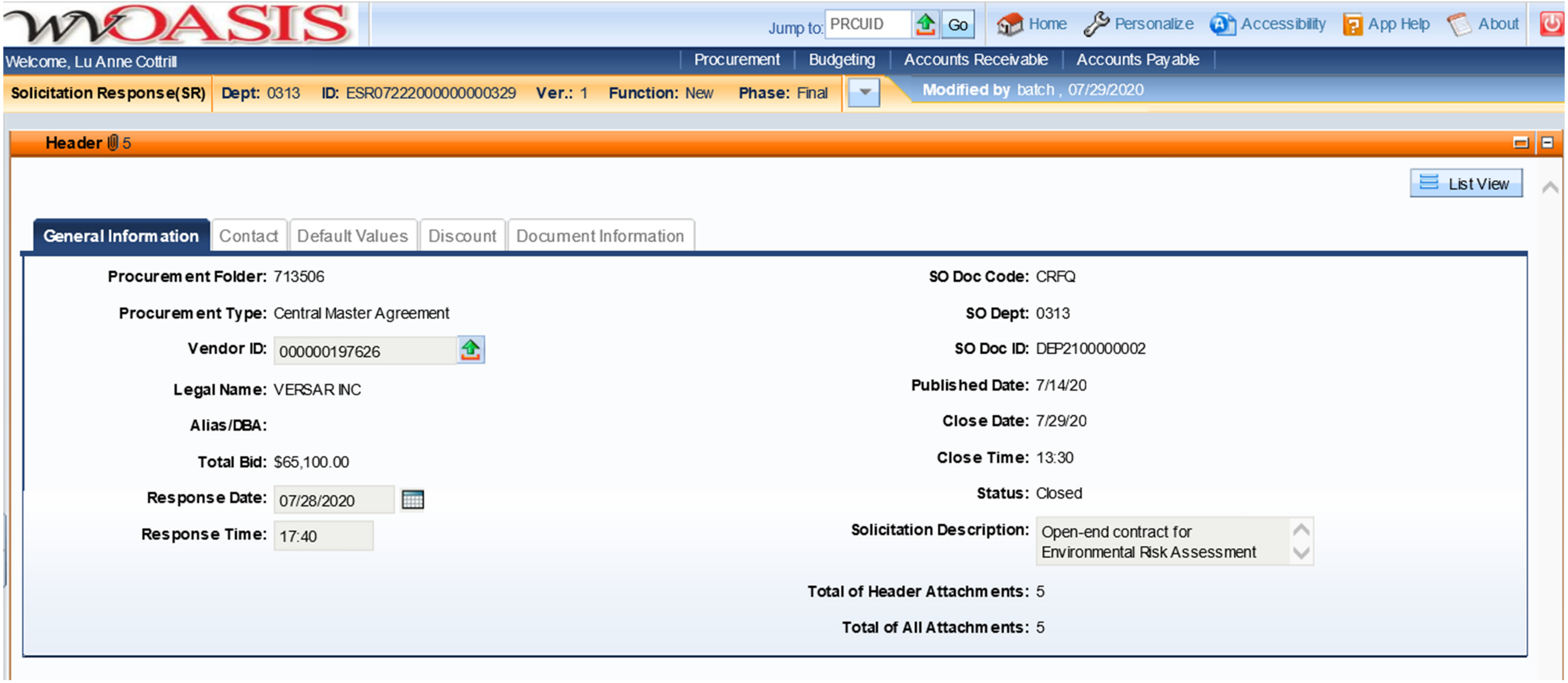
West Virginia
Purchasing Division

2019 Washington Street, East
Charleston, WV 25305
Telephone: 304-558-2306
General Fax: 304-558-6026
Bid Fax: 304-558-3970

The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at *wvOASIS.gov*. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at *WVPurchasing.gov* with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.



Welcome, Lu Anne Cottrill

Solicitation Response(SR) **Dept:** 0313 **ID:** ESR07222000000000329 **Ver.:** 1 **Function:** New **Phase:** Final

Modified by batch , 07/29/2020

Procurement Folder: 713506

Procurement Type: Central Master Agreement

Vendor ID: 000000197626

Legal Name: VERSAR INC

Alias/DBA:

Total Bid: $65,100.00

Response Date: 07/28/2020

Response Time: 17:40

SO Doc Code: CRFQ

SO Dept: 0313

SO Doc ID: DEP2100000002

Published Date: 7/14/20

Close Date: 7/29/20

Close Time: 13:30

Status: Closed

Solicitation Description: Open-end contract for Environmental Risk Assessment

Total of Header Attachments: 5

Total of All Attachments: 5

Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Solicitation Response

Proc Folder : 713506

Solicitation Description : Open-end contract for Environmental Risk Assessment

Proc Type : Central Master Agreement

Date issued	Solicitation Closes	Solicitation Response	Version
	2020-07-29 13:30:00	SR 0313 ESR07222000000000329	1

VENDOR

000000197626

VERSAR INC

Solicitation Number: CRFQ 0313 DEP2100000002

Total Bid : $65,100.00 **Response Date:** 2020-07-28 **Response Time:** 17:40:09

Comments: N/A

FOR INFORMATION CONTACT THE BUYER

Joseph E Hager III
(304) 558-2306
joseph.e.hageriii@wv.gov

Signature on File **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	Risk or hazard assessment	700.00000	HOUR	$93.000000	$65,100.00

Comm Code	Manufacturer	Specification	Model #
77101501			

Extended Description : Environmental Risk Assessor Open end contract for service, bid sheet represents an estimated number of hours for bidding purposes to establish a contracted set price per hour.

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

CONSTRUCTION CONTRACTS: Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

ALL CONTRACTS: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Versar, Inc

Authorized Signature: Yuwana Neogi Date: 7/28/2020

State of Maryland

County of Montgomery, to-wit:

Taken, subscribed, and sworn to before me this 26 day of July, 2020

My Commission expires 07/08, 2020

AFFIX SEAL HERE NOTARY PUBLIC

BRETT [illegible]
Notary Public
Montgomery County
Maryland
My Commission Expires July 08, 2022

Purchasing Affidavit (Revised 01/19/2018)

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: CRFQ 0313 DEP2100000002

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

X ☐ Addendum No. 1
☐ Addendum No. 2
☐ Addendum No. 3
☐ Addendum No. 4
☐ Addendum No. 5
☐ Addendum No. 6
☐ Addendum No. 7
☐ Addendum No. 8
☐ Addendum No. 9
☐ Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

VERSAR, INC
Company

Yuwana Neogi
Authorized Signature

July 28, 2020
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

(Name, Title)

Yuwana Neogi, Contracts Manager

(Printed Name and Title)

20251 Century Blvd., Suite 150, Germantown, MD 20874

(Address)

Phone: 240-252-5797

(Phone Number) / (Fax Number)

yneogi@versar.com

(email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

VERSAR, INC.

(Company)

Yuwana Neogi, Contracts Manager

(Authorized Signature) (Representative Name, Title)

Yuwana Neogi, Contracts Manager

(Printed Name and Title of Authorized Representative)

7/28/2020

(Date)

Phone: 240-252-5797

(Phone Number) (Fax Number)

7.2.3 Any other remedies available in law or equity.

8 MISCELLANEOUS:

8.1 No Substitutions: Vendor shall supply only Contract Items submitted in response to the Solicitation unless a contract modification is approved in accordance with the provisions contained in this Contract.

8.2 Vendor Supply: Vendor must carry sufficient inventory of the Contract Items being offered to fulfill its obligations under this Contract. By signing its bid, Vendor certifies that it can supply the Contract Items contained in its bid response.

8.3 Reports: Vendor shall provide quarterly reports and annual summaries to the Agency showing the Agency's items purchased, quantities of items purchased, and total dollar value of the items purchased. Vendor shall also provide reports, upon request, showing the items purchased during the term of this Contract, the quantity purchased for each of those items, and the total value of purchases for each of those items. Failure to supply such reports may be grounds for cancellation of this Contract.

8.4 Contract Manager: During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

Contract Manager: YUWANA A NEOGI
Telephone Number: 240-252-5797
Fax Number:
Email Address: yneogi@versar.com

West Virginia Department of Environmental Protection: Environmental Risk Assessment Support

Technical Proposal

Solicitation No. 6CRFQ 0313 DEP2100000002

July 29, 2019

Submitted to:
West Virginia Department of
Environmental Protection
Office of Environmental Remediation
601 57th St SE
Charleston, WV 25304

Submitted by:
Versar, Inc.
6850 Versar Center
Suite 201
Springfield, VA 22151

VERSAR
Your Needs. Our Mission.

6850 Versar Center
Suite 201
Springfield, VA 22151
703.750.3000
info@versar.com

July 28, 2020

The State of West Virginia
Department of Administration, Purchasing Division
Attention: Mr. Joseph Hager III, Buyer
2019 Washington Street East
Charleston, WV 25305-0130

Subject: **Versar's Response to Solicitation No: CRFQ 0313 DEP2100000002**

Dear Mr. Hager,

Attached please find Versar's proposal in response to the subject solicitation, for your review.

This proposal is valid for 90 days from the date of submittal.

For any technical inquiries please contact Hassan Husain, Senior Program Manager at hhusain@versar.com or at 240-499-4302; for all contract related matters please contact me at yneogi@versar.com or 240-252-5797.

Sincerely,

Yuwana Neogi
Contracts Manager

EXECUTIVE SUMMARY

Versar's Exposure and Risk Assessment Division provides scientific, technical, and peer review support to government and commercial clients in activities related to single and multimedia human and environmental exposure/risk assessments. The Division is comprised of a diverse staff of more than 30 in-house scientists (i.e., biologists, chemists, toxicologists, environmental scientists) and engineers (i.e., chemical, civil) and outside subcontractors and consultants. Versar's Exposure and Risk Assessment Division brings to this effort more than 35 years of experience in all aspects of the exposure/risk assessment process including: characterization of the physical/chemical properties of toxic chemicals, materials balance (source analysis), environmental fate analysis, monitoring or modeling to estimate environmental concentrations, characterization of exposed populations, identification of significant exposure pathways, quantitative estimation of dose, review of toxicological data, risk characterization, and uncertainty/sensitivity analysis.

Human health and ecological site risk assessments have been conducted at more than 50 sites for numerous clients including: the Environmental Protection Agency, Army, Navy, Air Force, state environmental protection agencies, NASA, and private clients. These assessments typically follow Risk Assessment Guidance for Superfund (RAGS) and include: evaluations and statistical analyses of site data; review of environmental fate and transport mechanisms that may affect chemical exposure; development of conceptual site models; identification of receptors; evaluation of the pathways of exposure; quantification of chemical intakes; toxicity assessment; characterization of risks; and uncertainty analysis. Specific examples of risk assessments conducted for the Army include facilities such as Ft. Des Moines, Iowa; Newport, Indiana; and Ft. Meade, Maryland. Examples for the Navy include Sebana Seca, Puerto Rico; and Dahlgren, Virginia, and examples for the Air Force include Wright-Patterson, Ohio; Tinker, Oklahoma; Wurtsmith, Michigan; Homestead, Florida; Brooks, Texas; Lowry and Buckley, Colorado; and Thule, Greenland. Versar has also provided technical support for human health and ecological assessments conducted by NASA, the National Park Service, and state agencies. In fact, Versar has completed risk assessment support contracts for the Kentucky Department of Environmental Protection, Indiana Department of Environmental Management, and Idaho Department of Environmental Quality.

Versar has more than 20 years of experience working with Federal, State, regional, and local risk assessment guidelines and requirements as a result of its long-term support to EPA's PCB risk assessment program. In support to EPA's National Program Chemicals Division, Fibers and Organics(FOB), Versar has been supporting EPA's Regional PCB Coordinators by reviewing risk assessments submitted to EPA under the PCB disposal regulations. Over 50 reviews have been conducted for most of the EPA Regions as well as for Headquarters.

PROPOSED STAFF

LAURA WILLIAMS

Education:

Data Analytics and Visualization Bootcamp, University of Richmond, July 2020
Virginia Natural Resources Leadership Institute, Class of 2015
Virginia Commonwealth University, Richmond VA
Master of Science in Environmental Studies, Graduated Magna Cum Laude December 2012
University of Mary Washington, Fredericksburg, VA
Bachelor of Science in Biological Sciences, Graduated Cum Laude May 2003

Experience Summary:

Ms. Laura Williams brings more than 10 years' experience serving as an environmental scientist to a variety of clients. Her current experience within Versar's Environmental Services Group involves supporting various government clients including the U.S. EPA, FDA, and DOD related to environmental and human health risk assessments. Ms. Williams current work includes the development of CSMs for DOD, risk assessment literature reviews for high-visibility chemicals for the EPA, and supporting FDA in conducting peer reviews.

TECHNICAL EXPERIENCE:

Peer Review Support for FDA/CFSAN

Team lead for FDA peer review projects and tasks. As part of these peer reviews, Ms. Williams manages review staff to ensure technical quality that addresses a variety of chemical and microbial risk assessment topics, such as methylmercury, melamine, and pharmaceuticals in milk. Assists FDA in evaluating the presence, concentrations, hazards, and potential risks associated with toxic drug residues by reviewing literature and providing writing/editorial and meeting support.

Peer Review and Risk Assessment Guidelines Activities for EPA

Team lead for EPA peer review projects and tasks. As part of these peer reviews, Ms. Williams has worked with nationally recognized experts in fields such as human health risk assessment, toxicology, epidemiology, pharmacokinetics, biostatistics, and other related disciplines.

Preparation of Consumer, General Population, and Environmental Exposure Assessments for EPA's Existing Chemicals Programs, OPPTS/EPA

Supporting consumer, general population, and environmental exposure assessments for human health and ecological risk assessments by assisting EPA with the collection, generation, evaluation, analysis or use of environmental data to complete tasks within all phases of the risk assessment process (i.e., Scoping, Characterization, and Assessment). Implementing updated systematic review methods involving full-text screening, data evaluation, data extraction and data summaries. Continuing support for use of systematic review tools such as HEROnet and DistillerSR software to aid in the organization, screening, evaluating, and extracting of literature search retrievals. Support for development and enhancements of OPPT's tools and methodologies.

Performance-Based Remediation LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Baseline human health and ecological risk assessments were performed as part of the remedial investigation for LF512 Building 30013 Sump Pit Area at Wright-Patterson Air Force Base. Ms. Williams provided Quality Control soil and groundwater data and conceptual site models related to risk assessments conducted for various Army facilities.

Senior Environmental Scientist

Ms. Williams has served as project lead on over two dozen different projects/sites under CERCLA, RCRA, and FUDS. Her work included conducting report reviews on Remedial Investigations, Feasibility Studies, Remedial Action Plans, Records of Decision, as well as other supporting documents and producing technical comments for review by local, state, and federal agencies. Ms. Williams created site factsheets and presentations for public consumption taking into account varying reading levels and site-specific concerns as well as developed a Quality Assurance Project Plan report for use by an independent bioremediation firm. Ms. Williams has conducted literature research regarding the latest ex situ and in situ remediation technologies, including: dredging (mechanical and hydraulic), capping, solidification/stabilization, incineration, landfill/disposal, thermal methods, bioremediation, and phytoremediation. She has assessed reports on appropriateness of contaminant cleanup levels and remediation methods for several rivers and harbors: Hudson, Housatonic, Passaic, Spokane, Duwamish, Portland Harbor, Port Angeles Harbor. She has also assessed reports on sites with groundwater impacts and the appropriateness of remediation methods based on hydrogeology of the Brunswick, GA area and marsh sites in Brooklyn, NY near Newtown Creek/East River. Additionally, she has analyzed reports related to WWI ordnance and related contaminants for the FUDS in Spring Valley, Washington DC. Ms. Williams' work includes the an assessment report of assumptions made in human health and ecological risk assessments, including exposure pathways, hazard identification, and dose-response analysis as well as assumptions regarding the properties and health effects of several site contaminants, including: PCBs and other organochlorines, PAHs, dioxin/furans, toxic and heavy metals (arsenic, mercury, lead), DNT. Additionally, she developed a Human Health Risk Assessment for the City of Wildwood, MO.

Master of Science in Environmental Studies, December 2012

Ms. Williams' Experimental Thesis research was conducted on "The Effects of River Sediment, Endosulfan, and Moderate Hypoxia on Blue Crabs (*Callinectes sapidus*) from the Tidal, Freshwater James River". This thesis involved the field collection, aquatic animal husbandry, physiological measurements, respirometry, enzyme activity analysis, BioRad protein analysis. As part of this thesis, Ms. Williams attended the Society of Integrative and Comparative Biology (SICB) Meetings and presented the thesis and the related thesis poster.

Ms. Williams also served as a Graduate Class Guest Lecturer for Intro to Environmental Science, Pollution Physiology in 2012 and 2013 covering CERCLA, endocrine disrupting chemicals, and PCBs.

CERTIFICATES

- Excel Skills for Business Specialization (Coursera - Macquarie University)
  - Excel Skills for Business: Essentials Course Certificate (August 2019)
  - Excel Skills for Business: Intermediate I (January 2020)
- Basic Wetland Delineation and Regional Supplement Training: 36 Professional Development Hours; The Swamp School, completed March 2018
- Virginia Department of Environmental Quality Certificates of Training in:
  - Plants in Stormwater Management and Erosion and Sediment Control, 12.5.17
  - Regulatory SWPPP Inspections for Localities, 12.12.17
  - Program Administrator for Erosion and Sediment Control, 1.10.18
  - Program Administrator for Stormwater Management, 1.11.18
- "Epidemiology in Public Health Practice by Johns Hopkins University on Coursera. Certificate earned on Sunday, January 7, 2018 9:26 PM GMT
- 24-Hour HAZWOPER Training, November 2015 (Cert # 142740)

PUBLICATIONS

Articles

- deFur, P.L., L.E. Williams, and S.D. Sanford. 2016. "Emerging Contaminants in Virginia" in the *William & Mary Environmental Law and Policy Review*, Volume 40, Issue 2.
- deFur, P.L. and L.E. Williams. 2015. "Endocrine Disrupting Chemicals" in *The Natural History of Crustacea: Physiology*, Volume 4, eds. Chang, E. and M. Thiel. Oxford University Press, New York
- "Facultative rest-phase hypothermia in free-ranging White-throated Sparrows," *The Condor*, Volume 106, Number 2:386-390, May 2004.

DAVID P. BOTTIMORE

EDUCATION:

University of Pennsylvania
B.S., Chemical Engineering, 1986
University of Pennsylvania
B.A., American Civilization, 1986

EXPERIENCE SUMMARY: Total Years' Experience 34

Mr. David Bottimore brings more than 30 years of experience managing large environmental risk assessment support contracts for federal and state agencies. In addition to federal contracts supporting the U.S. EPA, FDA, and CPSC, he has recently managed risk assessment contracts with the Kentucky Department of Environmental Protection, Indiana Department of Environmental Management, and Idaho Department of Environmental Quality.

Mr. Bottimore has conducted exposure and risk assessments for a variety of toxic chemicals in commercial products, manufacturing, and at contaminated waste sites. He has also developed exposure and risk assessment guidance documents, computer modeling tools, and methods to assess risks. Many of these efforts have addresses high-visibility chemicals such as dioxins, PCBs, asbestos, and other toxics. Mr. Bottimore has conducted more than 400 peer reviews, hosted more than 100 peer review and scientific meetings and workshops, and prepared more than 100 scientific documents and journal articles. He has managed more than 2,000 nationally recognized experts in fields such as exposure/risk assessment, toxicology, epidemiology, pharmacokinetics, microbiology, biostatistics, and other related human health risk assessment disciplines. Mr. Bottimore is Project Management Institute (PMI) trained and has served as Program/Project Manager on more than 10 large contracts with values exceeding $75 Million.

PROGRAM MANAGER EXPERIENCE:

Mr. Bottimore has managed thirteen contracts with risk assessment support activities for EPA, FDA, and CPSC. As Program Manager for these contracts, he is responsible for technical quality, staff resources, timeliness, budgeting, cost-monitoring, and technical and financial reporting. He manages a diverse staff of environmental scientists, engineers, biologists, chemists, and computer programmers. From more than 30 years of experience supporting research and regulatory programs, he has managed hundreds of tasks on high-visibility human health and ecological risk assessment topics. He has also developed and implemented exposure/risk assessment methods and guidance documents and assisted EPA on many highly influential scientific assessments.

A major portion of Mr. Bottimore's support to EPA has focused on ecological and human health risk assessments for chemicals, including assisting EPA with improving the quality of data and assessments (exposure, toxicity, hazard, dose-response). As parts of these efforts, Mr. Bottimore has managed more than 2,000 experts with expertise in human health and ecological toxicology, epidemiology, pharmacokinetics, biostatistics, environmental chemistry, and other related disciplines. Many of these efforts have supported EPA's Integrated Risk Information System

(IRIS), helping to ensure the quality of IRIS toxicological reviews for more than 40 chemicals, which evaluate the hazard identification and dose-response assessments for both noncancer and cancer endpoints. Similarly, he has managed the scientific review of more than 50 EPA documents on ecological toxicology, fate and transport, and ecological risk assessment for aquatic, terrestrial, and avian receptors.

TECHNICAL EXPERIENCE:

Site-specific Risk Assessments

Mr. Bottimore has designed and conducted environmental risk assessments for a variety of contaminated sites across the United States, and internationally. These risk assessments have been completed based on EPA guidance and have conformed to state guidance where applicable, for development of conceptual site models and identification of receptors and pathways of concern. He previously conducted a baseline human health risk assessment for Thule Air Base, Greenland. This project developed conceptual site models and identified receptors and pathways of concern for dermal contact, ingestion, and inhalation, from contaminated soil and subsurface waters associated with six landfills at Thule. Mr. Bottimore also conducted an assessment of potential risks to children and adults at a former landfill site in Waukegan, IL. The assessment used modeled data to evaluate exposures and risks to children and adult receptors using the former landfill site for recreational purposes. For Langley Air Force Base he developed guidance documents for conducting risk assessments at more than 60 contaminated sites. The document described procedures for development of conceptual site models, identification of receptors and pathways of interest, selection of contaminants of concern, and conducting the risk assessments. He has also overseen risk assessments conducted at Vandenberg AFB, Wallops Island, Calabasas Landfill, and other locations.

Exposure & Risk Assessments for EPA (OPPT)

Mr. Bottimore has managed more than 70 work assignments to support OPPT's new and existing chemicals programs, including high priority chemicals such as PFOA, PCBs, asbestos, dioxins, and nanomaterials. As part of these efforts, he has conducted exposure and risk assessments; collected exposure data from the literature and monitoring studies; assisted with development of computer models and databases; prepared guidance documents, outreach/communication materials, and case studies; and organized meetings on a variety of exposure and risk assessment topics. Has participated in and overseen the development of several computer data bases and models for OPPT, such as the New Chemicals Exposure Model (NCEM2), Exposure and Fate Assessment Screening Tool (E-FAST2), EPI Suite, and Source Ranking Database (SRD). He is currently assisting OPPT to prepare a review article that describes available data on the environmental fate, transport, and transformation of perfluorochemicals (PFCs) from industrial and domestic wastewater treatment plant (WWTP) influents, effluents, and sludges. He has assisted the VCCEP program with review of documents on benzene, toluene, and xylenes. He previously also helped OPPT to develop approaches for evaluating and promoting environmentally preferable cleaning products, as well as projects under Buy Clean and Design for the Environment (DfE) program, such as case studies.

Other highlights of his support to OPPT have included developing and implementing approaches for community-based risk assessments of major urban areas (Chicago, Baltimore, and Washington, D.C.). He assisted OPPT in completing a major community-based environmental health study, *Baltimore Community Environmental Partnership Air Committee Technical Report - Community Risk-Based Air Screening: A Case Study in Baltimore, MD* (EPA/744/R-00/045). Also, he was lead on the *Environmental Loadings Profile for the Chicago Cumulative Risk Initiative* (EPA 747-R-01-002), which characterized sources, multimedia releases, and ambient levels in air, water, drinking water, soil, and other media, which were obtained from more than 400 published articles/reports. Similarly, he published the results of a study on environmental risks to human health in Washington, DC, focusing on air quality, water pollution, drinking water, and other issues (*An Environmental Characterization of the District of Columbia* (EPA 903-R-97-027)).

Risk Assessments for EPA (ORD)

Mr. Bottimore has created many scientific documents that have been: published as EPA reports, widely used by risk assessors nationwide, referenced in publications in the scientific literature, and in support of EPA's most visible programs. He led the development of five technical papers on issues in cumulative risk assessment, which were published as a Mini-Monograph, entitled, "Frontiers in Cumulative Risk Assessment," in *Environmental Health Perspectives*, (Vol. 115 No. 5, May 2007). Similarly, he assisted EPA's Risk Assessment Forum with the *Framework for Metals Risk Assessment* (EPA 120/R-07/001), as well as several risk assessment guidelines documents. He has also authored several Reports to Congress for EPA's Environmental Monitoring and Assessment Program (EMAP). Mr. Bottimore was co-author with EPA personnel of *Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans and 1989 Update* (EPA/625/3-89/016). This document was one product of a multi-year effort to develop the International Toxicity Equivalency Factor (I-TEF) Method of Risk Assessment for Dioxins and Furans.

Peer and Toxicological Review for CPSC

Mr. Bottimore was the Program Manager of *Peer Review and Toxicological Review Services* (Contract No. CPSC-D-06-0006) a 5-year contract with the U.S. Consumer Product Safety Commission (CPSC). Under this contract, he has managed 15 task orders with a value exceeding $1M, including peer reviews, toxicological reviews, and risk assessments. These tasks have addressed many critical issues for CPSC such as metals, phthalates, nanomaterials, spray foam, and dry wall, and have encompassed all aspects of conducting peer reviews, evaluating toxicological data, deriving acceptable daily intakes, estimating exposures, conducting risk assessments, and assisting advisory committees. Many of these activities have supported CPSC in meeting requirements under Consumer Product Safety Improvement Act (CPSIA), Federal Hazardous Substances Act (FHSA), and other mandates. Specifically, Versar has conducted peer reviews on children's metal jewelry, phthalate toxicology assessments, reproductive/developmental toxicology and neurotoxicity, and other related topics.

More than 25 toxicological reviews have been developed under Versar's contract, addressing phthalates, phthalate alternatives, metals, and fire retardant nanomaterials. Similarly, Versar has evaluated exposure data for these compounds to complement the toxicological assessments. In addition, expansive exposure assessments/documents have been developed for phthalates based on biomonitoring data, intake from consumer products and environmental media, and estimated for a variety of subpopulations. Many of these activities were completed in support of the Chronic Hazard Advisory Panel (CHAP) on Phthalates.

Peer Review Support for FDA/CFSAN

Mr. Bottimore is the Program Manager of Versar's contract with the Food and Drug Administration's Center for Food Safety and Applied Nutrition (CFSAN)). For the past five years, he has managed 22 tasks with a value of almost $1M. Peer reviews for CFSAN have included more than 75 experts in various pathogens, exposure modeling, hazard assessment, and disciplines related to food safety. Several of the peer reviews conducted by Versar have been joint efforts by CFSAN, along with other Federal agencies, such as USDA Food Safety Inspection Service (FSIS) and Health Canada. In addition to these peer reviews, Versar has also supported CFSAN in the development of a risk assessment addressing potential drug residues in milk and milk products.

Peer Review and Risk Assessment Guidelines Activities for EPA

For the past 20 years, Mr. Bottimore has been the Program Manager for three U.S. EPA peer review contracts (Contract Nos. EP-C-07-025, 68-C-02-061, and 68-C-99-238), including the current contract entitled *Peer Review and Risk Assessment Activities*, through which he leads peer reviews, meetings, and other risk assessment-related studies. Over the past decade under these contracts, he has managed more than 200 peer review tasks for 15 different EPA offices, having a value of $5M. Major activities have included support to EPA's IRIS program, for which he has managed peer reviews of more than 35 IRIS toxicological review documents. Meetings managed by Mr. Bottimore have included: *Review of the Reference Dose and Reference Concentration Processes*, U.S. EPA Workshop on the Use of Mechanistic Data in Risk Assessment, *Approaches for the Application of Physiologically-Based Pharmacokinetic Data and Models in Risk Assessment*, *Framework for Metals Risk Assessment*, and *Nanotechnology White Paper*. In addition, he has supported five peer reviews conducted by the National Academy of Sciences/National Research Council (NAS/NRC) and EPA Science Advisory Board (SAB) on topics related to environmental monitoring and risk assessment.

He managed the development of five technical papers on issues in cumulative risk assessment, which were published as a Mini-Monograph, entitled, "Frontiers in Cumulative Risk Assessment," in Environmental Health Perspectives. Mr. Bottimore obtained 14 experts who have published in the areas of interest (e.g., cumulative risk assessment, mixtures toxicology, epidemiology, biomonitoring, vulnerability, sociology, etc.) to assist with the authorship of the papers. Versar facilitated meetings and dozens of conference calls among the authors, who worked in four groups, along with more than 10 EPA scientists, to develop the papers. Versar also conducted literature searches and obtained journal articles from the human health, ecological, psychological, and physiological sciences and provided to the authors to support their writing efforts. The five papers were published in Environmental Health Perspectives, one of the preeminent journals in the field, in 2007.

Topics addressed by the peer reviews included microbial risks, seafood consumption, contaminants in milk, and animal feed operations. Mr. Bottimore has also conducted peer reviews and large meetings on a variety of emerging concerns and high priority issues, including nanotechnology, genomics, and several reviews related to the health effects of the World Trade Center disaster. He has also assisted NCEA with reviews of several microbial risk assessment documents, including *Technical Report on Developing Dynamic Infection Transmission Models for Microbial Risk Assessment (MRA) Applications*. He reviewed *Mycobacterium avium Complex Exposure Assessment for a High Risk Population* and recently completed a peer review workshop on Waterborne Disease Burden in the United States. Mr. Bottimore also conducted an external scientific peer review of NCEA's draft *Exposure and Human Health Evaluation of Airborne Pollution from the World Trade Center Disaster*. Mr. Bottimore's responsibilities included identifying and selecting the panel of seven experts, providing logistical support for the two-day meeting, and producing the peer review meeting report that documented reviewer recommendations for revisions to the exposure and risk assessment approaches. Another workshop was the NCEA/NHEERL *Workshop on Potential Common Modes of Action of Endpoints of Toxicity*. He coordinated logistics for this meeting, invited attendees, and obtained the services of two experts to produce background issue papers on application of mode of action in risk assessment. For the Risk Assessment Forum he completed a peer review of *Harmonization In Interspecies Extrapolation: Use Of BW3/4 As Default Method In Derivation Of The Oral RfD*.

Mr. Bottimore was Project Manager of *NCEA Support for Peer Review and Risk Assessment* Contract No. 68-C99-238, in which he managed peer reviews, meetings, and other risk assessment-related studies. Under this contract, he managed 35 task orders, many of which address human health and ecological risk assessment topics. Under the *NCEA Support for Peer Review and Risk Assessment* contract, Mr. Bottimore identified and selected internationally-recognized experts for peer reviews on topics such as ecological risk assessment (on aquatic, terrestrial, and avian impacts), dioxin bioaccumulation factors, persistent organic pollutants (POPs), global climate, and many other areas. He managed the peer reviews of *Clinch and Powell Valley Watershed Ecological Risk Assessment* and *Waquoit Bay Watershed Ecological Risk Assessment*. He also organized a 2-day peer review workshop on EPA's draft document *Guidance Document on Ecological Soil Screening Levels*. Major activities under the NCEA Peer Review contract have included support of the IRIS program. He conducted an in-depth study of the characterization of uncertainty and variability in IRIS assessments, with the participation of six experts in toxicology and risk assessment. In addition, he managed peer reviews of 10 IRIS assessments. These reviews addressed the following chemicals: hexachlorocyclopentadiene, methyl chloride, quinoline, chloroprene, methylmercury, boron, hydrogen sulfide, xylenes, acrolein, and tetrachloroethylene. The reviews for methylmercury and tetrachloroethylene included selecting seven-person panels and hosting peer review workshops. He also assisted the IRIS program in a two-day peer consultation meeting on risk assessment approaches for polycyclic aromatic hydrocarbons (PAHs), which included meeting logistics and preparation of a detailed meeting report that documented the discussion and recommendations from a 10-person panel. To assist NCEA with improving risk assessment methodologies, Mr. Bottimore managed literature reviews and contributed to the preparation of two reports *Exploration of Perinatal Pharmacokinetic Issues and Exploration of Aging and Toxic Response Issues*. He also managed a task order to peer review NCEA's document *Integration of Ecological Risk Assessment and Economics for Watershed Management.* He led a 13-person panel to evaluate *A Review of the Reference Dose and Reference Coordination Processes* and

Other major peer reviews successfully completed under the NCEA contract included two reviews of research grant proposals, one on children's health and one for the Environmental Monitoring for Public Access and Tracking (EMPACT) program. For the children's health review, he assembled a group of five experts in children's environmental health, who evaluated the research projects and provided "scoring" of the projects based on several criteria. The EMPACT review included assembling a panel of 15 experts in human health and ecological monitoring for a 2-day meeting to evaluate more than 30 separate project proposals. He prepared evaluation criteria and developed a weighted, iterative scoring methodology for use by the panel in evaluating the merit of the various EMPACT projects.

In addition to human health-related topics, he managed peer reviews on ecological risk assessments, including two watershed assessments (Waquoit Bay and the Clinch River valley) and a guidance document on ecological soil screening levels. For the Waquoit Bay and Clinch River peer reviews, he identified experts in aquatic toxicology, ecological monitoring, and watershed assessment to evaluate the methods, data, and conclusions presented in the documents. The peer review for the draft EPA document, *Guidance Document on Ecological Soil Screening Levels*, called for identifying and selecting nine experts in terrestrial and avian toxicology. A 2-day meeting was organized by Mr. Bottimore and Versar staff, who also handled logistics and co-authored the peer review proceedings document.

Development of Communication Strategies for EPA

Mr. Bottimore has developed communication and marketing strategies for a variety of topics and projects, including on indoor air issues. For the EPA/GSA Cleaners Project and Buy Clean Initiatives, he assisted with developing approaches for disseminating information to the target audiences, which included development of brochures, fact sheets, exhibit booths, and web pages. In a separate effort, he prepared an outreach and communication strategy for EPA Region 3 following publication of EPA, including *An Environmental Characterization of the District of Columbia - A Scientific Basis for Setting an Environmental Agenda* (EPA/903/R-97/027). Mr. Bottimore was the lead author of this report, which characterized both environmental health and ecological risks in Washington D.C. He prepared a communication strategy and a full color executive summary/brochure for distribution to community groups, local government agencies, and the public. He also participated in strategic planning efforts for the Environmental Monitoring and Assessment Program (EMAP). These efforts were oriented to make information available to other EPA offices, other Federal agencies, the Regions, the scientific community, and the public, through the use of fact sheets, newsletters, brochures, speeches, briefing packages, posters, and videotapes.

Education and Outreach Product Development and Dissemination for EPA

Mr. Bottimore has more than 15 years of experience developing outreach and communication materials to translate scientific information to general audiences. He has produced brochures, newsletters, videos, reports, speeches, exhibit booths, and other materials. He provided technical and communication/outreach support to EPA under an innovative program with the General Services Administration (GSA) Public Buildings Service (PBS) that promoted the procurement and use of environmentally preferable cleaning products. Mr. Bottimore's was Versar's task manager for this effort and his responsibilities included preparing brochures, educational materials that were used in schools, and an exhibit booth. Mr. Bottimore also supported EPA's work under the Buy Clean Initiative. For that project, Versar helped develop procurement guidelines for products used in or by schools in order to identify products that eliminate or minimize contributions to asthma and other respiratory irritations. Efforts included developing outreach materials targeted at students, teachers, administrative staff, and maintenance workers in elementary and middle schools. Mr. Bottimore worked with a team of Versar staff to develop a series of outreach materials (brochures/pamphlets, communications strategies, case studies, Web site content, and other tools). The brochures and fact sheets include "Summary of Public Schools K-12 Purchasing Behavior," "Healthy Indoor Painting Practices," "Fact Sheet on Cleaning Product Selection and Use," and "Helping Schools Procure Products and Services to Create a Better Indoor Environment for Children." These outreach materials have been used at meetings and have been distributed to communities as they begin their pilot projects.

Mr. Bottimore prepared numerous outreach and risk communication documents for the Environmental Monitoring and Assessment Program (EMAP). Many of these products were technology transfer documents intended to make information available to other EPA offices, other Federal agencies, the Regions, the scientific community, and the public. Under a series of work assignments over five years, Mr. Bottimore developed outreach materials, such as fact sheets, brochures, speeches, briefing packages, and posters. In addition to fact sheets that introduced EMAP and its regional component R-EMAP, he drafted four Reports to Congress, several interagency newsletters, and other brochures to educate nontechnical audiences on EMAP's monitoring activities, assessments, and products. Mr. Bottimore also assisted with scripting and producing videotapes to communicate EMAP's complex science to general audiences. He produced a 20-minute videotape, *EMAP: America's Ecological Report Card*, as a tool to communicate a complex scientific research program to general audiences of Congress, other Federal agencies, and the public. Much of the footage and information presented addressed water quality issues and impacts to aquatic resources. Mr. Bottimore collaborated with another Versar employee in conceptualizing and scripting the videotape, which emphasized the importance of a multimedia ecological monitoring for policy-relevant decision making. Versar supervised extensive filming of monitoring and research activities in the field as well as the editing of the final video tape.

Publications

Journal Articles

Bottimore, D.P., F.W. Kutz, and E.W. Bretthauer. 1989. Accomplishments of the NATO/CCMS Pilot Study on International Information Exchange on Dioxins and Related Compounds. Toxicol. Env. Chem. 26:111-122.

Bottimore D.P., F.W. Kutz, E.W. Bretthauer, and D.N. McNelis. 1988. Availability of International Information Exchange Publications. Chemosphere 17:11:8-11.

Bretthauer, E.W., F.W. Kutz, and D.P. Bottimore. 1990. Exposure Assessment Research at EPA. Chapter in Total Exposure Assessment Methodology: A New Horizon. Pittsburgh, Pennsylvania. Air and Waste Management Association, p. 1-5.

Fairbrother, A., K Sappington, R Wentsel, C Menzie, D Bottimore, P Downey, L Haber, I Harding-Barlow, M Nelson, K Thornton. Principles for Metals Risk Assessment USEPA Framework. Presented at the Society for Risk Analysis Annual Conference, December 2006, Baltimore, MD.

Kutz, F.W., D.G. Barnes, and D.P. Bottimore. 1990. The Toxicity Equivalency Factor (TEF) Method: Decision Criteria for Determining Applicability. Proceedings of Dioxin '90. September 1990.

Kutz, F.W., D.G. Barnes, D.P. Bottimore, H. Greim, and E.W. Bretthauer. 1989. The I-TEF Method for Estimating Risks Associated with Exposures to Complex Mixtures of Dioxins and Related Compounds. Toxicol. Env. Chem. 26:99-109.

Kutz, F.W., D.G. Barnes, D.P. Bottimore, H. Greim, and E.W. Bretthauer. 1990. The International Toxicity Equivalency Factor (I-TEF) Method of Risk Assessment for Complex Mixture of Dioxins and Related Compounds. Chemosphere 20:7-9, 751-757.

Kutz, F.W., D.G. Barnes, D.P. Bottimore, and E.W. Bretthauer. 1990. The Toxicity Equivalency Factor (TEF) Method for Estimating Risks Associated with Exposures to Complex Mixtures. Chapter in Total Exposure Assessment Methodology: A New Horizon. Pittsburgh, Pennsylvania. Air and Waste Management Association, p. 619-629.

Kutz, F.W. and D.P. Bottimore. 1987. A Project for International Information Exchange on Dioxins, Furans, and Related Chemicals. Chemosphere 16:10-12.

Kutz, F.W., D.P. Bottimore, E.W. Bretthauer, and D.N. McNelis. 1989. International Information Exchange Activities on Dioxins. Chemosphere 18:1-6.

Kutz, F.W. and D.P. Bottimore, eds. 1988. Proceedings of Symposium Seminar on Prospective Research and Regulatory Issues Involving Dioxins and Related Compounds. Chemosphere 17:11:1-67.

Kutz, F.W., D.P. Bottimore, and E.W. Bretthauer. 1988. Prospective Dioxin Research and Regulatory Issues in the United States. Chemosphere 17:11:63-67.

Kutz, F.W., D.P. Bottimore, and E.W. Bretthauer. 1990. Prospective Research and Regulatory Issues Involving Dioxins and Related Compounds in the U.S. Proceedings of Dioxin '90. September 1990.

Kutz, F.W., D.P. Bottimore, and E.W. Bretthauer. 1990. The I-TEF Method of Risk Assessment. Toxicol. Environ. Chem. 26:99-109. 1990.

Kutz, F.W., P.A. Wood, and D.P. Bottimore. Monitoring Your Safety: Toxic Chemicals in Our Environment. Amer. Nurseryman, March 15, 1989.

Kutz, F.W., P.A. Wood, and D.P. Bottimore. 1990. Organochlorine Pesticides and PCBs in Human Adipose Tissue. Reviews of Environ. Contamination and Toxicology, Vol. 120:1-82. 1990.

Kutz, F.W., P.H. Wood, and D.P. Bottimore. 1990. Organochlorine Pesticides and Polychlorinated Biphenyls in Human Adipose Tissue. Proceedings of Dioxin '90. September 1990.

Lorber M, Shapiro P, Bottimore D., Schwartz S, Peck C, Meng D. 1999. A risk assessment tool for the metal finishing industry. Pages 31-19 in, Proceedings: The AESF/EPA Conference for Environmental Excellence. Held Jan 24-27, 1999, at Lake Buena Vista, FL. Published by, AESF, 12644 Research Parkway, Orlando, FL 32826-3298.

Lorber M, Schweer G, Schwartz S, Peck C, Bottimore D, Shapiro P. 2000. EPA's metal finishing facility risk screening tool (MFFRST) Part 1: Status and Update. Pages 13-28 in, Proceedings: The AESF/EPA Conference for Environmental Excellence. Held Jan 17-29, 2000, in Orlando, Florida. Published by, AESF, 12644 Research Parkway, Orlando, FL. 32826-3298.

Skinner, J.H., F.W. Kutz, and D.P. Bottimore. 1991. The Environmental Monitoring and Assessment Program: National and Global Perspectives. Presented at National Environmental Information Conference. Philadelphia, PA. December 1991.

Skinner, J.H., F.W. Kutz, and D.P. Bottimore. 1991. The Expanded Role of Entomology in Environmental Research. Progress and Perspectives for the 21st Century, 1991.

NATO/CCMS Reports

Barnes, D.G., F.W. Kutz, D.P. Bottimore, D. Grant, H. Greim, and J. Wilson. 1988. Report No. 176. International Toxicity Equivalency Factor (I-TEF) Method of Risk Assessment for Complex Mixtures of Dioxins and Related Compounds. North Atlantic Treaty Organization/Committee on the Challenges of Modern Society. October 1988.

Bottimore, D.P., F.W. Kutz, and E.W. Bretthauer. 1988. Report No. 169. Inventory of Regulations and Statutes Concerning Dioxins and Related Compounds. North Atlantic Treaty Organization/Committee on the Challenges of Modern Society. October 1988.

Bottimore, D.P., F.W. Kutz, and E.W. Bretthauer. 1988. Report No. 168. Listing of Analytical Centers with Expertise in the Detection of Dioxins and Related Compounds. North Atlantic Treaty Organization/Committee on the Challenges of Modern Society. October 1988.

Kutz, F.W. and D.P. Bottimore, eds. 1988. Report No. 179. Proceedings of Symposium Seminar on Prospective Research and Regulatory Issues Involving Dioxins and Related Compounds. North Atlantic Treaty Organization/Committee on the Challenges of Modern Society. October 1988.

McNelis, D.N., F.W. Kutz, D.P. Bottimore, and E.W. Bretthauer. 1987. Report No. 166. Dioxins and Related Chemicals--Research and Analytical Centers. North Atlantic Treaty Organization/Committee on the Challenges of Modern Society. October 1987.

McNelis, D.N., E.W. Bretthauer, F.W. Kutz, D.P. Bottimore, and S.J. Duda. 1989. Report No. 170. International Exchange of Research and Technology Information on Dioxins and Related Compounds. North Atlantic Treaty Organization/Committee on the Challenges of Modern Society. December 1989.

Safe, S.H., F.W. Kutz, and D.P. Bottimore. 1988. Report No. 178. Scientific Basis for the Development of the International Toxicity Equivalency Factor (I-TEF) Method of Risk Assessment for Complex Mixtures of Dioxins and Related Compounds. North Atlantic Treaty Organization/Committee on the Challenges of Modern Society. December 1988.

Books

Bretthauer, E.W., H.W. Kraus, A. di Domenico, O. Hutzinger, F.W. Kutz, and D.P. Bottimore, eds. 1992. Dioxin Perspectives: Accomplishments of the Pilot Study on International Information Exchange on Dioxins and Related Compounds. Plenum Publishing Corporation.

EPA Reports

Barnes, D.G., F.W. Kutz, and D.P. Bottimore. 1989. Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans (CDDs and CDFs) and 1989 Update. EPA/625/3-89/016. March 1989.

Bottimore, D., Southerland, M., Wood, P., and Doherty, A. 1997. An Environmental Characterization of the District of Columbia - A Scientific Basis for An Environmental Agenda. U.S. EPA Office of Research and Development. EPA 903-R-97-027.

U.S. EPA. 1987. Onsite Engineering Report for Horsehead Resource Development Co. Inc., Palmerton, Pa., for K061. U.S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C. 20460.

U.S. EPA. 1988. Onsite Engineering Report for Waterways Experiment Station for K061. U.S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C. 20460.

U.S. EPA. 1988. Best Demonstrated Available Technology (BDAT) Background Document for K001.

U.S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C. 20460.

U.S. EPA. 1988. Best Demonstrated Available Technology (BDAT) Background Document for K061. U.S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C. 20460.

U.S. EPA. 1990. Best Demonstrated Available Technology (BDAT) Background Document for K061 Wastewaters. U.S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C. 20460.

U.S. EPA. 1993. The Environmental Monitoring and Assessment Program. U.S. Environmental Protection Agency, Office of Research and Development. Washington, D.C. 20460. EPA/620/–93/001.

U.S. EPA. 1993. Introducing the Regional Environmental Monitoring and Assessment Program (R-EMAP). U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C. 20460. EPA/620/–93/002.

U.S. EPA. 1994. EMAP: Progress in Developing America's Ecological Report Card. U.S. Environmental Protection Agency. Office of Research and Development, Washington, D.C. 20460. EPA/620/R-93/011.

U.S. EPA. 1994. Peer Review Workshop Report on Ecological Risk Assessment Issue Papers. U.S. Environmental Protection Agency, Office of Research and Development, Risk Assessment Forum, Washington, D.C. 20460. EPA/630/R-94/008.

U.S. EPA. 2000. Baltimore Community Environmental Partnership Air Committee Technical Report - Community Risk Based Air Screening: A Case Study in Baltimore, MD. Office of Pollution Prevention and Toxics. Washington, DC. EPA/744/R-00/045.

U.S. EPA. 2000. Characterization of Data Uncertainty and Variability In IRIS Assessments Pre-pilot vs Pilot/post-pilot. U.S. EPA National Center for Environmental Assessment .Washington, DC. http://oaspub.epa.gov/eims/eimscomm.getfile?p_download_id=4538

U.S. EPA. 2000. Expert Peer Review of Research Report: The Risk Assessment of Mixtures of Disinfection Byproducts (DBPs) for Drinking Water Treatment Systems. U.S. EPA National Center for Environmental Assessment. Cincinnati, OH.

U.S. EPA. 2000. Scientific Peer Review Meeting to Review Draft Guidance Document on Ecological Soil Screening Levels. U.S. EPA National Center for Environmental Assessment. Washington, DC. Available at http://www.epa.gov/superfund/programs/risk/ecorisk/peerrev.pdf

U.S. EPA. 2000. Peer Review Meeting Summary Report: Expert Panel Meeting to Review Reference Dose Derivation (RfD) of Methylmercury. U.S. EPA National Center for Environmental Assessment Washington, DC. EPA/630/R-03/001

U.S. EPA. 2001. Environmental Loadings Profile for Cook County, IL, and Lake County, IN. U.S. EPA, Office of Pollution Prevention and Toxics. Washington, DC. EPA/747-R-01-002.

U.S. EPA. 2001. The Metal Finishing Facility Risk Screening Tool (MFFRST): Technical Documentation and User's Guide. U.S. EPA National Center for Environmental Assessment Washington, DC. July 2001. EPA/600/R-01/057.

U.S. EPA. 2001. Maryland Agriculture and Your Watershed. U.S. EPA Region 3. Philadelphia, PA. EPA/903/R-00/009.

U.S. EPA. 2001. Summary Report of the Peer Consultation Workshop on the Draft Framework for Cumulative Risk Assessment. U.S. EPA National Center for Environmental Assessment. Washington, DC. EPA/630/R-01/005.

U.S. EPA. 2001. Exploration of Perinatal Pharmacokinetic Issues. U.S. EPA National Center for Environmental Assessment. Washington, DC. EPA/630/R-1/004.

U.S. EPA. 2001. Exploration of Aging And Toxic Response Issues. U.S. EPA National Center for Environmental Assessment. Washington, DC. EPA/630/R-1/003.

U.S. EPA. 2002. DBP Biomarkers Peer Review Workshop Report. U.S. EPA National Center for Environmental Assessment. Cincinnati, OH.

U.S. EPA. 2002. Peer Consultation Workshop on Approaches to Polycyclic Aromatic Hydrocarbon (PAH) Health Assessment. U.S. EPA National Center for Environmental Assessment. Washington, DC. EPA/R-02/005.

U.S. EPA. 2002. EPA's Global Climate Meeting: Lessons Learned in the National Assessment of the Potential Consequences of Climate Change. U.S. EPA National Center for Environmental Assessment. Washington, DC.

U.S. EPA. 2002. Summary Report of the Technical Peer Review Workshop on the EPA Risk Assessment Forum Draft Framework for Cumulative Risk Assessment. U.S. EPA National Center for Environmental Assessment. Washington, DC. EPA/630/R-03/002.

U.S. EPA. 2002. Summary Report of the Technical Peer Review Workshop on the Draft Document Titled A Review of the Reference Dose and Reference Concentration Processes. U.S. EPA National Center for Environmental Assessment. Washington, DC. EPA/630/R-03/001.

U.S. EPA. 2003. Summary Report of the U.S. EPA Technical Peer Review Meeting on the Draft Document Entitled: Exposure and Human Health Evaluation of Airborne Pollution from the World Trade Center Disaster. U.S. EPA National Center for Environmental Assessment. Washington, DC. EPA/600/R-03/142.

U.S. EPA. 2004. Community Air Screening How-To Manual - A Step-by-Step Guide to Using a Risk-Based Approach to Identify Priorities for Improving Outdoor Air Quality. Office of Pollution Prevention and Toxics. Washington, DC. EPA 744-B-04-001.

Versar. 2003. Summary Report of the EPP Workshop on Global Change and Protected Areas. Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment. April 7-8, 2003.

Versar. 2003. Issue Paper on Priority-Setting Criteria for IRIS Agenda. Prepared by Versar for Integrated Risk Information System (IRIS) Program. U.S. Environmental Protection Agency. February 27, 2003.

Versar. 2003. Summary of Stakeholder Workshop on Priority-Setting Criteria for the IRIS Agenda. Prepared by Versar for Integrated Risk Information System (IRIS) Program. U.S. Environmental Protection Agency. May 23, 2003.

Versar. 2003. Summary Report of the U.S. EPA Internal Workshop on the Use of Mechanistic Data in Risk Assessment. Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment. August 26, 2003.

Versar. 2004. Summary Report of the **"**Peer Involvement Workshop on the Preliminary Draft Framework for Metals Risk Assessment.**"** Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment. September 28, 2004.

Versar. 2004. Summary Report of the Biosolids Problem Formulation Meeting. Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment, Cincinnati. April 15, 2004.

Versar. 2005. Summary Report of the Expert Peer Review of "Application of PBPK Modeling in Human Health Risk Assessment**."** Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment, Cincinnati. August 21, 2005.

Versar. 2005. Summary Report of the Panel Peer Review of the Draft NCEA Document "Approaches for the Application of Physiologically Based Pharmacokinetic Models and Supporting Data in Risk Assessment." Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment. December 5, 2005.

Versar. 2006. Summary Report of the Peer Review Workshop on the *Nanotechnology White Paper: External Review Draft*. Prepared by Versar for U.S. Environmental Protection Agency, Office of the Science Advisor. July 7, 2006.

Versar. 2006. Summary Report of the Peer Review Teleconference on Harmonization in Interspecies Extrapolation: Use of BW3/4 as Default Method in Derivation of the Oral RfD. Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment. August 24, 2006.

Versar. 2007. Summary Report of the Panel Peer Review of the Draft NCEA Document "Approaches to Estimating the Waterborne Disease Outbreak Burden in the United States: Uses and Limitations of the Waterborne Disease Outbreak Surveillance System." Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment. February 2, 2007.

Versar. 2007. Summary Report of the U.S. EPA Workshop on: Challenges to Integrating Immunotoxicological and Microbial Risk Assessment for Susceptible Populations and Life Stages. Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment. May 24, 2007.

Versar 2008. Summary Report of the U.S. EPA External Peer Review Meeting on the Toxicological Review of 1,2,3-Trichloropropane. Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment, April 16, 2008.

Versar 2008. Summary Report of the U.S. EPA External Peer Review Meeting on the Toxicological Review of 2-Hexanone. Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment, June 5, 2008.

Versar 2008. Summary Report of the U.S. EPA External Peer Review Meeting on the Toxicological Review of Chlordecone (Kepone). Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment, May 5, 2008.

Versar, 2008. Summary Report of the External Peer Review Meeting on the U.S. EPA Draft Nanomaterial Research Strategy (NRS). Prepared by Versar for U.S. Environmental Protection Agency, Office of Research and Development. June 13, 2008.

Versar 2008. Summary Report of the U.S. EPA External Peer Review Teleconference on the Toxicological Review of Propionaldehyde. Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment, June 11, 2008.

Versar 2008. Summary Report of the U.S. EPA External Peer Review Panel Meeting on the Toxicological Review of Cerium Oxide and Cerium Compounds. Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment, July 25, 2008.

Versar 2008. Summary Report of the U.S. EPA External Peer Review Meeting on the Toxicological Review of Beryllium. Prepared by Versar for U.S. Environmental Protection Agency, National Center for Environmental Assessment, August 4, 2008.

Teri D. Schaeffer

EDUCATION:

Virginia Polytechnic Institute and State University
B.S. Biology, 1986

EXPERIENCE SUMMARY: Total Years' Experience 33

Ms. Schaeffer has more than thirty years of relevant experience in the field of environmental risk assessment. Ms. Schaeffer has executed both human health and ecological risk assessments for more than 12 military installations across the United States (OK, OH, VA, MD, CO, MI, and NC) and Greenland. Her experience involves a number of baseline human health risk assessments (BHHRA) conducted in accordance with RCRA corrective action and CERCLA remedial action activities along with USACE's Risk Assessment Handbook, Volume I: Human Health Evaluation, EPA's Risk Assessment Guidance for Superfund (RAGS), as well as other appropriate EPA and state-specific guidelines for risk assessments. The BHHRAs address hazard identification, toxicity assessment, exposure assessment, risk characterization, and uncertainty analysis. In addition to her site-specific risk assessment experience, Ms. Schaeffer is currently a Team Leader overseeing U.S. EPA tasks related to systematic review of TSCA (CS21) existing chemicals selected for risk evaluations. Her additional responsibilities include estimating aggregate human exposures by analyzing individual exposure scenarios to a variety of chemicals found in consumer products.

TECHNICAL EXPERIENCE:

Performance-Based Remediation LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Risk Assessor. Baseline human health and ecological risk assessments were performed as part of the remedial investigation for LF512 Building 30013 Sump Pit Area at Wright-Patterson Air Force Base. Ms. Schaeffer was responsible for conducting the human health risk assessment by evaluating current and potential future human health risks posed by the COPCs present at the site in soil and groundwater media. She identified exposure pathways and quantified potential risks from exposure to LF512 site media and other stressors. The human health risk assessment was conducted following the protocols from USEPA guidance and supplementary guidance (including Risk Assessment Guidance for Superfund Part A [1989], Part D [2001], Part E [2004], and Part F [2009]; as well as Ohio EPA guidance (2009).

Performance-Based Remedial Investigation/Site Characterization for TS899, Former Skeet and Trap Ranges, Wright-Patterson Air Force Base - Dayton, Ohio, United States

Risk Assessor. Determine the extent of PAH contamination throughout the 15.5 acre area of TS899. Determine the nature and extent of PAH contamination within the sediment of Hebble Creek. Evaluate up-stream locations via windshield survey to identify on-base source areas of PAH contamination that may be contributing to the observed PAH contamination in the sediment of Hebble Creek. Perform a risk assessment to determine if these affected soil and sediment areas pose a risk or hazard to current or future human and ecological receptors. Currently performing a human health risk assessment using soil and sediment data from the TS899, former skeet and trap ranges, site at Wright-Patterson Air Force Base. Assessing potential health impacts to humans considering current uses of the site. The HHRA will be conducted in accordance with guidance provided in USACE's Risk Assessment Handbook, Volume I: Human Health Evaluation (1999) and EPA's Risk Assessment Guidance for Superfund (RAGS), as well as other appropriate EPA and Ohio Department of Environmental Quality (ODEQ) guidelines for risk assessment.

Remedial Investigation for Area A, Performance-based Remediation for Tinker AFB, Air Force Center for Engineering and the Environment (AFCEE), Oklahoma, United States

Human Health Risk Assessor. .Evaluate human health risk and ecological risk, as applicable, for the three sites within Area A. Currently working on conducting a human health risk assessment and ecological risk assessment for three sites with Area A of Tinker Air Force Base. The HHRA and ERA are being performed in accordance with guidance provided in EPA's Risk Assessment Guidance for Superfund (RAGS), as well as other appropriate EPA and Oklahoma Department of Environmental Quality (Oklahoma DEQ) guidelines for risk assessment.

Draft Final Remedial Investigation Report for Buckley Air Force Base – East Industrial Area - 5 Sites - Aurora, Colorado, United States

Risk Assessor. A baseline risk assessment was performed for five sites in the East Industrial Area to determine whether constituents in soil and groundwater might pose a threat to human health or the environment. The baseline risk assessment includes a human health risk assessment (HHRA) and an ecological risk assessment (ERA). The HHRA provides a baseline evaluation of current or potential threats to human health under existing or anticipated future conditions from historical chemical releases in the East Industrial Area at Buckley AFB. The ERA was conducted for the sites in the East Industrial Area having viable ecological habitat. Assisted with addressing EPA Region 8 risk assessment comments on the draft final Remedial Investigation Report for Buckley Air Force Base – East Industrial Area dated March 2013. Helped with issues concerning the analysis of total versus filtered metals from turbid groundwater samples, the comparison of site concentrations of metals and PAHs to background concentrations and estimating the change in overall risk to future residential receptors with the addition of three contaminants of potential concern.

Draft Final Remedial Investigation Report for Buckley Air Force Base – East Industrial Area - 3 Sites - Aurora, Colorado, United States

Risk Assessor. A baseline risk assessment was performed for three sites in the East Industrial Area to determine whether constituents in soil and groundwater might pose a threat to human health or the environment. The baseline risk assessment includes a human health risk assessment (HHRA) and an ecological risk assessment (ERA). The HHRA provides a baseline evaluation of current or potential threats to human health under existing or anticipated future conditions from historical chemical releases in the East Industrial Area at Buckley AFB. The ERA was conducted for the sites in the East Industrial Area having viable ecological habitat. Performed a human health risk assessment using newly collected groundwater samples combined with samples from previous collections and incorporated the new results into an existing report for the 3 sites located within the East Industrial Area of Buckley AFB. Also incorporated changes in the 3-site report which were noted in the EPA Region 8 risk assessment comments on the draft final Remedial Investigation Report for Buckley Air Force Base – East Industrial Area - 5 Sites dated March 2013.

Draft Remedial Investigation / Risk Assessment for the Former Manassas Air Force Communications Facility, Independent Hill, Virginia, US Army Corps of Engineers, Norfolk District

Performed Human Health Risk Assessment (BHHRA). Completed the RI for the MAFCF site. All field investigations and data reporting activities performed in accordance with the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (U.S. EPA, October 1988). Provided technical labor and equipment resources necessary to perform the tasks outlined. Assessed potential health impacts to humans considering both the current and future uses of the site. The BHHRA was conducted in accordance with guidance provided in USACE's Risk Assessment Handbook, Volume I: Human Health Evaluation (1999) and EPA’s Risk Assessment Guidance for Superfund (RAGS), as well as other appropriate EPA and Virginia Department of Environmental Quality (VDEQ) guidelines for risk assessment. The deliverable consisted of a written RI report addressing hazard identification, toxicity assessment, exposure assessment, risk characterization, and uncertainty analysis.

Tinker AFB Performance-Based Remediation Contract, Air Force Center for Engineering and the Environment (AFCEE), Oklahoma, United States

Human Health Risk Assessor. Military Munitions Response Program (MMRP) Sites TS090 and TS093. Site-Specific Human Health Risk Assessment for Polycyclic Aromatic Hydrocarbons at Two Former Skeet Ranges at Tinker AFB, Oklahoma, to Support Selection of Non-Time Critical Removal Action (non-TCRA) Clean-up Criteria. Performed a site-specific human health risk assessment (SSHHRA) to assess potential health impacts to humans considering future uses of the site (lifetime residential). The SSHHRA was conducted in accordance with guidance provided in USACE's Risk Assessment Handbook, Volume I: Human Health Evaluation (1999) and EPA’s Risk Assessment Guidance for Superfund (RAGS).

Remedial Investigation/Feasibility Study Site SS-09, DPDO Hazardous Waste Storage Area-Seymour Johnson AFB, U.S. Department of the Army Corps of Engineers - Omaha District - , North Carolina, United States

Human Health Risk Assessor. Update the 2002 human health risk assessment. Updated the human health risk assessment conducted in 2002 for Site SS-09 at Seymour Johnson Air Force Base in North Carolina. The site is a former hazardous waste storage area where drums were stored. The site has undergone active remediation for chlorinated VOCs in groundwater. The existing HHRA was updated by including future residential use scenario and conducted in accordance with guidance provided in USACE's Risk Assessment Handbook, Volume I: Human Health Evaluation (1999) and EPA’s Risk Assessment Guidance for Superfund (RAGS).

Remedial Investigation (RI) of the Fort Monroe Building 204/205 Area at Hampton, Virginia, US Army Corps of Engineers, Norfolk District, Virginia, United States

Provided editorial support for both the human health and ecological risk assessment sections of the RI report. Versar was tasked to perform a remedial investigation of the Fort Monroe Building 204/205 area at Hampton, VA. Tasked to provide editorial support for both the human health and ecological risk assessment sections of the RI report. Was also responsible for coordinating all changes and delivery of these sections to the client for review.

Defense Supply Center Richmond (DSCR) Bldg. 74, Department of Defense (DOD)

Performed data validation analysis and performed human health risk assessment. Performed data validation analysis following guidelines presented in the HQ Air Force Center for Environmental Excellence (AFCEE) Technical Services Quality Assurance Program Quality Assurance Project Plan (QAPP). Identified toxicity values for chemicals of potential concern and ran the exposure point concentrations through the Virginia Department of Environmental Quality's Risk Exposure Analysis Modeling System (REAMS) to calculate the human health hazard quotients and carcinogenic risks for commercial/industrial worker and residential exposure pathway receptors. Assisted with the final assessment report.

Norfolk Naval Shipyard - Richmond, Virginia, United States

Performed human health risk assessment. Performed a statistical comparison of site-related data to background data. Identified toxicity values for the chemicals of potential concern (COPCs) and ran the exposure point concentrations (EPCs)through the Virginia Department of Environmental Quality's (VDEQ) Risk Exposure Analysis Modeling System (REAMS) to calculate the human health hazard quotients and carcinogenic risks for commercial/industrial worker and residential exposure pathway receptors. Assisted with final assessment report.

Naval Weapons Station (NWS) Yorktown Bldg. 402, Department of Defense (DOD) - , Virginia, United States

Performed human health risk assessment. Applied expertise to human health risk assessments by performing a statistical comparison of site-related data to background data. Identified toxicity values for the chemicals of potential concern and ran the exposure point concentrations through the Virginia Department of Environmental Quality's Risk Exposure Analysis Modeling System (REAMS) to calculate the human health hazard quotients and carcinogenic risks for commercial/industrial worker and residential exposure pathway receptors. Assisted in writing the final assessment reports.

Exposure/Risk Assessment-Wurtsmith Air Force Base, Wurtsmith Air Force Base, Department of Defense (DOD), Michigan, United States

Human Health Risk Assessment and coauthor of final report. Conducted a human health risk assessment for Wurtsmith Air Force Base using surface soil data. This involved a statistical analysis of the data, quantification of chemical intakes, and calculation of inhalation, dermal and incidental ingestion carcinogenic risks for current and future commercial/industrial workers, visitors, and future construction workers. Also assisted in writing the final assessment reports.

Human Health Risk Assessment-Thule AFB, Thule Air Force Base, Department of Defense (DOD) - , Greenland

Conducted human health risk assessment and coauthored final assessment reports. Conducted a human health risk assessment for Thule Air Force Base. Evaluated human health risks for a variety of media, exposure pathways, receptors and chemical of potential concern. Assisted in writing final assessment reports.

Preparation of Consumer, General Population, and Environmental Exposure Assessments for EPA's Existing Chemicals Programs, OPPTS/EPA

Team leader providing technical support for Existing Chemicals Program. Assessing chemicals on the TSCA (CS21) Inventory. Supporting consumer, general population, and environmental exposure assessments for human health and ecological risk assessments by assisting EPA with the collection, generation, evaluation, analysis or use of environmental data to complete tasks within all phases of the risk assessment process (i.e., Scoping, Characterization, and Assessment). Implementing updated systematic review methods involving full-text screening, data evaluation, data extraction and data summaries. Continuing support for use of systematic review tools such as HEROnet and DistillerSR software to aid in the organization, screening, evaluating, and extracting of literature search retrievals. Support for development and enhancements of OPPT's tools and methodologies.

Exposure Assessments for Toxic Substances (EATS) OPPTS/EPA

Technical support for Existing Chemicals Program. Assessing chemicals on the TSCA (CS21) Inventory. Supporting consumer, general population, and environmental exposure assessments for human health and ecological risk assessments by developing methods concerning literature search strategies, full-text screening, data evaluation, data extraction and data summaries. Proficient using Distiller and Hero software to aid in the screening and organization of literature search retrievals. Support for development and enhancements of OPPT's tools and methodologies. Supporting the development, design, and implementation of EPA/OPPT's ReachScan model. The ReachScan exposure assessment model will replace the surface water release and exposure calculations currently being performed within the EFAST2/NCEM2 models. Developing the facility and stream flow database that will be used as a part of the ReachScan model. Compiling the most up-to-date facility, reach, and stream flow data. When complete the ReachScan model will work on the IGEMS web-based platform.

Data Validation Analysis - Plattsburg Air Force Base, Department of Defense (DOD)

Performed data validation analysis using AFCEE Technical Services QAPP. Performed a data validation analysis for samples collected from Oceana Naval Air Station following the guidelines presented in the HQ Air Force Center for Environmental Excellence (AFCEE) Technical Services Quality Assurance Program Quality Assurance Project Plan (QAPP).

Naval Air Station (NAS) Oceana Buildings 1110 and 1112, Department of Defense (DOD) - , Virginia, United States

Performed data validation analysis. Responsible for conducting a data validation analysis on sample data collected from Oceana Naval Air Station following the guidelines presented in the HQ Air Force Center for Environmental Excellence (AFCEE) Technical Services Quality Assurance Program Quality Assurance Project Plan (QAPP).

Technical Support for Human Health Risk Assessment - Lowery AFB, Lowery Air Force Base, Department of Defense (DOD) - Denver, Colorado, United States

Collected fate and transport information for COPCs. Researched and compiled fate and transport information for a list of 58 chemicals of potential concern (COPCs).

SPECIALIZED TRAINING/CONTINUING EDUCATION:

- Operation of the Finnigan Mat 5100 Series GC/MS System Seminar
- Basic Supervision Seminar
- Chemical/Toxicological/TOXNET Databases Training
- Project Management Training
- Contractor TSCA DCO Training

Associated Diplomas

Virginia Commonwealth University

1838

In recognition of the successful completion of the required course of study, the Board of Visitors and the President of the University, by virtue of the authority vested by the Commonwealth of Virginia, hereby confer upon

Laura Elizabeth Williams

the degree of

Master of Science
Environmental Studies

with all the rights, honors, distinctions, and privileges thereto appertaining.

In testimony whereof we have caused the seal of the University and the signatures of the duly authorized officials to be hereunto affixed on this twenty-second day of December, in the year two thousand and twelve.

F. Douglas Boudinot
Dean, The Graduate School

Michael Rao
President of the University

John C. Doswell
Rector of the Board of Visitors

LEGES SINE MORIBUS VANAE

VNIVERSITAS PENNSYLVANIENSIS

OMNIBVS HAS LITTERAS LECTVRIS SALVTEM DICIT

Cum academiis antiquus mos sit scientiis litterisve
humanioribus excultos titulo iusto condecorare
nos igitur auctoritate Curatorum nobis commissa

DAVID BOTTIMORE

ob studia a Professoribus approbata ad gradum

BACHELOR OF SCIENCE IN ENGINEERING
CHEMICAL ENGINEERING

admisimus eique omnia iura honores privilegia ad hunc
gradum pertinentia libenter concessimus
Cuius rei testimonio nomina nostra die mensis
Maii XIX Anno Salutis MCMLXXXVI et Vniversitatis
conditae CCXLVI Philadelphiae subscripsimus

PRAESES

E D Glandt
DECANVS

Leslie Laird Kruhly
SIGILLI CVSTOS

Virginia Polytechnic Institute and State University

The Board of Visitors of the Virginia Polytechnic Institute and State University has conferred upon

Teri Deanne Schaeffer

upon the recommendation of the Faculty, the degree of

Bachelor of Science

Biology

with all the rights, privileges and honors pertaining thereto. In testimony whereof, the undersigned, by authority vested in them, have hereunto affixed their signatures and the seal of the University at Blacksburg, Virginia this twenty-ninth day of August, nineteen hundred and eighty-six.

A. F. Giacco
Rector

W. E. Lavery
President

M. Bauer
Dean

Sample Risk Assessment

FINAL

REMEDIAL INVESTIGATION

LF512 BUILDING 30013 SUMP PIT AREA
WRIGHT-PATTERSON AIR FORCE BASE, DAYTON, OHIO

Performance-Based Remediation
Worldwide Environmental Restoration and Construction Contract (WERC 09)
Contract Number: FA8903-09-D-8588
Task Order 0004
Sub-CLIN 0009FK

Prepared For:

Air Force Civil Engineer Center
2261 Hughes Avenue, Suite 163
Lackland Air Force Base, Texas 78236-9853
and
88th Air Base Wing
Environmental Branch (CEIE)
Wright-Patterson Air Force Base, Ohio 45433

Prepared By:

Versar, Inc.
6850 Versar Center
Springfield, Virginia 22151

MAY 2020

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (CONTINUED)

Section **Page**

LIST OF FIGURES

LIST OF TABLES

APPENDICES

ACRONYMS

AB	ambient blank
ABS	absorption factor
ABS_{GI}	absorbed from gastrointestinal tract
ABW	Air Base Wing
ADD	average daily dose
AFCEC	Air Force Civil Engineer Center
AFLCMC	Air Force Life Cycle Management Center
AFMC	Air Force Materiel Command
APTIM	APTIM Federal Services, LLC
AT-C	carcinogenic averaging time
AT-NC	non-cancer averaging time
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes (*m*-, *o*-, and *p*-xylene)
BUSTR	Bureau of Underground Storage Tank Regulations
BW	body weight
BWSC	Barge, Waggoner, Sumner & Cannon, Inc.
CAP	corrective action plan
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CH2M	CH2M Hill Ohio
cis12DCE	cis-1,2-dichloroethene
CLP	Contract Laboratory Program
COC	chemical of concern
COCR	chain of custody record
COI	chemical of interest
COPC	chemical of potential concern
CR	cancer risk
DA-event	dose per event
DELAP	Department of Defense Environmental Laboratory Accreditation Program
DERR	[Ohio Environmental Protection Agency] Division of Environmental Response and Revitalization
DO	dissolved oxygen
DoD	Department of Defense
DPT	direct-push technology
DRO	diesel range organics
EB	equipment blank
EC_{air}	exposure concentration in air
ED	exposure duration
EDD	electronic data deliverable
EF	exposure frequency
EPC	exposure point concentration
ERPIMS	Environmental Restoration Program Information Management System
ERA	ecological risk assessment
ESI	Engineering-Science, Inc.

ET	exposure time
FI	fraction ingested
FS	feasibility study
GC/MS	gas chromatograph/mass spectrometer
GRO	gasoline range organic
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
ID	identification
IDW	investigation-derived waste
Inh	inhalation rate
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
IR-S	soil ingestion rate
Kelchner	Environmental, Inc.
LADD	lifetime average daily dose
LF512	Building 30013 Sump Pit Area
LOD	limit of detection
LOQ	limit of quantitation
MECx	MEC^{x}, Inc.
Micah	Micah Group Energy and Environmental
MCL	maximum contaminant level
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
MW	monitoring well
NAD	North American Datum
NAVD	North American Vertical Datum
OAC	Ohio Administrative Code
ODOT	Ohio Department of Transportation
OEPA	Ohio Environmental Protection Agency
OLEM	Office of Land and Emergency Management
ORO	oil range organics
ORP	oxidation reduction potential
OSWER	Office of Solid Waste and Emergency Response
OU10	Operable Unit 10
OUPS	Ohio Utility Protection Service
PAH	polynuclear aromatic hydrocarbon
PAL	project action level
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PDF	portable document format
PEF	particulate emission factor
PID	photoionization detector
Pine	Pine Environmental
PPE	personal protective equipment

PRG	preliminary remediation goal
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QSM	*Quality Systems Manual for Environmental Laboratories*, Version 5.1
RAGS	Risk Assessment Guidance for Superfund
RAIS	Risk Assessment Information System
RfC	reference concentration
RfD	reference dose
RI	remedial investigation
RIWP	remedial investigation work plan
RL	reporting limit
RME	reasonable maximum exposure
RPD	relative percent difference
R&R	R&R International, Inc.
RSL	Regional Screening Level
SA	surface area
SAIC	Science Applications International Corp.
SB	soil boring
SC	specific conductivity
SDG	sample delivery group
SF	cancer slope factor
SSAF	soil-to-skin adherence factor
SSL	soil screening level
SVOC	semi-volatile organic compound
TB	trip blank
TCE	trichloroethene
TEF	toxicity equivalency factor
t_{event}	event time
TGC	Target Groundwater Concentration
THQ	target hazard quotient
TPH	total petroleum hydrocarbon
trans12DCE	trans-1,2-dichloroethene
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
UR	unit risk
URS	URS Group, Inc.
USEPA	United States Environmental Protection Agency
UST	underground storage tank
UTL	upper tolerance limit
VC	vinyl chloride
VDEQ	Virginia Department of Environmental Quality
Versar	Versar, Inc.
VI	vapor intrusion
VISL	Vapor Intrusion Screening Level
VOC	volatile organic compound
WPAFB	Wright-Patterson Air Force Base

cm^2	square centimeter
gpm	gallon per minute
kg	kilogram
m^3	cubic meter
m^3/kg	cubic meter per kilogram
m^3/µg	cubic meter of air per microgram of chemical
mg/cm^2	milligram per square centimeter
mg/day	milligram per day
mg/kg-day	milligram per kilogram per day
$(mg/kg\text{-}day)^{-1}$	milligram contaminant intake per kilogram body weight per day
mg/L	milligram per liter
mg/m^3	milligram per cubic meter
mS/cm	millisiemen per centimeter
ppm	parts per million
µg/kg	microgram per kilogram
µg/L	microgram per liter

EXECUTIVE SUMMARY

Under the Ohio Environmental Protection Agency (OEPA) Division of Environmental Response and Revitalization (DERR) and United States Environmental Protection Agency (USEPA) Region 5 Superfund Division, a Remedial Investigation (RI) was conducted at the Building 30013 Sump Pit Area (LF512) at Wright-Patterson Air Force Base (WPAFB), Ohio. This RI conforms to the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and is structured according to CERCLA, OEPA, and the Air Force Civil Engineer Center (AFCEC) specifications for Contract No. FA8903-09-D-8588, Task Order No. 0004 (Versar, Inc. [Versar], 2012).

LF512, located north of Building 30013 (**Figure 1-2**) was the site of a former oil sump pit used to store used oils from engine maintenance operations conducted in Building 30013. The usage of the sump was discontinued in 1985 and the sump was abandoned in place by filling with sand. In 1990, visual evidence of hydrocarbon contamination was observed at the surface emanating through the asphalt from the former sump pit just north of Building 30013, across the pavement (WPAFB, 1990a), and in three existing monitoring wells at the former sump pit site. An investigation and corrective action plan (CAP) were initiated and completed in 1994; however, during the sump removal action, additional tanks and construction debris were found in the excavation area (CH2M Hill Ohio [CH2M], 1995). Affected soil associated with the 1994 excavation area at LF512 was removed to a depth of approximately 12 to 15 feet below ground surface (bgs) and replaced with clean fill.

Although the LF512 sump pit area was not identified as an Installation Restoration Program (IRP) site, it was carried forward into the 1995 Operable Unit 10 (OU10) RI for further groundwater investigation. The 1995 OU10 RI determined LF512 did not appear to be a source of volatile organic compounds (VOCs) affecting groundwater and exposure to contaminated soil appeared to be limited. While the site sump area has undergone investigation and remediation under the Ohio Bureau of Underground Storage Tank Regulations (BUSTR) program previously in 1990 through 1995, a review of existing data and information on LF512 by OEPA in March 2014 lead to a determination the site should be regulated under CERCLA and not BUSTR.

The purpose and objectives of this project were to complete RI activities to evaluate the presence, or absence of impacted soil and/or groundwater due to a release from the former sump pit at LF512, as well as former leaking underground storage tanks (USTs) discovered during the 1994 excavation activities. The RI technical approach included a field investigation to provide data to evaluate potential impacts to soil and/or groundwater. The field investigation was based on historical investigations and excavations for contaminated soil left in place.

Based on the historical release from the former sump pit at LF512 and investigations and remedial actions conducted of and for the former sump pit, as well as large-scale investigations for OU10, the preliminary target analytes included VOCs, semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH; including gasoline, diesel, and oil range organics [GRO, DRO, and ORO, respectively]), and metals. In addition, while no evidence existed to indicate the presence of pesticides, herbicides, or polychlorinated biphenyls (PCBs), these compounds could not be categorically ruled out. Therefore, these compounds were included at specific locations associated with the former sump pit to investigate or rule out their presence. Activities conducted during this RI consisted of collecting soil samples to spatially cover the historical area of contamination as well as installing three new groundwater monitoring wells. Soil samples were collected in April and May 2017 and new monitoring wells were installed in July 2017 following preliminary soil data review and consultation with OEPA and USEPA. All existing and new monitoring wells were sampled in August and November 2017. Soil and groundwater were sampled for all target analytes. After the field investigation, soil and groundwater data were used to complete a baseline human health risk and ecological risk assessment (HHRA). Based on the nature of the site, an ecological risk assessment (ERA) was not warranted.

Analytical data from field activities were screened versus May 2019 USEPA Regional Screening Levels (RSLs) for Chemical Contaminants for Industrial Soils, Tapwater, and maximum contaminant levels (MCLs). Soil samples were also screened against USEPA Risk-based Soil Screening Levels (SSLs) and MCL-based SSLs to evaluate the potential for leaching from soil to groundwater. Summaries of all detected analytical data are presented in **Tables 4-1a** through **4-1c** and **4-2a** and **4-2b**. While compounds were detected in site soil, none, except for arsenic in soil, were detected exceeding the USEPA Industrial Soil RSL. Arsenic was reported in every soil sample at concentrations ranging from 3.1 to 25.8 milligrams per kilogram (mg/kg). The only compounds detected in site groundwater exceeding the tapwater RSLs were chloroform (non-detect to 1.9 micrograms per liter [µg/L]), naphthalene (non-detect to 1.2 J- µg/L), arsenic (non-detect to 0.74 J µg/L), and thallium (non-detect to 0.20 JB µg/L). Tetrachloroethene (PCE) was reported in every site well at concentrations between 0.81 J and 10.1 µg/L and exceeded the MCL in eight of the nine monitoring wells.

To evaluate LF512 appropriately for the risk assessment, analytical data were evaluated and chemicals of potential concern (COPCs) were selected following USEPA and supplementary guidance (including Risk Assessment Guidance for Superfund [RAGS] Part A [1989], Part D [2001], Part E [2004], and Part F [2009]; OEPA guidance [2008]; and the USEPA RSLs table [2019b]). Screening was conducted separately for each media type relevant to each risk scenario and employed the most conservative approach. Site soil was subdivided into surface (0 to 2.5 feet bgs) and aggregate (0 to 15 feet bgs) intervals and evaluated separately. Due to the mostly uniform distribution of PCE reported in site groundwater and the lack of a source area, all site groundwater monitoring well data were used together. COPCs for each media type are summarized in **Table 5-6** and include:

Surface soil (0 to 2.5 feet bgs): Benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, aluminum, iron, manganese, and thallium.

Aggregate soil (0 to 15 feet bgs): Benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, aluminum, arsenic, cadmium, iron, manganese, thallium, and vanadium.

Groundwater: Chloroform, PCE, dibenzofuran, naphthalene, arsenic, manganese, mercury, and thallium.

<u>Vapor intrusion exposures modeled from groundwater data for indoor site workers:</u> PCE and mercury.

The conceptual site model (CSM) for the baseline HHRA identified human receptors based on current and hypothetical future land uses at LF512. Currently, access to the site is restricted to military personnel and civilian workers. Human receptors that may potentially be exposed to COPCs include current indoor site workers, current outdoor site workers and future construction workers. Potentially completed exposure pathways include direct contact with soil (surface and/or aggregate), inhalation of fugitive dust and outdoor volatilized chemicals from soil, and inhalation of indoor and outdoor (trench) groundwater vapors.

The potential risks to receptors at LF512 are estimated for each receptor that may come into contact with one or more of the following: soil, groundwater, and indoor vapors from groundwater vapors. The cancer risks and non-cancer hazards estimated for each exposure route for each of these receptors are summarized in **Table 5-25-**. For current and future use scenarios, the overall cumulative risks for the indoor and outdoor site and/or construction worker are below the target acceptable risk goals. In that no important ecological resources are present on site or within the locality of LF512, no ecological risk screening or assessment is warranted. As such, the site does not pose unacceptable risks to human health or the environment under current or future use scenarios.

1.0 INTRODUCTION

This report presents the results of the Remedial Investigation (RI) and baseline Human Health Risk Assessment and Ecological Risk Assessment (HHRA and ERA, respectively) for the Building 30013 Sump Pit Area (LF512) at Wright-Patterson Air Force Base (WPAFB) located in Dayton, Ohio. This RI Report addresses Ohio Environmental Protection Agency (OEPA) Division of Environmental Response and Revitalization (DERR) and United States Environmental Protection Agency (USEPA) Region 5 Superfund Division concerns associated with the potential presence of elevated contaminant concentrations detected in initial screening level investigations of the site. This RI conforms to the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and is structured according to CERCLA, OEPA, and the Air Force Civil Engineer Center (AFCEC) specifications for Contract No. FA8903-09-D-8588, Task Order No. 0004.

1.1 Investigation Objectives

The purpose and objectives of this project were to complete RI activities to evaluate the presence, or absence of impacted soil and/or groundwater due to a release from a former sump pit on site, as well as former leaking underground storage tanks (USTs) discovered during the 1994 excavation of the LF512 Building 30013 Sump Pit Area.

The RI technical approach included an on-site file review at WPAFB as part of planning and a field investigation to provide data to evaluate potential impacts to soil and/or groundwater. The field investigation was based on historical investigations and excavations for contaminated soil left in place at the site. The site sump area has undergone investigation and remediation under the Ohio Bureau of Underground Storage Tank Regulations (BUSTR) program previously in 1990 through 1995. However, a review of existing data and information by OEPA in March 2014 lead to a determination that LF512 should be regulated under CERCLA and not BUSTR (Ohio Department of Commerce [ODC], 2014). The objectives of this RI were to:

- Identify chemicals of potential concern (COPCs) at the site;
- Determine the nature and extent of site-related COPCs in soil and groundwater;
- Understand the fate and transport of COPCs in environmental media at the site;
- Identify any exposure pathways (considering both current and potential future land use); and
- Evaluate current and potential future human health and ecological risks posed by COPCs present at the site.

The general approach in conducting this RI consisted of collecting soil and groundwater samples that spatially cover the historical area of suspected contamination. This RI required the installation of additional groundwater monitoring wells to supplement existing installed monitoring wells and provide adequate spatial and downgradient coverage of the shallow aquifer on site.

The completion of a Feasibility Study (FS) is not within the scope and purpose of this contractual effort.

1.2 Site Background

This section summarizes the operational history, previous investigations, and remedial actions for LF512.

1.2.1 Site Description

WPAFB is located in Montgomery and Green counties in Ohio, approximately 60 miles north of Cincinnati, 50 miles west of Columbus, 8 miles northeast of Dayton, and adjacent to the city of Fairborn, Ohio (**Figure 1-1**). The headquarters of the Air Force Materiel Command (AFMC) is located at WPAFB. The 88th Air Base Wing (ABW) is the host unit at the base and reports to the Air Force Life Cycle Management Center (AFLCMC), a major development and acquisition product center of AFMC. WPAFB is home to more than 60 organizations, whose missions vary from acquisition and logistics management to research and development, advanced education, flight operations, and a vast array of other activities.

The base is divided into two fields, Wright Field and Patterson Field, separated by State Route 444 and Norfolk Southern railroad. The base is also divided into two administrative areas: Area A and Area B. Area A encompasses approximately 5,700 acres and consists of building complexes, active runways, and flight facilities. Area B encompasses approximately 2,400 acres and contains a complex of buildings and three runways that are no longer used for aircraft, except occasionally when aircraft are flown in for exhibition at the Air Force Museum. Current and historical operations are oriented toward industrial use, as well as research and development.

LF512, located north of Building 30013 in Area A along Van Patton Drive east of Pearson Road (**Figure 1-2**), was the site of a former oil sump pit used to store used oils from engine maintenance operations conducted in Building 30013. There are no known drawings of the former sump pit; however, its reported dimensions were 2 feet 7 inches by 2 feet 7 inches wide by 2 feet 6 inches deep, with an approximate volume of 140 to 150 gallons.

1.2.2 Site History

The former sump, constructed in 1961, was originally a concrete steam valve box (Science Applications International Corp. [SAIC], 1991) for maintenance operations conducted in Building 30013. In 1973, the steam valves and piping were removed from the concrete steam valve box and the box was subsequently converted into a sump pit. The sump pit was used to collect oils, lubricants, and fuel from maintenance operations within Building 30013. The used oils, lubricants, and fuels were manually placed into the sump. The usage of the sump was discontinued in 1985 and the sump was abandoned in place by filling with sand.

Visual evidence of hydrocarbon contamination was observed at the surface and in three existing monitoring wells at the former sump pit site in the summer of 1990, prompting notification to BUSTR. Following initial abatement in 1990, the sump was registered as UST 313 with the Ohio

Fire Marshal's Office under their BUSTR program. The area associated with the former sump pit underwent investigation and a corrective action plan (CAP) was developed under the BUSTR program by WPAFB. The CAP was completed in early 1994; however, during the sump removal action, additional tanks and construction debris were found in the excavation area (CH2M Hill Ohio [CH2M], 1995). Affected soil associated with the 1994 excavation area at LF512 was removed to a depth of 15 feet below ground surface (bgs) and replaced with clean fill.

Although the LF512 sump pit area was not identified as an Installation Restoration Program (IRP) site, the site was carried forward into the 1995 Operable Unit 10 (OU10) RI as discussed in the December 1995 *Remedial Investigation Report Operable Unit* (CH2M, 1995) for further groundwater investigation. The investigation determined LF512 did not appear to be a source of volatile organic compounds (VOCs) affecting groundwater and exposure to contaminated soil within OU10 appeared to be limited. The site was presented in the 26 August 1996 *Record of Decision for 21 No Action Sites* (WPAFB, 1996), but was not considered for "No Action."

As of 2013, one of the USTs still had an open BUSTR file for Building 30013 (Facility Identification 29003894, Release Number N00001) that served as the basis for a BUSTR investigation, conducted at LF512 in 2013. Pursuant to conversations with a BUSTR Site Coordinator in March 2014, BUSTR closed its file on the referenced UST and deferred regulatory authority to the OEPA and USEPA, following the CERCLA process (ODC, 2014).

1.3 Previous Investigations

Previous investigations and/or corrective actions of the LF512 former sump have included the abandonment of the sump pit and associated piping, installation and brief operation of a vapor extraction/bioventing and groundwater recovery system, and excavation activities. Available historical documents are listed by reference document and date where known, below, and a comprehensive summary of each investigation and/or corrective action is presented in the RI work plan (RIWP) (Versar, Inc. [Versar], 2017a).

- *Feasibility Study at Sump Pit Area Building #13* (R&R International, Inc. [R&R], 1991b). Investigation 1990-1991.
- *Corrective Action Plan for the Sump Pit at Building 30013* (SAIC, 1991).
- *Removal Action Work Plan for Sump Pit Area Building 30013* (Kelchner Environmental, Inc. [Kelchner], 1992). Investigation 1992-1994.
- *Project Final Report Vapor Extraction/Groundwater Recovery System Task 5005 Sump Pit Area, Building 30013* (Kelchner, 1994). Investigation: 1992-1994.
- *Remedial Investigation Report Operable Unit 10, Landfill No. 13, Central Heating Plant 3, and Associated Battery Burial Site, TCE/PCE Groundwater Plume, and Related Potential Source Areas*, Volumes 1, 2, and 3 (CH2M, 1995). Investigation: 1995.
- *Record Decision for 21 No Action Sites* (WPAFB, 1996). Investigation: 1995-1996.
- *Final Evaluation Report Volume II,* Wright-Patterson Air Force Base One Cleanup Program, AFCEE Support (URS Group, Inc. [URS], July 2010).
- *Draft Tier 1 Investigation Form 2012, LF512 Facility ID #29003894,* BUSTR Investigation (Versar, 2014). Investigation: 2013.

Initial Release and Response 1990 to 1991

In September 1990, an oily liquid was observed emanating through the asphalt from a former sump pit located approximately 90 to 100 feet north of Building 30013 (WPAFB, 1990a). The sump was uncovered and 116 gallons of contaminated sands and oily liquids were removed in September 1990 (WPAFB, 1990b). As a follow up to the initial response, a Phase I Site Assessment and a Phase II Investigation were conducted in late 1990 and included the installation of soil borings during both investigations and conversion of four borings into monitoring wells. Three wells encountered shallow water at 5 to 10 feet bgs, while groundwater was encountered at 25 to 30 feet bgs in the fourth monitoring well (R&R, 1990). Groundwater was not encountered in two other soil borings when advanced to nearly 30 feet bgs. Soil and groundwater samples submitted during these investigations were analyzed for benzene, toluene, ethylbenzene, xylenes, total petroleum hydrocarbons (TPH), and lead, and analytical results indicated toluene, ethylbenzene, xylenes, TPH, and lead were present in site soils.

During the Phase I and II Investigations, free product was observed in MW-4 in November 1990 and free product recovery from MW-4 commenced. Based on free product characterization, the product exhibited characteristics of lubricating oils and diesel fuel/oil. From November 1990 through January 1991, approximately 100 gallons of free product were recovered using a free product recovery system. Free product recovery was discontinued due to diminishing recovery rates (R&R, 1991a).

In early 1991, WPAFB proceeded with the performance of a non-CERCLA based FS to develop a corrective action approach to address the benzene, toluene, ethylbenzene, and *m*-, *o*-, and *p*-xylenes (BTEX) and TPH contamination on site under BUSTR. The FS investigation included installation of additional soil borings, monitoring wells, and an extraction well (EW-1) (R&R, 1991b). The investigation also included a gridded soil gas survey to delineate BTEX and provide an estimated area of BTEX and TPH contamination in soil and groundwater at the site. The findings of the FS investigation concluded that a small perched aquifer was present in the immediate vicinity of the sump pit. The recommendations of the FS were to address the soil and groundwater contamination, including dewatering the perched aquifer, addressing soil vapor contamination, removing lead-impacted soil, and treating groundwater.

Corrective Action 1991 to 1994

Following the FS, WPAFB proceeded with the development and execution of a CAP (SAIC, 1991) to remove the contaminated perched water table and to use vapor extraction with air infiltration (bioventing) to address BTEX and TPH contamination in soil.

Removal action activities were performed from June 1992 through March 1994 (Kelchner, 1994) and began with dewatering the perched water table, followed by the excavation and removal of the sump itself. A total of 4.16 million gallons of water were pumped, treated, and discharged to the storm sewer (under an OEPA-issued National Pollution Discharge Elimination System permit). Following backfill and repaving, implementation of the bioventing groundwater treatment remedy began, operating from December 1992 through November 1993. Groundwater treatment at an extraction well installed near MW-7 commenced in December 1992 and continued to August 1993.

While the bioventing proved effective in the outer areas of the estimated BTEX and TPH contamination area, effects were minimal-to-none within the central area. The work was amended to include additional excavation of an area approximately 45 feet by 35 feet around the physical location of the former sump pit. Excavation began in early March 1994 and was completed in April 1994.

During the CAP excavation activities, three USTs, a leaking 55-gallon drum (containing liquid cresols), and buried debris were encountered (Kelchner, 1994). Buried debris included stained soils, concrete block, and pipes in the vicinity of the former sump pit and a brick wall and clay pipe connecting to a nearby storm drain. The clay pipe likely accounted for the localized perched aquifer and was removed before implementation of the bioventing. As further excavation progressed, wood, conduit, wires, paint cans, and concrete rubble were removed from the excavation. The positions and depth these items were not documented in the report (Kelchner, 1994) other than qualitative description of location. The three USTs removed included a 5,000-gallon steel UST containing water and sludge, a 500-gallon steel UST (with holes) containing free product, and a 5,000-gallon steel tank (with one end removed) containing dirt, water, and residual sludge. There was no record of piping associated with any of the removed USTs. Soils impacted by tank contents during removal efforts were excavated and removed from the site during the process. Excavation activities were completed in late March 1994 and the excavation was backfilled with clean soils. According to historical documentation, all samples from the sidewalls and bottom of this excavation were analyzed for BTEX, TPH, and PAHs with the north and south sidewalls and bottom of the excavation also being analyzed for VOCs and semi-volatile organic compounds (SVOCs) (Kelchner 1994). However, primarily BTEX and TPH contamination was still present in the sidewalls and bottom of the excavation and no other VOCs or SVOCs were reported. A total of approximately 1,200 cubic yards of soil were removed during the excavation based on the reported dimensions of the excavation.

<u>Operable Unit 10 Remedial Investigation 1994</u>

In 1994, WPAFB conducted a remedial investigation of a large, diffuse trichloroethene (TCE) and tetrachloroethene (PCE) groundwater plume within OU10. The OU10 area covers a large portion of the eastern half of Area A at WPAFB, including the area of the former sump pit adjacent Building 30013 (i.e., LF512). As part of the RI activities to identify a potential source of PCE and TCE contamination in groundwater, a groundwater monitoring investigation of the former sump pit, including a geophysical study, was conducted. The investigation goal was to determine if additional USTs or other items could still be buried near the former sump pit.

The geophysical survey did not uncover any additional USTs, items, or structures other than utilities (CH2M, 1995). Based on groundwater monitoring results, PCE and 1,4-dichlorobenzene were reported above preliminary remediation goals (PRGs) in two of the three site wells, at concentrations similar to upgradient wells associated with OU10 groundwater monitoring. Other VOCs and SVOCs were reported at levels below PRGs, but the constituent reporting between rounds was inconsistent. The highest concentrations were contained in MW-13, the upgradient well at LF512, and the presence of PCE in groundwater was attributed to upgradient sources (CH2M, 1995). Sixteen metals were reported above background in the total metals fractions, including eight that exceeded primary or secondary federal maximum contaminant levels (MCLs) (aluminum, beryllium, cadmium, chromium, iron, lead, manganese, and nickel); iron was the only metal reported above a secondary MCL. Groundwater samples, however, were highly turbid with substantial suspended sediments in the dissolved fraction. Beryllium, cadmium, chromium, copper, and lead were not detected in the dissolved fraction.

<u>BUSTR Tier 1 Investigation 2013</u>

Due to an open BUSTR case for an UST located at Building 30013, a BUSTR Tier 1 Investigation was conducted in 2013. The technical approach of the investigation was based on the estimated site conditions following the completed 1994 removal actions and included investigation of both soil and groundwater at LF512. Soil sample locations were selected using data from the historical investigations and three additional monitoring wells were installed at the site (**Figure 1-3**; Versar, 2014). Soil borings were advanced to the top of the groundwater table (encountered between 25 and 28 feet bgs). A perched groundwater table was not encountered during the BUSTR investigation.

The soil and groundwater results of the investigation determined that contamination was not widespread in the soils. Trace concentrations of petroleum hydrocarbons were reported in the soil and PCE was routinely reported in the lowest soil sample horizon just above the groundwater table (i.e., groundwater interface). An isolated area of TCE and TPH contamination (gasoline range organics [GRO]) was discovered to the northwest of the former excavation and sump pit location; however, the isolated nature and location of this contamination suggests that contamination may not be associated with the former sump pit, but does lie within the boundary of LF512.

Groundwater monitoring results indicated consistent levels of PCE at low concentrations (9.3 to 13.2 micrograms per liter [µg/L]) exceeding the MCL for drinking water (5 µg/L) in five of the six monitoring wells. Trace levels of chloroform at estimated concentrations below the reporting limit (RL) were also noted in site wells. One well, MW-7, contained trace levels of PCE, vinyl chloride (VC), and cis- and trans-1,2-dichloroethene (cis12DCE and trans12DCE, respectively) at estimated levels below the RL (Versar, 2014).

1.4 Chemicals of Potential Concern

Based on the historical release from the former sump pit at LF512, subsequent investigations and remedial actions of the former sump pit, and broader range investigations for Area A (i.e., the OU10 RI), the target analytes for soil and groundwater at LF512 consist of VOCs, SVOCs, TPH (including GRO, diesel range organics [DRO], and oil range organics [ORO]), pesticides, herbicides, polychlorinated biphenyls (PCBs), and metals. Pesticides, herbicides, and PCBs are not likely COPCs at LF512 since these chemicals are not associated with materials used in Building 30013. As a result, they were not likely discharged to the former sump and consequently released to the environment. In addition, much of the site is covered with impermeable surfaces; the use of pesticides and herbicides at the site is not probable.

Nonetheless, it was necessary to evaluate the former excavation areas since drums and other debris were noted in 1994. All target analytes were sampled for in accordance with the RIWP for this RI (Versar, 2017a).

When evaluating the occurrence of PCE in the soils, PCE was primarily reported in deepest interval of soil (at the groundwater table interface) at each boring during the 2013 BUSTR Tier 1 Investigation. The location of the soil detections strongly correlates to the PCE at these depths originating from the groundwater. Even at depths of 25 to 30 feet bgs, the groundwater exerts a vapor pressure and evaporates into the vadose zone, carrying with it any VOCs, such as PCE. Concentrations of PCE just above the groundwater were within a narrow range of 1.1 to 11.8 micrograms per kilogram (µg/kg) during the 2013 BUSTR Tier 1 Investigation. While these values are in the range of soil-to-groundwater migration soil screening values, the source of the PCE at these depths is the result of the underlying groundwater.

1.5 Report Organization

The format of this report presents data from the RI and baseline HHRA and ERA. Section 2.0, Study Area Investigation, presents a discussion of the sampling program, highlighting areas where any modifications to the RIWP were encountered or any additional procedures were required. Section 3.0 discusses the environmental setting, while Section 4.0 provides the results of the RI and summarizes contaminant fate and transport at the site. Finally, Section 5.0 presents the results of the baseline HHRA and ERA, respectively.

2.0 STUDY AREA INVESTIGATION

The purpose of this RI was to evaluate the presence, or absence of impacted soil and/or groundwater due to a release from a former sump pit on site, as well as former leaking USTs discovered during the 1994 excavation of the Building 30013 Sump Pit Area (i.e., LF512). This was accomplished by an investigation of LF512, including the VOC- and TPH-affected soil left in place after the 1994 sump pit excavation. The RI investigation activities addressed the remaining data gaps and included the following:

- Installation of soil borings to identify and characterize the potential source area from contaminated soil left in place;
- Installation of additional monitoring wells to investigate potential COPC impact to groundwater;
- Identification and verification of site COPCs; and
- Investigation of the potential of residual contamination to migrate to groundwater.

Key sources of information for developing the technical approach for this investigation were the *Corrective Action Plan for the Sump Pit at Building 30013* (SAIC, 1991) and the results of the 2013 BUSTR Tier 1 Investigation (Versar, 2014). CAP Figure 4.2 (SAIC, 1991) showed an estimated historical TPH in soil plume from the soil gas investigation. This figure was the basis for establishing a gridded approach to investigate soil and groundwater at LF512 during both the 2013 BUSTR Tier 1 Investigation and this RI (see **Figure 1-3**). Data gaps were assessed and identified, and a proposed sample location, frequency, and analysis plan was developed as presented in the RI Work Plan and Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP; Versar, 2017a). The UFP-QAPP was reviewed by AFCEC, OEPA, and USEPA Region 5 and formally approved by all parties in early-2017. The UFP-QAPP specifies the general quality assurance (QA)/quality control (QC) procedures to be followed and includes identification of project-specific data types and uses, data quality needs, levels of concern, and data quality indicators. The field process implemented for this RI included a phased approach with significant regulatory involvement. This phased approach allowed for analysis of soil data prior to well installation, to allow for optimal placement of the new groundwater monitoring wells.

The soil samples for the RI used field sample identification (IDs) with a prefix of “LF512RI” and a date-of-sample-collection suffix (“_DDMMYY”) to uniquely identify soil samples associated with this RI. Additionally, each soil sample collection interval, in feet, is noted within the field sample ID and set off by parentheses. For groundwater samples, a prefix of “LF512” and a date-of-sample-collection suffix (“_DDMMYY”) were used for each field sample ID. For ease of discussion purposes, the prefixes (LF512RI or LF512) and date suffixes are omitted from field sample IDs within this text and on figures; however, full field sample IDs are preserved in the data summary tables and within the laboratory and data review reports. On figures, the RI soil samples are shown with an altered ID prefix of “RISB” to differentiate RI soil samples from previous soil samples with similar numbering sequences (i.e., 2013 BUSTR investigation).

2.1 Field Investigation

A description of the RI field tasks and procedures used during the field investigation is presented in this section. Detailed descriptions of the sampling and analysis plan and field procedures, including field documentation, are presented in the approved RIWP and UFP-QAPP worksheets (Versar, 2017a). The field notes associated with samples collected during the investigation are contained in **Appendix A**.

To develop a population sufficient to determine the horizontal and vertical extent of contaminated soil left in place after the 1994 excavation and to perform a BRA, a combination of screening and definitive data was collected during this RI. The grid pattern used for the sampling approach was guided by the estimation as presented in the 1991 Corrective Action Plan (SAIC, 1991) based upon soil borings and soil gas survey conducted in 1991 (R&R International, 1991). This approach was agreed upon during pre-RI scoping conducted in August 2016 and approved in the Revised Final RI Work Plan (Versar, 2017). Soil and groundwater sampling data are compared with the project action levels (PALs; see Section 4.0) developed for LF512. Screening data for soil included an evaluation of each incremental soil sample recovered from each boring installed via use of a photoionization detector (PID). Groundwater screening data included water quality parameters measured during purging activities immediately prior to collecting groundwater samples. Definitive data included all soil and groundwater samples analyzed for target analytes (VOCs, SVOCs, polynuclear aromatic hydrocarbons [PAHs], TPH, pesticides, herbicides, PCBs, and metals). Screening and definitive data collection were performed in accordance with the UFP-QAPP (Versar, 2017a) and all applicable Versar Standard Operating Procedures (SOPs) and OEPA guidelines (i.e., *Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring*; OEPA, 2012).

2.1.1 Mobilization and Utility Clearances

Prior to each of the soil and groundwater investigation phases of this RI, pre-construction meetings were conducted with WPAFB staff as well as the drilling contractor. Before invasive field activities commenced for each phase of field work (soil boring advancement and monitoring well installation), utility clearances were conducted at the site by WPAFB via a Base Civil Engineering Work Clearance Request (103 Form) submitted to WPAFB Customer Service, and by the Ohio Utility Protection Service (OUPS). Utility location commenced after the identification and positioning of the soil boring and groundwater monitoring well locations on the ground surface with spray paint and/or survey flags. If a sample location was located within a marked utility line corridor, the sample location was moved. WPAFB utility clearances are included in **Appendix B**.

2.1.2 Soil Boring Installation and Sampling Activities

A total of 16 locations were selected for soil sampling at LF512 (SB-1 through SB-16; **Figure 1-3**) and 64 soil samples (four per location) submitted for laboratory analysis. These locations were based on a grid with 40-foot centers, superimposed over the central axis of the 1991 soil gas estimated limits of petroleum contamination (SAIC, 1991; Versar, 2017a). The gridded overlay corresponded to the area within and immediately adjacent to the former Building

30013 Sump Pit Area. Initially, sampling locations were placed in the center of each grid section. Final placements of sampling locations were adjusted in grid sections cut-off from Building 30013 and/or where utilities were known to be present.

Two sample locations, borings SB-4 and SB-6, were located to evaluate the potential contamination outside of the limits of the former excavation. Both locations are within approximately 15 feet of the former excavation. SB-4 required multiple days to complete sampling due to difficulties in soil recovery. There was little PID response during the screening at SB-4. Samples were collected from the 0 to 2.5, 5 to 10, 12.5 to 15, and 22.5 to 25 foot horizons. Minor VOCs were noted in the four horizons, with none exceeding the Industrial Scenario RSLs. Trace levels of methylene chloride (lab artifact), TCE, and PCE exceeded soil to groundwater migration SSLs with PCE only exceeding at the groundwater interface. Several SVOCs were noted in the 0 to 2.5 foot horizon (i.e., PAHs), which can be attributed to asphalt at the surface. Minor SVOCs were noted in the 5 to 10 foot horizon, but nothing at the 12.5 to 15 foot or 22.5 to 25 foot intervals. Minor TPH (GRO [surface only] and DRO) was also reported in the samples, but all below the BUSTR Allowable Residual TPH for Type 1 Soils. At SB-6, multiple advancements of the DPT tooling was necessary to collect all sufficient sample material. Based on PID results, samples were collected from 0 to 2.5, 15 to 17.5, 17.5 to 20, and 22 to 24 foot bgs. Minor VOCs were noted in all four sample horizons, but at low single digit to less than 1 µg/kg concentrations. Low concentrations of SVOCs were reported in the 0 to 2.5 foot bgs horizon, which can be contributed from the asphalt surface. No SVOCs were reported in the lower three sample horizons. TPH (DRO and ORO) was reported in the 0 to 2.5 foot bgs horizon as well and is also likely a function of asphalt material in the sample horizon. Based on these results, the limits of the former 1994 excavation show little residual contamination. Natural processes have likely attenuated contamination that may have remained post the 1994 excavation.

In addition, two sample locations were located targeting the area of the 1994 excavation were adjusted to maximize soil collection data and provide data from beneath and near the former sidewalls of the excavation (SB-5 and SB-8). Of note, the 12.5 to 15 foot interval at SB-8 was deemed to be the beginning of the native soils. This suggests that the excavation in the southeastern area of the did not extend to 15 feet below grade as reported in the existing documentation from the 1994 remedial action in the southwestern area of the former excavation. One additional sample location, SB-12, was specifically located next to the former 2013 BUSTR SB-17 location to investigate the TCE and GRO results during that investigation. Minor location adjustments for utilities were made in the field during the utility clearance and dig permitting process. Adjusted sampling locations were biasedly moved toward the former excavation area. Final soil boring locations are shown on **Figure 1-3**.

Soil sampling activities were conducted from 24 to 28 April 2017 and from 8 to 10 May 2017. Soil borings were drilled by Micah Group Energy and Environmental (Micah), of Lexington, Kentucky and advanced using a direct-push technology (DPT) rig fitted with a dual-tube sampling system. Total boring depths ranged from 25 to 30 feet bgs and corresponded to the groundwater interface (i.e., top of the saturated zone), which occurred at approximately 25 to 26 feet bgs. Soil cores were obtained from polyvinyl chloride (PVC) core liners fitted with core catchers. The entirety of each soil core was screened with a PID (described below). The soil lithology, field observations, PID readings, and boring depths for each soil boring were recorded on boring logs included as **Appendix C**.

To screen soil from each boring, core liners were placed on clean plastic sheeting and opened lengthwise with a liner cutter. Soil material from every screening interval was distributed between sample containers for potential submission to the laboratory and into zip-top plastic baggies for headspace analysis. Bagged-soil aliquots were screened with the PID after equilibration with warm temperatures. The samples associated with the three highest PID responses per location, as well as the horizon just above the water table, were submitted for laboratory analysis. If no PID responses were noted, samples were collected from the 0- to 2-foot, 6- to 8-foot, and 10- to 12-foot intervals, as well as the 2-foot horizon just above the water table (i.e., groundwater interface). Alternate sampling intervals for three locations were pre-determined prior to sampling activities to screen the former excavation area (SB-5 and SB-8) and to confirm the analytical results for one location from the 2013 BUSTR investigation (SB-12). Samples in the former excavation area were collected from the fill (above 12 feet bgs) to determine the status of the fill, and from below the fill (16 to 18 feet bgs, the horizon just beneath the bottom of the 1994 excavation) to determine if contamination is still present beneath the excavation area.

Soil for VOC and GRO laboratory analysis were discrete samples collected using dedicated and disposable terra core plungers. Soil for headspace analysis were discrete grab samples. Headspace, VOC, and GRO samples were all collected directly from the soil core liners to minimize the potential for volatilization. All remaining soil volume per sampling interval was then homogenized in a properly-decontaminated stainless-steel bowl prior to being containerized in appropriate sample containers for potential laboratory analysis. In order to obtain sufficient sample material for all analyses (see Section 2.6), at least two DPT pushes were advanced per interval, per sample location.

During and immediately after sample collection, all sample containers were labeled and placed either in a warm area (headspace baggies) or into an ice-filled cooler (all potential laboratory samples). After headspace readings were collected, recorded, and a determination was made of the three intervals (in addition to the groundwater interface interval) to submit for laboratory analysis, the laboratory samples were retained and the non-laboratory samples were disposed as investigation-derived waste (IDW). Samples were shipped under chain of custody overnight to the laboratory for analysis for VOCs, SVOCs, PAHs, TPH (including GRO, DRO, and ORO) and metals. Samples collected from beneath the former excavation (SB-5 and SB-8) were also analyzed for pesticides, herbicides, and PCBs.

All reusable sampling equipment that came into contact with the samples and/or sampling interface (e.g., mixing bowls, DPT rods, etc.) were constructed of steel and were decontaminated between sampling locations. All plastic sampling equipment contacting the samples and/or sampling interface, including PVC core liners, terra core plungers, and headspace baggies, were dedicated, disposable, and used only once. Upon completion of sampling activities, borings were backfilled just below grade with hydrated bentonite and the surface was repaired with either hole-patch or topsoil patching material.

IDW generated during the DPT activities consisted of soil cuttings, disposable sampling equipment and supplies (e.g., terra core sampling units, plastic sheeting, etc.), samples not identified for laboratory analysis, decontamination waters, and personal protective equipment (PPE; e.g., nitrile gloves). IDW was containerized in Ohio Department of Transportation (ODOT)-approved open-top 55-gallon drums pending characterization and disposal as non-hazardous waste.

2.1.3 Monitoring Well Installation and Development

Three groundwater monitoring wells (MW-17, MW-18, and MW-19) were installed during this RI, increasing the total groundwater monitoring well count at the site to nine (**Figure 1-3**). The three new wells were installed to fill data gaps identified following the 2013 BUSTR Tier 1 Investigation, as well as to provide groundwater data down- and upgradient of the site. New monitoring well placement was finalized based on the preliminary analytical results of the soil investigation and through coordination with WPAFB and OEPA in June and July 2017. Construction data for all site wells are provided in **Table 2-1**.

The three new wells were installed by Micah on 24 to 27 July 2017. Total depths of the new wells were between 29 and 31 feet bgs. Wells were constructed, in 3.5-inch diameter boreholes, with 2.0-inch inner diameter Schedule 40 PVC casing with 10-foot, 0.010-inch slotted, pre-packed well screens extending approximately 5 to 7 feet into the saturated zone, to straddle the water table. Annular space (0.75-inch) was backfilled with quartz filter sand (#5 sand) to correspond with the pre-pack filter pack and brought to grade with hydrated bentonite (Versar field notes indicate hydrated bentonite; however, a minor discrepancy exists in that the ODNR records indicate a bentonite/cement slurry was used). Well completions were constructed with 8-inch steel flush-mount vaults set into concrete and slightly countersunk to allow for unencumbered snow-plow use. Monitoring wells were not logged during installation – existing monitoring well borehole logs and the RI soil boring logs were used to determine well screen placement. Monitoring well construction diagrams and ODNR well logs are provided in **Appendix D**.

Following installation and after allowing bentonite seals sufficient time to set up, wells were developed by surging and over-pumping wells with a submersible pump. Due to weather impacts and equipment issues with the drilling equipment, the wells were developed approximately 24 hours after installation. While OEPA Guidance recommends 48 hours prior to development, the results of the groundwater monitoring produced consistent results with those of the prior installed wells on site. As such, the 24 hours period was sufficient time for the seal to cure. Wells were developed until the water ran clear to the unaided eye (no water quality parameters were collected during well development). Development water from each of the three wells started as silty-brown water and ended as clear water. Between 35 and 40 gallons of water were removed from each of the three new wells during development, significantly more than three times the well column of each well (between 2.2 and 3.2 gallons).

The existing wells were inspected for integrity (well, plugs, etc.) during the soils investigation and found to be in good shape. The existing wells were last developed in 2013. None of the existing wells were redeveloped prior to the RI groundwater monitoring.

IDW generated during the well installation and development activities consisted of development and decontamination waters and PPE. No soil cuttings were generated during well installation. All development water was collected in ODOT-approved 55-gallon drums pending characterization and disposal as non-hazardous waste.

2.1.4 Groundwater Monitoring Well Sampling

All nine groundwater monitoring wells (MW-7 and MW-12 through MW-19) were sampled twice during this RI to account for seasonal fluctuations in the groundwater. The first event was conducted 31 July through 3 August 2017 (with a resample effort on 23 August 2017) and the second event was conducted 28 and 29 November 2017. All groundwater sampling was conducted in accordance with the UFP-QAPP (Versar, 2017a). Site wells were purged and groundwater samples were collected following USEPA low-flow groundwater sampling protocols (USEPA, 1996).

Before sampling each monitoring well, each well was checked for the presence of VOCs using a PID. PID readings were recorded from wellheads immediately after opening each well. After checking each well for the presence of VOCs, the depth to water was measured to the nearest 0.01-foot using a decontaminated water level meter and recorded on the field log (**Appendix A**). Depth-to-water measurements and corresponding water level elevations are included in **Table 2-2**.

Groundwater samples were collected after water quality field parameters (temperature, pH, specific conductivity [SC], dissolved oxygen [DO], oxidation reduction potential [ORP], and turbidity) stabilized during purging. Water quality parameters were measured using a multi-meter fitted to a low-volume flow cell (e.g., Horiba U-50 series). Purging was complete when the field parameter readings stabilized for a minimum of three consecutive readings. For parameters that did not stabilize, purging was considered complete after a minimum of three purging volumes (three times the water column) were extracted from the well (see table below for locations that fit this criteria). The drawdown in each monitoring well was monitored during purging using a decontaminated water level meter. Pumping/flow rates were adjusted to minimize drawdown and prevent drawdown in any well to exceed 0.3 feet. Field parameters and drawdowns were measured every three to five minutes until the field parameters stabilized. Water quality and sampling logs are included in **Appendix E** and water quality measurements are summarized in **Table 2-3**. On some of the purge logs, there are minor transcription errors, with respect to total depth measurements; however, these errors do not have any impact on groundwater monitoring results. These minor transcription errors are:

- MW-07: in Table 2-1 the total depth is 31 feet. The November 2019 recorded measurement on the purge log is 30 feet. This appears to be a transcription error with MW-12. As a result, the placement of inlet tubing may be off by less than 6 inches vertically. Potential impact to groundwater monitoring – none.
- MW-12: in Table 2-1 the total depth is 30 feet. The November 2019 recorded measurement on the purge log is 30.1 feet. This appears to be a transcription error with MW-13. Potential impact to groundwater monitoring – none.

- MW-17: Total depth is correct (30.2 ft.); however, the screened interval is noted as 22 to 32 feet on the purge log rather than 20.2 to 30.2 feet. Potential impact to groundwater monitoring – none.
- MW-19: in Table 2-1 the total depth is 31.1 feet. The November 2019 recorded measurement on the purge log is 32 feet. As a result, the placement of inlet tubing may be off by less than 6 inches vertically. Potential impact to groundwater monitoring – none.

Well Location	Date	Water Quality Parameter Not Stabilized	Calculated Minimum Purge Volume	Minimum Purge Volume Achieved Prior to Analytical Sampling
MW-12	8/1/2017	temperature	3.1 gallons	approx. 5 gallons
MW-13	8/1/2017	dissolved oxygen	3.1 gallons	approx. 5 gallons
MW-19	8/2/2017	dissolved oxygen	3.2 gallons	approx. 4.5 gallons
MW-19	11/28/2017	dissolved oxygen	3.4 gallons	approx. 4 gallons

After water quality parameter stabilization, the flow cell and multi-meter were disconnected from the pump and the groundwater was pumped directly from the discharge tubing into appropriate laboratory sample containers and preserved as applicable; all samples were discrete samples. Dissolved metals samples were filtered in the field with dedicated and disposable 0.45-micron filters. Sample containers were labeled, placed in an ice-filled cooler, and shipped under chain of custody overnight to the laboratory for VOC, SVOC, PAH, TPH, and total and dissolved metals analysis.

Monitoring wells were purged and groundwater samples were collected using a peristaltic pump capable of flow rates between 100 and 500 milliliters (mL) per minute. Pumps were fitted with new, dedicated, and disposable Teflon-lined polyethylene and silicone tubing. Tubing inlets were placed at a depth corresponding to the center of the submerged screen interval.

Due to shipping complications resulting in a lost sample cooler, replacement samples for select parameters for wells MW-17 and MW-18 were collected on 23 August 2017. Samples during the resampling effort were collected for SVOC and PAH analysis, only. Based on weather reports, five precipitation events occurred between the initial and replacement sampling events with approximately 1.2-inches of rain occurring in the area. However, due to the extensive impermeable cover at the site (i.e., asphalt road and parking area as well as Building 30013) it is unlikely the precipitation events produced significant localized infiltration affecting groundwater at the site.

IDW generated during the groundwater sampling activities consisted of decontamination waters, purge water, disposable sampling equipment and supplies (e.g., tubing and filters), and PPE. All purge and decontamination waters were collected in ODOT-approved 55-gallon drums pending characterization and disposal as non-hazardous waste.

2.2 Survey

Following the field sampling efforts, the vertical elevation and horizontal location of the 16 soil borings and the three newly installed and six existing groundwater monitoring wells were surveyed by state-licensed Ohio surveyor Barge, Waggoner, Sumner & Cannon, Inc. (BWSC) on 2 August 2017. Ground surface and top of casing elevations were surveyed to an accuracy of 0.01-foot while the horizontal accuracy was one foot or less. WPAFB Control Monuments were used and data were generated in the North American Vertical Datum (NAVD) of 1988 and North American Datum (NAD) 1983 State Plane, Ohio South. Survey information is summarized in **Table 2-4**.

2.3 Investigation-derived Waste

IDW collected during this RI included soil cuttings generated during soil boring activities, asphalt and gravel from well surface completion installation, development water from new well development activities, purge water from water sampling activities, decontamination waters, plastic sampling equipment and supplies, and PPE (e.g., nitrile gloves). All field work was performed in a manner to minimize IDW. Soil cuttings, asphalt and gravel, and development, purge, and decontamination waters were containerized into ODOT-approved open-top 55-gallon steel drums. IDW was identified as non-hazardous. Aqueous waters were pumped out and disposed with IDW water for the basewide groundwater monitoring and the steel drums removed for recycling. The solid drums were removed by Clean Water Environmental, LLC of Dayton, Ohio. The waste profile and transportation manifest are included in **Appendix F**.

2.4 Project Documentation

2.4.1 Field Documentation

Field personnel kept a permanently bound field logbook for documenting field activities during all phases of this RI. In addition, supplementary field forms were used (i.e., boring logs and water quality and sampling logs). Logbook and field form entries were dated, legible, and contained accurate and inclusive documentation of the investigation activities and included information pertaining to field staff on site, weather observations, date and time of sample collection, and other pertinent field-related information. A copy of the field notebook is included in **Appendix A**, soil boring logs are included in **Appendix C**, monitoring well construction diagrams in **Appendix D**, and water quality and sampling logs are included as **Appendix E**.

Prior to starting field investigation activities, field personnel, including the subcontractor (Micah), read the UFP-QAPP and signed off on the Health and Safety sign-off form. In addition, tailgate safety meetings were held daily prior to soil boring and/or drilling activities. All field health and safety documentation are included in **Appendix A**.

Each sample collected during this RI was assigned a unique project-specific identification code (i.e., ID). Soil and groundwater sample IDs included the site name, sample type (soil boring [SB] or monitoring well [MW]), sample location number, sample interval (soils, only), and the date. Duplicate samples included a “DUP” or “D” within the sample ID. Quality control sample IDs contained the type of quality control prefix (trip blank [TB], equipment blank [EB], ambient blank [AB]) and a date suffix. All sample labels affixed to sample containers were printed clearly and provided sufficient information to enable cross-referencing with the chain of custody record (COCR; **Appendix G**) and analytical laboratory logins.

2.4.2 Equipment Calibration

Versar used field equipment supplied by Pine Environmental (Pine) (e.g., PID, water quality meters). Equipment rentals through Pine arrived on the site fully calibrated and ready to use. Field staff performed daily calibration checks of the PID (during soil boring activities) and daily and/or as needed of the water quality meters (during groundwater sampling activities).

Minor potential discrepancies related to pH and SC were noted during the August 2017 groundwater sampling event. As a result, calibration tests were performed and both meters appeared to be measuring slightly high for pH and one meter was slightly high for SC (between 0.25 and 0.5 pH units and less than 0.5 millisiemens per centimeter [mS/cm]). A PID was not used during the November 2017 sampling event due to a shipping error that resulted in no delivery of the unit. All field equipment calibration documentation is included in **Appendix A**.

2.5 Data Quality

Data quality refers to the validity associated with a data set and is a result of the sampling plan rationale, the sampling procedures, and the analytical methods and instrumentation used to measure analyte concentrations. The UFP-QAPP was designed to ensure that data collected are of known and documented quality and are useful for the intended purposes. Each data quality component has its respective potential sources of uncertainty and biases that can affect data quality. Any source of uncertainty related to the sampling component of the data collection was minimized by following project SOPs and the OEPA Technical Guidance Manual. Field sampling and analysis for this RI were performed using applicable procedures described in the UFP-QAPP and summarized in the following sections.

2.5.1 Quality Control

Surface soil, subsurface soil, and groundwater samples were collected during this RI and analyzed by SGS of Dayton, New Jersey, a Department of Defense (DoD) Environmental Laboratory Accreditation Program (DELAP)-accredited laboratory. SGS performed all analyses using accepted USEPA methodology, specifically USEPA Solid Waste Methods as detailed in *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods* (USEPA, 2015). Analysis of sample data followed Ohio Administrative Code (OAC) 1301:7-9-01 through -19 for TPH analysis and DERR Remedial Response Program and USEPA guidance. Analytical methods are summarized in **Table 2-5**. Limits of quantitation (LOQs), limits of detection (LODs), or method detection limits (MDLs) were sufficiently low to achieve the project data quality objectives as indicated on Worksheet 15 of the UFP-QAPP (Versar, 2017a). Soil and groundwater data were collected and analyzed to support the metric of exposure to soil exceeding applicable unrestricted use cleanup goals. A summary of the chemicals identified for further evaluation in the baseline HHRA and ERA as well as the analytical data are presented for both soil and groundwater in Section 4.0.

As a check on sampling performance during RI activities, multiple types of QA/QC samples were generated during this RI: TBs, ABs (i.e., field blanks), field EBs, field duplicates, and matrix spike (MS)/matrix spike duplicates (MSDs). Detailed discussion of the QA/QC procedures is contained in the UFP-QAPP (Versar, 2017a). QA/QC samples are collected to evaluate precision and bias during field activities and subsequent laboratory analyses. Different sample types, sample quantities collected, and the associated method of analysis for each sample type and/or group are summarized in **Table 2-5**. Analytical summaries of TB, AB, and EB samples collected during the soil and groundwater investigation are contained in **Table 2-6** (TBs), **Tables 2-7a** through **2-7d** (ABs), **Tables 2-8a** through **2-8d** (EBs), and **Table 2-9** (soil ABs and EBs for pesticides, herbicides, and PCBs, only).

TBs are aqueous VOC samples that are prepared by the laboratory prior to the sampling trip and travel with sample containers as a check for contamination originating from sample containers or from general sample handling procedures. TBs were collected at a rate of one sample per VOC sample shipment and are analyzed for the same list of VOC analytical parameters as the environmental samples. No VOCs or GRO were detected in TBs collected during the RI field activities (**Table 2-6**).

ABs are samples that are collected in the field at a representative location where samples are containerized as a check for contamination originating from ambient conditions at the site. ABs were collected on a frequency of one sample daily for each matrix sampled and are analyzed for the same list of analytical parameters as the environmental samples. Several metals constituents were detected in the ABs at estimated values throughout the RI during both soil and groundwater sampling activities (**Table 2-7**).

EBs are samples that are collected if field decontamination of sampling equipment occurred as a check for the thoroughness of the field decontamination procedures. Equipment blanks were collected on a frequency of one sample daily when field decontamination of sampling equipment occurred and are analyzed for the same list of analytical parameters as the environmental samples. EBs for this RI were performed on the stainless-steel bowls used for homogenizing soil samples and on the stainless-steel cutting shoe from the DPT rig tool string. Equipment used for groundwater sampling activities (i.e., peristaltic pumps) utilized dedicated and disposable tubing that was replaced between each sampling location and as such, did not require decontamination or an EB. Carbon disulfide, caprolactam, bis(2-ethylhexyl)phthalate, ORO, and several metals at estimated values were detected in EBs during this RI (**Table 2-7**).

Field duplicates are collected to measure the variability of both sample collection procedures and analytical procedures. A field duplicate consists of two samples collected from the same location, at the same time, in such a manner to ensure that each sample represents the same population. Field duplicate samples were collected at a frequency of one per ten samples (10 percent basis) for each media sampled and are presented below. During the data review process, the analytical results for duplicate pairs were compared, with the difference expressed as relative percent difference (RPD). A high level of precision is shown by a small RPD; RPDs are summarized in the data review reports (**Appendix H**).

Parent Sample	Field Duplicate Sample	SDG	Analysis Parameters
SB-11(24-26)_042517	SB-11(24-26)_042517_FD	JC41973	VOC, SVOC, PAH, TPH, metals
SB-5(15-20)_042717	SB-5(15-20)_042717_FD	JC41973	Pesticides, herbicides, PCBs
SB-7(0-5)_042817	SB-7(0-5)_042817_FD	JC42293	VOC, SVOC, PAH, TPH, metals
SB-6(0-2.5)_050817	SB-6(0-2.5)_050817_FD	JC42885	VOC, SVOC, PAH, TPH, metals
SB-9(0-2.5)_050817	SB-9(0-2.5)_050817_FD	JC42885	VOC, SVOC, PAH, TPH, metals
SB-3(7.5-10)_050917	SB-3(7.5-10)_050917_FD	JC42953	VOC, SVOC, PAH, TPH, metals
SB-12(0-2.5)_050917	SB-12(0-2.5)_050917_FD	JC42953	VOC, SVOC, PAH, TPH, metals
SB-1(12.5-15)_050917	SB-1(12.5-15)_050917_FD	JC42953	VOC, SVOC, PAH, TPH, metals
SB-15(7.5-10)_051017	SB-15(7.5-10)_051017_FD	JC43060	VOC, SVOC, PAH, TPH, metals

Matrix spike/matrix spike duplicates are collected to measure the accuracy and precision of laboratory analytical procedures. MS samples are primary samples “spiked” by the laboratory with a known concentration of an analyte. The spike sample is analyzed for the parameter(s) of interest using the same analytical methods as the normal environmental samples. A percentage recovery is calculated by subtracting the known spike concentration from the result and expressing the result as a percentage. Data are acceptable if the MS recovery percentage is within an acceptable range. MS/MSD samples were collected at a frequency of one per 20 samples (5 percent basis) for each media sampled. Additionally, the laboratory also performs MS/MSD analysis separate from the project-specific MS/MSDs samples; these were collected on an as-requested basis. Results of MS/MSD analyses are included within the laboratory data packages (**Appendix I**).

2.5.2 Data Management

Processes were established in the UFP-QAPP to ensure data were of sufficient quality to be used for their intended purpose, and to ensure that data were managed in a manner ensuring their integrity and long-term use, including the use of electronic data deliverables (EDDs), laboratory QA/QC programs, and data verification and validation.

SGS provided analytical data as AFCEC definitive data packages in EDDs. EDDs were delivered as complete Contract Laboratory Program (CLP) Level 4 data packages in portable document format (PDF) as well as in Environmental Restoration Program Information Management System (ERPIMS) X format. The PDFs contain the entire final laboratory reports, including the original COCR and any changes in the analytical program. ERPIMS data underwent internal and external QA/QC processes to ensure accuracy. All generated field data (e.g., lithological observations, headspace PID readings, water elevation measurements, field water quality parameter measurements, and laboratory analytical data) were transmitted to AFCEC via ERPIMS (#20171224, submitted 9 February 2018 and #20180365, submitted 27 February 2018).

2.5.3 Data Verification and Validation

All laboratory data reports (i.e., sample delivery groups [SDGs]) were forwarded to Versar's data validator, MEC^x, Inc. (MECx), an independent third-party data validator, for review of compliance with the UFP-QAPP. Analytical laboratory data quality was measured and evaluated in terms of precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) parameters as presented in the UFP-QAPP. Data validations were completed to Level IIb (90 percent) and to Level IV (10 percent) by MECx and validated as per the UFP-QAPP using the DoD *Quality Systems Manual for Environmental Laboratories* (QSM), Version 5.1. Data review reports are included as **Appendix H**.

During data review, validators assign qualifiers, in addition to those assigned by the laboratory, based on the internal laboratory method QC (e.g., calibration verification, surrogates, internal standards, and/or check standards). Validator-assigned qualifiers are denoted in data summary tables in a second qualifier column ("V"); laboratory-assigned qualifiers are denoted in data summary tables in columns identified as "Q."

Overall, soil and groundwater results met project quality objectives and data quality indicators with minor exceptions (see data review columns in tables as well as data review reports in **Appendix H**). Samples with non-detected results affected by verification and/or validation quality determinations were flagged as estimated (UJ) and sample with detected results were flagged as estimated (J). Sample results not meeting acceptable quality criteria were rejected (R).

2.5.3.1 Precision

Precision is evaluated using the relative percent difference (RPD) by evaluating the reproducibility of field duplicate samples, matrix spike/matrix spike duplicates (MS/MSD), laboratory control sample/laboratory control sample duplicate (LCS/LCSD) and laboratory duplicate sample. RPDs are calculated when both the parent and duplicate results exceed the LOD. Results with RPDs that exceed the acceptance criteria defined in the UFP-QAPP are reviewed and qualified. Systemic RPD exceedances are investigated to ensure that procedural errors are not present.

Except as noted in the data review reports, the RPDs for field duplicates were within project control limits for common detects above the LOQ, or within the reasonable control limit of ±LOQ for detects below the LOQ. Sample results for outliers were flagged as estimated (J or UJ). Precision exceptions encountered during the data review were not expected to impact the overall data quality of the dataset or were within acceptable parameters. No results were rejected (R) due to precision failures. No systemic trends or biased were observed.

2.5.3.2 Accuracy

Accuracy is evaluated by reviewing the surrogate recoveries, MS/MSD recoveries, LCS/LCSD recoveries, and initial and continuing calibration recoveries. The recoveries of surrogates in organic methods are also used to demonstrate accuracy.

Minor accuracy exceptions were identified during the data review that do not impact overall data quality. These exceptions are discussed in detail in **Appendix H**. Significant exceptions include:

- **JC41973 Method 8015C**: Total TPH (C10-C34, PHC as diesel fuel, C20-C34, PHC as heavy/residual range) was not recovered in the LCS and LCSD for blank samples AB_04261701 and EB_04261701. The TPH results for both blanks were qualified as rejected (R) and are not considered to be usable.
- **JC41973 Method SW8151**: Dinoseb was not recovered in the LCS and LCSD for blank samples AB_04271701 and EB_04271701 or the MS/MSD for sample SB-5(15-20)_042717. The dinoseb results for these three samples were qualified as rejected (R) and are not considered to be usable.

Analytes [method]	SDG	Sample ID	Result and Qualifiers	Rejection Reason
DRO [M8015C]	JC41973	AB_04261701	0.025 mg/L U (R)	Laboratory control sample recovery less than the lower control limit (LCL).
ORO (C20-C34) [M8015C]	JC41973	AB_04261701	0.025 mg/L U (R)	LCL
ORO (>C28-C40) [M8015C]	JC41973	AB_04261701	0.025 mg/L U (R)	LCL
Total TPH [M8015C]	JC41973	AB_04261701	0.025 mg/L U (R)	LCL
DRO [M8015C]	JC41973	EB_04261701	0.025 mg/L U (R)	LCL
ORO (C20-C34) [M8015C]	JC41973	EB_04261701	0.025 mg/L U (R)	LCL
ORO (>C28-C40) [M8015C]	JC41973	EB_04261701	0.025 mg/L U (R)	LCL
Total TPH [M8015C]	JC41973	EB_04261701	0.025 mg/L U (R)	LCL
dalapon [SW8151]	JC41973	SB-5(15-20)_042717	3.5 µg/kg U (R)	Matrix spike recovery less than the lower control limit (MSL).
dinoseb [SW8151]	JC41973	AB_04271701	0.50 µg/L U (R)	LCL
dinoseb [SW8151]	JC41973	EB_04271701	0.50 µg/L U (R)	LCL

With the exception of sample SB-5(15-20)_042717 for total TPH, these excursions are associated with blanks and do not impair the sampling results. The total TPH excursion affects only this single sample.

Except as noted in the data review reports, all other recoveries were within project control limits for common detects above the LOQ, or within the reasonable control limit of ±LOQ for detects below the LOQ. Sample results for outliers were flagged as estimated (J or UJ). Except as noted above, accuracy exceptions encountered during the data review were not expected to impact the overall data quality of the dataset or were within acceptable parameters. No systemic trends or biased were observed. No systemic trends or biases were observed.

2.5.3.3 Representativeness

Representativeness is demonstrated through the review of sample documentation and the evaluation of field, laboratory, and equipment blanks.

Samples were collected according to the procedures outlined in the UFP-QAPP and QSM.

Minor representativeness exceptions were identified during the data review and are discussed in detail in **Appendix H**.

Significant exceptions that impact data quality include:

- **JC41973 Method 8015C**: As discussed in section 2.5.3.2, Total TPH (C10-C34, PHC as diesel fuel, C20-C34, PHC as heavy/residual range) was not recovered in the LCS and LCSD for blank samples AB_04261701 and EB_04261701. The TPH results for both blanks were qualified as rejected (R) and are not considered to be usable.
- **JC41973 Method SW8151**: As discussed in section 2.5.3.2, dinoseb was not recovered in the LCS and LCSD for blank samples AB_04271701 and EB_04271701. The dinoseb results for these blank samples were qualified as rejected (R) and are not considered to be usable.
- **JC42953 Method SW8270D:** The SVOC analysis of EB_05091701 had detections for all 68 target compounds. The data reviewer suspected laboratory contamination and directed the laboratory to re-extract the sample beyond the holding time. The re-extraction analysis did not confirm the original results; however, the laboratory did not report the re-extraction as the preferred analysis. As laboratory contamination was evident, and based on professional judgement and review of the re-extraction data by the data reviewer, the initial extraction results were rejected (R) and were not used to qualify associated samples.

TBs, ABs, and EBs had no target compound detects above the control limit of one-half the LOQ affecting soil or groundwater samples, except for the following samples, which were qualified as ambient or equipment blank contamination (B):

Analyte [method]	SDG	Sample ID	Result and Qualifiers	Qualifier Reason
carbon disulfide [SW8260C]	JC41973	SB-8(20-25)_042617	0.99 µg/kg J (B)	Equipment blank concentration greater than the reporting limit (EBG).
carbon disulfide [SW8260C]	JC41973	SB-10(25-27)_042617	3.6 µg/kg (B)	EBG
beryllium (total) [6010C]	JC48106	MW-7_020817	0.031 µg/L J (B)	Field blank concentration less than the reporting limit (FBL).
manganese, total [6010C] manganese, dissolved	JC48106	MW-16_010817	9.2 µg/L J (B) 8.3 µg/L J (B)	FBL
manganese, total [6010C] manganese, dissolved	JC48106	MW-17_020817	15.1 µg/L (B) 14.7 µg/L J (B)	FBL
manganese, total [6010C] manganese, dissolved	JC48106	MW-18_020817	14.5 µg/L J (B) 14.1 µg/L J (B)	FBL
manganese, total [6010C] manganese, dissolved	JC48106	MW-19_020817	8.9 µg/L J (B) 8.2 µg/L J (B)	FBL

Analyte [method]	SDG	Sample ID	Result and Qualifiers	Qualifier Reason
manganese, total [6010C]	JC56189	MW-13_112817	0.6 µg/L J (B)	FBL
nickel, total [6010C]	JC56189	MW-13_112817	2.7 µg/L J (B)	FBL
manganese, total [6010C]	JC56189	MW-17_112817	1.5 µg/L J (B)	FBL
manganese, total [6010C]	JC56189	MW-19_112817	1.6 µg/L J (B)	FBL
nickel, total [6010C]	JC56189	MW-12_112917	2.0 µg/L J (B)	FBL
manganese, total [6010C]	JC56189	MW-16_112917	7.9 µg/L J (B)	FBL
manganese, total [6010C]	JC56189	MW-18_112917	0.7 µg/L J (B)	FBL

Except as noted above, representativeness exceptions encountered during the data review were not expected to impact the overall data quality of the dataset or were within acceptable parameters. No systemic trends or biased were observed. No systemic trends or biases were observed.

All other representativeness indicators are within acceptable parameters.

2.5.3.4 Comparability

Comparability is evaluated by ensuring that the data set collected during the investigation event is comparable or agrees with the data set collected during a previous sampling event. A review of the sampling, preparation, and analytical methods is performed to verify consistency between events.

The samples were collected, prepared, and analyzed in accordance with the methodologies presented in the QSM and the UFP-QAPP.

2.5.3.5 Completeness

Completeness is calculated as the ratio of usable data to all analytical data collected. For completeness requirements, usable results are all results not qualified with an “R” (rejected data) qualifier during data verification/validation. The completeness goal, as defined in the UFP-QAPP, is 90% of each parameter. The following equation is used to calculate analytical completeness:

% Analytical Completeness = (number of non-rejected results/number of reported results) * 100

The dalapon result for field sample SB-5(15-20)_042717 was rejected due to low matrix spike/matrix spike duplicate recoveries. All other rejected results identified during the data review were in equipment and ambient blanks. The calculated analytical completeness attained for this sampling event is greater than 95%. The analytical completeness goal was met.

2.5.3.6 Sensitivity

Sensitivity is evaluated by comparing the reporting limits to the project action limits. The instrument or method should provide an accurate analyte concentration that is not greater than the applicable standard and/or screening level. The reporting requirement for the QSM is to report for compound results in three levels (high level –LOQ, middle level - LOD, and low level –DL). As required by DOD QSM 4.2 protocol, all compounds, which were qualitatively identified at concentrations below their respective LOQ but above the DL, have been marked with "J" qualifiers to indicate that they are quantitative estimates. Non-detect results have been reported to the LOD.

2.6 Deviations from the Work Plan

Deviations from the RIWP included moving soil boring and monitoring well locations, using different sized DPT dual-tube tooling (2.25-inch versus 3.25-inch), and advancing multiple pushes of tooling to obtain sufficient sample volume for headspace and laboratory analyses. Borings SB-4 and SB-10 were moved approximately five to seven feet to maintain proper utility clearances. Boring SB-8, near MW-15 and within the former excavation, was moved approximately two to three feet to the southeast, biased toward the former excavation, due to two tractor-trailers preventing DPT rig access. The two trailers were semi-permanently located on site to provide storage for on-going construction activities conducted at Building 30013 (window replacement) and were unable to be moved during this RI. No negative impacts on the project goals were realized due to movement of these soil borings.

In accordance to the UFP-QAPP, soil PID screening was to occur over every 2-foot increment to depth. To provide the requisite sample volume for both headspace and laboratory sample collection, 3.25-inch tooling was proposed for soil boring advancement at the site. However, shortly after beginning DPT activities, soil core recoveries were very poor (less than one foot of recovery for every five feet advanced, i.e., less than 20 percent recovery). Subsurface matrix conditions consisting of gravel larger than 2.5-inches were represented by the entire cutting shoe being filled with rock – material stuck inside the cutting shoe prevented soil from entering core liners. As a result, not enough sample material was present to screen over the proposed 2-foot sample increments. Multiple unsuccessful attempts were conducted to increase recoveries with the 3.25-inch tooling. After consultation with WPAFB and OEPA, borings were advanced with 2.25-inch dual-tube tooling and samples were collected from smaller core liners over approximate 2.5-foot intervals. However, even with the slight improvement of sample recoveries using the smaller diameter tooling, recovered sample material volume insufficient to analyze for all intended parameters. As a result, multiple pushes were performed at each boring in order to obtain sufficient sample material volume. The first push was advanced to depth and screened as presented in the UFP-QAPP and headspace, VOC, and GRO samples were collected from the first push core liners. Subsequent pushes were used for SVOC, TPH, and metals sample collection. All secondary and tertiary pushes were advanced with new, clean core liners and were advanced within 6 inches of the initial push.

The initial boring for SB-4 was inadvertently advanced within the utility corridor for a water line running through the site. Upon discovery, work was immediately halted and the project manager and AFCEC POC were contacted. At that point, the tooling was at depth at 25 feet bgs. The area was checked for the presence of water, of which none was noted. The tooling was then removed from the boring and the boring was backfilled with hydrated bentonite, and a new boring was advanced approximately four feet to the northeast and samples were collected. However, the VOC and GRO samples from 0 to 2.5 feet (SB-4[0-2.5]_042717) were unintentionally shipped to the laboratory for analysis. Replacement VOC and GRO samples were collected the next day from the new SB-4 boring location and also analyzed (SB-4[0-2.5]_042817).

Due to fill material creating difficult drilling conditions resulting in poor soil recovery, insufficient sample material was available for analysis of all parameters (including pesticides, herbicides, and PCBs) for the 15- to 20- foot interval at SB-8, despite several attempts at advancing the boring. As a result, the 15- to 20-foot interval at SB-8 was not analyzed for SVOCs, TPH, or metals – only VOCs, GRO, pesticides, herbicides, and PCBs were analyzed for the interval.

The locations of the new monitoring wells were revised as per a telephone conversation between USEPA Region 5 and WPAFB IRP staff on 19 July 2017. While no significant areas of potential impact were noted during the soil investigation and preliminary data analysis, specific site conditions warranted adjusting the final placement of all three proposed wells. MW-17 was moved approximately 25 feet to the southeast to a more upgradient location in order to avoid installing the well completion in an area of incompetent asphalt due to jointing and patching within the road. MW-18 was moved approximately 10 to 15 feet to the southwest from within the active traffic lane to a safer location just inside a parking spot. MW-19 was moved northwest to a location more centrally located downgradient between existing wells MW-7 and MW-14 and outside of the utility clearance zone required for a high-pressured water line running through the site. All field and analytical data generated during the soil investigation (PID data, soil boring lithology, preliminary soil analytical data, as well as groundwater elevation measurements) were assessed prior to selecting the final placements of the three new wells.

3.0 GENERAL ENVIRONMENTAL SETTING

LF512 is located within Area A of WPAFB. The site, less than one acre in size, is flat and largely covered with impermeable surfaces consisting of asphalt or concrete. A small area, less than 0.20 acres is covered with regularly-maintained grass. The site is currently used as a parking area servicing Building 30013 personnel.

3.1 Physiography

WPAFB is located within the Till Plains section of the Central Lowlands Physiographic Province. Till Plains areas are characterized by extensive areas with a flat to slightly undulating terrain, consisting of a mixture of clay, sand, gravel, and boulders deposited by glaciers of the Pleistocene Age. Within this province, glacial drift (till and/or outwash) blankets the underlying bedrock and the ground surface topography is generally gently rolling. Slopes leading from river valleys to the uplands are generally steep and are comprised of till overlying bedrock. The principal streams draining the region are the Great Miami River, the Mad River, and the Stillwater River.

3.2 Regional Geology and Hydrogeology

The bedrock beneath WPAFB consists of gently dipping sedimentary rock of Ordovician and Silurian age. The Richmond Group, consisting of shale with interbedded thin limestone, is of Ordovician age and directly underlies the unconsolidated sedimentary deposits of the Mad River Valley at the base. In areas of higher topography, the Richmond Group is overlain by the Brassfield Limestone, a gray to brown fossiliferous limestone that occasionally crops out on the hillsides. Unconsolidated, glacially related outwash and tills are the predominant sediments directly underlying the installation. More than 250 feet of sand and gravel outwash fill the ancient valley underlying the airfields. Discontinuous, thick lenses of relatively impermeable clay till are interbedded in the porous sand and gravel glacial outwash.

At WPAFB, the outwash is locally separated from overlying alluvial materials by 2 to 7 feet of dense, unsorted till composed of clay, silt, gravel, and sand. In many areas, the till layer is thin or absent and the outwash deposits are directly overlain by alluvium. Also, in many areas, one or more layers of till occur within the glacial outwash, dividing it locally into separate hydraulic units.

Aquifer types in the region include the water table aquifers that occur in the coarse-grained deposits found in most valley locations and in the fine-grained (silts and clays) and till deposits found in the hill regions. Groundwater can also be found in semi-confined zones and occasionally in bedrock. Hydraulic permeability in the hill and valley regions of WPAFB varies widely. Many locations on the hill or in the upland portion of WPAFB have very limited water-producing zones, with localized discontinuous sandy zones in silt and clay.

Glacial drift deposits comprise the major aquifers in the region. Some bedrock may produce limited groundwater within bedding planes and fractures; however, many shallow bedrock locations are dry. The water table aquifer underlying WPAFB is part of the Great Miami/Little

Miami Buried Valley Aquifer System. In 1987, USEPA designated this aquifer as a sole-source aquifer under the provisions of the Safe Drinking Water Act.

The aquifer underlying WPAFB is located approximately 20 to 30 feet beneath the ground surface with well yields upwards of 1,500 to 2,000 gallons per minute (gpm) in highly permeable areas with significant aquifer thickness. Bedrock groundwater at the WPAFB generally occurs at a lower hydraulic head (elevation) than the sand and gravel aquifer. The shale bedrock in the region is not considered a viable aquifer. Drinking water wells for the city of Dayton are located directly downgradient from the southwestern boundary of Area A.

3.3 Site Geology and Hydrogeology

Sediments encountered at LF512 during this RI consisted of fill material and interbeds of glacial till and outwash deposits. The predominant sediment type encountered at LF512 consisted of a silty sand with gravel and fines in differing percentages across the site. Gravels ranged in size from 0.25 inches to more than 3 inches. Fill material was encountered in areas associated with the former excavation area and included fragmented stone, concrete, and gravel in a silty sand matrix. At several boring locations, gravel encountered contained clasts larger in diameter than the DPT tooling sizes (greater than 1.5 to 3 inches in diameter using either 1.5-inch or 3-inch tooling), resulting in DPT refusal and/or limited to no recovery of material. Limited recovery was in part attributed to mangled core liners or clogging of the cutting shoe, preventing material from entering the core liners.

Soil borings were completed to just below the top of the saturated zone at depths of approximately 25 or 30 feet bgs. Soil boring logs for borings advanced during the RI are included in **Appendix C**. The saturated zone was encountered between 24 and 27 feet bgs in all borings except for SB-13 and SB-16, where saturated zones were encountered shallower at 22.5 and deeper at 27.5, respectively.

Groundwater flow at LF512 generally flows to the southwest. Two rounds of groundwater elevation data were collected during the RI, first on 1 August 2017 and again 28 November 2017 (**Table 2-2**). Groundwater contours for August 2017 and November 2017 are presented on **Figures 3-1** and **3-2**, respectively.

Surface water at WPAFB is managed by an extensive network of storm water sewers discharging to ditches and eventually into the Mad River. Surface water runoff at LF512 is directed to onsite storm water inlets and removed from the site via the storm water sewer system; there are no surface waterbodies at LF512.

3.4 Land Use

The land at LF512 is approximately six-tenths of an acre in size and is located northeast of Building 30013. The majority of the site is covered with asphalt and/or concrete and serves as a parking area for the occupants of Building 30013. A small portion of the site is grass-covered.

4.0 NATURE AND EXTENT OF CONTAMINATION

The following sections present soil and groundwater data generated during RI field activities. During the RI, a grid-based soil sampling effort was conducted to evaluate site soil for potential COPCs related to the former UST and excavations. Three groundwater monitoring wells were installed during this RI to evaluate upgradient and downgradient groundwater at the site. Two rounds of groundwater sampling were performed in August and November 2017 at all nine site monitoring wells. Field work was conducted in accordance with the Final UFP-QAPP and as discussed in Section 2. Analytical data were validated according to the most recent QSM guidelines and, except as noted in the data review reports (see Section 2.5), are usable for their intended purposes. This section presents summary screening tables and summary figures.

In analytical summary tables (**Tables 4-1a** through **4-1c**, **4-2a,** and **4-2b**), data from LF512 are screened versus May 2019 USEPA Regional Screening Levels (RSLs) for Chemical Contaminants for Industrial Soils, Tapwater, and MCLs (USEPA, 2019b). Soil results were also screened against USEPA Risk-based Soil Screening Levels (SSLs) and MCL-based SSLs to evaluate the potential for leaching from soil to groundwater. COPCs (Section 5.0) were selected by comparing the maximum detected concentrations to USEPA RSLs for residential soil so that the risk-assessment would remain health-protective (see Section 5.2.1). For soil and groundwater results, all detected concentrations are bolded. Soil concentrations exceeding industrial RSLs are highlighted blue in screening tables, soil concentrations exceeding risk-based SSLs are twice underlined, and soil concentrations exceeding MCL-based SSLs are color-coded red, while groundwater concentrations exceeding tapwater RSLs are color-coded red and those present above MCLs are twice underlined. To aid in efficient data presentation, analytes with exclusively non-detected data, per media group, are not presented on summary tables (**Tables 4-1a** through **4-1c**, **4-2a,** and **4-2b**). Alternate versions of summary tables showing all detected and non-detected data are provided in **Appendix J**. Figures show only those analytes identified as COPCs during the baseline HHRA. COPCs for soil and groundwater were selected based on the initial baseline HHRA hazard assessment performed separately for each media type relevant to each risk scenario (see Section 5.2.1) and are based on residential soil RSLs.

4.1 Soil Analytical Results

The following data comprise all soil data evaluated in the baseline HHRA and ERA (Section 5). Four sample intervals were submitted for laboratory analysis from each of the 16 soil boring locations. Sampling intervals were selected based on PID readings and biased to represent the three most affected intervals (i.e., highest PID headspace readings) while the fourth interval was collected at the groundwater interface. Specific soil intervals were pre-determined for three soil borings (SB-5, SB-8, and SB-12) to target evaluation of the excavation fill, the soil just below the excavation bottom, and to confirm results from the 2013 BUSTR SB-17 location.

The results from 2017, for SB-12, did not confirm the presence of elevated concentrations of TCE or TPH GRO. The screening of the soil column using the PID noted only low to moderate responses (3.2 to 17.7 ppmv). Boring SB-12 was located approximately 1.5 feet from the original boring in 2013. The presence of a volatile compound like TCE and the components of DRO TPH would have been detected if they were present. No TPH nor TCE were reported in the nearest downgradient well, MW-16.

If PID headspace analysis indicated no elevated PID detections, and the location was not one of the three locations with pre-determined sampling intervals, then risk assessment-based samples were collected from 0 to 2.5 feet bgs, 7.5 to 10 feet bgs, 10 to 12.5 feet bgs, and at the groundwater interface. In isolated instances where two intervals had similar PID headspace readings, the interval most closely matching the preferred risk-assessment intervals was selected for laboratory analysis. PID readings were noted in nearly every boring location and ranged from 0 parts per million (ppm) to greater than 350 ppm; most readings were less than 5 ppm. In evaluating the samples for collection at SB-13, a sample was collected from the higher of the two sample intervals (12.5 to 15 foot bgs) from the 10 to 15 foot interval based on the PID readings. Since the PID responses were all relatively low, the 0 to 2.5 foot interval was selected for risk assessment purposes to ensure sufficient data were available for residential exposure scenarios.

To appropriately evaluate LF512 soil for the risk assessment, site soil was subdivided into surface (0 to 2.5 feet bgs) and aggregate (0 to 15 feet bgs) intervals. Surface soil samples included seven sampling locations: SB-2, SB-4, SB-6, SB-9, SB-12, SB-13, and SB-14. Aggregate samples included the seven surface soil samples as well as all samples collected from 2.5 to 15 feet bgs and included samples from all 16 sampling locations. Additional samples were collected from potentially impacted zones between 15 feet bgs and the groundwater interface at 11 locations: SB-1, SB-3, SB-5, SB-6, SB-7, SB-8, SB-10, SB-12, SB-14, SB-15, and SB-16. Groundwater interface soil samples were collected at each of the 16 locations from depths between 22 and 27.5 feet bgs (with exception of SB-8, which was sampled from 20 to 25 feet bgs due to low material recovery). Sampling locations and associated intervals are summarized below:

Sampling Locations and Associated Intervals

Surface Soil Samples **(0 to 2.5 feet bgs)**	**Aggregate Soil Samples[1]** **(0 to 15 feet bgs)**	**Potentially Impacted Zone Soil Samples** **(15 feet bgs to groundwater interface)**	**Groundwater Interface Soil Samples** **(groundwater interface)**
SB-2(0-2.5)	SB-1(2.5-5)	SB-1(17.5-20)	SB-1(22.5-25)
SB-4(0-2.5)[2]	SB-1(12.5-15) & duplicate	SB-3(17.5-20)	SB-2(22.5-24)
SB-6(0-2.5) & duplicate	SB-2(5-7.5)	SB-3(20-22.5)	SB-3(22.5-25)
SB-9(0-2.5) & duplicate	SB-2(10-12.5)	SB-5(15-20)	SB-4(22.5-25)
SB-12(0-2.5) & duplicate	SB-3(7.5-10) & duplicate	SB-6(15-17.5)	SB-5(22.5-25)
SB-13(0-2.5)	SB-4(5-10)	SB-6(17.5-20)	SB-6(22-24)
SB-14(0-2)	SB-4(12.5-15)	SB-7(15-20)	SB-7(22.5-25)
	SB-5(2.5-5)	SB-7(20-22.5)	SB-8(20-25)[3]
	SB-5(7.5-10)	SB-8(15-20)	SB-9(22.5-25)
	SB-7(0-5) & duplicate	SB-10(22.5-25)	SB-10(25-27)
	SB-8(2-5)	SB-12(15-20)	SB-11(24-26) & duplicate
	SB-8(12-14)	SB-14(18-20)	SB-12(22.5-25)
	SB-9(10-12.5)	SB-15(17.5-20)	SB-13(20-22.5)[4]
	SB-9(12.5-15)	SB-16(17.5-20)	SB-14(25-27)
	SB-10(2-4)		SB-15(22.5-25)

Surface Soil Samples (0 to 2.5 feet bgs)		**Aggregate Soil Samples[1] (0 to 15 feet bgs)**		**Potentially Impacted Zone Soil Samples (15 feet bgs to groundwater interface)**		**Groundwater Interface Soil Samples (groundwater interface)**	
		SB-10(6-8)				SB-16(25-27.5)	
		SB-11(4-6)					
		SB-11(6-8)					
		SB-11(10-15)					
		SB-12(10-12.5)					
		SB-13(7.5-10)					
		SB-13(12.5-15)					
		SB-14(12-14)					
		SB-15(7.5-10) & duplicate					
		SB-15(12.5-15)					
		SB-16(7.5-10)					
		SB-16(12.5-15)					
Total	***7 Locations 7 Samples***	***Total***	***16 Locations 34 Samples***	***Total***	***11 Locations 14 Samples***	***Total***	***16 Locations 16 Samples***

1: Aggregate soil samples are a combination of surface soil samples (0 to 2.5 feet bgs) and samples from 2.5 to 15 feet bgs.
2: SB-4 0 to 2.5 feet bgs sample interval sampled twice. See Section 2.6.
3: SB-8 sampled from 20 to 25 feet bgs due to low material recovery. See Section 2.6
4: SB-13 sampled from 20 to 22.5 feet bgs due to presence of water at 22.5 feet bgs. See Section 3.3.

All soil samples submitted to the laboratory were analyzed for VOCs, SVOCs, PAHs, TPH, and metals. In addition, samples from below the excavation fill material at SB-5 and SB-8 were analyzed for pesticides, herbicides, and PCBs. Note that due to low material recovery at SB-8, the 15- to 20-foot bgs interval was not analyzed for SVOCs, TPH, or metals to ensure sufficient material was available to analyze for pesticide, herbicide, and PCB analysis; however, VOCs and GRO were analyzed.

Based on the soil boring lithology for SB-8, the fill material ends at approximately 12 feet bgs, thus the soils from the 12 to 14 foot interval represent native material underlying the former excavation. This suggests that the excavation in the southeastern area of the did not extend to 15 feet below grade as reported in the existing documentation from the 1994 remedial action in the southwestern area of the former excavation. This horizon corresponds to elevated GRO TPH and also contains SVOCs, but not at concentrations exceeding Industrial Soil RSLs. Several PAHs do exceed soil to groundwater screening levels in this horizon. No SVOCs were detected at the soil groundwater interface horizon of 20 to 25 feet bgs; however, PAHs are not present in the groundwater at MW-15 situated within the former excavation. OEPA had requested pesticide, herbicide, and PCB analyses at the 15- to 20-foot horizon at SB-5 and SB-8 to prove the presence or absence of these target constituents within the sample horizon just beneath the estimated bottom of the former excavation. OEPA was also on site during the sampling efforts at SB-8 and SB-5 within the former excavation. At SB-5 within the former excavation area, samples were collected in the 15 to 20 foot horizon just below a layer of gravel fill and would be judged to be the first layer of native material. SVOC samples were collected from this location after multiple attempts of DPT advancement. No PID responses or SVOCs were reported in any of the SB-5 samples and as such, a data gap for SVOCs in the vicinity of the former excavation does not exist.

4.1.1 Volatile Organic Compounds

VOCs were detected in site soils; however, none of the detections exceeded May 2019 Industrial Soil RSLs (blue shading, **Table 4-1a**), while numerous results exceeded USEPA RSL Risk-based SSLs (double underlining, **Table 4-1a**) and/or USEPA RSL MCL-based SSLs (red text, **Table 4-1a**) for protection of groundwater. However, no VOCs were identified as COPCs for either surface or aggregate soil for the risk assessment (see Section 5.2.1).

<u>Surface Soil</u>

A total of 15 VOCs was detected below industrial RSLs in surface soil (0 to 2.5 feet bgs) at LF512 (**Table 4-1a**):

- acetone
- benzene
- 2-butanone
- carbon disulfide
- cyclohexane
- ethylbenzene
- isopropylbenzene
- methyl acetate
- methylcyclohexane
- methylene chloride
- toluene
- TCE
- *m,p*-xylene
- *o*-xylene
- total xylene

Of these, three parameters exceeded the risk-based and/or MCL-based SSLs at more than one location:

Surface Soil (0 to 2.5 feet bgs) VOC Exceedances

Parameter	**Range (µg/kg)**		**Industrial RSL (µg/kg)**		**Risk-based SSL* (µg/kg)**		**MCL-based SSL* (µg/kg)**	
	Minimum	**Maximum**	**Value**	**Exceed**	**Value**	**Exceed**	**Value**	**Exceed**
Benzene	0.22 J	2.0	5,100	no	0.23	yes	2.6	no
Methylene chloride	2.2 J	15.4 J	1,000,000	no	2.9	yes	1.3	yes
TCE	0.30 J	4.5 J	6,000	no	0.18	yes	1.8	yes

Note: *Risk- and MCL-based SSLs evaluate the potential for leaching to groundwater.

<u>Aggregate Soil</u>

A total of 25 VOCs was detected below industrial RSLs in aggregate soil (0 to 15 feet bgs) at LF512 (**Table 4-1a**):

- acetone
- benzene
- 2-butanone
- carbon disulfide
- chlorobenzene
- chloroform
- cyclohexane
- 1,2-dichlorobenzene
- 1,3-dichlorobenzene
- 1,4-dichlorobenzene
- 1,2-dichloroethane
- 1,1-dichloroethene
- cis12DCE
- trans12DCE
- ethylbenzene
- isopropylbenzene
- methyl acetate
- methylcyclohexane
- methylene chloride
- PCE
- TCE
- toluene
- *m,p*-xylene
- *o*-xylene
- total xylene

Of these, seven parameters exceeded the risk-based and/or the MCL-based SSLs at more than one location/interval. In addition, three parameters exceeded the risk-based and/or the MCL-based SSLs in only one sample, each:

Aggregate Soil (0 to 15 feet bgs) VOC Exceedances

Parameter	**Range (µg/kg)**		**Industrial RSL (µg/kg)**		**Risk-based SSL* (µg/kg)**		**MCL-based SSL* (µg/kg)**	
	Minimum	**Maximum**	**Value**	**Exceed**	**Value**	**Exceed**	**Value**	**Exceed**
Benzene	0.13 J	29.3 J	5,100	no	0.23	yes	2.6	yes
Chlorobenzene	--	262	1,300,000	no	53	yes	68	yes
Chloroform	0.24 J	1.8 J	1,400	no	0.061	yes	22	no
1,4-Dichlorobenzene	--	259	11,000	no	0.46	yes	72	yes
1,2-Dichloroethane	--	0.29 J	2,000	no	0.048	yes	1.4	no
Ethylbenzene	0.21 J	76.4 J	25,000	no	1.7	yes	780	no
Isopropylbenzene	0.18 J	1,110	9,900,000	no	740	yes	--	--
Methylene chloride	0.99 J	15.4 J	1,000,000	no	2.9	yes	1.3	yes
TCE	0.30 J	112	6,000	no	0.18	yes	1.8	yes
Total xylenes	0.20 J	249	2,500,000	no	190	yes	9,900	no

Note: *Risk- and MCL-based SSLs evaluate the potential for leaching to groundwater.

Groundwater Interface Soil

A total of 23 VOCs was detected below industrial RSLs in soil at the groundwater interface (between 22 and 27 feet bgs) (**Table 4-1a**):

- acetone
- benzene
- carbon disulfide
- carbon tetrachloride
- chloroform
- chloromethane
- cyclohexane
- 1,2-dichlorobenzene
- 1,2-dichloroethane
- cis12DCE
- ethylbenzene
- isopropylbenzene
- methyl acetate
- methylcyclohexane
- 4-methyl-2-pentanone
- methylene chloride
- PCE
- styrene
- TCE
- toluene
- *m,p*-xylene
- *o*-xylene
- total xylene

Of the 23 VOCs, six parameters had more than one detection with values exceeding the risk-based and/or MCL-based SSLs and one VOC, 1,2-dichlorethane, had only one detection exceeding the risk-based SSL:

Groundwater Interface Soil VOC Exceedances

Parameter	Range (µg/kg)		Industrial RSL (µg/kg)		Risk-based SSL* (µg/kg)		MCL-based SSL* (µg/kg)	
	Minimum	Maximum	Value	Exceed	Value	Exceed	Value	Exceed
Benzene	0.19 J	1.1	5,100	no	0.23	yes	2.6	no
Carbon tetrachloride	0.34 J	0.43 J	2,900	no	0.18	yes	1.9	no
Chloroform	0.21 J	0.76 J	1,400	no	0.061	yes	22	no
1,2-Dichloroethane	--	1.3	2,000	no	0.048	yes	1.4	no
Methylene chloride	0.97 J	13.7	1,000,000	no	2.9	yes	1.3	yes
PCE	0.98 J	12.2	100,000	no	5.1	yes	2.3	yes
TCE	0.24 J	13.0	6,000	no	0.18	yes	1.8	yes

Note: *Risk- and MCL-based SSLs evaluate the potential for leaching to groundwater.

4.1.2 Semi-volatile Organic Compounds

SVOCs were detected in site soils, but none of the detections exceeded May 2019 Industrial Soil RSLs (blue shading, **Table 4-1b**), while many exceeded USEPA RSL Risk-based SSLs (double underlining, **Table 4-1b**) and/or USEPA RSL MCL-based SSLs (red text, **Table 4-1b**) for protection of groundwater. Three SVOCs, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene, are identified as a COPCs for surface and aggregate soil for the risk assessment (see Section 5.2.1).

Surface Soil

A total of 22 SVOCs were detected below industrial RSLs in surface soil (0 to 2.5 feet bgs) at LF512 (**Table 4-1b**):

- acenaphthene
- acenaphthylene
- anthracene
- benzaldehyde
- benzo(a)anthracene
- benzo(a)pyrene
- benzo(b)fluoranthene
- benzo(g,h,i)perylene
- benzo(k)fluoranthene
- 1,1’-biphenyl
- carbazole
- caprolactam
- chrysene
- dibenzo(a,h)anthracene
- dibenzofuran
- fluoranthene
- fluorene
- indeno(1,2,3-cd)pyrene
- 2-methylnaphthalene
- naphthalene
- phenanthrene
- pyrene

Of the 22 SVOCs, eight parameters were detected at concentrations exceeding the risk-based and/or the MCL-based SSLs at more than one location, and one SVOC, benzaldehyde, was only detected exceeding SSLs at one location:

Surface Soil (0 to 2.5 feet bgs) SVOC Exceedances

Parameter	Range (µg/kg)		Industrial RSL (µg/kg)		Risk-based SSL* (µg/kg)		MCL-based SSL* (µg/kg)	
	Minimum	Maximum	Value	Exceed	Value	Exceed	Value	Exceed
Benzaldehyde	--	40.8 J	820,000	no	4.1	yes	--	--
Benzo(a)anthracene	32.7 J	1,030	21,000	no	11	yes	--	--
Benzo(a)pyrene	26.8 J	853	2,100	no	29	yes	240	yes
Benzo(b)fluoranthene	35.8	1,280	21,000	no	300	yes	--	--
1,1'-Biphenyl	19.0 J	37.1 J	200,000	no	8.7	yes	--	--
Dibenzo(a,h)anthracene	95.1 J	183	2,100	no	96	yes	--	--
Dibenzofuran	20.3 J	181	1,000,000	no	150	yes	--	--
2-Methylnaphthalene	65.5 J	204 J	3,000,000	no	190	yes	--	--
Naphthalene	35.7 J	218	17,000	no	0.54	yes	--	--

Notes: COPCs are indicated by gray shading. *Risk- and MCL-based SSLs evaluate the potential for leaching to groundwater.

Benzo(a)pyrene, one of the three COPCs, was detected in six of seven surface soil samples collected at LF512. Concentrations of benzo(a)pyrene exceeded one or both SSLs in five of the six samples and ranged from 26.8 J (below SSLs) at SB-12 (0 to 2.5 feet bgs) to 853 µg/kg at SB-4 (0 to 2.5 feet bgs). Benzo(b)fluoranthene, detected in six of seven samples, ranged from 35.8 µg/kg (SB-12) to 1,280 µg/kg (SB-2), with four samples exceeding the risk-based SSL. The third COPC, dibenzo(a,h)anthracene, was detected in four surface soil samples, with three exceeding the risk-based SSL. Dibenzo(a,h)anthracene concentrations ranged from 95.1 J (below the SSL) to 183 µg/kg at SB-6 and SB-4, respectively. These three COPCs are indicated in **Table 4-1b** and shown on **Figures 4-1a** and **4-1b**.

<u>Aggregate Soil</u>

A total of 29 SVOCs were detected below industrial RSLs in aggregate soil (0 to 15 feet bgs) at LF512 (**Table 4-1b**):

- acenaphthene
- acenaphthylene
- acetophenone
- anthracene
- benzaldehyde
- benzo(a)anthracene
- benzo(a)pyrene
- benzo(b)fluoranthene
- benzo(g,h,i)perylene
- benzo(k)fluoranthene
- 1,1'-biphenyl
- bis(2-ethylhexyl)phthalate
- carbazole
- caprolactam
- chrysene
- dibenzo(a,h)anthracene
- dibenzofuran
- 2,4-dimethylphenol
- Di-n-butyl phthalate
- fluoranthene
- fluorene
- indeno(1,2,3-cd)pyrene
- 2-methylnaphthalene
- 2-methylphenol
- 3&4-methylphenol
- naphthalene
- phenanthrene
- phenol
- pyrene

Of the 29 SVOCs, nine were detected at concentrations exceeding SSLs at more than one location and one SVOC, 2,4-Dimethylphenol, was only detected exceeding an SSL at one location:

Aggregate Soil (0 to 15 feet bgs) SVOC Exceedances

Parameter	Range (µg/kg)		Industrial RSL (µg/kg)		Risk-based SSL* (µg/kg)		MCL-based SSL* (µg/kg)	
	Minimum	Maximum	Value	Exceed	Value	Exceed	Value	Exceed
Benzaldehyde	40.8 J	97.1 J	820,000	no	4.1	yes	--	--
Benzo(a)anthracene	17.8 J	1,030	21,000	no	11	yes	--	--
Benzo(a)pyrene	24.3 J	853	2,100	no	29	yes	240	yes
Benzo(b)fluoranthene	16.0 J	1,280	21,000	no	300	yes	--	--
1,1’-Biphenyl	18.1 J	43.4 J	200,000	no	8.7	yes	--	--
Dibenzo(a,h)anthracene	18.0 J	183	2,100	no	96	yes	--	--
Dibenzofuran	15.4 J	656	1,000,000	no	150	yes	--	--
2,4-Dimethylphenol	--	658 J	16,000,000	no	420	yes	--	--
2-Methylnaphthalene	17.5 J	2,210	3,000,000	no	190	yes	--	--
Naphthalene	17.1 J	1,650	17,000	no	0.54	yes	--	--

Notes: COPCs are indicated by gray shading. *Risk- and MCL-based SSLs evaluate the potential for leaching to groundwater.

Benzo(a)pyrene was detected in 15 of the aggregate soil samples (at 11 of 16 locations), exceeding one or both the SSLs, at concentrations between 24.3 J µg/kg at SB-11 (4 to 6 feet bgs) and 853 µg/kg at SB-4 (0 to 2.5 feet bgs). Benzo(b)fluoranthene concentrations ranged between 16.0 J at SB-16 (12.5 to 15 feet bgs) and 1,280 µg/kg at SB-2 (0 to 2.5 feet bgs) with a total of 18 detections (at 12 locations), five of which exceeded the risk-based SSL. Concentrations of dibenzo(a,h)anthracene ranged from 18.0 J at SB-10 (2 to 4 feet bgs) to 183 at SB-4 (0 to 2.5 feet bgs) with three of the 10 detections exceeding the risk-based SSL. The highest concentrations of the three COPCs not attributed with surface soil occurred with sample location SB-15 at the 7.5 to 10 foot bgs interval: benzo(a)pyrene was reported at 386 J µg/kg, benzo(b)fluoranthene at 389 J µg/kg, and dibenzo(a,h)anthracene at 84.7 J µg/kg. The three COPCs in aggregate soil are presented in **Table 4-1b** and on **Figures 4-2a** and **4-2b**.

Groundwater Interface Soil

Only five SVOCs were detected at concentrations below industrial RSLs in soil at the groundwater interface (between 22 and 27 feet bgs) (**Table 4-1b**):

- caprolactam
- hexachlorobenzene
- 4-nitroaniline
- phenanthrene
- pyrene

No COPCs were detected in soil at the groundwater interface and only two of the five SVOCs were detected at concentrations below industrial RSLs but exceeding SSLs in only two soil samples collected at the groundwater interface (SB-13 and SB-16):

Groundwater Interface Soil SVOC Exceedances

Parameter	**Range (μg/kg)**		**Industrial RSL (μg/kg)**		**Risk-based SSL* (μg/kg)**		**MCL-based SSL* (μg/kg)**	
	Minimum	**Maximum**	**Value**	**Exceed**	**Value**	**Exceed**	**Value**	**Exceed**
Hexachlorobenzene	--	13.7 J	960	no	0.12	yes	13	yes
4-Nitroaniline	--	15.1 J	110,000	no	1.6	yes	--	--

Note: *Risk- and MCL-based SSLs evaluate the potential for leaching to groundwater.

4.1.3 Total Petroleum Hydrocarbons

TPH was detected in site soils and detected concentrations were compared to the Ohio Maximum Allowable Residual TPH for Type 1 Soils (blue shading, **Table 4-1b**) and OEPA Soil Leaching to Groundwater (red text) screening levels (OEPA, 2008).

<u>Surface Soil</u>

TPH was detected in surface soil, but only DRO exceeded the BUSTR Maximum Allowable Residual TPH standard for Type 1 Soils. Multiple locations exceeded the Ohio Soil Leaching to Groundwater Standards, but TPH was not reported in groundwater with the exception of trace DRO- and ORO-TPH in MW-7 in the August 2017 event only. None of the detected concentrations exceeded the Maximum Allowable Residual screening levels (**Table 4-1b**). No TPH fractions were identified as COPCs for the risk assessment. DRO was detected at concentrations between 12.8 mg/kg and 106 mg/kg. GRO was not detected in surface soil and while ORO was detected, none of the concentrations exceeded a screening level in surface soil.

<u>Aggregate Soil</u>

TPH concentrations exceeding screening levels in aggregate soil included GRO and DRO; ORO, while reported, was not reported at concentrations exceeding either screening level. GRO was detected in four samples at two locations (SB-10 and SB-11) at concentrations ranging between 31.3 mg/kg and 45.9 mg/kg and exceeding the soil leaching level. GRO was also detected in one location, SB-8 at 12 to 14 feet bgs, with a concentration exceeding both the soil leaching level and the maximum residual screening level at 1,810 mg/kg. DRO exceeded only the soil leaching level and was reported in 15 samples at concentrations between 10.1 mg/kg and 269 mg/kg.

<u>Groundwater Interface Soil</u>

TPH was detected in soil at the groundwater interface and GRO (one location, only) and DRO concentrations exceeded soil leaching levels. GRO was detected in SB-8 at a concentration of 72.9 mg/kg and DRO was detected in five locations with concentrations between 9.55 and 38.0 mg/kg. ORO, while detected in eight locations, was not detected at concentrations exceeding the soil leaching level.

4.1.4 Inorganic Compounds

Inorganic compounds were detected in site soils, but none of the detections, except for arsenic, exceeded May 2018 Industrial Soil RSLs (blue shading, **Table 4-1c**), while many exceeded USEPA RSL Risk-based SSLs (double underlining, **Table 4-1c**) and/or USEPA RSL MCL-based SSLs (red text, **Table 4-1c**) for protection of groundwater. Five inorganic compounds, including aluminum, cobalt, iron, manganese, and thallium are identified as COPCs in surface and aggregate soil, and three additional compounds, arsenic, cadmium, and vanadium, are also identified as COPCs for aggregate soil (see Section 5.2.1).

<u>Surface Soil</u>

A total of 21 inorganic compounds were detected below industrial RSLs and one inorganic compound, arsenic, was detected exceeding industrial RSLs in surface soil (0 to 2.5 feet bgs) at LF512 (**Table 4-1c**):

- aluminum
- arsenic
- barium
- beryllium
- cadmium
- calcium
- chromium
- cobalt
- copper
- iron
- lead
- magnesium
- manganese
- mercury
- nickel
- potassium
- selenium
- silver
- sodium
- thallium
- vanadium
- zinc

Of the 22 inorganic compounds, seven were detected at concentrations exceeding the risk-based and/or the MCL-based SSLs at more than one location; three compounds, selenium, silver, and thallium, were detected exceeding SSLs at one location, each; and arsenic was detected at concentrations exceeding both SSLs and the industrial RSL in all samples:

Surface Soil (0 to 2.5 feet bgs) Inorganic Compound Exceedances

Parameter	Range (mg/kg)		Industrial RSL (mg/kg)		Risk-based SSL* (mg/kg)		MCL-based SSL* (mg/kg)	
	Minimum	Maximum	Value	Exceed	Value	Exceed	Value	Exceed
Arsenic	3.1	12.4 J	3.0	yes	0.0015	yes	0.29	yes
Barium	18.1 J	602	220,000	no	160	yes	82	yes
Cadmium	0.28 J	1.5	980	no	0.69	yes	0.38	yes
Cobalt	1.8 J	9.2	350	no	0.27	yes	--	--
Iron	6,350	23,900 J	820,000	no	350	yes	--	--
Lead	4.2	148	800	no	--	--	14	yes
Manganese	185	870 J	26,000	no	28	yes	--	--
Mercury	0.024 J	0.057	46	no	0.033	yes	0.10	no
Selenium	--	0.66 J	5,800	no	0.52	yes	0.26	yes
Silver	--	2.3 J	5,800	no	0.80	yes	--	--
Thallium	--	0.93 J	12	no	0.014	yes	0.14	yes

Notes: COPCs are indicated by gray shading. Aluminum, a COPC, was not detected at concentrations exceeding screening levels, and therefore, is not included in this table. *Risk- and MCL-based SSLs evaluate the potential for leaching to groundwater.

Three of the four surface soil COPCs were detected in all surface soil samples and included aluminum, iron, and manganese. Other than aluminum, COPCs exceeded one or both SSLs; aluminum concentrations (2,350 J to 16,600 mg/kg) did not exceed any screening level. The fourth surface soil COPC, thallium, was reported in only one sample at a concentration of 0.93 J mg/kg. These COPCs are indicated in **Table 4-1c** and shown on **Figures 4-1a** and **4-1b**.

Aggregate Soil

A total of 22 inorganic compounds were detected below industrial RSLs and one inorganic compound, arsenic, was detected exceeding industrial RSLs in aggregate soil (0 to 15 feet bgs) at LF512:

- aluminum
- antimony
- arsenic
- barium
- beryllium
- cadmium
- calcium
- chromium
- cobalt
- copper
- iron
- lead
- magnesium
- manganese
- mercury
- nickel
- potassium
- selenium
- silver
- sodium
- thallium
- vanadium
- zinc

Of the 23 detected inorganic compounds, 11 had reported concentrations exceeding the risk-based and/or the MCL-based SSLs at more than one location; silver was also detected at a concentration exceeding an SSL, but at only one location; and arsenic, detected in every aggregate soil samples, was detected at concentrations exceeding SSLs and the industrial RSL:

Aggregate Soil (0 to 15 feet bgs) Inorganic Compound Exceedances

Parameter	Range (mg/kg)		Industrial RSL (mg/kg)		Risk-based SSL* (mg/kg)		MCL-based SSL* (mg/kg)	
	Minimum	Maximum	Value	Exceed	Value	Exceed	Value	Exceed
Antimony	0.62 J	1.0 J	470	no	0.35	yes	0.27	yes
Arsenic	3.1	13.9 J	3.0	yes	0.0015	yes	0.29	yes
Barium	10.2 J	602	220,000	no	160	yes	82	yes
Cadmium	0.24 J	14.7	980	no	0.69	yes	0.38	yes
Cobalt	1.8 J	9.3	350	no	0.27	yes	--	--
Copper	5.1	136	47,000	no	28	yes	46	yes
Iron	5,190	26,000 J	820,000	no	350	yes	--	--
Lead	2.5 J	195	800	no	--	--	14	yes
Manganese	168	877 J	26,000	no	28	yes	--	--
Mercury	0.024 J	0.26	46	no	0.033	yes	0.10	yes
Selenium	0.60 J	0.82 J	5,800	no	0.52	yes	0.26	yes
Silver	--	2.3 J	5,800	no	0.80	yes	--	--
Thallium	0.56 J	0.93 J	12	no	0.014	yes	0.14	yes

Notes: COPCs are indicated by gray shading. Aluminum and vanadium, both COPCs, were not detected at concentrations exceeding screening levels, and therefore, are not included in this table. *Risk- and MCL-based SSLs evaluate the potential for leaching to groundwater.

Eight compounds are identified as COPCs for aggregate soil and include aluminum, arsenic, cadmium, cobalt, iron, manganese, thallium, and vanadium. All COPCs were reported in more than one location and other than aluminum, arsenic, and vanadium, COPCs exceeded one or both

SSLs. Arsenic exceeded both SSLs and the industrial RSL while aluminum (1,720 J and 20,300 J mg/kg) and vanadium (6.0 and 41.2 mg/kg) did not exceed any screening level. These COPCs are indicated in **Table 4-1c** and shown on **Figures 4-2a** and **4-2b**.

Groundwater Interface Soil

A total of 21 inorganic compounds were detected in soil samples collected at the groundwater interface (**Table 4-1c**):

- aluminum
- antimony
- arsenic
- barium
- beryllium
- cadmium
- calcium
- chromium
- cobalt
- copper
- iron
- lead
- magnesium
- manganese
- mercury
- nickel
- potassium
- selenium
- sodium
- vanadium
- zine

Six of the compounds had reported concentrations exceeding one or both the SSLs and one compound, arsenic, had detections exceeding SSLs and the industrial RSL. Compounds with exceedances included: antimony (0.74 J to 0.79 J mg/kg), arsenic (4.4 to 10.5 mg/kg), barium (13.6 J to 96.9 mg/kg), cobalt (2.0 J to 8.1 mg/kg), iron (5,040 J to 20,300 mg/kg), manganese (196 J to 909 mg/kg), and selenium (one location at 0.51 J mg/kg).

Groundwater Interface Soil Inorganic Compound Exceedances

Parameter	Range (mg/kg)		Industrial RSL (mg/kg)		Risk-based SSL* (mg/kg)		MCL-based SSL* (mg/kg)	
	Minimum	Maximum	Value	Exceed	Value	Exceed	Value	Exceed
Antimony	0.74 J	0.79 J	470	no	0.35	yes	0.27	yes
Arsenic	4.4	10.5	3.0	yes	0.0015	yes	0.29	yes
Barium	13.6 J	96.9	220,000	no	160	no	82	yes
Cobalt	2 J	8.1	350	no	0.27	yes	--	--
Iron	5,040 J	20,300	820,000	no	350	yes	--	--
Manganese	196 J	909	26,000	no	28	yes	--	--
Selenium	--	0.51 J	5,800	no	0.52	no	0.26	yes

Note: *Risk- and MCL-based SSLs evaluate the potential for leaching to groundwater.

4.2 Groundwater

A total of nine groundwater monitoring wells are located at LF512, including three monitoring wells installed during this RI. Groundwater samples were collected during two separate rounds: August 2017 and November 2017. Groundwater occurs at approximately 25 feet bgs and flows to the west-southwest, as indicated on the potentiometric surface shown on **Figures 3-1** and **3-2**. Groundwater elevations were approximately 0.6-feet lower during the November sampling event than as measured during the August sampling event.

The following data comprise all groundwater data evaluated in the baseline HHRA and ERA (see Section 5). The LF512 monitoring well network provides representative groundwater data for the site and includes wells upgradient (MW-17), cross-gradient (MW-12, MW-13, MW-14), and downgradient (MW-7, MW-16, MW-18, MW-19) of the former excavation area, and one well within the former excavation (MW-15). All groundwater samples submitted to the laboratory were analyzed for VOCs, SVOCs, PAHs, TPH, and total and dissolved metals.

Overall, the data between the two monitoring events were similar for all wells. Several VOCs, SVOCs, PAHs, TPH, and metals were all detected in groundwater; however, the only analytes reported at concentrations exceeding either the May 2019 Tapwater RSL or MCLs were chloroform, naphthalene, PCE, total and dissolved arsenic, and dissolved thallium.

4.2.1 August Sampling Event

The first sampling event for the RI occurred in early August 2017. All nine wells were sampled and samples were submitted to the laboratory for analysis. However, one of the shipped coolers was lost during transit and was never located. As a result, the laboratory did not have sufficient sample volume to run all requested analyses for wells MW-17 and MW-18. An additional sampling event to collect additional water volume from these two wells was conducted in late August.

Few parameters were reported in groundwater in August 2018 (**Table 4-2a**). Parameters detected at reportable concentrations included two VOCs; one SVOC, PAH, and TPH (one location, only); and 13 inorganic compounds:

- chloroform
- PCE
- dibenzofuran
- acenaphthene
- DRO
- arsenic
- barium
- beryllium
- calcium
- chromium
- iron
- magnesium
- manganese
- mercury
- potassium
- sodium
- thallium
- zinc

Groundwater Exceedances – August 2017

Parameter	Range (µg/L)		Tapwater RSL (µg/L)		MCL (µg/L)	
	Minimum	Maximum	Value	Exceed	Value	Exceed
Chloroform	1.1	1.8	0.22	yes	80	no
PCE	0.81 J	10.1	11	no	5.0	yes
Arsenic	0.47 J	0.74 J	0.052	yes	10	no

Note: COPCs are indicated by gray shading. COPCs dibenzofuran, naphthalene, and manganese were not detected at concentrations exceeding screening levels, and therefore, are not included in this table.

Of these detections, only chloroform, PCE, and total arsenic were detected at concentrations exceeding either May 2019 Tapwater RSLs or MCLs (**Table 4-2a**). Chloroform was reported in eight of the nine wells at concentrations between 1.1 and 1.8 µg/L – all detections exceeded the tapwater RSL, but not the MCL; chloroform was not detected in MW-7. PCE was detected in eight wells at concentrations exceeding the MCL and ranged from 6.5 to 10.1 µg/L, PCE was also detected in the ninth well, but at an estimated concentration below the MCL (MW-7 at

0.81 J µg/L). Dibenzofuran and acenaphthene were detected in MW-7 at concentrations below their respective screening levels, and DRO, while detected in MW-7 at 0.14 mg/L, does not have a groundwater screening level. The only inorganic compound exceeding a screening level was total arsenic, detected in MW-13 and MW-18, at a concentration of 0.68 J µg/L and 0.47 J/0.74 J (total/dissolved) µg/L, respectively. These arsenic concentrations do not, however, exceed the MCL.

Compounds identified as COPCs for groundwater (see Section 5.2.1) include PCE, dibenzofuran, naphthalene, and manganese. During the August 2017 sampling event, the only COPC detected at a concentration exceeding any screening level was PCE (6.5 to 10.1 µg/L). COPCs in groundwater are presented on **Figure 4-3**. PCE was identified as a COPC for indoor air via groundwater vapor intrusion (VI) (see Section 5.2.1). Total mercury was only reported in MW-13 at a reported concentration of 0.29 µg/L and did not exceed either the tapwater RSL or the MCL.

4.2.2 November Sampling Event

The second sampling event for the RI occurred in late November 2017. All nine wells were sampled and samples were submitted to the laboratory for analysis.

Parameters detected during the November sampling event included two VOCs; two SVOCs, four PAHs, and 14 inorganic compounds. Of these detections, chloroform, PCE, naphthalene, arsenic (total and dissolved), and dissolved thallium were detected at concentrations exceeding either May 2019 Tapwater RSLs or MCLs (**Table 4-2b**):

- chloroform
- PCE
- dibenzofuran
- di-n-butyl phthalate
- acenaphthene
- fluoranthene
- naphthalene
- pyrene
- aluminum
- arsenic
- barium
- calcium
- chromium
- iron
- magnesium
- manganese
- mercury
- nickel
- potassium
- thallium
- zinc

Groundwater Exceedances

Parameter	Range (µg/L)		Tapwater RSL (µg/L)		MCL (µg/L)	
	Minimum	Maximum	Value	Exceed	Value	Exceed
Chloroform	1.3	1.9	0.22	yes	80	no
PCE	1.3	9.3	11	no	5.0	yes
Naphthalene	0.11	1.2 J-	0.17	yes	--	--
Arsenic	--	0.48 JB	0.052	yes	10	No
Thallium	0.42 JB	0.59 J	0.20	yes	2.0	no

Note: COPCs are indicated by gray shading. COPCs dibenzofuran and manganese were not detected at concentrations exceeding screening levels, and therefore, are not included in this table.

Reported concentrations of chloroform exceeded the tapwater RSL in eight of the nine wells at concentrations between 1.2 and 1.9 µg/L, but not the MCL; chloroform was again not detected in MW-7. PCE was detected in eight wells at concentrations exceeding the MCL and ranged from 6.6 to 9.3 µg/L, PCE was also detected in the ninth well, but at a concentration below the MCL

(MW-7 at 1.3 µg/L). Naphthalene, detected in two locations, exceeded the tapwater RSL in only one of the two samples, at a reported concentration of 1.2 J- µg/L in MW-16. Naphthalene is not a COC associated with OU10 at WPAFB. It is possible that naphthalene is associated with the former activities at LF512. Naphthalene is reported in several samples collected during the RI, but not at the soil-groundwater horizon interval. The locations of the wells with detections, MW-12 and MW-16, are outside the limits of the former excavation and cross gradient to upgradient to the former excavation. Naphthalene is only reported during the second monitoring event. Previously, during a BUSTR investigation (2013), no naphthalene was reported in either of these wells nor any of the existing wells in 2013. The presence of naphthalene also contributes negligible risk under even the most conservative exposure scenarios. Based on the sample results from 2013 and 2017, naphthalene is ephemeral in nature and poses negligible risk. No further characterization with respect to naphthalene is warranted.

Dibenzofuran, di-n-butyl phthalate, acenaphthene, fluoranthene, and pyrene were detected in singular wells at concentrations well below their respective screening levels. The only inorganic compounds with reported concentrations exceeding a screening level were arsenic (total and dissolved), detected in MW-7 and MW-18 at concentrations of 0.59 J µg/L (dissolved) and 0.48 JB/0.42 JB µg/L (dissolved), respectively, and dissolved thallium at 0.20 JB µg/L in MW-7 and 0.047 JB µg/L (dissolved) in MW-16.

COPCs PCE, dibenzofuran, naphthalene, and manganese were detected during the November 2017 sampling event (**Figure 4-3**); however, the only COPCs detected at concentrations exceeding a screening level were PCE (6.6 to 9.3 µg/L) and naphthalene (1.2 J- µg/L). PCE was identified as a COPC for indoor air via groundwater VI (see Section 5.2.1). Total mercury was reported in MW-7, MW-15, and MW-18 at concentrations between 0.091 J and 0.13 J µg/L; none of the detections exceeds either the tapwater RSL or the MCL.

4.3 Fate and Transport

Contaminants at LF512 may be subjected to physical, biological, and chemical reactions that directly influence their persistence and potential migration. Potential migration pathways are routes by which a compound travels following a release or spill from a source. Migration pathways are complete if a compound present in a source area is detected in multiple media at concentrations illustrating a trend (i.e., increasing or decreasing). However, if a trend does not exist or illustrate a specific chemical process is taking place (e.g., degradation, dilution, etc.), then a separate source area or another reason for the presence of a compound (e.g., laboratory cross-contamination, anomaly, etc.) may be indicated.

4.3.1 Contaminant Migration Processes

The mobility and persistence of COPCs at LF512 are key characteristics in determining their probable behavior. Mobility is the potential for a compound to migrate in environmental media and persistence is a measure of how long a compound will remain in the environment in its current form. The primary fate and transport mechanisms controlling mobility and persistence of COPCs are aqueous solubility, sorption, volatility, and degradation. These are briefly described, below.

Adsorption

Migration of compounds through the subsurface is a function of the extent to which they are adsorbed to soil particles. Organic chemicals moving through the subsurface will alternately adsorb or desorb from available organic matter in a given soil matrix based on soil/water partitioning coefficients and organic carbon adsorption coefficients. In general, the higher the organic carbon adsorption coefficient, the greater the tendency of a chemical to be sorbed and the lower its mobility in the subsurface environment (including groundwater). Many SVOCs are relatively immobile in subsurface environments and preferentially bind to soil and thus will not travel to and/or in groundwater as easily as compounds with higher solubility.

Volatilization

Volatilization is the movement of a compound from the liquid or solid phase to a gas phase. Compounds with a higher Henry's Law Constant or vapor pressure values have a greater tendency for volatilization; values for VOCs are generally much higher than for PAHs and TPH. Volatilization is primarily a means for compound mobility at surface water to air or soil to air interfaces.

Dissolution and Precipitation

Dissolution and precipitation of COPCs are related to compound solubility. Compounds with a higher solubility will enter water or liquid solutions more readily than less soluble compounds. In general, VOCs are more soluble in water than PAH or TPH compounds.

Advection, Dispersion, and Chemical Retardation

Advection is the mass transport of COPCs within the flow of groundwater, while dispersion is related to the different flow paths water particles travel within the subsurface matrix. The direction and rate of mass transport is generally related to that of groundwater and its flow, although dissolved compounds are also subject to sorption processes by soil that groundwater comes into contact with, resulting in a lower advection rate than the groundwater. Dispersion creates a zone of mixing between displacing fluid and the fluid being replaced as well as spreads some of the mass beyond the region it would occupy due to advection alone.

Chemical retardation occurs when a contaminant reacts with the porous media and its rate of movement is retarded relative to the advective groundwater velocity. Retardation can occur by a variety of processes including adsorption and precipitation. Contaminants can sorb onto particles of organic carbon that are present in minor amounts in the aquifer matrix.

Diffusion

Diffusion is the process by which a contaminant in water will move from an area of greater concentration toward an area where it is less concentrated. Diffusion will occur as long as a concentration gradient exists, even if the fluid is not moving, and as a result, a contaminant may spread away from the place where it is introduced into a porous medium.

4.3.2 LF512 Site Contaminant Fate and Transport

The presence of contaminants in surface and aggregate soil and groundwater at LF512 is confirmed by the findings of this RI. Several VOCs, SVOCs, PAHs, TPH, and inorganic compounds were detected in soil and/or groundwater. However, comparison of maximum detected values with conservative risk screening values and/or background concentrations eliminated all soil compounds as COPCs for human health in surface and/or aggregate soil except for PAHs benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene, and seven inorganic compounds (aluminum, arsenic, cadmium, iron, manganese, thallium, and vanadium) (see Section 5). The only COPCs in groundwater were chloroform, PCE, dibenzofuran, naphthalene, arsenic, manganese, mercury, and thallium.

At LF512, potential migration pathways consist of migration via leaching (vertical and/or horizontal) through the unsaturated and saturated zones, migration via surface transport, migration via groundwater transport, and atmospheric transport and/or re-suspension from mechanical disturbance via prevailing winds.

Due to the extensive impermeable surface cover at LF512 (asphalt and/or concrete) and the curbed, well-established vegetated area, transport of COPCs via surface water runoff (i.e., overland flow) is unlikely. In addition, atmospheric transport and/or re-suspension from mechanical disturbance via prevailing winds is also unlikely due to the extensive surface cover at the site and site use (parking lot). Contaminant migration via leaching and/or via groundwater transport are the prevalent potential migration pathways identified at LF512.

<u>Volatile Organic Compounds</u>

The only VOCs detected and classified as COPCs in groundwater at LF512 are chloroform and PCE. No VOCs, including PCE, are identified as COPCs in any soil group. PCE, however, was detected in site soil, but at concentrations below industrial soil RSLs. Several concentrations marginally exceeded the residential soil RSL while fewer also slightly exceeded SSLs.

Reported higher concentrations of PCE in soil were predominantly at the groundwater interface (depths between 20 and 26 feet bgs, shown on **Figure 4-4**) and ranged in concentration from non-detect to 12.2 µg/kg (at MW-14). While PCE was detected at other soil depths across the site, these detections were limited spatially, depths of detections were inconsistent, and concentrations were not elevated above industrial RSLs and rarely exceeded the residential soil RSL or SSLs. PCE was not reported in surface soil samples (0 to 2.5 feet bgs). The concentrations of PCE are consistent with evapotranspiration of groundwater, with attendant PCE contamination, into the 20- to 26-foot bgs horizon. The presence of PCE in this soil horizon is from the groundwater.

PCE, the only VOC COPC for groundwater, was detected in all site monitoring wells. Eight of the nine wells had similar reported concentrations exceeding screening levels, including upgradient well MW-17 and cross-gradient wells. The presence of PCE in the upgradient wells is consistent with concentrations of PCE reported in OU10 wells in 2017 (APTIM Federal Services, LLC [APTIM], 2018). Monitoring well MW-7 had an estimated PCE detection well below the screening level. The lack of elevated PCE at MW-7 is likely due to very localized biodegradation of PCE. MW-7 is immediately downgradient from the former 1994 excavation area, which was backfilled with non-site soil following removal of impacted soil. Water quality measurements collected in August and November 2017 (**Table 2-3**) indicated that all site wells, excluding MW-7, were aerobic with DOs ranging from 0.96 to over 6 milligrams per liter (mg/L) and had positive ORP values. MW-7, however, was anaerobic (0.0 mg/L of DO) and had moderately strong negative ORP values – conditions favorable for in-situ biodegradation. It is possible that site conditions related to the former sump pit locally altered and affected subsurface conditions within the area around MW-7. Hydrocarbons from the former sump pit may have served as a carbon donor source for microorganisms, causing biodegradation and negative ORP.

Due to the lack of COPCs in surface and aggregate soil, no migration potential for VOC COPCs exists for soil. Due to the depth of the groundwater, the migration potential of PCE is limited to groundwater transport; however, LF512 is not the source area for PCE in groundwater – it is part of the larger OU10 PCE in groundwater plume.

Semi-volatile Organic Compounds

The SVOCs (including PAHs) detected and classified as COPCs in surface (0 to 2.5 feet bgs) and aggregate soil (0 to 15 feet bgs) at LF512 include benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene. None of the reported SVOC COPC concentrations exceeded industrial soil RSLs at any interval or sample location at the site during this RI. Detected concentrations were primarily present in surface soil (0 to 2.5 feet bgs) or aggregate soil (0 to 15 feet bgs) and markedly decreased in concentration with depth, oftentimes not detected beyond the surface soil. No SVOC COPCs were detected in soil collected from the groundwater interface.

In general, PAHs have very high organic carbon adsorption coefficients and are strongly immobile and largely insoluble. Additionally, vapor pressures of PAHs tend to be lower than for VOCs. As a result, PAHs are not likely to leach into groundwater or surface water runoff (in vegetated areas) and are not likely to volatilize; PAHs tend to remain in the shallow soil for long periods of time. In the case of LF512, where most of the site is covered with impermeable surfaces, PAHs may remain in surface soil indefinitely due to the extensive coverage of the site with paving and very slow weathering.

SVOC COPCs in groundwater included dibenzofuran and naphthalene. None of the soil SVOC COPCs were identified as COPCs for groundwater – indicating that the SVOC-impacted soil at LF512 is not adversely impacting groundwater at the site and SVOC migration to groundwater is not occurring. Dibenzofuran was detected at only MW-07 at a very low, estimated concentration, and naphthalene was detected once at MW-16. Due to the depth of groundwater at LF512, the migration potential of SVOCs to groundwater transport is limited. With respect to the isolated instances of SVOC COPC-detections, migration potential of these COPCs is low.

Inorganic Compounds

Several inorganic compounds are present in site soil and are classified as site COPCs in surface and/or aggregate soil. None of the inorganic COPCs, except for arsenic, exceeded industrial

RSLs. Arsenic, present across the site at consistent concentrations, occurs in all sampled intervals and exceeds the industrial soil RSL in every instance, suggesting that arsenic at the site is naturally occurring. Elevated arsenic concentrations noted in background samples collected at non-impacted locations near LF512 (CH2M, 1995 and Engineering Science, Inc. [ESI], 1995) support that arsenic is naturally occurring at elevated concentrations (see also Section 5.2.1).

Inorganic compounds present in groundwater are arsenic, manganese, mercury, and thallium. Metals solubility is diminished by the neutral to slightly basic nature of the groundwater; the pH of site groundwater ranges from 7.0 to 8.6.

5.0 BASELINE RISK ASSESSMENT

5.1 Introduction

5.1.1 Purpose and Scope

The technical approach used to conduct the RI activities at LF512 Building 30013 Sump Pit Area included the evaluation of the presence, or absence, of impacted soil and/or groundwater due to a release from a former sump pit on site, as well as former leaking USTs discovered during the 1994 excavation of the LF512 Building 30013 Sump Pit Area. The site sump area has undergone investigation and remediation under the BUSTR program previously in 1990 through 1995. A review of existing data and information on LF512 by OEPA in March 2014 lead to a determination the site should be regulated under CERCLA and not BUSTR. The RI included the collection of soil samples from the site to cover the spatial historical area of contamination as well as the collection of groundwater samples from existing and proposed monitoring wells. Proposed contaminants of interest included VOCs, SVOCs, metals, and TPH (GRO, DRO, and ORO) as the analytical suite for investigation.

A baseline HHRA and ERA were intended as part of this RI for LF512. The purpose of the risk assessments is to determine if the soil and groundwater pose a risk or hazard to current or future human and ecological receptors. The risk assessments will identify potential hazards and quantify risks from exposures to onsite COPCs. The results of this assessment will be used to help determine whether remedial action may be required for the site.

5.1.2 Site Description

WPAFB is located in Montgomery and Greene Counties in Ohio, approximately 60 miles north of Cincinnati, 50 miles west of Columbus, 8 miles northeast of Dayton, and adjacent to Fairborn, Ohio. The base is divided into two fields, Wright Field and Patterson Field, separated by State Route 444 and Norfolk Southern railroad tracks. It is further divided into two administrative areas: Area A and Area B. Area A encompasses 5,700 acres and primarily consists of building complexes, active runways, and flight facilities. Area B encompasses about 2,400 acres and consists primarily of research and development facilities with educational function.

LF512 is approximately 0.59-acre in size and located north of Building 30013 in Area A along Van Patton Drive east of Pearson Road. LF512 was the site of a former waste oil sump pit used to store used oils from engine maintenance operations conducted in Building 30013. The sump was originally a concrete steam valve box constructed in 1961 (SAIC, 1991). In 1973, the steam valves and piping were removed from the box and it was subsequently converted into a sump pit. The sump pit was used to collect used oils, lubricants and fuel from maintenance operations within Building 30013. The used oils, lubricants and fuels were manually placed into the sump. The usage of the sump was discontinued in 1985 and the sump was abandoned in place by filling with sand.

5.1.3 Risk Assessment Methodology

The USEPA provides guidance and specific procedures for conducting baseline risk assessments. The following is a brief description of the risk assessment methodologies used for the baseline HHRA and ERA.

5.1.3.1 Human Health Risk Assessment Methodology

The baseline HHRA has been prepared following USEPA guidance and supplementary guidance (including Risk Assessment Guidance for Superfund [RAGS] Part A [1989], Part D [2001], Part E [2004], and Part F [2009]; as well as OEPA guidance [2008]). These guidelines, along with the USEPA RSLs Table (2019b), are the primary sources used to conduct the baseline HHRA for LF512.

The baseline HHRA methodology involves a four-step process:

1. Hazard Assessment;
2. Exposure Assessment;
3. Toxicity Assessment; and
4. Risk Characterization.

A brief description of each step is provided below.

In the hazard assessment, COPCs are identified and selected for inclusion throughout the remainder of the risk assessment using applicable site-specific monitoring data that have been evaluated according to USEPA guidelines. The rationale for COPC selection and elimination and hazard assessment are documented in the subsequent sections of this report.

In the exposure assessment, COPC exposure point concentrations (EPCs) are estimated based upon the site-specific monitoring data, exposed populations are characterized (e.g., site worker, construction worker, and hypothetical resident), and relevant potential pathways of exposure (e.g., soil and groundwater) are identified. The COPC EPCs in relevant media are converted into systemic doses, taking into account rates of contact (e.g., ingestion rates) and absorption rates of each COPC. The magnitude, frequency, and duration of these exposures are then integrated to obtain estimates of daily intakes over a specified period (e.g., lifetime, activity-specific duration).

In the toxicity assessment, the relationship between extent of exposure and extent of toxic injury or disease is estimated for each COPC. Chemical-specific toxicity values, such as cancer slope factors (SFs) for carcinogenic compounds and reference doses (RfDs) or reference concentrations (RfCs) for non-carcinogens are the factors used to derive estimated risks to individuals.

Risk characterization integrates the results of the toxicity assessment and the exposure assessment to derive quantitative estimates of human health risk, including the risk of both carcinogenic and non-carcinogenic effects.

Uncertainties are inherent in the risk assessment process because of the numerous assumptions that are made in estimating exposure, toxicity, and potential risk. The major uncertainties and limitations associated with the estimates of risk and their potential ramifications are also presented in this report.

5.1.3.2 Ecological Risk Assessment Methodology

As noted previously, LF512 lies in an industrial area. The site is predominantly covered by paving and concrete and there are no important ecological resources on site. Based on the lack of ecological resources on site, no further ecological evaluation is warranted.

5.1.4 Data Evaluation

Data collection and evaluation involved gathering and reviewing site data relevant to human health and identifying those substances present at the site that should be the focus of the risk assessment process (i.e., identifying COPCs). Analytical data generated during this RI were evaluated and organized into a form appropriate for baseline risk assessments. The primary purpose of the data evaluation was to identify the chemicals that were likely to be site-related and to select and organize validated analytical results that were of adequate quality for use in quantifying risks.

Adequate data quality was achieved through the implementation of SOPs during sample collection and sample analyses; quality control checks, including field duplicate analyses, and equipment and laboratory blank analyses; and data review and data validation. Limitations and uncertainties associated with the analytical results were evaluated as part of the data reporting requirements of the analytical laboratories. Analytical data-related qualifiers identified by the laboratory as well as information provided for all field and laboratory blank samples, were taken into consideration in the evaluation process. Only data considered usable according to the guidelines established by the USEPA were used in the risk assessment.

The following steps were conducted to produce the final data set for the baseline HHRA at LF512:

- Chemicals with at least one detected value for a specific media were retained for further evaluation.
- If a chemical was not detected in any of the samples of a specific medium (indicated by a “U” qualifier in the laboratory data and “ND” in the baseline HHRA), that chemical was eliminated from consideration for that medium. Chemicals that were not detected in samples from the site but whose one-half LODs exceeded the screening levels were retained and discussed qualitatively.
- Data labelled with “J” qualifiers were assumed to be positive identifications for those media. “J” indicates that the numerical value is an estimated concentration, often because it is reported below the minimum confident sample quantitation limit. In other words, it is reported between the LOD and the LOQ. Chemicals identified and marked with “J” qualifiers were retained for further evaluation.

- Data labelled with “E” qualifiers are positive identifications with estimated concentrations exceeding the calibration range of the gas chromatograph/mass spectrometer (GC/MS) instrument and these were also retained for further evaluation.
- For field duplicates in which each sample had detectable quantities of the chemical in question, the higher of the two measured concentrations was selected for analysis. If the chemical was only detected in one of the duplicate samples, the detected value was selected.

5.2 Baseline Human Health Risk Assessment

5.2.1 Hazard Assessment

The hazard assessment was the first step of the baseline HHRA process. A hazard assessment was conducted to determine COPCs at the site. In the hazard assessment, site-specific data were analyzed and compared to risk-based screening values. Screening was conducted to determine COPCs and whether the area warrants further evaluation.

Soil boring and groundwater samples were collected from LF512 at planned locations throughout the 0.59-acre area to determine the extent of VOC, SVOC, metals, and TPH contamination. Surface soil samples were collected at a depth of 0 to 2.5 feet bgs and aggregate soil samples (see Section 4.1) were collected at a depth of 0 to 15 feet bgs in the vicinity of the 1994 excavation, within and immediately adjacent to the Building 30013 Sump Pit Area. Groundwater monitoring consisted of six existing monitoring wells plus three additional wells. Two groundwater monitoring events took place approximately four months apart. All samples were used in the assessment. There was a total of seven surface soil samples, 34 aggregate soil samples, and 18 groundwater samples. VOC, SVOC, metals, and TPH contaminants were detected in all soil and groundwater samples for LF512.

If chemical of interest (COI) concentrations were a mixture of detected concentrations and LODs, the maximum detected concentration was selected for comparison with the appropriate risk-based screening value. This approach was applied to identify chemicals present at sufficiently high concentrations that may pose a potential risk to human health. Surface soil and aggregate soil COPCs were selected by comparing the maximum detected concentrations to USEPA RSLs for residential soil (USEPA, 2019b). Use of the residential criteria as a default for both the surface and aggregate soil samples results in highly conservative screening values because the exposure frequency for residential use is much higher than that for other receptor scenarios. LF512 is currently designated as a parking lot with a small plot of grass and it is not zoned for residential use; however, residential criteria were selected so that the risk assessment would remain health-protective.

Groundwater COPCs were selected by comparing the maximum detected concentrations to the lower of Federal MCLs and USEPA RSLs for tap water (USEPA, 2019b). The MCLs, RSLs for tap water, and selected screening level for each COPC are identified in **Table 5-4**.

To derive applicable groundwater vapor screening criteria, the toxicity and volatility of each detected chemical in groundwater was first determined. The maximum detected concentrations of those chemicals that were sufficiently toxic and sufficiently volatile were compared to USEPA Target Groundwater Concentrations (TGC) for evaluating impacts to indoor air (USEPA, 2002b). When a TGC value was not available, the USEPA Office of Solid Waste and Emergency Response (OSWER) Vapor Intrusion Screening Level (VISL) calculator (USEPA, 2019e) was used to calculate a groundwater screening level for indoor site workers. Both the USEPA TGC and OSWER VISL calculator used an attenuation factor of 0.001 for groundwater.

When the maximum detected concentration of a chemical exceeded the relevant risk screening level, the chemical was retained as a COPC and subjected to additional risk analysis. The following criteria were used to determine whether chemicals that presented a potential risk to human health were identified as COPCs for LF512:

- If the maximum concentration of a detected chemical was found to be above the screening level, it was retained.
- If a chemical was detected at a level consistent with or below background levels it was eliminated from further consideration.
- If a chemical was not detected in any sample from a specific medium, it was not considered to be a COPC for that medium. Should a chemical not be detected, however, the detection limits were compared to the screening value to determine if the chemical should be forwarded into the risk assessment based on elevated detection limits.
- If the maximum concentration of a detected chemical was found to be below the screening value, it was eliminated from further consideration.
- Chemicals detected at the site that did not have a residential soil RSL are evaluated via surrogates with similar toxicity (e.g., acenaphthene for acenaphthylene, fluoranthene for benzo(b)fluoranthene, pyrene for benzo(g,h,i)perylene and phenanthrene as indicated in the screening tables).
- If a chemical had no screening limit (i.e., no toxicity data) and no appropriate surrogate toxicity value, it was not evaluated unless an appropriate surrogate chemical was available.

To ensure that chemicals with additive effects were not prematurely eliminated during screening, RSLs based on non-cancer toxicity data (denoted with an “nc” in the RSL table) were reduced by a factor of 10 (i.e., multiplied by 0.1). In cases where both cancer and non-cancer based RSL concentrations were available, the lower of the two values was used for screening to be more protective of human health. The selection of screening level concentrations for the VI from groundwater scenario can be found in **Appendix K** (**Table K-1**).

No site-wide background concentrations for PAHs or metals in surface soil were developed for the LF512 Building 30013 Sump Pit Area at WPAFB. Background surface soil samples were collected to determine the anthropogenic background concentrations of PAHs (Versar, 2017b) and metals (CH2M, 1995 and ESI, 1995) at non-impacted locations at or near WPAFB for comparison to PAH and metal concentrations at LF512. Background sampling locations relative to the LF512 Building 30013 Sump Pit Area are depicted in **Figure 5-1**. The PAH background samples were collected approximately 1.25 miles from LF512. The metal background samples were collected approximately 1.75 miles from LF512.

For the background comparison, a 95 percent upper tolerance limit (UTL) of the data population was estimated to serve as a background threshold limit. The 95 percent UTL is an appropriate means of estimating a 95 percent upper percentile limit of the background data population. The 95 percent UTL is calculated as:

95 percent UTL = X + (K * SD)

Where:
X = mean
K = t * sqrt(1-1/n)
t = probability points of the t-Distribution at n-1 degrees of freedom and the 0.05 level of significance.
n = number of observations
SD = standard deviation

The estimated 95 percent UTLs are calculated in **Table 5-1**. The maximum soil COI concentrations for the LF512 field samples were compared to the background 95 percent UTLs.

COI concentrations that exceed screening levels but that were detected at concentrations less than the 95th percentile UTL background concentrations for soils were eliminated from consideration in the baseline HHRA based upon the background comparison.

Summary tables, included at the end of this report, were prepared using the standard "Occurrence, Distribution, and Selection of COCs" from USEPA RAGS, Part D (2001). The following data for each detected COI for each medium are shown in **Tables 5-2** through **5-5**: number of samples, detection frequency, minimum and maximum detected concentrations, and selected risk screening levels. In addition, background surface soil levels for those COIs that exceeded risk-based screening levels are also shown in these tables.

Screening was conducted separately for each media type relevant to each scenario. The COPCs identified for each media type are summarized in **Table 5-6**. A total of eight COPCs in surface soil, eleven COPCs in aggregate soil, eight COPCs in groundwater, and two COPCs in groundwater vapors intruding into workspaces have been identified based on the RSL risk-based screening.

For the LF512 area, the COPCs identified include:

<u>Surface soil (0 to 2.5 feet bgs)</u>: Benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, aluminum, iron, manganese, and thallium. Arsenic and cobalt were below background levels.

<u>Aggregate soil (0 to 15 feet bgs)</u>: Benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, aluminum, arsenic, cadmium, iron, manganese, thallium, and vanadium. Cobalt was below background levels.

<u>Groundwater</u>: Chloroform, PCE, dibenzofuran, naphthalene, arsenic, manganese, mercury, and thallium.

Vapor intrusion exposures modeled from groundwater data for current indoor site workers: PCE and mercury.

5.2.2 Exposure Assessment

The second step of the baseline HHRA process is the exposure assessment. Exposure bridges the gap between a potential hazard (i.e., presence of a toxic chemical) and a risk. The methodology used to calculate EPCs for each media, identify human exposure scenarios, compile exposure factors, and calculate dose for each unique combination of COPC, exposure pathway, and receptor is described in this section.

5.2.2.1 Estimating Exposure Point Concentrations

EPCs for each COPC were calculated based on chemical measurements from surface soil, aggregate soil, and groundwater sampled at LF512 that exceeded risk-based screening levels. Data for each COPC were assessed utilizing the statistical software package ProUCL (Version 5.1.002), developed for USEPA (2016). ProUCL consists of all parametric and non-parametric UCL computation methods presented in USEPA's revised guidance document *Calculating the Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (2002a).

The software computes parametric UCLs based upon normal, lognormal, and gamma distributions, as well as several non-parametric methods. The recommendations for the most appropriate 95th percentile UCL(s) provided by ProUCL were used to estimate EPCs for the selected COPCs. ProUCL guidance recommends that there be 8 to 10 observations and no less than 5 detections for each COPC to run the statistical methods found in ProUCL. Observations for this assessment ranged from 7 (surface soil samples) to 34 (aggregate soil samples). Versar opted to calculate UCLs for the surface soil samples when the number of detects was equal to or greater than 5, even though the number of observations was less than ideal. In some instances, when ProUCL determined that there was an insufficient quantity of samples to adequately characterize the COPC concentration, the EPC was assumed to be the maximum measured concentration. When the estimated UCL exceeded the maximum concentration for a COPC, ProUCL recommended using the maximum concentration as the EPC or using an alternate UCL.

Detected and non-detected samples for each unique combination of COPC and media were assessed for this baseline HHRA. ProUCL calculations used MDLs for non-detected samples. The recent guidance in the *ProUCL Version 5.1 Technical Guide* (USEPA, 2015b) suggests that "when most (e.g., >95 percent) of the observations for a contaminant lie below the detection limit(s) or RLs, the sample median or the sample mode (rather than the sample average, which cannot be computed accurately) may be used as an estimate for the EPC term. Note that when the majority of the data are non-detects, the median and the mode will also be a non-detect." According to USEPA (USEPA, 2015b), in cases where the number of available detected samples is small (e.g., <5), an alternate estimate of the EPC should be developed on a site-specific basis; therefore, in instances when the number of detects were less than five, the maximum of the data set was used as an estimate of the EPC.

The EPCs and rationales for the selections of COPCs for surface soil, aggregate soil, groundwater, and groundwater VI are presented respectively in **Tables 5-7** through **5-10**. ProUCL statistical outputs for all COPCs for surface soil, aggregate soil, and groundwater are provided in **Appendix K (Tables K-2** through **K-4)**.

Some exposures, like the inhalation of volatilized chemicals from groundwater, are due to inter-media transfer (e.g., groundwater to air) of COPCs. In those instances, the EPCs for the original media were based on ProUCL and the EPCs in the secondary media were calculated using appropriate models from USEPA's *Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual, Part F* (USEPA, 2009). All information related to the groundwater VI EPC calculations are summarized in **Table 5-11**. Contaminant concentrations in indoor air were estimated using the VISL Calculator (USEPA, 2019e). The VISL calculator calculates the indoor air concentration from the respective user-provided COPC groundwater concentration. The calculated indoor air concentration is provided in **Appendix K** (**Table K-8**).

In order to estimate the inhalation exposure of construction workers to volatiles from groundwater in a construction/utility trench, a combination of two models was used. These two models are a vadose zone model (to estimate volatilization of gases from contaminated groundwater into a trench) and a box model (to estimate dispersion of the contaminants from the air inside the trench into the aboveground atmosphere). This combined approach is part of a widely used exposure model developed by the Virginia Department of Environmental Quality (VDEQ). The detailed elements of the model used to calculate the concentration of volatiles in a construction trench are found in the *Virginia Unified Risk Assessment Model – VURAM User's Guide for Risk Assessors* (VDEQ, 2016). If the depth to groundwater at a site is greater than 15 feet, the model assumes that a construction/utility worker would not encounter groundwater when digging an excavation trench. The average depth to groundwater at the LF512 Building 30013 Sump Pit Area is 27.5 feet bgs. Therefore, the worker would not have direct exposure to the groundwater pooling at the bottom of the trench. However, the construction worker would be exposed to contaminants in the air inside the trench that would result from volatilization from that groundwater. The model assumes that the trench is 3 feet wide by 8 feet long (VDEQ, 2016). VDEQ assumes that a construction project could result in an excavation as deep as 15 feet. Therefore, a trench depth of 15 feet was used in the calculation. The calculated chemical concentrations in trench air are shown in **Table 5-12**.

5.2.2.2 Human Health Conceptual Site Model

The conceptual site model (CSM) for the baseline HHRA is a representation of chemical sources, transport mechanisms, exposure pathways, exposure routes, and potentially exposed populations (**Figure 5-2**). It provides the basis for developing exposure scenarios to be evaluated in the exposure assessment component of the baseline HHRA. Human receptors (population groups potentially at risk from exposure to COPCs) were identified based on current and hypothetical future land uses at LF512.

Site LF512, located north of Building 30013 in Area A along Van Patton Drive east of Pearson Road, was the site of a former oil sump pit used to store used oils from engine maintenance operations conducted in Building 30013. Building 30013 is adjacent to the sampling area, which is comprised of parking, roadway, and a small plot of grass. Currently, access to this area is restricted to military personnel and civilian workers. Building 30013 is adjacent to the sampling area, which is comprised of parking, roadway, and a small plot of grass. The approved UFP-QAPP notes that commercial/industrial and construction workers are the current and potential future receptors at LF512. As such, no risk evaluation of a residential scenario is included in this assessment. Therefore, human receptors that may potentially be exposed to COPCs at this site include: (1) current indoor and outdoor site workers and (2) future construction workers. All human receptor groups being evaluated are assumed to have equal accessibility to the entire LF512 area.

An exposure pathway describes a mechanism by which a population or individual may be exposed to chemicals present at a site. A completed exposure pathway requires the following four components:

1. A source and mechanism of chemical release to the environment;
2. An environmental transport medium for the released chemical;
3. A point of potential human contact with the contaminated medium;
4. A human exposure route at the point of exposure.

All four components must exist for an exposure pathway to be complete and for exposure to occur. Incomplete exposure pathways do not result in actual human exposure and are not included in the exposure assessment and resulting risk characterization. Potential exposure pathways for LF512 include: (1) direct contact with soil (surface and aggregate) and groundwater (i.e., dermal absorption and incidental ingestion); (2) inhalation of fugitive dust and outdoor volatilized chemicals from soil; and (3) inhalation of indoor and outdoor (trench) groundwater vapors. The human health CSM identifies pathways as potentially complete or incomplete. All complete pathways, except those with low exposure potential, were evaluated quantitatively in the baseline HHRA. Potential exposure pathways for LF512 are summarized in **Table 5-13** with the rationale for whether or not they were evaluated quantitatively.

In accordance with USEPA guidance (USEPA, 1989), the values used to assess exposure in this baseline HHRA were selected to represent a reasonable maximum exposure (RME). RME is the highest exposure that is reasonably expected to occur at a site and is generally used by USEPA to determine whether to conduct a feasibility study for potential remedial actions (USEPA, 1989). RME scenarios, by definition, likely overestimate exposure for many individuals, but were used here to ensure that this baseline HHRA is health-protective. Each scenario shown on **Figure 5-2** and in **Table 5-13** is discussed qualitatively below. The exposure parameters for each scenario are presented in Section 5.2.2.3.

Current Indoor Site Worker

Current indoor site workers are assumed to be performing routine indoor activities such as clerical, administration, and general maintenance work in buildings on the LF512 site; these activities would not involve working outdoors in any capacity. It is assumed that indoor site workers could be exposed to groundwater in the form of structural vapor intrusion while working inside a building. The only potential exposure pathway for indoor site workers at LF512 includes:

- Inhalation of vapors from chemicals volatilized from the groundwater intruding into indoor airspaces.

The indoor site worker is not expected to encounter groundwater directly because groundwater is not used as a drinking water source at this site. Therefore, all other groundwater exposure pathways were not considered.

Current Outdoor Site Worker

Current outdoor site workers are assumed to be performing routine outdoor activities such as mowing and general maintenance in and around the LF512 site; these activities would not involve digging or construction work. Potential exposure pathways for outdoor site workers at LF512 include:

- Inhalation of fugitive dust from surface soil;
- Dermal contact with surface soil; and
- Incidental ingestion of surface soil.

Outdoor site worker exposure to surface soil was assessed using all surface soil samples collected 0 to 2.5 feet bgs at the site. There were no soil exposure pathways that were considered incomplete; however, risk from the inhalation of VOCs from soil was insignificant as no VOCs were retained as COPCs.

The outdoor site worker is not expected to encounter groundwater. Therefore, groundwater exposure pathways were not considered.

Future Construction Workers

Future construction activities are assumed to take place on the LF512 area. Construction workers would potentially be exposed to soil during excavation and other construction activities. Potential exposure pathways for the construction worker receptor include:

- Inhalation of fugitive dust from aggregate soil;
- Dermal absorption of aggregate soil;
- Incidental ingestion of aggregate soil; and
- Inhalation of vapors that migrate from groundwater and collect in the trench.

The future construction worker was assumed to be directly exposed to soil from all depths as a result of mixing that would occur during these construction activities. These exposures were evaluated by combining analytical soil data into one dataset representing all COPCs detected in soils sampled from a depth of 0 to 15 feet bgs. Risks associated with the inhalation of VOCs from soil was insignificant as no VOCs were retained as COPCs. The construction worker is not expected to encounter groundwater during excavation due to the depth of the water table (greater than 25 feet bgs). Therefore, exposure to groundwater via dermal contact and incidental ingestion were considered to be incomplete exposure pathways; however, inhalation of volatilized COPCs from the groundwater in the trench was considered to be a complete exposure pathway.

5.2.2.3 Quantification of Exposures

Chemical exposure is a result of the intake or uptake of a chemical from the environment. The quantitative methods used to evaluate potential receptor exposures at LF512 are described in this section of the report. The equations, as well as the parameters, that were used to estimate chronic daily intake (CDI) of the COPCs for each receptor are presented. Each exposure scenario described in this section of the report is based on the premise that the extent of exposure to a chemical in an environmental medium is proportional to: (1) the concentration of the chemical in the medium, (2) rate of contact with the medium, and (3) the duration of exposure. Though RMEs represent the highest level of exposure that may reasonably occur, they do not necessarily indicate the worst level of exposure (USEPA, 1989, 1991, 2002c).

Exposure dose is related to the magnitude, frequency, and duration of exposure. Two types of doses are calculated representing cancer risk and non-cancer effects. The lifetime average daily dose (LADD) is averaged over a 70-year lifetime and is an estimate of cancer risk. The average daily dose (ADD) is proportional to the actual exposure duration for a receptor and represents non-cancer health effects. These doses are calculated by combining the EPC with various other exposure parameters.

5.2.2.3.1 Exposure Factors

The specific parameter values used to estimate daily intake or inhalation exposure concentrations for each plausible receptor are summarized in **Tables 5-14** through **5-17**. Specific values and assumptions used in estimating exposures were selected based on USEPA guidance documents (1989, 2002c, 2004, 2009, 2011, and 2014), OEPA technical guidance (OEPA, 2004), VDEQ model inputs (VDEQ, 2016), and professional judgment. The groups of receptors that may be exposed to COPCs at LF512 include: (1) current indoor and outdoor site workers and (2) future construction workers. The exposure scenarios and parameters used in estimating intake of COPCs and risks for each receptor group are described in the following sections.

Current Indoor Site Workers

Indoor site workers are potentially exposed to volatilized COPCs from groundwater that find their way into the building interiors while they are performing routine indoor activities, such as clerical, administrative, and maintenance work inside the buildings at LF512.

The site worker is assumed to be an adult with a lifetime of 70 years, an exposure time (ET) of 8 hours of work per day, and an exposure frequency (EF) of 250 days per year (USEPA, 2014). The exposure duration (ED) is 25 years (USEPA, 2014). The carcinogenic averaging time (AT-C) and the non-cancer averaging time are 365 days (USEPA, 2014).

Volatiles from groundwater that possibly enter the buildings at LF512 by vapor intrusion could subsequently inhaled by the indoor site workers. An attenuation factor of 0.001 was used for groundwater vapor concentration moving across the floor slab and into the breathing zone (USEPA, 2019f). Exposure factors used under this scenario are provided in **Table 5-14**.

Current Outdoor Site Workers

Outdoor site workers are potentially exposed to COPCs in surface soil while performing routine activities, such as periodic maintenance and grounds-keeping, at LF512 (**Table 5-15**).

The site worker is assumed to be an adult with a body weight (BW) of 80 kilograms (kg) who works 8 hours per day, 5 days per week, for a total of 225 days per year (USEPA, 2014). Exposure duration (ED) is assumed to be 25 years. The carcinogenic averaging time (AT-C) is 25,550 days (i.e., 70 years x 365 days/year; USEPA, 2002c). The non-cancer averaging time (AT-NC) is 9,125 days (i.e., exposure duration in years x 365 days/year). The outdoor site worker is assumed to ingest both soil and dust. Therefore, the USEPA OSWER recommends a default adult outdoor worker soil (soil + dust) ingestion rate of 100 milligrams per day (mg/day; USEPA, 2014). The site worker was assumed to ingest soil only from the LF512 area, so a value of 1.0 was assumed as the fraction ingested (FI) from the contaminated source. This worker is also assumed to be exposed to outdoor airborne dusts emitted from soils. The USEPA default particulate emission factor (PEF) of 1.36×10^9 cubic meters per kilogram (m^3/kg) is assumed (USEPA, 2002c).

Site workers are expected to come into dermal contact with surface soil; however, it is assumed that clothing would provide partial protection. Soil contact is assumed to occur on a skin surface area (SA) of 3,527 square centimeters (cm^2; USEPA, 2014). The soil-to-skin adherence factor (SSAF) is conservatively assumed to be 0.12 milligrams per square centimeter (mg/cm^2) for soil (USEPA, 2014). The dermal absorption factors (ABS) for the COPCs are shown in **Table 5-19**.

Future Construction Workers

Construction workers are potentially exposed to COPCs in aggregate soil and groundwater while performing excavation activities such as excavating, grading, or other soil-moving activities and upgrading or adding utilities at the LF512 area (**Table 5-16**).

A future construction worker was assumed to be an 80-kg adult who works 8 hours per day. Based on recommended values, it was assumed that construction work may occur for an entire year and consist of 120 working days (OEPA, 2004). The AT-C assumed was 25,550 days and the AT-NC was 365 days (USEPA, 2002c). The construction worker was assumed to have a soil ingestion rate (IR-S) of 330 mg/day (USEPA, 2002c). The construction worker was assumed to ingest soil only from the LF512 area, so a value of 1.0 was assumed as the FI from the contaminated source. Clothing was assumed to provide partial protection to construction workers from dermal exposure to aggregated soil. A skin SA of 3,527 cm^2 was assumed to be in contact with soil, and the recommended SSAF of 0.3 mg/cm^2 (USEPA, 2014; USEPA, 2002c). The ABS for COPCs are shown in shown in **Table 5-19**. This worker is also assumed to be exposed to outdoor airborne dusts emitted from soils.

The USEPA default PEF of 1.36×10^9 m^3/kg used for evaluating exposure to outdoor airborne dusts emitted from soils is not appropriate for construction workers exposed to particulate emissions while engaged in intrusive soil activities (USEPA, 2002c). A site-specific PEF value was developed using the EPA RSL Calculator (USEPA, 2019d). Exposure factors from OEPA's *Voluntary Action Program Derived Leach-Based Soil Values Technical Guidance Document* (OEPA, 2008) were compared to the values provided in the US EPA's *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, 2002c) in order to validate and select the most regionally and site-specific values. In addition to the exposure factors based on time spent on site and human qualities, the RSL Calculator also considered site-specific factors. Values such as average depth of the excavation site, site size, and areas of excavation, dozing, tilling, and grading were extracted from the draft remediation report where available. The site size reported in the draft remediation report was 0.59 acres (0.2 acres being grass), and the average excavation depth was reported as 15 feet (4.6 m). The areas of excavation, dozing, tilling, and grading were assumed to be the entire area of 0.59 acres for a conservative estimate of exposure. Regional values included gravimetric soil moisture content for dozing and excavating (7.9% and 12% respectively), in situ soil density (1.7 g/cm^3), soil silt content for dozing and tilling (6.9% and 1.8% respectively), and mean annual wind speed (4.7 m/s) (OEPA, 2008). All RSL Calculator inputs are detailed in **Table K-10** with their respective sources or rationales for selection. The calculated site-specific PEF value is 3.8×10^7 mg^3/kg.

For inhalation of groundwater vapor in the trench, the construction worker was assumed to be in the trench 4 hours per day, 120 days per year for one year (OEPA, 2004). **Table 5-17** shows the equations and parameters associated with the groundwater inhalation exposure calculations for the trench scenario (VDEQ, 2007 and VDEQ, 2016).

5.2.2.3.2 Exposure Equations

The EPCs were used in combination with exposure factors from USEPA guidance and standard default parameters (see Section 5.2.2.3.1) to estimate chemical intake via each exposure pathway for each receptor. Some default exposure factors have been updated in the 2014 USEPA OSWER (now Office of Land and Emergency Management [OLEM]) Directive 9200.1-120 (USEPA, 2014); these values were incorporated. Chemical intake is expressed in terms of milligrams of chemical per kilogram of body weight per day (mg/kg-day), using the following general equation, which is adjusted based on the exposure pathway and medium:

$$\text{Intake} = \text{EPC} \times \text{IR} \times \text{EF} \times \text{ED} \times 1/\text{BW} \times 1/\text{AT}$$

Where:
Intake = Daily intake or exposure dose (mg/kg-day)
EPC = Exposure point concentration of COPC
IR = Ingestion rate; amount of contaminated medium ingested over exposure period
EF = Exposure frequency; how often exposure occurs (days/year)
ED = Exposure duration; how long exposure occurs (years)
BW = Body weight; average body weight over the exposure period (kg)
AT = Averaging time; period over which exposure is averaged (days)

Each of the intake variables in the above equation consists of a range of values taken from RAGS, Part A through F (USEPA, 1989, 2009) and other applicable risk guidance, e.g., the Exposure Factors Handbook (USEPA, 2011). The exposure factors and intakes for receptor population groups for each exposure pathway are discussed in the previous Section 5.2.2.3.1.

5.2.3 Toxicity Assessment

Toxicity assessment is the third step of the baseline HHRA process. The toxicity values that were used to quantify potential adverse effects on human health associated with potential exposure to COPCs at LF512 is discussed in this section. These toxicity values include SFs for carcinogenic COPCs and RfDs for non-carcinogenic COPCs. The toxicity values used to assess the effects of non-carcinogenic COPCs are summarized in Section 5.2.3.1. The toxicity values used to assess the effects of carcinogenic COPCs are summarized in Section 5.2.3.2. The approach used to estimate toxicity values for evaluation of dermal exposure is discussed in Section 5.2.3.3. The carcinogenic and non-carcinogenic toxicity factors identified for each COPC are documented in **Tables 5-18** through **5-20**.

Toxicity values used in this assessment were obtained from two sources with the following order of priority: (1) the USEPA's online database known as the Integrated Risk Information System (IRIS) (USEPA, 2019a) and (2) USEPA's RSL Summary Table (USEPA, 2019b). Other sources are noted where appropriate.

Surrogate toxicity values were used for assessment of dermal exposures for chemicals without specific toxicity values. Based on USEPA guidance (USEPA, 1992), oral toxicity values were used to evaluate dermal exposures. Using these surrogate values is generally not expected to significantly underestimate the risk or hazard relative to other routes of exposure. Other toxicity values were determined either by assuming certain chemical isomers have similar toxic effects or by assuming that toxicity values developed for a specific route of exposure can be extrapolated to other routes.

Toxicity values were not available for TPHs (DRO/GRO/ORO). Therefore, risks and hazards were not calculated for TPHs. Extensive data was available for VOCs and SVOCs (numerically and spatially) and these COPCs are better suited for the purpose of calculating risks and hazards associated with DRO/GRO/ORO.

5.2.3.1 Non-Cancer Toxicity Assessment

The RfD is a pathway-specific (i.e., oral or dermal) estimate of daily chemical intake per unit body weight that is likely to be without deleterious effects (USEPA, 1989). The RfC used to evaluate non-cancer hazard for the inhalation exposure route is an estimate of a concentration that is likely to be without deleterious effects during a lifetime of continuous exposure. USEPA derives RfDs and RfCs to protect sensitive populations such as children. RfDs are expressed in units of mg/kg-day. RfCs are expressed in units of milligrams of chemical per cubic meter of air (mg/m^3).

USEPA's IRIS database did not provide oral RfDs for all PAHs of interest. Therefore, for the purposes of this baseline HHRA, oral RfDs were assigned to additional PAHs using surrogates (USEPA, 1992). Under this approach, oral RfDs for anthracene and fluoranthene were assigned to PAHs without oral RfDs based on structural similarities. Specifically, PAHs without oral RfDs were assigned the following surrogates:

- Anthracene was assigned as the surrogate for dibenz(a,h)anthracene.
- Fluoranthene was assigned as the surrogate for benzo(b)fluoranthene.

5.2.3.2 Cancer Toxicity Assessment

The USEPA SFs and unit risks (URs) used for estimating cancer risks (CRs) are upper 95th percentile confidence limits of the probability of response per unit intake of contaminant (by oral or inhalation routes) over a lifetime. SFs and URs are based on mathematical extrapolation from experimental animal data and epidemiological studies, when available. SFs are expressed in units of risk per milligram(s) contaminant intake per kilogram body weight per day $(\text{mg/kg-day})^{-1}$. URs are expressed in units of cubic meter(s) of air per microgram of chemical $(m^3/\mu g)$.

The only PAH for which an SF has been developed is benzo(a)pyrene, whose SF is 1.0 $(\text{mg/kg-day})^{-1}$ (OEPA, 2017). To characterize carcinogenic risks for the other six potentially carcinogenic PAHs, their carcinogenic potency relative to benzo(a)pyrene was estimated. For the purposes of this baseline HHRA, USEPA-derived benzo(a)pyrene toxicity equivalency factors (TEFs) (**Table 5-21**) were used to calculate PAH-specific SFs, as shown in the equation below the table (USEPA, 1993).

5.2.3.3 Dermal Toxicity Assessment

Dermal exposure was evaluated for all COPCs in surface soil and aggregate soil. The oral toxicity factor (RfD or SF) relates toxic response to an administered dose of chemical, only some of which may be absorbed by the body, whereas chemical intake from dermal contact is estimated as an absorbed dose using chemical-specific permeability constants for dermal absorbed fractions from soil (USEPA, 2004). So that dermal toxicity is not underestimated, USEPA (2004) recommends adjusting oral toxicity factors by the estimated fraction of chemical absorbed from the gastrointestinal tract (ABS_{GI}) to evaluate toxic effects of a dermally absorbed dose.

According to USEPA (2004), if the ABS_{GI} is greater than 50 percent, then no adjustment of the oral toxicity value is needed. If the ABS_{GI} is less than 50 percent, then the dermal toxicity factor should be derived as follows:

$RfD_d = RfD_o \times ABS_{GI}$

$SF_d = SF_o/ABS_{GI}$

RfD_d = Dermal reference dose (mg/kg-day)

RfD_o = Oral reference dose (mg/kg-day)
SF_d = Dermal slope factor $(mg/kg\text{-}day)^{-1}$
SF_o = Oral slope factor $(mg/kg\text{-}day)^{-1}$
ABS_{GI} = Fraction of chemical absorbed from the gastrointestinal tract (unitless)

Chemical-specific ABS_{GI} values and ABSs for evaluating risk from dermal absorption of COPCs from soil were obtained from USEPA (2004; 2019c).

5.2.4 Human Risk Characterization

Risk characterization is the fourth step of the baseline HHRA process. Risk characterization integrates the exposure assessment and chemical toxicity information to quantitatively estimate potential health risks due to COPCs. Risk estimates were determined for individual routes of chemical exposure as well as for additive effects. The results of the risk characterization provide a basis for decisions regarding further remedial action at LF512.

The qualitative methodologies that were used to characterize non-carcinogenic hazards and carcinogenic risks associated with potential surface soil, aggregate soil, and vapor intrusion from groundwater exposures are discussed in Sections 5.2.4.1 and 5.2.4.2. A summary of the risk results is presented by receptor in **Tables 5-22 through 5-24**. The risk calculations are presented in detail in **Appendix K** (**Tables K-5** through **K-8**).

5.2.4.1 Estimation of Non-Cancer Hazard

Hazard quotients (HQs) are the basis of quantifying non-cancer risks (hazards). An HQ is the ratio of the CDI or exposure concentration in air (EC_{air}) (Section 5.2.2.3) to the COPC-specific RfD or RfC (Section 5.2.3.1). It should be noted that hazards are exceedance ratios, not probabilities. An HQ greater than 1 indicates that the exposure dose is greater than the toxicity threshold and, thus, adverse effects may occur. Use of the RfD or RfC assumes that there is a level of intake or an exposure concentration (the RfD or RfC, respectively) below which it is unlikely that even sensitive individuals, such as children, will experience adverse health effects over the period of exposure.

For oral and dermal exposures, HQs are calculated using the equation:

$$HQ = CDI\ (mg/kg\text{-}day)\ /\ RfD\ (mg/kg\text{-}day)$$

The units of both the CDI and RfD are those of daily dose; the resulting HQ is unitless.

Inhalation HQs are calculated using an analogous equation:

$$HQ = EC_{air}\ (mg/m^3)\ /\ RfC\ (mg/m^3)$$

The units of both the EC_{air} and RfC are the same; the resulting HQ is unitless.

For consideration of exposures to more than one chemical causing systemic toxicity via several different pathways, the individual HQs are summed to provide an overall hazard index (HI). If the HI is less than 1.0, then no adverse health effects are likely to be associated with exposures at the site; however, if the total HI is greater than 1.0, separate endpoint-specific HIs may be calculated based on toxic endpoint of concern or target organ (e.g., HQs for neurotoxins are summed separately from HQs for renal toxins). Only if an endpoint-specific HI is greater than 1.0 is there reason for concern about potential health effects for that endpoint.

5.2.4.2 Estimation of Cancer Risks

Potential for carcinogenic effects was characterized in terms of the incremental probability of an individual developing cancer over a lifetime because of site-related exposure to a potential carcinogen. Excess individual lifetime CR was estimated from the projected lifetime CDI or EC_{air} (Section 5.2.2.3) and the cancer SF or UR (Section 5.2.3.2), which represent upper bound estimates of the dose-response relationship. CR for chemical carcinogens for the oral and dermal routes of exposure is calculated by multiplying the CDI by the cancer SF, as follows:

$$CR = CDI\ (mg/kg\text{-}day) \times SF\ (risk\ per\ mg/kg\text{-}day)$$

For the inhalation routes of exposure, CR is calculated by multiplying the EC_{air} by the UR and a conversion factor.

$$CR = EC_{air}\ (mg/m^3) \times UR\ (m^3/\mu g) \times conversion\ factor\ (1000\ \mu g/mg)$$

The CR for each COPC in each scenario and each exposure route was calculated by multiplying the chemical intake by the route- and chemical-specific SF or UR. Oral SFs were used for oral routes of exposure, URs were used for inhalation routes of exposure, and dermal SFs (adjusted oral SFs) were used for dermal routes of exposure.

The risks resulting from exposure to multiple carcinogens are assumed to be additive. To assess pathway-specific exposures to multiple contaminants, the CRs for all COPCs are summed to yield a pathway-specific CR. If a receptor may be exposed by multiple pathways, the CRs from all identified relevant pathways are summed to obtain the total CR for that receptor.

5.2.4.3 Cumulative Risks

The total carcinogenic risks and overall non-carcinogenic HI values are estimated for each receptor of potential concern at LF512. Risks are provided for each receptor group, each COPC, and each potentially complete exposure pathway. Each risk analysis set determines the contribution (noted as percentages) of each COPC to the overall risk estimates. The risk analyses, therefore, show the influence of individual COPCs on the overall risk estimates. Cancer risks and HIs are presented in **Tables 5-22 through 5-24**. The cancer risks and non-cancer HIs for all exposure scenarios and for all COPCs are summarized in **Table 5-25**. Detailed calculations are shown in **Appendix K** (**Tables K-5** through **K-8**). Please note that, while the risks presented in the Section 6 tables display risks to two (2) significant figures, the reporting within this section uses a single significant figure as recommended in USEPA's RAGS Part A (EPA 1989).

In August 2009, the DERR Remedial Response Program (OEPA, 2009) issued a decision document to identify the human health cumulative excess lifetime cancer risk goal and the non-cancer hazard goal. The DERR Remedial Response Program has adopted a human health cumulative excess lifetime carcinogenic risk goal of $1x10^{-5}$ and a cumulative non-cancer hazard goal equal to a HI of 1.0 for all receptors and land uses. These goals are to be used as both the level of acceptable excess cancer risk or non-cancer hazard and for the development of remediation goals for a site; therefore, the estimated risk probabilities for LF512 were evaluated using these risk goals.

Current Indoor Site Workers

Carcinogenic risks were calculated for indoor site workers potentially exposed to COPCs in subsurface groundwater vapors intruding into the indoor air of the buildings in which they work at LF512. This risk estimate is below the DERR acceptable risk goal of $1x10^{-5}$ and therefore, the cumulative risk is considered acceptable. The risk estimate of $2x10^{-7}$ was driven by tetrachloroethene, which contributed to 100 percent of the overall total risk.

The non-carcinogenic HI was also calculated for indoor site workers potentially exposed to COPCs in subsurface groundwater vapors intruding into the indoor air of the buildings in which they work at LF512. (**Table 5-22**). The overall non-carcinogenic HI is $8x10^{-2}$ and is below the acceptable HI goal of 1.0. The likelihood of an indoor site worker experiencing adverse non-cancer health effects at LF512 is negligible.

Current Outdoor Site Workers

Carcinogenic risks were calculated for outdoor site workers potentially exposed to COPCs in surface soil at LF512. The overall cumulative cancer risk estimates for site workers exposed to soil is approximately $4x10^{-7}$ as shown in **Table 5-23**. This risk estimate is below the DERR acceptable risk goal of $1x10^{-5}$ and therefore, the cumulative risk is considered acceptable. The highest contributing pathway for the site worker is dermal contact with surface soil, driven predominantly by benzo(a)pyrene. Across the three pathways (ingestion, dermal, and inhalation), benzo(a)pyrene contributes about 72 percent of the overall total risk.

The non-carcinogenic HI was also calculated for outdoor site workers potentially exposed to COPCs in surface soil at LF512 (**Table 5-23**). The overall non-carcinogenic HI is $1x10^{-1}$ and is below the acceptable HI goal of 1.0. The likelihood of a site worker experiencing adverse non-cancer health effects at LF512 is negligible.

Future Construction Workers

Carcinogenic risk probabilities were calculated for construction workers potentially exposed to COPCs in soil and groundwater vapors in a trench while performing future onsite development or utility maintenance at LF512. The overall cancer risk estimates for construction workers, shown in **Table 5-24**, is approximately 3x10^{-7}. This risk estimate is below the DERR acceptable risk goal of 1.0x10^{-5} and therefore, the cumulative risk is considered acceptable. The highest contributing pathway for the construction worker is incidental ingestion of aggregate soil (3x10^{-7}) driven predominantly by arsenic, which contributes across the three pathways about 94 percent of the overall total risk.

The non-carcinogenic HI was also calculated for construction workers potentially exposed to COPCs in soil and groundwater at LF512 (**Table 5-24**). The overall non-carcinogenic HI is 3x10^{-1} and is below the acceptable HI goal of 1. The likelihood of a construction worker experiencing adverse non-cancer health effects at LF512 is negligible.

5.2.5 Uncertainty Analysis

Uncertainty can be introduced into a health risk assessment at every step. Despite recent advances in risk assessment methodology, there is always some uncertainty regarding the resulting risk estimates. To appreciate the limitation and significance of risk estimates, it is important to understand the sources and magnitudes of uncertainty. Sources of uncertainty in this risk assessment, as in any risk assessment, may include sampling and analysis procedures, data evaluation during the hazard assessment, exposure assessment assumptions, and limitations inherent in a toxicity assessment.

Assumptions were made in each step of this baseline HHRA that introduced uncertainty into the risk characterization results. While this could potentially lead to an underestimation of risk, the use of numerous conservative (i.e., protective of human health) assumptions probably resulted in a net overestimation of potential risk; therefore, the results of this assessment are likely to be protective of human health despite the inherent uncertainties in the process.

5.2.5.1 Uncertainty in Sampling and Analysis Procedures

Sampling was conducted using accepted procedures so that samples collected were representative of environmental media. Analyses were performed in accordance with USEPA QC procedures. Data were subsequently reviewed in a data validation process; however, such current analytical procedures may not identify all potentially hazardous contaminants at a site, and analytical errors may have occurred despite stringent QA/QC procedures. To reduce the uncertainties with respect to sampling and analysis, the site history was used to develop the analytical and approach and SOPs were used to generate consistent and representative data. In conducting this risk assessment, it was assumed, not guaranteed, that the reported chemical concentrations were representative of actual site conditions. Predicted health risks could be biased in either direction due to sampling uncertainty and possible analytical error.

5.2.5.2 Uncertainty in Data Evaluation

Guidance from USEPA (1989) indicates that if a chemical is believed to be present at a site, non-detected values should be included when estimating the EPC. Similarly, according to USEPA's Supplemental Soil Screening Guidance (USEPA, 2002c), samples where a chemical was not positively identified are assumed to have concentrations equal to their respective sample-specific

MDLs. Note that when a sample result is reported as “not detected,” the chemical may actually not be present in that sample, or the concentration may be below levels that the laboratory can reliably measure; therefore, assuming that chemical concentration is equal to its respective MDL introduces some degree of error in estimation of the EPC and potentially introduces a conservative bias into the risk characterization.

When calculating concentrations representative of non-detected samples for LF512, the LODs were used. LODs indicate the lowest concentration of an analyte that can be detected by an instrument. LOQs indicate the lowest level at which an analyte may be accurately and reproducibly measured. The LOD provides a detection limit specific to each sample analyte and takes into account the reagents, sample matrix, and the preparation steps applied to a sample in specific analytical methods. If a non-detected analyte is present at the LOD introduces uncertainty into the assessment, particularly when based on the LOQ, which may be a factor of three to five times higher than the LOD. LOQs present a higher degree of confidence than LODs; however, if a LOQ value is high, the assumed concentration may result in a high value for the EPC and give the appearance that contamination is present at these levels. Uncertainty associated with incorporating non-detected samples should be considered when evaluating the results of the risk analysis. For the LF512 risk assessment, these uncertainties are considered to be very low.

5.2.5.3 Uncertainty in Exposure Assessment

The exposure assessment is perhaps the most critical step in achieving a reliable estimate of health risks to humans. In this assessment, a number of assumptions were made concerning the human populations that could come into contact with media at LF512, the frequencies of these contacts, and the durations of these contacts. In this assessment, the exposure parameters used were largely based on: (1) USEPA’s OSWER Directive 9200.1-120 Update of Standard Default Exposure Factors (USEPA, 2014), (2) USEPA’s Exposure Factors Handbook (USEPA, 2011), (3) USEPA’s Supplemental Soil Screening Guidance (USEPA, 2002c), (4) USEPA’s RAGS, Part E (USEPA, 2004), (5) OEPA technical guidance (OEPA, 2004), and (6) OEPA’s Voluntary Action Program Derived Leach-Based Soil Values Technical Guidance Document (OEPA, 2008). These exposure parameters may not be representative of actual current and future receptor populations; they are intended, in fact, to represent an RME.

Recommended default values were assumed in order to represent the RME scenario for potential receptors. To ensure that risks were not underestimated, many of the assumptions made in the exposure analyses were selected because they were considered health protective. Most default exposure inputs in the dose calculations represent an upper bound estimate (i.e., 90th to 95th percentile). The combination of multiple 90th or 95th percentile RME default assumptions, however, contributes to overestimation of plausible real-life exposures. When these overestimations are combined with conservative toxicity criteria, upper bound site risk estimates that may be over-protective can result.

Some pathways were not evaluated because they were considered likely to be negligible based on professional judgment. Exposure to VOCs in outdoor air was considered a potentially complete but negligible pathway because concentrations of VOCs that enter outdoor air from soil or groundwater are small due to dilution and wind dispersion.

5.2.5.4 Uncertainty in Toxicity Assessment

Data on toxic effects in humans for the COPCs found at LF512 are generally based on animal testing conducted in only a few species of animals. Toxicity data are largely derived from laboratory animals. Experimental animal data have historically been relied upon by regulatory agencies and other expert groups to assess the hazards of chemicals to humans. Even though this reliance has been supported by empirical observations, there may be interspecies differences in the absorption, metabolism, excretion, detoxification, and toxic responses to specific chemicals of concern. These differences, however, are generally accounted for in the development of toxicity factors (SFs, RfDs). There may also be uncertainties concerning the relevance of animal studies using exposure routes that differ from human exposure routes. Assumptions are therefore needed to extend the animal data to diverse human populations. Consequently, varying degrees of uncertainty surround the assessment of adverse health effects in potentially exposed populations. Sources of uncertainty for toxic effects in humans include:

- use of dose-response data from experiments on animals to predict effects in human populations (interspecies extrapolation);
- accounting for the diversity of the human population that may be exposed to the chemical substance (intraspecies variability); and
- extrapolation of data from high doses in animals to "real-world" low doses, from acute or subchronic exposure to chronic exposure, and from one route to another (e.g., from ingestion to dermal absorption).

When characterizing risk from exposures to chemical mixtures, USEPA usually assumes dose additivity and does not account for potential synergisms, antagonisms, differences in target organ specificity, or mechanisms of action. Despite these many limitations, animal experiments are widely believed to be a necessary part of toxicity assessment, especially in the absence of human epidemiological data. The uncertainty factors used in RfD derivations for single chemicals may compensate for any unknown effects of synergistic exposures.

5.2.6 Summary and Conclusions

Excess lifetime cancer risks and non-cancer hazards have been estimated for current conditions based on indoor and outdoor site workers. Cancer risks and non-cancer hazards for future conditions were evaluated based on construction workers. The potential risks to receptors at LF512 have been estimated for each receptor that may come into contact with one or more of the following: soil, groundwater, and indoor vapors from groundwater. The cancer risks and non-cancer hazards estimated for each exposure route for each of these receptors are summarized in **Table 5-25**. Chemicals of concern (COCs) are those COPCs that contribute to cancer risks that exceed 1.0×10^{-5} or HIs that are greater than 1.0, but that are not attributable to background conditions.

To understand the significance of the risk estimates, lifetime excess cancer risks and total HIs are compared to the DERR cumulative excess lifetime cancer risk goal of 1.0×10^{-5} and non-cancer hazard goal of 1.0.

For current use scenarios, the overall cumulative risk of $2\text{x}10^{-7}$ for the indoor site worker and $4\text{x}10^{-7}$ for the outdoor site worker are below the target acceptable risk goal. The HI for current use scenarios in this assessment ($8\text{x}10^{-2}$ for indoor site worker and $1\text{x}10^{-1}$ for the outdoor site worker) are below the benchmark of 1.0, indicating non-cancer effects are below the regulatory level of concern.

For future use scenarios, the overall cumulative risk of $3\text{x}10^{-7}$ for the construction worker is below the target acceptable risk goal. The HI for the construction worker is below the benchmark of 1.0, indicating non-cancer effects are below the regulatory level of concern.

Based on the current and foreseeable future scenario at LF512 (i.e., industrial use), this site does not pose an unacceptable risk to human health or the environment.

6.0 SUMMARY AND CONCLUSIONS

The purpose and objectives of this project were to complete RI activities to evaluate the presence, or absence of impacted soil and/or groundwater due to a release from the former sump pit at LF512, as well as former leaking USTs discovered during the 1994 excavation activities.

6.1 Remedial Investigation Summary

A total of 16 soil borings were advanced at LF512 during April and May 2017. Soils were collected from soil borings on a grid pattern within and immediately adjacent to the former Building 30013 sump pit area. The soil sample locations were selected to investigate the estimated soil plume from a soil gas investigation conducted in 1991 and depicted in a corrective action plan for Building 30013 (SAIC, 1991) and to investigate the area excavated in 1994. Soil for this RI were collected from biased intervals to the groundwater interface at the site to identify any residual contamination locations.

Following analysis of preliminary soil analytical results, three new groundwater monitoring wells were installed at the site in July 2017. Two rounds of groundwater sampling were performed in August and November 2017. Groundwater sample collection at LF512 was performed to determine if contaminated soil left in place during the previous excavation may have eventually impacted groundwater, even though it was originally found not to have done so in 1995 (CH2M, 1995). Groundwater samples were analyzed for the same COPCs as for the soil samples.

6.1.1 Nature and Extent of Contamination

COPCs at the site were found in surface soil (0 to 2.5 feet bgs) and consisted of PAHs benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene and metals aluminum, iron, manganese, and thallium. COPCs were also found within aggregate soil (0 to 15 feet bgs) and consisted of the same PAHs and metals as found in surface soil as well as arsenic, cadmium, and vanadium. However, no surface or aggregate soil COPCs, except for arsenic, were identified exceeding 2017 USEPA Industrial RSLs. No PAH COPCs were detected in soil deeper than 15 feet bgs and no VOCs were identified as COPCs in either surface or aggregate soil (**Tables 4-1a** and **4-1b**). Arsenic exceeding the industrial soil RSL was reported in all sample locations and every sample interval – including those upgradient from the former excavation area. However, the 95 percent UCL from background concentrations (**Tables 5-1** through **5-3**) was exceeded in only two locations (SB-15 and SB-16) in aggregate soil (**Table 4-1c**), supporting that arsenic is naturally elevated near and within the site.

COPCs were detected in groundwater at the site and consisted of chloroform, PCE, dibenzofuran, naphthalene, arsenic, manganese, mercury, and thallium. PCE was detected in every site well during this RI, at reported concentrations below the tapwater RSL, but exceeding the MCL in eight of nine wells. Dibenzofuran is only reported in one well, MW-7, with concentrations around 1.0 µg/L and well below tapwater RSLs. Naphthalene was reported in two wells (MW-12 and MW-16) during the November 2017 sampling event but not during the August 2017 sampling event. Naphthalene in MW-16 during the November 2017 exceeded the tapwater RSL. Manganese was reported in several wells, including wells upgradient from the former excavation area; all reported concentrations were well below the tapwater RSL.

6.1.2 Fate and Transport

Potential migration pathways at LF512 were evaluated during this RI. Due to the extensive impermeable surface cover at LF512 and the relatively small size of the vegetated area, transport of COPCs via surface water runoff (i.e., overland flow) is unlikely. Additionally, atmospheric transport and/or re-suspension from mechanical disturbance via prevailing winds is also unlikely due to the extensive surface cover at the site and site use (parking lot). As such, contaminant migration via leaching and/or via groundwater transport are the prevalent potential migration pathways identified at LF512.

COPCs identified in surface and/or aggregate soil included several PAHs and several inorganic compounds. PAH concentrations markedly decreased in concentration with depth and were not detected in soil at the groundwater interface. In general, PAHs are strongly immobile, largely insoluble, and not likely to leach into groundwater. As such, PAHs in site soils are not likely to volatilize and may remain in soil indefinitely due to limits of weathering on site soil due to the impermeable cover. None of the inorganic COPCs, except for arsenic, exceeded industrial RSLs. Arsenic is detected ubiquitously in site soil and is likely naturally-occurring at encountered concentrations and not as a result of historical impacts from the former sump pit or buried USTs and/or debris.

COPCs identified in groundwater included PCE, two SVOCs, and manganese. Dibenzofuran and naphthalene were not detected widely at the site. Manganese is detected in several wells at the site, including in wells upgradient from the former excavation area. It is likely manganese from the site is not as a result of the historical contamination at the site. In addition, metals solubility is diminished by the neutral to slightly basic nature of the groundwater; the pH of site groundwater ranges from 7.0 to 8.6. PCE, present in all site wells including upgradient wells, is present at concentrations similar to those found within the OU10 PCE plume and is not related to LF512.

Due to the lack of VOC COPCs in surface and aggregate soil, no migration potential for VOC COPCs exists. In addition, there is limited to no migration potential from leaching for PAHs and/or metals at LF512. Due to the depth of the groundwater, the migration potential of PCE is limited to groundwater transport; however, LF512 is not a source area for PCE in groundwater.

6.1.3 Risk Assessment

Excess lifetime cancer risks and non-cancer hazards have been estimated for current conditions based on indoor and outdoor site workers. Cancer risks and non-cancer hazards for future conditions were evaluated based on construction worker.

For current use scenarios, the overall cumulative risks of 2×10^{-7} for the indoor site worker and 4×10^{-7} for the outdoor site worker are below the target acceptable risk goal. The HI for current use scenarios in this assessment (8×10^{-2} for indoor site worker and 1×10^{-1} for the outdoor site worker) are below the benchmark of 1.0, indicating non-cancer effects are below the regulatory level of concern.

For future use scenarios, the overall cumulative risk of $3x10^{-7}$ for the construction worker is below the target acceptable risk goal. The HI for the construction worker is below the benchmark of 1.0, indicating non-cancer effects are below the regulatory level of concern.

6.2 Conclusions

Based on the findings of the RI and risk assessments, no evidence of lingering impact from the former sump pit and/or the excavated USTs exists. The presence of site-related COPCs at LF512 are principally the result of impacted soil left in place after excavation efforts. No land use controls currently exist at the Site; however, all intrusive activities are governed by the performance objectives in the LUCIP and that legally enforceable and transferable land use controls are associated with the prevention of residential redevelopment (in lieu of a sufficient baseline human health risk assessment) at the site (it is anticipated that the ongoing FS for the site will include land use controls as part of the selected remedy). The primary migration pathways are from the subsurface soil via leaching through the unsaturated and saturated zones; however, this migration pathway is considered less likely given the area of infiltration from precipitation and that most of the site is covered with impermeable cover. Since groundwater is shown to be at approximately 25 feet bgs, any vertical migration through leaching from the unsaturated zone to the saturated zone has minimal to no impact on groundwater.

Groundwater at LF512 contains concentrations of PCE above the drinking water MCL. These PCE concentrations are consistent with the historical reported concentrations of groundwater associated with the OU10 PCE plume that underlies LF512 (see **Figure 1-2**). The plume associated with OU10 has shown little variability in long-term monitoring since the original OU10 RI was completed in 1995. These data, along with the soil data, support that LF512 is not contributing to groundwater contamination and the PCE is from an upgradient source. Groundwater is not a source of drinking water at the site. Overall, exposure to contaminated soil and/or groundwater at LF512 is limited.

Based upon the completed risk assessment at LF512, the site does not pose unacceptable risks to human health or the environment under current or future use scenarios. The current industrial land use at LF512 is expected to remain industrial in the foreseeable future. A feasibility study is still recommended to ensure that adequate controls are in place since this area of WPAFB is commercial and industrial in nature and the residential scenario is not evaluated.

7.0 REFERENCES

APTIM Federal Services, LLC, 2018. *Final Long-Term Groundwater Monitoring Interim Summary Report: Winter and Spring 2017, Wright-Patterson AFB Long Term Monitoring Program*. June 2018.

CH2M Hill Ohio, 1995. *Remedial Investigation Report Operable Unit 10 Landfill No. 13 Central Heating Plant 3 and Associated Battery Burial Site, TCE/PCE Groundwater Plume, and Related Potential Source Areas*, Volumes 1, 2, and 3. December 1995.

Engineering-Science, Inc., 1995. *Installation Restoration Program, Final Remedial Investigation Report for Operable Unit 2 at Wright-Patterson Air Force Base, Ohio*. August.

Kelchner Environmental, Inc., 1992. *Removal Action Work Plan for Sump Pit Area Building 30013*. June 1991.

Kelchner Environmental, Inc., 1994. *Project Final Report Vapor Extraction/Groundwater Recovery System Task 5005 Sump Pit Area, Building 30013*). June 1994.

Ohio Department of Commerce (BUSTR), Notice of Regulatory Authority Deferral, 20 October 2014.

Ohio Environmental Protection Agency, 2004. *Technical Guidance Compendium.* Evaluating Exposure to Groundwater for the Construction Worker and Excavation Activity Receptor Populations. VA30009.14.002. January.

Ohio Environmental Protection Agency, 2008. *Ohio EPA Voluntary Action Program Derived Leach-Based Soil Values Technical Guidance Document*. October 2008.

Ohio Environmental Protection Agency, 2009. *Technical Decision Compendium*. Human Health Cumulative Carcinogenic Risk and Non-carcinogenic Hazard Goals for the DERR Remedial Response Program. August 2009.

Ohio Environmental Protection Agency, 2012. *Ohio EPA Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring*.

Ohio Environmental Protection Agency, 2016. Memorandum entitled *Ohio EPA's 2010 Vapor Intrusion Guidance*. May 24.

Ohio Environmental Protection Agency, 2017. Technical Guidance Compendium. Property-Specific Standards Using Updated Exposure Factors and Toxicity Information. VA30009.17.002. March.

R&R International, Inc., 1990. *Free Product Characterization Study Addendum to Site Investigation/Assessment of Sump Pit at Building #13 Wright-Patterson Air Force Base*. November 19, 1990.

R&R International, Inc., 1991a. *Free Product Removal Report for Sump Pit Area at Building #13 Wright-Patterson Air Force Base*. January 1991.

R&R International, Inc., 1991b. *Feasibility Study at Sump Pit Area Building #13 Wright-Patterson Air Force Base*. October 1991.

Science Applications International Corp., 1991. *Corrective Action Plan for the Sump Pit at Building 30013, Wright-Patterson Air Force Base, Ohio.* December 1991.

United States Environmental Protection Agency, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, Interim Final. Office of Emergency and Remedial Response. USEPA/540/G-89/004. OSWER Directive 9355.3-01. October 1988.

United States Environmental Protection Agency, 1989. *Risk Assessment Guidance for Superfund (RAGS)*. Human Health Evaluation Manual Part A. Office of Emergency and Remedial Response, Washington, D.C. December. USEPA/540/1-89/002.

United States Environmental Protection Agency, 1991. *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual*. Part B, Development of Risk-Based Preliminary Remediation Goals. December. USEPA/540/R-92/003. Publication 9285.7-01B.

United States Environmental Protection Agency, 1992. *Dermal Exposure Assessment: Principles and Application*. Office of Health and Environmental Assessment. Washington, DC. January. USEPA/600/8-91-011B.

United States Environmental Protection Agency, 1993. *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons*. Office of Research and Development. Washington, DC. July. USEPA/600/R-93/089.

United States Environmental Protection Agency, 1996. *Low-flow (Minimal Drawdown) Ground-Water Sampling Procedures*. USEPA/840/S-95/504.

United States Environmental Protection Agency, 2001. *Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual*. Part D, Standardizing, Planning, Reporting and Review of Superfund Risk Assessment. Final. December. Publication 9285.7-47.

United States Environmental Protection Agency, 2002a. *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites*. Office of Emergency and Remedial Response. December. OSWER 9285.6-10.

United States Environmental Protection Agency, 2002b. *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*. November. EPA530-D-02-004.

United States Environmental Protection Agency, 2002c. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*. Office of Emergency and Remedial Response. Washington, DC. December. OSWER 9355.4-24.

United States Environmental Protection Agency, 2004. *Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual*. Part E, Supplemental Guidance for Dermal Risk Assessment. Final. Office of Emergency and Remedial Response. Washington, DC. December. USEPA/540/R/99/005.

United States Environmental Protection Agency, 2009. *Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual*. Part F, Supplemental Guidance for Inhalation Risk Assessment. Final. Office of Emergency and Remedial Response. Washington, DC. January. USEPA/540/R/070/002.

United States Environmental Protection Agency, 2011. *Exposure Factors Handbook: 2011 Edition*. Office of Research and Development, Washington, DC. September.

United States Environmental Protection Agency, 2012. EPI Suite™ (Version 4.11). [Software]. Available from: www.epa.gov/oppt/exposure/pubs/episuite.htm.

United States Environmental Protection Agency, 2014. Memorandum entitled *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors*. February. OSWER Directive 9200.1-120. Available online at: http://rais.ornl.gov/documents/EFH Memo.pdf

United States Environmental Protection Agency, 2015a. *ProUCL Version 5.1 User Guide. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations*. USEPA Office of Research and Development. October. USEPA/600/R-07/041.

United States Environmental Protection Agency, 2015b. *ProUCL Version 5.1 Technical Guide. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations*. USEPA Office of Research and Development. October. USEPA/600/R-07/041.

United States Environmental Protection Agency, 2015c. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. Publication SW-846, Third Edition, Final Update V (2015).

United States Environmental Protection Agency, 2016. ProUCL (Version 5.1.002). [Software]. May. Available from https://www.epa.gov/land-research/proucl-version-5100-documentation-downloads

United States Environmental Protection Agency, 2019a. Integrated Risk Information System Database (IRIS). Accessed September 2019. Online at: www.epa.gov/iriswebp/iris/index.html

United States Environmental Protection Agency, 2019b. *Regional Screening Levels for Chemical Contaminants*. May 2019 update. Accessed September 2019. Online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

United States Environmental Protection Agency, 2019c. *Regional Screening Level Chemical-Specific Parameters*. Accessed September 2019. Online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

United States Environmental Protection Agency, 2019d. *Regional Screening Level (RSL) Calculator.* Accessed September 2019. Online at: https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search

United States Environmental Protection Agency, 2019e. *OSWER Vapor Intrusion Screening Level (VISL) Calculator.* Accessed November 2019. Online at: https://epa-visl.ornl.gov/cgi-bin/visl_search

United States Environmental Protection Agency, 2019f. *Vapor Intrusion Screening Level (VISL) Calculator User's Guide.* November 2019. Accessed online at: https://www.epa.gov/vaporintrusion/visl-users-guide

URS Group, Inc., 2010. *Final Evaluation Report Volume II, One Cleanup Program, AFCEE Support, DERA Eligibility Site Evaluation, Groundwater Optimization, and Site Audit Support*. July 2010.

Versar, Inc., 2014. *Draft BUSTR Tier 1 Investigation Form 2012, LF512 Facility ID #29003894, Wright-Patterson AFB*. February 2014.

Versar, Inc., 2017a. *Revised Final Remedial Investigation Work Plan, LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio*. April 2017.

Versar, Inc., 2017b. *Revised Final Remedial Investigation and Site Characterization Report, TS899 Former Skeet and Trap Ranges,* Wright-Patterson Air Force Base, Dayton, Ohio. May 2017.

Virginia Department of Environmental Quality, 2007. *Voluntary Remediation Program - Risk Assessment Guidance. 3.2.2 Exposure of Workers to Volatiles in a Construction/Utility Trench*. October. Available online: http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RemediationProgram/VoluntaryRemediationProgram/VRPRiskAssessmentGuidance/Guidance.aspx#3.22

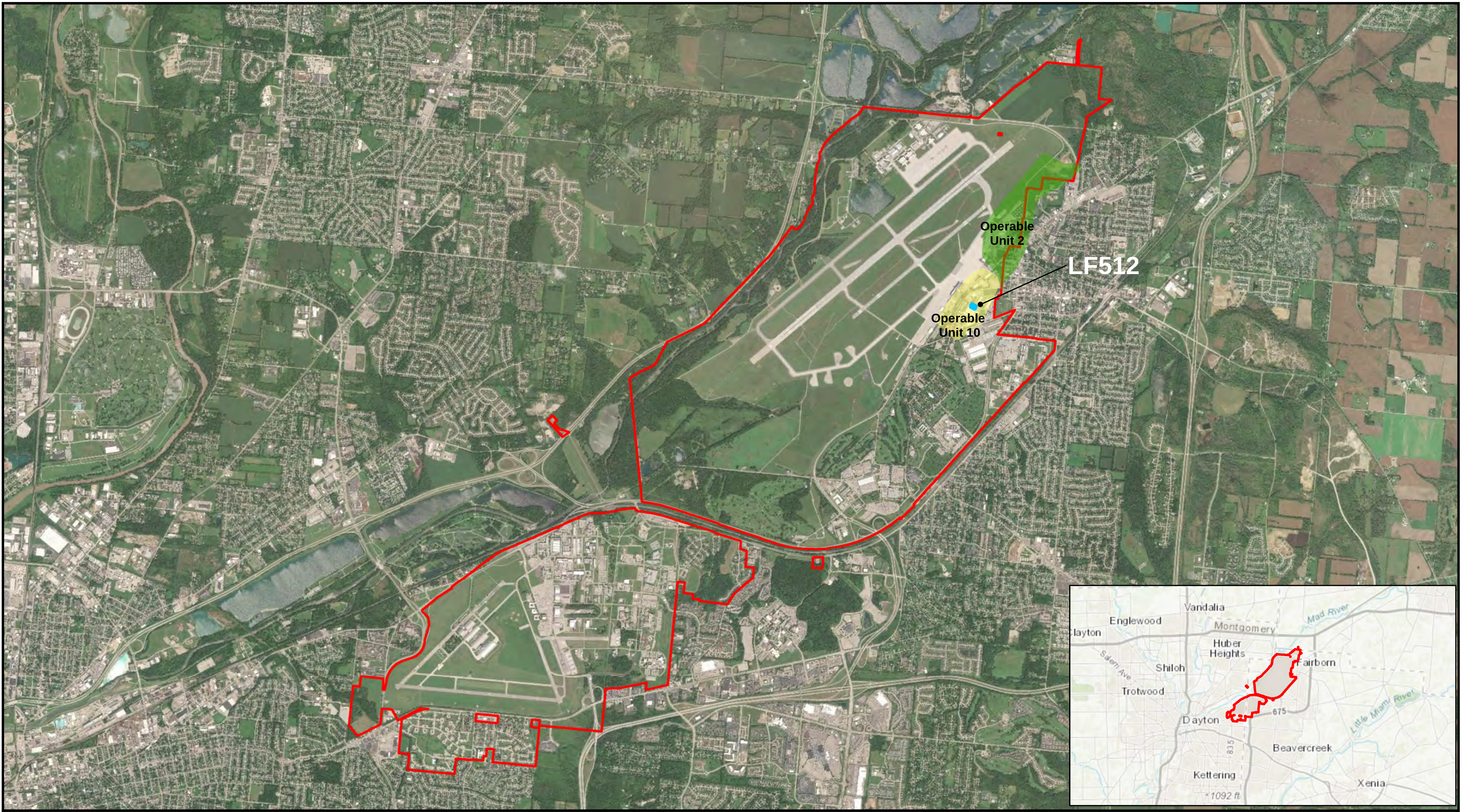
Virginia Department of Environmental Quality, 2016. *Virginia Unified Risk Assessment Model - VURAM User's Guide for Risk Assessors*. Available online: http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RemediationProgram/RiskAssessment.aspx

Wright-Patterson Air Force Base, 1990a. *Suspected Release Report*. September 1990.

Wright-Patterson Air Force Base, 1990b. *Underground Storage Tank (UST) Release. Initial Corrective Action*. September 1990.

Wright-Patterson Air Force Base, 1996. *Record of Decision for 21 No Action Sites*. August 26, 1996.

FIGURES



Legend

- 🟦 LF512 Site Boundary
- 🟩 Operable Unit 2
- 🟨 Operable Unit 10
- 🟥 Installation Boundary

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial Imagery from State of Ohio
Image Date: 2010

Wright-Patterson Air Force Base

A F C E C

PROJECT NO. 111900.0004.115
DESIGNED: E. Madison **DATE:** 4/13/2020
DRAWN: H.G. Coats **DATE:** 4/13/2020

VERSAR
Your Needs. Our Mission.

Wright-Patterson Air Force Base
Dayton, Ohio

Site Overview Map
LF512 Building 30013 Sump Pit Area

FIGURE: 1-1

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig1-1.mxd

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig1-2.mxd

Legend

▭	LF512 Site Boundary
🟩	Operable Unit 2
🟨	Operable Unit 10
⬚	Sump Pit Excavation Area (1994)
→	Groundwater Flow Direction
- - -	PCE Isopleth (ppb) (dashed where inferred)
═	Road
▨	Buildings with Numbers
▭	Installation Boundary
▭	Map Area

0 250 500 1,000
Feet

Note:
The PCE plume and Groundwater Flow Direction shown on this figure are from work associated with, and reported in, the Annual Report for OU10. It's inclusion here does not imply that monitoring of the OU10 plume is part of the work associated with LF512.

N

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial Imagery from Wright Patterson AFB.
Image Date: 2010

Wright-Patterson Air Force Base

A F C E C

PROJECT NO. 111900.0004.115
DESIGNED: E. Madison **DATE:** 4/13/2020
DRAWN: H.G. Coats **DATE:** 4/13/2020

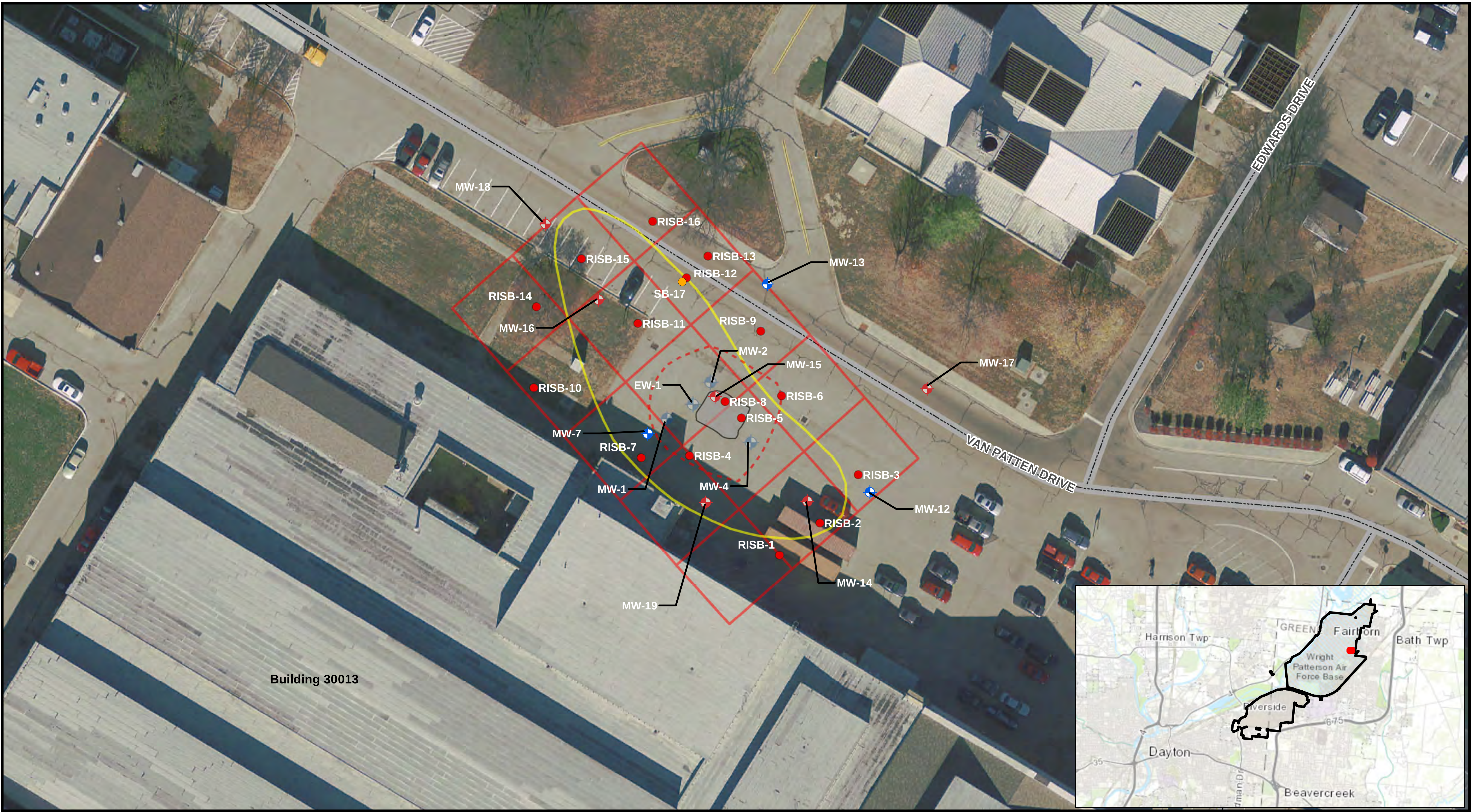
VERSAR
Your Needs. Our Mission.

Wright-Patterson Air Force Base
Dayton, Ohio

Site Location Map and
OU10 PCE Plume
LF512 Building 30013 Sump Pit Area

FIGURE: 1-2

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig1-3.mxd



Legend

⊕ Monitoring Well (Installed 2013-2017)	▭ Sump Pit Excavation Area (1994)
⊕ Monitoring Well (Installed 1990-1991)	▭ Initial Response Excavation (1990)
⊕ Abandoned Monitoring Well (Installed 1990-1991)	▭ Estimated TPH Contamination Plume, 1991
● Soil Boring (Installed August 2017)	▭ Sample Grid 2017
● BUSTR Soil Boring (2013)	--- Road
	▭ Installation Boundary

0 25 50 100
Feet

N

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial; USGS Ortho Imagry 2009 - 1 Meter

Wright-Patterson Air Force Base

A F C E C

PROJECT NO. 111900.0004.115

DESIGNED: E. Madison **DATE:** 4/13/2020

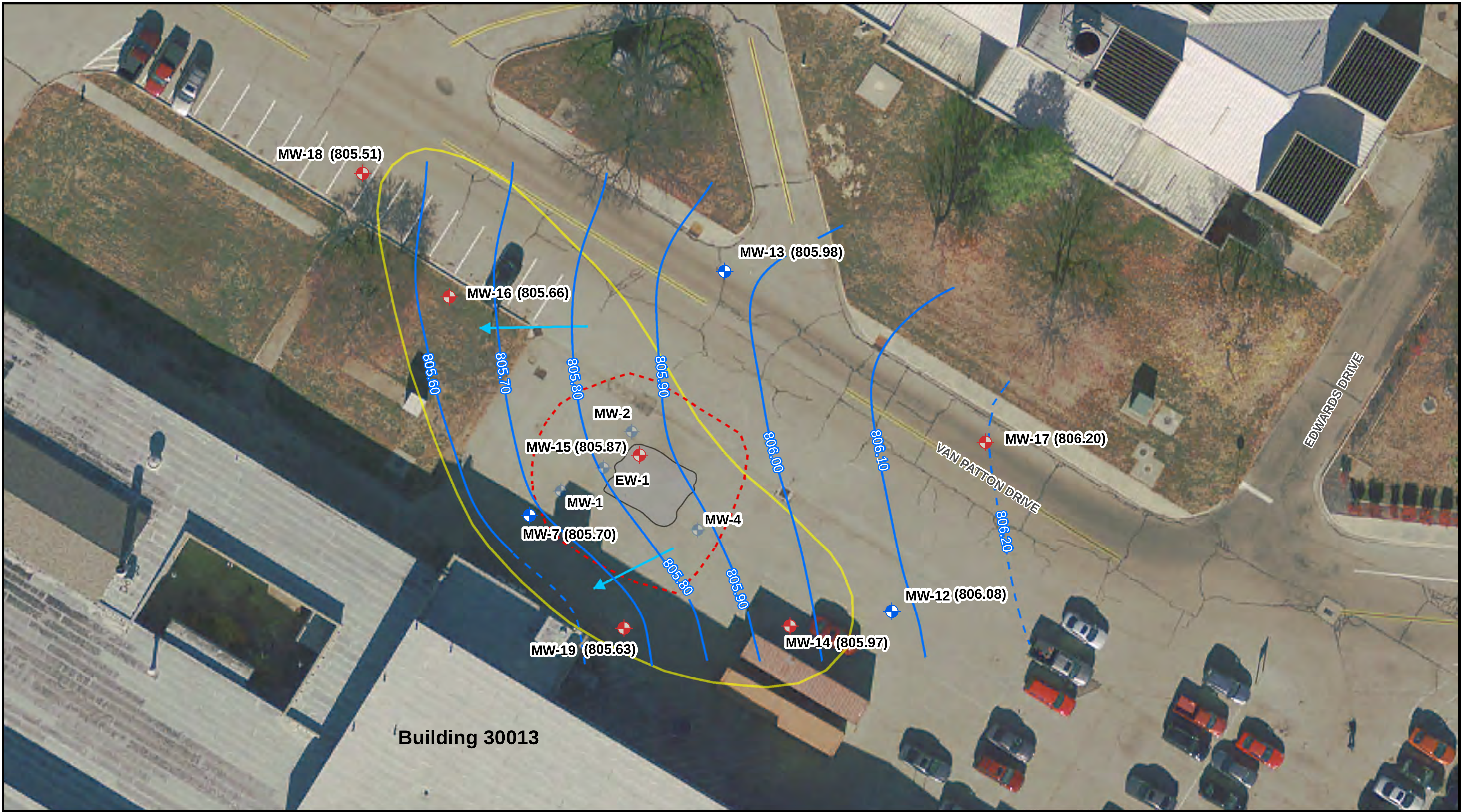
DRAWN: H.G. Coats **DATE:** 4/13/2020

VERSAR
Your Needs. Our Mission.

Wright-Patterson Air Force Base
Dayton, Ohio

Site Features Map
LF512 Building 30013 Sump Pit Area

FIGURE: 1-3



Legend

⊕	Monitoring Well (Installed 2013-2017)
⊕	Monitoring Well (Installed 1990-1991)
⊕	Abandoned Monitoring Well (1990-1991)
—	Potentiometric Surface Contour
- -	Inferred Potentiometric Surface Contour
→	Approximate Groundwater Flow Direction
▭	Sump Pit Excavation Area (1994)
▭	Estimated TPH Contamination Plume, 1991
▭	Initial Response Excavation (1990)

Note:
Groundwater elevation data collected 1 August 2017

(805.03) Groundwater Elevation in feet, NAVD 88

N

0 25 50 100
Feet

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial; USGS Ortho Imagery 2009 - 1 Meter

Wright-Patterson Air Force Base

A F C E C

PROJECT NO. 111900.0004.115
DESIGNED: E. Madison **DATE:** 4/13/2020
DRAWN: H.G. Coats **DATE:** 4/13/2020

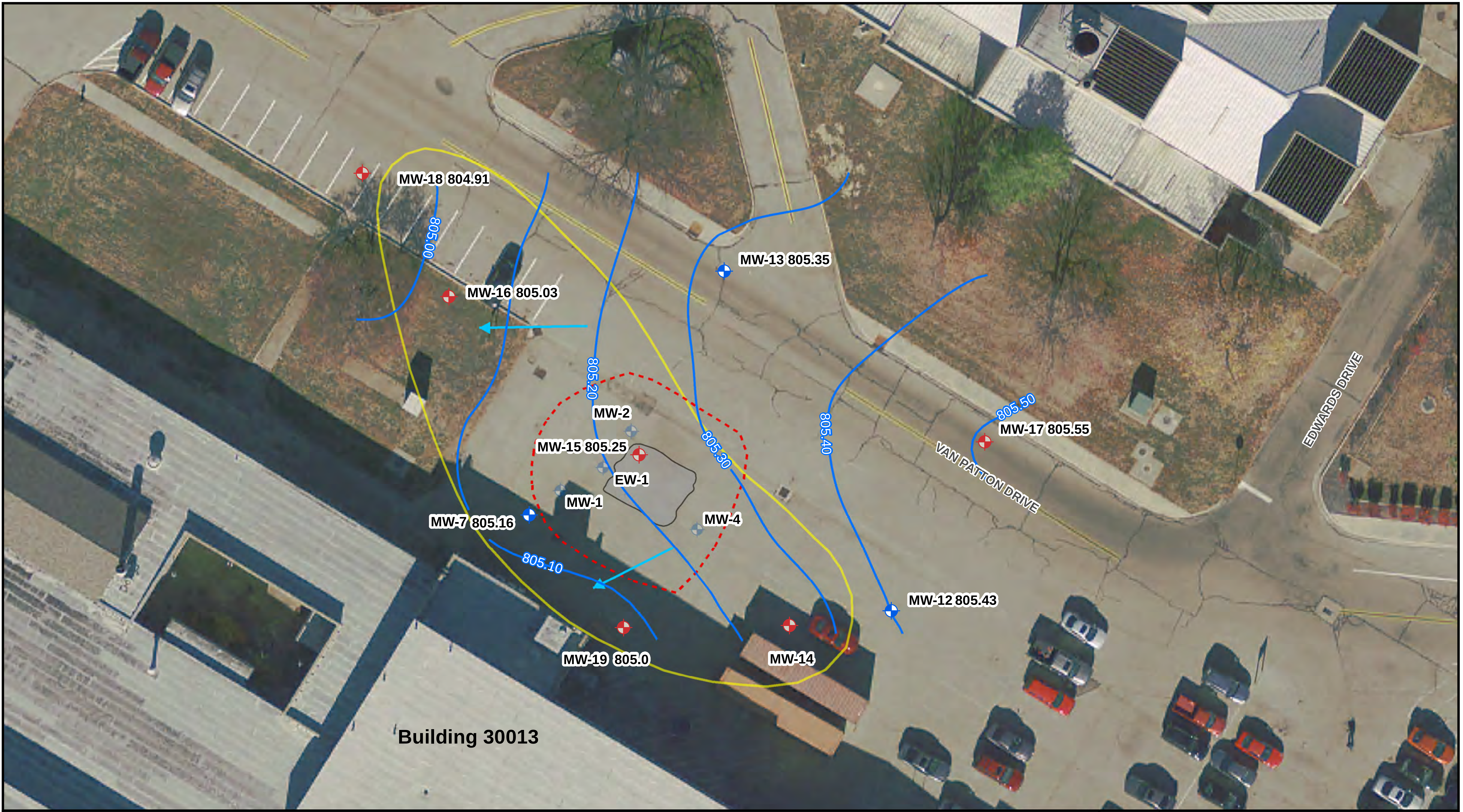
VERSAR
Your Needs. Our Mission.

Wright-Patterson Air Force Base
Dayton, Ohio

Potentiometric Surface Map,
August 2017
LF512 Building 30013 Sump Pit Area

FIGURE: 3-1

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig3-1.mxd



Legend

- ⊕ Monitoring Well (Installed 2013-2017)
- ⊕ Monitoring Well (Installed 1990-1991)
- ⊕ Abandoned Monitoring Well (1990-1991)
- — Potentiometric Surface Contour
- → Approximate Groundwater Flow Direction
- ▭ Sump Pit Excavation Area (1994)
- ▭ Estimated TPH Contamination Plume, 1991
- ▨ Initial Response Excavation (1990)

Note:
Groundwater elevation data collected 28 November 2017
(805.03) Groundwater Elevation in feet, NAVD 88

0 25 50 100 Feet

N

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial; USGS Ortho Imagery 2009 - 1 Meter

Wright-Patterson Air Force Base

A F C E C

PROJECT NO. 111900.0004.115
DESIGNED: E. Madison DATE: 4/13/2020
DRAWN: H.G. Coats DATE: 4/13/2020

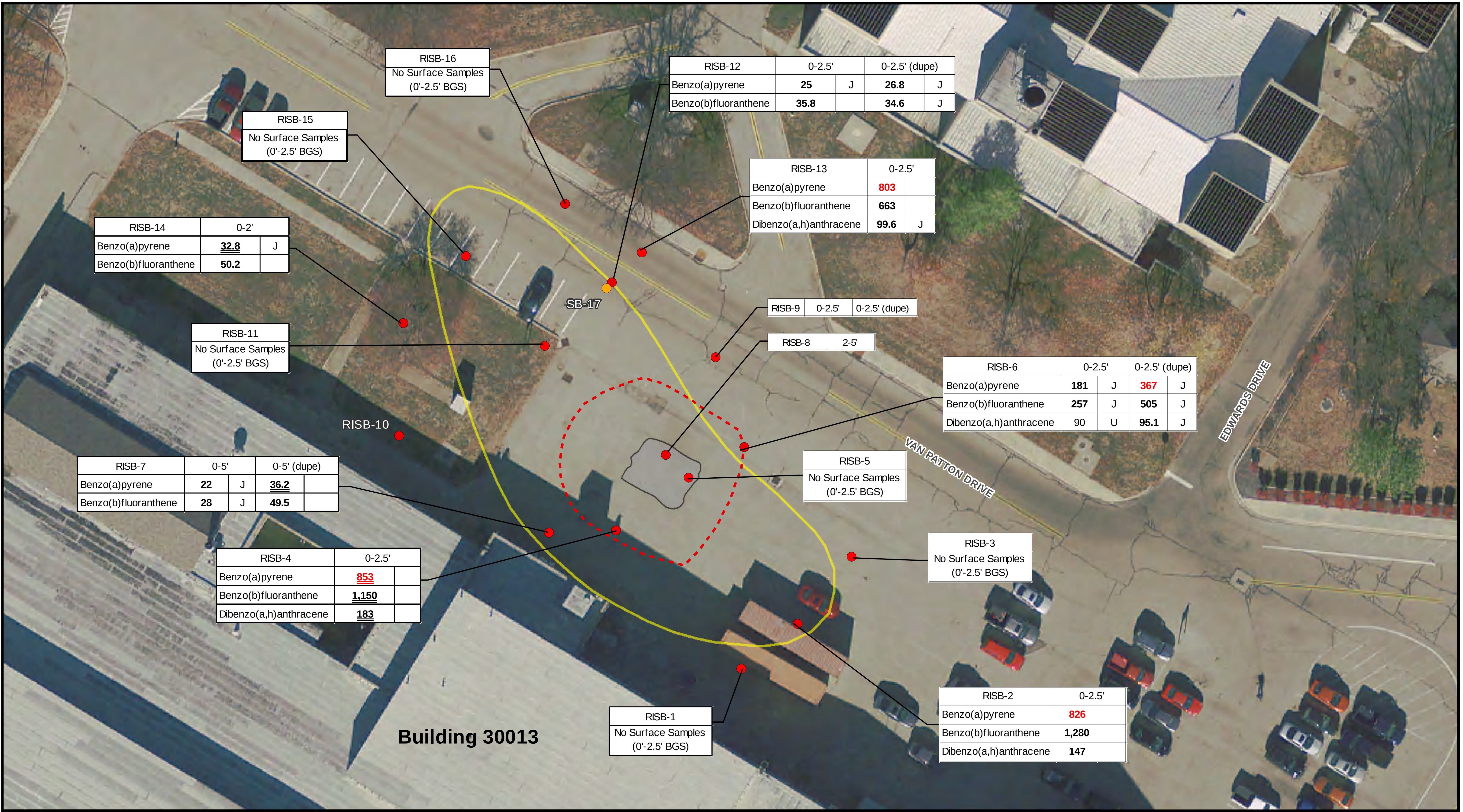
VERSAR
Your Needs. Our Mission.

Wright-Patterson Air Force Base
Dayton, Ohio

Potentiometric Surface Map, November 2017
LF512 Building 30013 Sump Pit Area

FIGURE: 3-2

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig3-2.mxd



RISB-16
No Surface Samples (0'-2.5' BGS)

RISB-15
No Surface Samples (0'-2.5' BGS)

RISB-12	0-2.5'		0-2.5' (dupe)	
Benzo(a)pyrene	**25**	J	**26.8**	J
Benzo(b)fluoranthene	**35.8**		**34.6**	J

RISB-13	0-2.5'	
Benzo(a)pyrene	**803**	
Benzo(b)fluoranthene	**663**	
Dibenzo(a,h)anthracene	**99.6**	J

RISB-14	0-2'	
Benzo(a)pyrene	**32.8**	J
Benzo(b)fluoranthene	**50.2**	

RISB-11
No Surface Samples (0'-2.5' BGS)

RISB-9	0-2.5'	0-2.5' (dupe)

RISB-8	2-5'

RISB-6	0-2.5'		0-2.5' (dupe)	
Benzo(a)pyrene	**181**	J	**367**	J
Benzo(b)fluoranthene	**257**	J	**505**	J
Dibenzo(a,h)anthracene	90	U	**95.1**	J

RISB-7	0-5'		0-5' (dupe)	
Benzo(a)pyrene	**22**	J	**36.2**	
Benzo(b)fluoranthene	**28**	J	**49.5**	

RISB-5
No Surface Samples (0'-2.5' BGS)

RISB-3
No Surface Samples (0'-2.5' BGS)

RISB-4	0-2.5'	
Benzo(a)pyrene	**853**	
Benzo(b)fluoranthene	**1,150**	
Dibenzo(a,h)anthracene	**183**	

RISB-2	0-2.5'	
Benzo(a)pyrene	**826**	
Benzo(b)fluoranthene	**1,280**	
Dibenzo(a,h)anthracene	**147**	

RISB-1
No Surface Samples (0'-2.5' BGS)

Legend

●	Soil Boring (Installed August 2017)
●	BUSTR Soil Boring (2013)
▭	Sump Pit Excavation Area (1994)
▭	Estimated TPH Contamination Plume (1991)
▨	Initial Response Excavation (1990)

Notes:
mg/kg: milligrams per kilogram; inorganics results
µg/kg: micrograms per kilogram; volatile and semi-volatile organic compound results
bgs: below ground surface
bold, black: analyte detected
double underline: exceeds United States Environmental Protection Agency (USEPA) Regional Screening Level (RSL) Risk-based Soil Screening Level (SSL)
bold,red: exceeds USEPA RSL Maximum Contaminant Level (MCL)-based SSL
blue shading: exceeds USEPA RSL for Industrial Soil
Data Qualifiers:
J: estimated value
U: undetected; value shown is Limit of Detection

N

0 25 50
Feet

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial; USGS Ortho Imagery 2009 - 1 Meter

Wright-Patterson Air Force Base

AFCEC

PROJECT NO.	111900.0004.115
DESIGNED: E. Madison	DATE: 4/15/2020
DRAWN: CGomez	DATE: 4/15/2020

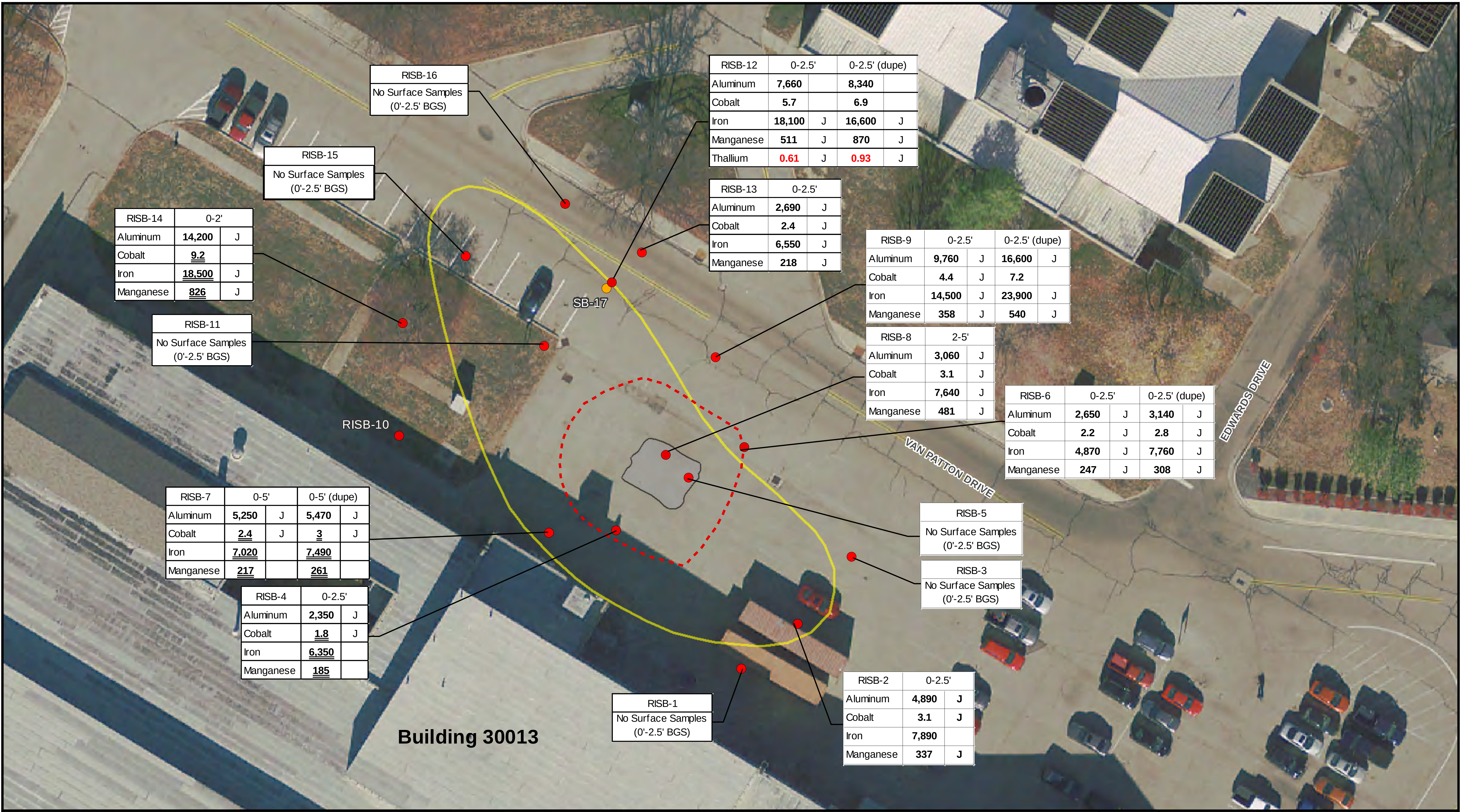
VERSAR
Your Needs. Our Mission.

Wright-Patterson Air Force Base
Dayton, Ohio

Detected Chemicals of Potential Concern in Surface Soil (SVOCs)
LF512 Building 30013 Sump Pit Area

FIGURE: 4-1A

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig4-1A.mxd



RISB-12	0-2.5'		0-2.5' (dupe)	
Aluminum	**7,660**		**8,340**	
Cobalt	**5.7**		**6.9**	
Iron	**18,100**	J	**16,600**	J
Manganese	**511**	J	**870**	J
Thallium	**0.61**	J	**0.93**	J

RISB-16
No Surface Samples
(0'-2.5' BGS)

RISB-15
No Surface Samples
(0'-2.5' BGS)

RISB-13	0-2.5'	
Aluminum	**2,690**	J
Cobalt	**2.4**	J
Iron	**6,550**	J
Manganese	**218**	J

RISB-14	0-2'	
Aluminum	**14,200**	J
Cobalt	**9.2**	
Iron	**18,500**	J
Manganese	**826**	J

RISB-9	0-2.5'		0-2.5' (dupe)	
Aluminum	**9,760**	J	**16,600**	J
Cobalt	**4.4**	J	**7.2**	
Iron	**14,500**	J	**23,900**	J
Manganese	**358**	J	**540**	J

RISB-11
No Surface Samples
(0'-2.5' BGS)

RISB-8	2-5'	
Aluminum	**3,060**	J
Cobalt	**3.1**	J
Iron	**7,640**	J
Manganese	**481**	J

RISB-6	0-2.5'		0-2.5' (dupe)	
Aluminum	**2,650**	J	**3,140**	J
Cobalt	**2.2**	J	**2.8**	J
Iron	**4,870**	J	**7,760**	J
Manganese	**247**	J	**308**	J

RISB-7	0-5'		0-5' (dupe)	
Aluminum	**5,250**	J	**5,470**	J
Cobalt	**2.4**	J	**3**	J
Iron	**7,020**		**7,490**	
Manganese	**217**		**261**	

RISB-5
No Surface Samples
(0'-2.5' BGS)

RISB-3
No Surface Samples
(0'-2.5' BGS)

RISB-4	0-2.5'	
Aluminum	**2,350**	J
Cobalt	**1.8**	J
Iron	**6,350**	
Manganese	**185**	

RISB-1
No Surface Samples
(0'-2.5' BGS)

RISB-2	0-2.5'	
Aluminum	**4,890**	J
Cobalt	**3.1**	J
Iron	**7,890**	
Manganese	**337**	J

Legend

- 🔴 Soil Boring (Installed August 2017)
- 🟠 BUSTR Soil Boring (2013)
- ⬚ Sump Pit Excavation Area (1994)
- ▭ Estimated TPH Contamination Plume (1991)
- ▨ Initial Response Excavation (1990)

Notes:
mg/kg: milligrams per kilogram; inorganics results
µg/kg: micrograms per kilogram; volatile and semi-volatile organic compound results
bgs: below ground surface
bold, black: analyte detected
double underline: exceeds United States Environmental Protection Agency (USEPA) Regional Screening Level (RSL) Risk-based Soil Screening Level (SSL)
bold,**red**: exceeds USEPA RSL Maximum Contaminant Level (MCL)-based SSL
blue shading: exceeds USEPA RSL for Industrial Soil
Data Qualifiers:
J: estimated value
U: undetected; value shown is Limit of Detection

N

0 25 50
Feet

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial; USGS Ortho Imagery 2009 - 1 Meter

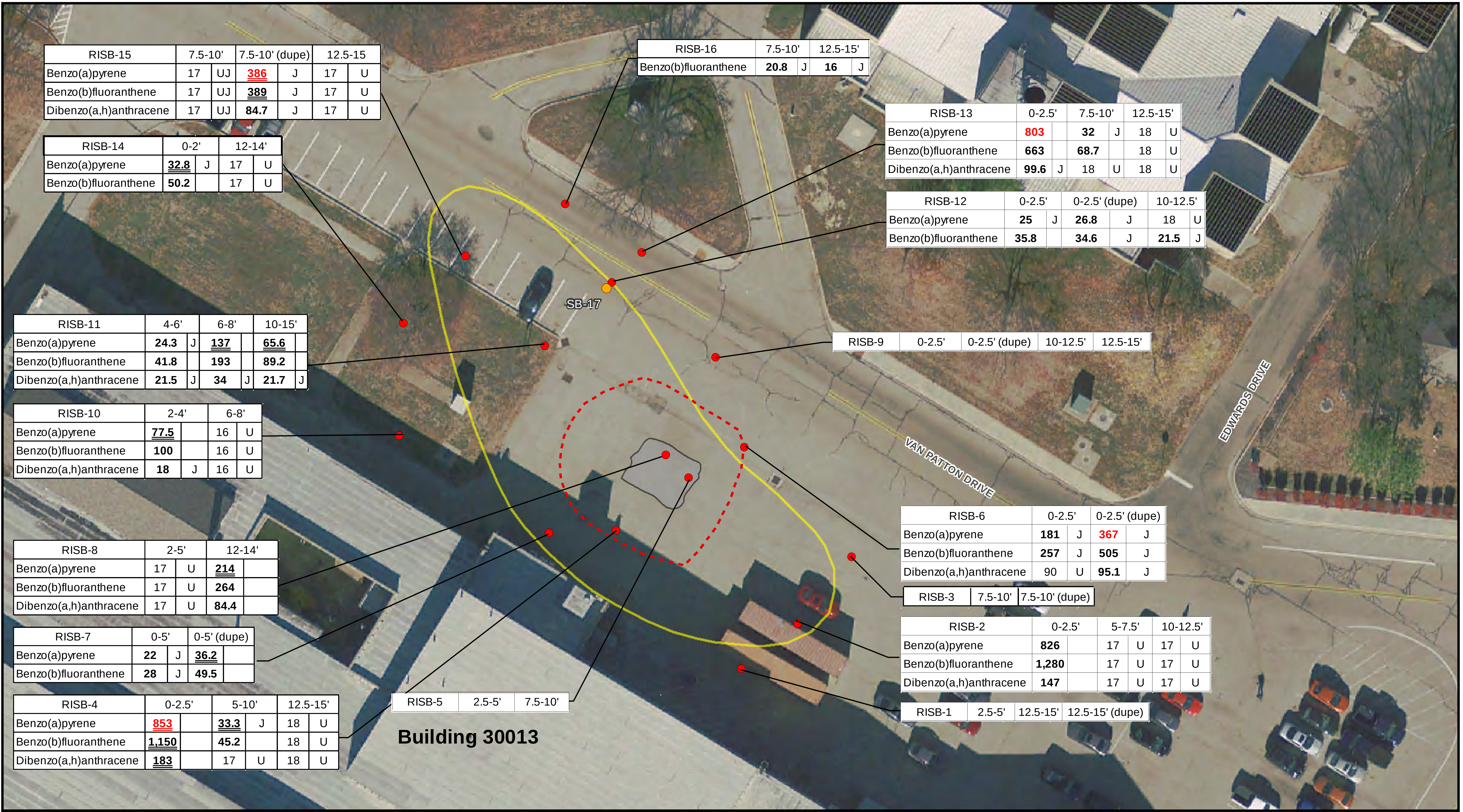
Wright-Patterson Air Force Base
A F C E C

PROJECT NO. 111900.0004.115
DESIGNED: E. Madison **DATE:** 4/15/2020
DRAWN: CGomez **DATE:** 4/15/2020

VERSAR
Your Needs. Our Mission.

Wright-Patterson Air Force Base
Dayton, Ohio
Detected Chemicals of Potential Concern in Surface Soil (Metals)
LF512 Building 30013 Sump Pit Area
FIGURE: 4-1B

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig4-1B.mxd



RISB-15	7.5-10'		7.5-10' (dupe)		12.5-15	
Benzo(a)pyrene	17	UJ	**386**	J	17	U
Benzo(b)fluoranthene	17	UJ	**389**	J	17	U
Dibenzo(a,h)anthracene	17	UJ	**84.7**	J	17	U

RISB-14	0-2'		12-14'	
Benzo(a)pyrene	**32.8**	J	17	U
Benzo(b)fluoranthene	**50.2**		17	U

RISB-11	4-6'		6-8'		10-15'	
Benzo(a)pyrene	**24.3**	J	**137**		**65.6**	
Benzo(b)fluoranthene	**41.8**		**193**		**89.2**	
Dibenzo(a,h)anthracene	**21.5**	J	**34**	J	**21.7**	J

RISB-10	2-4'		6-8'	
Benzo(a)pyrene	**77.5**		16	U
Benzo(b)fluoranthene	**100**		16	U
Dibenzo(a,h)anthracene	**18**	J	16	U

RISB-8	2-5'		12-14'	
Benzo(a)pyrene	17	U	**214**	
Benzo(b)fluoranthene	17	U	**264**	
Dibenzo(a,h)anthracene	17	U	**84.4**	

RISB-7	0-5'		0-5' (dupe)	
Benzo(a)pyrene	**22**	J	**36.2**	
Benzo(b)fluoranthene	**28**	J	**49.5**	

RISB-4	0-2.5'		5-10'		12.5-15'	
Benzo(a)pyrene	**853**		**33.3**	J	18	U
Benzo(b)fluoranthene	**1,150**		**45.2**		18	U
Dibenzo(a,h)anthracene	**183**		17	U	18	U

RISB-5	2.5-5'	7.5-10'

RISB-16	7.5-10'		12.5-15'	
Benzo(b)fluoranthene	**20.8**	J	**16**	J

RISB-13	0-2.5'		7.5-10'		12.5-15'	
Benzo(a)pyrene	**803**		**32**	J	18	U
Benzo(b)fluoranthene	**663**		**68.7**		18	U
Dibenzo(a,h)anthracene	**99.6**	J	18	U	18	U

RISB-12	0-2.5'		0-2.5' (dupe)		10-12.5'	
Benzo(a)pyrene	**25**	J	**26.8**	J	18	U
Benzo(b)fluoranthene	**35.8**		**34.6**	J	**21.5**	J

RISB-9	0-2.5'	0-2.5' (dupe)	10-12.5'	12.5-15'

RISB-6	0-2.5'		0-2.5' (dupe)	
Benzo(a)pyrene	**181**	J	**367**	J
Benzo(b)fluoranthene	**257**	J	**505**	J
Dibenzo(a,h)anthracene	90	U	**95.1**	J

RISB-3	7.5-10'	7.5-10' (dupe)

RISB-2	0-2.5'	5-7.5'		10-12.5'	
Benzo(a)pyrene	**826**	17	U	17	U
Benzo(b)fluoranthene	**1,280**	17	U	17	U
Dibenzo(a,h)anthracene	**147**	17	U	17	U

RISB-1	2.5-5'	12.5-15'	12.5-15' (dupe)

Legend

- ● Soil Boring (2017)
- ● BUSTR Soil Boring (2013)
- ▭ Sump Pit Excavation Area (1994)
- ▭ Estimated TPH Contamination Plume (1991)
- ▨ Initial Response Excavation (1990)

Notes:
mg/kg: milligrams per kilogram; inorganics results
µg/kg: micrograms per kilogram; volatile and semi-volatile organic compound results
bgs: below ground surface
bold, black: analyte detected
double underline: exceeds United States Environmental Protection Agency (USEPA) Regional Screening Level (RSL) Risk-based Soil Screening Level (SSL)
bold, red: exceeds USEPA RSL Maximum Contaminant Level (MCL)-based SSL
blue shading: exceeds USEPA RSL for Industrial Soil
Data Qualifiers:
J: estimated value
U: undetected; value shown is Limit of Detection

N

0 25 50
Feet

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial; USGS Ortho Imagery 2009 - 1 Meter

Wright-Patterson Air Force Base

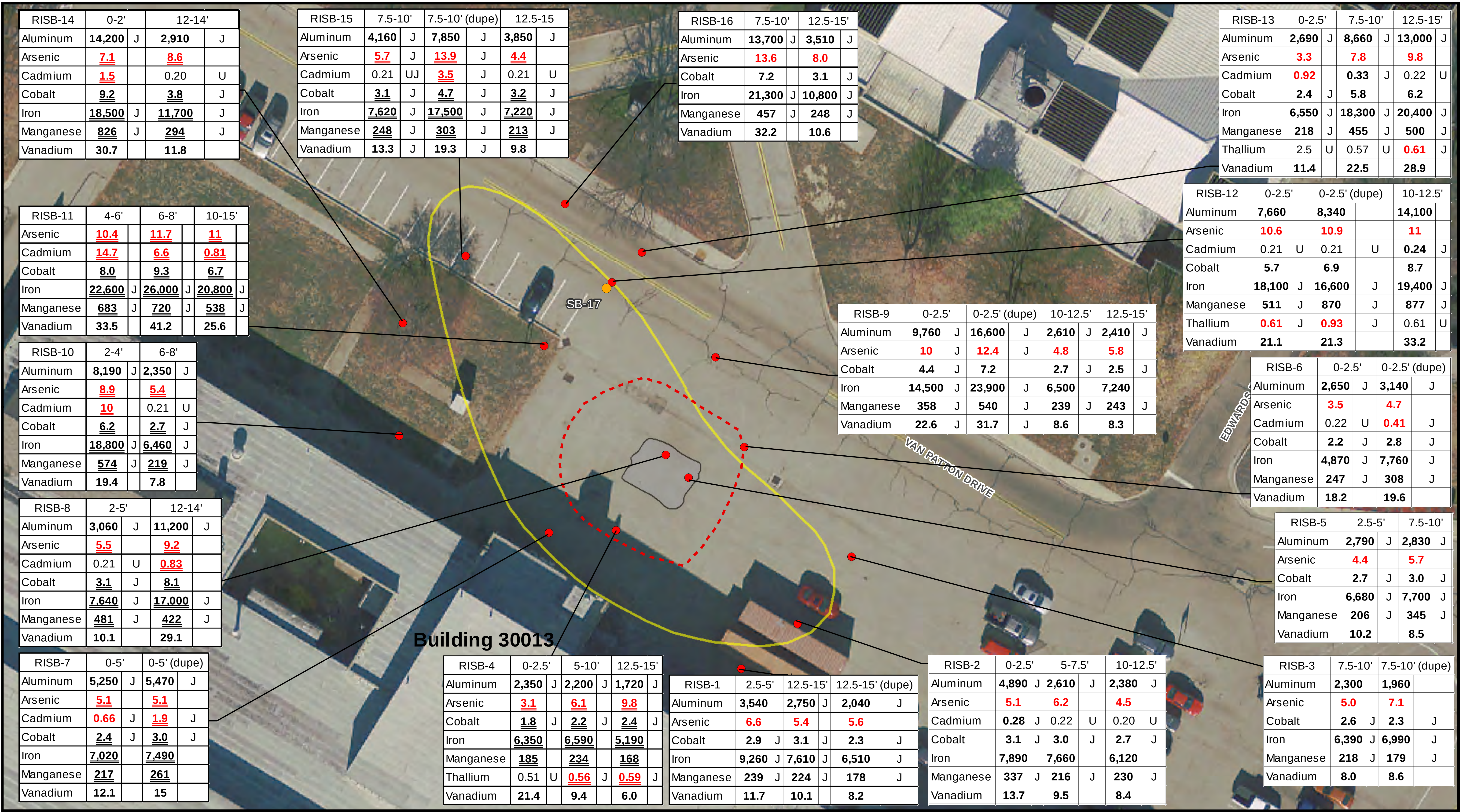
A F C E C

PROJECT NO. 111900.0004.115
DESIGNED: E. Madison DATE: 4/15/2020
DRAWN: CGomez DATE: 4/15/2020

VERSAR
Your Needs. Our Mission.

Wright-Patterson Air Force Base
Dayton, Ohio
Detected Chemicals of Potential Concern in Aggregate Soil (SVOCs)
LF512 Building 30013 Sump Pit Area
FIGURE: 4-2A

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig4-2A.mxd



RISB-14	0-2'		12-14'	
Aluminum	14,200	J	2,910	J
Arsenic	7.1		8.6	
Cadmium	1.5		0.20	U
Cobalt	9.2		3.8	J
Iron	18,500	J	11,700	J
Manganese	826	J	294	J
Vanadium	30.7		11.8	

RISB-15	7.5-10'		7.5-10' (dupe)		12.5-15	
Aluminum	4,160	J	7,850	J	3,850	J
Arsenic	5.7	J	13.9	J	4.4	
Cadmium	0.21	UJ	3.5	J	0.21	U
Cobalt	3.1	J	4.7	J	3.2	J
Iron	7,620	J	17,500	J	7,220	J
Manganese	248	J	303	J	213	J
Vanadium	13.3	J	19.3	J	9.8	

RISB-16	7.5-10'		12.5-15'	
Aluminum	13,700	J	3,510	J
Arsenic	13.6		8.0	
Cobalt	7.2		3.1	J
Iron	21,300	J	10,800	J
Manganese	457	J	248	J
Vanadium	32.2		10.6	

RISB-13	0-2.5'		7.5-10'		12.5-15'	
Aluminum	2,690	J	8,660	J	13,000	J
Arsenic	3.3		7.8		9.8	
Cadmium	0.92		0.33	J	0.22	U
Cobalt	2.4	J	5.8		6.2	
Iron	6,550	J	18,300	J	20,400	J
Manganese	218	J	455	J	500	J
Thallium	2.5	U	0.57	U	0.61	J
Vanadium	11.4		22.5		28.9	

RISB-12	0-2.5'		0-2.5' (dupe)		10-12.5'	
Aluminum	7,660		8,340		14,100	
Arsenic	10.6		10.9		11	
Cadmium	0.21	U	0.21	U	0.24	J
Cobalt	5.7		6.9		8.7	
Iron	18,100	J	16,600	J	19,400	J
Manganese	511	J	870	J	877	J
Thallium	0.61	J	0.93	J	0.61	U
Vanadium	21.1		21.3		33.2	

RISB-11	4-6'		6-8'		10-15'	
Arsenic	10.4		11.7		11	
Cadmium	14.7		6.6		0.81	
Cobalt	8.0		9.3		6.7	
Iron	22,600	J	26,000	J	20,800	J
Manganese	683	J	720	J	538	J
Vanadium	33.5		41.2		25.6	

RISB-9	0-2.5'		0-2.5' (dupe)		10-12.5'		12.5-15'	
Aluminum	9,760	J	16,600	J	2,610	J	2,410	J
Arsenic	10	J	12.4	J	4.8		5.8	
Cobalt	4.4	J	7.2		2.7	J	2.5	J
Iron	14,500	J	23,900	J	6,500		7,240	
Manganese	358	J	540	J	239	J	243	J
Vanadium	22.6	J	31.7	J	8.6		8.3	

RISB-10	2-4'		6-8'	
Aluminum	8,190	J	2,350	J
Arsenic	8.9		5.4	
Cadmium	10		0.21	U
Cobalt	6.2		2.7	J
Iron	18,800	J	6,460	J
Manganese	574	J	219	J
Vanadium	19.4		7.8	

RISB-6	0-2.5'		0-2.5' (dupe)	
Aluminum	2,650	J	3,140	J
Arsenic	3.5		4.7	
Cadmium	0.22	U	0.41	J
Cobalt	2.2	J	2.8	J
Iron	4,870	J	7,760	J
Manganese	247	J	308	J
Vanadium	18.2		19.6	

RISB-8	2-5'		12-14'	
Aluminum	3,060	J	11,200	J
Arsenic	5.5		9.2	
Cadmium	0.21	U	0.83	
Cobalt	3.1	J	8.1	
Iron	7,640	J	17,000	J
Manganese	481	J	422	J
Vanadium	10.1		29.1	

RISB-5	2.5-5'		7.5-10'	
Aluminum	2,790	J	2,830	J
Arsenic	4.4		5.7	
Cobalt	2.7	J	3.0	J
Iron	6,680	J	7,700	J
Manganese	206	J	345	J
Vanadium	10.2		8.5	

RISB-7	0-5'		0-5' (dupe)	
Aluminum	5,250	J	5,470	J
Arsenic	5.1		5.1	
Cadmium	0.66	J	1.9	J
Cobalt	2.4	J	3.0	J
Iron	7,020		7,490	
Manganese	217		261	
Vanadium	12.1		15	

RISB-4	0-2.5'		5-10'		12.5-15'	
Aluminum	2,350	J	2,200	J	1,720	J
Arsenic	3.1		6.1		9.8	
Cobalt	1.8	J	2.2	J	2.4	J
Iron	6,350		6,590		5,190	
Manganese	185		234		168	
Thallium	0.51	U	0.56	J	0.59	J
Vanadium	21.4		9.4		6.0	

RISB-1	2.5-5'		12.5-15'		12.5-15' (dupe)	
Aluminum	3,540		2,750	J	2,040	J
Arsenic	6.6		5.4		5.6	
Cobalt	2.9	J	3.1	J	2.3	J
Iron	9,260	J	7,610	J	6,510	J
Manganese	239	J	224	J	178	J
Vanadium	11.7		10.1		8.2	

RISB-2	0-2.5'		5-7.5'		10-12.5'	
Aluminum	4,890	J	2,610	J	2,380	J
Arsenic	5.1		6.2		4.5	
Cadmium	0.28	J	0.22	U	0.20	U
Cobalt	3.1	J	3.0	J	2.7	J
Iron	7,890		7,660		6,120	
Manganese	337	J	216	J	230	J
Vanadium	13.7		9.5		8.4	

RISB-3	7.5-10'		7.5-10' (dupe)	
Aluminum	2,300		1,960	
Arsenic	5.0		7.1	
Cobalt	2.6	J	2.3	J
Iron	6,390	J	6,990	J
Manganese	218	J	179	J
Vanadium	8.0		8.6	

Legend

- ● BUSTR Soil Boring (2013)
- ● Soil Boring (2017)
- ⬚ Sump Pit Excavation Area (1994)
- ▭ Estimated TPH Contamination Plume (1991)
- ▨ Initial Response Excavation (1990)

Notes:
mg/kg: milligrams per kilogram; inorganics results
µg/kg: micrograms per kilogram; volatile and semi-volatile organic compound results
bgs: below ground surface
bold, black: analyte detected
double underline: exceeds United States Environmental Protection Agency (USEPA) Regional Screening Level (RSL) Risk-based Soil Screening Level (SSL)
bold,**red**: exceeds USEPA RSL Maximum Contaminant Level (MCL)-based SSL
blue shading: exceeds USEPA RSL for Industrial Soil
Data Qualifiers:
J: estimated value
U: undetected; value shown is Limit of Detection

N

0 25 50
Feet

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial; USGS Ortho Imagery 2009 - 1 Meter

Wright-Patterson Air Force Base

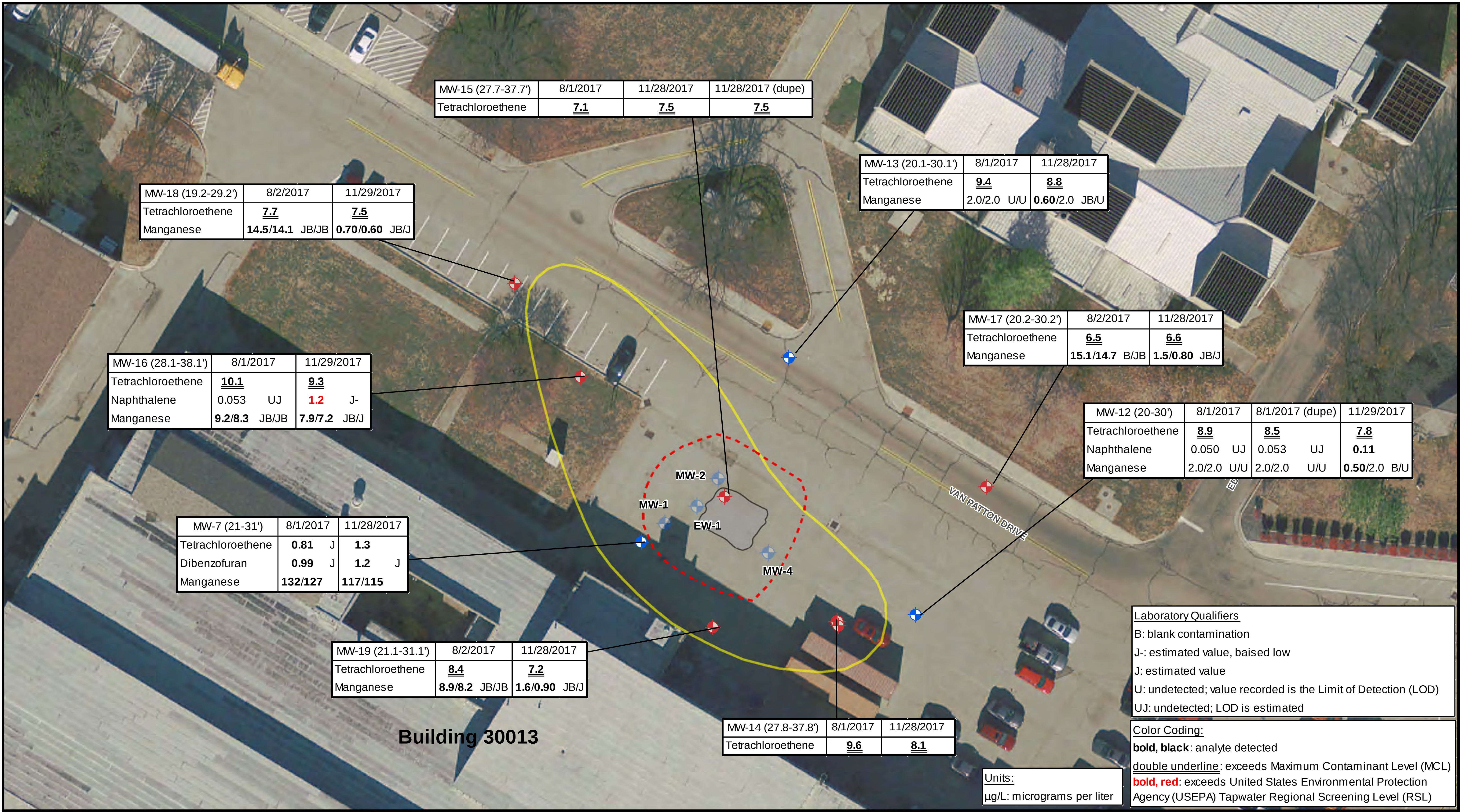
A F C E C

PROJECT NO. 111900.0004.115	
DESIGNED: E. Madison	DATE: 4/15/2020
DRAWN: CGomez	DATE: 4/15/2020

Wright-Patterson Air Force Base
Dayton, Ohio
Detected Chemicals of Potential Concern in Aggregate Soil (Metals)
LF512 Building 30013 Sump Pit Area

FIGURE: 4-2B

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig4-2B.mxd



MW-15 (27.7-37.7')	8/1/2017	11/28/2017	11/28/2017 (dupe)
Tetrachloroethene	**7.1**	**7.5**	**7.5**

MW-13 (20.1-30.1')	8/1/2017	11/28/2017
Tetrachloroethene	**9.4**	**8.8**
Manganese	2.0/2.0 U/U	**0.60**/2.0 JB/U

MW-18 (19.2-29.2')	8/2/2017	11/29/2017
Tetrachloroethene	**7.7**	**7.5**
Manganese	**14.5/14.1** JB/JB	**0.70/0.60** JB/J

MW-17 (20.2-30.2')	8/2/2017	11/28/2017
Tetrachloroethene	**6.5**	**6.6**
Manganese	**15.1/14.7** B/JB	**1.5/0.80** JB/J

MW-16 (28.1-38.1')	8/1/2017	11/29/2017
Tetrachloroethene	**10.1**	**9.3**
Naphthalene	0.053 UJ	**1.2** J-
Manganese	**9.2/8.3** JB/JB	**7.9/7.2** JB/J

MW-12 (20-30')	8/1/2017	8/1/2017 (dupe)	11/29/2017
Tetrachloroethene	**8.9**	**8.5**	**7.8**
Naphthalene	0.050 UJ	0.053 UJ	**0.11**
Manganese	2.0/2.0 U/U	2.0/2.0 U/U	**0.50**/2.0 B/U

MW-7 (21-31')	8/1/2017	11/28/2017
Tetrachloroethene	**0.81** J	**1.3**
Dibenzofuran	**0.99** J	**1.2** J
Manganese	**132/127**	**117/115**

MW-19 (21.1-31.1')	8/2/2017	11/28/2017
Tetrachloroethene	**8.4**	**7.2**
Manganese	**8.9/8.2** JB/JB	**1.6/0.90** JB/J

MW-14 (27.8-37.8')	8/1/2017	11/28/2017
Tetrachloroethene	**9.6**	**8.1**

Laboratory Qualifiers
B: blank contamination
J-: estimated value, baised low
J: estimated value
U: undetected; value recorded is the Limit of Detection (LOD)
UJ: undetected; LOD is estimated

Units:
µg/L: micrograms per liter

Color Coding:
bold, black: analyte detected
double underline: exceeds Maximum Contaminant Level (MCL)
bold, red: exceeds United States Environmental Protection Agency (USEPA) Tapwater Regional Screening Level (RSL)

Legend

⊕	Monitoring Well (Installed 2013-2017)
⊕	Monitoring Well (Installed 1990-1991)
⊕	Abandoned Monitoring Well (1990-1991)
⬚	Sump Pit Excavation Area (1994)
☐	Estimated TPH Contamination Plume, 1991
■	Initial Response Excavation (1990)

0 35 70 140
Feet

N

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial; USGS Ortho Imagery 2009 - 1 Meter

Wright-Patterson Air Force Base
A F C E C

PROJECT NO. 111900.0004.115
DESIGNED: E. Madison DATE: 4/14/2020
DRAWN: H.G. Coats DATE: 4/14/2020

VERSAR
Your Needs. Our Mission.

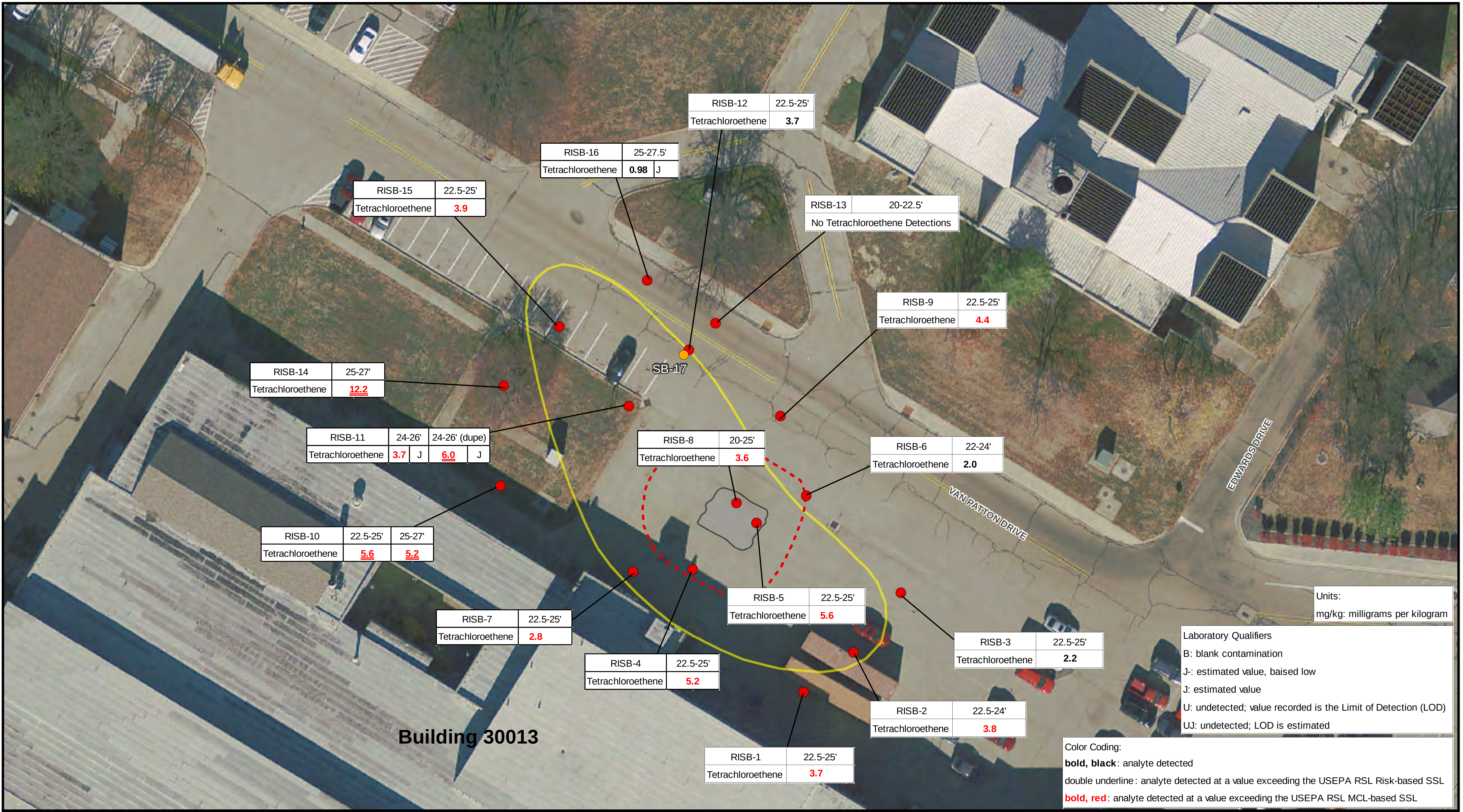
Wright-Patterson Air Force Base
Dayton, Ohio

Detected Chemicals of Potential Concern in Groundwater LF512 Building 30013 Sump Pit Area

FIGURE: 4-3

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig4-3.mxd

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig4-4.mxd



Units:
mg/kg: milligrams per kilogram

Laboratory Qualifiers
B: blank contamination
J-: estimated value, baised low
J: estimated value
U: undetected; value recorded is the Limit of Detection (LOD)
UJ: undetected; LOD is estimated

Color Coding:
bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL

Legend

- ● Soil Boring (Installed August 2017)
- ● BUSTR Soil Boring (2013)
- ▭ Sump Pit Excavation Area (1994)
- ▭ Estimated TPH Contamination Plume, 1991
- ▨ Initial Response Excavation (1990)

N

0 35 70 140 Feet

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial; USGS Ortho Imagery 2009 - 1 Meter

Wright-Patterson Air Force Base
AFCEC

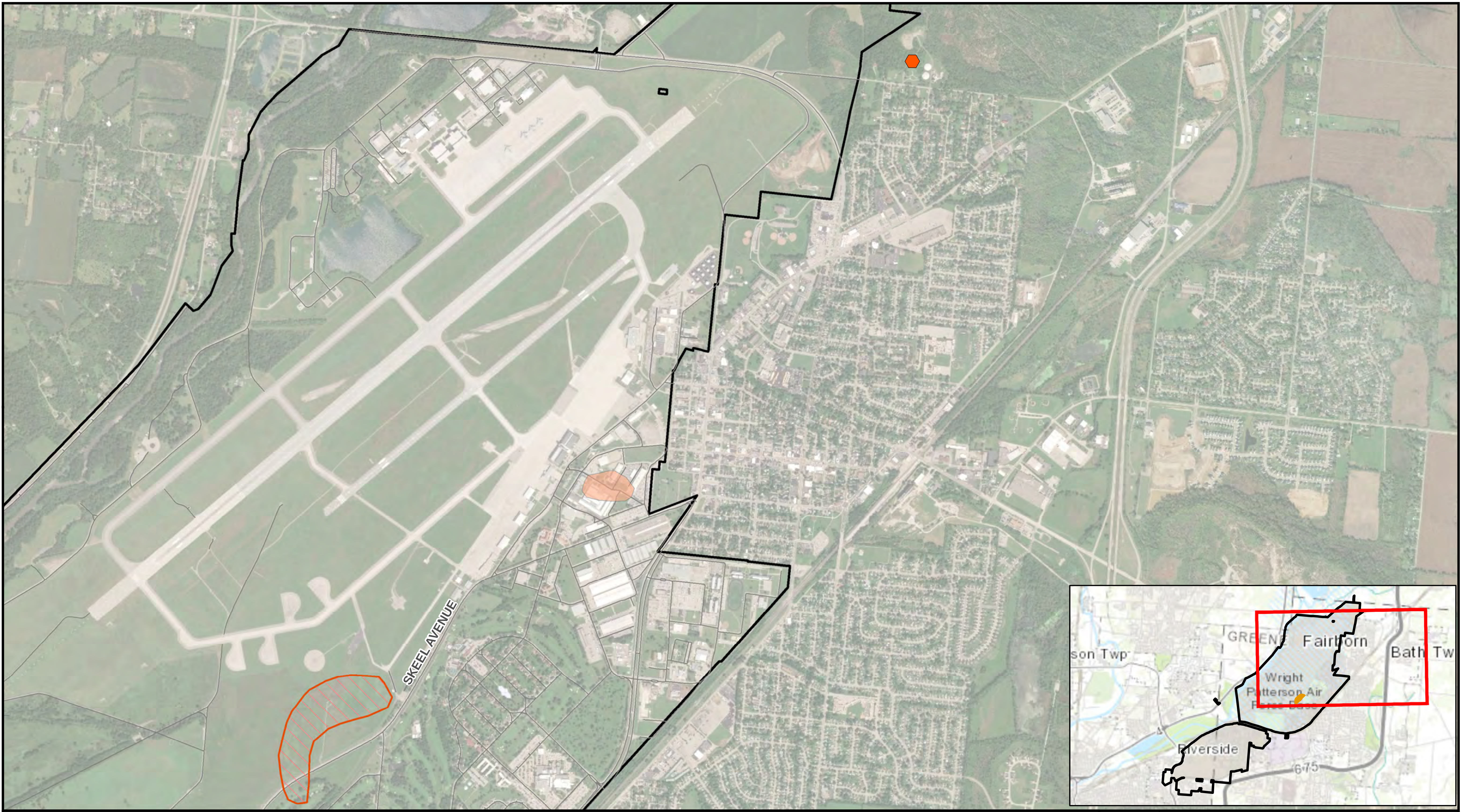
PROJECT NO. 111900.0004.115
DESIGNED: E. Madison DATE: 4/14/2020
DRAWN: H.G. Coats DATE: 4/14/2020

VERSAR
Your Needs. Our Mission.

Wright-Patterson Air Force Base
Dayton, Ohio

Tetrachloroethene in Groundwater Interface Soil
LF512 Building 30013 Sump Pit Area

FIGURE: 4-4



Legend

⬢	Sandhill Park
🟧	LF512 Site Area
▨	Background Sample Location
☐	Installation Boundary
—	Roads

0 950 1,900 3,800 Feet

Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
Aerial Imagery from Wright Patterson AFB
Image Date: 2013

N

Wright-Patterson Air Force Base

A F C E C

PROJECT NO. 111900.0004.115
DESIGNED: **DATE:** 4/14/2020
DRAWN: Hcoats **DATE:** 4/14/2020

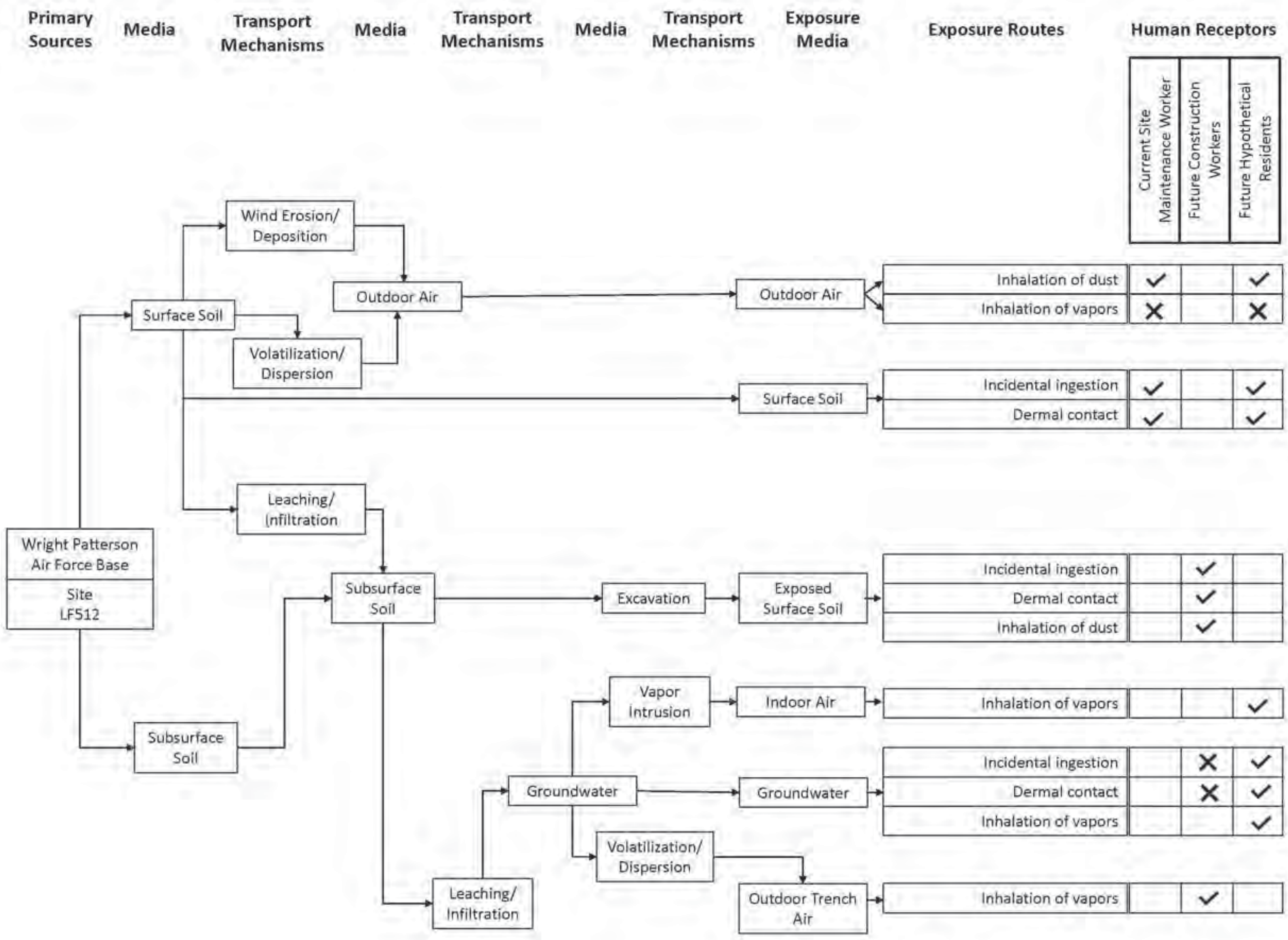
VERSAR
Your Needs. Our Mission.

Wright Patterson Air Force Base
Dayton, OH

Background Locations
LF512 Building 30013 Sump Pit Area

FIGURE: 5-1

K:\111900 AFCEE WERC 09 Contract\FA8903-09-R-9999-R188 - PBR at Great Lakes Bases\GIS\Sites\LF512\Figures\Workplan_Rev\GL_LF512 Figure Updates 03_2018\Updated_Figures_04132020\GL_LF512_WP_SiteMap_Fig5-1.mxd



Exposure Media	Exposure Routes	Current Site Maintenance Worker	Future Construction Workers	Future Hypothetical Residents
Outdoor Air	Inhalation of dust	✓		✓
	Inhalation of vapors	✗		✗
Surface Soil	Incidental ingestion	✓		✓
	Dermal contact	✓		✓
Exposed Surface Soil	Incidental ingestion		✓	
	Dermal contact		✓	
	Inhalation of dust		✓	
Indoor Air	Inhalation of vapors			✓
Groundwater	Incidental ingestion		✗	✓
	Dermal contact		✗	✓
	Inhalation of vapors			✓
Outdoor Trench Air	Inhalation of vapors		✓	

✓ = Potentially complete exposure pathway
✗ = Incomplete exposure pathway

Wright-Patterson Air Force Base
AFCEC

PROJECT NO. 111900.0004.115
DESIGNED: E. Madison DATE: 6/29/2018
DRAWN: E. Madison DATE: 6/29/2018

Wright-Patterson Air Force Base
Dayton, Ohio

Conceptual Site Model
LF512 Building 30013 Sump Pit Area

VERSAR
Your Needs. Our Mission.

FIGURE: 5-2

TABLES

Table 2-1. Well Construction Summary
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Well ID	Year Installed	Drilling Method	Top of [inner] Casing Elevation (feet amsl)	Ground Surface [RIM] Elevation (feet amsl)	Well Diameter (inches)	Well Material	Installed Total Depth (feet bgs)	Screened Interval	Screen Length (feet) [construction type]
MW-7	1990	HSA	829.55	830.32	2	PVC	31.0	21.0 - 31.0	10 [conventional]
MW-12	1991	HSA	829.57	829.99	2	SS	30.0	20.0 - 30.0	10 [conventional]
MW-13	1991	HSA	829.57	829.92	2	SS	30.1	20.1 - 30.1	10 [conventional]
MW-14	2013	DPT	829.77	830.23	2	PVC	38.8	27.8 - 37.8	10 [prepack] with 1-foot sump
MW-15	2013	DPT	829.57	829.88	2	PVC	38.7	27.7 - 37.7	10 [prepack] with 1-foot sump
MW-16	2013	DPT	830.16	830.42	2	PVC	39.1	28.1 - 38.1	10 [prepack] with 1-foot sump
MW-17	2017	DPT	829.59	829.85	2	PVC	30.2	20.2 - 30.2	10 [prepack]
MW-18	2017	DPT	830.19	830.50	2	PVC	29.2	19.2 - 29.2	10 [prepack]
MW-19	2017	DPT	830.02	830.47	2	PVC	31.1	21.1 - 31.1	10 [prepack]

Notes:
amsl: above mean sea level
bgs: below ground surface
btoc: below top of [inner] casing
DPT: direct push technology
HSA: hollow-stem auger
PVC: polyvinyl chloride
SS: stainless steel

Table 2-2. Groundwater Elevation Summary
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Well ID	Top of [inner] Casing Elevation (ft amsl)	*July 2013 BUSTR Investigation*			*August 27, 2015*			*April 2017 Remedial Investigation*			*August 2017 Remedial Investigation*			*November 2017 Remedial Investigation*		
		PID (ppm)	**DTW (feet btoc)**	**GW Elevation (feet amsl)**	**PID (ppm)**	**DTW (feet btoc)**	**GW Elevation (feet amsl)**	**PID (ppm)**	**DTW (feet btoc)**	**GW Elevation (feet amsl)**	**PID (ppm)**	**DTW (feet btoc)**	**GW Elevation (feet amsl)**	**PID (ppm)**	**DTW (feet btoc)**	**GW Elevation (feet amsl)**
MW-7	829.55	4	25.26	804.58	NM	24.11	805.73	0.7	24.60	805.24	0	23.85	805.70	NM	24.39	805.16
MW-12	829.57	0	24.92	805.03	NM	23.79	806.16	0	24.30	805.65	0.3	23.49	806.08	NM	24.14	805.43
MW-13	829.57	233	24.98	804.89	NM	23.89	805.98	0	24.40	805.47	0.3	23.59	805.98	NM	24.22	805.35
MW-14	829.77	5.2	25.17	804.77	NM	24.08	805.86	0	24.59	805.35	0	23.80	805.97	NM	24.05	805.72
MW-15	829.57	10?	25.15	805.23	NM	23.98	806.40	0	24.49	805.89	0.1	23.70	805.87	NM	24.32	805.25
MW-16	830.16	2.8	26.00	804.52	NM	24.80	805.72	0.5	25.31	805.21	0.5	24.50	805.66	NM	25.13	805.03
MW-17	829.59	--	--	--	--	--	--	--	--	--	0.7	23.39	806.20	NM	24.04	805.55
MW-18	830.19	--	--	--	--	--	--	--	--	--	2.7	24.68	805.51	NM	25.28	804.91
MW-19	830.02	--	--	--	--	--	--	--	--	--	0	24.39	805.63	NM	25.02	805.00

Notes:

amsl: above mean sea level

btoc: below top of [inner] casing

GW: groundwater

NM: not measured

PID: photoionization detector

ppm: parts per million

Table 2-3. Field Water Quality Measurements Summary
LF512 Building 30013 Sump Pit Wright-Patterson Air Force Base, Dayton, Ohio

Well ID	Sampling Event	pH	Temperature	Specific Conductivity	Oxidation Reduction Potential	Dissolved Oxygen	Turbidity	Notes
		--	°C	mS/cm	mV	mg/L	NTU	
MW-07	8/1/17	8.18	18.63	0.805	-153	0.00	1.7	slight odor
MW-12	8/1/17	7.73	19.05	0.610	173	6.97	0.0	
MW-13	8/1/17	8.48	18.51	0.790	53	0.96	1.8	
MW-14	8/1/17	7.71	20.59	0.585	138	2.49	0.0	
MW-15	8/1/17	8.39	18.56	0.816	151	2.35	0.3	
MW-16	8/1/17	7.70	17.35	0.605	70	1.69	0.8	
MW-17	8/1/17	7.72	18.46	0.624	171	5.79	19.9	
MW-18	8/1/17	7.49	17.73	0.663	157	2.34	0.0	
MW-19	8/1/17	8.63	17.73	0.833	110	2.06	4.1	
MW-17	8/23/17	7.00	18.38	0.778	102	2.44	0.5	water quality readings for replacement samples
MW-18	8/23/17	7.02	18.39	0.747	113	1.05	0.0	water quality readings for replacement samples
MW-07	11/28/17	7.63	16.55	0.769	-105	0.00	2.9	
MW-12	11/28/17	7.81	16.39	0.801	107	3.14	5	
MW-13	11/28/17	7.81	16.20	0.783	39	2.31	2.9	
MW-14	11/28/17	7.67	16.72	0.758	133	6.63	5.8	
MW-15	11/28/17	7.65	17.06	0.766	80	5.68	1.5	
MW-17	11/28/17	7.76	16.79	0.795	89	3.45	1.8	
MW-19	11/28/17	7.79	16.67	0.816	125	3.15	3.5	
MW-16	11/29/17	7.65	15.03	0.770	256	2.84	9.5	
MW-18	11/29/17	7.83	15.13	0.807	164	3.77	3.0	

Notes:

a: reading abnormal

b: purging parameters collected after recharge

°C: degrees Celsius	mS/cm: millisiemens per centimeter
g/L: grams per liter	mV: millivolts
H_2S: hydrogen sulfide	NA: not applicable
mg/L: milligrams per liter	NTU: Nephelometric Turbidity Unit

Table 2-4. Survey Coordinate Summary
LF512 Building 30013 Sump Pit, Wright-Patterson Air Force Base, Dayton, Ohio

Location	Northing Coordinate[1]	Easting Coordinate[1]	Ground Surface Elevation[2] (feet amsl)	Top of Casing Elevation[2] (feet amsl)
SB-1	666500.50	1537596.22	830.58	--
SB-2	666516.01	1537615.61	830.30	--
SB-3	666539.22	1537634.11	829.88	--
SB-4	666548.38	1537552.99	829.94	--
SB-5	666566.48	1537577.92	829.71	--
SB-6	666577.11	1537597.25	829.88	--
SB-7	666547.40	1537529.76	830.27	--
SB-8	666570.11	1537577.36	829.60	--
SB-9	666608.06	1537587.22	829.97	--
SB-10	666580.97	1537478.10	831.12	--
SB-11	666611.90	1537528.18	829.81	--
SB-12	666633.83	1537551.47	829.99	--
SB-13	666644.27	1537561.86	829.71	--
SB-14	666619.84	1537479.42	830.83	--
SB-15	666643.00	1537500.96	830.13	--
SB-16	666660.90	1537535.28	829.84	--
LF512_MW-7*	666558.99	1537532.95	829.55	830.32
LF512_MW-12*	666530.74	1537639.77	829.57	829.99
LF512_MW-13*	666630.88	1537590.41	829.57	829.92
LF512_MW-14*	666526.39	1537609.68	829.77	830.23
LF512_MW-15*	666576.73	1537565.34	829.57	829.88
LF512_MW-16*	666623.42	1537509.25	830.16	830.42
LF512_MW-17	666580.52	1537667.33	829.59	829.85
LF512_MW-18	666659.82	1537483.73	830.19	830.50
LF512_MW-19	666525.82	1537560.80	830.02	830.47

Notes:
Survey conducted by Barge, Waggoner, Sumner & Cannon, Inc. in August 2017.
1: North American Datum 1983 (NAD83) State Plane, Ohio South
2: North American Vertical Datum 1988 (NAVD88)
*Existing Well Prior to 2017 Remedial Investigation
--: not applicable
amsl: above mean sea level

Table 2-5. Sample and Method Summary
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Sample Type	Analyte List *(see Methods and Matrix)*	Soil Investigation	Groundwater Investigation	
		April-May 2017	August 2017	November 2017
Normal	VOC, SVOC, PAH, TPH, Metals	64	9	9
Normal	Pest, Herb, PCB	2	0	0
Field Duplicate	VOC, SVOC, PAH, TPH, Metals	8	1	1
Field Duplicate	Pest, Herb, PCB	1	0	0
Trip Blank	VOC, GRO	7	2	2
Ambient Blank	VOC, SVOC, PAH, TPH, Metals	7	3	2
Ambient Blank	Pest, Herb, PCB	1	0	0
Equipment Blank	VOC, SVOC, PAH, TPH, Metals	7	0	0
Equipment Blank	Pest, Herb, PCB	1	0	0
Matrix Spike/Matrix Spike Duplicate	VOC, SVOC, PAH, TPH, Metals	4	1	1
Matrix Spike/Matrix Spike Duplicate	Pest, Herb, PCB	1	0	0

Methods and Matrix	Soil	Groundwater
Volatile Organic Compounds (VOCs)	SW846 8260C	SW846 8260C
Semi-volatile Organic Compounds (SVOCs)	SW846 8270D SW846 3546	SW846 8270D SW846 3510C
Polynuclear Aromatic Hydrocarbons (PAHs)	*Not Applicable*	SW846 8270D by SIM SW846 3510C
Gasoline Range Organics (GRO)	SW846 8015C	SW846 8015C
Total Petroleum Hydrocarbons	SW846 8015C SW846 3546	SW846 8015C SW846 3510C
Metals (except Mercury)	SW846 6010C SW846 3050B	SW846 6010C or 6020A SW846 3010A
Mercury	SW846 7471B SW846 7471B	SW846 7470A SW846 7470A
Pesticides (Pest)	SW846 8081B SW846 3546	SW846 8081B SW846 3510C
Herbicides (Herb)	SW846 8151 SW846 8151/3546	SW846 8151 SW846 3510C
Polychlorinated Biphenyls (PCBs)	SW846 8082A SW846 3546	SW846 8082A SW846 3510C

Table 2-6. Field Quality Control Sample Summary - Trip Blanks
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Location ID:	Units	Project Action Limits[1]		Trip Blank			Trip Blank			Trip Blank			Trip Blank			Trip Blank			Trip Blank			Trip Blank			Trip Blank			Trip Blank			Trip Blank			Trip Blank		
Field Sample ID:		EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)	EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)	TB_04251701			TB_04261701			TB_04271701			TB_04281701			TB_05081701			TB_05091701			TB_05101701			TB01081701			TB02081701			TB11281701			TB11291701		
Sampled Interval (feet)				NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA		
Laboratory[2] Sample ID:				*JC41973-1*			*JC41973-26*			*JC41973-34*			*JC42293-1*			*JC42885-1*			*JC42953-1*			*JC43060-1*			*JC48106-1*			*JC48106-10*			*JC56189-1*			*JC56189-10*		
Date Sampled:				4/25/2017			4/27/2017			4/27/2017			4/28/2017			5/8/2017			5/9/2017			5/10/2017			8/1/2017			8/2/2017			11/28/2017			11/29/2017		
Result and Qualifiers:				Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Volatile Organic Compounds (SW846 8260C)																																				
Acetone	µg/L	14,000	-	5.0	U	UJ	5.0	U	UJ	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	UJ	5.0	U	UJ
Benzene	µg/L	0.46	5.0	0.25	U	UJ	0.25	U	UJ	0.25	U		0.25	U		0.25	U		0.25	U		0.25	U		0.25	U		0.25	U		0.25	U		0.25	U	
Bromochloromethane	µg/L	83	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Bromodichloromethane	µg/L	0.13	80	0.75	U	UJ	0.75	U	UJ	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
Bromoform	µg/L	3.3	80	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Bromomethane	µg/L	7.5	-	1.0	U	UJ	1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.4	U		1.4	U		1.4	U		1.4	U	
2-Butanone (MEK)	µg/L	5,600	-	5.0	U	UJ	5.0	U	UJ	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Carbon disulfide	µg/L	810	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		1.0	U		1.0	U	
Carbon tetrachloride	µg/L	0.46	5.0	0.75	U	UJ	0.75	U	UJ	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
Chlorobenzene	µg/L	78	100	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Chloroethane	µg/L	21,000	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.59	U		0.59	U		0.59	U		0.59	U	
Chloroform	µg/L	0.22	80	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Chloromethane	µg/L	190	-	1.0	U	UJ	1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Cyclohexane	µg/L	13,000	-	1.0	U	UJ	1.0	U	UJ	1.0	U		1.0	U		1.0	U	UJ	1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
1,2-Dibromo-3-chloropropane	µg/L	0.00033	0.20	1.0	U	UJ	1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Dibromochloromethane	µg/L	0.87	80	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dibromoethane	µg/L	0.0075	0.050	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dichlorobenzene	µg/L	300	600	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,3-Dichlorobenzene	µg/L	-	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,4-Dichlorobenzene	µg/L	0.48	75	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Dichlorodifluoromethane	µg/L	200	-	1.0	U	UJ	1.0	U	UJ	1.0	U	UJ	1.0	U	UJ	1.0	U		1.0	U		1.0	U	UJ	1.9	U		1.9	U		1.9	U		1.9	U	
1,1-Dichloroethane	µg/L	2.8	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dichloroethane	µg/L	0.17	5.0	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,1-Dichloroethene	µg/L	280	7.0	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
cis-1,2-Dichloroethene	µg/L	36	70	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
trans-1,2-Dichloroethene	µg/L	360	100	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dichloropropane	µg/L	0.14	5.0	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
cis-1,3-Dichloropropene	µg/L	-	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
trans-1,3-Dichloropropene	µg/L	-	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Ethylbenzene	µg/L	1.5	700	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Freon 113	µg/L	10,000	-	2.5	U	UJ	2.5	U	UJ	2.5	U		2.5	U		2.5	U	UJ	2.5	U	UJ	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U	
2-Hexanone	µg/L	38	-	2.5	U	UJ	2.5	U	UJ	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		3.5	U		3.5	U		3.5	U		3.5	U	
Isopropylbenzene	µg/L	450	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Methyl Acetate	µg/L	20,000	-	2.5	U	UJ	2.5	U	UJ	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		3.5	U		3.5	U		3.5	U		3.5	U	
Methylcyclohexane	µg/L	-	-	2.0	U	UJ	2.0	U	UJ	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl Tert Butyl Ether	µg/L	14	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
4-Methyl-2-pentanone(MIBK)	µg/L	6,300	-	2.5	U	UJ	2.5	U	UJ	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		3.5	U		3.5	U		3.5	U		3.5	U	
Methylene chloride	µg/L	11	5.0	1.0	U	UJ	1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Styrene	µg/L	1,200	100	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,1,2,2-Tetrachloroethane	µg/L	0.076	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Tetrachloroethene	µg/L	11	5.0	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Toluene	µg/L	1,100	1,000	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2,3-Trichlorobenzene	µg/L	7.0	-	0.75	U	UJ	0.75	U	UJ	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
1,2,4-Trichlorobenzene	µg/L	1.2	70	0.75	U	UJ	0.75	U	UJ	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
1,1,1-Trichloroethane	µg/L	8,000	200	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,1,2-Trichloroethane	µg/L	0.28	5.0	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Trichloroethene	µg/L	0.49	5.0	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Trichlorofluoromethane	µg/L	5,200	-	1.0	U	UJ	1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Vinyl chloride	µg/L	0.019	2.0	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.62	U		0.62	U		0.62	U		0.62	U	
m,p-Xylene	µg/L	-	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
o-Xylene	µg/L	190	-	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Xylene (total)	µg/L	190	10,000	0.50	U	UJ	0.50	U	UJ	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Total Petroleum Hydrocarbons (SW846 8015C)																																				
TPH-GRO (C6-C12)	µg/L	-	-	0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		-			-		

Notes:
GRO: gasoline-range organic
MCL: maximum contaminant level
NA: not applicable
TPH: total petroleum hydrocarbons

bold, black: analyte detected
-: not applicable, no value available, or not sampled

Laboratory (Q) and Data Review Qualifiers (V):
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey

Table 2-7a. Field Quality Control Sample Summary - Ambient Blanks: Volatile Organic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Location ID:	Units	**Project Action Limits[1]**		Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank		
Field Sample ID:		**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**	AB_04251701			AB_04261701			AB_04271701			AB_04281701			AB_05081701			AB_05091701			AB_05101701		
Sampled Interval (feet)				NA			NA			NA			NA			NA			NA			NA		
Laboratory[2] Sample ID:				*JC41973-2*			*JC41973-27*			*JC41973-35*			*JC42293-11*			*JC42885-2*			*JC42953-2*			*JC43060-2*		
Date Sampled:				4/25/2017			4/26/2017			4/27/2017			4/28/2017			5/8/2017			5/9/2017			5/10/2017		
Result and Qualifiers:				Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Volatile Organic Compounds (SW846 8260C)																								
Acetone	µg/L	14,000	-	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Benzene	µg/L	0.46	5.0	0.25	U		0.25	U		0.25	U		0.25	U		0.25	U		0.25	U		0.25	U	
Bromochloromethane	µg/L	83	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Bromodichloromethane	µg/L	0.13	80	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
Bromoform	µg/L	3.3	80	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Bromomethane	µg/L	7.5	-	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
2-Butanone (MEK)	µg/L	5,600	-	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Carbon disulfide	µg/L	810	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Carbon tetrachloride	µg/L	0.46	5.0	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
Chlorobenzene	µg/L	78	100	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Chloroethane	µg/L	21,000	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Chloroform	µg/L	0.22	80	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Chloromethane	µg/L	190	-	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Cyclohexane	µg/L	13,000	-	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	UJ	1.0	U	UJ	1.0	U	
1,2-Dibromo-3-chloropropane	µg/L	0.00033	0.20	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Dibromochloromethane	µg/L	0.87	80	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dibromoethane	µg/L	0.0075	0.050	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dichlorobenzene	µg/L	300	600	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,3-Dichlorobenzene	µg/L	-	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,4-Dichlorobenzene	µg/L	0.48	75	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Dichlorodifluoromethane	µg/L	200	-	1.0	U	UJ	1.0	U	UJ	1.0	U	UJ	1.0	U	UJ	1.0	U		1.0	U		1.0	U	UJ
1,1-Dichloroethane	µg/L	2.8	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dichloroethane	µg/L	0.17	5.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,1-Dichloroethene	µg/L	280	7.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
cis-1,2-Dichloroethene	µg/L	36	70	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
trans-1,2-Dichloroethene	µg/L	360	100	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dichloropropane	µg/L	0.14	5.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
cis-1,3-Dichloropropene	µg/L	-	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
trans-1,3-Dichloropropene	µg/L	-	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Ethylbenzene	µg/L	1.5	700	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Freon 113	µg/L	10,000	-	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U	UJ	2.5	U	UJ	2.5	U	
2-Hexanone	µg/L	38	-	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U	
Isopropylbenzene	µg/L	450	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Methyl Acetate	µg/L	20,000	-	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U	
Methylcyclohexane	µg/L	-	-	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl Tert Butyl Ether	µg/L	14	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
4-Methyl-2-pentanone(MIBK)	µg/L	6,300	-	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U	
Methylene chloride	µg/L	11	5.0	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Styrene	µg/L	1,200	100	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,1,2,2-Tetrachloroethane	µg/L	0.076	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Tetrachloroethene	µg/L	11	5.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Toluene	µg/L	1,100	1,000	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2,3-Trichlorobenzene	µg/L	7.0	-	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
1,2,4-Trichlorobenzene	µg/L	1.2	70	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
1,1,1-Trichloroethane	µg/L	8,000	200	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,1,2-Trichloroethane	µg/L	0.28	5.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Trichloroethene	µg/L	0.49	5.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Trichlorofluoromethane	µg/L	5,200	-	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Vinyl chloride	µg/L	0.019	2.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
m,p-Xylene	µg/L	-	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
o-Xylene	µg/L	190	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Xylene (total)	µg/L	190	10,000	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	

Location ID:	Units	Ambient Blank			Ambient Blank (filtered)			Ambient Blank			Ambient Blank (filtered)			Ambient Blank			Ambient Blank			Ambient Blank		
Field Sample ID:		AB01081701			AB01081701			AB02081701			AB02081701			AB23081701			AB11281701			AB11291701		
Sampled Interval (feet)		NA			NA			NA			NA			NA			NA			NA		
Laboratory[2] Sample ID:		*JC48106-2*			*JC48106-2F*			*JC48106-11*			*JC48106-11F*			*JC48106-15*			*JC56189-2*			*JC56189-11*		
Date Sampled:		8/1/2017			8/1/2017			8/2/2017			8/2/2017			8/23/2017			11/28/2017			11/29/2017		
Result and Qualifiers:		Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Volatile Organic Compounds (SW846 8260C)																						
Acetone	µg/L	5.0	U		-			5.0	U		-			-			5.0	U	UJ	5.0	U	UJ
Benzene	µg/L	0.25	U		-			0.25	U		-			-			0.25	U		0.25	U	
Bromochloromethane	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Bromodichloromethane	µg/L	0.75	U		-			0.75	U		-			-			0.75	U		0.75	U	
Bromoform	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Bromomethane	µg/L	1.4	U		-			1.4	U		-			-			1.4	U		1.4	U	
2-Butanone (MEK)	µg/L	5.0	U		-			5.0	U		-			-			5.0	U		5.0	U	
Carbon disulfide	µg/L	0.50	U		-			0.50	U		-			-			1.0	U		1.0	U	
Carbon tetrachloride	µg/L	0.75	U		-			0.75	U		-			-			0.75	U		0.75	U	
Chlorobenzene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Chloroethane	µg/L	0.59	U		-			0.59	U		-			-			0.59	U		0.59	U	
Chloroform	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Chloromethane	µg/L	1.0	U		-			1.0	U		-			-			1.0	U		1.0	U	
Cyclohexane	µg/L	1.0	U		-			1.0	U		-			-			1.0	U		1.0	U	
1,2-Dibromo-3-chloropropane	µg/L	1.0	U		-			1.0	U		-			-			1.0	U		1.0	U	
Dibromochloromethane	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
1,2-Dibromoethane	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
1,2-Dichlorobenzene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
1,3-Dichlorobenzene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
1,4-Dichlorobenzene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Dichlorodifluoromethane	µg/L	1.9	U		-			1.9	U		-			-			1.9	U		1.9	U	
1,1-Dichloroethane	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
1,2-Dichloroethane	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
1,1-Dichloroethene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
cis-1,2-Dichloroethene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
trans-1,2-Dichloroethene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
1,2-Dichloropropane	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
cis-1,3-Dichloropropene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
trans-1,3-Dichloropropene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Ethylbenzene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Freon 113	µg/L	2.5	U		-			2.5	U		-			-			2.5	U		2.5	U	
2-Hexanone	µg/L	3.5	U		-			3.5	U		-			-			3.5	U		3.5	U	
Isopropylbenzene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Methyl Acetate	µg/L	3.5	U		-			3.5	U		-			-			3.5	U		3.5	U	
Methylcyclohexane	µg/L	2.0	U		-			2.0	U		-			-			2.0	U		2.0	U	
Methyl Tert Butyl Ether	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
4-Methyl-2-pentanone(MIBK)	µg/L	3.5	U		-			3.5	U		-			-			3.5	U		3.5	U	
Methylene chloride	µg/L	1.0	U		-			1.0	U		-			-			1.0	U		1.0	U	
Styrene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
1,1,2,2-Tetrachloroethane	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Tetrachloroethene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Toluene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
1,2,3-Trichlorobenzene	µg/L	0.75	U		-			0.75	U		-			-			0.75	U		0.75	U	
1,2,4-Trichlorobenzene	µg/L	0.75	U		-			0.75	U		-			-			0.75	U		0.75	U	
1,1,1-Trichloroethane	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
1,1,2-Trichloroethane	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Trichloroethene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Trichlorofluoromethane	µg/L	1.0	U		-			1.0	U		-			-			1.0	U		1.0	U	
Vinyl chloride	µg/L	0.62	U		-			0.62	U		-			-			0.62	U		0.62	U	
m,p-Xylene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
o-Xylene	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	
Xylene (total)	µg/L	0.50	U		-			0.50	U		-			-			0.50	U		0.50	U	

Notes:

MCL: maximum contaminant level
NA: not applicable

bold, black: analyte detected
-: not applicable, no value available, or not sampled

Laboratory (Q) and Data Review Qualifiers (V):
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey

Table 2-7b. Field Quality Control Sample Summary - Ambient Blanks: Semi-volatile Organic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Location ID:	Units	Project Action Limits[1]		Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank (filtered)			Ambient Blank			Ambient Blank (filtered)			Ambient Blank			Ambient Blank			Ambient Blank		
Field Sample ID:		**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**	AB_04251701			AB_04261701			AB_04271701			AB_04281701			AB_05081701			AB_05091701			AB_05101701			AB01081701			AB01081701			AB02081701			AB02081701			AB23081701			AB11281701			AB11291701		
Sampled Interval (feet)				NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA		
Laboratory[2] Sample ID:				*JC41973-2*			*JC41973-27*			*JC41973-35*			*JC42293-11*			*JC42885-2*			*JC42953-2*			*JC43060-2*			*JC48106-2*			*JC48106-2F*			*JC48106-11*			*JC48106-11F*			*JC48106-15*			*JC56189-2*			*JC56189-11*		
Date Sampled:				4/25/2017			4/26/2017			4/27/2017			4/28/2017			5/8/2017			5/9/2017			5/10/2017			8/1/2017			8/1/2017			8/2/2017			8/2/2017			8/23/2017			11/28/2017			11/29/2017		
Result and Qualifiers:				Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Semi-volatile Organic Compounds (SW846 8270D)																																													
2-Chlorophenol	µg/L	91	-	2.5	U	UJ	2.5	U		2.5	U	UJ	2.6	U		2.5	U		2.5	U		2.6	U		2.5	U		-			2.5	U		-			2.5	U		2.5	U		2.5	U	
4-Chloro-3-methyl phenol	µg/L	1,400	-	2.5	U	UJ	2.5	U		2.5	U	UJ	2.6	U		2.5	U		2.5	U		2.6	U		2.5	U		-			2.5	U		-			2.5	U		2.5	U		2.5	U	
2,4-Dichlorophenol	µg/L	46	-	2.0	U	UJ	2.0	U		2.0	U	UJ	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		-			2.0	U		-			2.0	U		2.0	U		2.0	U	
2,4-Dimethylphenol	µg/L	360	-	2.5	U	UJ	2.5	U		2.5	U	UJ	2.6	U		2.5	U		2.5	U		2.6	U		2.5	U		-			2.5	U		-			2.5	U		2.5	U		2.5	U	
2,4-Dinitrophenol	µg/L	39	-	5.0	U	UJ	4.9	U		5.0	U	UJ	5.1	U		5.0	U		5.0	U		5.1	U		5.0	U		-			5.1	U		-			5.0	U		5.0	U		5.0	U	
4,6-Dinitro-o-cresol	µg/L	1.5	-	2.5	U	UJ	2.5	U		2.5	U	UJ	2.6	U		2.5	U		2.5	U		2.6	U		2.5	U		-			2.5	U		-			2.5	U		2.5	U		2.5	U	
2-Methylphenol	µg/L	930	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
3&4-Methylphenol	µg/L	-	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
2-Nitrophenol	µg/L	-	-	2.5	U	UJ	2.5	U		2.5	U	UJ	2.6	U		2.5	U		2.5	U		2.6	U		2.5	U		-			2.5	U		-			2.5	U		2.5	U		2.5	U	
4-Nitrophenol	µg/L	-	-	2.5	U	UJ	2.5	U	UJ	2.5	U	UJ	2.6	U		2.5	U		2.5	U		2.6	U		2.5	U		-			2.5	U		-			2.5	U		2.5	U		2.5	U	
Pentachlorophenol	µg/L	0.041	1.0	2.0	U	UJ	2.0	U		2.0	U	UJ	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		-			2.0	U		-			2.0	U		2.0	U		2.0	U	
Phenol	µg/L	5,800	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
2,3,4,6-Tetrachlorophenol	µg/L	240	-	2.5	U	UJ	2.5	U		2.5	U	UJ	2.6	U		2.5	U		2.5	U		2.6	U		2.5	U		-			2.5	U		-			2.5	U		2.5	U		2.5	U	
2,4,5-Trichlorophenol	µg/L	1,200	-	2.5	U	UJ	2.5	U		2.5	U	UJ	2.6	U		2.5	U		2.5	U		2.6	U		2.5	U		-			2.5	U		-			2.5	U		2.5	U		2.5	U	
2,4,6-Trichlorophenol	µg/L	4.1	-	2.5	U	UJ	2.5	U		2.5	U	UJ	2.6	U		2.5	U		2.5	U		2.6	U		2.5	U		-			2.5	U		-			2.5	U		2.5	U		2.5	U	
Acetophenone	µg/L	1,900	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
Atrazine	µg/L	0.30	3.0	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
Benzaldehyde	µg/L	19	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
4-Bromophenyl phenyl ether	µg/L	-	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
Butyl benzyl phthalate	µg/L	16	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
1,1'-Biphenyl	µg/L	0.83	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
2-Chloronaphthalene	µg/L	750	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
4-Chloroaniline	µg/L	0.37	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
Carbazole	µg/L	-	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
Caprolactam	µg/L	9,900	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
bis(2-Chloroethoxy)methane	µg/L	59	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
bis(2-Chloroethyl)ether	µg/L	0.014	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
bis(2-Chloroisopropyl)ether	µg/L	710	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
4-Chlorophenyl phenyl ether	µg/L	-	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
2,4-Dinitrotoluene	µg/L	0.24	-	0.75	U	UJ	0.74	U		0.75	U	UJ	0.77	U		0.75	U		0.75	U		0.77	U		0.75	U		-			0.76	U		-			0.75	U		0.75	U		0.75	U	
2,6-Dinitrotoluene	µg/L	0.049	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
3,3'-Dichlorobenzidine	µg/L	0.13	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
1,4-Dioxane	µg/L	0.46	-	0.75	U	UJ	0.74	U		0.75	U	UJ	0.77	U		0.75	U		0.75	U		0.77	U		0.75	U		-			0.76	U		-			0.75	U		0.75	U		0.75	U	
Dibenzofuran	µg/L	7.9	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
Di-n-butyl phthalate	µg/L	900	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
Di-n-octyl phthalate	µg/L	200	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U	UJ	0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
Diethyl phthalate	µg/L	15,000	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
Dimethyl phthalate	µg/L	-	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
bis(2-Ethylhexyl)phthalate	µg/L	5.6	6.0	1.8	U	UJ	1.7	U		1.8	U	UJ	1.8	U		1.8	U		1.8	U		1.8	U		1.8	U		-			1.8	U		-			1.8	U		1.8	U		1.8	U	
Hexachlorobenzene	µg/L	0.0098	1.0	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
Hexachlorobutadiene	µg/L	0.14	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
Hexachlorocyclopentadiene	µg/L	0.41	50	5.0	U	UJ	4.9	U		5.0	U	UJ	5.1	U		5.0	U		5.0	U		5.1	U		5.0	U		-			5.1	U		-			5.0	U		5.0	U		5.0	U	UJ
Hexachloroethane	µg/L	0.33	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
Isophorone	µg/L	78	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
2-Methylnaphthalene	µg/L	36	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
2-Nitroaniline	µg/L	190	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
3-Nitroaniline	µg/L	-	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
4-Nitroaniline	µg/L	3.8	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
Nitrobenzene	µg/L	0.14	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
N-Nitroso-di-n-propylamine	µg/L	0.011	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	
N-Nitrosodiphenylamine	µg/L	12	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.50	U		-			0.51	U		-			0.50	U		0.50	U		0.50	U	
1,2,4,5-Tetrachlorobenzene	µg/L	1.7	-	1.0	U	UJ	0.98	U		1.0	U	UJ	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		-			1.0	U		1.0	U		1.0	U	

Notes:

MCL: maximum contaminant level

NA: not applicable

bold, black: analyte detected

-: not applicable, no value available, or not sampled

Laboratory (Q) and Data Review Qualifiers (V):

U: undetected; value recorded is the limit of detection (LOD)

UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.

2: Samples analyzed by SGS of Dayton, New Jersey

Table 2-7c. Field Quality Control Sample Summary - Ambient Blanks: Polynuclear Aromatic Hydrocarbons and Total Petroleum Hydrocarbons
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Location ID:	Units	**Project Action Limits[1]**		Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank (filtered)			Ambient Blank			Ambient Blank (filtered)			Ambient Blank			Ambient Blank			Ambient Blank		
Field Sample ID:		**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**	AB_04251701			AB_04261701			AB_04271701			AB_04281701			AB_05081701			AB_05091701			AB_05101701			AB01081701			AB01081701			AB02081701			AB02081701			AB23081701			AB11281701			AB11291701		
Sampled Interval (feet)				NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA		
Laboratory[2] Sample ID:				*JC41973-2*			*JC41973-27*			*JC41973-35*			*JC42293-11*			*JC42885-2*			*JC42953-2*			*JC43060-2*			*JC48106-2*			*JC48106-2F*			*JC48106-11*			*JC48106-11F*			*JC48106-15*			*JC56189-2*			*JC56189-11*		
Date Sampled:				4/25/2017			4/26/2017			4/27/2017			4/28/2017			5/8/2017			5/9/2017			5/10/2017			8/1/2017			8/1/2017			8/2/2017			8/2/2017			8/23/2017			11/28/2017			11/29/2017		
Result and Qualifiers:				Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Polycyclic Aromatic Hydrocarbons (SW846 8270D)																																													
Acenaphthene	µg/L	530	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U		-			0.050	U		-			0.050	U		0.051	U		0.050	U	
Acenaphthylene	µg/L	-	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.059	U		-			0.055	U		-			0.055	U		0.056	U		0.055	U	
Anthracene	µg/L	1,800	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.059	U	UJ	-			0.055	U	UJ	-			0.055	U	UJ	0.056	U		0.055	U	
Benzo(a)anthracene	µg/L	0.030	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U	UJ	-			0.050	U	UJ	-			0.050	U		0.051	U		0.050	U	
Benzo(a)pyrene	µg/L	0.025	0.20	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U	UJ	-			0.050	U	UJ	-			0.050	U		0.051	U		0.050	U	
Benzo(b)fluoranthene	µg/L	0.25	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U		-			0.050	U		-			0.050	U		0.051	U		0.050	U	
Benzo(g,h,i)perylene	µg/L	-	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U		-			0.050	U		-			0.050	U		0.051	U		0.050	U	
Benzo(k)fluoranthene	µg/L	2.5	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U	UJ	-			0.050	U	UJ	-			0.050	U		0.051	U		0.050	U	
Chrysene	µg/L	25	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U		-			0.050	U		-			0.050	U		0.051	U		0.050	U	
Dibenzo(a,h)anthracene	µg/L	0.025	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U		-			0.050	U		-			0.050	U	UJ	0.051	U		0.050	U	
Fluoranthene	µg/L	800	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U	UJ	-			0.050	U	UJ	-			0.050	U		0.051	U		0.050	U	
Fluorene	µg/L	290	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U		-			0.050	U		-			0.050	U		0.051	U		0.050	U	
Indeno(1,2,3-cd)pyrene	µg/L	0.25	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U	UJ	-			0.050	U	UJ	-			0.050	U		0.051	U		0.050	U	
Naphthalene	µg/L	0.17	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U	UJ	-			0.050	U	UJ	-			0.050	U		0.051	U		0.050	U	
Phenanthrene	µg/L	-	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.053	U	UJ	-			0.050	U	UJ	-			0.050	U		0.051	U		0.050	U	
Pyrene	µg/L	120	-	0.50	U	UJ	0.49	U		0.50	U	UJ	0.51	U		0.50	U		0.50	U		0.51	U		0.027	U		-			0.025	U		-			0.025	U		0.026	U		0.025	U	
Total Petroleum Hydrocarbons (SW846 8015C)																																													
TPH-GRO (C6-C12)	mg/L	-	-	0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		-			0.10	U		-			-			0.10	U		0.10	U	UJ
TPH-DRO (C10-C20)	mg/L	-	-	0.025	U	UJ	0.025	U	*R*	0.026	U	UJ	0.025	U		0.025	U	UJ	0.024	U		0.083	U		0.026	U		-			0.025	U	UJ	-			-			0.083	U		0.025	U	
TPH-ORO (C20-C34)	mg/L	-	-	0.025	U	UJ	0.025	U	*R*	0.026	U	UJ	0.025	U		0.025	U	UJ	0.024	U		0.083	U		0.026	U		-			0.025	U	UJ	-			-			0.083	U		0.025	U	
TPH-ORO (>C28-C40)	mg/L	-	-	0.025	U	UJ	0.025	U	*R*	-			0.025	U		0.025	U	UJ	0.024	U		0.083	U		0.026	U		-			0.025	U	UJ	-			-			0.083	U		0.025	U	
Total OH TPH (C10-C34)	mg/L	-	-	0.025	U	UJ	0.025	U	*R*	0.026	U	UJ	0.025	U		0.025	U	UJ	0.024	U		0.083	U		0.026	U		-			0.025	U	UJ	-			-			0.083	U		0.025	U	

Notes:
DRO: diesel-range organic
GRO: gasoline-range organic
MCL: maximum contaminant level
NA: not applicable
ORO: oil-range organic
TPH: total petroleum hydrocarbon

bold, black: analyte detected
-: not applicable, no value available, or not sampled

Laboratory (Q) and Data Review Qualifiers (V):
R : data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey

Table 2-7d. Field Quality Control Sample Summary - Ambient Blanks: Inorganic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Location ID:	Units	**Project Action Limits**[1]		Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank			Ambient Blank (filtered)			Ambient Blank			Ambient Blank (filtered)			Ambient Blank			Ambient Blank			Ambient Blank		
Field Sample ID:		**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**	AB_04251701			AB_04261701			AB_04271701			AB_04281701			AB_05081701			AB_05091701			AB_05101701			AB01081701			AB01081701			AB02081701			AB02081701			AB23081701			AB11281701			AB11291701		
Sampled Interval (feet)				NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA		
Laboratory[2] *Sample ID:*				*JC41973-2*			*JC41973-27*			*JC41973-35*			*JC42293-11*			*JC42885-2*			*JC42953-2*			*JC43060-2*			*JC48106-2*			*JC48106-2F*			*JC48106-11*			*JC48106-11F*			*JC48106-15*			*JC56189-2*			*JC56189-11*		
Date Sampled:				4/25/2017			4/26/2017			4/27/2017			4/28/2017			5/8/2017			5/9/2017			5/10/2017			8/1/2017			8/1/2017			8/2/2017			8/2/2017			8/23/2017			11/28/2017			11/29/2017		
Result and Qualifiers:				Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Metals (6010C, 7470A)																																													
Aluminum	µg/L	20,000	-	100	U		100	U		100	U		100	U		100	U		100	U		100	U		100	U		100	U		100	U		100	U		-			100	U		100	U	
Antimony	µg/L	7.8	6.0	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		-			5.0	U		5.0	U	
Arsenic	µg/L	0.052	10	3.0	U		3.0	U		3.0	U		3.0	U		3.0	U		3.0	U		3.0	U		2.0	U		2.0	U		2.0	U		2.0	U		-			2.0	U		2.0	U	
Barium	µg/L	3,800	2,000	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U		**1.7**	J		**1.5**	J		-			10	U		10	U	
Beryllium	µg/L	25	4.0	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		**0.059**	J		**0.055**	J		**0.026**	J		**0.040**	J		-			0.50	U		0.50	U	
Cadmium	µg/L	9.2	5.0	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		4.0	U		4.0	U		4.0	U		4.0	U		-			4.0	U		4.0	U	
Calcium	µg/L	-	-	200	U		200	U		200	U		200	U		200	U		200	U		200	U		**239**	J		**260**	J		**262**	J		**241**	J		-			**348**	J		**342**	J	
Chromium	µg/L	-	100	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		-			5.0	U		5.0	U	
Cobalt	µg/L	6.0	-	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		**1.0**	J		-			2.0	U		2.0	U	
Copper	µg/L	800	1,300	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		8.0	U		8.0	U		8.0	U		8.0	U		-			8.0	U		8.0	U	
Iron	µg/L	14,000	-	50	U		50	U		50	U		50	U		50	U		50	U		50	U		50	U		50	U		50	U		50	U		-			50	U		50	U	
Lead	µg/L	15	15	3.0	U		3.0	U		3.0	U		3.0	U		3.0	U		3.0	U		3.0	U		2.0	U		2.0	U		2.0	U		2.0	U		-			2.0	U		2.0	U	
Magnesium	µg/L	-	-	100	U		100	U		100	U		100	U		100	U		100	U		100	U		100	U		100	U		100	U		100	U		-			**65.4**	J		100	U	
Manganese	µg/L	430	-	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		**2.7**	J		**2.7**	J		**3.2**	J		**2.9**	J		-			**2.5**	J		**2.5**	J	
Mercury	µg/L	0.63	2.0	0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		-			0.15	U		0.15	U	
Nickel	µg/L	220	-	4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		8.0	U		8.0	U		**3.7**	J		**4.3**	J		-			**3.3**	J		**3.5**	J	
Potassium	µg/L	-	-	500	U		500	U		500	U		500	U		500	U		500	U		500	U		500	U		500	U		500	U	UJ	500	U	UJ	-			500	U		500	U	
Selenium	µg/L	100	50	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		8.0	U		8.0	U		8.0	U		8.0	U		-			8.0	U		8.0	U	
Silver	µg/L	94	-	4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		-			4.0	U		4.0	U	
Sodium	µg/L	-	-	100	U		100	U		100	U		100	U		100	U		100	U		100	U		500	U		500	U		**159**	J	J-	500	U	UJ	-			**229**	J		**188**	J	
Thallium	µg/L	0.20	2.0	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		1.0	U		1.0	U		1.0	U		1.0	U		-			1.0	U		1.0	U	
Vanadium	µg/L	86	-	4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		-			4.0	U		4.0	U	
Zinc	µg/L	6,000	-	**16**	J		10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U		**4.3**	J		10	U	UJ	-			**0.70**	J		10	U	

Notes:
MCL: maximum contaminant level
NA: not applicable

bold, black: analyte detected
-: not applicable, no value available, or not sampled

Laboratory (Q) and Data Review Qualifiers (V):
J: estimated value
J-: estimated value, biased low
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey

Table 2-8a. Field Quality Control Sample Summary - Equipment Blanks: Volatile Organic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Location ID:	Units	**Project Action Limits**[1]		Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank		
Field Sample ID:		**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**	EB_04251701			EB_04261701			EB_04271701			EB_04281701			EB_05081701			EB_05091701			EB_05101704		
Sampled Interval (feet)				NA			NA			NA			NA			NA			NA			NA		
Laboratory[2] *Sample ID:*				*JC41973-3*			*JC41973-28*			*JC41973-36*			*JC42293-12*			*JC42885-21*			*JC42953-3*			*JC43060-3*		
Date Sampled:				4/25/2017			4/26/2017			4/27/2017			4/28/2017			5/8/2017			5/9/2017			5/10/2017		
Result and Qualifiers:				Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Volatile Organic Compounds (SW846 8260C)																								
Acetone	µg/L	14,000	-	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Benzene	µg/L	0.46	5.0	0.25	U		0.25	U		0.25	U		0.25	U		0.25	U		0.25	U		0.25	U	
Bromochloromethane	µg/L	83	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Bromodichloromethane	µg/L	0.13	80	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
Bromoform	µg/L	3.3	80	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Bromomethane	µg/L	7.5	-	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
2-Butanone (MEK)	µg/L	5,600	-	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Carbon disulfide	µg/L	810	-	0.50	U		**7.0**			0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Carbon tetrachloride	µg/L	0.46	5.0	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
Chlorobenzene	µg/L	78	100	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Chloroethane	µg/L	21,000	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Chloroform	µg/L	0.22	80	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Chloromethane	µg/L	190	-	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Cyclohexane	µg/L	13,000	-	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	UJ	1.0	U	UJ	1.0	U	
1,2-Dibromo-3-chloropropane	µg/L	0.00033	0.20	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Dibromochloromethane	µg/L	0.87	80	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dibromoethane	µg/L	0.0075	0.050	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dichlorobenzene	µg/L	300	600	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,3-Dichlorobenzene	µg/L	-	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,4-Dichlorobenzene	µg/L	0.48	75	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Dichlorodifluoromethane	µg/L	200	-	1.0	U	UJ	1.0	U	UJ	1.0	U	UJ	1.0	U	UJ	1.0	U		1.0	U		1.0	U	UJ
1,1-Dichloroethane	µg/L	2.8	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dichloroethane	µg/L	0.17	5.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,1-Dichloroethene	µg/L	280	7.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
cis-1,2-Dichloroethene	µg/L	36	70	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
trans-1,2-Dichloroethene	µg/L	360	100	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2-Dichloropropane	µg/L	0.14	5.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
cis-1,3-Dichloropropene	µg/L	-	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
trans-1,3-Dichloropropene	µg/L	-	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Ethylbenzene	µg/L	1.5	700	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Freon 113	µg/L	10,000	-	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U	UJ	2.5	U	UJ	2.5	U	
2-Hexanone	µg/L	38	-	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U	
Isopropylbenzene	µg/L	450	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Methyl Acetate	µg/L	20,000	-	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U	
Methylcyclohexane	µg/L	-	-	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Methyl Tert Butyl Ether	µg/L	14	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
4-Methyl-2-pentanone(MIBK)	µg/L	6,300	-	2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U		2.5	U	
Methylene chloride	µg/L	11	5.0	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Styrene	µg/L	1,200	100	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,1,2,2-Tetrachloroethane	µg/L	0.076	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Tetrachloroethene	µg/L	11	5.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Toluene	µg/L	1,100	1,000	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,2,3-Trichlorobenzene	µg/L	7.0	-	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
1,2,4-Trichlorobenzene	µg/L	1.2	70	0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U		0.75	U	
1,1,1-Trichloroethane	µg/L	8,000	200	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
1,1,2-Trichloroethane	µg/L	0.28	5.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Trichloroethene	µg/L	0.49	5.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Trichlorofluoromethane	µg/L	5,200	-	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Vinyl chloride	µg/L	0.019	2.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
m,p-Xylene	µg/L	-	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
o-Xylene	µg/L	190	-	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
Xylene (total)	µg/L	190	10,000	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	

Notes:

MCL: maximum contaminant level

NA: not applicable

bold, black: analyte detected

-: not applicable, no value available, or not sampled

Laboratory (Q) and Data Review Qualifiers (V):

U: undetected; value recorded is the limit of detection (LOD)

UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.

2: Samples analyzed by SGS of Dayton, New Jersey

Table 2-8b. Field Quality Control Sample Summary - Equipment Blanks: Semi-volatile Organic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Location ID:		**Project Action Limits**[1]		Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank		
Field Sample ID:	Units	**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**	EB_04251701			EB_04261701			EB_04271701			EB_04281701			EB_05081701			EB_05091701[3]			EB_05101704		
Sampled Interval (feet)				NA			NA			NA			NA			NA			NA			NA		
Laboratory[2] *Sample ID:*				*JC41973-3*			*JC41973-28*			*JC41973-36*			*JC42293-12*			*JC42885-21*			*JC42953-3*			*JC43060-3*		
Date Sampled:				4/25/2017			4/26/2017			4/27/2017			4/28/2017			5/8/2017			5/9/2017			5/10/2017		
Result and Qualifiers:				Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Semi-volatile Organic Compounds (SW846 8270D)																								
2-Chlorophenol	µg/L	91	-	2.5	U	UJ	2.6	U		2.5	U	UJ	2.6	U		2.5	U		**11.1**		*R*	2.6	U	
4-Chloro-3-methyl phenol	µg/L	1,400	-	2.5	U	UJ	2.6	U		2.5	U	UJ	2.6	U		2.5	U		**10.2**		*R*	2.6	U	
2,4-Dichlorophenol	µg/L	46	-	2.0	U	UJ	2.1	U		2.0	U	UJ	2.0	U		2.0	U		**6.0**		*R*	2.1	U	
2,4-Dimethylphenol	µg/L	360	-	2.5	U	UJ	2.6	U		2.5	U	UJ	2.6	U		2.5	U		**11.2**		*R*	2.6	U	
2,4-Dinitrophenol	µg/L	39	-	5.0	U	UJ	5.2	U		5.0	U	UJ	5.1	U		5.0	U		**9.0**	J	*R*	5.2	U	
4,6-Dinitro-o-cresol	µg/L	1.5	-	2.5	U	UJ	2.6	U		2.5	U	UJ	2.6	U		2.5	U		**3.0**	J	*R*	2.6	U	
2-Methylphenol	µg/L	930	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**17.1**		*R*	1.0	U	
3&4-Methylphenol	µg/L	-	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**18.5**		*R*	1.0	U	
2-Nitrophenol	µg/L	-	-	2.5	U	UJ	2.6	U		2.5	U	UJ	2.6	U		2.5	U		**3.0**	J	*R*	2.6	U	
4-Nitrophenol	µg/L	-	-	2.5	U	UJ	2.6	U	UJ	2.5	U	UJ	2.6	U		2.5	U		**15.3**		*R*	2.6	U	
Pentachlorophenol	µg/L	0.041	1.0	2.0	U	UJ	2.1	U		2.0	U	UJ	2.0	U		2.0	U		**3.5**	J	*R*	2.1	U	
Phenol	µg/L	5,800	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**12.5**		*R*	1.0	U	
2,3,4,6-Tetrachlorophenol	µg/L	240	-	2.5	U	UJ	2.6	U		2.5	U	UJ	2.6	U		2.5	U		**1.8**	J	*R*	2.6	U	
2,4,5-Trichlorophenol	µg/L	1,200	-	2.5	U	UJ	2.6	U		2.5	U	UJ	2.6	U		2.5	U		**3.0**	J	*R*	2.6	U	
2,4,6-Trichlorophenol	µg/L	4.1	-	2.5	U	UJ	2.6	U		2.5	U	UJ	2.6	U		2.5	U		**2.6**	J	*R*	2.6	U	
Acetophenone	µg/L	1,900	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**2.9**		*R*	0.52	U	
Atrazine	µg/L	0.30	3.0	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**5.3**		*R*	1.0	U	
Benzaldehyde	µg/L	19	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**3.8**	J	*R*	0.52	U	
4-Bromophenyl phenyl ether	µg/L	-	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**9.0**		*R*	0.52	U	
Butyl benzyl phthalate	µg/L	16	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**13.1**		*R*	0.52	U	
1,1'-Biphenyl	µg/L	0.83	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**1.8**		*R*	0.52	U	
2-Chloronaphthalene	µg/L	750	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**3.0**		*R*	0.52	U	
4-Chloroaniline	µg/L	0.37	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**2.4**	J	*R*	1.0	U	
Carbazole	µg/L	-	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**2.2**		*R*	0.52	U	
Caprolactam	µg/L	9,900	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		**1.0**	J		**5.0**		*R*	1.0	U	
bis(2-Chloroethoxy)methane	µg/L	59	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**3.6**		*R*	0.52	U	
bis(2-Chloroethyl)ether	µg/L	0.014	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**4.6**		*R*	0.52	U	
bis(2-Chloroisopropyl)ether	µg/L	710	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**2.1**		*R*	0.52	U	
4-Chlorophenyl phenyl ether	µg/L	-	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**6.8**		*R*	0.52	U	
2,4-Dinitrotoluene	µg/L	0.24	-	0.75	U	UJ	0.77	U		0.75	U	UJ	0.77	U		0.75	U		**3.2**		*R*	0.78	U	
2,6-Dinitrotoluene	µg/L	0.049	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**2.4**		*R*	0.52	U	
3,3'-Dichlorobenzidine	µg/L	0.13	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**6.4**		*R*	1.0	U	
1,4-Dioxane	µg/L	0.46	-	0.75	U	UJ	0.77	U		0.75	U	UJ	0.77	U		0.75	U		**8.2**		*R*	0.78	U	
Dibenzofuran	µg/L	7.9	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**2.3**	J	*R*	0.52	U	
Di-n-butyl phthalate	µg/L	900	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**10.3**		*R*	1.0	U	
Di-n-octyl phthalate	µg/L	200	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**14.9**		*R*	0.52	U	UJ
Diethyl phthalate	µg/L	15,000	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**2.3**		*R*	0.52	U	
Dimethyl phthalate	µg/L	-	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**2.5**		*R*	0.52	U	
bis(2-Ethylhexyl)phthalate	µg/L	5.6	6.0	1.8	U	UJ	1.8	U		**9.4**		J	1.8	U		1.8	U		**16**		*R*	1.8	U	
Hexachlorobenzene	µg/L	0.0098	1.0	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**11.9**		*R*	0.52	U	
Hexachlorobutadiene	µg/L	0.14	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**2.4**		*R*	1.0	U	
Hexachlorocyclopentadiene	µg/L	0.41	50	5.0	U	UJ	5.2	U		5.0	U	UJ	5.1	U		5.0	U		**5.1**	J	*R*	5.2	U	
Hexachloroethane	µg/L	0.33	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**1.5**	J	*R*	1.0	U	
Isophorone	µg/L	78	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**3.1**		*R*	1.0	U	
2-Methylnaphthalene	µg/L	36	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**2.0**		*R*	0.52	U	
2-Nitroaniline	µg/L	190	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**5.3**		*R*	1.0	U	
3-Nitroaniline	µg/L	-	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**16.3**		*R*	1.0	U	
4-Nitroaniline	µg/L	3.8	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**15.7**		*R*	1.0	U	
Nitrobenzene	µg/L	0.14	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**2.5**		*R*	1.0	U	
N-Nitroso-di-n-propylamine	µg/L	0.011	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**3.1**		*R*	1.0	U	
N-Nitrosodiphenylamine	µg/L	12	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**4.8**	J	*R*	0.52	U	
1,2,4,5-Tetrachlorobenzene	µg/L	1.7	-	1.0	U	UJ	1.0	U		1.0	U	UJ	1.0	U		1.0	U		**3.9**		*R*	1.0	U	

Notes:
DRO: diesel-range organic
GRO: gasoline-range organic
MCL: maximum contaminant level
NA: not applicable
ORO: oil-range organic
TPH: total petroleum hydrocarbon

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based soil screening level (SSL)
-: not applicable, no value available, or not sampled

Laboratory (Q) and Data Review Qualifiers (V):
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: See discussion in Section 2.5.3 of Remedial Investigation report

Table 2-8c. Field Quality Control Sample Summary - Equipment Blanks: Polynuclear Aromatic Hydrocarbons and Total Petroleum Hydrocarbons
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Location ID:	Units	**Project Action Limits[1]**		Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank		
Field Sample ID:		**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**	EB_04251701			EB_04261701			EB_04271701			EB_04281701			EB_05081701			EB_05091701[3]			EB_05101704		
Sampled Interval (feet)				NA			NA			NA			NA			NA			NA			NA		
Laboratory[2] Sample ID:				*JC41973-3*			*JC41973-28*			*JC41973-36*			*JC42293-12*			*JC42885-21*			*JC42953-3*			*JC43060-3*		
Date Sampled:				4/25/2017			4/26/2017			4/27/2017			4/28/2017			5/8/2017			5/9/2017			5/10/2017		
Result and Qualifiers:				Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Polycyclic Aromatic Hydrocarbons (SW846 8270D)																								
Acenaphthene	µg/L	530	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**3.4**		*R*	0.52	U	
Acenaphthylene	µg/L	-	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**3.0**		*R*	0.52	U	
Anthracene	µg/L	1,800	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**9.2**		*R*	0.52	U	
Benzo(a)anthracene	µg/L	0.030	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**13.6**		*R*	1.0	U	
Benzo(a)pyrene	µg/L	0.025	0.20	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**14.2**		*R*	0.52	U	
Benzo(b)fluoranthene	µg/L	0.25	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**13.3**		*R*	0.52	U	
Benzo(g,h,i)perylene	µg/L	-	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**14.4**		*R*	0.52	U	
Benzo(k)fluoranthene	µg/L	2.5	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**14.2**		*R*	0.52	U	
Chrysene	µg/L	25	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**13.5**		*R*	0.52	U	
Dibenzo(a,h)anthracene	µg/L	0.025	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**14.2**		*R*	0.52	U	
Fluoranthene	µg/L	800	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**10.6**		*R*	0.52	U	
Fluorene	µg/L	290	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**5.6**		*R*	0.52	U	
Indeno(1,2,3-cd)pyrene	µg/L	0.25	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**13.5**		*R*	0.52	U	
Naphthalene	µg/L	0.17	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**1.7**		*R*	0.52	U	
Phenanthrene	µg/L	-	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**8.2**		*R*	0.52	U	
Pyrene	µg/L	120	-	0.50	U	UJ	0.52	U		0.50	U	UJ	0.51	U		0.50	U		**11.4**		*R*	0.52	U	
Total Petroleum Hydrocarbons (SW846 8015C)																								
TPH-GRO (C6-C12)	mg/L	-	-	0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		0.10	U		0.10	U	
TPH-DRO (C10-C20)	mg/L	-	-	0.028	U	UJ	0.025	U	*R*	0.026	U	UJ	0.028	U		0.025	U	UJ	0.024	U		0.083	U	
TPH-ORO (C20-C34)	mg/L	-	-	0.028	U	UJ	0.025	U	*R*	0.026	U	UJ	0.028	U		**0.033**		J	0.024	U		0.083	U	
TPH-ORO (>C28-C40)	mg/L	-	-	0.028	U	UJ	0.025	U	*R*	0.026	U	UJ	0.028	U		0.025	U	UJ	0.024	U		0.083	U	
Total OH TPH (C10-C34)	mg/L	-	-	0.028	U	UJ	0.025	U	*R*	0.026	U	UJ	0.028	U		**0.033**		J	0.024	U		0.083	U	

Notes:

DRO: diesel-range organic
GRO: gasoline-range organic
MCL: maximum contaminant level
NA: not applicable
ORO: oil-range organic
TPH: total petroleum hydrocarbon

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based soil screening level (SSL)
-: not applicable, no value available, or not sampled

Laboratory (Q) and Data Review Qualifiers (V):
J: estimated value
R : data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: See discussion in Section 2.5.3 of Remedial Investigation report

Table 2-8d. Field Quality Control Sample Summary - Equipment Blanks: Inorganic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Location ID:	Units	**Project Action Limits[1]**		Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank			Equipment Blank		
Field Sample ID:		**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**	EB_04251701			EB_04261701			EB_04271701			EB_04281701			EB_05081701			EB_05091701			EB_05101704		
Sampled Interval (feet)				NA			NA			NA			NA			NA			NA			NA		
Laboratory[2] Sample ID:				*JC41973-3*			*JC41973-28*			*JC41973-36*			*JC42293-12*			*JC42885-21*			*JC42953-3*			*JC43060-3*		
Date Sampled:				4/25/2017			4/26/2017			4/27/2017			4/28/2017			5/8/2017			5/9/2017			5/10/2017		
Result and Qualifiers:				Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Metals (6010C, 7470A)																								
Aluminum	µg/L	20,000	-	100	U		100	U		100	U		100	U		100	U		100	U		100	U	
Antimony	µg/L	7.8	6.0	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Arsenic	µg/L	0.052	10	3.0	U		3.0	U		3.0	U		3.0	U		3.0	U		3.0	U		3.0	U	
Barium	µg/L	3,800	2,000	10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Beryllium	µg/L	25	4.0	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
Cadmium	µg/L	9.2	5.0	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Calcium	µg/L	-	-	200	U		200	U		200	U		**419**	J		**412**	J		**465**	J		**436**	J	
Chromium	µg/L	-	100	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Cobalt	µg/L	6.0	-	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Copper	µg/L	800	1,300	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Iron	µg/L	14,000	-	50	U		50	U		50	U		50	U		50	U		50	U		50	U	
Lead	µg/L	15	15	3.0	U		3.0	U		3.0	U		3.0	U		3.0	U		3.0	U		3.0	U	
Magnesium	µg/L	-	-	100	U		100	U		100	U		**137**	J		**109**	J		100	U		100	U	
Manganese	µg/L	430	-	2.0	U		**2.3**	J		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Mercury	µg/L	0.63	2.0	0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U	
Nickel	µg/L	220	-	4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U	
Potassium	µg/L	-	-	500	U		500	U		500	U		500	U		500	U		500	U		500	U	
Selenium	µg/L	100	50	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U	
Silver	µg/L	94	-	4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U	
Sodium	µg/L	-	-	100	U		100	U		100	U		100	U		**277**	J		100	U		100	U	
Thallium	µg/L	0.20	2.0	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
Vanadium	µg/L	86	-	4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U		4.0	U	
Zinc	µg/L	6,000	-	10	U		10	U		10	U		10	U		10	U		10	U		10	U	

Notes:

MCL: maximum contaminant level
NA: not applicable

bold, black: analyte detected
-: not applicable, no value available, or not sampled

Laboratory (Q) and Data Review Qualifiers (V):
J: estimated value
U: undetected; value recorded is the limit of detection (LOD)

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey

Table 2-9. Field Quality Control Sample Summary - Pesticides, Herbicides, and PCBs
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Location ID:	Units	Ambient Blank			Equipment Blank		
Field Sample ID:		AB_04271701			EB_04271701		
Sampled Interval (feet)		NA			NA		
Laboratory[1] Sample ID:		*JC41973-35*			*JC41973-36*		
Date Sampled:		4/27/2017			4/27/2017		
Result and Qualifiers:		Result	Q	V	Result	Q	V
Pesticides (SW846 8081B)							
Aldrin	µg/L	0.0082	U		0.0075	U	
alpha-BHC	µg/L	0.0082	U		0.0075	U	
beta-BHC	µg/L	0.0082	U		0.0075	U	
delta-BHC	µg/L	0.0054	U		0.0050	U	
gamma-BHC (Lindane)	µg/L	0.0054	U		0.0050	U	
alpha-Chlordane	µg/L	0.0054	U		0.0050	U	
gamma-Chlordane	µg/L	0.0054	U		0.0050	U	
Dieldrin	µg/L	0.0054	U		0.0050	U	
4,4'-DDD	µg/L	0.0054	U		0.0050	U	
4,4'-DDE	µg/L	0.0082	U		0.0075	U	
4,4'-DDT	µg/L	0.0054	U		0.0050	U	
Endrin	µg/L	0.0082	U		0.0075	U	
Endosulfan sulfate	µg/L	0.0082	U		0.0075	U	
Endrin aldehyde	µg/L	0.0082	U		0.0075	U	
Endosulfan-I	µg/L	0.0054	U		0.0050	U	
Endosulfan-II	µg/L	0.0054	U		0.0050	U	
Heptachlor	µg/L	0.0054	U		0.0050	U	
Heptachlor epoxide	µg/L	0.0082	U		0.0075	U	
Methoxychlor	µg/L	0.0082	U		0.0075	U	
Endrin ketone	µg/L	0.0082	U		0.0075	U	
Toxaphene	µg/L	0.22	U		0.20	U	
Polychlorinated Biphenyls (SW846 8082A)							
Aroclor 1016	µg/L	0.28	U		0.25	U	
Aroclor 1221	µg/L	0.44	U		0.40	U	
Aroclor 1232	µg/L	0.28	U		0.25	U	
Aroclor 1242	µg/L	0.44	U		0.40	U	
Aroclor 1248	µg/L	0.50	U		0.45	U	
Aroclor 1254	µg/L	0.28	U		0.25	U	
Aroclor 1260	µg/L	0.50	U		0.45	U	
Aroclor 1268	µg/L	0.28	U		0.25	U	
Aroclor 1262	µg/L	0.28	U		0.25	U	
Herbicides (SW846 8151)							
2,4-D	µg/L	0.50	U		0.50	U	
2,4,5-TP (Silvex)	µg/L	0.080	U		0.080	U	
2,4,5-T	µg/L	0.080	U		0.080	U	
Dalapon	µg/L	0.080	U	UJ	0.080	U	UJ
Dicamba	µg/L	0.10	U	UJ	0.10	U	UJ
Dichloroprop	µg/L	0.50	U		0.50	U	
Dinoseb	µg/L	0.50	U	*R*	0.50	U	*R*
MCPA	µg/L	25	U		25	U	
MCPP	µg/L	25	U		25	U	
Pentachlorophenol	µg/L	0.050	U	UJ	0.050	U	UJ
2,4-DB	µg/L	0.50	U		0.50	U	

Notes:
1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
Laboratory (Q) and Data Review Qualifiers (V):
R : data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

Table 4-1a. Analytical Sample Summary - Soil: Volatile Organic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:		Project Action Limits[1]			SB-1			SB-1			SB-1 field duplicate			SB-1			SB-1		
	Field Sample ID:	Units	**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-1 (2.5-5)_050917[4]			LF512RI_SB-1 (12.5-15)_050917			LF512RI_SB-1 (12.5-15)_050917_FD			LF512RI_SB-1 (17.5-20)_050917			LF512RI_SB-1 (22.5-25)_050917		
	Sampled Interval (feet):					2.5-5			12.5-15			12.5-15_FD			17.5-20			22.5-25		
	Laboratory[2] Sample ID:					*JC42953-4*			*JC42953-5*			*JC42953-6*			*JC42953-7*			*JC42953-8*		
	Date Sampled:					5/9/2017			5/9/2017			5/9/2017			5/9/2017			5/9/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Volatile Organic Compounds (SW846 8260C)																			
	Acetone	µg/kg	670,000,000	2,900	-	**22.9**			**23.9**		J	**34.6**		J	**11.5**			**45**		
	Benzene	µg/kg	5,100	0.23	2.6	0.27	U		0.27	U		0.26	U		0.25	U		0.24	U	
	2-Butanone (MEK)	µg/kg	190,000,000	1,200	-	5.4	U		5.5	U		5.1	U		5.0	U		4.9	U	
	Carbon disulfide	µg/kg	3,500,000	240	-	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	Carbon tetrachloride	µg/kg	2,900	0.18	1.9	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	Chlorobenzene	µg/kg	1,300,000	53	68	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	Chloroform	µg/kg	1,400	0.061	22	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	Chloromethane	µg/kg	460,000	49	-	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	Cyclohexane	µg/kg	27,000,000	13,000	-	1.1	U		1.1	U		1.0	U		0.99	U		0.98	U	
	1,2-Dichlorobenzene	µg/kg	9,300,000	300	580	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	1,3-Dichlorobenzene	µg/kg	-	-	-	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	1,4-Dichlorobenzene	µg/kg	11,000	0.46	72	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	1,2-Dichloroethane	µg/kg	2,000	0.048	1.4	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	1,1-Dichloroethene	µg/kg	1,000,000	100	2.5	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	cis-1,2-Dichloroethene	µg/kg	2,300,000	11	21	1.1	U		1.1	U		1.0	U		0.99	U		0.98	U	
	trans-1,2-Dichloroethene	µg/kg	23,000,000	110	31	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	Ethylbenzene	µg/kg	25,000	1.7	780	**0.31**	J		0.55	U		0.51	U		0.50	U		0.49	U	
	Isopropylbenzene	µg/kg	9,900,000	740	-	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	Methyl Acetate	µg/kg	1,200,000,000	4,100	-	2.7	U		2.7	U		2.6	U		2.5	U		2.4	U	
	Methylcyclohexane	µg/kg	-	-	-	1.1	U		1.1	U		1.0	U		0.99	U		0.98	U	
	4-Methyl-2-pentanone(MIBK)	µg/kg	140,000,000	1,400	-	2.2	U		2.2	U		2.0	U		2.0	U		2.0	U	
	Methylene chloride	µg/kg	1,000,000	2.9	1.3	1.1	U		1.1	U		1.0	U		0.99	U		0.98	U	
	Styrene	µg/kg	35,000,000	1,300	110	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	Tetrachloroethene	µg/kg	100,000	5.1	2.3	1.1	U		1.1	U		**0.74**	J		**2.1**			**3.7**		
	Toluene	µg/kg	47,000,000	760	690	**0.45**	J		**0.34**	J		**0.52**	J		**0.43**	J		**0.52**	J	
	Trichloroethene	µg/kg	6,000	0.18	1.8	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	m,p-Xylene	µg/kg	-	-	-	**0.43**	J		0.55	U		**0.24**	J		0.50	U		**0.25**	J	
	o-Xylene	µg/kg	2,800,000	190	-	0.54	U		0.55	U		0.51	U		0.50	U		0.49	U	
	Xylene (total)	µg/kg	2,500,000	190	9,900	**0.43**	J		0.55	U		**0.24**	J		0.50	U		**0.25**	J	

COPC[3]	Location ID:	SB-2			SB-2			SB-2			SB-2			SB-3			SB-3 field duplicate			SB-3			SB-3		
	Field Sample ID:	LF512RI_SB-2 (0-2.5)_050817			LF512RI_SB-2 (5-7.5)_050817			LF512RI_SB-2 (10-12.5)_050817			LF512RI_SB-2 (22.5-24)_050817			LF512RI_SB-3 (7.5-10)_050917			LF512RI_SB-3 (7.5-10)_050917_FD			LF512RI_SB-3 (17.5-20)_050917			LF512RI_SB-3 (20-22.5)_050917		
	Sampled Interval (feet):	0-2.5			5-7.5			10-12.5			22.5-24			7.5-10			7.5-10_FD			17.5-20			20-22.5		
	Laboratory[2] Sample ID:	*JC42885-17*			*JC42885-18*			*JC42885-19*			*JC42885-20*			*JC42953-10*			*JC42953-11*			*JC42953-13*			*JC42953-14*		
	Date Sampled:	5/8/2017			5/8/2017			5/8/2017			5/8/2017			5/9/2017			5/9/2017			5/9/2017			5/9/2017		
	Result[7] and Qualifiers:	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Volatile Organic Compounds (SW846 8260C)																								
	Acetone	**23.6**			**36**			5.8	U		**15.6**			**32.1**			**34.3**			**13.5**			**17.4**		
	Benzene	**0.33**	J		**0.23**	J		**0.28**	J		**0.20**	J		**0.24**	J		0.25	U		0.21	U		0.29	U	
	2-Butanone (MEK)	4.6	U		4.4	U		5.8	U		5.0	U		6.0	U		4.9	U		4.2	U		5.7	U	
	Carbon disulfide	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	Carbon tetrachloride	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	Chlorobenzene	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	Chloroform	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	Chloromethane	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	Cyclohexane	0.92	U		0.88	U		1.2	U		0.99	U		1.2	U		0.98	U		0.83	U		1.1	U	
	1,2-Dichlorobenzene	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	1,3-Dichlorobenzene	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	1,4-Dichlorobenzene	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	1,2-Dichloroethane	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	1,1-Dichloroethene	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	cis-1,2-Dichloroethene	0.92	U		0.88	U		1.2	U		0.99	U		1.2	U		0.98	U		0.83	U		1.1	U	
	trans-1,2-Dichloroethene	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	Ethylbenzene	**0.37**	J		**0.44**	J		**0.50**	J		**0.25**	J		**0.34**	J		0.49	U		0.42	U		0.57	U	
	Isopropylbenzene	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	Methyl Acetate	2.3	U		2.2	U		2.9	U		2.5	U		3.0	U		2.5	U		2.1	U		2.9	U	
	Methylcyclohexane	0.92	U		0.88	U		1.2	U		0.99	U		1.2	U		0.98	U		0.83	U		1.1	U	
	4-Methyl-2-pentanone(MIBK)	1.8	U		1.8	U		2.3	U		2.0	U		2.4	U		2.0	U		1.7	U		2.3	U	
	Methylene chloride	0.92	U		0.88	U		**1.2**	J		0.99	U		1.2	U		**2.5**	J		**1.5**	J		**1.6**	J	
	Styrene	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	Tetrachloroethene	0.92	U		0.88	U		**0.41**	J		**3.8**			1.2	U		0.98	U		**1.3**	J		**3.3**		
	Toluene	**0.82**	J		**0.88**			**1.1**	J		**0.55**	J		**0.78**	J		**0.51**	J		0.42	U		**0.26**	J	
	Trichloroethene	0.46	U		0.44	U		0.58	U		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	m,p-Xylene	**0.51**	J		**0.67**	J		**0.77**	J		**0.42**	J		**0.48**	J		**0.25**	J		0.42	U		0.57	U	
	o-Xylene	**0.20**	J		**0.27**	J		**0.35**	J		0.50	U		0.60	U		0.49	U		0.42	U		0.57	U	
	Xylene (total)	**0.71**	J		**0.94**			**1.2**			**0.42**	J		**0.48**	J		**0.25**	J		0.42	U		0.57	U	

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R : data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-1a. Analytical Sample Summary - Soil: Volatile Organic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3] Location ID:	Units	Project Action Limits[1]			SB-3			SB-4			SB-4			SB-4			SB-4			SB-4			SB-4			SB-4			SB-5			SB-5			SB-5			SB-5		
Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-3 (22.5-25)_050917			LF512RI_SB-4 (0-2.5)_042717			LF512RI_SB-4 (0-2.5)_042817			LF512RI_SB-4 (5-10)_042717			LF512RI_SB-4 (5-10)_042817			LF512RI_SB-4 (12.5-15)_042717			LF512RI_SB-4 (12.5-15)_042817			LF512RI_SB-4 (22.5-25)_042717			LF512RI_SB-5 (2.5-5)_042717			LF512RI_SB-5 (7.5-10)_042717			LF512RI_SB-5 (15-20)_042717[5]			LF512RI_SB-5 (22.5-25)_042717		
Sampled Interval (feet):					22.5-25			0-2.5			0-2.5			5-10			5-10			12.5-15			12.5-15			22.5-25			2.5-5			7.5-10			15-20			22.5-25		
Laboratory[2] Sample ID:					*JC42953-15*			*JC41973-42*			*JC42293-2*			*JC41973-43*			*JC42293-3*			*JC41973-44*			*JC42293-4*			*JC41973-45*			*JC41973-37*			*JC41973-38*			*JC41973-39*			*JC41973-41*		
Date Sampled:					5/9/2017			4/27/2017			4/28/2017			4/27/2017			4/28/2017			4/27/2017			4/28/2017			4/27/2017			4/27/2017			4/27/2017			4/27/2017			4/27/2017		
Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
Volatile Organic Compounds (SW846 8260C)																																								
Acetone	µg/kg	670,000,000	2,900	-	**19.7**			4.6	U		**28.3**			4.0	U		-			**15.8**			-			**6.6**	J		**10.8**			4.6	U		**6.4**	J		**12.2**		
Benzene	µg/kg	5,100	0.23	2.6	**0.49**	J		0.23	U		**2.0**			**0.13**	J		-			**0.45**	J		-			**0.19**	J		**0.46**			**0.51**			**0.44**			**0.20**	J	
2-Butanone (MEK)	µg/kg	190,000,000	1,200	-	5.4	U		4.6	U		**14.0**			4.0	U		-			4.9	U		-			3.9	U		**3.8**	J		4.6	U		4.3	U		5.0	U	
Carbon disulfide	µg/kg	3,500,000	240	-	0.54	U		0.46	U		**0.47**	J		0.40	U	UJ	-			0.49	U	UJ	-			0.39	U	UJ	0.43	U	UJ	0.46	U	UJ	0.43	U		0.50	U	UJ
Carbon tetrachloride	µg/kg	2,900	0.18	1.9	0.54	U		0.46	U		0.68	U		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
Chlorobenzene	µg/kg	1,300,000	53	68	0.54	U		0.46	U		0.68	U		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
Chloroform	µg/kg	1,400	0.061	22	0.54	U		0.46	U		0.68	U		**0.24**	J		-			0.49	U		-			**0.21**	J		0.43	U		0.46	U		0.43	U		0.50	U	
Chloromethane	µg/kg	460,000	49	-	0.54	U		0.46	U		0.68	U		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
Cyclohexane	µg/kg	27,000,000	13,000	-	1.1	U		0.91	U		1.4	U		0.80	U		-			0.99	U		-			0.78	U		0.86	U		0.93	U		**0.76**	J		1.0	U	
1,2-Dichlorobenzene	µg/kg	9,300,000	300	580	0.54	U		0.46	U		0.68	U		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
1,3-Dichlorobenzene	µg/kg	-	-	-	0.54	U		0.46	U		0.68	U		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
1,4-Dichlorobenzene	µg/kg	11,000	0.46	72	0.54	U		0.46	U		0.68	U		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
1,2-Dichloroethane	µg/kg	2,000	0.048	1.4	0.54	U		0.46	U		0.68	U		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
1,1-Dichloroethene	µg/kg	1,000,000	100	2.5	0.54	U		0.46	U		0.68	U		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
cis-1,2-Dichloroethene	µg/kg	2,300,000	11	21	1.1	U		0.91	U		1.4	U		0.80	U		-			**0.47**	J		-			0.78	U		0.86	U		0.93	U		0.86	U		1.0	U	
trans-1,2-Dichloroethene	µg/kg	23,000,000	110	31	0.54	U		0.46	U		0.68	U		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
Ethylbenzene	µg/kg	25,000	1.7	780	**0.66**	J		**0.72**	J		**1.1**	J		0.40	U		-			**0.44**	J		-			**0.16**	J		**0.49**	J		**0.37**	J		**0.47**	J		**0.17**	J	
Isopropylbenzene	µg/kg	9,900,000	740	-	0.54	U		0.46	U		**0.79**	J		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
Methyl Acetate	µg/kg	1,200,000,000	4,100	-	2.7	U		2.3	U		**3.9**	J		2.0	U		-			2.5	U		-			**2.7**	J		2.2	U		2.3	U		2.1	U		2.5	U	
Methylcyclohexane	µg/kg	-	-	-	**1.0**	J		0.91	U		1.4	U		0.80	U		-			**0.66**	J		-			0.78	U		**0.60**	J		**0.76**	J		**1.4**	J		1.0	U	
4-Methyl-2-pentanone(MIBK)	µg/kg	140,000,000	1,400	-	2.2	U		1.8	U		2.7	U		1.6	U		-			2.0	U		-			1.6	U		1.7	U		1.9	U		1.7	U		2.0	U	
Methylene chloride	µg/kg	1,000,000	2.9	1.3	**1.6**	J		**1.0**	J		**2.2**	J		0.80	U		-			**0.99**	J		-			0.78	U		0.86	U		0.93	U		0.86	U		**1.3**	J	
Styrene	µg/kg	35,000,000	1,300	110	0.54	U		0.46	U		0.68	U		0.40	U		-			0.49	U		-			0.39	U		0.43	U		0.46	U		0.43	U		0.50	U	
Tetrachloroethene	µg/kg	100,000	5.1	2.3	**2.2**			0.91	U		1.4	U		**0.55**	J		-			**1.6**	J		-			**5.2**			0.86	U		0.93	U		**2.7**			**5.6**		
Toluene	µg/kg	47,000,000	760	690	**1.5**			**0.20**	J		**2.2**			**0.29**	J		-			**1.3**			-			**0.49**	J		**1.4**			**1.1**			**1.4**			**0.46**	J	
Trichloroethene	µg/kg	6,000	0.18	1.8	0.54	U		0.46	U		**1.1**	J		**2.0**			-			**2.9**			-			**0.63**	J		0.43	U		**0.72**	J		**0.59**	J		**0.24**	J	
m,p-Xylene	µg/kg	-	-	-	**0.87**	J		**3.5**			**2.8**			0.40	U		-			**0.58**	J		-			**0.26**	J		**0.78**	J		**0.49**	J		**0.75**	J		**0.30**	J	
o-Xylene	µg/kg	2,800,000	190	-	**0.40**	J		**1.7**			**4.3**			0.40	U		-			**0.25**	J		-			0.39	U		**0.37**	J		**0.20**	J		**0.31**	J		0.50	U	
Xylene (total)	µg/kg	2,500,000	190	9,900	**0.87**	J		**5.2**			**7.1**			0.40	U		-			**0.83**	J		-			**0.26**	J		**1.2**			**0.69**	J		**1.1**			**0.30**	J	

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-1a. Analytical Sample Summary - Soil: Volatile Organic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	**Location ID:**	Units	**Project Action Limits[1]**			**SB-6**			**SB-6 field duplicate**			**SB-6**			**SB-6**			**SB-6**			**SB-7**			**SB-7 field duplicate**			**SB-7**			**SB-7**			**SB-7**			**SB-8**			**SB-8**			**SB-8**		
	Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-6 (0-2.5)_050817			LF512RI_SB-6 (0-2.5)_050817_FD			LF512RI_SB-6 (15-17.5)_050817			LF512RI_SB-6 (17.5-20)_050817			LF512RI_SB-6 (22-24)_050817			LF512RI_SB-7 (0-5)_042817			LF512RI_SB-7 (0-5)_042817_FD			LF512RI_SB-7 (15-20)_042817			LF512RI_SB-7 (20-22.5)_042817			LF512RI_SB-7 (22.5-25)_042817			LF512RI_SB-8 (2-5)_042517			LF512RI_SB-8 (12-14)_042517			LF512RI_SB-8 (15-20)_042617		
	Sampled Interval (feet):					0-2.5			0-2.5_FD			15-17.5			17.5-20			22-24			0-5			0-5_FD			15-20			20-22.5			22.5-25			2-5			12-14			15-20		
	Laboratory[2] Sample ID:					*JC42885-3*			*JC42885-4*			*JC42885-8*			*JC42885-9*			*JC42885-10*			*JC42293-5*			*JC42293-6*			*JC42293-8*			*JC42293-9*			*JC42293-10*			*JC41973-5*			*JC41973-7*			*JC41973-24*		
	Date Sampled:					5/8/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			4/28/2017			4/28/2017			4/28/2017			4/28/2017			4/28/2017			4/25/2017			4/25/2017			4/26/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Volatile Organic Compounds (SW846 8260C)																																													
	Acetone	µg/kg	670,000,000	2,900	-	**10.2**		J	**41.3**		J	**54.7**			**32.1**			**16.9**			**15.3**		J	**6.3**	J		**5.6**	J		4.0	U		**8.8**	J		**6.2**	J		510	U		**29.5**		
	Benzene	µg/kg	5,100	0.23	2.6	**0.69**		J	0.25	U	UJ	**0.26**	J		**0.21**	J		**0.30**	J		**0.38**	J		**0.26**	J		**0.55**		J	**0.15**	J		**0.34**	J		**0.29**	J		**29.3**	J		**0.28**	J	
	2-Butanone (MEK)	µg/kg	190,000,000	1,200	-	4.4	U		5.0	U		5.8	U		4.8	U		4.7	U		4.4	U		4.1	U		4.4	U		4.0	U		4.6	U		4.2	U		510	U		5.5	U	
	Carbon disulfide	µg/kg	3,500,000	240	-	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U	UJ	0.44	U	UJ	0.40	U	UJ	0.46	U		0.42	U	UJ	51	U	UJ	0.55	U	UJ
	Carbon tetrachloride	µg/kg	2,900	0.18	1.9	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		0.42	U		51	U		0.55	U	
	Chlorobenzene	µg/kg	1,300,000	53	68	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		0.42	U		**262**			0.55	U	
	Chloroform	µg/kg	1,400	0.061	22	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		0.42	U		51	U		0.55	U	
	Chloromethane	µg/kg	460,000	49	-	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		0.42	U		51	U		0.55	U	
	Cyclohexane	µg/kg	27,000,000	13,000	-	0.89	U		1.0	U		1.2	U		0.96	U		0.94	U		0.88	U		0.81	U		**0.65**	J		0.80	U		0.93	U		0.83	U		**608**			1.1	U	
	1,2-Dichlorobenzene	µg/kg	9,300,000	300	580	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		0.42	U		**193**			0.55	U	
	1,3-Dichlorobenzene	µg/kg	-	-	-	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		0.42	U		**32.2**	J		0.55	U	
	1,4-Dichlorobenzene	µg/kg	11,000	0.46	72	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		0.42	U		**259**			0.55	U	
	1,2-Dichloroethane	µg/kg	2,000	0.048	1.4	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		0.42	U		51	U		0.55	U	
	1,1-Dichloroethene	µg/kg	1,000,000	100	2.5	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		**0.66**	J		51	U		0.55	U	
	cis-1,2-Dichloroethene	µg/kg	2,300,000	11	21	0.89	U		1.0	U		1.2	U		0.96	U		0.94	U		0.88	U		0.81	U		0.87	U		0.80	U		0.93	U		0.83	U		100	U		1.1	U	
	trans-1,2-Dichloroethene	µg/kg	23,000,000	110	31	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		0.42	U		51	U		0.55	U	
	Ethylbenzene	µg/kg	25,000	1.7	780	**0.67**	J		**0.19**	J		**0.52**	J		**0.36**	J		**0.35**	J		**0.45**	J		**0.28**	J		**0.67**	J		**0.13**	J		**0.28**	J		**0.22**	J		**76.4**	J		**0.40**	J	
	Isopropylbenzene	µg/kg	9,900,000	740	-	**0.18**	J		0.50	U		**0.23**	J		**0.19**	J		0.47	U		0.44	U		0.41	U		**0.16**	J		0.40	U		0.46	U		0.42	U		**1,110**			**0.27**	J	
	Methyl Acetate	µg/kg	1,200,000,000	4,100	-	2.2	U		2.5	U		**8.3**			**5.8**			2.3	U		2.2	U		2.0	U		**5.9**			**5.8**			**11.3**			2.1	U		**223**	J		2.8	U	
	Methylcyclohexane	µg/kg	-	-	-	**1.0**	J		1.0	U		1.2	U		0.96	U		0.94	U		**0.56**	J		0.81	U		**1.3**	J		0.80	U		**0.49**	J		**0.60**	J		**5,270**			**1.6**	J	
	4-Methyl-2-pentanone(MIBK)	µg/kg	140,000,000	1,400	-	1.8	U		2.0	U		2.3	U		1.9	U		1.9	U		1.8	U		1.6	U		1.7	U		1.6	U		1.9	U		1.7	U		200	U		2.2	U	
	Methylene chloride	µg/kg	1,000,000	2.9	1.3	0.89	U		1.0	U		1.2	U		0.96	U		0.94	U		0.88	U		**1.5**	J		**1.4**	J		**1.1**	J		**1.0**	J		**1.5**	J		100	U		1.1	U	
	Styrene	µg/kg	35,000,000	1,300	110	0.44	U		0.50	U		0.58	U		0.48	U		0.47	U		0.44	U		0.41	U		0.44	U		0.40	U		0.46	U		0.42	U		51	U		0.55	U	
	Tetrachloroethene	µg/kg	100,000	5.1	2.3	0.89	U		1.0	U		**0.36**	J		**0.52**	J		**2.0**			0.88	U		0.81	U		**2.8**			**5.2**			**2.8**			0.83	U		100	U		**2.1**	J	
	Toluene	µg/kg	47,000,000	760	690	**2.1**		J	**0.39**	J		**0.94**	J		**0.70**	J		**0.90**	J		**1.0**			**0.61**	J		**1.6**			**0.38**	J		**0.75**	J		**0.73**	J		**83.9**	J		**0.91**	J	
	Trichloroethene	µg/kg	6,000	0.18	1.8	0.44	U		**0.30**	J		**0.79**	J		**0.52**	J		**0.45**	J		**0.75**	J		**0.62**	J		**1.8**			**2.3**			**0.77**	J		0.42	U		**112**			**0.40**	J	
	m,p-Xylene	µg/kg	-	-	-	**1.6**		J	**0.44**	J		**1.1**	J		**0.72**	J		**0.47**	J		**0.56**	J		**0.38**	J		**0.98**			**0.24**	J		**0.45**	J		**0.24**	J		**122**			**0.54**	J	
	o-Xylene	µg/kg	2,800,000	190	-	**0.62**	J		0.50	U		**0.34**	J		**0.20**	J		**0.20**	J		**0.27**	J		**0.24**	J		**0.43**	J		0.40	U		0.46	U		0.42	U		**127**			**0.27**	J	
	Xylene (total)	µg/kg	2,500,000	190	9,900	**2.2**		J	**0.44**	J		**1.4**			**0.92**	J		**0.67**	J		**0.83**	J		**0.62**	J		**1.4**			**0.24**	J		**0.45**	J		**0.24**	J		**249**			**0.81**	J	

Notes:

bold, black: analyte detected

double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL

bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL

blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil

-: not applicable, no value available, or not sampled

MCL: maximum contaminant level

SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):

B: blank contamination

J-: estimated value, biased low

J: estimated value

R : data are unusable; See Data Review Report(s)

U: undetected; value recorded is the limit of detection (LOD)

UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.

2: Samples analyzed by SGS of Dayton, New Jersey

3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.

4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)

5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR

6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR

7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-1a. Analytical Sample Summary - Soil: Volatile Organic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-8			SB-9			SB-9 field duplicate			SB-9			SB-9			SB-9			SB-10			SB-10			SB-10			SB-10			SB-11			SB-11			SB-11		
	Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-8 (20-25)_042617			LF512RI_SB-9 (0-2.5)_050817			LF512RI_SB-9 (0-2.5)_050817_FD			LF512RI_SB-9 (10-12.5)_050817			LF512RI_SB-9 (12.5-15)_050817			LF512RI_SB-9 (22.5-25)_050817			LF512RI_SB-10 (2-4)_042617			LF512RI_SB-10 (6-8)_042617			LF512RI_SB-10 (22.5-25)_042617			LF512RI_SB-10 (25-27)_042617			LF512RI_SB-11 (4-6)_042517			LF512RI_SB-11 (6-8)_042517			LF512RI_SB-11 (10-15)_042517		
	Sampled Interval (feet):					20-25			0-2.5			0-2.5_FD			10-12.5			12.5-15			22.5-25			2-4			6-8			22.5-25			25-27			4-6			6-8			10-15		
	Laboratory[2] Sample ID:					*JC41973-25*			*JC42885-11*			*JC42885-16*			*JC42885-13*			*JC42885-14*			*JC42885-15*			*JC41973-29*			*JC41973-30*			*JC41973-31*			*JC41973-32*			*JC41973-9*			*JC41973-10*			*JC41973-11*		
	Date Sampled:					4/26/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			4/26/2017			4/26/2017			4/26/2017			4/26/2017			4/25/2017			4/25/2017			4/25/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Volatile Organic Compounds (SW846 8260C)																																										
	Acetone	µg/kg	670,000,000	2,900	-	**26.6**			**111**		J	**70.5**		J	**31.5**			**10.9**			**10.5**			4.7	U		**18.4**			**10.2**			**37.2**		J	**49.4**			5.3	U		4.2	U	
	Benzene	µg/kg	5,100	0.23	2.6	0.31	U		**0.22**	J		0.22	U		**0.30**	J		0.25	U		**0.23**	J		**1.4**			0.26	U		0.26	U		**0.96**			**0.27**	J		0.26	U		**0.28**	J	
	2-Butanone (MEK)	µg/kg	190,000,000	1,200	-	6.3	U		4.4	U		4.4	U		4.5	U		5.0	U		4.6	U		4.7	U		5.2	U		5.2	U		5.3	U		**6.8**	J		5.3	U		4.2	U	
	Carbon disulfide	µg/kg	3,500,000	240	-	**0.99**	J	B	0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U	UJ	0.52	U	UJ	0.52	U	UJ	**3.6**		B	**0.22**	J		0.53	U	UJ	0.42	U	UJ
	Carbon tetrachloride	µg/kg	2,900	0.18	1.9	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		0.53	U		0.45	U		0.53	U		0.42	U	
	Chlorobenzene	µg/kg	1,300,000	53	68	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		0.53	U		0.45	U		0.53	U		0.42	U	
	Chloroform	µg/kg	1,400	0.061	22	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		**0.51**	J		**0.28**	J		**0.89**	J		**0.34**	J		**0.72**	J	
	Chloromethane	µg/kg	460,000	49	-	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		**0.47**	J		0.45	U		0.53	U		0.42	U	
	Cyclohexane	µg/kg	27,000,000	13,000	-	1.3	U		0.89	U		0.87	U		0.91	U		0.99	U		0.92	U		**0.88**	J		1.0	U		1.0	U		1.1	U		0.90	U		1.1	U		0.84	U	
	1,2-Dichlorobenzene	µg/kg	9,300,000	300	580	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		0.53	U		**0.36**	J		0.53	U		0.42	U	
	1,3-Dichlorobenzene	µg/kg	-	-	-	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		0.53	U		0.45	U		0.53	U		0.42	U	
	1,4-Dichlorobenzene	µg/kg	11,000	0.46	72	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		0.53	U		0.45	U		0.53	U		0.42	U	
	1,2-Dichloroethane	µg/kg	2,000	0.048	1.4	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		0.53	U		0.45	U		0.53	U		**0.29**	J	
	1,1-Dichloroethene	µg/kg	1,000,000	100	2.5	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		0.53	U		0.45	U		0.53	U		0.42	U	
	cis-1,2-Dichloroethene	µg/kg	2,300,000	11	21	1.3	U		0.89	U		0.87	U		0.91	U		0.99	U		0.92	U		**1.4**			1.0	U		1.0	U		1.1	U		**2.3**			**3.2**			**6.5**		
	trans-1,2-Dichloroethene	µg/kg	23,000,000	110	31	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		**0.39**	J		0.52	U		0.52	U		0.53	U		0.45	U		0.53	U		0.42	U	
	Ethylbenzene	µg/kg	25,000	1.7	780	0.63	U		**0.27**	J		0.44	U		**0.42**	J		**0.35**	J		**0.25**	J		**0.37**	J		**0.33**	J		0.52	U		**0.84**	J		0.45	U		0.53	U		0.42	U	
	Isopropylbenzene	µg/kg	9,900,000	740	-	0.63	U		**0.18**	J		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		**0.16**	J		0.45	U		0.53	U		0.42	U	
	Methyl Acetate	µg/kg	1,200,000,000	4,100	-	3.1	U		**5.1**		J	2.2	U	UJ	2.3	U		2.5	U		2.3	U		2.4	U		2.6	U		2.6	U		2.7	U	UJ	2.3	U		2.6	U		2.1	U	
	Methylcyclohexane	µg/kg	-	-	-	1.3	U		0.89	U		0.87	U		**0.62**	J		**0.56**	J		**0.49**	J		**1.1**	J		1.0	U		1.0	U		**1.0**	J		**1.3**	J		1.1	U		**0.68**	J	
	4-Methyl-2-pentanone(MIBK)	µg/kg	140,000,000	1,400	-	2.5	U		1.8	U		1.7	U		1.8	U		2.0	U		1.8	U		1.9	U		2.1	U		2.1	U		**13.1**		J	1.8	U		2.1	U		1.7	U	
	Methylene chloride	µg/kg	1,000,000	2.9	1.3	1.3	U		0.89	U		0.87	U		0.91	U		0.99	U		**0.97**	J		**1.1**	J		**1.3**	J		**2.2**	J		1.1	U		0.90	U		1.1	U		0.84	U	
	Styrene	µg/kg	35,000,000	1,300	110	0.63	U		0.44	U		0.44	U		0.45	U		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		**1.0**	J		0.45	U		0.53	U		0.42	U	
	Tetrachloroethene	µg/kg	100,000	5.1	2.3	**3.6**			0.89	U		0.87	U		0.91	U		0.99	U		**4.4**			0.95	U		1.0	U		**5.6**			**5.2**			0.90	U		1.1	U		0.84	U	
	Toluene	µg/kg	47,000,000	760	690	**0.19**	J		**0.54**	J		0.44	U		**0.85**	J		**0.71**	J		**0.62**	J		**1.6**			**0.41**	J		**0.45**	J		**2.7**		J	**0.27**	J		0.53	U		**0.28**	J	
	Trichloroethene	µg/kg	6,000	0.18	1.8	**0.31**	J		**2.7**		J	0.44	U	UJ	**0.72**	J		0.50	U		0.46	U		**12.1**			0.52	U		**3.7**			**10.4**		J	**12.8**			**15.3**			**20.8**		
	m,p-Xylene	µg/kg	-	-	-	0.63	U		**0.59**	J		0.44	U		**0.69**	J		**0.66**	J		**0.44**	J		**1.0**			**1.1**			**0.36**	J		**1.3**			**0.41**	J		0.53	U		**0.20**	J	
	o-Xylene	µg/kg	2,800,000	190	-	0.63	U		**0.20**	J		0.44	U		**0.23**	J		0.50	U		0.46	U		0.47	U		0.52	U		0.52	U		**0.53**	J		**0.29**	J		0.53	U		0.42	U	
	Xylene (total)	µg/kg	2,500,000	190	9,900	0.63	U		**0.79**	J		0.44	U		**0.92**			**0.66**	J		**0.44**	J		**1.0**			**1.1**			**0.36**	J		**1.8**			**0.70**	J		0.53	U		**0.20**	J	

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

Table 4-1a. Analytical Sample Summary - Soil: Volatile Organic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	**Location ID:**	Units	**Project Action Limits[1]**			**SB-11**			**SB-11 field duplicate**			**SB-12**			**SB-12 field duplicate**			**SB-12**			**SB-12**			**SB-12**			**SB-13**			**SB-13**			**SB-13**			**SB-13**			**SB-14**			**SB-14**		
	Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-11 (24-26)_042517			LF512RI_SB-11 (24-26)_042517_FD[6]			LF512RI_SB-12 (0-2.5)_050917			LF512RI_SB-12 (0-2.5)_050917_FD			LF512RI_SB-12 (10-12.5)_050917			LF512RI_SB-12 (15-20)_050917			LF512RI_SB-12 (22.5-25)_050917			LF512RI_SB-13 (0-2.5)_051017			LF512RI_SB-13 (7.5-10)_051017			LF512RI_SB-13 (12.5-15)_051017			LF512RI_SB-13 (20-22.5)_051017			LF512RI_SB-14 (0-2)_042517			LF512RI_SB-14 (12-14)_042517		
	Sampled Interval (feet):					24-26			24-26_FD			0-2.5			0-2.5_FD			10-12.5			15-20			22.5-25			0-2.5			7.5-10			12.5-15			20-22.5			0-2			12-14		
	Laboratory[2] Sample ID:					*JC41973-12*			*JC41973-13*			*JC42953-16*			*JC42953-17*			*JC42953-18*			*JC42953-19*			*JC42953-20*			*JC43060-14*			*JC43060-16*			*JC43060-17*			*JC43060-18*			*JC41973-14*			*JC41973-20*		
	Date Sampled:					4/25/2017			4/25/2017			5/9/2017			5/9/2017			5/9/2017			5/9/2017			5/9/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			4/25/2017			4/25/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Volatile Organic Compounds (SW846 8260C)																																											
	Acetone	µg/kg	670,000,000	2,900	-	5.1	U	UJ	**11.5**		J	**30.1**			**26.4**			**27.9**			**78**			**42.2**			**64.4**			**74.5**			**19**			**18.4**			6.3	U		4.7	U	UJ
	Benzene	µg/kg	5,100	0.23	2.6	0.26	U		**0.20**	J		**0.25**	J		0.21	U		0.25	U		0.34	U		**1.1**			**0.75**			0.33	U		0.21	U		**0.40**	J		0.31	U		0.23	U	
	2-Butanone (MEK)	µg/kg	190,000,000	1,200	-	5.1	U		5.6	U		4.2	U		4.1	U		4.9	U		6.8	U		5.0	U		**11**			**18.6**			4.3	U		5.4	U		6.3	U		4.7	U	
	Carbon disulfide	µg/kg	3,500,000	240	-	0.51	U	UJ	0.56	U	UJ	0.42	U		0.41	U		0.49	U		0.68	U		0.50	U		0.42	U		0.66	U		0.43	U		**0.25**	J		0.63	U	UJ	0.47	U	
	Carbon tetrachloride	µg/kg	2,900	0.18	1.9	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		**0.34**	J		0.42	U		0.66	U		0.43	U		**0.43**	J		0.63	U		0.47	U	
	Chlorobenzene	µg/kg	1,300,000	53	68	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		**0.75**	J		0.50	U		0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	Chloroform	µg/kg	1,400	0.061	22	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		**0.35**	J		0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	Chloromethane	µg/kg	460,000	49	-	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		0.50	U		0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	Cyclohexane	µg/kg	27,000,000	13,000	-	1.0	U		1.1	U		0.84	U		0.83	U		0.99	U		1.4	U		1.0	U		**1.2**	J		1.3	U		0.85	U		**0.65**	J		1.3	U		0.94	U	
	1,2-Dichlorobenzene	µg/kg	9,300,000	300	580	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		**0.27**	J		0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	1,3-Dichlorobenzene	µg/kg	-	-	-	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		0.50	U		0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	1,4-Dichlorobenzene	µg/kg	11,000	0.46	72	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		0.50	U		0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	1,2-Dichloroethane	µg/kg	2,000	0.048	1.4	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		**1.3**			0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	1,1-Dichloroethene	µg/kg	1,000,000	100	2.5	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		0.50	U		0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	cis-1,2-Dichloroethene	µg/kg	2,300,000	11	21	1.0	U		1.1	U		0.84	U		0.83	U		0.99	U		1.4	U		**0.49**	J		0.84	U		1.3	U		0.85	U		1.1	U		1.3	U		0.94	U	
	trans-1,2-Dichloroethene	µg/kg	23,000,000	110	31	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		0.50	U		0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	Ethylbenzene	µg/kg	25,000	1.7	780	0.51	U		0.56	U		**0.21**	J		0.41	U		0.49	U		0.68	U		**0.39**	J		**0.69**	J		0.66	U		0.43	U		**0.54**	J		0.63	U		**0.32**	J	
	Isopropylbenzene	µg/kg	9,900,000	740	-	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		**0.45**	J		0.50	U		0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	Methyl Acetate	µg/kg	1,200,000,000	4,100	-	2.6	U		2.8	U		2.1	U		2.1	U		2.5	U		**14.1**			2.5	U		**16**			**28.4**			2.1	U		2.7	U		3.1	U		2.3	U	UJ
	Methylcyclohexane	µg/kg	-	-	-	1.0	U		1.1	U		**0.69**	J		0.83	U		0.99	U		1.4	U		**0.70**	J		**2.4**			1.3	U		0.85	U		**1.2**	J		1.3	U		0.94	U	
	4-Methyl-2-pentanone(MIBK)	µg/kg	140,000,000	1,400	-	2.1	U		2.3	U		1.7	U		1.7	U		2.0	U		2.7	U		2.0	U		1.7	U		2.6	U		1.7	U		2.2	U		2.5	U		1.9	U	
	Methylene chloride	µg/kg	1,000,000	2.9	1.3	1.0	U		1.1	U		**15.4**		J	**11.8**		J	**15**			**2.4**	J		**13.7**			0.84	U		1.3	U		0.85	U		1.1	U		1.3	U		0.94	U	
	Styrene	µg/kg	35,000,000	1,300	110	0.51	U		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		0.50	U		0.42	U		0.66	U		0.43	U		0.54	U		0.63	U		0.47	U	
	Tetrachloroethene	µg/kg	100,000	5.1	2.3	**3.7**		J	**6.0**		J	0.84	U		0.83	U		0.99	U		**0.70**	J		**3.7**			0.84	U		1.3	U		0.85	U		1.1	U		1.3	U		0.94	U	
	Toluene	µg/kg	47,000,000	760	690	**0.26**	J		**0.42**	J		**0.55**	J		**0.17**	J		0.49	U		**0.28**	J		**1.5**			**2.4**			**0.70**	J		**0.30**	J		**1.1**			0.63	U		**0.40**	J	
	Trichloroethene	µg/kg	6,000	0.18	1.8	**1.8**		J	**2.9**		J	**3.2**		J	**4.5**		J	**13.6**			**3.4**			**13**			0.42	U		**0.71**	J		**1.6**			**12.7**			0.63	U		0.47	U	
	m,p-Xylene	µg/kg	-	-	-	**0.27**	J		0.56	U		**0.31**	J		0.41	U		0.49	U		0.68	U		**0.83**	J		**1.7**			0.66	U		0.43	U		**0.80**	J		0.63	U		**1.1**		
	o-Xylene	µg/kg	2,800,000	190	-	0.51	U		0.56	U		**0.23**	J		0.41	U		0.49	U		0.68	U		**0.42**	J		**0.68**	J		0.66	U		0.43	U		**0.42**	J		0.63	U		0.47	U	
	Xylene (total)	µg/kg	2,500,000	190	9,900	**0.27**	J		0.56	U		0.42	U		0.41	U		0.49	U		0.68	U		**0.83**	J		**2.4**			0.66	U		0.43	U		**0.80**	J		0.63	U		**1.1**		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R : data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-1a. Analytical Sample Summary - Soil: Volatile Organic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-14			SB-14			SB-15			SB-15 field duplicate			SB-15			SB-15			SB-15			SB-16			SB-16			SB-16			SB-16		
	Field Sample ID:		USEPA RSL Industrial Soil (5/2018)	USEPA RSL Risk-based SSL (5/2018)	USEPA RSL MCL-based SSL (5/2018)	LF512RI_SB-14 (18-20)_042517			LF512RI_SB-14 (25-27)_042617			LF512RI_SB-15 (7.5-10)_051017			LF512RI_SB-15 (7.5-10)_051017_FD			LF512RI_SB-15 (12.5-15)_051017			LF512RI_SB-15 (17.5-20)_051017			LF512RI_SB-15 (22.5-25)_051017			LF512RI_SB-16 (7.5-10)_051017			LF512RI_SB-16 (12.5-15)_051017			LF512RI_SB-16 (17.5-20)_051017			LF512RI_SB-16 (25-27.5)_051017		
	Sampled Interval (feet):					18-20			25-27			7.5-10			7.5-10_FD			12.5-15			17.5-20			22.5-25			7.5-10			12.5-15			17.5-20			25-27.5		
	Laboratory[2] Sample ID:					*JC41973-23*			*JC41973-33*			*JC43060-4*			*JC43060-5*			*JC43060-6*			*JC43060-7*			*JC43060-8*			*JC43060-10*			*JC43060-11*			*JC43060-12*			*JC43060-13*		
	Date Sampled:					4/25/2017			4/26/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Volatile Organic Compounds (SW846 8260C)																																					
	Acetone	µg/kg	670,000,000	2,900	-	**14.5**			**6.0**	J		**18.2**			**21**			**24.1**			**33.3**			**39.1**			**16.6**			**29.4**			**34.8**			**31.2**		
	Benzene	µg/kg	5,100	0.23	2.6	0.28	U		**0.52**			**0.56**	J		**0.26**	J		**0.41**	J		**0.32**	J		**0.33**	J		**0.33**	J		**0.68**			**0.48**	J		**0.62**		
	2-Butanone (MEK)	µg/kg	190,000,000	1,200	-	5.5	U		4.7	U		6.2	U		6.8	U		5.1	U		5.7	U		5.9	U		4.8	U		4.9	U		**6.6**	J		4.9	U	
	Carbon disulfide	µg/kg	3,500,000	240	-	0.55	U	UJ	0.47	U	UJ	0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		**0.30**	J	
	Carbon tetrachloride	µg/kg	2,900	0.18	1.9	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	Chlorobenzene	µg/kg	1,300,000	53	68	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	Chloroform	µg/kg	1,400	0.061	22	0.55	U		**0.76**	J		0.62	U		**1.8**	J		0.51	U		**0.39**	J		**0.65**	J		**0.28**	J		0.49	U		0.53	U		0.49	U	
	Chloromethane	µg/kg	460,000	49	-	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	Cyclohexane	µg/kg	27,000,000	13,000	-	1.1	U		0.95	U		1.2	U		1.4	U		**0.56**	J		1.1	U		1.2	U		0.97	U		0.98	U		1.1	U		**0.74**	J	
	1,2-Dichlorobenzene	µg/kg	9,300,000	300	580	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	1,3-Dichlorobenzene	µg/kg	-	-	-	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	1,4-Dichlorobenzene	µg/kg	11,000	0.46	72	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	1,2-Dichloroethane	µg/kg	2,000	0.048	1.4	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	1,1-Dichloroethene	µg/kg	1,000,000	100	2.5	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	cis-1,2-Dichloroethene	µg/kg	2,300,000	11	21	1.1	U		0.95	U		1.2	U	UJ	**5.1**		J	1.0	U		1.1	U		1.2	U		**1.4**			0.98	U		1.1	U		0.98	U	
	trans-1,2-Dichloroethene	µg/kg	23,000,000	110	31	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	Ethylbenzene	µg/kg	25,000	1.7	780	**0.39**	J		**0.33**	J		**0.55**	J		0.68	U		**0.56**	J		**0.40**	J		**0.34**	J		0.48	U		**0.76**	J		**0.54**	J		**0.98**		
	Isopropylbenzene	µg/kg	9,900,000	740	-	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	Methyl Acetate	µg/kg	1,200,000,000	4,100	-	2.8	U		**4.5**	J		3.1	U		3.4	U		**4.1**	J		**4.1**	J		**5.9**			2.4	U		**4.3**	J		**10.1**			**5.1**		
	Methylcyclohexane	µg/kg	-	-	-	1.1	U		**0.80**	J		**0.98**	J		**0.79**	J		**0.90**	J		1.1	U		1.2	U		0.97	U		**1.0**	J		**1.2**	J		**1.7**	J	
	4-Methyl-2-pentanone(MIBK)	µg/kg	140,000,000	1,400	-	2.2	U		1.9	U		2.5	U		2.7	U		2.0	U		2.3	U		2.4	U		1.9	U		2.0	U		2.1	U		2.0	U	
	Methylene chloride	µg/kg	1,000,000	2.9	1.3	1.1	U		0.95	U		1.2	U		1.4	U		1.0	U		1.1	U		1.2	U		0.97	U		0.98	U		1.1	U		0.98	U	
	Styrene	µg/kg	35,000,000	1,300	110	0.55	U		0.47	U		0.62	U		0.68	U		0.51	U		0.57	U		0.59	U		0.48	U		0.49	U		0.53	U		0.49	U	
	Tetrachloroethene	µg/kg	100,000	5.1	2.3	**0.48**	J		**12.2**			**0.37**	J		**0.63**	J		1.0	U		**1.3**	J		**3.9**			0.97	U		0.98	U		**0.98**	J		**0.98**	J	
	Toluene	µg/kg	47,000,000	760	690	**0.52**	J		**1.2**			**1.6**			**0.28**	J		**1.4**			**1.1**			**1.5**			**0.63**	J		**2.0**			**1.5**			**2.3**		
	Trichloroethene	µg/kg	6,000	0.18	1.8	**1.6**			**5.9**			**17.6**		J	**88.7**		J	**7.6**			**2.7**			**1.5**			**14.9**			**5.4**			**3.1**			**4.7**		
	m,p-Xylene	µg/kg	-	-	-	**1.5**			**0.47**	J		**0.80**	J		0.68	U		**0.80**	J		**0.61**	J		**0.54**	J		**0.24**	J		**0.99**			**0.71**	J		**1.3**		
	o-Xylene	µg/kg	2,800,000	190	-	0.55	U		0.47	U		**0.32**	J		0.68	U		**0.35**	J		**0.27**	J		0.59	U		0.48	U		**0.43**	J		**0.34**	J		**0.61**	J	
	Xylene (total)	µg/kg	2,500,000	190	9,900	**1.5**			**0.47**	J		**0.80**	J		0.68	U		**0.80**	J		**0.61**	J		**0.54**	J		**0.24**	J		**0.99**			**0.71**	J		**1.3**		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-1b. Analytical Sample Summary - Soil: Semi-volatile Organic Compounds and Total Petroleum Hydrocarbons
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-1			SB-1			SB-1 field duplicate			SB-1			SB-1			SB-2			SB-2			SB-2			SB-2			SB-3			SB-3 field duplicate			SB-3			SB-3		
	Field Sample ID:		USEPA RSL Industrial Soil (5/2018)	USEPA RSL Risk-based SSL (5/2018)	USEPA RSL MCL-based SSL (5/2018)	LF512RI_SB-1 (2.5-5)_050917[4]			LF512RI_SB-1 (12.5-15)_050917			LF512RI_SB-1 (12.5-15)_050917_FD			LF512RI_SB-1 (17.5-20)_050917			LF512RI_SB-1 (22.5-25)_050917			LF512RI_SB-2 (0-2.5)_050817			LF512RI_SB-2 (5-7.5)_050817			LF512RI_SB-2 (10-12.5)_050817			LF512RI_SB-2 (22.5-24)_050817			LF512RI_SB-3 (7.5-10)_050917			LF512RI_SB-3 (7.5-10)_050917_FD			LF512RI_SB-3 (17.5-20)_050917			LF512RI_SB-3 (20-22.5)_050917		
	Sampled Interval (feet):					2.5-5			12.5-15			12.5-15_FD			17.5-20			22.5-25			0-2.5			5-7.5			10-12.5			22.5-24			7.5-10			7.5-10_FD			17.5-20			20-22.5		
	Laboratory[2] Sample ID:					*JC42953-4*			*JC42953-5*			*JC42953-6*			*JC42953-7*			*JC42953-8*			*JC42885-17*			*JC42885-18*			*JC42885-19*			*JC42885-20*			*JC42953-10*			*JC42953-11*			*JC42953-13*			*JC42953-14*		
	Date Sampled:					5/9/2017			5/9/2017			5/9/2017			5/9/2017			5/9/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			5/9/2017			5/9/2017			5/9/2017			5/9/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Semi-volatile Organic Compounds (SW846 8270D)																																											
	2,4-Dimethylphenol	µg/kg	16,000,000	420	-	80	U		84	U		86	U		85	U		85	U		88	U	UJ	86	U		83	U		87	U		85	U		85	U		87	U		89	U	
	2-Methylphenol	µg/kg	41,000,000	750	-	32	U		34	U		34	U		34	U		34	U		35	U	UJ	34	U		33	U		35	U		34	U		34	U		35	U		35	U	
	3&4-Methylphenol	µg/kg	-	-	-	32	U		34	U		34	U		34	U		34	U		35	U	UJ	34	U		33	U		35	U		34	U		34	U		35	U		35	U	
	Phenol	µg/kg	250,000,000	3,300	-	32	U		34	U		34	U		34	U		34	U		35	U	UJ	34	U		33	U		35	U		34	U		34	U		35	U		35	U	
	Acenaphthene	µg/kg	45,000,000	5,500	-	32	U		34	U		34	U		34	U		34	U		**169**			34	U		33	U		35	U		34	U		34	U		35	U		35	U	
	Acenaphthylene	µg/kg	-	-	-	19	U		20	U		21	U		20	U		20	U		**54.4**			21	U		20	U		21	U		20	U		20	U		21	U		21	U	
	Acetophenone	µg/kg	120,000,000	580	-	16	U		17	U		17	U		17	U		17	U		18	U		17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Anthracene	µg/kg	230,000,000	58,000	-	24	U		25	U		26	U		26	U		25	U		**373**			26	U		25	U		26	U		25	U		25	U		26	U		27	U	
	Benzo(a)anthracene	µg/kg	21,000	11	-	16	U		17	U		17	U		17	U		17	U		**1,030**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
X	**Benzo(a)pyrene**	µg/kg	2,100	29	240	16	U		17	U		17	U		17	U		17	U		**826**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
X	**Benzo(b)fluoranthene**	µg/kg	21,000	300	-	16	U		17	U		17	U		17	U		17	U		**1,280**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Benzo(g,h,i)perylene	µg/kg	-	-	-	16	U		17	U		17	U		17	U		17	U		**541**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Benzo(k)fluoranthene	µg/kg	210,000	2,900	-	16	U		17	U		17	U		17	U		17	U		**451**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	1,1'-Biphenyl	µg/kg	200,000	8.7	-	16	U		17	U		17	U		17	U		17	U		**37.1**	J		17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Benzaldehyde	µg/kg	820,000	4.1	-	16	U		17	U		17	U		17	U		17	U		18	U		17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Carbazole	µg/kg	-	-	-	32	U		34	U		34	U		34	U		34	U		**524**			34	U		33	U		35	U		34	U		34	U		35	U		35	U	
	Caprolactam	µg/kg	400,000,000	2,500	-	32	U		34	U		34	U		34	U		34	U		35	U		34	U		33	U		35	U		34	U		34	U		35	U		35	U	
	Chrysene	µg/kg	2,100,000	9,000	-	16	U		17	U		17	U		17	U		17	U		**1,290**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
X	**Dibenzo(a,h)anthracene**	µg/kg	2,100	96	-	16	U		17	U		17	U		17	U		17	U		**147**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Dibenzofuran	µg/kg	1,000,000	150	-	16	U		17	U		17	U		17	U		17	U		**181**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Di-n-butyl phthalate	µg/kg	82,000,000	2,300	-	16	U		17	U		17	U		17	U		17	U		18	U		17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	bis(2-Ethylhexyl)phthalate	µg/kg	160,000	1,300	1,400	32	U		34	U		34	U		34	U		34	U		35	U		34	U		33	U		35	U		34	U		34	U		35	U		35	U	
	Fluoranthene	µg/kg	30,000,000	89,000	-	16	U		17	U		17	U		17	U		17	U		**3,520**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Fluorene	µg/kg	30,000,000	5,400	-	32	U		34	U		34	U		34	U		34	U		**344**			34	U		33	U		35	U		34	U		34	U		35	U		35	U	
	Hexachlorobenzene	µg/kg	960	0.12	13	16	U		17	U		17	U		17	U		17	U		18	U		17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Indeno(1,2,3-cd)pyrene	µg/kg	21,000	980	-	32	U		34	U		34	U		34	U		34	U		**602**			34	U		33	U		35	U		34	U		34	U		35	U		35	U	
	2-Methylnaphthalene	µg/kg	3,000,000	190	-	16	U		17	U		17	U		17	U		17	U		**84.3**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	4-Nitroaniline	µg/kg	110,000	1.6	-	160	U		170	U		170	U		170	U		170	U		180	U		170	U		170	U		170	U		170	U		170	U		170	U		180	U	
	Naphthalene	µg/kg	17,000	0.54	-	16	U		17	U		17	U		17	U		17	U		**46.2**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Phenanthrene	µg/kg	-	-	-	16	U		17	U		17	U		17	U		17	U		**2,700**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Pyrene	µg/kg	23,000,000	13,000	-	16	U		17	U		17	U		17	U		17	U		**3,180**			17	U		17	U		17	U		17	U		17	U		17	U		18	U	
	Total Petroleum Hydrocarbons (SW846 8015C)		**Maximum Allowable Residual TPH Type 1 Soils[8]**		**OEPA Soil Leaching to Groundwater[9]**																																							
	TPH-GRO (C6-C12)	mg/kg	1,000	-	3.1	12	U		11	U		18	U		11	U		10	U		9.7	U		9.1	U		11	U		12	U		10	U		12	U		8.6	U		11	U	
	TPH-DRO (C10-C20)	mg/kg	2,000	-	2.7	7.4	U		7.4	U		6.9	U		7.9	U		7.3	U		**50.3**			**15.4**			7.3	U		**10.3**			7.0	U		6.6	U		8.1	U		8.1	U	
	TPH-ORO (>C28-C40)	mg/kg	5,000	-	5,000	7.4	U		7.4	U		6.9	U		7.9	U		7.3	U		**242**			6.6	U		7.3	U		7.1	U		7.0	U		6.6	U		8.1	U		8.1	U	
	TPH-ORO (C20-C34)	mg/kg	5,000	-	5,000	7.4	U		7.4	U		6.9	U		7.9	U		7.3	U		**304**			**13.7**			7.3	U		7.1	U		7.0	U		6.6	U		8.1	U		8.1	U	
	Total OH TPH (C10-C34)	mg/kg	-	-	-	7.4	U		7.4	U		6.9	U		7.9	U		7.3	U		**354**			**29.1**			7.3	U		**10.3**			7.0	U		6.6	U		8.1	U		8.1	U	

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
lilac shading: analyte detected at a value exceeding the OEPA TPH Standard
bold, purple: analyte detected at a value exceeding the OEPA Leaching Standard
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.
8: Ohio Residual Saturation Concentrations for Type 1 Soils (i.e., Maximum Allowable Residual Total Petroleum Hydrocarbon [TPH] Type 1 Soils)
9: Ohio Environmental Protection Agency (OEPA) Soil Leaching to Groundwater Standards

Table 4-1b. Analytical Sample Summary - Soil: Semi-volatile Organic Compounds and Total Petroleum Hydrocarbons
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	**Location ID:**	Units	**Project Action Limits[1]**			**SB-3**			**SB-4**			**SB-4**			**SB-4**			**SB-4**			**SB-4**		
	Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-3 (22.5-25)_050917			LF512RI_SB-4 (0-2.5)_042717			LF512RI_SB-4 (0-2.5)_042817			LF512RI_SB-4 (5-10)_042717			LF512RI_SB-4 (5-10)_042817			LF512RI_SB-4 (12.5-15)_042717		
	Sampled Interval (feet):					22.5-25			0-2.5			0-2.5			5-10			5-10			12.5-15		
	Laboratory[2] Sample ID:					*JC42953-15*			*JC41973-42*			*JC42293-2*			*JC41973-43*			*JC42293-3*			*JC41973-44*		
	Date Sampled:					5/9/2017			4/27/2017			4/28/2017			4/27/2017			4/28/2017			4/27/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Semi-volatile Organic Compounds (SW846 8270D)																						
	2,4-Dimethylphenol	µg/kg	16,000,000	420	-	87	U		-			440	U		-			84	U		-		
	2-Methylphenol	µg/kg	41,000,000	750	-	35	U		-			180	U		-			34	U		-		
	3&4-Methylphenol	µg/kg	-	-	-	35	U		-			180	U		-			34	U		-		
	Phenol	µg/kg	250,000,000	3,300	-	35	U		-			180	U		-			34	U		-		
	Acenaphthene	µg/kg	45,000,000	5,500	-	35	U		-			180	U		-			34	U		-		
	Acenaphthylene	µg/kg	-	-	-	21	U		-			110	U		-			20	U		-		
	Acetophenone	µg/kg	120,000,000	580	-	17	U		-			88	U		-			17	U		-		
	Anthracene	µg/kg	230,000,000	58,000	-	26	U		-			**259**			-			25	U		-		
	Benzo(a)anthracene	µg/kg	21,000	11	-	17	U		-			**866**			-			**36.2**			-		
X	**Benzo(a)pyrene**	µg/kg	2,100	29	240	17	U		-			**853**			-			**33.3**	J		-		
X	**Benzo(b)fluoranthene**	µg/kg	21,000	300	-	17	U		-			**1,150**			-			**45.2**			-		
	Benzo(g,h,i)perylene	µg/kg	-	-	-	17	U		-			**633**			-			**26.1**	J		-		
	Benzo(k)fluoranthene	µg/kg	210,000	2,900	-	17	U		-			**450**			-			**20.9**	J		-		
	1,1'-Biphenyl	µg/kg	200,000	8.7	-	17	U		-			88	U		-			17	U		-		
	Benzaldehyde	µg/kg	820,000	4.1	-	17	U		-			88	U		-			17	U		-		
	Carbazole	µg/kg	-	-	-	35	U		-			**136**	J		-			34	U		-		
	Caprolactam	µg/kg	400,000,000	2,500	-	**52.6**	J		-			180	U		-			34	U		-		
	Chrysene	µg/kg	2,100,000	9,000	-	17	U		-			**1,100**			-			**46.3**			-		
X	**Dibenzo(a,h)anthracene**	µg/kg	2,100	96	-	17	U		-			**183**			-			17	U		-		
	Dibenzofuran	µg/kg	1,000,000	150	-	17	U		-			**133**	J		-			17	U		-		
	Di-n-butyl phthalate	µg/kg	82,000,000	2,300	-	17	U		-			88	U		-			17	U		-		
	bis(2-Ethylhexyl)phthalate	µg/kg	160,000	1,300	1,400	35	U		-			180	U		-			34	U		-		
	Fluoranthene	µg/kg	30,000,000	89,000	-	17	U		-			**2,130**			-			**81**			-		
	Fluorene	µg/kg	30,000,000	5,400	-	35	U		-			180	U		-			34	U		-		
	Hexachlorobenzene	µg/kg	960	0.12	13	17	U		-			88	U		-			17	U		-		
	Indeno(1,2,3-cd)pyrene	µg/kg	21,000	980	-	35	U		-			**613**			-			**23.1**	J		-		
	2-Methylnaphthalene	µg/kg	3,000,000	190	-	17	U		-			**201**	J		-			17	U		-		
	4-Nitroaniline	µg/kg	110,000	1.6	-	170	U		-			880	U		-			170	U		-		
	Naphthalene	µg/kg	17,000	0.54	-	17	U		-			**172**	J		-			17	U		-		
	Phenanthrene	µg/kg	-	-	-	17	U		-			**1,530**			-			**62.8**			-		
	Pyrene	µg/kg	23,000,000	13,000	-	17	U		-			**1,910**			-			**70.1**			-		
	Total Petroleum Hydrocarbons (SW846 8015C)		**Maximum Allowable Residual TPH Type 1 Soils[8]**		**OEPA Soil Leaching to Groundwater[9]**																		
	TPH-GRO (C6-C12)	mg/kg	1,000	-	3.1	11	U		**13.7**	J		19	U		8.2	U		-			10	U	
	TPH-DRO (C10-C20)	mg/kg	2,000	-	2.7	6.8	U		-			**49.5**			-			**10.1**			-		
	TPH-ORO (>C28-C40)	mg/kg	5,000	-	5,000	6.8	U		-			7.0	U		-			7.0	U		-		
	TPH-ORO (C20-C34)	mg/kg	5,000	-	5,000	6.8	U		-			**183**			-			**36.9**			-		
	Total OH TPH (C10-C34)	mg/kg	-	-	-	6.8	U		-			**232**			-			**47**			-		

COPC[3]	**Location ID:**	Units	**SB-4**			**SB-4**			**SB-5**			**SB-5**			**SB-5**			**SB-5**		
	Field Sample ID:		LF512RI_SB-4 (12.5-15)_042817			LF512RI_SB-4 (22.5-25)_042717			LF512RI_SB-5 (2.5-5)_042717			LF512RI_SB-5 (7.5-10)_042717			LF512RI_SB-5 (15-20)_042717[5]			LF512RI_SB-5 (22.5-25)_042717		
	Sampled Interval (feet):		12.5-15			22.5-25			2.5-5			7.5-10			15-20			22.5-25		
	Laboratory[2] Sample ID:		*JC42293-4*			*JC41973-45*			*JC41973-37*			*JC41973-38*			*JC41973-39*			*JC41973-41*		
	Date Sampled:		4/28/2017			4/27/2017			4/27/2017			4/27/2017			4/27/2017			4/27/2017		
	Result[7] and Qualifiers:		Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Semi-volatile Organic Compounds (SW846 8270D)																				
	2,4-Dimethylphenol	µg/kg	92	U		87	U		82	U		85	U		83	U		81	U	
	2-Methylphenol	µg/kg	37	U		35	U		33	U		34	U		33	U		33	U	
	3&4-Methylphenol	µg/kg	37	U		35	U		33	U		34	U		33	U		33	U	
	Phenol	µg/kg	37	U		35	U		33	U		34	U		33	U		33	U	
	Acenaphthene	µg/kg	37	U		35	U		33	U		34	U		33	U		33	U	
	Acenaphthylene	µg/kg	22	U		21	U		20	U		20	U		20	U		20	U	
	Acetophenone	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Anthracene	µg/kg	28	U		26	U		25	U		25	U		25	U		24	U	
	Benzo(a)anthracene	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
X	**Benzo(a)pyrene**	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
X	**Benzo(b)fluoranthene**	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Benzo(g,h,i)perylene	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Benzo(k)fluoranthene	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	1,1'-Biphenyl	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Benzaldehyde	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Carbazole	µg/kg	37	U		35	U		33	U		34	U		33	U		33	U	
	Caprolactam	µg/kg	37	U		35	U		33	U		34	U		33	U		33	U	
	Chrysene	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
X	**Dibenzo(a,h)anthracene**	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Dibenzofuran	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Di-n-butyl phthalate	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	bis(2-Ethylhexyl)phthalate	µg/kg	37	U		35	U		33	U		34	U		33	U		33	U	
	Fluoranthene	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Fluorene	µg/kg	37	U		35	U		33	U		34	U		33	U		33	U	
	Hexachlorobenzene	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Indeno(1,2,3-cd)pyrene	µg/kg	37	U		35	U		33	U		34	U		33	U		33	U	
	2-Methylnaphthalene	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	4-Nitroaniline	µg/kg	180	U		170	U		160	U		170	U		170	U		160	U	
	Naphthalene	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Phenanthrene	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Pyrene	µg/kg	18	U		17	U		16	U		17	U		17	U		16	U	
	Total Petroleum Hydrocarbons (SW846 8015C)																				
	TPH-GRO (C6-C12)	mg/kg	-			8.0	U		11	U		9.5	U		11	U		10	U	
	TPH-DRO (C10-C20)	mg/kg	**14.4**			**27.3**			7.5	U		7.6	U		**54.1**			**38**		
	TPH-ORO (>C28-C40)	mg/kg	7.9	U		6.9	U		7.5	U		7.6	U		**20.1**			**21.7**		
	TPH-ORO (C20-C34)	mg/kg	**29.5**			**33**			7.5	U		7.6	U		**54.4**			**54.3**		
	Total OH TPH (C10-C34)	mg/kg	**43.9**			**60.3**			7.5	U		7.6	U		**109**			**92.3**		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
lilac shading: analyte detected at a value exceeding the OEPA TPH Standard
bold, purple: analyte detected at a value exceeding the OEPA Leaching Standard
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.
8: Ohio Residual Saturation Concentrations for Type 1 Soils (i.e., Maximum Allowable Residual Total Petroleum Hydrocarbon [TPH] Type 1 Soils)
9: Ohio Environmental Protection Agency (OEPA) Soil Leaching to Groundwater Standards

Table 4-1b. Analytical Sample Summary - Soil: Semi-volatile Organic Compounds and Total Petroleum Hydrocarbons
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-6			SB-6 field duplicate			SB-6			SB-6			SB-6			SB-7			SB-7 field duplicate			SB-7			SB-7			SB-7			SB-8			SB-8			SB-8		
	Field Sample ID:		USEPA RSL Industrial Soil (5/2018)	USEPA RSL Risk-based SSL (5/2018)	USEPA RSL MCL-based SSL (5/2018)	LF512RI_SB-6 (0-2.5)_050817			LF512RI_SB-6 (0-2.5)_050817_FD			LF512RI_SB-6 (15-17.5)_050817			LF512RI_SB-6 (17.5-20)_050817			LF512RI_SB-6 (22-24)_050817			LF512RI_SB-7 (0-5)_042817			LF512RI_SB-7 (0-5)_042817_FD			LF512RI_SB-7 (15-20)_042817			LF512RI_SB-7 (20-22.5)_042817			LF512RI_SB-7 (22.5-25)_042817			LF512RI_SB-8 (2-5)_042517			LF512RI_SB-8 (12-14)_042517			LF512RI_SB-8 (15-20)_042617		
	Sampled Interval (feet):					0-2.5			0-2.5_FD			15-17.5			17.5-20			22-24			0-5			0-5_FD			15-20			20-22.5			22.5-25			2-5			12-14			15-20		
	Laboratory[2] Sample ID:					*JC42885-3*			*JC42885-4*			*JC42885-8*			*JC42885-9*			*JC42885-10*			*JC42293-5*			*JC42293-6*			*JC42293-8*			*JC42293-9*			*JC42293-10*			*JC41973-5*			*JC41973-7*			*JC41973-24*		
	Date Sampled:					5/8/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			4/28/2017			4/28/2017			4/28/2017			4/28/2017			4/28/2017			4/25/2017			4/25/2017			4/26/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Semi-volatile Organic Compounds (SW846 8270D)																																											
	2,4-Dimethylphenol	µg/kg	16,000,000	420	-	450	U		430	U		86	U		85	U		87	U		86	U	UJ	85	U		85	U		82	U		87	U		83	U		93	U		-		
	2-Methylphenol	µg/kg	41,000,000	750	-	180	U		170	U		35	U		34	U		35	U		34	U	UJ	34	U		34	U		33	U		35	U		33	U		37	U		-		
	3&4-Methylphenol	µg/kg	-	-	-	180	U		170	U		35	U		34	U		35	U		34	U	UJ	34	U		34	U		33	U		35	U		33	U		37	U		-		
	Phenol	µg/kg	250,000,000	3,300	-	180	U		170	U		35	U		34	U		35	U		34	U	UJ	34	U		34	U		33	U		35	U		33	U		37	U		-		
	Acenaphthene	µg/kg	45,000,000	5,500	-	180	U		170	U		35	U		34	U		35	U		34	U		34	U		34	U		33	U		35	U		33	U		**723**			-		
	Acenaphthylene	µg/kg	-	-	-	110	U		100	U		21	U		20	U		21	U		21	U		20	U		20	U		20	U		21	U		20	U		**124**			-		
	Acetophenone	µg/kg	120,000,000	580	-	90	U		87	U		17	U		17	U		17	U		17	U		17	U		17	U		16	U		17	U		17	U		19	U		-		
	Anthracene	µg/kg	230,000,000	58,000	-	140	U		130	U		26	U		25	U		26	U		26	U		25	U		25	U		24	U		26	U		25	U		**144**			-		
	Benzo(a)anthracene	µg/kg	21,000	11	-	**175**	J		**386**		J	17	U		17	U		17	U		**26.7**	J		**48.2**			17	U		16	U		17	U		17	U		**182**			-		
X	**Benzo(a)pyrene**	µg/kg	2,100	29	240	**181**		J	**367**		J	17	U		17	U		17	U		**22**	J		**36.2**			17	U		16	U		17	U		17	U		**214**			-		
X	**Benzo(b)fluoranthene**	µg/kg	21,000	300	-	**257**		J	**505**		J	17	U		17	U		17	U		**28**	J		**49.5**			17	U		16	U		17	U		17	U		**264**			-		
	Benzo(g,h,i)perylene	µg/kg	-	-	-	**170**	J		**344**			17	U		17	U		17	U		17	U		**25.3**	J		17	U		16	U		17	U		17	U		**246**			-		
	Benzo(k)fluoranthene	µg/kg	210,000	2,900	-	**88.3**	J		**195**			17	U		17	U		17	U		17	U		**18.6**	J		17	U		16	U		17	U		17	U		**112**			-		
	1,1'-Biphenyl	µg/kg	200,000	8.7	-	90	U		87	U		17	U		17	U		17	U		17	U		17	U		17	U		16	U		17	U		17	U		19	U		-		
	Benzaldehyde	µg/kg	820,000	4.1	-	90	U		87	U		17	U		17	U		17	U		17	U		17	U		17	U		16	U		17	U		17	U		19	U		-		
	Carbazole	µg/kg	-	-	-	180	U		170	U		35	U		34	U		35	U		34	U		34	U		34	U		33	U		35	U		33	U		**38.8**	J		-		
	Caprolactam	µg/kg	400,000,000	2,500	-	180	U		170	U		35	U		34	U		35	U		34	U		34	U		34	U		33	U		35	U		33	U		37	U		-		
	Chrysene	µg/kg	2,100,000	9,000	-	**220**		J	**507**		J	17	U		17	U		17	U		**26.3**	J		**47**			17	U		16	U		17	U		17	U		**214**			-		
X	**Dibenzo(a,h)anthracene**	µg/kg	2,100	96	-	90	U		**95.1**	J		17	U		17	U		17	U		17	U		17	U		17	U		16	U		17	U		17	U		**84.4**			-		
	Dibenzofuran	µg/kg	1,000,000	150	-	90	U		87	U		17	U		17	U		17	U		17	U		17	U		17	U		16	U		17	U		17	U		**656**			-		
	Di-n-butyl phthalate	µg/kg	82,000,000	2,300	-	90	U		87	U		17	U		17	U		17	U		17	U		17	U		17	U		16	U		17	U		17	U		19	U		-		
	bis(2-Ethylhexyl)phthalate	µg/kg	160,000	1,300	1,400	180	U		170	U		35	U		34	U		35	U		34	U		34	U		34	U		33	U		35	U		33	U		**251**			-		
	Fluoranthene	µg/kg	30,000,000	89,000	-	**346**		J	**859**		J	17	U		17	U		17	U		**34.2**		J	**85.1**		J	17	U		16	U		17	U		17	U		**334**			-		
	Fluorene	µg/kg	30,000,000	5,400	-	180	U		170	U		35	U		34	U		35	U		34	U		34	U		34	U		33	U		35	U		33	U		**619**			-		
	Hexachlorobenzene	µg/kg	960	0.12	13	90	U		87	U		17	U		17	U		17	U		17	U		17	U		17	U		16	U		17	U		17	U		19	U		-		
	Indeno(1,2,3-cd)pyrene	µg/kg	21,000	980	-	**173**	J		**297**			35	U		34	U		35	U		**17.6**	J		**25.5**	J		34	U		33	U		35	U		33	U		**206**			-		
	2-Methylnaphthalene	µg/kg	3,000,000	190	-	90	U		87	U		17	U		17	U		17	U		17	U		**17.5**	J		17	U		16	U		17	U		17	U		**2,210**			-		
	4-Nitroaniline	µg/kg	110,000	1.6	-	900	U		870	U		170	U		170	U		170	U		170	U		170	U		170	U		160	U		170	U		170	U		190	U		-		
	Naphthalene	µg/kg	17,000	0.54	-	90	U		87	U		17	U		17	U		17	U		17	U		17	U		17	U		16	U		17	U		17	U		**1,650**			-		
	Phenanthrene	µg/kg	-	-	-	**134**	J		**565**		J	17	U		17	U		17	U		**31.1**	J		**76.4**			17	U		16	U		17	U		17	U		**685**			-		
	Pyrene	µg/kg	23,000,000	13,000	-	**338**		J	**767**		J	17	U		17	U		17	U		**30.9**	J		**69.3**		J	17	U		16	U		17	U		17	U		**307**			-		
	Total Petroleum Hydrocarbons (SW846 8015C)		**Maximum Allowable Residual TPH Type 1 Soils[8]**		**OEPA Soil Leaching to Groundwater[9]**																																							
	TPH-GRO (C6-C12)	mg/kg	1,000	-	3.1	9.4	U		9.4	U		10	U		11	U		10	U		11	U		9.9	U		10	U		8.2	U		9.0	U		9.3	U		**1,810**			10	U	
	TPH-DRO (C10-C20)	mg/kg	2,000	-	2.7	**18.5**		J	**106**		J	7.2	U		7.2	U		8.1	U		**135**			**115**			8.0	U		6.7	U		7.4	U		6.9	U		**269**			-		
	TPH-ORO (>C28-C40)	mg/kg	5,000	-	5,000	**57.2**		J	**309**		J	7.2	U		7.2	U		8.1	U		7.7	U		7.9	U		8.0	U		6.7	U		7.4	U		6.9	U		**29.1**			-		
	TPH-ORO (C20-C34)	mg/kg	5,000	-	5,000	**48.3**		J	**253**		J	7.2	U		7.2	U		8.1	U		**108**		J	**76.3**		J	8.0	U		**10.9**			**15.6**			6.9	U		**107**			-		
	Total OH TPH (C10-C34)	mg/kg	-	-	-	**66.8**		J	**359**		J	7.2	U		7.2	U		8.1	U		**243**			**192**			8.0	U		**10.9**			**15.6**			6.9	U		**377**			-		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
lilac shading: analyte detected at a value exceeding the OEPA TPH Standard
bold, purple: analyte detected at a value exceeding the OEPA Leaching Standard
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.
8: Ohio Residual Saturation Concentrations for Type 1 Soils (i.e., Maximum Allowable Residual Total Petroleum Hydrocarbon [TPH] Type 1 Soils)
9: Ohio Environmental Protection Agency (OEPA) Soil Leaching to Groundwater Standards

Table 4-1b. Analytical Sample Summary - Soil: Semi-volatile Organic Compounds and Total Petroleum Hydrocarbons
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-8			SB-9			SB-9 field duplicate			SB-9			SB-9			SB-9			SB-10			SB-10			SB-10			SB-10			SB-11			SB-11			SB-11		
	Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-8 (20-25)_042617			LF512RI_SB-9 (0-2.5)_050817			LF512RI_SB-9 (0-2.5)_050817_FD			LF512RI_SB-9 (10-12.5)_050817			LF512RI_SB-9 (12.5-15)_050817			LF512RI_SB-9 (22.5-25)_050817			LF512RI_SB-10 (2-4)_042617			LF512RI_SB-10 (6-8)_042617			LF512RI_SB-10 (22.5-25)_042617			LF512RI_SB-10 (25-27)_042617			LF512RI_SB-11 (4-6)_042517			LF512RI_SB-11 (6-8)_042517			LF512RI_SB-11 (10-15)_042517		
	Sampled Interval (feet):					20-25			0-2.5			0-2.5_FD			10-12.5			12.5-15			22.5-25			2-4			6-8			22.5-25			25-27			4-6			6-8			10-15		
	Laboratory[2] Sample ID:					*JC41973-25*			*JC42885-11*			*JC42885-16*			*JC42885-13*			*JC42885-14*			*JC42885-15*			*JC41973-29*			*JC41973-30*			*JC41973-31*			*JC41973-32*			*JC41973-9*			*JC41973-10*			*JC41973-11*		
	Date Sampled:					4/26/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			4/26/2017			4/26/2017			4/26/2017			4/26/2017			4/25/2017			4/25/2017			4/25/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Semi-volatile Organic Compounds (SW846 8270D)																																											
	2,4-Dimethylphenol	µg/kg	16,000,000	420	-	98	U		460	U		93	U		81	U		83	U		82	U		92	U		80	U		84	U		81	U		99	U		100	U		98	U	
	2-Methylphenol	µg/kg	41,000,000	750	-	39	U		180	U		37	U		32	U		33	U		33	U		37	U		32	U		34	U		33	U		40	U		41	U		39	U	
	3&4-Methylphenol	µg/kg	-	-	-	39	U		180	U		37	U		32	U		33	U		33	U		37	U		32	U		34	U		33	U		40	U		41	U		39	U	
	Phenol	µg/kg	250,000,000	3,300	-	39	U		180	U		37	U		32	U		33	U		33	U		37	U		32	U		34	U		33	U		40	U		41	U		39	U	
	Acenaphthene	µg/kg	45,000,000	5,500	-	39	U		180	U		37	U		32	U		33	U		33	U		37	U		32	U		34	U		33	U		40	U		41	U		39	U	
	Acenaphthylene	µg/kg	-	-	-	24	U		110	U		22	U		19	U		20	U		20	U		**59.4**			19	U		20	U		20	U		**28.5**	J		**50**			**31.2**	J	
	Acetophenone	µg/kg	120,000,000	580	-	20	U		92	U		19	U		16	U		17	U		16	U		**59.7**	J		16	U		17	U		16	U		20	U		20	U		20	U	
	Anthracene	µg/kg	230,000,000	58,000	-	29	U		140	U		28	U		24	U		25	U		25	U		**27.9**	J		24	U		25	U		24	U		30	U		**65**			29	U	
	Benzo(a)anthracene	µg/kg	21,000	11	-	20	U		92	U		19	U		16	U		17	U		16	U		**55.3**			16	U		17	U		16	U		**28.7**	J		**143**			**54.9**		
X	**Benzo(a)pyrene**	µg/kg	2,100	29	240	20	U		92	U		19	U		16	U		17	U		16	U		**77.5**			16	U		17	U		16	U		**24.3**	J		**137**			**65.6**		
X	**Benzo(b)fluoranthene**	µg/kg	21,000	300	-	20	U		92	U		19	U		16	U		17	U		16	U		**100**			16	U		17	U		16	U		**41.8**			**193**			**89.2**		
	Benzo(g,h,i)perylene	µg/kg	-	-	-	20	U		92	U		19	U		16	U		17	U		16	U		**98.6**			16	U		17	U		16	U		**51.5**			**138**			**74.6**		
	Benzo(k)fluoranthene	µg/kg	210,000	2,900	-	20	U		92	U		19	U		16	U		17	U		16	U		**34.8**	J		16	U		17	U		16	U		20	U		**66**			**33.7**	J	
	1,1'-Biphenyl	µg/kg	200,000	8.7	-	20	U		92	U		19	U		16	U		17	U		16	U		**28.4**	J		16	U		17	U		16	U		20	U		**43.4**	J		**18.1**	J	
	Benzaldehyde	µg/kg	820,000	4.1	-	20	U		92	U		19	U		16	U		17	U		16	U		18	U		16	U		17	U		16	U		**92.8**	J		**84.3**	J		**51.8**	J	
	Carbazole	µg/kg	-	-	-	39	U		180	U		37	U		32	U		33	U		33	U		37	U		32	U		34	U		33	U		40	U		**29.4**	J		39	U	
	Caprolactam	µg/kg	400,000,000	2,500	-	39	U		180	U		37	U		32	U		33	U		33	U		37	U		32	U		34	U		33	U		40	U		41	U		39	U	
	Chrysene	µg/kg	2,100,000	9,000	-	20	U		92	U		19	U		16	U		17	U		16	U		**69.8**			16	U		17	U		16	U		**40**			**151**			**64.2**		
X	**Dibenzo(a,h)anthracene**	µg/kg	2,100	96	-	20	U		92	U		19	U		16	U		17	U		16	U		**18**	J		16	U		17	U		16	U		**21.5**	J		**34**	J		**21.7**	J	
	Dibenzofuran	µg/kg	1,000,000	150	-	20	U		92	U		19	U		16	U		17	U		16	U		**39**	J		16	U		17	U		16	U		**55**	J		**94.2**			**48.2**	J	
	Di-n-butyl phthalate	µg/kg	82,000,000	2,300	-	20	U		92	U		19	U		16	U		17	U		16	U		18	U		16	U		17	U		16	U		20	U		20	U		20	U	
	bis(2-Ethylhexyl)phthalate	µg/kg	160,000	1,300	1,400	39	U		180	U		37	U		32	U		33	U		33	U		37	U		32	U		34	U		33	U		40	U		41	U		39	U	
	Fluoranthene	µg/kg	30,000,000	89,000	-	20	U		**92.8**	J		19	U		16	U		17	U		16	U		**56**			16	U		17	U		16	U		**35**	J		**262**			**72.5**		
	Fluorene	µg/kg	30,000,000	5,400	-	39	U		180	U		37	U		32	U		33	U		33	U		37	U		32	U		34	U		33	U		40	U		**20**	J		39	U	
	Hexachlorobenzene	µg/kg	960	0.12	13	20	U		92	U		19	U		16	U		17	U		16	U		18	U		16	U		17	U		16	U		20	U		20	U		20	U	
	Indeno(1,2,3-cd)pyrene	µg/kg	21,000	980	-	39	U		180	U		37	U		32	U		33	U		33	U		**75.4**			32	U		34	U		33	U		**33.6**	J		**119**			**61.8**		
	2-Methylnaphthalene	µg/kg	3,000,000	190	-	20	U		92	U		19	U		16	U		17	U		16	U		**152**			16	U		17	U		16	U		**221**			**333**			**170**		
	4-Nitroaniline	µg/kg	110,000	1.6	-	200	U		920	U		190	U		160	U		170	U		160	U		180	U		160	U		170	U		160	U		200	U		200	U		200	U	
	Naphthalene	µg/kg	17,000	0.54	-	20	U		92	U		19	U		16	U		17	U		16	U		**79.9**			16	U		17	U		16	U		**96.6**			**210**			**113**		
	Phenanthrene	µg/kg	-	-	-	20	U		**160**	J		19	U		16	U		17	U		16	U		**87.9**			16	U		17	U		16	U		**83.3**			**308**			**105**		
	Pyrene	µg/kg	23,000,000	13,000	-	20	U		**108**	J		19	U		16	U		17	U		16	U		**69.6**			16	U		17	U		16	U		**38.3**	J		**230**			**81**		
	Total Petroleum Hydrocarbons (SW846 8015C)		**Maximum Allowable Residual TPH Type 1 Soils[8]**		**OEPA Soil Leaching to Groundwater[9]**																																							
	TPH-GRO (C6-C12)	mg/kg	1,000	-	3.1	**72.9**			12	U		10	U		9.1	U		9.4	U		9.8	U		**35.5**			11	U		9.9	U		10	U		**45.9**			**32**			**31.3**		
	TPH-DRO (C10-C20)	mg/kg	2,000	-	2.7	8.0	U		8.3	U	UJ	8.4	U		7.0	U		6.6	U		6.5	U		**34.7**			6.7	U		7.4	U		**9.6**			**32.5**			**25.9**			8.8	U	
	TPH-ORO (>C28-C40)	mg/kg	5,000	-	5,000	8.0	U		8.3	U	UJ	8.4	U		7.0	U		6.6	U		6.5	U		**72.5**			6.7	U		7.4	U		6.8	U		**47**			**63.2**			**13.7**		
	TPH-ORO (C20-C34)	mg/kg	5,000	-	5,000	**31.7**			8.3	U	UJ	8.4	U		7.0	U		6.6	U		6.5	U		**130**			6.7	U		7.4	U		**24.1**			**77.8**			**89.8**			**24.9**		
	Total OH TPH (C10-C34)	mg/kg	-	-	-	**31.7**			8.3	U	UJ	8.4	U		7.0	U		6.6	U		6.5	U		**165**			6.7	U		7.4	U		**33.6**			**110**			**116**			**24.9**		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
lilac shading: analyte detected at a value exceeding the OEPA TPH Standard
bold, purple: analyte detected at a value exceeding the OEPA Leaching Standard
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.
8: Ohio Residual Saturation Concentrations for Type 1 Soils (i.e., Maximum Allowable Residual Total Petroleum Hydrocarbon [TPH] Type 1 Soils)
9: Ohio Environmental Protection Agency (OEPA) Soil Leaching to Groundwater Standards

Table 4-1b. Analytical Sample Summary - Soil: Semi-volatile Organic Compounds and Total Petroleum Hydrocarbons
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-11			SB-11 field duplicate			SB-12			SB-12 field duplicate			SB-12			SB-12			SB-12			SB-13			SB-13			SB-13			SB-13			SB-14			SB-14		
	Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-11 (24-26)_042517			LF512RI_SB-11 (24-26)_042517_FD[6]			LF512RI_SB-12 (0-2.5)_050917			LF512RI_SB-12 (0-2.5)_050917_FD			LF512RI_SB-12 (10-12.5)_050917			LF512RI_SB-12 (15-20)_050917			LF512RI_SB-12 (22.5-25)_050917			LF512RI_SB-13 (0-2.5)_051017			LF512RI_SB-13 (7.5-10)_051017			LF512RI_SB-13 (12.5-15)_051017			LF512RI_SB-13 (20-22.5)_051017			LF512RI_SB-14 (0-2)_042517			LF512RI_SB-14 (12-14)_042517		
	Sampled Interval (feet):					24-26			24-26_FD			0-2.5			0-2.5_FD			10-12.5			15-20			22.5-25			0-2.5			7.5-10			12.5-15			20-22.5			0-2			12-14		
	Laboratory[2] Sample ID:					*JC41973-12*			*JC41973-13*			*JC42953-16*			*JC42953-17*			*JC42953-18*			*JC42953-19*			*JC42953-20*			*JC43060-14*			*JC43060-16*			*JC43060-17*			*JC43060-18*			*JC41973-14*			*JC41973-20*		
	Date Sampled:					4/25/2017			4/25/2017			5/9/2017			5/9/2017			5/9/2017			5/9/2017			5/9/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			4/25/2017			4/25/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Semi-volatile Organic Compounds (SW846 8270D)																																											
	2,4-Dimethylphenol	µg/kg	16,000,000	420	-	81	U		84	U		88	U		87	U		91	U		**167**	J		83	U		430	U		91	U		92	U		83	U		100	U		87	U	
	2-Methylphenol	µg/kg	41,000,000	750	-	33	U		33	U		35	U		35	U		36	U		**66.9**			33	U		170	U		36	U		37	U		33	U		41	U		35	U	
	3&4-Methylphenol	µg/kg	-	-	-	33	U		33	U		35	U		35	U		36	U		**421**			33	U		170	U		36	U		37	U		33	U		41	U		35	U	
	Phenol	µg/kg	250,000,000	3,300	-	33	U		33	U		35	U		35	U		36	U		33	U		33	U		170	U		36	U		37	U		33	U		41	U		35	U	
	Acenaphthene	µg/kg	45,000,000	5,500	-	33	U		33	U		35	U		35	U		36	U		33	U		33	U		170	U		36	U		37	U		33	U		41	U		35	U	
	Acenaphthylene	µg/kg	-	-	-	20	U		20	U		21	U		21	U		22	U		20	U		20	U		**389**			22	U		22	U		20	U		25	U		21	U	
	Acetophenone	µg/kg	120,000,000	580	-	16	U		17	U		18	U		17	U		18	U		17	U		17	U		86	U		18	U		18	U		17	U		21	U		17	U	
	Anthracene	µg/kg	230,000,000	58,000	-	24	U		25	U		26	U		26	U		27	U		25	U		25	U		**132**	J		27	U		28	U		25	U		31	U		26	U	
	Benzo(a)anthracene	µg/kg	21,000	11	-	16	U		17	U		**32.7**	J		**27.6**	J		**17.8**	J		17	U		17	U		**165**	J		**33.3**	J		18	U		17	U		**37.5**	J		17	U	
X	**Benzo(a)pyrene**	µg/kg	2,100	29	240	16	U		17	U		**25**	J		**26.8**	J		18	U		**17.6**	J		17	U		**803**			**32**	J		18	U		17	U		**32.8**	J		17	U	
X	**Benzo(b)fluoranthene**	µg/kg	21,000	300	-	16	U		17	U		**35.8**			**34.6**	J		**21.5**	J		**34**			17	U		**663**			**68.7**			18	U		17	U		**50.2**			17	U	
	Benzo(g,h,i)perylene	µg/kg	-	-	-	16	U		17	U		**22**	J		**27.6**	J		18	U		**21**	J		17	U		**1,200**			**41.1**			18	U		17	U		**41.3**			17	U	
	Benzo(k)fluoranthene	µg/kg	210,000	2,900	-	16	U		17	U		18	U		17	U		18	U		17	U		17	U		**181**			**22**	J		18	U		17	U		21	U		17	U	
	1,1'-Biphenyl	µg/kg	200,000	8.7	-	16	U		17	U		18	U		17	U		18	U		17	U		17	U		86	U		18	U		18	U		17	U		**19**	J		17	U	
	Benzaldehyde	µg/kg	820,000	4.1	-	16	U		17	U		18	U		17	U		18	U		17	U		17	U		86	U		**97.1**	J		18	U		17	U		**40.8**	J		17	U	
	Carbazole	µg/kg	-	-	-	33	U		33	U		35	U		35	U		36	U		33	U		33	U		170	U		36	U		37	U		33	U		41	U		35	U	
	Caprolactam	µg/kg	400,000,000	2,500	-	33	U		33	U		**79.6**			**45**	J		36	U		**1,020**			33	U		170	U		36	U		37	U		33	U		41	U		35	U	
	Chrysene	µg/kg	2,100,000	9,000	-	16	U		17	U		**40.3**			**37.1**			**20.9**	J		**18.7**	J		17	U		**386**			**49.1**			18	U		17	U		**44.2**			17	U	
X	**Dibenzo(a,h)anthracene**	µg/kg	2,100	96	-	16	U		17	U		18	U		17	U		18	U		17	U		17	U		**99.6**	J		18	U		18	U		17	U		21	U		17	U	
	Dibenzofuran	µg/kg	1,000,000	150	-	16	U		17	U		**44.5**	J		**23.9**	J		**15.4**	J		**16.9**	J		17	U		86	U		**26.1**	J		18	U		17	U		**20.3**	J		17	U	
	Di-n-butyl phthalate	µg/kg	82,000,000	2,300	-	16	U		17	U		18	U		17	U		18	U		17	U		17	U		86	U		18	U		18	U		17	U		21	U		17	U	
	bis(2-Ethylhexyl)phthalate	µg/kg	160,000	1,300	1,400	33	U		33	U		35	U		35	U		36	U		**175**			33	U		170	U		36	U		37	U		33	U		41	U		35	U	
	Fluoranthene	µg/kg	30,000,000	89,000	-	16	U		17	U		**56.2**			**47**			**22.8**	J		**61.7**			17	U		**211**			**60.1**			18	U		17	U		**65.2**			17	U	
	Fluorene	µg/kg	30,000,000	5,400	-	33	U		33	U		35	U		35	U		36	U		**16.6**	J		33	U		170	U		36	U		37	U		33	U		41	U		35	U	
	Hexachlorobenzene	µg/kg	960	0.12	13	16	U		17	U		18	U		17	U		18	U		17	U		17	U		86	U		18	U		18	U		**13.7**	J		21	U		17	U	
	Indeno(1,2,3-cd)pyrene	µg/kg	21,000	980	-	33	U		33	U		**17**	J		**20.5**	J		36	U		**28.7**	J		33	U		**554**			**37.2**			37	U		33	U		**35**	J		35	U	
	2-Methylnaphthalene	µg/kg	3,000,000	190	-	16	U		17	U		**154**		J	**83.8**		J	**62.4**	J		**56.4**	J		17	U		**204**	J		**90.1**			18	U		17	U		**65.5**	J		17	U	
	4-Nitroaniline	µg/kg	110,000	1.6	-	160	U		170	U		180	U		170	U		180	U		170	U		170	U		860	U		180	U		180	U		170	U		210	U		170	U	
	Naphthalene	µg/kg	17,000	0.54	-	16	U		17	U		**98.2**		J	**51.4**		J	**45.7**			**85.9**			17	U		**218**			**66.2**			18	U		17	U		**35.7**	J		17	U	
	Phenanthrene	µg/kg	-	-	-	16	U		17	U		**123**		J	**64**		J	**32.3**	J		**42.8**			17	U		**90.7**	J		**69.6**			18	U		**21.7**	J		**70.3**			17	U	
	Pyrene	µg/kg	23,000,000	13,000	-	16	U		17	U		**69.3**			**53.8**			**25**	J		**69.7**			17	U		**2,420**			**56**			18	U		**18.1**	J		**58**			17	U	
	Total Petroleum Hydrocarbons (SW846 8015C)		**Maximum Allowable Residual TPH Type 1 Soils[8]**		**OEPA Soil Leaching to Groundwater[9]**																																							
	TPH-GRO (C6-C12)	mg/kg	1,000	-	3.1	11	U		11	U		12	U		10	U		10	U		13	U		11	U		13	U		9.4	U		8.7	U		9.6	U		14	U		11	U	
	TPH-DRO (C10-C20)	mg/kg	2,000	-	2.7	6.6	U		6.7	U		**15.4**		J	7.7	U	UJ	8.7	U		**84.9**			**10.1**			**12.8**			7.3	U		7.3	U		7.3	U		**15.1**			7.2	U	
	TPH-ORO (>C28-C40)	mg/kg	5,000	-	5,000	6.6	U		6.7	U		**37**		J	**26.7**		J	8.7	U		**47.2**			**17.9**			7.6	U		7.3	U		7.3	U		7.3	U		**25.8**			7.2	U	
	TPH-ORO (C20-C34)	mg/kg	5,000	-	5,000	6.6	U		6.7	U		**48.5**			**43.3**			8.7	U		**94.4**			**32.3**			**23.8**			7.3	U		7.3	U		**10.5**			**37.5**			7.2	U	
	Total OH TPH (C10-C34)	mg/kg	-	-	-	6.6	U		6.7	U		**63.8**		J	**43.3**		J	8.7	U		**179**			**42.5**			**36.5**			7.3	U		7.3	U		**10.5**			**52.6**			7.2	U	

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
lilac shading: analyte detected at a value exceeding the OEPA TPH Standard
bold, purple: analyte detected at a value exceeding the OEPA Leaching Standard
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R : data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.
8: Ohio Residual Saturation Concentrations for Type 1 Soils (i.e., Maximum Allowable Residual Total Petroleum Hydrocarbon [TPH] Type 1 Soils)
9: Ohio Environmental Protection Agency (OEPA) Soil Leaching to Groundwater Standards

Table 4-1b. Analytical Sample Summary - Soil: Semi-volatile Organic Compounds and Total Petroleum Hydrocarbons
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-14			SB-14			SB-15			SB-15 field duplicate			SB-15			SB-15			SB-15			SB-16			SB-16			SB-16			SB-16		
	Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-14 (18-20)_042517			LF512RI_SB-14 (25-27)_042617			LF512RI_SB-15 (7.5-10)_051017			LF512RI_SB-15 (7.5-10)_051017_FD			LF512RI_SB-15 (12.5-15)_051017			LF512RI_SB-15 (17.5-20)_051017			LF512RI_SB-15 (22.5-25)_051017			LF512RI_SB-16 (7.5-10)_051017			LF512RI_SB-16 (12.5-15)_051017			LF512RI_SB-16 (17.5-20)_051017			LF512RI_SB-16 (25-27.5)_051017		
	Sampled Interval (feet):					18-20			25-27			7.5-10			7.5-10_FD			12.5-15			17.5-20			22.5-25			7.5-10			12.5-15			17.5-20			25-27.5		
	Laboratory[2] Sample ID:					*JC41973-23*			*JC41973-33*			*JC43060-4*			*JC43060-5*			*JC43060-6*			*JC43060-7*			*JC43060-8*			*JC43060-10*			*JC43060-11*			*JC43060-12*			*JC43060-13*		
	Date Sampled:					4/25/2017			4/26/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Semi-volatile Organic Compounds (SW846 8270D)																																					
	2,4-Dimethylphenol	µg/kg	16,000,000	420	-	85	U		82	U		86	U	UJ	**658**		J	83	U		85	U		81	U		97	U		84	U		87	U		88	U	
	2-Methylphenol	µg/kg	41,000,000	750	-	34	U		33	U		34	U	UJ	**335**		J	33	U		34	U		32	U		39	U		34	U		35	U		35	U	
	3&4-Methylphenol	µg/kg	-	-	-	34	U		33	U		34	U	UJ	**764**		J	33	U		34	U		32	U		39	U		34	U		35	U		35	U	
	Phenol	µg/kg	250,000,000	3,300	-	34	U		33	U		34	U	UJ	**202**		J	33	U		34	U		32	U		39	U		34	U		35	U		35	U	
	Acenaphthene	µg/kg	45,000,000	5,500	-	34	U		33	U		34	U		**22.6**	J		33	U		34	U		32	U		39	U		34	U		35	U		35	U	
	Acenaphthylene	µg/kg	-	-	-	21	U		20	U		21	U	UJ	**164**		J	20	U		20	U		19	U		23	U		20	U		21	U		21	U	
	Acetophenone	µg/kg	120,000,000	580	-	17	U		16	U		17	U		19	U		17	U		17	U		16	U		**23.3**	J		17	U		17	U		18	U	
	Anthracene	µg/kg	230,000,000	58,000	-	26	U		24	U		26	U	UJ	**158**		J	25	U		26	U		24	U		29	U		25	U		26	U		27	U	
	Benzo(a)anthracene	µg/kg	21,000	11	-	17	U		16	U		17	U	UJ	**319**		J	17	U		17	U		16	U		**18.3**	J		17	U		17	U		18	U	
X	**Benzo(a)pyrene**	µg/kg	2,100	29	240	17	U		16	U		17	U	UJ	**386**		J	17	U		17	U		16	U		19	U		17	U		17	U		18	U	
X	**Benzo(b)fluoranthene**	µg/kg	21,000	300	-	17	U		16	U		17	U	UJ	**389**		J	17	U		17	U		16	U		**20.8**	J		**16**	J		17	U		18	U	
	Benzo(g,h,i)perylene	µg/kg	-	-	-	17	U		16	U		17	U	UJ	**576**		J	17	U		17	U		16	U		19	U		17	U		17	U		18	U	
	Benzo(k)fluoranthene	µg/kg	210,000	2,900	-	17	U		16	U		17	U	UJ	**147**		J	17	U		17	U		16	U		19	U		17	U		17	U		18	U	
	1,1'-Biphenyl	µg/kg	200,000	8.7	-	17	U		16	U		17	U		**21.7**	J		17	U		17	U		16	U		**19.4**	J		17	U		17	U		18	U	
	Benzaldehyde	µg/kg	820,000	4.1	-	17	U		16	U		17	U		19	U		17	U		17	U		16	U		19	U		17	U		17	U		18	U	
	Carbazole	µg/kg	-	-	-	34	U		33	U		34	U		**50**	J		33	U		34	U		32	U		39	U		34	U		35	U		35	U	
	Caprolactam	µg/kg	400,000,000	2,500	-	34	U		33	U		34	U		39	U		33	U		34	U		32	U		39	U		34	U		35	U		35	U	
	Chrysene	µg/kg	2,100,000	9,000	-	17	U		16	U		17	U	UJ	**323**		J	17	U		17	U		16	U		**21.1**	J		**14.8**	J		17	U		18	U	
X	**Dibenzo(a,h)anthracene**	µg/kg	2,100	96	-	17	U		16	U		17	U	UJ	**84.7**		J	17	U		17	U		16	U		19	U		17	U		17	U		18	U	
	Dibenzofuran	µg/kg	1,000,000	150	-	17	U		16	U		17	U	UJ	**87.2**		J	17	U		17	U		16	U		**50.3**	J		17	U		17	U		18	U	
	Di-n-butyl phthalate	µg/kg	82,000,000	2,300	-	17	U		16	U		17	U		**49.1**	J		17	U		17	U		16	U		19	U		17	U		17	U		18	U	
	bis(2-Ethylhexyl)phthalate	µg/kg	160,000	1,300	1,400	34	U		33	U		34	U		39	U		33	U		34	U		32	U		**53**	J		34	U		35	U		35	U	
	Fluoranthene	µg/kg	30,000,000	89,000	-	17	U		16	U		17	U	UJ	**517**		J	17	U		17	U		16	U		**23.6**	J		**19.5**	J		17	U		18	U	
	Fluorene	µg/kg	30,000,000	5,400	-	34	U		33	U		34	U		**28.8**	J		33	U		34	U		32	U		39	U		34	U		35	U		35	U	
	Hexachlorobenzene	µg/kg	960	0.12	13	17	U		16	U		17	U		19	U		17	U		17	U		16	U		19	U		17	U		17	U		18	U	
	Indeno(1,2,3-cd)pyrene	µg/kg	21,000	980	-	34	U		33	U		34	U	UJ	**406**		J	33	U		34	U		32	U		39	U		34	U		35	U		35	U	
	2-Methylnaphthalene	µg/kg	3,000,000	190	-	17	U		16	U		17	U	UJ	**344**		J	17	U		17	U		16	U		**201**			**21.8**	J		17	U		18	U	
	4-Nitroaniline	µg/kg	110,000	1.6	-	170	U		160	U		170	U		190	U		170	U		170	U		160	U		190	U		170	U		170	U		**15.1**	J	
	Naphthalene	µg/kg	17,000	0.54	-	17	U		16	U		17	U	UJ	**264**		J	17	U		17	U		16	U		**132**			**17.1**	J		17	U		18	U	
	Phenanthrene	µg/kg	-	-	-	17	U		16	U		17	U	UJ	**429**		J	17	U		17	U		16	U		**95.2**			**30.9**	J		17	U		18	U	
	Pyrene	µg/kg	23,000,000	13,000	-	17	U		16	U		17	U	UJ	**562**		J	17	U		17	U		16	U		**27.1**	J		**18.3**	J		17	U		18	U	
	Total Petroleum Hydrocarbons (SW846 8015C)		**Maximum Allowable Residual TPH Type 1 Soils[8]**		**OEPA Soil Leaching to Groundwater[9]**																																	
	TPH-GRO (C6-C12)	mg/kg	1,000	-	3.1	9.9	U		9.8	U		12	U		12	U		12	U		8.8	U		16	U		11	U		12	U		12	U		8.9	U	
	TPH-DRO (C10-C20)	mg/kg	2,000	-	2.7	8.4	U		7.0	U		7.8	U	UJ	**25.2**		J	7.4	U		7.7	U		7.2	U		8.9	U		7.4	U		7.6	U		7.8	U	
	TPH-ORO (>C28-C40)	mg/kg	5,000	-	5,000	8.4	U		7.0	U		7.8	U	UJ	**13.1**		J	7.4	U		7.7	U		7.2	U		8.9	U		7.4	U		7.6	U		7.8	U	
	TPH-ORO (C20-C34)	mg/kg	5,000	-	5,000	8.4	U		7.0	U		**16.1**		J	**33**		J	7.4	U		7.7	U		7.2	U		8.9	U		**15.3**			7.6	U		**12.7**		
	Total OH TPH (C10-C34)	mg/kg	-	-	-	8.4	U		7.0	U		**16.1**		J	**58.2**		J	7.4	U		7.7	U		7.2	U		8.9	U		**15.3**			7.6	U		**12.7**		

Notes:

bold, black: analyte detected

double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL

bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL

blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil

lilac shading: analyte detected at a value exceeding the OEPA TPH Standard

bold, purple: analyte detected at a value exceeding the OEPA Leaching Standard

-: not applicable, no value available, or not sampled

MCL: maximum contaminant level

SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):

B: blank contamination

J-: estimated value, biased low

J: estimated value

R: data are unusable; See Data Review Report(s)

U: undetected; value recorded is the limit of detection (LOD)

UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.

2: Samples analyzed by SGS of Dayton, New Jersey

3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.

4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)

5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR

6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR

7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

8: Ohio Residual Saturation Concentrations for Type 1 Soils (i.e., Maximum Allowable Residual Total Petroleum Hydrocarbon [TPH] Type 1 Soils)

9: Ohio Environmental Protection Agency (OEPA) Soil Leaching to Groundwater Standards

Table 4-1c. Analytical Sample Summary - Soil: Inorganic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-1			SB-1			SB-1 field duplicate			SB-1			SB-1			SB-2			SB-2			SB-2			SB-2			SB-3			SB-3 field duplicate			SB-3			SB-3		
	Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-1 (2.5-5)_050917[4]			LF512RI_SB-1 (12.5-15)_050917			LF512RI_SB-1 (12.5-15)_050917_FD			LF512RI_SB-1 (17.5-20)_050917			LF512RI_SB-1 (22.5-25)_050917			LF512RI_SB-2 (0-2.5)_050817			LF512RI_SB-2 (5-7.5)_050817			LF512RI_SB-2 (10-12.5)_050817			LF512RI_SB-2 (22.5-24)_050817			LF512RI_SB-3 (7.5-10)_050917			LF512RI_SB-3 (7.5-10)_050917_FD			LF512RI_SB-3 (17.5-20)_050917			LF512RI_SB-3 (20-22.5)_050917		
	Sampled Interval (feet):					2.5-5			12.5-15			12.5-15_FD			17.5-20			22.5-25			0-2.5			5-7.5			10-12.5			22.5-24			7.5-10			7.5-10_FD			17.5-20			20-22.5		
	Laboratory[2] Sample ID:					*JC42953-4*			*JC42953-5*			*JC42953-6*			*JC42953-7*			*JC42953-8*			*JC42885-17*			*JC42885-18*			*JC42885-19*			*JC42885-20*			*JC42953-10*			*JC42953-11*			*JC42953-13*			*JC42953-14*		
	Date Sampled:					5/9/2017			5/9/2017			5/9/2017			5/9/2017			5/9/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			5/9/2017			5/9/2017			5/9/2017			5/9/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Metals (6010C, 7470A)																																											
X	**Aluminum**	mg/kg	1,100,000	30,000	-	**3,540**			**2,750**		J	**2,040**		J	**3,650**			**2,290**			**4,890**		J	**2,610**		J	**2,380**		J	**2,700**		J	**2,300**			**1,960**			**4,080**			**2,260**		
	Antimony	mg/kg	470	0.35	0.27	0.50	U		0.54	U		0.55	U		0.52	U		0.53	U		0.56	U	UJ	0.54	U	UJ	0.49	U	UJ	0.51	U	UJ	0.49	U		0.51	U		0.54	U		0.52	U	
X	**Arsenic**	mg/kg	3.0	0.0015	0.29	**6.6**			**5.4**			**5.6**			**9.9**			**5.8**			**5.1**			**6.2**			**4.5**			**5.7**			**5.0**			**7.1**			**7.0**			**7.5**		
	Barium	mg/kg	220,000	160	82	**19.2**	J		**11.6**	J		**10.3**	J		**24.3**			**16.3**	J		**30.5**			**12.2**	J		**11.4**	J		**16.2**	J		**21.5**			**11.8**	J		**23.8**			**13.9**	J	
	Beryllium	mg/kg	2,300	19	3.2	**0.20**			**0.15**	J		**0.14**	J		**0.24**			**0.16**	J		**0.20**	J	B	**0.15**	J	B	**0.12**	J	B	**0.16**	J	B	**0.15**	J		**0.13**	J		**0.25**			**0.18**	J	
X	**Cadmium**	mg/kg	980	0.69	0.38	0.20	U		0.21	U		0.22	U		0.21	U		0.21	U		**0.28**	J		0.22	U		0.20	U		0.20	U		0.20	U		0.21	U		0.21	U		0.21	U	
	Calcium	mg/kg	-	-	-	**146,000**			**135,000**			**143,000**			**126,000**			**159,000**			**131,000**			**139,000**			**149,000**			**131,000**			**149,000**			**152,000**			**118,000**			**123,000**		
	Chromium	mg/kg	-	-	180,000	**8.7**		J	**6.3**		J	**5.9**		J	**6.1**		J	**4.1**		J	**7.1**		J	**5.6**		J	**6.0**		J	**4.9**		J	**4.9**		J	**4.6**		J	**6.8**		J	**5.8**		J
	Cobalt	mg/kg	350	0.27	-	**2.9**	J		**3.1**	J		**2.3**	J		**4.1**	J		**2.7**	J		**3.1**	J		**3.0**	J		**2.7**	J		**3.2**	J		**2.6**	J		**2.3**	J		**3.9**	J		**2.9**	J	
	Copper	mg/kg	47,000	28	46	**8.8**			**8.0**			**6.9**			**10.1**			**7.7**			**10.1**			**8.5**			**7.6**			**8.4**			**7.4**			**8.3**			**10.1**			**8.9**		
X	**Iron**	mg/kg	820,000	350	-	**9,260**		J	**7,610**		J	**6,510**		J	**11,600**		J	**6,780**		J	**7,890**			**7,660**			**6,120**			**11,400**			**6,390**		J	**6,990**		J	**10,500**		J	**9,230**		J
	Lead	mg/kg	800	-	14	**5.4**	J		2.7	U		2.7	U		**5.4**	J		**3.2**	J		**8.6**	J		**4.0**	J		**2.5**	J		**4.1**	J		**2.5**	J		2.6	U		**5.7**	J		**5.4**	J	
	Magnesium	mg/kg	-	-	-	**61,200**			**49,100**			**57,600**			**53,500**			**55,300**			**48,000**		J	**54,400**		J	**55,400**		J	**50,000**		J	**51,100**			**63,900**			**50,000**			**45,700**		
X	**Manganese**	mg/kg	26,000	28	-	**239**		J	**224**		J	**178**		J	**204**		J	**247**		J	**337**		J	**216**		J	**230**		J	**267**		J	**218**		J	**179**		J	**215**		J	**176**		J
	Mercury	mg/kg	46	0.033	0.10	0.023	U		0.023	U		0.023	U		0.024	U		0.025	U		0.025	U		0.025	U		0.025	U		0.026	U		0.023	U		0.023	U		0.027	U		0.024	U	
	Nickel	mg/kg	11,000	26	-	**8.8**			**7.2**			**6.1**			**11.2**			**7.5**			**8.4**			**7.4**			**7.1**			**9.1**			**7.2**			**5.9**			**10.6**			**8.4**		
	Potassium	mg/kg	-	-	-	**648**	J		**602**	J		**594**	J		**1,090**			**695**	J		**994**	J		**632**	J		**636**	J		**690**	J		**584**	J		**555**	J		**1,110**			**650**	J	
	Selenium	mg/kg	5,800	0.52	0.26	0.50	U		0.54	U		0.55	U		0.52	U		0.53	U		**0.66**	J		0.54	U		**0.78**	J		**0.51**	J		0.49	U		0.51	U		0.54	U		0.52	U	
	Silver	mg/kg	5,800	0.80	-	2.0	U		2.1	U		2.2	U		2.1	U		2.1	U		**2.3**	J		2.2	U	UJ	2.0	U	UJ	2.0	U	UJ	2.0	U		2.1	U		2.1	U		2.1	U	
	Sodium	mg/kg	-	-	-	**221**	J		**185**	J		**185**	J		**182**	J		**176**	J		**351**	J		**188**	J		**178**	J		**160**	J		**190**	J		**201**	J		**250**	J		**215**	J	
X	**Thallium**	mg/kg	12	0.014	0.14	2.5	U		2.7	U		2.7	U		2.6	U		2.6	U		0.56	U		0.54	U		0.49	U		0.51	U		2.5	U		2.6	U		2.7	U		2.6	U	
X	**Vanadium**	mg/kg	5,800	86	-	**11.7**			**10.1**			**8.2**			**12.5**			**8.2**			**13.7**			**9.5**			**8.4**			**9.1**			**8.0**			**8.6**			**12.4**			**10.2**		
	Zinc	mg/kg	350,000	370	-	**25.8**		J	**24.8**		J	**20.9**		J	**41.8**		J	**33.2**		J	**24.8**		J	**31.3**		J	**20.9**		J	**40**		J	**20.4**		J	**26.9**		J	**33.8**		J	**42.6**		J
	General Chemistry																																											
	Solids, Percent	%	-	-	-	**96.7**			**97.3**			**95.8**			**93.3**			**94.8**			**93.6**			**95.8**			**96.6**			**93.5**			**97.2**			**96.2**			**92.4**			**93.1**		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R : data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-1c. Analytical Sample Summary - Soil: Inorganic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-3			SB-4			SB-4			SB-4			SB-4			SB-4		
	Field Sample ID:		USEPA RSL Industrial Soil (5/2018)	USEPA RSL Risk-based SSL (5/2018)	USEPA RSL MCL-based SSL (5/2018)	LF512RI_SB-3 (22.5-25)_050917			LF512RI_SB-4 (0-2.5)_042717			LF512RI_SB-4 (0-2.5)_042817			LF512RI_SB-4 (5-10)_042717			LF512RI_SB-4 (5-10)_042817			LF512RI_SB-4 (12.5-15)_042717		
	Sampled Interval (feet):					22.5-25			0-2.5			0-2.5			5-10			5-10			12.5-15		
	Laboratory[2] Sample ID:					*JC42953-15*			*JC41973-42*			*JC42293-2*			*JC41973-43*			*JC42293-3*			*JC41973-44*		
	Date Sampled:					5/9/2017			4/27/2017			4/28/2017			4/27/2017			4/28/2017			4/27/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Metals (6010C, 7470A)																						
X	**Aluminum**	mg/kg	1,100,000	30,000	-	**2,010**			-			**2,350**		J	-			**2,200**		J	-		
	Antimony	mg/kg	470	0.35	0.27	0.51	U		-			0.51	U	UJ	-			0.51	U	UJ	-		
X	**Arsenic**	mg/kg	3.0	0.0015	0.29	**6.4**			-			**3.1**			-			**6.1**			-		
	Barium	mg/kg	220,000	160	82	**14.7**	J		-			**18.1**	J		-			**35.7**			-		
	Beryllium	mg/kg	2,300	19	3.2	**0.14**	J		-			**0.12**	J		-			**0.12**	J		-		
X	**Cadmium**	mg/kg	980	0.69	0.38	0.20	U		-			0.20	U		-			0.21	U		-		
	Calcium	mg/kg	-	-	-	**154,000**			-			**139,000**			-			**148,000**			-		
	Chromium	mg/kg	-	-	180,000	**4.2**		J	-			**6.0**			-			**6.5**			-		
	Cobalt	mg/kg	350	0.27	-	**2.6**	J		-			**1.8**	J		-			**2.2**	J		-		
	Copper	mg/kg	47,000	28	46	**7.6**			-			**5.1**			-			**7.9**			-		
X	**Iron**	mg/kg	820,000	350	-	**7,550**		J	-			**6,350**			-			**6,590**			-		
	Lead	mg/kg	800	-	14	**3.9**	J		-			**4.2**			-			**4.8**			-		
	Magnesium	mg/kg	-	-	-	**46,500**			-			**56,300**			-			**59,200**			-		
X	**Manganese**	mg/kg	26,000	28	-	**242**		J	-			**185**			-			**234**			-		
	Mercury	mg/kg	46	0.033	0.10	0.024	U		-			0.025	U		-			0.024	U		-		
	Nickel	mg/kg	11,000	26	-	**6.4**			-			**9.9**			-			**7.4**			-		
	Potassium	mg/kg	-	-	-	**622**	J		-			**649**	J		-			**635**	J		-		
	Selenium	mg/kg	5,800	0.52	0.26	0.51	U		-			2.5	U		-			2.6	U		-		
	Silver	mg/kg	5,800	0.80	-	2.0	U		-			2.0	U		-			2.1	U		-		
	Sodium	mg/kg	-	-	-	**203**	J		-			**230**	J		-			**207**	J		-		
X	**Thallium**	mg/kg	12	0.014	0.14	2.6	U		-			0.51	U		-			**0.56**	J		-		
X	**Vanadium**	mg/kg	5,800	86	-	**8.9**			-			**21.4**			-			**9.4**			-		
	Zinc	mg/kg	350,000	370	-	**28.6**		J	-			**19.6**		J	-			**21.9**		J	-		
	General Chemistry																						
	Solids, Percent	%	-	-	-	**94**			**96**			**93.6**			**94.2**			**95.6**			**95.4**		

COPC[3]	Location ID:	Units	SB-4			SB-4			SB-5			SB-5			SB-5			SB-5		
	Field Sample ID:		LF512RI_SB-4 (12.5-15)_042817			LF512RI_SB-4 (22.5-25)_042717			LF512RI_SB-5 (2.5-5)_042717			LF512RI_SB-5 (7.5-10)_042717			LF512RI_SB-5 (15-20)_042717[5]			LF512RI_SB-5 (22.5-25)_042717		
	Sampled Interval (feet):		12.5-15			22.5-25			2.5-5			7.5-10			15-20			22.5-25		
	Laboratory[2] Sample ID:		*JC42293-4*			*JC41973-45*			*JC41973-37*			*JC41973-38*			*JC41973-39*			*JC41973-41*		
	Date Sampled:		4/28/2017			4/27/2017			4/27/2017			4/27/2017			4/27/2017			4/27/2017		
	Result[7] and Qualifiers:		Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Metals (6010C, 7470A)																				
X	**Aluminum**	mg/kg	**1,720**		J	**1,950**		J	**2,790**		J	**2,830**		J	**5,220**		J	**2,450**		J
	Antimony	mg/kg	**0.92**	J		**0.74**	J		0.51	U		**0.62**	J		0.53	U		0.52	U	
X	**Arsenic**	mg/kg	**9.8**			**5.6**			**4.4**			**5.7**			**4.9**			**10.5**		
	Barium	mg/kg	**10.2**	J		**16.6**	J		**18.8**	J		**21**			**53.5**			**15.6**	J	
	Beryllium	mg/kg	0.079	U		**0.15**	J		**0.13**	J		**0.13**	J		**0.20**	J		**0.16**	J	
X	**Cadmium**	mg/kg	0.16	U		0.21	U		0.21	U		0.20	U		**4.5**			**0.24**	J	
	Calcium	mg/kg	**160,000**			**215,000**			**148,000**			**131,000**			**136,000**			**148,000**		
	Chromium	mg/kg	**4.7**			**4.5**			**6.8**			**5.2**			**10.3**			**5.6**		
	Cobalt	mg/kg	**2.4**	J		**2.3**	J		**2.7**	J		**3.0**	J		**3.6**	J		**2.5**	J	
	Copper	mg/kg	**6.5**			**6.7**			**8.8**			**7.8**			**19.6**			**10.2**		
X	**Iron**	mg/kg	**5,190**			**6,800**		J	**6,680**		J	**7,700**		J	**9,980**		J	**11,000**		J
	Lead	mg/kg	**7.1**			**5.7**			**4.0**			**4.2**			**74.8**			**8.1**		
	Magnesium	mg/kg	**70,600**			**46,600**			**66,300**			**53,600**			**68,200**			**48,000**		
X	**Manganese**	mg/kg	**168**			**278**		J	**206**		J	**345**		J	**245**		J	**196**		J
	Mercury	mg/kg	0.026	U		0.025	U		0.024	U		0.025	U		0.024	U		0.026	U	
	Nickel	mg/kg	**6.4**			**6.0**			**7.2**			**8.9**			**10.1**			**6.8**		
	Potassium	mg/kg	**465**	J		**664**	J		**680**	J		**638**	J		**741**	J		**655**	J	
	Selenium	mg/kg	4.0	U		2.6	U		2.6	U		2.6	U		2.7	U		2.6	U	
	Silver	mg/kg	3.2	U		2.1	U		2.1	U		2.0	U		2.1	U		2.1	U	
	Sodium	mg/kg	**205**	J		**169**	J		**235**	J		**166**	J		**234**	J		**170**	J	
X	**Thallium**	mg/kg	**0.59**	J		0.52	U		0.51	U		0.51	U		0.53	U		0.52	U	
X	**Vanadium**	mg/kg	**6.0**			**7.8**			**10.2**			**8.5**			**16**			**9.9**		
	Zinc	mg/kg	**17.3**		J	**23.4**		J	**26.5**		J	**26.4**		J	**47.1**		J	**39.9**		J
	General Chemistry																				
	Solids, Percent	%	**86**			**91**			**96.4**			**94.8**			**92.3**			**94.5**		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R : data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-1c. Analytical Sample Summary - Soil: Inorganic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	**Location ID:**	Units	**Project Action Limits[1]**			**SB-6**			**SB-6 field duplicate**			**SB-6**			**SB-6**			**SB-6**			**SB-7**			**SB-7 field duplicate**			**SB-7**			**SB-7**			**SB-7**			**SB-8**			**SB-8**			**SB-8**		
	Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-6 (0-2.5)_050817			LF512RI_SB-6 (0-2.5)_050817_FD			LF512RI_SB-6 (15-17.5)_050817			LF512RI_SB-6 (17.5-20)_050817			LF512RI_SB-6 (22-24)_050817			LF512RI_SB-7 (0-5)_042817			LF512RI_SB-7 (0-5)_042817_FD			LF512RI_SB-7 (15-20)_042817			LF512RI_SB-7 (20-22.5)_042817			LF512RI_SB-7 (22.5-25)_042817			LF512RI_SB-8 (2-5)_042517			LF512RI_SB-8 (12-14)_042517			LF512RI_SB-8 (15-20)_042617		
	Sampled Interval (feet):					0-2.5			0-2.5_FD			15-17.5			17.5-20			22-24			0-5			0-5_FD			15-20			20-22.5			22.5-25			2-5			12-14			15-20		
	Laboratory[2] Sample ID:					*JC42885-3*			*JC42885-4*			*JC42885-8*			*JC42885-9*			*JC42885-10*			*JC42293-5*			*JC42293-6*			*JC42293-8*			*JC42293-9*			*JC42293-10*			*JC41973-5*			*JC41973-7*			*JC41973-24*		
	Date Sampled:					5/8/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			4/28/2017			4/28/2017			4/28/2017			4/28/2017			4/28/2017			4/25/2017			4/25/2017			4/26/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Metals (6010C, 7470A)																																											
X	**Aluminum**	mg/kg	1,100,000	30,000	-	**2,650**		J	**3,140**		J	**2,860**		J	**2,410**		J	**3,170**		J	**5,250**		J	**5,470**		J	**3,480**		J	**4,070**		J	**2,870**		J	**3,060**		J	**11,200**		J	-		
	Antimony	mg/kg	470	0.35	0.27	0.55	U	UJ	0.52	U	UJ	0.52	U	UJ	0.51	U	UJ	0.54	U	UJ	**1.0**	J		**0.95**	J		**0.53**	J		**0.80**	J		**0.79**	J		0.52	U		0.59	U		-		
X	**Arsenic**	mg/kg	3.0	0.0015	0.29	**3.5**			**4.7**			**5.0**			**5.3**			**8.2**			**5.1**			**5.1**			**6.1**			**5.9**			**5.8**			**5.5**			**9.2**			-		
	Barium	mg/kg	220,000	160	82	**18.6**	J		**27.9**			**15.4**	J		**15.3**	J		**21.3**	J		**39.7**			**41.4**			**26.9**			**26.5**			**17.4**	J		**25.7**			**109**			-		
	Beryllium	mg/kg	2,300	19	3.2	**0.14**	J	B	**0.14**	J	B	**0.15**	J	B	**0.15**	J	B	**0.20**	J	B	0.11	U		**0.13**	J		**0.20**	J		**0.16**	J		0.10	U		**0.19**	J		**0.63**			-		
X	**Cadmium**	mg/kg	980	0.69	0.38	0.22	U		**0.41**	J		0.21	U		0.20	U		0.22	U		**0.66**		J	**1.9**		J	**0.21**	J		0.21	U		0.20	U		0.21	U		**0.83**			-		
	Calcium	mg/kg	-	-	-	**141,000**			**132,000**			**142,000**			**175,000**			**137,000**			**165,000**		J	**126,000**		J	**126,000**			**137,000**			**169,000**			**156,000**			**23,200**			-		
	Chromium	mg/kg	-	-	180,000	**5.1**		J	**5.6**		J	**4.9**		J	**4.4**		J	**8.6**		J	**7.7**			**8.7**			**6.4**			**7.6**			**5.5**			**6.3**			**19.1**			-		
	Cobalt	mg/kg	350	0.27	-	**2.2**	J		**2.8**	J		**2.7**	J		**2.4**	J		**3.3**	J		**2.4**	J		**3.0**	J		**3.4**	J		**3.6**	J		**2.8**	J		**3.1**	J		**8.1**			-		
	Copper	mg/kg	47,000	28	46	**5.7**		J	**7.4**		J	**7.2**			**8.0**			**9.8**			**9.4**		J	**12.1**		J	**12.9**			**9.6**			**6.8**			**8.5**			**22.1**			-		
X	**Iron**	mg/kg	820,000	350	-	**4,870**		J	**7,760**		J	**8,020**			**6,990**			**9,960**			**7,020**			**7,490**			**10,500**			**8,430**			**7,420**			**7,640**		J	**17,000**		J	-		
	Lead	mg/kg	800	-	14	**2.8**	J		**6.3**	J		**5.3**	J		**4.2**	J		**4.8**	J		**8.5**		J	**20.8**		J	**4.7**			**4.7**			**4.4**			**4.0**			**75.3**			-		
	Magnesium	mg/kg	-	-	-	**48,100**		J	**55,700**		J	**57,200**		J	**81,300**		J	**68,800**		J	**63,800**			**52,800**			**50,200**			**63,200**			**57,700**			**51,800**			**9,370**			-		
X	**Manganese**	mg/kg	26,000	28	-	**247**		J	**308**		J	**210**		J	**214**		J	**366**		J	**217**			**261**			**229**			**233**			**261**			**481**		J	**422**		J	-		
	Mercury	mg/kg	46	0.033	0.10	0.026	U		0.024	U		0.026	U		0.023	U		0.026	U		**0.024**	J		0.023	U		0.026	U		0.025	U		0.025	U		0.024	U		**0.032**	J		0.026	U	
	Nickel	mg/kg	11,000	26	-	**9.7**			**11**			**7.8**			**6.4**			**9.0**			**6.9**		J	**9.3**		J	**8.0**			**9.9**			**7.5**			**9.0**			**17.8**			-		
	Potassium	mg/kg	-	-	-	**580**	J		**796**	J		**752**	J		**775**	J		**876**	J		**729**	J		**977**	J		**742**	J		**1,200**		J	**740**	J		**724**	J		**1,170**	J		-		
	Selenium	mg/kg	5,800	0.52	0.26	0.55	U		0.52	U		**0.84**	J		0.51	U		0.54	U		5.4	U		2.8	U		2.6	U		2.7	U		5.1	U		2.6	U		0.59	U		-		
	Silver	mg/kg	5,800	0.80	-	2.2	U	UJ	2.1	U	UJ	2.1	U	UJ	2.0	U	UJ	2.2	U	UJ	4.3	U		2.2	U		2.1	U		2.1	U		4.1	U		2.1	U		0.47	U		-		
	Sodium	mg/kg	-	-	-	**171**	J		**209**	J		**222**	J		**248**	J		**238**	J		**203**	J		**216**	J		**209**	J		**188**	J		**183**	J		**335**	J		**152**	J		-		
X	**Thallium**	mg/kg	12	0.014	0.14	0.55	U		0.52	U		0.52	U		0.51	U		0.54	U		0.54	U		0.55	U		0.52	U		0.53	U		0.51	U		2.6	U		0.59	U		-		
X	**Vanadium**	mg/kg	5,800	86	-	**18.2**			**19.6**			**7.4**			**8.4**			**10.2**			**12.1**			**15**			**10.8**			**11.9**			**10.6**			**10.1**			**29.1**			-		
	Zinc	mg/kg	350,000	370	-	**19**		J	**24.5**		J	**24.7**		J	**21.1**		J	**29.7**		J	**24.6**		J	**39.2**		J	**36.2**		J	**29.3**		J	**21.7**		J	**25.8**		J	**92.7**		J	-		
	General Chemistry																																											
	Solids, Percent	%	-	-	-	**90.7**			**94.4**			**95.4**			**95.1**			**92.1**			**93**			**93.4**			**94**			**94.2**			**94.4**			**93.9**			**83.4**			**90.9**		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-1c. Analytical Sample Summary - Soil: Inorganic Compounds

LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-8			SB-9			SB-9 field duplicate			SB-9			SB-9			SB-9			SB-10			SB-10			SB-10			SB-10			SB-11			SB-11			SB-11		
	Field Sample ID:		USEPA RSL Industrial Soil (5/2018)	USEPA RSL Risk-based SSL (5/2018)	USEPA RSL MCL-based SSL (5/2018)	LF512RI_SB-8 (20-25)_042617			LF512RI_SB-9 (0-2.5)_050817			LF512RI_SB-9 (0-2.5)_050817_FD			LF512RI_SB-9 (10-12.5)_050817			LF512RI_SB-9 (12.5-15)_050817			LF512RI_SB-9 (22.5-25)_050817			LF512RI_SB-10 (2-4)_042617			LF512RI_SB-10 (6-8)_042617			LF512RI_SB-10 (22.5-25)_042617			LF512RI_SB-10 (25-27)_042617			LF512RI_SB-11 (4-6)_042517			LF512RI_SB-11 (6-8)_042517			LF512RI_SB-11 (10-15)_042517		
	Sampled Interval (feet):					20-25			0-2.5			0-2.5_FD			10-12.5			12.5-15			22.5-25			2-4			6-8			22.5-25			25-27			4-6			6-8			10-15		
	Laboratory[2] Sample ID:					*JC41973-25*			*JC42885-11*			*JC42885-16*			*JC42885-13*			*JC42885-14*			*JC42885-15*			*JC41973-29*			*JC41973-30*			*JC41973-31*			*JC41973-32*			*JC41973-9*			*JC41973-10*			*JC41973-11*		
	Date Sampled:					4/26/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			5/8/2017			4/26/2017			4/26/2017			4/26/2017			4/26/2017			4/25/2017			4/25/2017			4/25/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Metals (6010C, 7470A)																																											
X	**Aluminum**	mg/kg	1,100,000	30,000	-	**15,500**			**9,760**		J	**16,600**		J	**2,610**		J	**2,410**		J	**2,500**		J	**8,190**		J	**2,350**		J	**2,400**		J	**2,440**		J	**16,200**		J	**20,300**		J	**11,500**		J
	Antimony	mg/kg	470	0.35	0.27	0.64	U		0.56	U	UJ	0.57	U	UJ	0.52	U	UJ	0.52	U	UJ	0.51	U	UJ	0.53	U		0.53	U		0.50	U		**0.92**	J		0.61	U		0.61	U		0.61	U	
X	**Arsenic**	mg/kg	3.0	0.0015	0.29	**10.2**			**10**		J	**12.4**		J	**4.8**			**5.8**			**5.8**			**8.9**			**5.4**			**5.2**			**8.4**			**10.4**			**11.7**			**11**		
	Barium	mg/kg	220,000	160	82	**96.9**			**43.4**		J	**73**		J	**13.4**	J		**13.3**	J		**18.4**	J		**224**			**12.9**	J		**14**	J		**18.9**	J		**98.1**			**110**			**133**		
	Beryllium	mg/kg	2,300	19	3.2	**0.64**			**0.45**		J	**0.63**		J	**0.16**	J	B	**0.12**	J	B	**0.15**	J	B	**0.45**			**0.14**	J		**0.13**	J		**0.16**	J		**0.65**			**0.80**			**0.63**		
X	**Cadmium**	mg/kg	980	0.69	0.38	0.26	U		0.22	U		0.23	U		0.21	U		0.21	U		0.20	U		**10**			0.21	U		0.20	U		**0.33**	J		**14.7**			**6.6**			**0.81**		
	Calcium	mg/kg	-	-	-	**41,700**			**106,000**		J	**10,600**		J	**160,000**			**168,000**			**168,000**			**97,000**			**141,000**			**162,000**			**182,000**			**52,300**			**50,000**			**83,300**		
	Chromium	mg/kg	-	-	180,000	**16.4**			**10.9**		J	**16.7**		J	**5.9**		J	**4.6**		J	**4.6**		J	**29.4**			**4.3**			**5.7**			**8.5**			**18.3**			**22.4**			**15.7**		
	Cobalt	mg/kg	350	0.27	-	**8.1**			**4.4**	J		**7.2**			**2.7**	J		**2.5**	J		**2.3**	J		**6.2**			**2.7**	J		**2.2**	J		**3.3**	J		**8.0**			**9.3**			**6.7**		
	Copper	mg/kg	47,000	28	46	**16.8**			**14.6**			**18**			**7.4**			**7.6**			**7.5**			**136**			**9.8**			**8.1**			**10.5**			**55.9**			**47**			**25.3**		
X	**Iron**	mg/kg	820,000	350	-	**20,300**			**14,500**		J	**23,900**		J	**6,500**			**7,240**			**7,500**			**18,800**		J	**6,460**		J	**6,670**		J	**11,100**		J	**22,600**		J	**26,000**		J	**20,800**		J
	Lead	mg/kg	800	-	14	**13.1**			**10.9**			**13.1**			**3.1**	J		**2.7**	J		**2.9**	J		**195**			**4.5**			**4.5**			**9.1**			**133**			**59.5**			**73.1**		
	Magnesium	mg/kg	-	-	-	**20,700**			**56,800**		J	**6,390**		J	**61,700**		J	**59,800**		J	**66,700**		J	**32,400**			**54,600**			**65,000**			**83,800**			**22,100**			**16,600**			**25,900**		
X	**Manganese**	mg/kg	26,000	28	-	**909**			**358**		J	**540**		J	**239**		J	**243**		J	**218**		J	**574**		J	**219**		J	**212**		J	**286**		J	**683**		J	**720**		J	**538**		J
	Mercury	mg/kg	46	0.033	0.10	**0.028**	J		**0.030**	J		0.028	U		0.023	U		0.024	U		0.024	U		**0.22**			0.024	U		0.024	U		0.024	U		**0.22**			**0.26**			**0.039**		
	Nickel	mg/kg	11,000	26	-	**20.7**			**16.8**			**22.9**			**6.7**			**6.4**			**5.7**			**25.6**			**7.2**			**6.6**			**9.3**			**24.1**			**24.9**			**16.4**		
	Potassium	mg/kg	-	-	-	**1,370**			**1,070**	J		**1,110**		J	**766**	J		**557**	J		**795**	J		**940**	J		**504**	J		**648**	J		**746**	J		**1,490**		J	**1,680**		J	**1,340**		J
	Selenium	mg/kg	5,800	0.52	0.26	0.64	U		0.56	U		0.57	U		0.52	U		**0.60**	J		0.51	U		**0.82**	J		2.6	U		5.0	U		5.4	U		0.61	U		0.61	U		0.61	U	
	Silver	mg/kg	5,800	0.80	-	0.51	U		0.45	U	UJ	0.46	U	UJ	2.1	U	UJ	2.1	U	UJ	2.0	U	UJ	2.1	U		2.1	U		4.0	U		4.3	U		0.49	U		0.49	U		0.49	U	
	Sodium	mg/kg	-	-	-	**144**	J		**820**	J		**1,580**			**333**	J		**256**	J		**245**	J		**141**	J		**186**	J		**197**	J		**227**	J		**358**	J		**445**	J		**237**	J	
X	**Thallium**	mg/kg	12	0.014	0.14	0.64	U		0.56	U		0.57	U		0.52	U		0.52	U		0.51	U		0.53	U		0.53	U		0.50	U		0.54	U		0.61	U		0.61	U		0.61	U	
X	**Vanadium**	mg/kg	5,800	86	-	**32.5**			**22.6**		J	**31.7**		J	**8.6**			**8.3**			**8.5**			**19.4**			**7.8**			**8.0**			**10**			**33.5**			**41.2**			**25.6**		
	Zinc	mg/kg	350,000	370	-	**52.4**			**40.2**		J	**64.1**		J	**26.4**		J	**27.3**		J	**25**		J	**213**		J	**22**		J	**22.9**		J	**34.5**		J	**139**		J	**126**		J	**111**		J
	General Chemistry																																											
	Solids, Percent	%	-	-	-	**79.8**			**85.6**			**85.7**			**96.6**			**96.8**			**96.9**			**89.6**			**95.5**			**95.8**			**94.1**			**80.1**			**80.5**			**81.6**		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-1c. Analytical Sample Summary - Soil: Inorganic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-11			SB-11 field duplicate			SB-12			SB-12 field duplicate		
	Field Sample ID:		USEPA RSL Industrial Soil (5/2018)	USEPA RSL Risk-based SSL (5/2018)	USEPA RSL MCL-based SSL (5/2018)	LF512RI_SB-11 (24-26)_042517			LF512RI_SB-11 (24-26)_042517_FD[6]			LF512RI_SB-12 (0-2.5)_050917			LF512RI_SB-12 (0-2.5)_050917_FD		
	Sampled Interval (feet):					24-26			24-26_FD			0-2.5			0-2.5_FD		
	Laboratory[2] Sample ID:					*JC41973-12*			*JC41973-13*			*JC42953-16*			*JC42953-17*		
	Date Sampled:					4/25/2017			4/25/2017			5/9/2017			5/9/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Metals (6010C, 7470A)																
X	**Aluminum**	mg/kg	1,100,000	30,000	-	**2,500**		J	**2,310**		J	**7,660**			**8,340**		
	Antimony	mg/kg	470	0.35	0.27	0.51	U		0.52	U		0.53	U		0.54	U	
X	**Arsenic**	mg/kg	3.0	0.0015	0.29	**5.9**			**6.5**			**10.6**			**10.9**		
	Barium	mg/kg	220,000	160	82	**17.3**	J		**22.6**			**54.7**			**46.5**		
	Beryllium	mg/kg	2,300	19	3.2	**0.16**	J		**0.16**	J		**0.31**		J	**0.42**		J
X	**Cadmium**	mg/kg	980	0.69	0.38	0.20	U		0.21	U		0.21	U		0.21	U	
	Calcium	mg/kg	-	-	-	**160,000**			**169,000**			**54,400**		J	**105,000**		J
	Chromium	mg/kg	-	-	180,000	**5.6**			**5.4**			**10.4**		J	**10.1**		J
	Cobalt	mg/kg	350	0.27	-	**3.0**	J		**2.8**	J		**5.7**			**6.9**		
	Copper	mg/kg	47,000	28	46	**9.3**			**9.2**			**12.2**			**13.2**		
X	**Iron**	mg/kg	820,000	350	-	**7,720**		J	**8,080**		J	**18,100**		J	**16,600**		J
	Lead	mg/kg	800	-	14	**5.6**			**4.9**			**9.5**		J	**7.6**		J
	Magnesium	mg/kg	-	-	-	**69,100**			**72,300**			**22,700**		J	**54,400**		J
X	**Manganese**	mg/kg	26,000	28	-	**271**		J	**301**		J	**511**		J	**870**		J
	Mercury	mg/kg	46	0.033	0.10	0.023	U		0.023	U		**0.024**	J		0.026	U	
	Nickel	mg/kg	11,000	26	-	**8.4**			**8.1**			**13.3**		J	**16.3**		J
	Potassium	mg/kg	-	-	-	**721**	J		**678**	J		**898**	J		**1,040**	J	
	Selenium	mg/kg	5,800	0.52	0.26	13	U		13	U		0.53	U		0.54	U	
	Silver	mg/kg	5,800	0.80	-	10	U		10	U		0.42	U		2.1	U	
	Sodium	mg/kg	-	-	-	**209**	J		**231**	J		**466**	J		**378**	J	
X	**Thallium**	mg/kg	12	0.014	0.14	13	U		13	U		**0.61**	J		**0.93**	J	
X	**Vanadium**	mg/kg	5,800	86	-	**10.4**			**9.5**			**21.1**			**21.3**		
	Zinc	mg/kg	350,000	370	-	**29.4**		J	**29.3**		J	**38.9**		J	**39.9**		J
	General Chemistry																
	Solids, Percent	%	-	-	-	**95.6**			**94.5**			**91.4**			**91.6**		

COPC[3]	Location ID:	Units	SB-12			SB-12			SB-12			SB-13			SB-13		
	Field Sample ID:		LF512RI_SB-12 (10-12.5)_050917			LF512RI_SB-12 (15-20)_050917			LF512RI_SB-12 (22.5-25)_050917			LF512RI_SB-13 (0-2.5)_051017			LF512RI_SB-13 (7.5-10)_051017		
	Sampled Interval (feet):		10-12.5			15-20			22.5-25			0-2.5			7.5-10		
	Laboratory[2] Sample ID:		*JC42953-18*			*JC42953-19*			*JC42953-20*			*JC43060-14*			*JC43060-16*		
	Date Sampled:		5/9/2017			5/9/2017			5/9/2017			5/10/2017			5/10/2017		
	Result[7] and Qualifiers:		Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Metals (6010C, 7470A)																
X	**Aluminum**	mg/kg	**14,100**			**10,700**			**2,140**			**2,690**		J	**8,660**		J
	Antimony	mg/kg	0.61	U		0.52	U		0.52	U		0.51	U	UJ	0.57	U	UJ
X	**Arsenic**	mg/kg	**11**			**7.8**			**5.1**			**3.3**			**7.8**		
	Barium	mg/kg	**95.3**			**70.1**			**14.5**	J		**602**			**99.3**		
	Beryllium	mg/kg	**0.69**			**0.42**			**0.12**	J		**0.18**	J		**0.52**		
X	**Cadmium**	mg/kg	**0.24**	J		**0.36**	J		0.21	U		**0.92**			**0.33**	J	
	Calcium	mg/kg	**2,410**			**33,500**			**179,000**			**133,000**		J	**15,000**		J
	Chromium	mg/kg	**16.7**		J	**12.9**		J	**4.5**		J	**12.6**			**11.3**		
	Cobalt	mg/kg	**8.7**			**7.7**			**2.4**	J		**2.4**	J		**5.8**		
	Copper	mg/kg	**17.6**			**14.7**			**6.2**			**11.5**			**13.2**		
X	**Iron**	mg/kg	**19,400**		J	**14,900**		J	**6,310**		J	**6,550**		J	**18,300**		J
	Lead	mg/kg	**20.4**			**25.3**			**6.5**	J		**148**			**81.8**		
	Magnesium	mg/kg	**2,360**			**15,900**			**76,600**			**53,000**		J	**6,030**		J
X	**Manganese**	mg/kg	**877**		J	**416**		J	**535**		J	**218**		J	**455**		J
	Mercury	mg/kg	0.027	U		0.024	U		0.023	U		**0.028**	J		0.028	U	
	Nickel	mg/kg	**20.3**			**16.5**			**6.7**	J		**9.4**			**12.1**		
	Potassium	mg/kg	**1,160**	J		**1,020**			**658**	J		**636**	J		**890**	J	
	Selenium	mg/kg	0.61	U		0.52	U		0.52	U		0.51	U		0.57	U	
	Silver	mg/kg	0.49	U		0.41	U		2.1	U		2.0	U		0.45	U	
	Sodium	mg/kg	**371**	J		**239**	J		**235**	J		**184**	J		**837**	J	
X	**Thallium**	mg/kg	0.61	U		0.52	U		2.6	U		2.5	U		0.57	U	
X	**Vanadium**	mg/kg	**33.2**			**26.2**			**6.8**			**11.4**			**22.5**		
	Zinc	mg/kg	**73.7**		J	**54.4**		J	**22.3**		J	**82.8**		J	**78.9**		J
	General Chemistry																
	Solids, Percent	%	**84.2**			**94.9**			**97.5**			**95.6**			**86.4**		

COPC[3]	Location ID:	Units	SB-13			SB-13			SB-14			SB-14		
	Field Sample ID:		LF512RI_SB-13 (12.5-15)_051017			LF512RI_SB-13 (20-22.5)_051017			LF512RI_SB-14 (0-2)_042517			LF512RI_SB-14 (12-14)_042517		
	Sampled Interval (feet):		12.5-15			20-22.5			0-2			12-14		
	Laboratory[2] Sample ID:		*JC43060-17*			*JC43060-18*			*JC41973-14*			*JC41973-20*		
	Date Sampled:		5/10/2017			5/10/2017			4/25/2017			4/25/2017		
	Result[7] and Qualifiers:		Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Metals (6010C, 7470A)													
X	**Aluminum**	mg/kg	**13,000**		J	**2,220**		J	**14,200**		J	**2,910**		J
	Antimony	mg/kg	0.55	U	UJ	0.52	U	UJ	0.60	U		0.51	U	
X	**Arsenic**	mg/kg	**9.8**			**4.4**			**7.1**			**8.6**		
	Barium	mg/kg	**55.3**			**13.6**	J		**174**			**14.5**	J	
	Beryllium	mg/kg	**0.54**			**0.14**	J		**0.77**			**0.16**	J	
X	**Cadmium**	mg/kg	0.22	U		0.21	U		**1.5**			0.20	U	
	Calcium	mg/kg	**66,000**		J	**195,000**		J	**14,100**			**164,000**		
	Chromium	mg/kg	**13.9**			**3.5**			**18.9**			**5.9**		
	Cobalt	mg/kg	**6.2**			**2.0**	J		**9.2**			**3.8**	J	
	Copper	mg/kg	**14.9**			**5.1**			**24.4**			**10.7**		
X	**Iron**	mg/kg	**20,400**		J	**5,040**		J	**18,500**		J	**11,700**		J
	Lead	mg/kg	**9.9**			2.6	U		**70.6**			**5.8**		
	Magnesium	mg/kg	**26,400**		J	**69,000**		J	**6,450**			**60,200**		
X	**Manganese**	mg/kg	**500**		J	**249**		J	**826**		J	**294**		J
	Mercury	mg/kg	0.026	U		0.023	U		**0.057**			0.025	U	
	Nickel	mg/kg	**16.3**			**5.4**			**18.5**			**8.9**		
	Potassium	mg/kg	**1,300**			**810**	J		**1,330**		J	**713**	J	
	Selenium	mg/kg	0.55	U		0.52	U		0.60	U		13	U	
	Silver	mg/kg	1.3	U		2.1	U		0.48	U		10	U	
	Sodium	mg/kg	**329**	J		**199**	J		**84**	J		**191**	J	
X	**Thallium**	mg/kg	**0.61**	J		2.6	U		0.60	U		13	U	
X	**Vanadium**	mg/kg	**28.9**			**6.8**			**30.7**			**11.8**		
	Zinc	mg/kg	**53.2**		J	**18.2**		J	**71.6**		J	**31.6**		J
	General Chemistry													
	Solids, Percent	%	**89.1**			**95.8**			**79.4**			**95**		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R : data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

[1] Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
[2] Samples analyzed by SGS of Dayton, New Jersey
[3] Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
[4] Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
[5] Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
[6] Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
[7] Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-1c. Analytical Sample Summary - Soil: Inorganic Compounds
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:	Units	Project Action Limits[1]			SB-14			SB-14			SB-15			SB-15 field duplicate			SB-15			SB-15			SB-15			SB-16			SB-16			SB-16			SB-16		
	Field Sample ID:		**USEPA RSL Industrial Soil (5/2018)**	**USEPA RSL Risk-based SSL (5/2018)**	**USEPA RSL MCL-based SSL (5/2018)**	LF512RI_SB-14 (18-20)_042517			LF512RI_SB-14 (25-27)_042617			LF512RI_SB-15 (7.5-10)_051017			LF512RI_SB-15 (7.5-10)_051017_FD			LF512RI_SB-15 (12.5-15)_051017			LF512RI_SB-15 (17.5-20)_051017			LF512RI_SB-15 (22.5-25)_051017			LF512RI_SB-16 (7.5-10)_051017			LF512RI_SB-16 (12.5-15)_051017			LF512RI_SB-16 (17.5-20)_051017			LF512RI_SB-16 (25-27.5)_051017		
	Sampled Interval (feet):					18-20			25-27			7.5-10			7.5-10_FD			12.5-15			17.5-20			22.5-25			7.5-10			12.5-15			17.5-20			25-27.5		
	Laboratory[2] Sample ID:					*JC41973-23*			*JC41973-33*			*JC43060-4*			*JC43060-5*			*JC43060-6*			*JC43060-7*			*JC43060-8*			*JC43060-10*			*JC43060-11*			*JC43060-12*			*JC43060-13*		
	Date Sampled:					4/25/2017			4/26/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017			5/10/2017		
	Result[7] and Qualifiers:					Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Metals (6010C, 7470A)																																					
X	**Aluminum**	mg/kg	1,100,000	30,000	-	**3,240**		J	**2,330**		J	**4,160**		J	**7,850**		J	**3,850**		J	**2,440**		J	**2,420**		J	**13,700**		J	**3,510**		J	**2,630**		J	**4,720**		J
	Antimony	mg/kg	470	0.35	0.27	0.27	U		0.52	U		0.53	U	UJ	0.60	U	UJ	0.52	U	UJ	0.54	U	UJ	0.49	U	UJ	0.59	U	UJ	0.53	U	UJ	0.52	U	UJ	0.55	U	UJ
X	**Arsenic**	mg/kg	3.0	0.0015	0.29	**4.0**			**5.0**			**5.7**		J	**13.9**		J	**4.4**			**6.2**			**7.3**			**13.6**			**8.0**			**25.8**			**7.8**		
	Barium	mg/kg	220,000	160	82	**22.3**			**18.2**	J		**21.9**		J	**75.6**		J	**13.8**	J		**16**	J		**24.1**			**107**			**18**	J		**17.7**	J		**29.1**		
	Beryllium	mg/kg	2,300	19	3.2	**0.17**			**0.20**	J		**0.24**		J	**0.76**		J	**0.13**	J		**0.15**	J		**0.16**	J		**0.53**			**0.17**	J		**0.17**	J		**0.24**		
X	**Cadmium**	mg/kg	980	0.69	0.38	0.11	U		0.21	U		0.21	U	UJ	**3.5**		J	0.21	U		0.22	U		0.20	U		0.24	U		0.21	U		0.21	U		0.22	U	
	Calcium	mg/kg	-	-	-	**109,000**			**159,000**			**171,000**		J	**70,900**		J	**145,000**		J	**168,000**		J	**153,000**		J	**3,230**		J	**159,000**		J	**166,000**		J	**150,000**		J
	Chromium	mg/kg	-	-	180,000	**5.4**			**4.5**			**6.6**		J	**12.1**		J	**5.5**			**4.9**			**5.0**			**15.6**			**5.4**			**5.1**			**16.9**		
	Cobalt	mg/kg	350	0.27	-	**3.1**			**2.4**	J		**3.1**	J		**4.7**	J		**3.2**	J		**2.4**	J		**2.4**	J		**7.2**			**3.1**	J		**2.1**	J		**3.7**	J	
	Copper	mg/kg	47,000	28	46	**10**			**7.6**			**7.9**		J	**17.3**		J	**9.3**			**7.0**			**8.2**			**13.5**			**9.9**			**10.5**			**10.9**		
X	**Iron**	mg/kg	820,000	350	-	**7,410**		J	**6,140**		J	**7,620**		J	**17,500**		J	**7,220**		J	**6,050**		J	**7,220**		J	**21,300**		J	**10,800**		J	**12,700**		J	**13,500**		J
	Lead	mg/kg	800	-	14	**3.4**			**4.0**			**5.5**	J		**37.5**		J	2.6	U		**3.4**	J		**3.7**	J		**19.4**			**6.3**	J		**31.4**			**9.9**	J	
	Magnesium	mg/kg	-	-	-	**48,900**			**71,000**			**64,700**		J	**32,900**		J	**64,700**		J	**65,700**		J	**68,500**		J	**2,140**		J	**57,800**		J	**68,000**		J	**59,900**		J
X	**Manganese**	mg/kg	26,000	28	-	**282**		J	**256**			**248**		J	**303**		J	**213**		J	**254**		J	**288**		J	**457**		J	**248**		J	**281**		J	**339**		J
	Mercury	mg/kg	46	0.033	0.10	0.027	U		0.025	U		0.026	U		**0.038**			0.024	U		0.024	U		0.023	U		0.028	U		0.023	U		0.026	U		0.025	U	
	Nickel	mg/kg	11,000	26	-	**8.2**			**7.7**			**7.9**		J	**12.5**		J	**7.1**			**7.1**			**7.7**			**14.9**			**8.6**			**7.2**			**10.8**		
	Potassium	mg/kg	-	-	-	**969**		J	**617**	J		**858**	J		**853**	J		**592**	J		**755**	J		**688**	J		**1,090**	J		**774**	J		**756**	J		**882**	J	
	Selenium	mg/kg	5,800	0.52	0.26	6.8	U		5.2	U		0.53	U		0.60	U		0.52	U		0.54	U		0.49	U		0.59	U		0.53	U		0.52	U		0.55	U	
	Silver	mg/kg	5,800	0.80	-	5.4	U		4.2	U		2.1	U		1.4	U		2.1	U		2.2	U		2.0	U		0.47	U		2.1	U		2.1	U		2.2	U	
	Sodium	mg/kg	-	-	-	**160**	J		**212**	J		**271**	J		**424**	J		**396**	J		**221**	J		**212**	J		**983**	J		**418**	J		**400**	J		**493**	J	
X	**Thallium**	mg/kg	12	0.014	0.14	6.8	U		0.52	U		2.6	U		0.60	U		2.6	U		2.7	U		2.5	U		0.59	U		2.6	U		2.6	U		2.7	U	
X	**Vanadium**	mg/kg	5,800	86	-	**8.8**			**7.7**			**13.3**		J	**19.3**		J	**9.8**			**8.1**			**9.1**			**32.2**			**10.6**			**10.1**			**15.5**		
	Zinc	mg/kg	350,000	370	-	**28.9**		J	**21.3**			**27.7**		J	**58.1**		J	**20.5**		J	**21**		J	**25.3**		J	**55.2**		J	**34.1**		J	**24.5**		J	**30.5**		J
	General Chemistry																																					
	Solids, Percent	%	-	-	-	**88.9**			**94.3**			**94.2**			**83.9**			**95.9**			**95.8**			**96.3**			**82.2**			**94.9**			**94.5**			**93**		

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA RSL Risk-based SSL
bold, red: analyte detected at a value exceeding the USEPA RSL MCL-based SSL
blue shading: analyte detected at a value exceeding the USEPA RSL for Industrial Soil
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
SSL: soil screening level

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Surface Soil (0 to 2.5 feet below ground surface [bgs]) and/or Aggregate Soil (0 to 15 feet bgs). COPCs selected via screening against USEPA RSLs for Resident Soil.
4: Field sample ID incorrectly logged in laboratory report as LF512RI_SB-1(2.5-5)_050917_FD; field sample ID shown as per the Chain-of-Custody Record (COCR)
5: Field sample ID incorrectly logged in laboratory and data review reports as "LF512RI_SB-5(15-20)_042717-"; field sample ID shown as per the COCR
6: Field sample ID truncated in length in laboratory and data review reports; field sample ID shown as per the COCR
7: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-2a. Analytical Sample Summary - Groundwater: August 2017
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:		Project Action Limits[1]		MW-7			MW-7 (filtered)			MW-12			MW-12 (filtered)			MW-12 (duplicate)			MW-12 (filtered duplicate)			MW-13		
	Field Sample ID:		**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**	LF512_MW-7 _010817			LF512_MW-7 _010817			LF512_MW-12 _010817			LF512_MW-12 _010817			LF512_MW-12 _010817-DUP			LF512_MW-12 _010817-DUP			LF512_MW-13 _010817		
	Screened Interval (feet):				21 - 31			21 - 31			20 - 30			20 - 30			20 - 30			20 - 30			20.1 - 30.1		
	Laboratory[2] Sample ID:				*JC48106-3*			*JC48106-3F*			*JC48106-8*			*JC48106-8F*			*JC48106-9*			*JC48106-9F*			*JC48106-7*		
	Date Sampled:				8/1/2017			8/1/2017			8/1/2017			8/1/2017			8/1/2017			8/1/2017			8/1/2017		
	Result[4] and Qualifiers:	Units			Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Volatile Organic Compounds (SW846 8260C)																								
	Chloroform	µg/L	0.22	80	0.50	U		-			**1.7**			-			**1.7**			-			**1.5**		
X	Tetrachloroethene	µg/L	11	5.0	**0.81**	J		-			**8.9**			-			**8.5**			-			**9.4**		
	Semi-volatile Organic Compounds (SW846 8270D)																								
X	**Dibenzofuran**	µg/L	7.9	-	**0.99**	J		-			0.56	U		-			0.50	U		-			0.56	U	
	Di-n-butyl phthalate	µg/L	900	-	1.1	U		-			1.1	U		-			1.0	U		-			1.1	U	
	Polycyclic Aromatic Hydrocarbons (SW846 8270D BY SIM)																								
	Acenaphthene	µg/L	530	-	**0.82**			-			0.050	U		-			0.053	U		-			0.054	U	
	Fluoranthene	µg/L	800	-	0.053	U	UJ	-			0.050	U	UJ	-			0.053	U	UJ	-			0.054	U	UJ
X	**Naphthalene**	µg/L	0.17	-	0.053	U	UJ	-			0.050	U	UJ	-			0.053	U	UJ	-			0.054	U	UJ
	Pyrene	µg/L	120	-	0.026	U		-			0.025	U		-			0.026	U		-			0.027	U	
	Total Petroleum Hydrocarbons (SW846 8015C)																								
	TPH-DRO (C10-C20)	mg/L	-	-	**0.14**			-			0.025	U		-			0.026	U		-			0.027	U	
	Total OH TPH (C10-C34)	mg/L	-	-	**0.14**			-			0.025	U		-			0.026	U		-			0.027	U	
	Metals (6010C, 7470A)																								
	Aluminum	µg/L	20,000	-	100	U		100	U		100	U		100	U		100	U		100	U		100	U	
	Arsenic	µg/L	0.052	10	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		**0.68**	J	
	Barium	µg/L	3,800	2,000	**101**	J		**100**	J		**107**	J		**104**	J		**107**	J		**107**	J		**114**	J	
	Beryllium	µg/L	25	4.0	**0.031**	J	B	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
	Calcium	µg/L	-	-	**84,100**			**81,500**			**95,000**			**80,400**			**83,200**			**81,900**			**86,700**		
	Chromium	µg/L	-	100	5.0	U		5.0	U		**5.4**	J		5.0	U		5.0	U		5.0	U		**7.2**	J	
	Iron	µg/L	14,000	-	50	U		50	U		50	U		50	U		50	U		50	U		**61**	J	
	Magnesium	µg/L	-	-	**24,300**			**24,100**			**26,200**			**25,600**			**26,000**			**26,100**			**25,800**		
X	**Manganese**	µg/L	430	-	**132**			**127**			2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
	Mercury	µg/L	0.63	2.0	0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		**0.29**		
	Nickel	µg/L	220	-	8.0	U		8.0	U		8.0	U		8.0	U		8.0	U		8.0	U		8.0	U	
	Potassium	µg/L	-	-	**4,540**	J		**4,450**	J		**4,950**	J		**4,910**	J		**5,010**	J		**5,030**	J		**4,930**	J	
	Sodium	µg/L	-	-	**59,900**			**59,400**			**55,500**			**54,400**			**55,600**			**55,500**			**50,900**		
	Thallium	µg/L	0.20	2.0	**0.048**	J		1.0	U		1.0	U		1.0	U		1.0	U		**0.054**	J		1.0	U	
	Zinc	µg/L	6,000	-	10	U		10	U		10	U		10	U		10	U		10	U		10	U	

COPC[3]	Location ID:		MW-13 (filtered)			MW-14			MW-14 (filtered)			MW-15			MW-15 (filtered)			MW-16			MW-16 (filtered)	
	Field Sample ID:		LF512_MW-13 _010817			LF512_MW-14 _010817			LF512_MW-14 _010817			LF512_MW-15 _010817			LF512_MW-15 _010817			LF512_MW-16 _010817			LF512_MW-16 _010817	
	Screened Interval (feet):		20.1 - 30.1			27.8 - 37.8			27.8 - 37.8			27.7 - 37.7			27.7 - 37.7			28.1 - 38.1			28.1 - 38.1	
	Laboratory[2] Sample ID:		*JC48106-7F*			*JC48106-6*			*JC48106-6F*			*JC48106-5*			*JC48106-5F*			*JC48106-4*			*JC48106-4F*	
	Date Sampled:		8/1/2017			8/1/2017			8/1/2017			8/1/2017			8/1/2017			8/1/2017			8/1/2017	
	Result[4] and Qualifiers:	Units	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q
	Volatile Organic Compounds (SW846 8260C)																					
	Chloroform	µg/L	-			**1.8**			-			**1.1**			-			**1.3**			-	
X	Tetrachloroethene	µg/L	-			**9.6**			-			**7.1**			-			**10.1**			-	
	Semi-volatile Organic Compounds (SW846 8270D)																					
X	**Dibenzofuran**	µg/L	-			0.51	U		-			0.54	U		-			0.53	U		-	
	Di-n-butyl phthalate	µg/L	-			1.0	U		-			1.1	U		-			1.1	U		-	
	Polycyclic Aromatic Hydrocarbons (SW846 8270D BY SIM)																					
	Acenaphthene	µg/L	-			0.053	U		-			0.053	U		-			0.053	U		-	
	Fluoranthene	µg/L	-			0.053	U	UJ	-			0.053	U	UJ	-			0.053	U	UJ	-	
X	**Naphthalene**	µg/L	-			0.053	U	UJ	-			0.053	U	UJ	-			0.053	U	UJ	-	
	Pyrene	µg/L	-			0.027	U		-			0.026	U		-			0.026	U		-	
	Total Petroleum Hydrocarbons (SW846 8015C)																					
	TPH-DRO (C10-C20)	mg/L	-			0.025	U		-			0.027	U		-			0.025	U		-	
	Total OH TPH (C10-C34)	mg/L	-			0.025	U		-			0.027	U		-			0.025	U		-	
	Metals (6010C, 7470A)																					
	Aluminum	µg/L	100	U		100	U		100	U		100	U		100	U		100	U		100	U
	Arsenic	µg/L	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U
	Barium	µg/L	**113**	J		**105**	J		**103**	J		**111**	J		**109**	J		**114**	J		**114**	J
	Beryllium	µg/L	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U
	Calcium	µg/L	**86,100**			**85,400**			**83,600**			**80,000**			**81,900**			**82,700**			**85,100**	
	Chromium	µg/L	5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U		5.0	U
	Iron	µg/L	50	U		50	U		50	U		50	U		50	U		50	U		50	U
	Magnesium	µg/L	**25,700**			**26,200**			**25,500**			**25,600**			**25,500**			**26,400**			**26,400**	
X	**Manganese**	µg/L	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		**9.2**	J	B	**8.3**	J
	Mercury	µg/L	0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U		0.15	U
	Nickel	µg/L	8.0	U		8.0	U		8.0	U		8.0	U		8.0	U		8.0	U		8.0	U
	Potassium	µg/L	**4,960**	J		**5,890**	J		**5,810**	J		**4,780**	J		**4,760**	J		**5,000**	J		**5,030**	J
	Sodium	µg/L	**51,100**			**51,400**			**50,400**			**58,600**			**58,100**			**52,200**			**52,500**	
	Thallium	µg/L	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U
	Zinc	µg/L	10	U	UJ	10	U		10	U		10	U		10	U		10	U		10	U

Notes:

bold, black: analyte detected

double underline: analyte detected at a value exceeding the USEPA MCL

bold, red: analyte detected at a value exceeding the USEPA Tapwater RSL

-: not applicable, no value available, or not sampled

MCL: maximum contaminant level

August 2017 Data [Event 1]

November 2017 Data [Event 2]

Laboratory (Q) and Data Review Qualifiers (V):

B: blank contamination

J-: estimated value, biased low

J: estimated value

R: data are unusable; See Data Review Report(s)

U: undetected; value recorded is the limit of detection (LOD)

UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.

2: Samples analyzed by SGS of Dayton, New Jersey

3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Groundwater.

4: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-2a. Analytical Sample Summary - Groundwater: August 2017
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:		Project Action Limits[1]			MW-17			MW-17 (filtered)			MW-17			MW-18			MW-18 (filtered)			MW-18			MW-19			MW-19 (filtered)		
	Field Sample ID:		**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**		LF512_MW-17_020817			LF512_MW-17_020817			LF512_MW-17_230817			LF512_MW-18_020817			LF512_MW-18_020817			LF512_MW-18_230817			LF512_MW-19_020817			LF512_MW-19_020817		
	Screened Interval (feet):					20.2 - 30.2			20.2 - 30.2			20.2 - 30.2			19.2 - 29.2			19.2 - 29.2			19.2 - 29.2			21.1 - 31.1			21.1 - 31.1		
	Laboratory[2] Sample ID:					*JC48106-12*			*JC48106-12F*			*JC48106-16*			*JC48106-13*			*JC48106-13F*			*JC48106-17*			*JC48106-14*			*JC48106-14F*		
	Date Sampled:					8/2/2017			8/2/2017			8/23/2017			8/2/2017			8/2/2017			8/23/2017			8/2/2017			8/2/2017		
	Result[4] and Qualifiers:	Units			V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V	Result	Q	V
	Volatile Organic Compounds (SW846 8260C)																												
	Chloroform	µg/L	0.22	80		**1.3**			-			-			**1.5**			-			-			**1.4**			-		
X	Tetrachloroethene	µg/L	11	5.0		**6.5**			-			-			**7.7**			-			-			**8.4**			-		
	Semi-volatile Organic Compounds (SW846 8270D)																												
X	**Dibenzofuran**	µg/L	7.9	-		-			-			0.57	U		0.50	U		-			-			0.50	U		-		
	Di-n-butyl phthalate	µg/L	900	-		-			-			1.1	U		1.0	U		-			-			1.0	U		-		
	Polycyclic Aromatic Hydrocarbons (SW846 8270D BY SIM)																												
	Acenaphthene	µg/L	530	-		-			-			0.056	U		-			-			0.056	U		0.053	U		-		
	Fluoranthene	µg/L	800	-		-			-			0.056	U		-			-			0.056	U		0.053	U	UJ	-		
X	**Naphthalene**	µg/L	0.17	-		-			-			0.056	U		-			-			0.056	U		0.053	U	UJ	-		
	Pyrene	µg/L	120	-		-			-			0.028	U		-			-			0.028	U		0.026	U		-		
	Total Petroleum Hydrocarbons (SW846 8015C)																												
	TPH-DRO (C10-C20)	mg/L	-	-		0.025	U	UJ	-			-			0.025	U		-			-			0.025	U		-		
	Total OH TPH (C10-C34)	mg/L	-	-		0.025	U	UJ	-			-			0.025	U		-			-			0.025	U		-		
	Metals (6010C, 7470A)																												
	Aluminum	µg/L	20,000	-		100	U		100	U		-			100	U		100	U		-			100	U		100	U	
	Arsenic	µg/L	0.052	10		2.0	U		2.0	U		-			**0.47**	J		**0.74**	J		-			2.0	U		2.0	U	
	Barium	µg/L	3,800	2,000		**110**	J		**114**	J		-			**108**	J		**110**	J		-			**107**	J		**107**	J	
	Beryllium	µg/L	25	4.0		0.50	U		0.50	U		-			0.50	U		0.50	U		-			0.50	U		0.50	U	
	Calcium	µg/L	-	-		**82,000**			**86,600**			-			**82,600**			**88,500**			-			**85,800**			**87,200**		
	Chromium	µg/L	-	100		**1.0**	J		5.0	U		-			5.0	U		5.0	U		-			5.0	U		5.0	U	
	Iron	µg/L	14,000	-		50	U		50	U		-			50	U		50	U		-			50	U		50	U	
	Magnesium	µg/L	-	-		**28,300**			**29,000**			-			**27,100**			**27,500**			-			**27,800**			**27,800**		
X	**Manganese**	µg/L	430	-	B	**15.1**		B	**14.7**	J	B	-			**14.5**	J	B	**14.1**	J	B	-			**8.9**	J	B	**8.2**	J	B
	Mercury	µg/L	0.63	2.0		0.15	U		0.15	U		-			0.15	U		0.15	U		-			0.15	U		0.15	U	
	Nickel	µg/L	220	-		8.0	U		8.0	U		-			8.0	U		8.0	U		-			8.0	U		8.0	U	
	Potassium	µg/L	-	-		**4,710**	J		**4,850**	J		-			**4,110**	J		**4,090**	J		-			**4,950**	J		**4,910**	J	
	Sodium	µg/L	-	-		**59,100**			**61,100**			-			**55,200**			**56,300**			-			**58,000**			**58,200**		
	Thallium	µg/L	0.20	2.0		1.0	U		**0.061**	J		-			**0.086**	J		**0.048**	J		-			1.0	U		1.0	U	
	Zinc	µg/L	6,000	-		10	U	UJ	**5.9**	J		-			**2.3**	J	J-	**2.0**	J	J-	-			**1.2**	J	J-	**0.50**	J	J-

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA MCL
bold, red: analyte detected at a value exceeding the USEPA Tapwater RSL
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
August 2017 Data [Event 1]
November 2017 Data [Event 2]

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Groundwater.
4: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-2b. Analytical Sample Summary - Groundwater: November 2017
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC[3]	Location ID:		Project Action Limits[1]		MW-7			MW-7 (filtered)			MW-12			MW-12 (filtered)			MW-13			MW-13 (filtered)			MW-14		
	Field Sample ID:		EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)	EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)	LF512_MW-7 _112817			LF512_MW-7 _112817			LF512_MW-12 _112917			LF512_MW-12 _112917			LF512_MW-13 _112817			LF512_MW-13 _112817			LF512_MW-14 _112817		
	Screened Interval (feet):				21 - 31			21 - 31			20 - 30			20 - 30			20.1 - 30.1			20.1 - 30.1			27.8 - 37.8		
	Laboratory[2] Sample ID:				*JC56189-3*			*JC56189-3F*			*JC56189-14*			*JC56189-14F*			*JC56189-9*			*JC56189-9F*			*JC56189-8*		
	Date Sampled:				11/28/2017			11/28/2017			11/29/2017			11/29/2017			11/28/2017			11/28/2017			11/28/2017		
	Result[4] and Qualifiers:	Units			Result	Q	V[3]	Result	Q	V[3]	Result	Q	V[3]	Result	Q	V[3]	Result	Q	V[3]	Result	Q	V[3]	Result	Q	V[3]
	Volatile Organic Compounds (SW846 8260C)																								
	Chloroform	µg/L	0.22	80	0.50	U		-			**1.9**			-			**1.6**			-			**1.6**		
X	Tetrachloroethene	µg/L	11	5.0	**1.3**			-			**7.8**			-			**8.8**			-			**8.1**		
	Semi-volatile Organic Compounds (SW846 8270D)																								
X	**Dibenzofuran**	µg/L	7.9	-	**1.2**	J		-			0.50	U		-			0.50	U		-			0.53	U	
	Di-n-butyl phthalate	µg/L	900	-	1.0	U		-			1.0	U		-			1.0	U		-			1.1	U	
	Polycyclic Aromatic Hydrocarbons (SW846 8270D BY SIM)																								
	Acenaphthene	µg/L	530	-	**0.85**			-			0.050	U		-			0.050	U		-			0.053	U	
	Fluoranthene	µg/L	800	-	**0.19**			-			0.050	U		-			0.050	U		-			0.053	U	
X	**Naphthalene**	µg/L	0.17	-	0.050	U		-			**0.11**			-			0.050	U		-			0.053	U	
	Pyrene	µg/L	120	-	**0.083**	J		-			0.025	U		-			0.025	U		-			0.026	U	
	Total Petroleum Hydrocarbons (SW846 8015C)																								
	TPH-DRO (C10-C20)	mg/L	-	-	0.083	U		-			0.025	U		-			0.083	U		-			0.083	U	
	Total OH TPH (C10-C34)	mg/L	-	-	0.083	U		-			0.025	U		-			0.083	U		-			0.083	U	
	Metals (6010C, 7470A)																								
	Aluminum	µg/L	20,000	-	**42.9**	J		100	U		100	U		**33.8**	J		100	U		100	U		100	U	
	Arsenic	µg/L	0.052	10	2.0	U		**0.59**	J		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U	
	Barium	µg/L	3,800	2,000	**122**	J		**119**	J		**127**	J		**121**	J		**131**	J		**133**	J		**120**	J	
	Beryllium	µg/L	25	4.0	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
	Calcium	µg/L	-	-	**88,000**			**84,800**			**96,200**			**96,000**			**85,900**			**89,500**			**96,200**		
	Chromium	µg/L	-	100	**1.2**	J		**0.90**	J		**5.2**	J		5.0	U		**16**			**1.5**	J		**1.0**	J	
	Iron	µg/L	14,000	-	**37.8**	J		50	U		50	U		50	U		**106**			50	U		50	U	
	Magnesium	µg/L	-	-	**28,700**			**28,400**			**30,300**			**29,000**			**29,400**			**29,700**			**29,000**		
X	**Manganese**	µg/L	430	-	**117**			**115**			**0.50**	J	B	2.0	U		**0.60**	J	B	2.0	U		2.0	U	
	Mercury	µg/L	0.63	2.0	**0.13**	J		0.15	U		0.15	U		**0.088**	J		0.15	U		**0.096**	J		0.15	U	
	Nickel	µg/L	220	-	8.0	U		8.0	U		**2.0**	J	B	**2.1**	J		**2.7**	J	B	8.0	U		8.0	U	
	Potassium	µg/L	-	-	**5,390**	J		**5,310**	J		**6,190**	J		**5,950**	J		**5,370**	J		**5,480**	J		**6,870**	J	
	Sodium	µg/L	-	-	**58,100**			**57,200**			**59,600**			**57,100**			**54,000**			**54,800**			**54,500**		
	Thallium	µg/L	0.20	2.0	1.0	U		**0.20**	J	B	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
	Zinc	µg/L	6,000	-	10	U		10	U		10	U		10	U		10	U		10	U		10	U	

COPC[3]	Location ID:		MW-14 (filtered)			MW-15			MW-15 (filtered)			MW-15 (duplicate)			MW-15 (filtered duplicate)			MW-16			MW-16 (filtered)	
	Field Sample ID:		LF512_MW-14 _112817			LF512_MW-15 _112817			LF512_MW-15 _112817			LF512_MW-15 _D_112817			LF512_MW-15 _D_112817			LF512_MW-16 _112917			LF512_MW-16 _112917	
	Screened Interval (feet):		27.8 - 37.8			27.7 - 37.7			27.7 - 37.7			27.7 - 37.7			27.7 - 37.7			28.1 - 38.1			28.1 - 38.1	
	Laboratory[2] Sample ID:		*JC56189-8F*			*JC56189-5*			*JC56189-5F*			*JC56189-6*			*JC56189-6F*			*JC56189-13*			*JC56189-13F*	
	Date Sampled:		11/28/2017			11/28/2017			11/28/2017			11/28/2017			11/28/2017			11/29/2017			11/29/2017	
	Result[4] and Qualifiers:	Units	Result	Q	V[3]	Result	Q	V[3]	Result	Q	V[3]	Result	Q	V[3]	Result	Q	V[3]	Result	Q	V[3]	Result	Q
	Volatile Organic Compounds (SW846 8260C)																						
	Chloroform	µg/L	-			**1.2**			-			**1.3**			-			**1.4**			-	
X	Tetrachloroethene	µg/L	-			**7.5**			-			**7.5**			-			**9.3**			-	
	Semi-volatile Organic Compounds (SW846 8270D)																						
X	**Dibenzofuran**	µg/L	-			0.53	U		-			0.50	U		-			0.50	U		-	
	Di-n-butyl phthalate	µg/L	-			1.1	U		-			**1.1**	J		-			1.0	U		-	
	Polycyclic Aromatic Hydrocarbons (SW846 8270D BY SIM)																						
	Acenaphthene	µg/L	-			0.051	U		-			0.050	U		-			0.056	U		-	
	Fluoranthene	µg/L	-			0.051	U		-			0.050	U		-			0.056	U		-	
X	**Naphthalene**	µg/L	-			0.051	U		-			0.050	U		-			**1.2**		J-	-	
	Pyrene	µg/L	-			0.026	U		-			0.025	U		-			0.028	U		-	
	Total Petroleum Hydrocarbons (SW846 8015C)																						
	TPH-DRO (C10-C20)	mg/L	-			0.083	U	UJ	-			0.083	U		-			0.025	U		-	
	Total OH TPH (C10-C34)	mg/L	-			0.083	U	UJ	-			0.083	U		-			0.025	U		-	
	Metals (6010C, 7470A)																						
	Aluminum	µg/L	100	U		100	U		100	U		100	U		100	U		100	U		100	U
	Arsenic	µg/L	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		2.0	U
	Barium	µg/L	**118**	J		**127**	J		**126**	J		**128**	J		**129**	J		**130**	J		**127**	J
	Beryllium	µg/L	0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U
	Calcium	µg/L	**84,400**			**85,300**			**85,900**			**86,400**			**84,800**			**102,000**			**97,900**	
	Chromium	µg/L	5.0	U		5.0	U		5.0	U		5.0	U		**0.90**	J		**1.2**	J		**1.0**	J
	Iron	µg/L	50	U		50	U		50	U		50	U		50	U		50	U		50	U
	Magnesium	µg/L	**29,100**			**29,000**			**28,600**			**29,200**			**29,300**			**30,500**			**29,900**	
X	**Manganese**	µg/L	2.0	U		2.0	U		2.0	U		2.0	U		2.0	U		**7.9**	J	B	**7.2**	J
	Mercury	µg/L	0.15	U		**0.091**	J		0.15	U		**0.13**	J		0.15	U		0.15	U		0.15	U
	Nickel	µg/L	8.0	U		8.0	U		8.0	U		8.0	U		8.0	U		8.0	U		8.0	U
	Potassium	µg/L	**6,830**	J		**5,380**	J		**5,350**	J		**5,450**	J		**5,460**	J		**5,660**	J		**5,550**	J
	Sodium	µg/L	**54,300**			**57,800**			**57,100**			**58,300**			**58,800**			**55,200**			**54,200**	
	Thallium	µg/L	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		**0.047**	J
	Zinc	µg/L	10	U		10	U		10	U		10	U		10	U		10	U		10	U

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA MCL
bold, red: analyte detected at a value exceeding the USEPA Tapwater RSL
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
August 2017 Data [Event 1]
November 2017 Data [Event 2]

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Groundwater.
4: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 4-2b. Analytical Sample Summary - Groundwater: November 2017
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

COPC^3	Location ID:		Project Action Limits^1			MW-17			MW-17 (filtered)			MW-18			MW-18 (filtered)			MW-19			MW-19 (filtered)		
	Field Sample ID:		**EPA Region 3,6,9 RSL - Tapwater - THQ=1.0 (USEPA 5/18)**	**EPA Region 3,6,9 RSL - Water MCL - THQ=1.0 (USEPA 5/18)**		LF512_MW-17 _112817			LF512_MW-17 _112817			LF512_MW-18 _112917			LF512_MW-18 _112917			LF512_MW-19 _112817			LF512_MW-19 _112817		
	Screened Interval (feet):					20.2 - 30.2			20.2 - 30.2			19.2 - 29.2			19.2 - 29.2			21.1 - 31.1			21.1 - 31.1		
	Laboratory^2 Sample ID:					*JC56189-7*			*JC56189-7F*			*JC56189-12*			*JC56189-12F*			*JC56189-4*			*JC56189-4F*		
	Date Sampled:					11/28/2017			11/28/2017			11/29/2017			11/29/2017			11/28/2017			11/28/2017		
	Result^4 and Qualifiers:	Units			V^3	Result	Q	V^3	Result	Q	V^3	Result	Q	V^3	Result	Q	V^3	Result	Q	V^3	Result	Q	V^3
	Volatile Organic Compounds (SW846 8260C)																						
	Chloroform	µg/L	0.22	80		**1.5**			-			**1.9**			-			**1.4**			-		
X	Tetrachloroethene	µg/L	11	5.0		**6.6**			-			**7.5**			-			**7.2**			-		
	Semi-volatile Organic Compounds (SW846 8270D)																						
X	**Dibenzofuran**	µg/L	7.9	-		0.50	U		-			0.50	U		-			0.50	U		-		
	Di-n-butyl phthalate	µg/L	900	-		1.0	U		-			1.0	U		-			1.0	U		-		
	Polycyclic Aromatic Hydrocarbons (SW846 8270D BY SIM)																						
	Acenaphthene	µg/L	530	-		0.050	U		-			0.050	U		-			0.050	U		-		
	Fluoranthene	µg/L	800	-		0.050	U		-			0.050	U		-			0.050	U		-		
X	**Naphthalene**	µg/L	0.17	-		0.050	U		-			0.050	U		-			0.050	U		-		
	Pyrene	µg/L	120	-		0.025	U		-			0.025	U		-			0.025	U		-		
	Total Petroleum Hydrocarbons (SW846 8015C)																						
	TPH-DRO (C10-C20)	mg/L	-	-		0.083	U	UJ	-			0.025	U		-			0.083	U	UJ	-		
	Total OH TPH (C10-C34)	mg/L	-	-		0.083	U	UJ	-			0.025	U		-			0.083	U	UJ	-		
	Metals (6010C, 7470A)																						
	Aluminum	µg/L	20,000	-		100	U		100	U		100	U		100	U		100	U		100	U	
	Arsenic	µg/L	0.052	10		2.0	U		2.0	U		**0.48**	J	B	**0.42**	J	B	2.0	U		2.0	U	
	Barium	µg/L	3,800	2,000		**129**	J		**125**	J		**128**	J		**129**	J		**125**	J		**124**	J	
	Beryllium	µg/L	25	4.0		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U		0.50	U	
	Calcium	µg/L	-	-		**86,800**			**84,500**			**93,900**			**93,900**			**87,400**			**84,900**		
	Chromium	µg/L	-	100		5.0	U		5.0	U		**1.0**	J		**1.0**	J		**0.90**	J		5.0	U	
	Iron	µg/L	14,000	-		50	U		50	U		50	U		50	U		50	U		50	U	
	Magnesium	µg/L	-	-		**29,700**			**28,600**			**29,100**			**29,300**			**29,200**			**28,800**		
X	**Manganese**	µg/L	430	-		**1.5**	J	B	**0.80**	J		**0.70**	J	B	**0.60**	J		**1.6**	J	B	**0.90**	J	
	Mercury	µg/L	0.63	2.0		0.15	U		0.15	U		**0.12**	J		0.15	U		0.15	U		0.15	U	
	Nickel	µg/L	220	-		8.0	U		8.0	U		8.0	U		8.0	U		8.0	U		8.0	U	
	Potassium	µg/L	-	-		**5,750**	J		**5,620**	J		**4,750**	J		**4,820**	J		**5,810**	J		**5,780**	J	
	Sodium	µg/L	-	-		**58,100**			**56,400**			**56,400**			**56,900**			**61,200**			**61,100**		
	Thallium	µg/L	0.20	2.0	B	1.0	U		1.0	U		1.0	U		1.0	U		1.0	U		1.0	U	
	Zinc	µg/L	6,000	-		10	U		**1.7**	J		10	U		10	U		10	U		10	U	

Notes:

bold, black: analyte detected
double underline: analyte detected at a value exceeding the USEPA MCL
bold, red: analyte detected at a value exceeding the USEPA Tapwater RSL
-: not applicable, no value available, or not sampled
MCL: maximum contaminant level
August 2017 Data [Event 1]
November 2017 Data [Event 2]

Laboratory (Q) and Data Review Qualifiers (V):
B: blank contamination
J-: estimated value, biased low
J: estimated value
R: data are unusable; See Data Review Report(s)
U: undetected; value recorded is the limit of detection (LOD)
UJ: undetected; LOD is estimated

1: Project Action Limits derived from United States Environmental Protection Agency (USEPA) Regions 3, 6, 9 Regional Screening Levels (RSLs) (May 2018) where the target hazard quotient (THQ) is equal to 1.0.
2: Samples analyzed by SGS of Dayton, New Jersey
3: Contaminant of Potential Concern (COPC) identified in report Section 5.0; applies to Groundwater.
4: Only analytical data with positive detections are presented in this summary table. Tables presenting the full analytical data are provided in Appendix J; see report Section 4.0.

Table 5-1. Estimation of Background 95 Percent Upper Tolerance Limit - Surface Soil LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Estimation of Background 95 Percent Upper Threshold Limits Medium: Soils

Source	Chemical	CAS Number	Number Observations	t-value	Mean Concentration (µg/kg)	Standard Deviation	K t*sqrt(1+1/n)	95% UTL [X+(K*SD)] (µg/kg)	95% UTL Background (mg/kg)
TS899 RI	Acenaphthene	83-32-9	10	1.833	--	--	1.922	--	--
	Acenaphthylene	208-96-8	10	1.833	1.36E+01	7.5	1.922	2.80E+01	2.80E-02
	Anthracene	120-12-7	10	1.833	1.26E+01	3.8	1.922	2.00E+01	2.00E-02
	Benzo(a)anthracene	56-55-3	10	1.833	3.93E+01	20.3	1.922	7.84E+01	7.84E-02
	Benzo(a)pyrene	50-32-8	10	1.833	5.76E+01	33.6	1.922	1.22E+02	1.22E-01
	Benzo(b)fluoranthene	205-99-2	10	1.833	8.95E+01	49.3	1.922	1.84E+02	1.84E-01
	Benzo(g,h,i)perylene	191-24-2	10	1.833	5.57E+01	27.9	1.922	1.09E+02	1.09E-01
	Benzo(k)fluoranthene	207-08-9	10	1.833	3.21E+01	18.6	1.922	6.78E+01	6.78E-02
	Chrysene	218-01-9	10	1.833	5.81E+01	27.6	1.922	1.11E+02	1.11E-01
	Dibenzo(a,h)anthracene	53-70-3	10	1.833	9.80E+00	5.6	1.922	2.05E+01	2.05E-02
	Fluoranthene	206-44-0	10	1.833	9.90E+01	49.7	1.922	1.95E+02	1.95E-01
	Fluorene	86-73-7	10	1.833	--	--	1.922	--	--
	Indeno(1,2,3-cd)pyrene	193-39-5	10	1.833	4.09E+01	32.6	1.922	1.04E+02	1.04E-01
	2-Methylnaphthalene	91-57-6	10	1.833	--	--	1.922	--	--
	Naphthalene	91-20-3	10	1.833	7.14E+01	39.0	1.922	1.46E+02	1.46E-01
	Phenanthrene	85-01-8	10	1.833	--	--	1.922	--	--
	Pyrene	129-00-0	10	1.833	--	--	1.922	--	--
OU2 RI OU10 RI	Aluminum	7429-90-5	10	1.833	7.98E+03	1000.7	1.922	NA	9.91E+03
	Arsenic	7440-38-2	10	1.833	8.30E+00	2.6	1.922	NA	1.33E+01
	Barium	7440-39-3	10	1.833	6.25E+01	3.8	1.922	NA	6.98E+01
	Beryllium	7440-41-7	10	1.833	2.00E-01	0.1	1.922	NA	3.92E-01
	Cadmium	7440-43-9	10	1.833	1.00E+00	0.4	1.922	NA	1.77E+00
	Calcium	7440-70-2	10	1.833	2.66E+03	333.9	1.922	NA	3.31E+03
	Chromium	7440-47-3	10	1.833	1.28E+01	1.4	1.922	NA	1.55E+01
	Cobalt	7440-48-4	10	1.833	1.24E+01	2.2	1.922	NA	1.66E+01
	Copper	7440-50-8	10	1.833	1.59E+01	2.0	1.922	NA	1.97E+01
	Iron	7439-89-6	10	1.833	1.67E+04	1321.7	1.922	NA	1.92E+04
	Lead	7439-92-1	10	1.833	2.65E+01	1.7	1.922	NA	2.98E+01
	Magnesium	7439-95-4	10	1.833	1.77E+03	292.4	1.922	NA	2.33E+03
	Manganese	7439-96-5	10	1.833	6.65E+02	62.1	1.922	NA	7.84E+02
	Nickel	7440-02-0	10	1.833	1.34E+01	2.2	1.922	NA	1.76E+01
	Potassium	7440-09-7	10	1.833	1.05E+03	318.1	1.922	NA	1.66E+03
	Selenium	7782-49-2	10	1.833	1.00E-01	0.1	1.922	NA	2.92E-01
	Silver	7440-22-4	10	1.833	9.00E-01	0.2	1.922	NA	1.28E+00
	Sodium	7440-23-5	10	1.833	4.50E+01	21.1	1.922	NA	8.56E+01
	Vanadium	7440-62-2	10	1.833	2.13E+01	1.8	1.922	NA	2.48E+01
	Zinc	7440-66-6	10	1.833	5.08E+01	5.6	1.922	NA	6.16E+01

References:

- Versar, Inc., 2017. Revised Final Remedial Investigation and Site Characterization Report, TS899 Former Skeet and Trap Ranges, Wright-Patterson Air Force Base, Dayton, Ohio. May.
- Engineering-Science, Inc., 1995. Installation Restoration Program, Final Remedial Investigation Report for Operable Unit 2 at Wright-Patterson Air Force Base, Ohio. August.
- CH2M Hill Ohio, Inc., 1995. Remedial Investigation Report, Operable Unit 10, Landfill No. 13, Central Heating Plant 3 and Associated Battery Burial Site, TCE/PCE Groundwater Plume, and Related Potential Source Areas. December.

Notes:

--: Data either did not fit a distribution function (i.e., anthracene) or the constituent was not detected (i.e., 1- or 2-methylnaphthalene)
NA: not applicable; conversion not required

Table 5-2. Occurrence, Distribution and Selection of Chemicals of Potential Concern - Surface Soil
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil (0-2.5 feet bgs)

Exposure Point	Chemical	CAS Number	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Detection Frequency	Minimum Limit of Detection (LOD) (mg/kg)	Maximum Limit of Detection (LOD) (mg/kg)	Concentration Used for Screening (mg/kg)	Background Value (mg/kg)	Screening Value (mg/kg)	COPC Flag (Y/N)	Rationale for Selection or Deletion
	Volatile Organic Compounds											
	Acetone	67-64-1	2.36E-02	1.11E-01	6 / 7	6.30E-03	6.30E-03	1.11E-01	--	6.10E+03	No	BSL
	Benzene	71-43-2	2.20E-04	2.00E-03	6 / 7	3.10E-04	3.10E-04	2.00E-03	--	1.20E+00	No	BSL
	Carbon disulfide	75-15-0	4.70E-04	4.70E-04	1 / 7	4.20E-04	6.30E-04	4.70E-04	--	7.70E+01	No	BSL
	Cyclohexane	110-82-7	1.20E-03	1.20E-03	1 / 7	8.40E-04	1.40E-03	1.20E-03	--	6.50E+02	No	BSL
	Ethylbenzene	100-41-4	2.10E-04	1.10E-03	6 / 7	6.30E-04	6.30E-04	1.10E-03	--	5.80E+00	No	BSL
	Isopropylbenzene (Cumene)	98-82-8	1.80E-04	7.90E-04	3 / 7	4.20E-04	6.30E-04	7.90E-04	--	1.90E+02	No	BSL
	Methyl acetate	79-20-9	3.90E-03	1.60E-02	3 / 7	2.10E-03	3.10E-03	1.60E-02	--	7.80E+03	No	BSL
	Methyl ethyl ketone (2-Butanone)	78-93-3	1.10E-02	1.40E-02	2 / 7	4.20E-03	6.30E-03	1.40E-02	--	2.70E+03	No	BSL
	Methylcyclohexane	108-87-2	6.90E-04	2.40E-03	3 / 7	8.90E-04	1.40E-03	2.40E-03	--	--	No	NSL
	Methylene chloride	75-09-2	2.20E-03	1.54E-02	2 / 7	8.40E-04	1.30E-03	1.54E-02	--	3.50E+01	No	BSL
	Toluene	108-88-3	5.40E-04	2.40E-03	6 / 7	6.30E-04	6.30E-04	2.40E-03	--	4.90E+02	No	BSL
	Trichloroethylene (TCE)	79-01-6	3.00E-04	4.50E-03	4 / 7	4.20E-04	6.30E-04	4.50E-03	--	4.10E-01	No	BSL
	Xylenes, Total	1330-20-7	7.10E-04	7.10E-03	5 / 7	4.20E-04	6.30E-04	7.10E-03	--	5.80E+01	No	BSL
	m,p-Xylene (sum of isomers)	NA	3.10E-04	3.50E-03	6 / 7	4.10E-04	6.30E-04	3.50E-03	--	5.80E+01	No	BSL
	o-Xylene (1,2-Dimethylbenzene)	95-47-6	2.00E-04	4.30E-03	6 / 7	4.10E-04	6.30E-04	4.30E-03	--	6.50E+01	No	BSL
	Semi-volatile Organic Compounds											
	2-Methylnaphthalene	91-57-6	6.55E-02	2.04E-01	5 / 7	9.00E-02	9.20E-02	2.04E-01	--	2.40E+01	No	BSL
	Acenaphthene	83-32-9	1.69E-01	1.69E-01	1 / 7	3.50E-02	1.80E-01	1.69E-01	--	3.60E+02	No	BSL
	Acenaphthylene	208-96-8	5.44E-02	3.89E-01	2 / 7	2.10E-02	1.10E-01	3.89E-01	2.80E-02	3.60E+02	No	BSL
	Anthracene	120-12-7	1.32E-01	3.73E-01	3 / 7	2.60E-02	1.40E-01	3.73E-01	2.00E-02	1.80E+03	No	BSL
	Benzaldehyde	100-52-7	4.08E-02	4.08E-02	1 / 7	1.80E-02	9.20E-02	4.08E-02	--	1.70E+02	No	BSL
	Benzo(a)anthracene	56-55-3	3.27E-02	1.03E+00	6 / 7	9.20E-02	9.20E-02	1.03E+00	7.84E-02	1.10E+00	No	BSL
	Benzo(a)pyrene	50-32-8	2.68E-02	8.53E-01	6 / 7	9.20E-02	9.20E-02	8.53E-01	1.22E-01	1.10E-01	**Yes**	**ASL**
	Benzo(b)fluoranthene	205-99-2	3.58E-02	1.28E+00	6 / 7	9.20E-02	9.20E-02	1.28E+00	1.84E-01	1.10E+00	**Yes**	**ASL**
	Benzo(g,h,i)perylene	191-24-2	2.76E-02	1.20E+00	6 / 7	9.20E-02	9.20E-02	1.20E+00	1.09E-01	1.80E+02	No	BSL
	Benzo(k)fluoranthene	207-08-9	1.81E-01	4.51E-01	4 / 7	1.80E-02	9.20E-02	4.51E-01	6.78E-02	1.10E+01	No	BSL
	Biphenyl (Diphenyl)	92-52-4	1.90E-02	3.71E-02	2 / 7	1.80E-02	9.20E-02	3.71E-02	--	4.70E+00	No	BSL
	Caprolactam	105-60-2	7.96E-02	7.96E-02	1 / 7	3.50E-02	1.80E-01	7.96E-02	--	3.10E+03	No	BSL
	Carbazole	86-74-8	1.36E-01	5.24E-01	2 / 7	3.50E-02	1.80E-01	5.24E-01	--	--	No	NSL
	Chrysene	218-01-9	4.03E-02	1.29E+00	6 / 7	9.20E-02	9.20E-02	1.29E+00	1.11E-01	1.10E+02	No	BSL
	Dibenz(a,h)anthracene	53-70-3	9.51E-02	1.83E-01	4 / 7	1.80E-02	9.20E-02	1.83E-01	2.05E-02	1.10E-01	**Yes**	**ASL**
	Dibenzofuran	132-64-9	2.03E-02	1.81E-01	4 / 7	8.60E-02	9.20E-02	1.81E-01	--	7.30E+00	No	BSL
	Fluoranthene	206-44-0	5.62E-02	3.52E+00	7 / 7	--	--	3.52E+00	1.95E-01	2.40E+02	No	BSL
	Fluorene	86-73-7	3.44E-01	3.44E-01	1 / 7	3.50E-02	1.80E-01	3.44E-01	--	2.40E+02	No	BSL
	Indeno(1,2,3-cd)pyrene	193-39-5	2.05E-02	6.13E-01	6 / 7	1.80E-01	1.80E-01	6.13E-01	1.04E-01	1.10E+00	No	BSL
	Naphthalene	91-20-3	3.57E-02	2.18E-01	5 / 7	9.00E-02	9.20E-02	2.18E-01	1.46E-01	3.80E+00	No	BSL
	Phenanthrene	85-01-8	7.03E-02	2.70E+00	7 / 7	--	--	2.70E+00	--	1.80E+02	No	BSL
	Pyrene	129-00-0	5.80E-02	3.18E+00	7 / 7	--	--	3.18E+00	--	1.80E+02	No	BSL
	Inorganics											
	Aluminum	7429-90-5	2.35E+03	1.66E+04	7 / 7	--	--	1.66E+04	9.91E+03	7.70E+03	**Yes**	**ASL**
	Arsenic	7440-38-2	3.10E+00	1.24E+01	7 / 7	--	--	1.24E+01	1.33E+01	6.80E-01	**Yes**	BBL
	Barium	7440-39-3	1.81E+01	6.02E+02	7 / 7	--	--	6.02E+02	6.98E+01	1.50E+03	No	BSL
	Beryllium	7440-41-7	1.20E-01	7.70E-01	7 / 7	--	--	7.70E-01	3.92E-01	1.60E+01	No	BSL
	Cadmium	7440-43-9	2.80E-01	1.50E+00	4 / 7	2.00E-01	2.30E-01	1.50E+00	1.77E+00	7.10E+00	No	BSL
	Calcium	7440-70-2	1.41E+04	1.41E+05	7 / 7	--	--	1.41E+05	3.31E+03	NA	No	NUT
	Chromium, Total	7440-47-3	5.60E+00	1.89E+01	7 / 7	--	--	1.89E+01	1.55E+01	1.20E+04	No	BSL
	Cobalt	7440-48-4	1.80E+00	9.20E+00	7 / 7	--	--	9.20E+00	1.66E+01	2.30E+00	**Yes**	BBL
	Copper	7440-50-8	5.10E+00	2.44E+01	7 / 7	--	--	2.44E+01	1.97E+01	3.10E+02	No	BSL
	Iron	7439-89-6	6.35E+03	2.39E+04	7 / 7	--	--	2.39E+04	1.92E+04	5.50E+03	**Yes**	**ASL**
	Lead	7439-92-1	4.20E+00	1.48E+02	7 / 7	--	--	1.48E+02	2.98E+01	4.00E+02	No	BSL
	Magnesium	7439-95-4	6.45E+03	5.68E+04	7 / 7	--	--	5.68E+04	2.33E+03	NA	No	NUT
	Manganese	7439-96-5	1.85E+02	8.70E+02	7 / 7	--	--	8.70E+02	7.84E+02	1.80E+02	**Yes**	**ASL**
	Mercury	7439-97-6	2.40E-02	5.70E-02	4 / 7	2.50E-02	2.60E-02	5.70E-02	--	1.10E+00	No	BSL
	Nickel	7440-02-0	8.40E+00	2.29E+01	7 / 7	--	--	2.29E+01	1.76E+01	1.50E+02	No	BSL
	Potassium	7440-09-7	6.36E+02	1.33E+03	7 / 7	--	--	1.33E+03	1.66E+03	NA	No	NUT
	Selenium	7782-49-2	6.60E-01	6.60E-01	1 / 7	5.10E-01	2.50E+00	6.60E-01	2.92E-01	3.90E+01	No	BSL
	Silver	7440-22-4	2.30E+00	2.30E+00	1 / 7	4.60E-01	2.20E+00	2.30E+00	1.28E+00	3.90E+01	No	BSL
	Sodium	7440-23-5	8.40E+01	1.58E+03	7 / 7	--	--	1.58E+03	8.56E+01	NA	No	NUT
	Thallium	7440-28-0	9.30E-01	9.30E-01	1 / 7	5.10E-01	2.50E+00	9.30E-01	--	7.80E-02	**Yes**	**ASL**
	Vanadium	7440-62-2	1.14E+01	3.17E+01	7 / 7	--	--	3.17E+01	2.48E+01	3.90E+01	No	BSL
	Zinc	7440-66-6	1.96E+01	8.28E+01	7 / 7	--	--	8.28E+01	6.16E+01	2.30E+03	No	BSL

Table 5-2. Occurrence, Distribution and Selection of Chemicals of Potential Concern - Surface Soil
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Exposure Point	Chemical	CAS Number	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Detection Frequency	Minimum Limit of Detection (LOD) (mg/kg)	Maximum Limit of Detection (LOD) (mg/kg)	Concentration Used for Screening (mg/kg)	Background Value (mg/kg)	Screening Value (mg/kg)	COPC Flag (Y/N)	Rationale for Selection or Deletion
	Petroleum Hydrocarbons (PHC)											
	C10-C34 Petroleum Hydrocarbons	NA	3.65E+01	3.59E+02	6 / 7	8.40E+00	8.40E+00	3.59E+02	-	-	No	NSL
	C20-C34 Petroleum Hydrocarbons	NA	2.38E+01	3.04E+02	6 / 7	8.40E+00	8.40E+00	3.04E+02	-	5.00E+03	No	BSL
	PHC as Diesel Fuel (TPH-D)	NA	1.28E+01	1.06E+02	6 / 7	8.40E+00	8.40E+00	1.06E+02	-	-	No	NSL
	PHC as Gasoline (TPH-G)	NA	1.37E+01	1.37E+01	1 / 7	9.40E+00	1.90E+01	1.37E+01	-	-	No	NSL
	PHC as Heavy/Residual Range Organic Cmpds (TPH-O)	NA	2.58E+01	3.09E+02	4 / 7	7.00E+00	8.40E+00	3.09E+02	-	-	No	NSL

Rationale Codes:
Selection: ASL: Above Screening Level
Deletion: BSL: At or Below Screening Level
BBL: Below Background Level
NSL: No Screening Level Available
NUT: Essential Nutrient
bgs: below ground surface
mg/kg: milligram per kilogram
NA: not available/not applicable

Notes:
bold: indicates selected Chemical of Potential Concern (COPC)
•The maximum detected concentration is from all samples (i.e., duplicates have not been averaged).
•Screening level values are Residential RSLs from USEPA, 2019b (Accessed September 2019).
•Background obtained from TS899 RI (Versar, 2017), OU2 RI (ESI, 1995), and OU10 RI (CH2M Hill, 1995).
•The 95 precent upper tolerance limit (UTL) was calculated for background samples.
•For background data sets in which UTLs could not be calculated (i.e., less than 5 detected samples) mean values were utilized as a conservative estimate of background concentrations.
•For non-carcinogens, the target hazard quotient is adjusted to 0.1 to allow for potential additive toxicity of multiple contaminants.

Table 5-3. Occurrence, Distribution and Selection of Chemicals of Potential Concern - Aggregate Soil LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Aggregate Soil (0-15 feet bgs)

Exposure Point	Chemical	CAS Number	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Detection Frequency	Minimum Limit of Detection (LOD) (mg/kg)	Maximum Limit of Detection (LOD) (mg/kg)	Concentration Used for Screening (mg/kg)	Background Value (mg/kg)	Screening Value (mg/kg)	COPC Flag (Y/N)	Rationale for Selection or Deletion
	Volatile Organic Compounds											
	1,1-Dichloroethene	75-35-4	6.60E-04	6.60E-04	1 / 34	4.00E-04	5.10E-02	6.60E-04	--	2.30E+01	No	BSL
	1,2-Dichlorobenzene	95-50-1	3.60E-04	1.93E-01	2 / 34	4.00E-04	6.80E-04	1.93E-01	--	1.80E+02	No	BSL
	1,2-Dichloroethane	107-06-2	2.90E-04	2.90E-04	1 / 34	4.00E-04	5.10E-02	2.90E-04	--	4.60E-01	No	BSL
	1,3-Dichlorobenzene	541-73-1	3.22E-02	3.22E-02	1 / 34	4.00E-04	6.80E-04	3.22E-02	--	--	No	NSL
	1,4-Dichlorobenzene	106-46-7	2.59E-01	2.59E-01	1 / 34	4.00E-04	6.80E-04	2.59E-01	--	2.60E+00	No	BSL
	Acetone	67-64-1	6.20E-03	1.11E-01	25 / 34	4.00E-03	5.10E-01	1.11E-01	--	6.10E+03	No	BSL
	Benzene	71-43-2	1.30E-04	2.93E-02	24 / 34	2.10E-04	3.30E-04	2.93E-02	--	1.20E+00	No	BSL
	Carbon disulfide	75-15-0	2.20E-04	4.70E-04	2 / 34	4.00E-04	5.10E-02	4.70E-04	--	7.70E+01	No	BSL
	Chlorobenzene	108-90-7	2.62E-01	2.62E-01	1 / 34	4.00E-04	6.80E-04	2.62E-01	--	2.80E+01	No	BSL
	Chloroform	67-66-3	2.40E-04	1.80E-03	6 / 34	4.20E-04	5.10E-02	1.80E-03	--	3.20E-01	No	BSL
	cis-1,2-Dichloroethylene	156-59-2	4.70E-04	6.50E-03	7 / 34	8.00E-04	1.00E-01	6.50E-03	--	1.60E+01	No	BSL
	Cyclohexane	110-82-7	5.60E-04	6.08E-01	4 / 34	8.00E-04	1.40E-03	6.08E-01	--	6.50E+02	No	BSL
	Ethylbenzene	100-41-4	2.10E-04	7.64E-02	24 / 34	4.00E-04	6.60E-04	7.64E-02	--	5.80E+00	No	BSL
	Isopropylbenzene (Cumene)	98-82-8	1.80E-04	1.11E+00	4 / 34	4.00E-04	6.80E-04	1.11E+00	--	1.90E+02	No	BSL
	Methyl acetate	79-20-9	3.90E-03	2.23E-01	7 / 34	2.00E-03	3.40E-03	2.23E-01	--	7.80E+03	No	BSL
	Methyl ethyl ketone (2-Butanone)	78-93-3	3.80E-03	1.86E-02	5 / 34	4.00E-03	5.10E-01	1.86E-02	--	2.70E+03	No	BSL
	Methylcyclohexane	108-87-2	5.60E-04	5.27E+00	17 / 34	8.00E-04	1.40E-03	5.27E+00	--	--	No	NSL
	Methylene chloride	75-09-2	9.90E-04	1.54E-02	10 / 34	8.00E-04	1.00E-01	1.54E-02	--	3.50E+01	No	BSL
	Tetrachloroethylene (PCE)	127-18-4	4.10E-04	1.60E-03	5 / 34	8.30E-04	1.00E-01	1.60E-03	--	8.10E+00	No	BSL
	Toluene	108-88-3	2.70E-04	8.39E-02	31 / 34	4.90E-04	6.30E-04	8.39E-02	--	4.90E+02	No	BSL
	trans-1,2-Dichloroethene	156-60-5	3.90E-04	3.90E-04	1 / 34	4.00E-04	5.10E-02	3.90E-04	--	1.60E+02	No	BSL
	Trichloroethylene (TCE)	79-01-6	3.00E-04	1.12E-01	21 / 34	4.20E-04	6.30E-04	1.12E-01	--	4.10E-01	No	BSL
	Xylenes, Total	1330-20-7	2.00E-04	2.49E-01	27 / 34	4.00E-04	6.60E-04	2.49E-01	--	5.80E+01	No	BSL
	m,p-Xylene (sum of isomers)	n/a	2.00E-04	1.22E-01	28 / 34	4.00E-04	6.60E-04	1.22E-01	--	5.80E+01	No	BSL
	o-Xylene (1,2-Dimethylbenzene)	95-47-6	2.00E-04	1.27E-01	18 / 34	4.00E-04	6.60E-04	1.27E-01	--	6.50E+01	No	BSL
	Semi-volatile Organic Compounds											
	2,4-Dimethylphenol	105-67-9	6.58E-01	6.58E-01	1 / 34	8.00E-02	4.60E-01	6.58E-01	--	1.30E+02	No	BSL
	2-Methylnaphthalene	91-57-6	1.75E-02	2.21E+00	16 / 34	1.60E-02	9.20E-02	2.21E+00	--	2.40E+01	No	BSL
	2-Methylphenol (o-Cresol)	95-48-7	3.35E-01	3.35E-01	1 / 34	3.20E-02	1.80E-01	3.35E-01	--	3.20E+02	No	BSL
	Acenaphthene	83-32-9	2.26E-02	7.23E-01	3 / 34	3.20E-02	1.80E-01	7.23E-01	--	3.60E+02	No	BSL
	Acenaphthylene	208-96-8	2.85E-02	3.89E-01	8 / 34	1.90E-02	1.10E-01	3.89E-01	2.80E-02	3.60E+02	No	BSL
	Acetophenone	98-86-2	2.33E-02	5.97E-02	2 / 34	1.60E-02	9.20E-02	5.97E-02	--	7.80E+02	No	BSL
	Anthracene	120-12-7	2.79E-02	3.73E-01	7 / 34	2.40E-02	1.40E-01	3.73E-01	2.00E-02	1.80E+03	No	BSL
	Benzaldehyde	100-52-7	4.08E-02	9.71E-02	5 / 34	1.60E-02	9.20E-02	9.71E-02	--	1.70E+02	No	BSL
	Benzo(a)anthracene	56-55-3	1.78E-02	1.03E+00	17 / 34	1.60E-02	9.20E-02	1.03E+00	7.84E-02	1.10E+00	No	BSL
	Benzo(a)pyrene	50-32-8	2.43E-02	8.53E-01	15 / 34	1.60E-02	9.20E-02	8.53E-01	1.22E-01	1.10E-01	**Yes**	**ASL**
	Benzo(b)fluoranthene	205-99-2	1.60E-02	1.28E+00	18 / 34	1.60E-02	9.20E-02	1.28E+00	1.84E-01	1.10E+00	**Yes**	**ASL**
	Benzo(g,h,i)perylene	191-24-2	2.53E-02	1.20E+00	15 / 34	1.60E-02	9.20E-02	1.20E+00	1.09E-01	1.80E+02	No	BSL
	Benzo(k)fluoranthene	207-08-9	1.86E-02	4.51E-01	12 / 34	1.60E-02	9.20E-02	4.51E-01	6.78E-02	1.10E+01	No	BSL
	Biphenyl (Diphenyl)	92-52-4	1.81E-02	4.34E-02	7 / 34	1.60E-02	9.20E-02	4.34E-02	--	4.70E+00	No	BSL
	Bis(2-ethylhexyl) phthalate	117-81-7	5.30E-02	2.51E-01	2 / 34	3.20E-02	1.80E-01	2.51E-01	--	3.90E+01	No	BSL
	Caprolactam	105-60-2	7.96E-02	7.96E-02	1 / 34	3.20E-02	1.80E-01	7.96E-02	--	3.10E+03	No	BSL
	Carbazole	86-74-8	2.94E-02	5.24E-01	5 / 34	3.20E-02	1.80E-01	5.24E-01	--	--	No	NSL
	Chrysene	218-01-9	1.48E-02	1.29E+00	18 / 34	1.60E-02	9.20E-02	1.29E+00	1.11E-01	1.10E+02	No	BSL
	Cresols, m & p	n/a	7.64E-01	7.64E-01	1 / 34	3.20E-02	1.80E-01	7.64E-01	--	6.30E+02	No	BSL
	Dibenz(a,h)anthracene	53-70-3	1.80E-02	1.83E-01	10 / 34	1.60E-02	9.20E-02	1.83E-01	2.05E-02	1.10E-01	**Yes**	**ASL**
	Dibenzofuran	132-64-9	1.54E-02	6.56E-01	13 / 34	1.60E-02	9.20E-02	6.56E-01	--	7.30E+00	No	BSL
	Di-n-butyl phthalate	84-74-2	4.91E-02	4.91E-02	1 / 34	1.60E-02	9.20E-02	4.91E-02	--	6.30E+02	No	BSL
	Fluoranthene	206-44-0	1.95E-02	3.52E+00	19 / 34	1.60E-02	1.80E-02	3.52E+00	1.95E-01	2.40E+02	No	BSL
	Fluorene	86-73-7	2.00E-02	6.19E-01	4 / 34	3.20E-02	1.80E-01	6.19E-01	--	2.40E+02	No	BSL
	Indeno(1,2,3-cd)pyrene	193-39-5	2.05E-02	6.13E-01	15 / 34	3.20E-02	1.80E-01	6.13E-01	1.04E-01	1.10E+00	No	BSL
	Naphthalene	91-20-3	1.71E-02	1.65E+00	15 / 34	1.60E-02	9.20E-02	1.65E+00	1.46E-01	3.80E+00	No	BSL
	Phenanthrene	85-01-8	3.09E-02	2.70E+00	19 / 34	1.60E-02	1.80E-02	2.70E+00	--	1.80E+02	No	BSL
	Phenol	108-95-2	2.02E-01	2.02E-01	1 / 34	3.20E-02	1.80E-01	2.02E-01	--	1.90E+03	No	BSL
	Pyrene	129-00-0	1.83E-02	3.18E+00	19 / 34	1.60E-02	1.80E-02	3.18E+00	--	1.80E+02	No	BSL
	Inorganics											
	Aluminum	7429-90-5	1.72E+03	2.03E+04	34 / 34	NA	NA	2.03E+04	9.91E+03	7.70E+03	**Yes**	**ASL**
	Antimony	7440-36-0	6.20E-01	1.00E+00	3 / 34	4.90E-01	6.10E-01	1.00E+00	--	3.10E+00	No	BSL
	Arsenic	7440-38-2	3.10E+00	1.39E+01	34 / 34	NA	NA	1.39E+01	1.33E+01	6.80E-01	**Yes**	**ASL**
	Barium	7440-39-3	1.02E+01	6.02E+02	34 / 34	NA	NA	6.02E+02	6.98E+01	1.50E+03	No	BSL
	Beryllium	7440-41-7	1.20E-01	8.00E-01	33 / 34	7.90E-02	7.90E-02	8.00E-01	3.92E-01	1.60E+01	No	BSL
	Cadmium	7440-43-9	2.40E-01	1.47E+01	13 / 34	1.60E-01	2.40E-01	1.47E+01	1.77E+00	7.10E+00	**Yes**	**ASL**
	Calcium	7440-70-2	2.41E+03	1.71E+05	34 / 34	NA	NA	1.71E+05	3.31E+03	NA	No	NUT
	Chromium, Total	7440-47-3	4.30E+00	2.94E+01	34 / 34	NA	NA	2.94E+01	1.55E+01	1.20E+04	No	BSL
	Cobalt	7440-48-4	1.80E+00	9.30E+00	34 / 34	NA	NA	9.30E+00	1.66E+01	2.30E+00	**Yes**	BBL
	Copper	7440-50-8	5.10E+00	1.36E+02	34 / 34	NA	NA	1.36E+02	1.97E+01	3.10E+02	No	BSL
	Iron	7439-89-6	5.19E+03	2.60E+04	34 / 34	NA	NA	2.60E+04	1.92E+04	5.50E+03	**Yes**	**ASL**
	Lead	7439-92-1	2.50E+00	1.95E+02	32 / 34	2.60E+00	2.70E+00	1.95E+02	2.98E+01	4.00E+02	No	BSL
	Magnesium	7439-95-4	2.14E+03	7.06E+04	34 / 34	NA	NA	7.06E+04	2.33E+03	NA	No	NUT
	Manganese	7439-96-5	1.68E+02	8.77E+02	34 / 34	NA	NA	8.77E+02	7.84E+02	1.80E+02	**Yes**	**ASL**
	Mercury	7439-97-6	2.40E-02	2.60E-01	11 / 34	2.30E-02	2.80E-02	2.60E-01	--	1.10E+00	No	BSL

Table 5-3. Occurrence, Distribution and Selection of Chemicals of Potential Concern - Aggregate Soil LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Exposure Point	Chemical	CAS Number	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Detection Frequency	Minimum Limit of Detection (LOD) (mg/kg)	Maximum Limit of Detection (LOD) (mg/kg)	Concentration Used for Screening (mg/kg)	Background Value (mg/kg)	Screening Value (mg/kg)	COPC Flag (Y/N)	Rationale for Selection or Deletion
	Nickel	7440-02-0	6.40E+00	2.56E+01	34 / 34	NA	NA	2.56E+01	1.76E+01	1.50E+02	No	BSL
	Potassium	7440-09-7	4.65E+02	1.68E+03	34 / 34	NA	NA	1.68E+03	1.66E+03	NA	No	NUT
	Selenium	7782-49-2	6.00E-01	8.20E-01	4 / 34	5.00E-01	1.30E+01	8.20E-01	2.92E-01	3.90E+01	No	BSL
	Silver	7440-22-4	2.30E+00	2.30E+00	1 / 34	4.50E-01	1.00E+01	2.30E+00	1.28E+00	3.90E+01	No	BSL
	Sodium	7440-23-5	8.40E+01	1.58E+03	34 / 34	NA	NA	1.58E+03	8.56E+01	NA	No	NUT
	Thallium	7440-28-0	5.60E-01	9.30E-01	4 / 34	4.90E-01	1.30E+01	9.30E-01	--	7.80E-02	**Yes**	**ASL**
	Vanadium	7440-62-2	6.00E+00	4.12E+01	34 / 34	NA	NA	4.12E+01	2.48E+01	3.90E+01	**Yes**	**ASL**
	Zinc	7440-66-6	1.73E+01	2.13E+02	34 / 34	NA	NA	2.13E+02	6.16E+01	2.30E+03	No	BSL
	Petroleum Hydrocarbons (PHC)											
	C10-C34 Petroleum Hydrocarbons	NA	1.53E+01	3.77E+02	17 / 34	6.60E+00	8.90E+00	3.77E+02	--	--	No	NSL
	C20-C34 Petroleum Hydrocarbons	NA	1.37E+01	3.04E+02	17 / 34	6.60E+00	8.90E+00	3.04E+02	--	5.00E+03	No	BSL
	PHC as Diesel Fuel (TPH-D)	NA	1.01E+01	2.69E+02	15 / 34	6.60E+00	8.90E+00	2.69E+02	--	--	No	NSL
	PHC as Gasoline (TPH-G)	NA	1.37E+01	1.81E+03	6 / 34	8.20E+00	1.80E+01	1.81E+03	--	--	No	NSL
	PHC as Heavy/Residual Range Organic Cmpds (TPH-O)	NA	1.31E+01	3.09E+02	10 / 34	6.60E+00	8.90E+00	3.09E+02	--	--	No	NSL

Rationale Codes:

Selection: ASL: Above Screening Level
Deletion: BSL: At or Below Screening Level
BBL: Below Background Level
NSL: No Screening Level Available
NUT: Essential Nutrient
bgs: below ground surface
mg/kg: milligram per kilogram
NA: not available/not applicable

Notes:

bold: indicates selected Chemical of Potential Concern (COPC)
•The maximum detected concentration is from all samples (i.e., duplicates have not been averaged).
•Screening level values are Residential RSLs from USEPA, 2019b (Accessed September 2019).
•Background obtained from TS899 RI (Versar, 2017), OU2 RI (ESI, 1995), and OU10 RI (CH2M Hill, 1995).
•The 95 precent upper tolerance limit (UTL) was calculated for background samples.
•For background data sets in which UTLs could not be calculated (i.e., less than 5 detected samples) mean values were utilized as a conservative estimate of background concentrations.
•For non-carcinogens the target hazard quotient is adjusted to 0.1 to allow for potential additive toxicity of multiple contaminants.

Table 5-4. Occurrence, Distribution and Selection of Chemicals of Potential Concern - Groundwater
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical	CAS Number	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Detection Frequency	Minimum Limit of Detection (LOD) (µg/L)	Maximum Limit of Detection (LOD) (µg/L)	Concentration Used for Screening (µg/L)	EPA RSL Tapwater THQ=0.1 (µg/L)	EPA RSL Water MCL (µg/L)	Selected Screening Value (µg/L)	COPC Flag (Y/N)	Rationale for Selection or Deletion
	Volatile Organic Compounds												
	Chloroform	67-66-3	1.10E+00	1.90E+00	16 / 18	5.00E-01	5.00E-01	1.90E+00	2.20E-01	8.00E+01	2.20E-01	**Yes**	**ASL**
	Tetrachloroethene	127-18-4	8.10E-01	1.01E+01	18 / 18	--	--	1.01E+01	4.10E+00	5.00E+00	4.10E+00	**Yes**	**ASL**
	Semi-volatile Organic Compounds												
	Dibenzofuran	132-64-9	9.90E-01	1.20E+00	2 / 18	5.00E-01	5.70E-01	1.20E+00	7.90E-01	--	7.90E-01	**Yes**	**ASL**
	Di-n-butyl phthalate	84-74-2	1.10E+00	1.10E+00	1 / 18	1.00E+00	1.10E+00	1.10E+00	9.00E+01	--	9.00E+01	No	BSL
	Acenaphthene	83-32-9	8.17E-01	8.49E-01	2 / 18	5.00E-02	5.60E-02	8.49E-01	5.30E+01	--	5.30E+01	No	BSL
	Fluoranthene	206-44-0	1.85E-01	1.85E-01	1 / 18	5.00E-02	5.60E-02	1.85E-01	8.00E+01	--	8.00E+01	No	BSL
	Naphthalene	91-20-3	1.11E-01	1.24E+00	2 / 18	5.00E-02	5.60E-02	1.24E+00	1.70E-01	--	1.70E-01	**Yes**	**ASL**
	Pyrene	129-00-0	8.28E-02	8.28E-02	1 / 18	2.50E-02	2.80E-02	8.28E-02	1.20E+01	--	1.20E+01	No	BSL
	Inorganics												
	Aluminum	7429-90-5	4.29E+01	4.29E+01	1 / 18	1.00E+02	1.00E+02	4.29E+01	2.00E+03	--	2.00E+03	No	BSL
	Arsenic	7440-38-2	4.70E-01	6.80E-01	3 / 18	2.00E+00	2.00E+00	6.80E-01	5.20E-02	1.00E+01	5.20E-02	**Yes**	**ASL**
	Barium	7440-39-3	1.01E+02	1.31E+02	18 / 18	--	--	1.31E+02	3.80E+02	2.00E+03	3.80E+02	No	BSL
	Beryllium	7440-41-7	3.10E-02	3.10E-02	1 / 18	5.00E-01	5.00E-01	3.10E-02	2.50E+00	4.00E+00	2.50E+00	No	BSL
	Calcium	7440-70-2	8.00E+04	1.02E+05	18 / 18	--	--	1.02E+05	--	--	NA	No	NUT
	Chromium	7440-47-3	9.00E-01	1.60E+01	10 / 18	5.00E+00	5.00E+00	1.60E+01	--	1.00E+02	1.00E+02	No	BSL
	Iron	7439-89-6	3.78E+01	1.06E+02	3 / 18	5.00E+01	5.00E+01	1.06E+02	1.40E+03	--	1.40E+03	No	BSL
	Magnesium	7439-95-4	2.43E+04	3.05E+04	18 / 18	--	--	3.05E+04	--	--	NA	No	NUT
	Manganese	7439-96-5	5.00E-01	1.32E+02	12 / 18	2.00E+00	2.00E+00	1.32E+02	4.30E+01	--	4.30E+01	**Yes**	**ASL**
	Mercury	7439-97-6	1.20E-01	2.90E-01	4 / 18	1.50E-01	1.50E-01	2.90E-01	6.30E-02	2.00E+00	6.30E-02	**Yes**	**ASL**
	Nickel	7440-02-0	2.00E+00	2.70E+00	2 / 18	8.00E+00	8.00E+00	2.70E+00	3.90E+01	--	3.90E+01	No	BSL
	Potassium	7440-09-7	4.11E+03	6.87E+03	18 / 18	--	--	6.87E+03	--	--	NA	No	NUT
	Sodium	7440-23-5	5.09E+04	6.12E+04	18 / 18	--	--	6.12E+04	--	--	NA	No	NUT
	Thallium	7440-28-0	4.80E-02	8.60E-02	2 / 18	1.00E+00	1.00E+00	8.60E-02	2.00E-02	2.00E+00	2.00E-02	**Yes**	**ASL**
	Zinc	7440-66-6	1.20E+00	2.30E+00	2 / 18	1.00E+01	1.00E+01	2.30E+00	6.00E+02	--	6.00E+02	No	BSL
	Petroleum Hydrocarbons (PHC)												
	TPH-DRO (C10-C20)	NA	1.40E+02	1.40E+02	1 / 18	2.50E+01	8.30E+01	1.40E+02	--	--	--	No	NSL
	Total OH TPH (C10-C34)	NA	1.40E+02	1.40E+02	1 / 18	2.50E+01	8.30E+01	1.40E+02	--	--	--	No	NSL

Rationale Codes:
Selection: ASL: Above Screening Level
Deletion: BSL: At or Below Screening Level
NSL: No Screening Level Available
NUT: Essential Nutrient
µg/L: microgram per liter
NA: not available/not applicable

Notes:
bold: indicates selected Chemical of Potential Concern (COPC)
•The maximum detected concentration is from all samples (i.e., duplicates have not been averaged).
•Groundwater screening levels are based on lowest concentration between Federal maximum contaminant levels (MCLs) and EPA RSLs for tapwater.
•Screening level values are Residential RSLs from USEPA, 2019b (Accessed September 2019).
•For non-carcinogens the target hazard quotient is adjusted to 0.1 to allow for potential additive toxicity of multiple contaminants.

Table 5-5. Occurrence, Distribution and Selection of Chemicals of Potential Concern - Groundwater Vapor Intrusion
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	Chemical	CAS Number	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Detection Frequency	Minimum Limit of Detection (LOD) (µg/L)	Maximum Limit of Detection (LOD) (µg/L)	Concentration Used for Screening (µg/L)	EPA VISL TGC THQ=0.1 (µg/L)	COPC Flag (Y/N)	Rationale for Selection or Deletion
	Volatile Organic Compounds										
	Chloroform	67-66-3	1.10E+00	1.90E+00	16 / 18	5.00E-01	5.00E-01	1.90E+00	8.14E+00	No	BSL
	Tetrachloroethene	127-18-4	8.10E-01	1.01E+01	18 / 18	--	--	1.01E+01	5.76E+00	**Yes**	**ASL**
	Semi-volatile Organic Compounds										
	Dibenzofuran	132-64-9	9.90E-01	1.20E+00	2 / 18	5.00E-01	5.70E-01	1.20E+00	NA	No	NSL
	Di-n-butyl phthalate	84-74-2	1.10E+00	1.10E+00	1 / 18	1.00E+00	1.10E+00	1.10E+00	NA	No	NSL
	Acenaphthene	83-32-9	8.17E-01	8.49E-01	2 / 18	5.00E-02	5.60E-02	8.49E-01	NA	No	NSL
	Fluoranthene	206-44-0	1.85E-01	1.85E-01	1 / 18	5.00E-02	5.60E-02	1.85E-01	NA	No	NSL
	Naphthalene	91-20-3	1.11E-01	1.24E+00	2 / 18	5.00E-02	5.60E-02	1.24E+00	1.74E+01	No	BSL
	Pyrene	129-00-0	8.28E-02	8.28E-02	1 / 18	2.50E-02	2.80E-02	8.28E-02	NA	No	NSL
	Inorganics										
	Aluminum	7429-90-5	4.29E+01	4.29E+01	1 / 18	1.00E+02	1.00E+02	4.29E+01	NA	No	NSL
	Arsenic	7440-38-2	4.70E-01	6.80E-01	3 / 18	2.00E+00	2.00E+00	6.80E-01	NA	No	NSL
	Barium	7440-39-3	1.01E+02	1.31E+02	18 / 18	--	--	1.31E+02	NA	No	NSL
	Beryllium	7440-41-7	3.10E-02	3.10E-02	1 / 18	5.00E-01	5.00E-01	3.10E-02	NA	No	NSL
	Calcium	7440-70-2	8.00E+04	1.02E+05	18 / 18	--	--	1.02E+05	NA	No	NUT
	Chromium	7440-47-3	9.00E-01	1.60E+01	10 / 18	5.00E+00	5.00E+00	1.60E+01	NA	No	NSL
	Iron	7439-89-6	3.78E+01	1.06E+02	3 / 18	5.00E+01	5.00E+01	1.06E+02	NA	No	NSL
	Magnesium	7439-95-4	2.43E+04	3.05E+04	18 / 18	--	--	3.05E+04	NA	No	NUT
	Manganese	7439-96-5	5.00E-01	1.32E+02	12 / 18	2.00E+00	2.00E+00	1.32E+02	NA	No	NSL
	Mercury	7439-97-6	1.20E-01	2.90E-01	4 / 18	1.50E-01	1.50E-01	2.90E-01	8.89E-02	**Yes**	**ASL**
	Nickel	7440-02-0	2.00E+00	2.70E+00	2 / 18	8.00E+00	8.00E+00	2.70E+00	NA	No	NSL
	Potassium	7440-09-7	4.11E+03	6.87E+03	18 / 18	--	--	6.87E+03	NA	No	NUT
	Sodium	7440-23-5	5.09E+04	6.12E+04	18 / 18	--	--	6.12E+04	NA	No	NUT
	Thallium	7440-28-0	4.80E-02	8.60E-02	2 / 18	1.00E+00	1.00E+00	8.60E-02	NA	No	NSL
	Zinc	7440-66-6	1.20E+00	2.30E+00	2 / 18	1.00E+01	1.00E+01	2.30E+00	NA	No	NSL
	Petroleum Hydrocarbons (PHC)										
	TPH-DRO (C10-C20)	NA	1.40E+02	1.40E+02	1 / 18	2.50E+01	8.30E+01	1.40E+02	NA	No	NSL
	Total OH TPH (C10-C34)	NA	1.40E+02	1.40E+02	1 / 18	2.50E+01	8.30E+01	1.40E+02	NA	No	NSL

Rationale Codes:

Selection: ASL - Above Screening Level
Deletion: BSL - At or Below Screening Level
NSL - No Screening Level Available
NUT - Essential Nutrient

µg/L: microgram per liter
NA: not available/not applicable

Notes:

bold: indicates selected Chemical of Potential Concern (COPC)

- The maximum detected concentration is from all samples (i.e., duplicates have not been averaged).
- Screening levels are USEPA Target Groundwater Concentrations (TGCs) for protection of vapor intrusion into indoor air (OSWER VISL Calculator - commercial use scenario) (USEPA, 2019e).
- Volatility parameters for vapor intrusion are provided in Appendix Table K-1
- OSWER Calculator inputs (USEPA, 2019e): Exposure Scenario = Residential, Target Risk for Carcinogens = 1.0E-05; Target Hazard Quotient for Non-Carcinogens = 0.1; Average Groundwater Temperature = 25°C.
- Selection of screening level values is provided in Table K-1 in Appendix K.

Table 5-6. Summary of Chemicals of Potential Concern
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Chemical of Potential Concern	Surface Soil (0 to 2.5 feet bgs)	Aggregate Soil (0 to 15 feet bgs)	Groundwater	Indoor Air via Groundwater Vapor Intrusion
Volatile Organic Compounds				
Chloroform	--	--	X	--
Tetrachloroethene	--	--	X	X
Semi-volatile Organic Compounds				
Benzo(a)pyrene	X	X	--	--
Benzo(b)fluoranthene	X	X	--	--
Dibenzofuran	--	--	X	--
Dibenz(a,h)anthracene	X	X	--	--
Naphthalene	--	--	X	--
Inorganic Compounds				
Aluminum	X	X	--	--
Arsenic	X	X	X	--
Cadmium	--	X	--	--
Cobalt	X	X	--	--
Iron	X	X	--	--
Manganese	X	X	X	--
Mercury	--	--	X	X
Thallium	X	X	X	--
Vanadium	--	X	--	--

Notes:
bgs: below ground surface

Table 5-7. Exposure Point Concentration Summary - Surface Soil
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Surface Soil (0-2.5 feet bgs)

Exposure Point	Chemical of Potential Concern	Arithmetic Mean (mg/kg)	UCL (mg/kg)	Distribution	Maximum Concentration (mg/kg)	EPC (mg/kg)	Statistic	Rationale
Surface Soils	**Semi-volatile Organic Compounds**							
	Benzo(a)pyrene	4.85E-01	7.18E-01	95% KM (t) UCL	8.53E-01	7.18E-01	95% KM (t) UCL	ProUCL recommendation
	Benzo(b)fluoranthene	6.14E-01	9.26E-01	95% KM (t) UCL	1.28E+00	9.26E-01	95% KM (t) UCL	ProUCL recommendation
	Dibenz(a,h)anthracene	1.31E-01	N/A	N/A	1.83E-01	1.83E-01	Maximum	<5 detections
	Inorganic Compounds							
	Aluminum	7.46E+03	1.17E+04	95% Student's-t UCL	1.66E+04	1.17E+04	95% Student's-t UCL	ProUCL recommendation
	Arsenic	6.66E+00	9.36E+00	95% Student's-t UCL	1.24E+01	9.36E+00	95% Student's-t UCL	ProUCL recommendation
	Cobalt	4.77E+00	6.92E+00	95% Student's-t UCL	9.20E+00	6.92E+00	95% Student's-t UCL	ProUCL recommendation
	Iron	1.27E+04	1.80E+04	95% Student's-t UCL	2.39E+04	1.80E+04	95% Student's-t UCL	ProUCL recommendation
	Manganese	4.69E+02	6.77E+02	95% Student's-t UCL	8.70E+02	6.77E+02	95% Student's-t UCL	ProUCL recommendation
	Thallium	9.30E-01	N/A	N/A	9.30E-01	9.30E-01	Maximum	<5 detections

Notes:

- Upper confidence limits (UCLs) were calculated using the ProUCL 5.1.002 statistical program (USEPA, 2016) for all COPCs with 5 or more detects.
- Arithmetic mean is of detected concentrations.

bgs: below ground surface

EPC: exposure point concentration

mg/kg: milligram per kilogram

Table 5-8. Exposure Point Concentration Summary - Aggregate Soil
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Aggregate Soil (0-15 feet bgs)

Exposure Point	Chemical of Potential Concern	Arithmetic Mean (mg/kg)	UCL (mg/kg)	Distribution	Maximum Concentration (mg/kg)	EPC (mg/kg)	Statistic	Rationale
Aggregate Soil	**Semi-volatile Organic Compounds**							
	Benzo(a)pyrene	2.61E-01	2.44E-01	95% Adjusted Gamma KM-UCL	8.53E-01	2.44E-01	95% Adjusted Gamma KM-UCL	ProUCL recommendation
	Benzo(b)fluoranthene	2.77E-01	2.40E-01	KM H-UCL	1.28E+00	2.40E-01	KM H-UCL	ProUCL recommendation
	Dibenz(a,h)anthracene	7.89E-02	4.72E-02	95% KM (t) UCL	1.83E-01	4.72E-02	95% KM (t) UCL	ProUCL recommendation
	Inorganic Compounds							
	Aluminum	6.65E+03	1.06E+04	95% Chebyshev (Mean, Sd) UCL	2.03E+04	1.06E+04	95% Chebyshev (Mean, Sd) UCL	ProUCL recommendation
	Arsenic	7.57E+00	8.44E+00	95% Student's-t UCL	1.39E+01	8.44E+00	95% Student's-t UCL	ProUCL recommendation
	Cadmium	3.23E+00	3.06E+00	Gamma Adjusted KM-UCL	1.47E+01	3.06E+00	Gamma Adjusted KM-UCL	ProUCL recommendation
	Cobalt	4.50E+00	5.20E+00	95% Modified-t UCL	9.30E+00	5.20E+00	95% Modified-t UCL	ProUCL recommendation
	Iron	1.24E+04	1.73E+04	95% Chebyshev (Mean, Sd) UCL	2.60E+04	1.73E+04	95% Chebyshev (Mean, Sd) UCL	ProUCL recommendation
	Manganese	3.85E+02	4.47E+02	95% Modified-t UCL	8.77E+02	4.47E+02	95% Modified-t UCL	ProUCL recommendation
	Thallium	6.73E-01	N/A	N/A	9.30E-01	9.30E-01	Maximim	<5 detections
	Vanadium	1.76E+01	2.50E+01	95% Chebyshev (Mean, Sd) UCL	4.12E+01	2.50E+01	95% Chebyshev (Mean, Sd) UCL	ProUCL recommendation

Notes:
•Upper confidence limits (UCLs) were calculated using the ProUCL 5.1.002 statistical program (USEPA, 2016).
•Arithmetic mean is of detected concentrations.
bgs: below ground surface
EPC: exposure point concentration

Table 5-9. Exposure Point Concentration Summary - Groundwater
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Arithmetic Mean (µg/L)	UCL (µg/L)	Distribution	Maximum Concentration (µg/L)	EPC (µg/L)	Statistic	Rationale
Aggregate Soil	**Volatile Organic Compounds**							
	Chloroform	1.5E+00	1.6E+00	95% KM (t) UCL	1.9E+00	1.6E+00	95% KM (t) UCL	ProUCL recommendation
	Tetrachloroethene	7.4E+00	1.0E+01	95% Chebyshev (Mean, Sd) UCL	1.0E+01	1.0E+01	95% Chebyshev (Mean, Sd) UCL	ProUCL recommendation
	Semi-volatile Organic Compounds							
	Dibenzofuran	1.1E+00	N/A	N/A	1.2E+00	1.2E+00	Maximum	<5 detections
	Naphthalene	6.8E-01	N/A	N/A	1.2E+00	1.2E+00	Maximum	<5 detections
	Inorganic Compounds							
	Arsenic	5.4E-01	N/A	N/A	6.8E-01	6.8E-01	Maximum	<5 detections
	Manganese	2.6E+01	5.9E+01	95% Adjusted Gamma KM-UCL	1.3E+02	5.9E+01	95% Adjusted Gamma KM-UCL	ProUCL recommendation
	Mercury	1.7E-01	N/A	N/A	2.9E-01	2.9E-01	Maximum	<5 detections
	Thallium	6.7E-02	N/A	N/A	8.6E-02	8.6E-02	Maximum	<5 detections

Notes:
•Upper confidence limits (UCLs) were calculated using the ProUCL 5.1.002 statistical program (USEPA, 2016).
•Arithmetic mean is of detected concentrations.
EPC: exposure point concentration
µg/L: microgram per liter

Table 5-10. Exposure Point Concentration Summary - Groundwater Vapor Intrusion
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Arithmetic Mean (µg/L)	UCL (µg/L)	Distribution	Maximum Concentration (µg/L)	EPC (µg/L)	Statistic	Rationale
Indoor Air	**Volatile Organic Compounds**							
	Tetrachloroethene	7.37E+00	9.96E+00	95% Chebyshev (Mean, Sd) UCL	1.01E+01	9.96E+00	95% Chebyshev (Mean, Sd) UCL	ProUCL recommendation
	Inorganic Compounds							
	Mercury	1.68E-01	1.54E-01	95% KM (t) UCL	2.90E-01	1.54E-01	95% KM (t) UCL	ProUCL recommendation

Notes:
Upper confidence limits (UCLs) were calculated using the ProUCL 5.1.002 statistical program (USEPA, 2016).
Arithmetic mean is of detected concentrations.
bgs: below ground surface
EPC:exposure point concentration
µg/L: microgram per liter

Table 5-11. Values Used for Indoor Air Exposure Concentration Calculation Derived From Groundwater Concentration
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Current
Receptor: Indoor Site Worker
Medium: Groundwater Vapor
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference	Exposure Concentration Equation/ Model Name
Inhalation (indoor air)	Indoor Site Worker	Adult	Groundwater Vapor	C_{gw}	Chemical concentration in groundwater	Chemical-specific	µg/L	Refer to **Table 5-10**	Concentration in air (C_{ia}) (µg/m^3) = C_{gw} x AF_{gw} x CF x $H'T_{gw}$
				AF_{gw}	Attenuation factor	0.001	unitless	USEPA, 2019e	
				CF	Conversion factor	1,000	L/m^3	USEPA, 2019e	
				HLC	Henry's Law constant	Chemical-specific	unitless	Refer to **Table K-8**	

References:

USEPA, 2019f. Vapor Intrusion Screening Level (VISL) Calculator User’s Guide. September 2019. Accessed online at: https://www.epa.gov/vaporintrusion/visl-users-guide

Table 5-12. Calculation of Exposure Point Concentrations, Inhalation of Chemicals from Groundwater in a Trench
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

For Effective Diffusion Coefficients:

Hv	-240	cm
ACvad	0.25	cm^3/cm^3
PorVad	0.44	cm^3/cm^3
T	**77**	F
T	298	K
R	8.20E-05	atm-m^3/mol-K

For Emission Flux and Concentration in Trench:

CF1	1.00E-03	L/cm^3
CF2	1.00E+04	cm^2/m^2
CF3	3600	s/hr
Lgw	**27.5**	ft
Lgw	838	cm
F	**1**	
ACH	2	hr^{-1}

Trench dimensions:

Length	**8**	ft
	2.44	m
Width	**3**	ft
	0.91	m
Depth	**15**	ft
	4.57	m
Width/Depth	0.20	

Groundwater Screening Levels (Inhalation) for Construction/Utility Workers in a Trench: Groundwater >15 feet deep	**CAS Number**	**Molecular Weight (g/mol)**	**Henry's Law Constant (atm-m^3/mol)**	**Diffusion Coefficient in air (cm^2/s)**	**Area of Trench (m^2)**	**Depth of Trench (cm)**	**Distance Between Trench Bottom and Groundwater (cm)**	**Volume of Trench (m^3)**	**Volatilization Factor (L/m^3)**	**Concentration of Chemical in Groundwater (µg/L)**	**Concentration of Chemical in Trench (µg/m^3)**	**Concentration of Chemical in Trench (mg/m^3)**
		MWi	(Hi)	Dair	A	Dtrench	Ld	V	VF	CGW	Ctrench	Ctrench
Chloroform	67-66-3	119.4	3.7E-03	7.7E-02	2.2E+00	4.6E+02	3.8E+02	5.4E+00	2.1E-01	1.6E+00	3.3E-01	**3.3E-04**
Tetrachloroethylene (PCE)	127-18-4	165.8	1.8E-02	5.0E-02	2.2E+00	4.6E+02	3.8E+02	5.4E+00	6.7E-01	1.0E+01	6.6E+00	**6.6E-03**
Dibenzofuran	132-64-9	168.2	2.1E-04	6.5E-02	2.2E+00	4.6E+02	3.8E+02	5.4E+00	1.0E-02	1.2E+00	1.3E-02	**1.3E-05**
Naphthalene	91-20-3	128.2	4.4E-04	6.0E-02	2.2E+00	4.6E+02	3.8E+02	5.4E+00	2.0E-02	1.2E+00	2.5E-02	**2.5E-05**
Arsenic	7440-38-2	74.9	NA	NA	2.2E+00	4.6E+02	3.8E+02	5.4E+00	NA	6.8E-01	NA	**NA**
Manganese	7439-96-5	54.9	NA	NA	2.2E+00	4.6E+02	3.8E+02	5.4E+00	NA	5.9E+01	NA	**NA**
Mercury	7439-97-6	200.6	8.6E-03	3.1E-02	2.2E+00	4.6E+02	3.8E+02	5.4E+00	2.0E-01	2.9E-01	5.8E-02	**5.8E-05**
Thallium	7440-28-0	204.4	NA	NA	2.2E+00	4.6E+02	3.8E+02	5.4E+00	NA	8.6E-02	NA	**NA**

References/Notes:

- •VDEQ, 2016 -Virginia Unified Risk Assessment Model - VURAM User's Guide for Risk Assessors. Available online: http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RemediationProgram/RiskAssessment.aspx
- •USEPA, 2019c - Regional Screening Level Chemical-Specific Parameters. Accessed September 2019. Online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

NA: not applicable/not available

Table 5-13. Selection of Exposure Pathways
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Time Frame	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Groundwater	Air	Volatilized chemicals enter indoor air through slab (Indoor Air)	Site Worker (Indoor)	Adult	Inhalation	Quantitative	Pathway potentially complete; selected for Quantitative evaluation.
		Groundwater	Tap Water			Ingestion	None	Based on site information and exposure potential, ingestion is not anticipated to be an indoor pathway for this receptor because groundwater is not used for drinking water at this site. Therefore, pathway not selected for evaluation.
						Dermal	None	Based on site information and exposure potential, dermal contact is not anticipated to be an indoor pathway for this receptor because groundwater is not used for drinking water at this site. Therefore, pathway not selected for evaluation.
	Surface soil	Surface Soil	Surface Soil	Site Maintenance Worker (Outdoor)	Adult	Ingestion	Quantitative	Pathway potentially complete; selected for Quantitative evaluation.
						Dermal	Quantitative	Pathway potentially complete; selected for Quantitative evaluation.
		Air	Airborne particulate matter (Fugitive Dust)			Inhalation	Quantitative	Pathway potentially complete; selected for Quantitative evaluation.
			Air volatized from soil (Outdoor Air)			Inhalation	None	Based on site information and exposure potential, Inhalation is not anticipated to be a significant pathway for this receptor. Therefore, pathway not selected for evaluation.
	Groundwater	Groundwater	Tap Water			Ingestion	None	Based on site information and exposure potential, ingestion is not anticipated to be a significant outdoor pathway for this receptor. Therefore, pathway not selected for evaluation.
						Dermal	None	Based on site information and exposure potential, dermal contact is not anticipated to be a significant outdoor pathway for this receptor. Therefore, pathway not selected for evaluation.
Future	Aggregate Soil	Aggregate Soil	Aggregate Soil	Construction Worker	Adult	Ingestion	Quantitative	Pathway potentially complete; selected for Quantitative evaluation.
						Dermal	Quantitative	Pathway potentially complete; selected for Quantitative evaluation.
		Air	Air volatized from Aggregate Soil (Outdoor Air)			Inhalation	None	Based on site information and exposure potential, Inhalation is not anticipated to be a significant pathway for this receptor; therefore pathway not selected for evaluation.
			Airborne particulate matter (Fugitive Dust)			Inhalation	Quantitative	Pathway potentially complete; selected for Quantitative evaluation.
	Groundwater	Groundwater	Groundwater at excavation site			Ingestion	None	Pathway incomplete due to depth of water table.
						Dermal	None	Pathway incomplete due to depth of water table.
		Air	Air volatilized from groundwater in trench at excavation site			Inhalation	Quantitative	Pathway potentially complete; selected for Quantitative evaluation.

Table 5-14. Values Used for Daily Intake Calculations, Indoor Site Worker Inhalation of Indoor Air From Groundwater Vapor Intrusion LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Current
Receptor: Indoor Site Worker
Medium: Groundwater Vapor
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Indoor Site Worker	Adult	Indoor Air Vapor	Cia	Concentration in air	Chemical-specific	µg/m^3	Refer to **Table 5-11**	Chronic Daily Intake - cancer (µg/m^3) = C_{ia} x EF x ED x ET x CF_1 x 1/AT x 1/LT Chronic Daily Intake - noncancer (mg/m^3) = Ci_a x EF x ED x ET x CF_1 x 1/AT x 1/ED x 1/CF_2
				EF	Exposure frequency	250	days/year	OSWER Recommended Value (USEPA, 2014)	
				ED	Exposure duration	25	years	OSWER Recommended Value (USEPA, 2014)	
				ET	Exposure time	8	hours/day	OSWER Recommended Value (USEPA, 2014)	
				CF1	Conversion factor	1	day/24 hrs	OSWER Recommended Value (USEPA, 2014)	
				AT_c	Averaging time (Cancer)	365	days	OSWER Recommended Value (USEPA, 2014)	
				AT_{nc}	Averaging time (Non-Cancer)	365	days	OSWER Recommended Value (USEPA, 2014)	
				LT	Lifetime	70	years	OSWER Recommended Value (USEPA, 2014)	
				CF2	Conversion factor	1,000	µg/mg	OSWER Recommended Value (USEPA, 2014)	

References:

- •USEPA, 2014 - Memorandum entitled Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. February. OSWER Directive 9200.1-120. Available online at: http://rais.ornl.gov/documents/EFH Memo.pdf
- •USEPA, 2019f - Vapor Intrusion Screening Level (VISL) Calculator User's Guide. September 2019. Accessed online at: https://www.epa.gov/vaporintrusion/visl-users-guide

Table 5-15. Values Used for Daily Intake Calculations, Ingestion, Dermal, and Inhalation - Surface Soil
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Current
Receptor: Outdoor Site Worker, Adult
Medium: Soil
Exposure Medium: Surface Soil (0-2.5 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion (incidental)	Site Worker (Outdoor)	Adult	Surface Soils	EPC	Exposure point concentration	Chemical-specific	mg/kg	Refer to **Table 5-7**	Chronic Daily Intake (CDI) (mg/kg-day) = EPC x CF x IR-S x FI x EF X ED X 1/BW x 1/AT
				CF	Conversion factor	1.00E-06	kg/mg	--	
				IR-S	Ingestion rate of soil	100	mg/day	OSWER Recommended Value (USEPA, 2014)	
				FI	Fraction ingested	1	unitless	Professional Judgement	
				EF	Exposure frequency	225	days/year	USEPA, 2002c	
				ED	Exposure duration	25	years	USEPA, 2002c	
				BW	Body weight	80	kg	OSWER Recommended Value (USEPA, 2014)	
				AT-C	Averaging time (Cancer)	25,550	days	USEPA, 2002c	
				AT-NC	Averaging Time (Non-Cancer)	9,125	days	USEPA, 2002c	
Dermal	Site Worker (Outdoor)	Adult	Surface Soils	EPC	Exposure point concentration	Chemical-specific	mg/kg	Refer to **Table 5-7**	Chronic Daily Intake (CDI) (mg/kg-day) = EPC x CF x SA x SSAF x ABS x EF x ED x 1/BW x 1/AT
				CF	Conversion factor	1.00E-06	kg/mg	--	
				SA	Skin surface area available for	3,527	cm^2/day	OSWER Recommended Value (USEPA, 2014)	
				SSAF	Soil to skin adherence factor	0.12	mg/cm^2	OSWER Recommended Value (USEPA, 2014)	
				ABS	Dermal absorption factor	Chemical-specific	unitless	Refer to **Table 5-29**	
				EF	Exposure frequency	225	days/year	OSWER Recommended Value (USEPA, 2014)	
				ED	Exposure duration	25	years	OSWER Recommended Value (USEPA, 2014)	
				BW	Body weight	80	kg	OSWER Recommended Value (USEPA, 2014)	
				AT-C	Averaging time (Cancer)	25,550	days	USEPA, 2002c	
				AT-NC	Averaging Time (Non-Cancer)	9,125	days	USEPA, 2002c	
Inhalation (dust)	Site Worker	Adult	Surface Soils	EPC	Exposure point concentration	Chemical-specific	mg/kg	Refer to **Table 5-7**	Exposure Concentration in Air (EC_{air}) (mg/m^3) = EPC x 1/PEF x ET x EF x ED x 1/AT
				PEF	Particulate emission factor	1.36E+09	m^3/kg	Default (Eq. 4-5) - USEPA, 2002c	
				ET	Exposure time	8	hr/day	OSWER Recommended Value (USEPA, 2014)	
				EF	Exposure frequency	225	days/year	OSWER Recommended Value (USEPA, 2014)	
				ED	Exposure duration	25	years	OSWER Recommended Value (USEPA, 2014)	
				AT-C	Averaging time (Cancer)	613,200	hours	USEPA, 2002c	
				AT-NC	Averaging Time (Non-Cancer)	219,000	hours	USEPA, 2002c	

References/Notes:

•USEPA, 2002c - Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Emergency and Remedial Response. Washington, DC. December. OSWER 9355.4-24.

•USEPA, 2014 - Memorandum entitled Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. February. OSWER Directive 9200.1-120. Available online at: http://rais.ornl.gov/documents/EFH Memo.pdf

bgs: below ground surface

Table 5-16. Values Used for Daily Intake Calculations, Ingestion, Dermal, and Inhalation - Aggregate Soil
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Future
Receptor: Construction Worker
Medium: Soil
Exposure Medium: Aggregate Soil (0-15 feet bgs)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion (incidental)	Construction Worker	Adult	Aggregate Soil	EPC	Exposure point concentration	Chemical-specific	mg/kg	Refer to **Table 5-8**	Chronic Daily Intake (CDI) (mg/kg-day) = EPC x CF x IR-S x FI x EF X ED X 1/BW x 1/AT
				CF	Conversion factor	1.00E-06	kg/mg	--	
				IR-S	Ingestion rate of soil	330	mg/day	USEPA, 2002c	
				FI	Fraction ingested	1	unitless	Professional Judgement	
				EF	Exposure frequency	120	days/year	OEPA, 2004	
				ED	Exposure duration	1	years	USEPA, 2002c	
				BW	Body weight	80	kg	OSWER Recommended Value (USEPA, 2014)	
				AT-C	Averaging time (Cancer)	25,550	days	USEPA, 2002c	
				AT-NC	Averaging Time (Non-Cancer)	365	days	USEPA, 2002c	
Dermal	Construction Worker	Adult	Aggregate Soil	EPC	Exposure point concentration	Chemical-specific	mg/kg	Refer to **Table 5-8**	Chronic Daily Intake (CDI) (mg/kg-day) = EPC x CF x SA x SSAF x ABS x EF X ED X 1/BW x 1/AT
				CF	Conversion factor	1.00E-06	kg/mg	--	
				SA	Skin surface area available for contact	3,527	cm^2/day	OSWER Recommended Value (USEPA, 2014)	
				SSAF	Soil to skin adherence factor	0.3	mg/cm^2	USEPA, 2002c	
				ABS	Dermal absorption factor	Chemical-specific	unitless	USEPA, 2004	
				EF	Exposure frequency	120	days/year	OEPA, 2004	
				ED	Exposure duration	1	years	USEPA, 2002c	
				BW	Body weight	80	kg	OSWER Recommended Value (USEPA, 2014)	
				AT-C	Averaging time (Cancer)	25,550	days	USEPA, 2002c	
				AT-NC	Averaging Time (Non-Cancer)	365	days	USEPA, 2002c	
Inhalation (dust)	Construction Worker	Adult	Aggregate Soils	EPC	Exposure point concentration	Chemical-specific	mg/kg	Refer to **Table 5-8**	Exposure Concentration in Air (ECair) (mg/m3) = EPC x 1/PEF x ET x EF x ED x 1/AT
				PEF	Particulate emission factor	3.8E+07	m^3/kg	Site Specific (Refer to **Table K-10**)	
				ET	Exposure time	8	hr/day	OSWER Recommended Value (USEPA, 2014)	
				EF	Exposure frequency	120	days/year	OEPA, 2004	
				ED	Exposure duration	1	years	USEPA, 2002c	
				AT-C	Averaging time (Cancer)	613,200	hours	USEPA, 2002c	
				AT-NC	Averaging Time (Non-Cancer)	8,760	hours	USEPA, 2002c	

References/Notes:

•USEPA, 2002c - Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Emergency and Remedial Response. Washington, DC. December. OSWER 9355.4-24.

•USEPA, 2004 - Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual. Part E, Supplemental Guidance for Dermal Risk Assessment. Final. Office of Emergency and Remedial Response. Washington, DC. December. EPA/540/R/99/005.

•USEPA, 2014 - Memorandum entitled Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. February. OSWER Directive 9200.1-120. Available online at: http://rais.ornl.gov/documents/EFH Memo.pdf

•OEPA, 2004 - Technical Guidance Compendium. Evaluating Exposure to Groundwater for the Construction Worker and Excavation Activity Receptor Populations. VA30009.14.002. January.
bgs: below ground surface

Table 5-17. Values for Groundwater Vapor Inhalation Exposure Calculation, Construction Worker in a Trench - Groundwater >15' bgs LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Scenario Timeframe: Future
Receptor: Construction Worker, Adult
Medium: Groundwater
Exposure Medium: Air (Trench)

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Worker	Adult	Vapor from Trench	ET	Exposure Time (trench)	4	hr/day	Professional Judgement	Inhalation Exposure Concentration = Ctrench x ET X EF X ED X 1/(AT*24 hrs/day)
				EF	Exposure frequency	120	days/year	OEPA, 2004	
				ED	Exposure duration	1	years	OEPA, 2004	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 2002c	
				AT-NC	Averaging Time (Non-Cancer)	365	days	USEPA, 2002c	
				Ctrench	Concentration of contaminant in the trench	Site-specific	mg/m^3	See **Table 5-12**	Ctrench (mg/m^3) = CGW x VF
				CGW	Concentration of contaminant in groundwater	Site-specific	µg/L	See **Table 5-9**	
				VF	Volatilization factor	Chemical-specific	L/m^3	Calculated	
				Hi	Henry's Law constant of i	Chemical-specific	atm-m3/mole	USEPA, 2019c	Volatilization factor (VF) (L/m^3) = (Hi x Dair x ACvad3.33 x A x F x 10-3 x 104 x 3600) / (R x T x Ld x ACH x V x Porvad2) Ld = Lgw - Dtrench
				Dair	Diffusion coefficient in air	Chemical-specific	cm^2/s	USEPA, 2019c	
				ACvad	Volumetric air content in vadose zone soil	0.25	cm^3/cm^3	VDEQ, 2016	
				A	Area of the trench	2.22	m^2	VDEQ, 2016	
				F	Fraction of the floor through which contaminant can enter	1	unitless	VDEQ, 2016	
				10^{-3}	Conversion factor	1.00E-03	L/cm^3	--	
				10^{4}	Conversion factor	1.00E+04	cm^2/m^2	--	
				3600	Conversion factor	3600	s/hr	--	
				R	Ideal gas constant	8.20E-05	atm-m^3/mole-K	VDEQ, 2016	
				T	Average system absolute temperature	298	K	VDEQ, 2016	
				Ld	Distance between trench bottom and groundwater	Site-specific	cm	Calculated	
				Lgw	Depth of groundwater	Site-specific	cm	Measured (average depth)	
				Dtrench	Depth of trench	457	cm	VDEQ, 2016	
				ACH	Air changes per hour	2	hr^{-1}	VDEQ, 2016	
				V	Volume of trench	5.42	m^3	VDEQ, 2016	
				Porvad	Total soil porosity in vadose zone	0.44	cm^3/cm^3	VDEQ, 2016	

References/Notes:

- •USEPA, 2002c - Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Emergency and Remedial Response. Washington, DC. December. OSWER 9355.4-24.
- •VDEQ, 2016 - Virginia Unified Risk Assessment Model - VURAM User's Guide for Risk Assessors. Available online: http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RemediationProgram/RiskAssessment.aspx
- •OEPA, 2004 - Technical Guidance Compendium. Evaluating Exposure to Groundwater for the Construction Worker and Excavation Activity Receptor Populations. VA30009.14.002. January.
- •USEPA, 2019c - Regional Screening Level Chemical-Specific Parameters. Accessed September 2019. Online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.
- •Depth of trench = 15 ft = 4.57 m = 457 cm; default trench depth when GW >15 ft bgs (VDEQ, 2016)
- •Trench thickness of vadose zone = 30 cm (VDEQ, 2016)
- •Site-specific depth to groundwater = avg 25 - 30 ft = 27.5 ft = 838.2 cm
- •The worker is arbitrarily assumed to be exposed togroundwater for 4 hours a day. The groundwater is > 15 feet deep (avg depth to groundwater is 27.5 feet bgs), therefore the worker is not assumed to be exposed by inadvertent ingestion or dermal contact. The construction worker is assumed to be exposed by inhalation while in the trench.

Table 5-18. Oral Toxicity Values for Chemicals of Potential Concern
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Chemical of Potential Concern	Chronic RfD$_o$ (mg/kg-day)	Source	SF$_o$ (mg/kg-day)$^{-1}$	Source
Volatile Organic Compounds				
Chloroform	1.00E-02	I	3.10E-02	C
Tetrachloroethene	6.00E-03	I	2.10E-03	I
Semi-volatile Organic Compounds				
Benzo(a)pyrene	3.0E-04	I	1.0E+00	I
Benzo(b)fluoranthene	4.0E-02	S	1.0E-01	E
Dibenzofuran	1.0E-03	X	NV	--
Dibenz(a,h)anthracene	3.0E-01	S	1.0E+00	E
Naphthalene	2.0E-02	I	NV	-
Inorganics				
Aluminum	1.0E+00	P	NV	--
Arsenic	3.0E-04	I	1.5E+00	I
Cadmium	1.0E-03	I	NV	--
Iron	7.0E-01	P	NV	--
Manganese	1.4E-01	I	NV	--
Mercury	NV	--	NV	--
Thallium	1.0E-05	X	NV	--
Vanadium	5.0E-03	S	NV	--

References:

•USEPA, 2019b - Regional Screening Levels for Chemical Contaminants. Accessed September 2019. Online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

•USEPA, 1993 - Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. Office of Research and Development. Washington, DC. July. EPA/600/R-93/089.

•USEPA, 2019a - Integrated Risk Information System Database (IRIS). Accessed September 2019, Online at: www.epa.gov/iriswebp/iris/index.html

Notes:

COPC: chemical of potential concern
RfD$_o$: oral reference dose
SF$_o$: Oral slope factor
E: estimated using EPA-derived TEFs (USEPA, 1993); PAH-specific SF = SF for benzo(a)pyrene x PAH-specific TEF
I: IRIS (USEPA, 2019a; accessed online September 2019)
C: Cal EPA
P: PPRTV
S: surrogate value; anthracene was assigned as the surrogate for dibenz(a,h)anthracene; fluoranthene was assigned as the surrogate for benzo(b)fluoranthene
X: Appendix PPRTV Screen
NV: no toxicity value

•The oral RfD toxicity value for vanadium, used in this website, is derived from the IRIS oral RfD for vanadium pentoxide (V205) by factoring out the molecular weight (MW) of the oxide ion. V205 has a molecular weight of 181.88. The two atoms of vanadium contribute 56% of the MW. V205's oral RfD of 9E-03 mg/kg-day multiplied by 56% gives a vanadium oral RfD of 5.04E-03 mg/kg-day.

Table 5-19. Dermal Toxicity and Parameter Values for Chemicals of Potential Concern LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Chemical of Potential Concern	ABSGI	Chronic RfD_o (mg/kg-day)	Chronic RfD_d (mg/kg-day)	SF_o $(mg/kg\text{-}day)^{-1}$	SF_d $(mg/kg\text{-}day)^{-1}$	ABS
Volatile Organic Compounds						
Chloroform	1.0E+00	1.0E-02	1.0E-02	3.1E-02	3.1E-02	NV
Tetrachloroethene	1.0E+00	6.0E-03	6.0E-03	2.1E-03	2.1E-03	NV
Semi-volatile Organic Compounds						
Benzo(a)pyrene	1.0E+00	3.0E-04	3.0E-04	1.0E+00	1.0E+00	1.3E-01
Benzo(b)fluoranthene	1.0E+00	4.0E-02	4.0E-02	1.0E-01	1.0E-01	1.3E-01
Dibenzofuran	1.0E+00	1.0E-03	1.0E-03	NV	NV	3.0E-02
Dibenz(a,h)anthracene	1.0E+00	3.0E-01	3.0E-01	1.0E+00	1.0E+00	1.3E-01
Naphthalene	1.0E+00	2.0E-02	2.0E-02	NV	NV	1.3E-01
Inorganics						
Aluminum	1.0E+00	1.0E+00	1.0E+00	NV	NV	NV
Arsenic	1.0E+00	3.0E-04	3.0E-04	1.5E+00	1.5E+00	3.0E-02
Cadmium	2.5E-02	1.0E-03	2.5E-05	NV	NV	1.0E-03
Iron	1.0E+00	7.0E-01	7.0E-01	NV	NV	NV
Manganese	4.0E-02	2.4E-02	9.6E-04	NV	NV	NV
Mercury	1.0E+00	NV	NV	NV	NV	1.3E-01
Thallium	1.0E+00	1.0E-05	1.0E-05	NV	NV	NV
Vanadium	2.6E-02	5.0E-03	1.3E-04	NV	NV	NV

References:

- USEPA, 2004 - Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual. Part E, Supplemental Guidance for Dermal Risk Assessment. Final. Office of Emergency and Remedial Response. Washington, DC. December. EPA/540/R/99/005.
- USEPA, 2019b - Regional Screening Levels for Chemical Contaminants. Accessed September 2019. Online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables
- USEPA, 2019a - Integrated Risk Information System Database (IRIS). Accessed September 2019, Online at: www.epa.gov/iriswebp/iris/index.html

Notes:

ABS: dermal absorption factor (USEPA, 2004)
ABSGI: gastrointestinal absorption factor (USEPA, 2004)
COPC: chemical of potential concern
NV: no toxicity value
RfD_d: dermal reference dose (RfD_o × ABSGI)
RfD_o: oral reference dose
SF_d: dermal slope factor (SF_o ÷ ABSGI)
SF_o: oral slope factor

Table 5-20. Inhalation Toxicity Values for Chemicals of Potential Concern
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Chemical of Potential Concern	Chronic RfC (m^3/mg)$^{-1}$	Source	Unit risk (m^3/µg)	Unit risk (m^3/mg)	Source	Inhalation Slope Factor (kg-day/mg)	Inhalation Reference dose (kg-day/mg)
Volatile Organic Compounds							
Chloroform	9.8E-02	A	2.3E-05	2.3E-02	I	1.2E-03	2.8E-02
Tetrachloroethene	4.0E-02	I	2.6E-07	2.6E-04	I	1.3E-05	1.1E-02
Semi-volatile Organic Compounds							
Benzo(a)pyrene	2.0E-06	I	6.0E-04	6.0E-01	I	3.00E-02	5.71E-07
Benzo(b)fluoranthene	NV	--	6.0E-05	6.0E-02	E	3.00E-03	--
Dibenzofuran	NV	--	NV	NV	--	--	--
Dibenz(a,h)anthracene	NV	--	6.0E-04	6.0E-01	E	3.00E-02	--
Naphthalene	3.0E-03	I	3.4E-05	3.4E-02	C	1.7E-03	8.6E-04
Inorganics							
Aluminum	5.0E-03	P	NV	NV	--	--	1.4E-03
Arsenic	1.5E-05	C	4.3E-03	4.3E+00	I	2.2E-01	4.3E-06
Cadmium	1.0E-05	A	1.8E-03	1.8E+00	I	9.0E-02	2.9E-06
Iron	NV	--	NV	NV	--	--	--
Manganese	5.0E-05	I	NV	NV	--	--	1.4E-05
Mercury	3.0E-04	I	NV	NV	--	--	8.6E-05
Thallium	NV	--	NV	NV	--	--	--
Vanadium	1.0E-04	A	NV	NV	--	--	2.9E-05

References/Notes:

•USEPA, 2019a - Integrated Risk Information System Database (IRIS). Accessed September 2019, Online at: www.epa.gov/iriswebp/iris/index.html

COPC: chemical of potential concern
RfC: inhalation reference concentration
A: ATSDR
C: Cal EPA
E: estimated using EPA-derived TEFs (USEPA, 1993); PAH-specific SF = SF for benzo(a)pyrene x PAH-specific TEF
I: IRIS
P: PPRTV
m^3/µg: cubic meter per microgram
mg/kg-day: milligram per kilogram-day
mg/m$^{3:}$ milligram per cubic mete
NV: no toxicity value

Table 5-21. USEPA-Derived Toxicity Equivalent Factors
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Polynuclear Aromatic Hydrocarbon (PAH)	Toxicity Equivalent Factor (TEF) (unitless)
Benzo(a)pyrene	1
Benzo(a)anthracene	0.1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Chrysene	0.001
Dibenzo(a,h)anthracene	1
Indeno(1,2,3-cd)pyrene	0.1

References:
- USEPA, 1993 - Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EPA/600/R-93/089.
- USEPA 2019a - Integrated Risk Information System Database (IRIS). Accessed September 2019, Online at: www.epa.gov/iriswebp/iris/index.html

Notes:
PAH-specific SF: SF for benzo(a)pyrene x PAH-specific TEF
SF: slope factor $(mg/kg\text{-}day)^{-1}$

- The only PAH for which a slope factor has been developed is benzo(a)pyrene, whose slope factor is 1.0 (mg/kg-day)-1 (USEPA, 2018a). To characterize carcinogenic risks for the other six potentially carcinogenic PAHs, their carcinogenic potency relative to benzo(a)pyrene was estimated. For the purposes of this HHRA, EPA-derived benzo(a)pyrene TEF were used to calculate PAH-specific slope factors (USEPA, 1993).

Table 5-22. Cancer Risk and Hazard Index - Indoor Site Worker
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Chemical of Potential Concern	**Cancer Risk Probabilities**		
	Groundwater		
	Indoor Vapor from Groundwater	**Total Cancer Risk**	**Percent Contribution to Total**
Tetrachloroethene	1.5E-07	1.5E-07	100%
Mercury	--	--	--
Total:	1.5E-07	1.5E-07	100%

Chemical of Potential Concern	**Hazard Index (HI)**		
	Groundwater		
	Indoor Vapor from Groundwater	**Total HI**	**Percent Contribution to Total**
Tetrachloroethene	4.1E-02	4.1E-02	49.9%
Mercury	4.1E-02	4.1E-02	50%
Total:	8.2E-02	8.2E-02	100%

Notes:

--: There is no toxicity data for this COPC, so no risk or hazard can be calculated.

•Numbers in **bold, blue** exceed a cancer risk of 1x10^{-5} or a hazard quotient/index of 1.0.

Table 5-23. Cancer Risk and Hazard Index - Outdoor Site Worker
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Chemical of Potential Concern	Cancer Risk Probabilities				
	Soil			Total Cancer Risk	Percent Contribution to Total
	Ingestion of Soil	Dermal Contact with Soil	Inhalation of Dust		
Benzo(a)pyrene	2.0E-07	1.1E-07	2.3E-11	3.1E-07	6%
Benzo(b)fluoranthene	2.5E-08	1.4E-08	3.0E-12	4.0E-08	1%
Dibenz(a,h)anthracene	5.0E-08	2.8E-08	5.9E-12	7.8E-08	2%
Aluminum	--	--	--	--	--
Arsenic	**3.9E-06**	4.9E-07	2.2E-09	**4.4E-06**	91.1%
Cobalt	-	-	3.4E-09	3.4E-09	0.1%
Iron	--	--	--	--	--
Manganese	--	--	--	--	--
Thallium	--	--	--	--	--
Total:	**4.1E-06**	6.4E-07	5.6E-09	**4.8E-06**	100%

Chemical of Potential Concern	Hazard Index (HI)				
	Soil			Total HI	Percent Contribution to Total
	Ingestion of Soil	Dermal Contact with Soil	Inhalation of Dust		
Benzo(a)pyrene	1.8E-03	1.0E-03	5.4E-05	2.9E-03	1.7%
Benzo(b)fluoranthene	1.8E-05	9.8E-06	--	2.8E-05	0.016%
Dibenz(a,h)anthracene	4.7E-07	2.6E-07	--	7.3E-07	0.00042%
Aluminum	9.0E-03	--	3.5E-04	9.4E-03	5.4%
Arsenic	2.4E-02	3.1E-03	9.4E-05	2.7E-02	15.7%
Cobalt	1.8E-02	-	1.7E-04	1.8E-02	10.4%
Iron	2.0E-02	--	--	2.0E-02	11%
Manganese	2.2E-02	--	2.0E-03	2.4E-02	14%
Thallium	7.2E-02	--	--	7.2E-02	41%
Total:	1.7E-01	4.1E-03	2.7E-03	1.7E-01	100%

Notes:

--: There is no toxicity data for this COPC, so no risk or hazard can be calculated.

•Numbers in **bold, blue** exceed a cancer risk of $1x10^{-5}$ or a hazard quotient/index of 1.0.

Table 5-24. Cancer Risk and Hazard Index - Construction Worker
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Chemical of Potential Concern	Cancer Risk Probabilities							
	Soil				Groundwater		Total Cancer Risk	Percent Contribution to Total
	Ingestion of Soil	Dermal Contact with Soil	Inhalation of Dust	*Subtotal - Soil*	Inhalation of Outdoor Vapor in Trench	*Subtotal - Groundwater*		
Chloroform	NA	NA	NA	*NA*	6.0E-09	*6.0E-09*	6.0E-09	2.1%
Tetrachloroethene	NA	NA	NA	*NA*	1.3E-09	*1.3E-09*	1.3E-09	0.47%
Benzo(a)pyrene	4.7E-09	2.0E-09	6.0E-12	*6.7E-09*	NA	*NA*	6.7E-09	2.3%
Benzo(b)fluoranthene	4.6E-10	1.9E-10	5.9E-13	*6.6E-10*	NA	*NA*	6.6E-10	0.23%
Dibenzofuran	NA	NA	NA	*NA*	--	--	--	--
Dibenz(a,h)anthracene	9.1E-10	3.8E-10	1.2E-12	*1.3E-09*	NA	*NA*	1.3E-09	0.45%
Naphthalene	NA	NA	NA	*NA*	6.6E-10	*6.6E-10*	6.6E-10	0.23%
Aluminum	--	--	--	--	NA	*NA*	-	--
Arsenic	2.5E-07	2.4E-08	1.5E-09	*2.7E-07*	--	--	2.7E-07	94%
Cadmium	--	--	2.3E-10	*2.3E-10*	NA	*NA*	2.3E-10	0.078%
Cobalt	--	--	1.9E-09	*1.9E-09*	NA	*NA*	1.9E-09	0.66%
Iron	--	--	--	--	NA	*NA*	--	--
Manganese	--	--	--	--	--	--	--	--
Mercury	NA	NA	NA	*NA*	--	--	--	--
Thallium	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	NA	*NA*	--	--
Total:	2.5E-07	2.6E-08	3.6E-09	*2.8E-07*	8.0E-09	*8.0E-09*	2.9E-07	100%

Chemical of Potential Concern	Hazard Index (HI)							
	Soil				Groundwater		Total HI	Percent Contribution to Total
	Ingestion of Soil	Dermal Contact with Soil	Inhalation of Dust	*Subtotal - Soil*	Inhalation of Outdoor Vapor in Trench	*Subtotal - Groundwater*		
Chloroform	NA	NA	NA	*NA*	1.9E-04	*1.9E-04*	1.9E-04	0.055%
Tetrachloroethene	NA	NA	NA	*NA*	9.1E-03	*9.1E-03*	9.1E-03	2.7%
Benzo(a)pyrene	1.1E-03	4.6E-04	3.5E-04	*1.9E-03*	NA	*NA*	1.9E-03	0.57%
Benzo(b)fluoranthene	8.1E-06	3.4E-06	--	*1.2E-05*	NA	*NA*	1.2E-05	0.0034%
Dibenzofuran	NA	NA	NA	*NA*	--	--	--	--
Dibenz(a,h)anthracene	2.1E-07	8.9E-08	--	*3.0E-07*	NA	*NA*	3.0E-07	0.0001%
Naphthalene	NA	NA	NA	*NA*	4.5E-04	*4.5E-04*	4.5E-04	0.14%
Aluminum	1.4E-02	--	6.1E-03	*2.1E-02*	NA	*NA*	2.1E-02	6.1%
Arsenic	3.8E-02	3.7E-03	1.6E-03	*4.3E-02*	--	--	4.3E-02	13%
Cadmium	4.2E-03	5.3E-04	8.8E-04	*5.6E-03*	NA	*NA*	5.6E-03	1.7%
Cobalt	2.3E-02	--	2.5E-03	*2.6E-02*	NA	*NA*	2.6E-02	7.7%
Iron	3.3E-02	--	--	*3.3E-02*	NA	*NA*	3.3E-02	10%
Manganese	2.5E-02	--	2.6E-02	*5.1E-02*	--	--	5.1E-02	15%
Mercury	NA	NA	NA	*NA*	1.06E-02	*1.06E-02*	1.1E-02	3.1%
Thallium	1.26E-01	--	--	*1.26E-01*	--	--	1.3E-01	38%
Vanadium	6.78E-03	--	7.2E-04	*7.50E-03*	NA	*NA*	7.5E-03	2.2%
Total:	2.7E-01	4.7E-03	3.8E-02	*3.2E-01*	2.0E-02	*2.0E-02*	3.4E-01	100%

Notes:

NA: not applicable (not a COPC for this media)

--: no toxicity data for this COPC, so no risk can be calculated

•Numbers in **bold, blue** exceed a cancer risk of $1x10^{-5}$ or a hazard quotient/index of 1.0.

Table 5-25. Total Risk and Hazard Summary, Combined Media
LF512 Building 30013 Sump Pit Area, Wright-Patterson Air Force Base, Dayton, Ohio

Exposure Route	Cancer Risk	Percent of Total Risk	Hazard Index	Percent of Total Risk
Site Worker (Indoor)				
Indoor vapor from groundwater	1.5E-07	100%	8.2E-02	100%
Total	1.5E-07	100%	8.2E-02	100%
Site Worker (Outdoor)				
Soil ingestion	**4.1E-06**	86.5%	1.7E-01	96.1%
Soil dermal contact	6.4E-07	13.4%	4.1E-03	2.4%
Dust inhalation	5.6E-09	0.12%	2.7E-03	1.6%
Total	**4.8E-06**	100%	1.7E-01	100%
Construction Worker				
Soil ingestion	2.5E-07	86.9%	2.7E-01	81.3%
Soil dermal contact	2.6E-08	9.0%	4.7E-03	1.4%
Dust inhalation	3.6E-09	1.3%	3.8E-02	11.3%
Soil Subtotal	*2.8E-07*	*97.2%*	*31.5%*	*94.0%*
Vapor inahaltion in trench	8.0E-09	2.8%	2.0E-02	6.0%
Groundwater Subtotal	*8.0E-09*	*2.8%*	*2.0E-02*	*6.0%*
Total	2.9E-07	100%	3.4E-01	100%

Notes:

•Numbers in **bold, blue** exceed a cancer risk of 1x10^{-5} or a hazard quotient/index of 1.0.