSL	Sample ID	1992																	
					BH-MM-5	BH-NN-1	BH-NN-2	BH-NN-3	BH-NN-4	BH-NN-5	BH-OO-1	BH-OO-2	BH-OO-3	BH-OO-4	BH-OO-5	BH-PP-1	BH-PP-2	BH-PP-3	BH-PP-4	BH-PP-5		
					20'	0.5-1'	5'	10'	15'	20'	0.5-1'	5'	10'	15'	23.5'	0.5-1'	5'	10'	15'	20'		
bis(2-ethylhexyl)phthalate	0.44	39	160		<0.16	0.036 J	<0.17	<0.16	1.1	0.054	<0.17	<0.17	<0.16	<0.16	0.04	0.039	0.041	<0.17	<0.17	<0.17		
Acenaphthene		3,400	33,000		<0.16	<0.17	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Acenaphthylene					<0.16	<0.17	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Anthracene		17,000	170,000		<0.16	0.042	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Benzo(a)anthracene		0.15	2.1		<0.16	0.22 R	<0.17	<0.16	<0.17	<0.16	0.11	<0.17	<0.16	<0.16	<0.17	0.11	0.039	<0.17	<0.17	<0.17		
Benzo(a)pyrene	0.065	0.015	0.21		<0.16	0.21 R	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Benzo(b)fluoranthene		0.15	2.1		<0.16	0.25 R	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Benzo(g,h,i)perylene					<0.16	<0.17	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Benzo(k)fluoranthene		1.5	21		<0.16	0.098	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Chrysene		15	210		<0.16	0.23	<0.17	<0.16	<0.17	<0.16	0.13	<0.17	<0.16	<0.16	<0.17	0.14	0.039	<0.17	<0.17	<0.17		
Dibenzo(a,h)anthracene		0.015	0.21		<0.16	<0.17	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Fluoranthene		2,300	22,000		<0.16	0.5	<0.17	<0.16	<0.17	<0.16	0.21	<0.17	<0.16	<0.16	<0.17	0.27	0.091	<0.17	<0.17	<0.17		
Fluorene		2,300	22,000		<0.16	<0.17	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Indeno(1,2,3-cd)pyrene		0.15	2.1		<0.16	<0.17	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Naphthalene		3.6	18		<0.16	<0.17	<0.17	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	<0.16	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		
Phenanthrene					<0.16	0.25	<0.17	<0.16	<0.17	<0.16	0.15	<0.17	<0.16	<0.16	<0.17	0.17	0.1	<0.17	<0.17	<0.17		
Pyrene		1,700	17,000		<0.16	0.39	<0.17	<0.16	<0.17	<0.16	0.26	<0.17	<0.16	<0.16	<0.17	0.27	0.093	<0.17	<0.17	<0.17		

RSL - Regional Screening Level based on

Carcinogenic Target Risk = 1E-06

Yellow highlight = concentration exceeds at least one RSL

R = exceeds Residential Soil RSL

I = exceeds Industrial Soil RSL

ND - not detected

NA - not analyzed

*Where ND was reported, 1/2 detection limit was used in mean calculations.

Table 4.
Polycyclic Aromatic Hydrocarbon (PAH) Concentrations Compared to USEPA RSLs
Wainwright Operable Unit
224 Benton Avenue, Valley Park, Missouri

Analyte (mg/kg)	Health-based Remedial Action objectives (1995) (surficial)	EPA Residential Soil RSL	EPA Industrial Soil RSL	Sample ID Depth	1997 - Background															
					SS-01	SS-02	SS-03	SS-04	SS-05	SS-06	SS-07	SS-08	SS-27	SS-28	SS-29	SS-30	SS-31	SS-32		
					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	
bis(2-ethylhexyl)phthalate	0.44	39	160		<0.28	<0.28	<0.32	<0.44	<0.28	<0.56	<0.28	<0.28	0.1	0.056	0.18	0.35	ND	0.098		
Acenaphthene		3,400	33,000		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Acenaphthylene					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Anthracene		17,000	170,000		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Benzo(a)anthracene		0.15	2.1		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Benzo(a)pyrene	0.065	0.015	0.21		5.2 R,I	0.07 R	0.26 R,I	0.71 R,I	0.91 R,I	16 R,I	0.23 R,I	0.10 R	0.17 R	ND	ND	0.22 R,I	0.55 R,I	1.30 R,I		
Benzo(b)fluoranthene		0.15	2.1		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Benzo(g,h,i)perylene					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Benzo(k)fluoranthene		1.5	21		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Chrysene		15	210		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Dibenzo(a,h)anthracene		0.015	0.21		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Fluoranthene		2,300	22,000		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Fluorene		2,300	22,000		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Indeno(1,2,3-cd)pyrene		0.15	2.1		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Naphthalene		3.6	18		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Phenanthrene					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Pyrene		1,700	17,000		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		

RSL - Regional Screening Level based on

Carcinogenic Target Risk = 1E-06

Yellow highlight = concentration exceeds at least one RSL

R = exceeds Residential Soil RSL

I = exceeds Industrial Soil RSL

ND - not detected

NA - not analyzed

*Where ND was reported, 1/2 detection limit was used in mean calculations.

Table 4.
Polycyclic Aromatic Hydrocarbon (PAH) Concentrations Compared to USEPA RSLs
Wainwright Operable Unit
224 Benton Avenue, Valley Park, Missouri

				1997 - On-site																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
Analyte (mg/kg)	Health-based Remedial Action objectives (1995) (surficial)	EPA Residential Soil RSL	EPA Industrial Soil RSL	Sample ID																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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					0-6"	Dup 0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
bis(2-ethylhexyl)phthalate	0.44	39	160		<0.28	<0.28	<0.28	<0.28	<0.34	0.50UJ	<0.28	0.30U	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<

RSL - Regional Screening Level based on
Carcinogenic Target Risk = 1E-06
Yellow highlight = concentration exceeds at least one RSL
R = exceeds Residential Soil RSL
I = exceeds Industrial Soil RSL
ND - not detected
NA - not analyzed
*Where ND was reported, 1/2 detection limit was
used in mean calculations.

Table 4.
Polycyclic Aromatic Hydrocarbon (PAH) Concentrations Compared to USEPA RSLs
Wainwright Operable Unit
224 Benton Avenue, Valley Park, Missouri

Analyte (mg/kg)	Health-based Remedial Action objectives (1995) (surficial)	EPA Residential Soil RSL	EPA Industrial Soil RSL	Sample ID	2012 - Off-site				2012 - On-site							
					3rd Street (MDNR)	OSS-1-8	OSS-2-8	OSS-3-8	SB-201	SB-201	SB-201	SB-202	SB-202	SB-202	SB-202	SB-202
					Depth 6-12"	6-8"	6-8"	6-8"	3.5	6.5	10.5	2	5	9		
bis(2-ethylhexyl)phthalate	0.44	39	160		<0.106											
Acenaphthene		3,400	33,000		ND	0.0104	0.082	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene					ND	0.0244	0.0075	ND	ND	ND	ND	0.0165	0.029	ND	ND	ND
Anthracene		17,000	170,000		0.0635	0.0847	0.248	0.0334	ND	ND	ND	0.0261	0.0426	ND	ND	ND
Benzo(a)anthracene		0.15	2.1		0.346 R	0.303 R	0.772 R	0.299 R	0.0067	ND	ND	0.147	0.154 R	ND	ND	ND
Benzo(a)pyrene	0.065	0.015	0.21		0.567 R,I	0.248 R,I	0.756 R,I	0.367 R,I	0.0074	ND	ND	0.12 R	0.147 R	0.0268 R	ND	ND
Benzo(b)fluoranthene		0.15	2.1		0.304 R	0.558 R	1.18 R	0.584 R	0.0107	ND	ND	0.268 R	0.345 R	0.0523	ND	ND
Benzo(g,h,i)perylene					0.121	0.159	0.548	0.338	0.0053	ND	ND	0.135	0.201	0.041	ND	ND
Benzo(k)fluoranthene		1.5	21		0.191	0.201	0.348	0.195	0.0048	ND	ND	0.0882	0.141	ND	ND	ND
Chrysene		15	210		0.296	0.653	1.05	0.486	0.0108	ND	ND	0.251	0.299	0.0391	ND	ND
Dibenzo(a,h)anthracene		0.015	0.21		0.203 R	0.0416 R	0.129 R	0.0682 R	ND	ND	ND	0.0306 R	0.044 R	ND	ND	ND
Fluoranthene		2,300	22,000		0.549	0.386	2.07	0.708	0.0228	ND	0.0042	0.298	0.453	0.0333	ND	ND
Fluorene		2,300	22,000		ND	0.0105	0.0701	ND	ND	ND	ND	0.0045	0.005	ND	ND	ND
Indeno(1,2,3-cd)pyrene		0.15	2.1		0.142	0.145	0.483 R	0.279 R	0.0049	ND	ND	0.111	0.162 R	0.0355	ND	ND
Naphthalene		3.6	18		ND	0.0069	0.009	ND	ND	ND	ND	0.0131	0.0316	ND	ND	ND
Phenanthrene					0.238	0.176	1.06	0.215	0.0238	ND	ND	0.162	0.303	0.0234	ND	ND
Pyrene		1,700	17,000		0.492	0.424	1.64	0.608	0.0196	ND	0.0044	0.305	0.422	0.041	ND	ND

RSL - Regional Screening Level based on
Carcinogenic Target Risk = 1E-06
Yellow highlight = concentration exceeds at least one RSL
R = exceeds Residential Soil RSL
I = exceeds Industrial Soil RSL
ND - not detected
NA - not analyzed
*Where ND was reported, 1/2 detection limit was
used in mean calculations.

Table 5
Summary of Human Exposure Assumptions^a
Human Health Risk Assessment
WOU, Valley Park TCE Site, MO

Exposure Pathway	Parameter	Industrial/Commercial	Construction	Resident		Parameter
		Worker (Adult)	Worker (Adult)	Adult	Child	Units
General	Body weight (BW)	70	70	70	15	kg
	Exposure frequency (EF)	250	250	350	350	days/year
	Exposure duration (ED)	25	1	24	6	year
	Exposure time (ET)	8	8	24	24	hour/day
	Averaging time - Cancer ^b (AT _C)	25,550	25,550	25,550	25,550	days
	Averaging time - Noncancer ^c (AT _{NC})	9,125	365	8,760	2,190	days
Ingestion	Soil intake rate (IR _s)	50	100	100	200	mg/day
Inhalation	Particle Emission Factor (PEF) ^e	5.70E+09	to be determined	5.70E+09	5.70E+09	m ³ /kg
Dermal	Skin surface area available for contact (SSA)	3,527	3,527	6,032	2,373	cm ²
Absorption	Soil to skin adherence factor (SAF)	0.12	0.12	0.07	0.2	mg/cm ²

^(a)Unless otherwise noted, all exposure parameters are obtained from USEPA, 2014. *Human Health Evaluation Manual: Update of Standard Default Exposure Factors*.

^(b)Averaging time of exposure for carcinogenic effects is calculated as follows: 70-year lifetime exposure (70 years x 365 days/year = 25,550 days)

^(c)Averaging time for noncarcinogenic effects is calculated as follows: ED years x 365 days/year

^(d)Professional judgement

^(e)From: USEPA, 2002. *Supplemental Guidance for Developing Soil Screening Levels*.

na = not applicable for this receptor

Table 6. Comparison of Depth to Water in Soil Boring Logs and Monitoring Wells to Soil Sample Depths
Wainwright Operable Unit
224 Benton, Valley Park, Missouri

Soil Boring/Well	Soil Sample Date	Depth to Apparent Water Table ⁺ (ft)	Depth to Groundwater Date ⁺⁺	Depth to Groundwater (ft BTOC)	Deepest Soil Sample Depth (ft)	Sample Depths Below Apparent Water Table
1992						
MW-AA-B	4/14/1992	24	4/16/1992	26.4	24	none
			4/23/1992	27.16		
			5/22/1992	29.36		
MW-AA-B	4/1992			≈ 27		
BH-AA through BH-PP	4/1992	-			35	BH-AA-35* BH-KK-35*
1996						
MW/SB-BBC	11/2/1996	25	12/5/1996	31.36	40-42	40-42
			12/14/1996	32.9		
			12/16/1996	33.02		
RW-1	11/19/1996	-	12/5/1996	29.06	58-60	58-60
2006						
MW-BBC			4/11/2006	***		
SB-1-SB-5	5/23/2006	**			0-4	none
SB-3	5/23/2006	**			6-8	none
SB-4	5/23/2006	**			1-3	none
SB-5	5/23/2006	**			27-28	undetermined
2011						
MW-BBC			9/15/2011	35.5		
SB-101	11/9/2011	-			28	none
SB-102	11/9/2011	26			26	none
SB-103	11/9/2011	32			32	none
SB-104	11/9/2011	28			31	31
SB-105	11/9/2011	32			32	none
SB-106	11/9/2011	-			8	none
SB-107	11/10/2011	28			38	38
SB-108	11/10/2011	32			32	none
SB-109	11/10/2011	28			28	none
SB-110	11/10/2011	24			7	none
SB-111	11/10/2011	28			7	none
2012						
MW-BBC			8/29/2012	37.73		
SB-201	8/29/2012	-			10.5	none
SB-202	8/29/2012	-			9	none
SB-203	8/29/2012	**			16-17	none
SB-204	8/29/2012	**			5-6	none
"-" no depth to water or "wet" soil conditions recorded on boring log						
*assumed to be below water table based on depth to GW in nearby well and historic data						
** no boring log provided in MDNR or AMEC reports						
***data requested from MDNR						
+ depth to water as noted on soil boring log						
++ depth to groundwater measured in monitoring well shown						

***Remedial Investigation/Feasibility Study Workplan for Wainwright Property Operable Unit,
Lafser & Schreiber, Inc., 1991.***

**Table 11 – Sample Analysis Results (224 Benton Avenue),
Underneath Facility (July/September 1989)**

TABLE 11

**SAMPLE ANALYSIS RESULTS (224 BENTON AVENUE)
UNDERNEATH FACILITY (JULY/SEPTEMBER 1989)**

<u>SAMPLE LOCATION-DEPTH</u>	<u>(ppm)</u>	<u>ANALYTICAL RESULTS (ppb)</u>	
	<u>MIRAN 1B</u> (tetrachloroethylene)	<u>TETRACHLOROETHYLENE</u>	<u>TRICHLOROETHYLENE</u>
#1-10 ft.	85-90	61	ND
#2-10 ft.	>250	27,000	ND
#3-10 ft.	ND	430	ND
#4-10 ft.	ND	NT	NT
#5-10 ft.	ND	NT	NT
#6-10 ft.	ND	NT	NT
#7-10 ft.	ND	NT	NT
#8-10 ft.	ND	NT	NT
#9-10 ft.	20-30	36	ND
#10-10 ft.	ND	NT	NT
#11-10 ft.	100 ppm; sewage odor	29	ND
#12	Hit sewer line @ approx. 3 ft. - no samples taken--		
#13-10 ft.	100	1,680	520
#14	Digging obstruction @ 8 in. - no samples taken-----		
#15A-5 ft.	ND	NT	NT
#15B-10 ft.	ND	NT	NT
#15C-15 ft.	ND	NT	NT
#15D-20 ft.	ND	NT	NT
#15E-25-30 ft.	ND	11	13
#16A-5 ft.	ND	NT	NT
#16B-10 ft.	ND	NT	NT
#16C-15 ft.	ND	NT	NT
#16D-20 ft.	ND	NT	NT
#16E-25-30 ft.	ND	NT	NT
#17A-5 ft.	ND	NT	NT
#17B-10 ft.	ND	NT	NT
#17C-15 ft.	ND	NT	NT
#17D-20 ft.	ND	NT	NT
#17E-25-30 ft.	ND	NT	NT
#A	>250 ppm	368,000	6,340
#B	80-100 ppm	457	13

ND = Below detectable levels
NT = Not tested

***Final Remedial Investigation Report for the Wainwright Property Operable Unit, Valley Park,
Missouri, Schreiber Grana & Yonley, 1994.***

Table 7 – 2nd Round, Final Verification Sample Log

Table 15 – Analytical Summary - Soil

TABLE 7
2ND ROUND
FINAL VERIFICATION SAMPLE LOG

SAMPLE ID. NO.	DEPTH	MATRIX	LOCATION	ANALYSIS	RESULTS (ppm)	
					TCE	PCE
WANG 1A	4	soil	Grid 1	*VOA	6.3	1400
WANG 1B**	4	soil	Grid 1	*VOA	3.1	1100
WANG 1C**	4	soil	Grid 1	*VOA	.9	540
WANG 2A	4	soil	Grid 2	*VOA	ND	5.3
WANG 2B**	4	soil	Grid 2	*VOA	ND	2.4
WANG 2C**	4	soil	Grid 2	*VOA	ND	2.4
WANG 6A	6	soil	Grid 6	*VOA	2.3	220
WANG 8A	6	soil	Grid 8	*VOA	5	450
WANG 14A	11	soil	Grid 14	*VOA	.3	12
WANG 15A	11	soil	Grid 15	*VOA	1.6	240
WANG 16A	11	soil	Grid 16	*VOA	88	830
WANG 21A	4	soil	Grid 21	*VOA	1.6	130
WANG 23A	4	soil	Grid 23	*VOA	3.4	2.2
WANG 40A	--	distilled water	--	*VOA	ND	ND
WANG 50A	11	soil	Grid 16	*VOA	40	230
WANG 60A	--	soil	Grid 19	*VOA	Matrix Spike	

Notes: ND = Non Detected

*VOA - Volatile Organics SW-846 8240

**Denotes horizontal boring underneath the building with sample collected at 4 feet (B sample) and 6 feet (C sample) into the south wall.

WANG 50A is a duplicate of WANG 16A

-- Denotes not applicable

TABLE 15

ANALYTICAL SUMMARY - SOIL
0.5' to 1'

ANALYTE	BH-BB-1	BH-DD-1	BH-EE-1	BH-GG-1	BH-II-1	BH-LL-1	BH-MM-1
Anthracene	NA	ND	NA	NA	NA	NA	0.068 J
Benzo(a)anthracene	NA	ND	NA	NA	NA	NA	0.28 J
Benzo(a)pyrene	NA	ND	NA	NA	NA	NA	0.072 J
Benzo(b)fluoranthene	NA	ND	NA	NA	NA	NA	0.32 J
Benzo(k)fluoranthene	NA	ND	NA	NA	NA	NA	0.18 J
Bis(2-Ethylhexyl) Phthalate	NA	0.78	NA	NA	NA	NA	ND
Chrysene	NA	ND	NA	NA	NA	NA	0.3 J
Cis-1,2-Dichloroethene	2.6 J	1.4 J	ND	ND	ND	0.002 J	ND
Ethyl benzene	ND	ND	ND	ND	36	ND	ND
Fluoranthene	NA	ND	NA	NA	NA	NA	0.76
Isopropyl benzene	ND	ND	ND	ND	10	ND	ND
p-Isopropyl toluene	ND	ND	ND	ND	22	ND	ND
Methylene chloride	2.4 BJ	1.7 BJ	2.5 BJ	4.7 BJ	4.8 J	0.004 BJ	0.023 J
Naphthalene	ND	ND	ND	ND	61	ND	ND
Phenanthrene	NA	ND	NA	NA	NA	NA	0.5
Pyrene	NA	0.16 J	NA	NA	NA	NA	0.73
Tetrachloroethene	6800	2400	16	1800	12	0.41	0.39
Toluene	2.2 J	ND	ND	ND	28	0.003 J	0.008 J
Trichloroethene	420	51	ND	110	ND	0.093	0.041
1,2,4-Trimethylbenzene	1.3 J	ND	ND	ND	410	ND	ND
1,3,5-Trimethylbenzene	1.8 J	ND	ND	ND	ND	ND	ND
Xylenes (m-, o-)	2.0 J	ND	ND	ND	360	ND	ND
Xylene (p)	ND	ND	ND	ND	220		ND

Notes: Units are mg/kg or ppm

NA = No Analysis Conducted

ND = Not Detected at Quantitation Limit

J = Detected Below Quantitation Limit, Estimated

B = Detected In Method Blank

TABLE 15 (CONT'D)

ANALYTICAL SUMMARY - SOIL
0.5' to 1'

ANALYTE	BH-NN-1	BH-OO-1	BH-PP-1
Anthracene	0.042 J	ND	ND
Benzo(a)anthracene	0.22	0.11 J	0.11 J
Benzo(a)pyrene	0.21	ND	ND
Benzo(b)fluoranthene	0.25	ND	ND
Benzo(k)fluoranthene	0.098 J	ND	ND
Bis(2-Ethylhexyl) Phthalate	0.036 J	ND	0.039 J
Chrysene	0.23	0.13 J	0.14 J
Cis-1,2-Dichloroethene	ND	ND	ND
Ethyl benzene	ND	ND	ND
Fluoranthene	0.5	0.21	0.27
Isopropyl benzene	ND	ND	ND
p-Isopropyl toluene	ND	ND	ND
Methylene chloride	0.023 J	0.025	0.023 J
Naphthalene	ND	0.0125	0.0125
Phenanthrene	0.25	0.15 J	0.17 J
Pyrene	0.39	0.26	0.27
Tetrachloroethene	0.066	0.059	0.012 J
Toluene	ND	ND	ND
Trichloroethene	0.019 J	0.14	ND
1,2,4-Trimethylbenzene	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND
Xylenes (m-, o-)	ND	ND	ND
Xylene (p)	ND	ND	ND

Notes: Units are mg/kg or ppm

ND = Not Detected at Quantitation Limit

J = Detected Below Quantitation Limit, Estimated

TABLE 15 (CONT'D)

ANALYTICAL SUMMARY - SOIL

5'

ANALYTE	MW-AA-1	BH-AA-1	BH-BB-2	BH-CC-1	BH-DD-2	BH-EE-2	BH-GG-2	BH-II-2
Acetone	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	NA	NA	NA	ND	ND	NA	NA	NA
Bis(2-Ethylhexyl) Phthalate	NA	NA	NA	ND	2.2	NA	NA	NA
2-Butanone	ND	ND	ND	ND	ND	.99 J	ND	ND
Carbon Disulfide	.004 J	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	.56 J	ND	ND	ND	ND	ND
Chrysene	NA	NA	NA	ND	ND	NA	NA	NA
Diethylphthalate	NA	NA	NA	ND	ND	NA	NA	NA
Cis-1,2-Dichloroethene	ND	ND	3	ND	ND	ND	ND	ND
Fluoranthene	NA	NA	NA	ND	ND	NA	NA	ND
Methylene chloride	ND	ND	.3 BJ	0.007	1.4 BJ	.54 BJ	5.6 BJ	ND
Phenanthrene	NA	NA	NA	ND	ND	NA	NA	NA
Pyrene	NA	NA	NA	ND	.14 J	NA	NA	NA
Tetrachloroethene	.004 J	.73 E	1300 E	0.039	2300 E	2.3	20	0.01
Methyl Tertiary Butyl Ether (MTBE)	NA	.002 J	ND	ND	ND	ND	ND	0.013
Toluene	ND	ND	0.75	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	NA	ND	ND	ND	ND	.12 J	ND	ND
1,2,4-Trichlorobenzene	NA	ND	ND	ND	ND	.13 J	ND	ND
1,1,1-Trichloroethane	ND	ND	0.26	ND	ND	ND	ND	ND
Trichloroethene	ND	0.021	280 E	0.012	69	ND	9	ND

Notes: Units are mg/kg or ppm

NA = Not Analyzed for

ND = Not Detected at Quantitation Limit

J = Detected Below Quantitation Limit, Estimated

E = Concentration Exceeds Calibration Curve

B = Detected in Method Blank

TABLE 15 (CONT'D)

ANALYTICAL SUMMARY - SOIL
5'

ANALYTE	BH-JJ- 1	BH-KK- 1	BH-LL- LL-2	BH-LL- 2A	BH-MM- MM-2	BH-NN- 2	BH-OO- 2	BH-PP- PP-2
Acetone	ND	ND	0.016	ND	ND	ND	ND	ND
Benzo(a)anthracene	NA	NA	NA	NA	ND	ND	ND	.039 J
Bis(2-Ethylhexyl) Phthalate	NA	NA	NA	NA	ND	ND	ND	.041 J
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	0.028	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	NA	NA	NA	NA	ND	ND	ND	.039 J
Diethylphthalate	NA	NA	NA	NA	ND	ND	.072 J	ND
Cis-1,2-Dichloroethene	ND	ND	0.01	.003 J	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	NA	.052 J	ND	ND	.091 J
Methylene chloride	ND	0.007	ND	ND	.015 J	0.024	.024 J	.025 J
Phenanthrene	NA	NA	NA	NA	ND	ND	ND	.1 J
Pyrene	NA	NA	NA	NA	.034 J	ND	ND	.093 J
Tetrachloroethene	ND	0.054	0.22	.65 E	.011 J	.013 J	.007 J	.009 J
Tertiary Butyl Methyl Ether (MTBE)	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	0.006	ND	ND	ND	ND
1,2,3-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	.002 J	ND	ND	ND	ND
Trichloroethene	ND	.006 J	0.097	0.034	ND	.009 J	.009 J	ND

Notes: Units are mg/kg or ppm

NA = Not Analyzed for

ND = Not Detected at Quantitation Limit

J = Detected Below Quantitation Limit, Estimated

E = Concentration Exceeds Calibration Curve

TABLE 15 (CONT'D)

ANALYTICAL SUMMARY - SOIL
10'

ANALYTE	BH-BB-3	BH-DD-3	BH-DD-3A	BH-EE-3	BH-FF-1	BH-GG-3
Bis(2-Ethylhexyl)	NA	.11 J	.13 J	NA	ND	NA
Phthalate	ND	ND	ND	ND	ND	ND
Chloroform	0.12	ND	ND	ND	ND	ND
Cis-1,2-Dichloroethene	.012 BJ	ND	15 BJ	.43 BJ	.41 J	1.9 BJ
Methylene chloride	15 E	780 E	2000 E	8.9	1.6	24
Tetrachloroethene	.009 J	ND	ND	ND	ND	ND
Toluene	1.9 E	25	56	ND	.41 J	8.5
Trichloroethene	ND	ND	ND	ND	.17 J	NA
Trichlorofluoromethane	ND	ND	ND	ND	ND	NA
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	NA
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	NA
Xylenes (m-, p-)	ND	ND	ND	ND	ND	NA
Xylene (o)						

Notes: Units are mg/kg or ppm

NA = Not analyzed for

ND = Not detected

J = Detected below RQL, Estimated

E = Concentration Exceeds Calibration Curve

B = Detected in Method Blank

TABLE 15 (CONT'D)

ANALYTICAL SUMMARY - SOIL
10'

ANALYTE	BH-II-3	BH-LL-3	BH-MM-3	BH-NN-3	BH-OO-3	BH-PP-3
Bis(2-Ethylhexyl)	NA	NA	ND	ND	ND	ND
Phthalate	ND	ND	ND	0.007 J	ND	ND
Chloroform	.36 E	.012 J	.009 J	.012 J	ND	ND
Cis-1,2-Dichloroethene	.005 J	.013 J	.014 J	.012 J	.017 J	ND
Methylene chloride	1.7 E	0.34	0.66	1.8	.015 J	0.13
Tetrachloroethene	ND	ND	ND	ND	ND	ND
Toluene	0.15	0.13	0.24	6.1	0.053	0.13
Trichloroethene	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	.002 J	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	.004 J	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	.002 J	ND	ND	ND	ND	ND
Xylenes (m-, p-)	.002 J	ND	ND	ND	ND	ND
Xylene (o)						

Notes: Units are mg/kg or ppm

NA = Not analyzed for

ND = Not detected

J = Detected below RQL, Estimated

E = Concentration Exceeds Calibration Curve

TABLE 15 (CONT'D)
ANALYTICAL SUMMARY - SOIL
15'

ANALYTE	MW-AA-2	BH-AA-2	BH-BB-4	BH-CC-2	BH-DD-4	BH-EE-4	BH-FF-2	BH-GG-4	BH-HH-1
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl) Phthalate	NA	NA	NA	ND	.072 J	NA	.13 J	NA	NA
2-butanone	ND	ND	ND	ND	ND	.8 J	ND	ND	ND
Chlorobenzene	ND	ND	0.009	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	.004 J	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	.002 J	0.18	ND	ND	ND	ND	ND	.16 J
Trans-1,2-Dichloroethene	ND	ND	.002 J	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	.006 J	10 BJ	.79 B	2.0 BJ	2.1 BJ	.6 BJ
Naphthalene	NA	ND	.001 J	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.17	0.18	12 E	0.16	680 E	1.2	22	60	5.7
Toluene	ND	ND	.0018	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	.003 J	ND	ND	ND	ND	ND	ND
Trichloroethene	0.006	0.013	6.3 E	0.064	16	ND	3.5 J	9.5	.6 J
Trichlorofluoromethane	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	NA	ND	.002 J	ND	ND	ND	ND	ND	ND
Xylene (m-, p-)	ND	ND	.005 J	ND	ND	ND	ND	ND	ND
Xylene (o)	ND	ND	.002 J	ND	ND	ND	ND	ND	ND

Notes: Units are mg/kg or ppm
NA = No Analysis Conducted
ND = Not Detected
J = Detected below RQL, Estimated
E = Concentration Exceeds Calibration Curve
B = Detected in Method Blank

TABLE 15 (CONT'D)

ANALYTICAL SUMMARY - SOIL
15'

ANALYTE	BH-HH-2	BH-II-4	BH-JJ-2	BH-KK-2	BH-LL-4	BH-MM-4	BH-NN-4	BH-OO-4	BH-PP-4
Acetone	ND	ND	21	ND	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl) Phthalate	NA	NA	NA	NA	NA	ND	1.1	ND	ND
2-butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	.005 J	ND
cis-1,2-Dichloroethene	ND	.38 E	ND	ND	0.027	.022 J	ND	.018 J	.006 J
Trans-1,2-Dichloroethene	ND	.002 J	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	.004 J	3.3 BJ	ND	ND	.011 J	.018 J	.018 J	.006 J
Naphthalene	ND	.001 J	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	ND	ND	.006 J	ND	ND	ND	ND	ND	ND
Tetrachloroethene	150	6.7 E	ND	0.014	0.45	1.6	0.89	0.66	0.92
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	3.9 J	.53 E	ND	0.01	0.12	0.51	0.95	3.5	1.2
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	.002 J	ND	ND	ND	ND	ND	ND	ND
Xylene (m-, p-)	ND	.002 J	ND	ND	ND	ND	ND	ND	ND
Xylene (o)	ND	.002 J	ND	ND	ND	ND	ND	ND	ND

Notes: Units are mg/kg or ppm

NA = No Analysis Conducted

ND = Not Detected

J = Detected below RQL, Estimated

E = Concentration Exceeds Calibration Curve

TABLE 15 (CONT'D)

ANALYTICAL SUMMARY - SOIL
20' TO 23.5'

ANALYTE	MW-AA-3	MW-AA-3A	BH-LL-5	BH-MM-5	BH-NN-5	BH-OO-5	BH-PP-5
Acetone	0.011	ND	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl) Phthalate	ND	NA	NA	NA	.054 J	.04 J	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND
Cis-1,2-Dichloroethene	.001 J	.002 J	0.031	0.045	ND	ND	ND
Methylene chloride	ND	.002 BJ	ND	.02 J	.019 J	0.055	ND
Tetrachloroethene	0.71	.76 E	0.29	2.5	1.3	0.034	1.3
Trichloroethene	0.016	0.017	0.42	0.95	1.1	0.049	1.2

ANALYTICAL SUMMARY - SOIL
25'

ANALYTE	BH-AA-3	BH-BB-5	BH-CC-3	BH-DD-5	BH-EE-5	BH-EE-5A
Bis(2-Ethylhexyl) Phthalate	NA	NA	ND	.13 J	NA	ND
2-Butanone	ND	.93 J	ND	ND	ND	.79 J
n-Butylbenzene	ND	ND	ND	ND	ND	ND
Cis-1,2-Dichloroethene	ND	.15 J	ND	ND	ND	ND
Fluoranthene	ND	NA	ND	ND	NA	ND
Methylene chloride	ND	.18 BJ	.005 J	5.6 BJ	1.3 B	.49 BJ
2-Methylnaphthalene	NA	NA	ND	ND	NA	ND
Phenanthrene	NA	NA	ND	ND	NA	ND
Pyrene	.002 J	3.1	0.011	700 E	1	ND
Tetrachloroethene	ND	1.6	.002 J	14	ND	ND
Trichloroethene	ND	.14 J	ND	ND	.14 J	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND

Notes: Units are mg/kg or ppm
 NA = No Analysis Conducted
 ND = Not Detected
 J = Detected below RQL, Estimated
 E = Concentration Exceeds Calibration Curve
 B = Detected in Method Blank

TABLE 15 (CONT'D)
ANALYTICAL SUMMARY - SOIL
25'

ANALYTE	BH-FF- 3	BH-GG- 5	BH- HH-3	BH-II- 5	BH-JJ- 3	BH- KK-3
Bis(2-Ethylhexyl) Phthalate	.1 J	NA	NA	NA	NA	NA
2-Butanone	ND	ND	ND	ND	ND	ND
n-Butylbenzene	1.9 J	ND	ND	.002 J	ND	ND
Cis-1,2-Dichloroethene	ND	ND	ND	0.008	ND	.001 J
Fluoranthene	.039 J	NA	NA	NA	NA	NA
Methylene chloride	4.6 BJ	1.8 BJ	ND	.005 J	.007 J	ND
2-Methylnaphthalene	.1 J	NA	NA	NA	NA	NA
Phenanthrene	.098 J	NA	NA	NA	NA	NA
Pyrene	.077 J	NA	NA	NA	NA	NA
Tetrachloroethene	360 E	32	ND	4.2 E	ND	0.054
Trichloroethene	110	ND	ND	0.034	ND	0.036
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	1.5 J	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	1.6 J	ND	ND	ND	ND	ND

Units are mg/kg or ppm

NA = Analysis Not Conducted

ND = Not Detected

J = Detected below RQL, Estimated

E = Concentration Exceeds Calibration Curve

B = Detected in Method Blank

TABLE 15 (CONT'D)
ANALYTICAL SUMMARY - SOIL
35'

ANALYTE	BH-AA-4	BH-KK-4
Acetone	ND	0.026
Cis-1,2-Dichloroethene	ND	.002 J
Methylene chloride	ND	ND
Tetrachloroethene	0.015	0.025
Trichloroethene	.005 J	0.012

Notes: Units are mg/kg or ppm

ND = Not Detected

J = Detected below RQL, Estimated

**Letter from Laurie A. Bobbitt, Missouri Department of Natural Resources (MDNR), to
Robert J. Schreiber, Jr., P.E., Schreiber, Grana & Yonley, Inc., MDNR 1993.**

MDNR, 10/18/93, Shallow Soil Sampling (0'-0.25')

Wainwright

A25

11/22/93

MDNR 10/18/93 shallow soil sampling (0' - 0.25')
(ppm)

<u>ID</u>	<u>PCE</u>	<u>TCE</u>
1	0.22	ND
2	0.28	ND
3	10	0.071
4	11	0.056
4 (duplicate)	9.8	0.08

SGY 4,8/92 shallow soil sampling (~~0.5'~~ 0.5' - 1')
(ppm)

<u>ID</u>	<u>PCE</u>	<u>TCE</u>
BB	6,800	420
DD	2,400	51
EE	16	ND
GG	1800	110
HH	12	ND
LL	NA	0.093
MM	0.39	ND
NN	0.066	0.019
OO	0.059	0.14
PP	0.012	ND

off-site

42-381 50 SHEETS EYE-GLASS SQUARE
 42-382 100 SHEETS EYE-GLASS SQUARE
 42-383 200 SHEETS EYE-GLASS SQUARE
 42-384 400 SHEETS EYE-GLASS SQUARE
 42-385 800 SHEETS EYE-GLASS SQUARE
 42-386 1600 SHEETS EYE-GLASS SQUARE
 42-387 3200 SHEETS EYE-GLASS SQUARE
 42-388 6400 SHEETS EYE-GLASS SQUARE
 42-389 12800 SHEETS EYE-GLASS SQUARE
 42-390 25600 SHEETS EYE-GLASS SQUARE
 42-391 51200 SHEETS EYE-GLASS SQUARE
 42-392 102400 SHEETS EYE-GLASS SQUARE
 42-393 204800 SHEETS EYE-GLASS SQUARE
 42-394 409600 SHEETS EYE-GLASS SQUARE
 42-395 819200 SHEETS EYE-GLASS SQUARE
 42-396 1638400 SHEETS EYE-GLASS SQUARE
 42-397 3276800 SHEETS EYE-GLASS SQUARE
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 42-452 118059162071741130342400 SHEETS EYE-GLASS SQUARE
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**Letter Report, Off-Site Shallow Soil Sampling Analytical Results, Schreiber Grana &
Yonley, 1994**

Table 1 – Shallow Soil Sampling Analytical Results

TABLE 1
Shallow Soil Sampling Analytical Results
Wainwright Operable Unit
Valley Park, Missouri

ID	MIRAN	PCE	TCE	MeCL	Toluene	1,1,1 TCA	m-p- Xylene	1,1 DCE
A	0.0	0.023	ND	0.01	0.0053 J	ND	ND	ND
B	0.0	0.41	0.0031 J	0.013	0.0038 J	0.051	ND	ND
C	0.1	0.12	0.0093	0.02	0.0079	ND	ND	ND
D	0.6	0.049	0.0077	0.013	0.0049 J	ND	ND	ND
E	NS	0.033	ND	0.01	0.0067	ND	0.0023 J	ND
F	NS	0.21	0.0026	0.015	ND	0.049	ND	0.0039 J
G	NS	0.039	0.0021 J	0.026	0.0091	ND	0.002 J	ND
H	NS	0.035	0.0047	0.025	0.0047	ND	ND	ND
I	NS	0.025	0.0015 J	0.015	0.0018 J	ND	ND	ND
J	NS	0.041	0.023	0.024	0.0079	ND	0.0019 J	ND
K	NS	0.063	0.021	0.018	ND	ND	ND	ND
Dup. of K	NS	0.046	0.019	0.015	0.0017 J	0.27	ND	0.014

Notes: All results in parts per million
 ND denotes non-detect
 NS denotes not sampled
 J denotes estimated value below method quantitation limit

Results of Soil Sampling and Analysis, AMEC, 2011.

Table 2 – Results of Soil Sampling, Summary of Volatile Organic Compounds and Total Organic Carbon, All Soil Depths

Results of August 29, 2012 Groundwater and Soil Sampling, AMEC, 2012.

Table 2 – Sample Results – Detections in Surface Soil Samples

Table 3 – Sample Results – Detections in Boreholes Soil Samples

Table 2
Wainwright Industries- Valley Park, Missouri
Sample Results - Detections in Surface Soil Samples
Sample date 8/29/2012

Parameter	Method	Matrix	Units	OSS-1-8	OSS-2-8	OSS-3-6
Percent Moisture	ASTM D2974	Solid	%	15.2	16.8	14.4
Arsenic	EPA 6010	Solid	mg/kg	3.1	2.4	3.6
Barium	EPA 6010	Solid	mg/kg	135	66.1	139
Chromium	EPA 6010	Solid	mg/kg	8.0	9.8	9.2
Lead	EPA 6010	Solid	mg/kg	61.2	24.2	44.6
Acenaphthene	EPA 8270 by SIM	Solid	ug/kg	10.4	82.0	NA*
Acenaphthylene	EPA 8270 by SIM	Solid	ug/kg	24.4	7.5	NA*
Anthracene	EPA 8270 by SIM	Solid	ug/kg	84.7	248	33.4
Benzo(a)anthracene	EPA 8270 by SIM	Solid	ug/kg	303	772	299
Benzo(a)pyrene	EPA 8270 by SIM	Solid	ug/kg	248	756	367
Benzo(b)fluoranthene	EPA 8270 by SIM	Solid	ug/kg	558	1180	584
Benzo(g,h,i)perylene	EPA 8270 by SIM	Solid	ug/kg	159	548	338
Benzo(k)fluoranthene	EPA 8270 by SIM	Solid	ug/kg	201	348	195
Chrysene	EPA 8270 by SIM	Solid	ug/kg	653	1050	486
Dibenz(a,h)anthracene	EPA 8270 by SIM	Solid	ug/kg	41.6	129	68.2
Fluoranthene	EPA 8270 by SIM	Solid	ug/kg	386	2070	708
Fluorene	EPA 8270 by SIM	Solid	ug/kg	10.5	70.1	NA*
Indeno(1,2,3-cd)pyrene	EPA 8270 by SIM	Solid	ug/kg	145	483	279
Naphthalene	EPA 8270 by SIM	Solid	ug/kg	6.9	9.0	NA*
Phenanthrene	EPA 8270 by SIM	Solid	ug/kg	176	1060	215
Pyrene	EPA 8270 by SIM	Solid	ug/kg	424	1640	608

NA* = sample concentration was less than the reporting limit, see lab sheet for detection limits

sample identification - last number is depth in inches

Table 3
Wainwright Industries- Valley Park, Missouri
Sample Results - Detections in Boreholes Soil Samples
Sample date 8/29/2012

Parameter	Method	Matrix	Units	Interior building samples			outside building samples		
				SB-201-3.5	SB-201-6.5	SB-201-10.5	SB-202-2	SB-202-5	SB-202-9
Percent Moisture	ASTM D2974	Solid	%	18.5	19.0	20.4	18.8	19.3	19.7
Arsenic	EPA 6010	Solid	mg/kg	2.3	4.3	8.6	4.4	5.0	5.0
Barium	EPA 6010	Solid	mg/kg	158	80.8	184	147	152	382
Cadmium	EPA 6010	Solid	mg/kg	NA*	NA*	NA*	NA*	0.61	0.50
Chromium	EPA 6010	Solid	mg/kg	8.6	13.3	17.9	16.6	17.1	17.4
Lead	EPA 6010	Solid	mg/kg	19.2	17.4	35.3	54.0	83.1	51.2
1,2-Dichloroethene (Total)	EPA 8260	Solid	ug/kg	7010	4450	6520	50.2	110	283
2-Butanone (MEK)	EPA 8260	Solid	ug/kg	NA*	NA*	NA*	22.2	NA*	NA*
Acetone	EPA 8260	Solid	ug/kg	NA*	NA*	NA*	287	232	NA*
Tetrachloroethene	EPA 8260	Solid	ug/kg	NA*	616	1710	11800	19300	15100
Trichloroethene	EPA 8260	Solid	ug/kg	NA*	232	852	68.2	183	182
Vinyl chloride	EPA 8260	Solid	ug/kg	NA*	31.1	40.6	NA*	NA*	NA*
cis-1,2-Dichloroethene	EPA 8260	Solid	ug/kg	7010	4450	6520	50.2	110	283
trans-1,2-Dichloroethene	EPA 8260	Solid	ug/kg	NA*	15.3	17.6	NA*	NA*	NA*
Acenaphthylene	EPA 8270 by SIM	Solid	ug/kg	NA*	NA*	NA*	16.5	29.0	NA*
Anthracene	EPA 8270 by SIM	Solid	ug/kg	NA*	NA*	NA*	26.1	42.6	NA*
Benzo(a)anthracene	EPA 8270 by SIM	Solid	ug/kg	6.7	NA*	NA*	147	154	NA*
Benzo(a)pyrene	EPA 8270 by SIM	Solid	ug/kg	7.4	NA*	NA*	120	147	26.8
Benzo(b)fluoranthene	EPA 8270 by SIM	Solid	ug/kg	10.7	NA*	NA*	268	348	52.3
Benzo(g,h,i)perylene	EPA 8270 by SIM	Solid	ug/kg	5.3	NA*	NA*	135	201	41.0
Benzo(k)fluoranthene	EPA 8270 by SIM	Solid	ug/kg	4.8	NA*	NA*	88.2	141	NA*
Chrysene	EPA 8270 by SIM	Solid	ug/kg	10.8	NA*	NA*	251	299	39.1
Dibenz(a,h)anthracene	EPA 8270 by SIM	Solid	ug/kg	NA*	NA*	NA*	30.6	44.0	NA*
Fluoranthene	EPA 8270 by SIM	Solid	ug/kg	22.8	NA*	4.2	298	453	33.3
Fluorene	EPA 8270 by SIM	Solid	ug/kg	NA*	NA*	NA*	4.5	5.0	NA*
Indeno(1,2,3-cd)pyrene	EPA 8270 by SIM	Solid	ug/kg	4.9	NA*	NA*	111	162	35.5
Naphthalene	EPA 8270 by SIM	Solid	ug/kg	NA*	NA*	NA*	13.1	31.6	NA*
Phenanthrene	EPA 8270 by SIM	Solid	ug/kg	23.8	NA*	NA*	162	303	23.4
Pyrene	EPA 8270 by SIM	Solid	ug/kg	19.6	NA*	4.4	305	422	41.0

NA* = sample concentration was less than the reporting limit, see lab sheet for detection limits
sample identification - last number is depth in feet

APPENDIX 3

REMEDIAL FUNDS ESCROW AGREEMENT

THIS REMEDIAL FUNDS ESCROW AGREEMENT (the "**Agreement**") is made and entered into to be effective the 30th day of December, 2013, by and among Environmental Operations, Inc., a Missouri corporation ("EOI"), and William N. Wainwright, Arthur D. Wainwright and C. Royal Robbins ("Wainwright") and together with EOI, the "**Parties**" and individually, a "**Party**") and Enterprise Bank & Trust, a Missouri corporation, as escrow agent ("**Escrow Agent**").

WITNESSETH:

A. Pursuant to that Environmental Liabilities Transfer Agreement dated as of the 26th day of December, 2013, by and between EOI and Wainwright, (the "**ELTA**" of which a copy is attached hereto as **Exhibit A**), the Parties have agreed that Wainwright shall assign and transfer unto EOI environmental liabilities and obligations relating to the Property.

B. Pursuant to the ELTA, EOI has agreed to pay for and perform the Assumed Obligations related to the Property (collectively referred to herein as the "**Remedial Actions**").

C. Pursuant to Section 2 of the ELTA, EOI has agreed to deposit \$ _____ ("**Remedial Funds**") with Escrow Agent to be held in a separate escrow pursuant to the terms of the ELTA and this Agreement.

F. EOI, Wainwright and Escrow Agent desire to enter into this Agreement for the purpose of holding and disbursing the Remedial Funds in accordance with the terms of the ELTA and this Agreement.

G. EOI and Wainwright desire that the Escrow Agent serve as escrow agent of the Remedial Funds and the Escrow Agent agrees to serve as the escrow agent hereunder.

NOW, THEREFORE, for and in consideration of the foregoing premises (which shall be considered part of this Agreement), the mutual covenants and agreements contained herein and in the ELTA, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, EOI, Wainwright, and Escrow Agent do hereby covenant and agree as follows:

1. **Definitions.** Unless otherwise specifically provided herein, the defined terms set forth in the ELTA shall also apply to this Escrow Agreement.

2. **Remedial Funds.** Following Closing of the ELTA, all such Remedial Funds shall be deposited with the Escrow Agent and the Escrow Agent shall accept the Remedial Funds from EOI for the purposes set forth herein. Such deposit shall be in the form of a wire transfer of immediately available funds.

3. **Purpose of and Use of Remedial Funds.** The purpose of the Remedial Funds is to pay for and complete Assumed Obligations as provided for in the ELTA. Specifically, the Remedial Funds

may be used, deployed and disbursed for the following: Active Remediation, Cleanup Costs, Licenses and Permits and WOU Consent Decree, all as defined in the ELTA.

The foregoing itemization of eligible uses of Remedial Funds is in no way to be deemed, construed or interpreted to decrease, enlarge, expand, increase, supplement, amend or modify EOI's obligations under the ELTA or regulatory agencies and nothing set forth in the foregoing paragraph shall be deemed or construed to impose upon EOI an obligation to undertake environmental obligations under the supervision of any specific agency or within any specific remedial program unless required by applicable law and/or the ELTA. Rather, the foregoing itemization merely confirms that such costs and expenses, if prudently incurred by EOI in the course of Remedial Actions, are eligible for disbursement from the Remedial Funds.

Doubts as to whether or not Remedial Funds may be used for a specific use or purpose are to be resolved in favor of eligibility and, subject to the ELTA and applicable law and provided that EOI is not in material default beyond any applicable cure period under the ELTA or this Escrow Agreement, EOI shall retain exclusive control over the manner and method of undertaking Assumed Obligations.

4. **Administration of Escrow Remedial Funds.** The Escrow Agent, in consideration of the fees set forth on the Fees of Escrow Agent attached hereto as **Exhibit B**, hereby agrees to hold, administer and disburse the Remedial Funds pursuant to this Agreement and in accordance with this Agreement. Total fees charged by the Escrow Agent hereunder shall be paid from the Remedial Funds or, if insufficient, by EOI. The fee agreed upon for the services rendered hereunder is intended as full compensation for the Escrow Agent's services as contemplated by this Agreement; provided, however, the Escrow Agent renders any service agreed to be performed by EOI and not contemplated in this Agreement, the Escrow Agent shall be compensated for such extraordinary services and reimbursed for all costs and expenses, occasioned by any such event. The Escrow Agent shall have, and is hereby granted, a prior lien upon the Escrow Remedial Funds with respect to any earned unpaid fees, non-reimbursed expenses and unsatisfied indemnification rights, superior to the interests of any other persons or entities and is hereby granted the right to set off and deduct any earned unpaid fees, non-reimbursed expenses and unsatisfied indemnification rights from the Remedial Funds.

Escrow Agent agrees the Remedial Funds shall be invested as hereinafter provided: (a) obligations issued or guaranteed by the United States of America or any agency or instrumentality thereof (provided that the full faith and credit of the United States is pledged in support thereof); (b) obligations (including certificates of deposit and banker's acceptances) of any domestic commercial bank having capital and surplus in excess of \$500,000,000; (c) commercial paper rated at least A-1 or P-1 or, if not rated, issued by companies having outstanding debt rated at least AA or Aa, or (d) any money market fund invested exclusively in some or all of the above (collectively, the "Eligible Investments"). If otherwise qualified, obligations of the Escrow Agent or any of its affiliates shall qualify as Eligible Investments. The Escrow Agent shall have no liability for any loss resulting from investments made in accordance with the provisions of this Agreement, including, without limitation, any market loss on any investment liquidated prior to maturity in order to make a payment required hereunder. Earnings on the Remedial Funds shall be retained in the Fund prior to the termination of the Escrow. Earnings on the Remedial Funds shall be reported

on EOI's U.S. taxpayer identification number. The Parties acknowledge and agree that the Escrow Agent is not providing investment recommendations or advice. The Escrow Agent shall keep proper books of records and accounts, separate from all other records and accounts, in which complete and correct entries shall be made of all transactions relating to the Remedial Funds in accordance with reasonably prudent accounting principles.

To the extent that the Escrow Agent becomes liable for the payment of any taxes with respect to income derived from the investment of the Remedial Funds, the Escrow Agent shall satisfy such liability to the extent possible from the Remedial Funds. EOI hereby agrees to indemnify, defend, and hold the Escrow Agent harmless from and against any tax, late payment, interest, penalty, or other cost or expense that may be assessed against the Escrow Agent on or with respect to the Remedial Funds. The indemnification provided by this Section 4 is in addition to the indemnification provided in Section 6 and shall survive the resignation or removal of the Escrow Agent and the termination of this Agreement.

5. Disbursements by Escrow Agent.

(a) For the avoidance of doubt, Wainwright, Escrow Agent, and EOI acknowledge that EOI shall have no legal or equitable rights to receive all or any portion of the Remedial Funds until the disbursement approval procedures contained in this Agreement have been fulfilled. Disbursements of the Remedial Funds shall be pursuant to written requisitions ("**Requisition**") submitted by EOI in accordance with the **Requisition Form** attached hereto as **Exhibit C**. Each Requisition Form shall be signed by a principal of EOI and shall include: (i) the specific total amount being requisitioned out of the Remedial Funds; (ii) a detailed itemization of the costs and expenses covered by the Requisition, including the names of the governmental agencies, contractors, subcontractors, or other vendors or payees for whose fees or charges payment or reimbursement is being requisitioned; (iii) copies of complete and accurate receipts and invoices evidencing justification for the Requisition; and (iv) EOI's sworn certification that the Requisition is for proper expenditures authorized by the ELTA and this Agreement.

(b) Upon incurring eligible costs (as described in Section 3 above) but not more often than once per calendar month, EOI shall submit the original of each Requisition Form to the Escrow Agent with a copy to the Wainwright. The Escrow Agent shall have no obligation to investigate or inquire into the accuracy of any statements contained in the Requisition Form, except to confirm to Escrow Agent's reasonable satisfaction that the procedures herein have been followed, and the Requisition Form itself and the signature of EOI on the Requisition Form appears to be by an authorized signer. All disbursements shall be made within fourteen (14) business days of the expiration of the Objection Period identified in Subsection 5(c) below. In any event, the Escrow Agent shall disburse that portion of a requisition not timely objected to by Wainwright. If wire transfers of Remedial Funds are required for any disbursement, the Escrow Agent's regular charge or fee for such additional service shall be paid out of the Remedial Funds. No consent of Wainwright, any governmental agency, department, or official or any other person or entity is required for any disbursement and Escrow Agent shall not withhold, condition, or delay any proper disbursement request based upon any action or inaction of third parties; provided, however, that the Escrow Agent may decline to make a disbursement hereunder if doing so would result in the violation of an order of a judicial, regulatory, or similar entity or otherwise subject the Escrow

Agent to potential liability. If the Escrow Agent receives such an order, it shall immediately notify EOI and Wainwright in writing.

(c) In the event, and only in the event, Wainwright has reason to believe the items which are the subject of a pending requisition are: (i) ineligible for reimbursement from Remedial Funds; (ii) relate to work, services, materials, equipment, supplies, and/or labor performed in a materially and substantially defective manner; and/or (iii) are not otherwise in material compliance with applicable law or the ELTA, then Wainwright may make written objection to the Requisition Form with a copy of the written objection to be provided to EOI and Escrow Agent within ten (10) business days of Wainwright's receipt of the Requisition Form ("**Objection Period**"). Such objection shall set forth in specific detail the nature, scope and extent of Wainwright's objection and shall include reasonable back-up documentation supporting Wainwright's objection. Upon receipt of a timely objection by Wainwright, Escrow Agent shall refrain from disbursing only for the specific items objected to. Any Wainwright objections to all or any part of a requisition shall be specific and targeted to discrete items for which EOI seeks disbursement. Wainwright and EOI shall attempt to negotiate in good faith a mutually satisfactory resolution of the dispute and, if successful, report such resolution by joint written notice to the Escrow Agent, who shall respond accordingly. In the event Wainwright and EOI fail to so resolve such dispute within thirty (30) calendar days, then either party shall so notify Escrow Agent in writing of the failure to resolve such dispute and Escrow Agent shall refrain from disbursing the disputed amount to EPO and the dispute shall be referred for mandatory binding arbitration pursuant to the ELTA. The Parties agree to pursue any redress or recourse in connection with any such dispute without making the Escrow Agent a party to the same.

(d) Notwithstanding the foregoing, upon certification by EOI that Active Remediation, as that term is defined in the ELTA, has been completed, EOI may submit a Notice of Completion of Active Remediation, to Escrow Agent and Wainwright requesting disbursement for all Remedial Funds remaining in this Remedial Funds Escrow except for \$240,000, which shall be retained for monitoring.

Escrow Agent shall disburse such Remedial Funds on the thirtieth (30th) calendar day following EOI's delivery to the Escrow Agent and Wainwright of the Notice of Completion of Active Remediation unless Escrow Agent receives a Notice of Objection, as defined below, from Wainwright asserting Active Remediation is not complete. In the event Wainwright so objects to the disbursement request, then the Escrow Agent shall refrain from disbursing the Remedial Funds and the Parties agree to follow the dispute resolution procedures in the ELTA.

6. **Escrow Agent.** Notwithstanding any provision to the contrary, Escrow Agent is obligated only to perform the duties specifically set forth in this Agreement, which shall be deemed purely ministerial in nature. Under no circumstance will Escrow Agent be deemed to be a fiduciary to any Party or any other person under this Agreement. Escrow Agent will not be responsible or liable for the failure of any Party to perform in accordance with this Agreement. In the absence of bad faith on its part, Escrow Agent may conclusively rely on a notice of instruction that is furnished to Escrow Agent that conforms to the requirements of this Agreement. In performing any of its duties hereunder, Escrow Agent shall not incur any liability to anyone for any damages, losses or expenses except for damages, losses or expenses finally adjudicated to have been primarily caused by the gross negligence or willful misconduct of the Escrow Agent, and it shall accordingly not

incur any such liability with respect to any action taken or omitted in reliance upon any instrument, including any written notice or instruction provided for in this Agreement, not only as to its due execution and the validity and effectiveness of its provisions, contained therein, but which the Escrow Agent shall in good faith believe to be genuine, to have been signed or presented by a proper person or persons and to conform with the provisions of this Agreement. EOI hereby agrees to indemnify, defend and hold the Escrow Agent harmless against any and all losses, liabilities, damages, claims, costs, expenses and counsel fees and disbursements which may be imposed upon Escrow Agent or incurred by Escrow Agent hereunder, except those finally adjudicated to have been primarily caused by the gross negligence or willful misconduct of Escrow Agent in the performance of its duties, including any litigation arising from this Agreement or involving the subject matter hereof. The indemnification obligations of EOI under this Section 6 shall survive the resignation or removal of the Escrow Agent or the termination of this Agreement. The Escrow Agent shall neither be responsible for, nor chargeable with, knowledge of the terms and conditions of any other agreement, instrument or document between the other parties hereto, including, without limitation, the ELTA, unless specifically set forth herein. This Agreement sets forth all matters pertinent to the Escrow Agent's duties contemplated hereunder, and no additional obligations of the Escrow Agent shall be inferred from the terms of this Agreement or any other agreement. The Escrow Agent shall be entitled to rely on and shall not be liable for any action taken or omitted to be taken by the Escrow Agent in accordance with the advice of counsel or other professionals retained or consulted by the Escrow Agent. The Escrow Agent shall be reimbursed as set forth herein for any and all compensation (fees, expenses and other costs) paid and/or reimbursed to such counsel and/or professionals. In the event any party disputes a proposed disbursement by Escrow Agent and Escrow Agent is unable to resolve the dispute, Escrow Agent may tender the Remedial Funds into a court of competent jurisdiction, which shall discharge Escrow Agent of all further duties and liabilities hereunder or under this Agreement. Except as explicitly provided in this Agreement, no provision of this Agreement shall require the Escrow Agent to risk or advance its own Remedial Funds or otherwise incur any financial liability or potential financial liability in the performance of its duties or the exercise of its rights under this Agreement. IN NO EVENT SHALL THE ESCROW AGENT BE LIABLE, DIRECTLY OR INDIRECTLY, FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL LOSSES OR DAMAGES OF ANY KIND WHATSOEVER (INCLUDING, WITHOUT LIMITATION, LOST PROFITS), EVEN IF THE ESCROW AGENT HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH LOSSES OR DAMAGES AND REGARDLESS OF THE FORM OF ACTION.

7. **Default by EOI.** Section 8 of the ELTA contains terms and conditions for what Wainwright alleges to be any Material Breach by EOI that allows Wainwright to approve invoices submitted by contractors of another interested party that replaces EOI, and such terms and conditions of Section 8 of the ELTA are incorporated herein in full by this reference. Pursuant to the terms and conditions of Section 8 of the ELTA, and contingent upon Wainwright being the prevailing party under said terms and conditions, Wainwright may notify the Escrow Agent in writing of the New Donor replacing EOI, if any (the "New Donor"), and the New Donor's selected contractors.

8. **Notices.** Any notices pursuant to this Agreement shall be given in writing by (a) personal delivery, or (b) reputable overnight delivery service with proof of delivery, or (c) United States Mail, postage prepaid, registered or certified mail, return receipt requested, or (d) legible facsimile

transmission sent to the intended addressee, verification received, in each case addressed as follows:

If to Wainwright:

Nelson Wainwright
39 Chesterfield Lakes Road
Chesterfield, Missouri 63005
Email: wnw2@charter.net

If to EOI:

Attn: Eric Page
Environmental Operations, Inc.
1530 South Second Street
Saint Louis, Missouri 63104
Fax: (314) 436-2900

With a copy to:

George M. von Stamwitz
Armstrong Teasdale, LLP
7700 Forsyth Blvd., Suite 1800
Clayton, Missouri 63105
Fax: (314) 612-2300
Email: gvonstamwitz@armstrongteasdale.com

With a copy to:

Christopher J. Rausch, Esq.
Rausch Law Firm, L.L.C.
16713 Wild Horse Creek Road
Chesterfield, Missouri 63005
Fax: (636) 530-1336
Email: chrisrausch1@sbcglobal.net

Escrow Agent:

Enterprise Bank & Trust
8077 Maryland Ave.
Clayton, MO 63105
(314) 889-2000
Attn: Chief Fiduciary Officer

or to such other address or to the attention of such other person as the addressee shall have designated by written notice sent in accordance herewith, and shall be deemed to have been given either at the time of personal delivery, or, in the case of expedited delivery service or mail, as of the date of first attempted delivery at the address and in the manner provided herein, or, in the case of facsimile transmission, as of the date of the facsimile transmission, provided that an original of such facsimile is also sent to the intended addressee by means described in clauses (a), (b), or (c) above. Any party, by written notice to the others in the manner herein provided, may designate (A) an address different from that set forth in this Agreement and (B) an additional address (for example, without limitation, of a mortgagee). If any notice is mailed, it shall be deemed delivered five business days after the date such notice is deposited in the United States Mail. Any notice shall be deemed given upon the actual date of such delivery. It shall be the responsibility of the Parties to notify the Escrow Agent and the other party in writing of any name or address changes. In the case of communications delivered to the Escrow Agent, such communications shall be deemed to have been given on the date received by the Escrow Agent.

9. Counterparts/Facsimile Execution. This Agreement may be executed in multiple counterparts, each of which shall be deemed an original but together shall constitute one and the

same instrument. This Agreement may be executed by facsimile and each party shall have the right to rely upon a facsimile counterpart signed by any other party to the same extent as if such party had received an original counterpart from the party signing such facsimile counterpart.

10. **Miscellaneous.** This Agreement shall be construed, enforced and interpreted in accordance with the laws of the State of Missouri, without regard to its conflict of laws. The terms and conditions of this Agreement shall be binding upon and inure to the benefit of the parties hereto, their successors, legal representatives and assigns. The forgoing notwithstanding, no assignment of the interests of any of the parties hereto shall be binding on the Escrow Agent unless and until written notice of such assignment shall be delivered to and acknowledged by the Escrow Agent. This Agreement may not be amended or modified except by a written instrument executed by all of the parties hereto. If any time period by which any right, option or election provided in this Agreement must be exercised, or by which any act must be performed, expires on a Saturday, Sunday or legal holiday, then such time period shall be extended through the close of business on the next business day (which, for purposes hereof, shall be any day which is not a Saturday, Sunday or legal holiday). EOI's rights and obligations hereunder may be assigned by EOI to the same entity to which EOI may assign its rights and obligations under the ELTA, provided however, such assignment shall not relieve EOI of its obligations under the ELTA or this Agreement.

11. **Resignation or Removal.** The Escrow Agent may resign by furnishing written notice of its resignation to EOI with a copy to Wainwright. Such resignation shall be effective thirty (30) calendar days after the delivery of such notice or upon the earlier appointment of a successor, and the Escrow Agent's sole responsibility thereafter shall be to safely keep the Remedial Funds and to deliver the same to a successor Escrow Agent as shall be appointed by EOI and Wainwright, as evidenced by a written notice filed with the Escrow Agent or in accordance with a court order. Any replacement Escrow Agent shall be selected upon mutual written agreement of EOI and Wainwright. Prior to any such replacement, the Parties shall cause such replacement Escrow Agent to confirm in writing its willingness to adhere to all of the terms and conditions of this Agreement. If the Parties have failed to appoint a successor Escrow Agent prior to the expiration of thirty (30) calendar days following the delivery of such notice of resignation, the Escrow Agent or either Party may petition any court of competent jurisdiction for the appointment of a successor Escrow Agent or for other appropriate relief, and any such resulting appointment shall be binding upon the parties. In any event, the Escrow Agent shall wire transfer the balance of the Escrow Remedial Funds to such replacement Escrow Agent as soon as reasonably practicable.

12. **Merger or Consolidation.** Any corporation or association into which the Escrow Agent may be converted or merged, or with which it may be consolidated, or to which it may sell or transfer all or substantially all of its corporate trust business and assets as a whole or substantially as a whole, or any corporation or association resulting from any such conversion, sale, merger, consolidation or transfer to which the Escrow Agent is a party, shall be and become the successor Escrow Agent under this Agreement and shall have and succeed to the rights, powers, duties, immunities and privileges as its predecessor, without the execution or filing of any instrument or paper or the performance of any further act, other than the providing of written notice of the same to EOI and Wainwright.

13. **Attachment of Escrow Property; Compliance with Legal Orders.** In the event that any escrow property shall be attached, garnished or levied upon by any court order, or the delivery thereof shall be stayed or enjoined by an order of a court, or any order, judgment or decree shall be made or entered by any court order affecting such property, the Escrow Agent is hereby expressly authorized, in its sole discretion, to respond as it deems appropriate or to comply with all writs, orders or decrees so entered or issued, or which it is advised by legal counsel of its own choosing (at its sole cost) is binding upon it, whether with or without jurisdiction. In the event that the Escrow Agent obeys or complies with any such writ, order or decree it shall not be liable to any of the parties or to any other person, firm, or corporation, should, by reason of such compliance notwithstanding, such writ, order or decree be subsequently reversed, modified, annulled, set aside or vacated.

14. **Termination.** This Escrow Agreement shall terminate on the earlier of complete depletion of the Remedial Funds or upon the Escrow Agent's receipt of written instructions, executed by EOI and Wainwright, to disburse the balance of the Remedial Funds.

15. **Income Tax Allocation and Reporting.**

(a) The Parties agree that, for tax reporting purposes, all interest and other income from investment of the Remedial Funds shall, as of the end of each calendar year and to the extent required by the Internal Revenue Service, be reported as having been earned by EOI whether or not such income was disbursed during such calendar year, and EOI shall pay all taxes and interest on earnings from its own Remedial Funds.

(b) Prior to closing, the Parties shall provide the Escrow Agent with certified tax identification numbers by furnishing appropriate forms W-9 or W-8 and such other forms and documents that the Escrow Agent may request. The Parties understand that if such tax reporting documentation is not provided and certified to the Escrow Agent, the Escrow Agent may be required by the Internal Revenue Code of 1986, as amended, and the regulations promulgated thereunder, to withhold a portion of any interest or other income earned on the Remedial Funds.

(c) To the extent that the Escrow Agent becomes liable for the payment of any taxes in respect of income derived from the investment of the Escrow Remedial Funds, the Escrow Agent shall satisfy such liability to the extent possible from the Escrow Remedial Funds. EOI shall indemnify, defend and hold the Escrow Agent harmless from and against any tax, late payment, interest, penalty or other cost or expense that may be assessed against the Escrow Agent on or with respect to the Escrow Remedial Funds and the investment thereof unless such tax, late payment, interest, penalty or other expense was directly caused by the gross negligence or willful misconduct of the Escrow Agent. The indemnification provided by this Section is in addition to the indemnification provided in any other section hereof and shall survive the resignation or removal of the Escrow Agent and the termination of this Agreement.

16. **Force Majeure.** The Escrow Agent shall not be responsible or liable for any failure or delay in the performance of its obligation under this Agreement arising out of or caused, directly or indirectly, by circumstances beyond its reasonable control, including, without limitation, acts of God; earthquakes; fire; flood; wars; acts of terrorism; civil or military disturbances; sabotage;

epidemic; riots; interruptions, loss or malfunctions of utilities; labor disputes; acts of civil or military authority or governmental action; it being understood that the Escrow Agent shall use commercially reasonable efforts which are consistent with accepted practices in the banking industry to resume performance as soon as reasonably practicable under the circumstances.

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IN WITNESS WHEREOF, the parties have hereunto set their hands and seals effective the day and year first written above.

ENTERPRISE BANK & TRUST

By: [Signature]
Name: J.J. GAZDOL
Title: CEO - TRUST
Date: 12/31/13

WAINWRIGHT

By: [Signature]
Name: NELSON WAINWRIGHT
Title: PRESIDENT
Date: 12/31/13

Environmental Operations, Inc.

By: [Signature]
Name: Stacy W. Hastie
Title: CEO
Date: 12/31/13

EXHIBIT A

ELTA

EXHIBIT B

FEE SCHEDULE

For its services, Escrow Agent will receive an annual fee equal to \$5,000.00 for the first year and \$3,500.00 for subsequent years. Said annual fee will be paid in full in advance for each year.

EXHIBIT C

REQUISITION FORM

Requisition Date:

Requisition Period: XXX through XXX

_____ hereby certifies that: (1) all the Remedial Funds requisitioned from the Remedial Funds by this Requisition Form are proper expenditures authorized by the Escrow Agreement and the Environmental Liabilities Transfer Agreement attached thereto; (2) the attached itemization of the costs and expenses represents a true and accurate itemization of the Remedial Funds being requisitioned hereby; and (3) the attached receipts and invoices are true and accurate copies of the receipts and invoices paid or being paid by _____ and evidencing the basis for this requisition.

Name:

Title:

Signature:

Date:

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