JEFFREY H. WOOD
Acting Assistant Attorney General
Environment and Natural Resources Division
United States Department of Justice

DEBORAH A. GITIN (CA Bar No. 284947)
Senior Counsel
Environmental Enforcement Section
Environment and Natural Resources Division
United States Department of Justice
301 Howard Street, Suite 1050
San Francisco, California 94105
Telephone: (415) 744-6488
E-mail: Deborah.Gitin@usdoj.gov

Attorneys for Plaintiff United States of America

(additional counsel listed on following page)

UNITED STATES DISTRICT COURT FOR THE
EASTERN DISTRICT OF CALIFORNIA
SACRAMENTO DIVISION

UNITED STATES OF AMERICA and THE CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL, Plaintiffs, v. REGENTS OF THE UNIVERSITY OF CALIFORNIA, Defendant.	Case No. 18-1536 **REMEDIAL DESIGN/REMEDIAL ACTION CONSENT DECREE**

XAVIER BECERRA
Attorney General of the State of California
SUSAN FIERING
Supervising Deputy Attorney General
ANDREW WIENER (CA Bar No. 282414)
Deputy Attorney General
1515 Clay Street, 20th Floor
Post Office Box 70550
Oakland, California 94612-0550
Telephone: (510) 879-1975
E-mail: Andrew.Wiener@doj.ca.gov

Attorneys for Plaintiff the California Department of Toxic Substances Control

PEGGY OTUM (CA Bar No. 302949)
Partner
Arnold & Porter
Three Embarcadero Center, 10th Floor
San Francisco, California 94111
Telephone: (415) 471-3119
E-mail: Peggy.Otum@arnoldporter.com

Attorney for Defendant Regents of the University of California

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I. BACKGROUND

A. The United States of America ("United States"), on behalf of the Administrator of the United States Environmental Protection Agency ("EPA"), and the State of California Department of Toxic Substances Control ("DTSC") (collectively "Plaintiffs") filed a complaint ("Complaint") in this matter against the Regents of the University of California ("University") pursuant to Sections 106 and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §§ 9606 and 9607.

B. The United States in the Complaint seeks, *inter alia*: (1) reimbursement of costs incurred by EPA and the United States Department of Justice ("DOJ") for certain response actions at the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site in Davis, California ("Site"), together with accrued interest; and (2) performance of certain response actions by the University at the Site consistent with the National Contingency Plan, 40 C.F.R. Part 300 ("NCP").

C. In accordance with the NCP and Section 121(f)(1)(F) of CERCLA, 42 U.S.C. § 9621(f)(1)(F), EPA notified DTSC on November 29, 2016 of negotiations with the University, a potentially responsible party ("PRP"), regarding the implementation of the remedial design and remedial action ("RD/RA") for soil/solid waste and soil gas at Operable Unit 2 ("OU2") of the Site, and EPA has provided DTSC, the lead State agency at the Site, with an opportunity to participate in such negotiations and be a party to this Consent Decree ("CD").

D. DTSC, as co-plaintiff in the Complaint, seeks: (1) reimbursement of certain costs incurred by DTSC for response actions at the Site, together with accrued interest; and (2) performance of certain response actions by the University at the Site consistent with the NCP, 40 C.F.R. Part 300.

E. In accordance with Section 122(j)(1) of CERCLA, 42 U.S.C. § 9622(j)(1), EPA notified the United States Fish and Wildlife Service and the National Marine Fisheries Service on February 2, 2017, and the California Department of Fish and Wildlife on September 18, 2017, of negotiations with the University regarding the release of hazardous substances that may have resulted in injury to the natural resources under federal trusteeship, and encouraged the trustees to participate in the negotiation of this CD.

F. The University does not admit any liability to Plaintiffs arising out of the transactions or occurrences alleged in the Complaint, nor does it acknowledge that the release or threatened release of hazardous substance(s) at or from the soil/solid waste and soil gas at OU2 of the Site constitutes an imminent and substantial endangerment to the public health or welfare or the environment.

G. Pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List ("NPL"), set forth at 40 C.F.R. Part 300, App. B, by publication in the Federal Register on May 31, 1994, 59 Fed. Reg. 27989-01.

H. In response to a release or a substantial threat of a release of a hazardous substance(s) at or from the Site, the University commenced a Remedial Investigation and Feasibility Study ("RI/FS") for the soil/solid waste and soil gas at OU2 of the Site pursuant to 40 C.F.R. § 300.430.

I. The University completed two risk assessments to evaluate the risk to human health and to ecological receptors from exposure to contaminated soil, solid waste, and soil gas that are associated with the past use of OU2 as a waste disposal area. In addition, the University completed the *Final Remedial Investigation Report LEHR/SCDS* [South Campus Disposal Site] *Environmental Restoration, University of California, Davis* ("RI Report") in December 2004, and the University completed a Feasibility Study Data Gaps Technical Report ("FS Data Gaps

Report") in February 2010 and *the Final Feasibility Study for the University of California, Davis Areas Volume 1, Soil/Solid Waste and Soil Gas* ("Soil FS") in April 2012.

J. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA published notice of the completion of the Soil FS and of the proposed plan for remedial action on January 27, 2015, in the *Davis Enterprise*, a major local newspaper of general circulation. EPA provided an opportunity for written and oral comments from the public on the proposed plan for remedial action. A copy of the transcript of the public meeting is available to the public as part of the administrative record upon which the Acting Assistant Director, California Site Cleanup and Enforcement Branch, Superfund Division, EPA Region 9, based the selection of the response action.

K. The decision by EPA on the remedial action for the soil/solid waste and soil gas to be implemented at OU2 of the Site is embodied in a final Record of Decision ("ROD") (Appendix A to this Consent Decree), executed on September 29, 2016, on which DTSC has given its concurrence, and was updated in an Explanation of Significant Differences dated May 3, 2018 (Appendix B to this Consent Decree). The ROD includes a responsiveness summary to the public comments. Notice of the final plan was published in accordance with Section 117(b) of CERCLA, 42 U.S.C. § 9617(b). The groundwater associated with OU2 is anticipated to be addressed in a later record of decision.

L. On April 27, 2018, EPA approved the University's work plan to conduct an investigation of the Southern Trenches and Hopland Field Station Disposal Area, as those areas are depicted on page 56 (figure 6) of the ROD, to determine whether there is waste in these areas that requires remediation. The University is expected to complete this investigation prior to the initiation of the remedial design phase.

M. Based on the information presently available, EPA and DTSC believe that the Work will be properly and promptly conducted by the University if conducted in accordance with this CD and its appendices.

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

O. The Parties recognize, and the Court by entering this CD finds, that this CD has been negotiated by the Parties in good faith and implementation of this CD will expedite the cleanup of the soil/solid waste and soil gas at OU2 of the Site and will avoid prolonged and complicated litigation between the Parties, and that this CD is fair, reasonable, and in the public interest.

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

II. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331, 1367, and 1345, and 42 U.S.C. §§ 9606, 9607, and 9613(b). This Court also has personal jurisdiction over the University. Solely for the purposes of this CD and the underlying Complaint, the University waives all objections and defenses that it may have to jurisdiction of the Court or to venue in this District. The University shall not challenge the terms of this CD or this Court's jurisdiction to enter and enforce this CD.

III. PARTIES BOUND

2. This CD is binding upon the United States and DTSC and upon the University and its successors and assigns. Any change in ownership or corporate or other legal status of the

University including, but not limited to, any transfer of assets or real or personal property, shall in no way alter the University's responsibilities under this CD.

3. The University shall provide a copy of this CD to each contractor hired to perform the Work and to each person representing the University with respect to the soil/solid waste and soil gas at OU2 of the Site or the Work, and shall condition all contracts entered into hereunder upon performance of the Work in conformity with the terms of this CD. The University or its contractors shall provide written notice of the CD to all subcontractors hired to perform any portion of the Work. The University shall nonetheless be responsible for ensuring that its contractors and subcontractors perform the Work in accordance with the terms of this CD. With regard to the activities undertaken pursuant to this CD, each contractor and subcontractor shall be deemed to be in a contractual relationship with the University within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3).

IV. DEFINITIONS

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

"Affected Property" shall mean all real property at OU2 of the Site and any other real property where EPA determines, at any time, that access, land, water, or other resource use restrictions, and/or Institutional Controls are needed to implement the Remedial Action, including, but not limited to, the Eastern Trenches, Landfill Unit 1 ("LFU-1"), LFU-2, LFU-3, the Southern Trenches, the Hopland Field Station Disposal Area ("HFSDA"), and the Waste Burial Holes ("WBH"), as depicted in Appendix D hereto.

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

"Consent Decree" or "CD" shall mean this consent decree and all appendices attached hereto (listed in Section XXI). In the event of conflict between this CD and any appendix, this CD shall control.

"Day" or "day" shall mean a calendar day. In computing any period of time under this CD, where the last day would fall on a Saturday, Sunday, or federal or state holiday, the period shall run until the close of business of the next working day.

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

"DTSC" shall mean the California Department of Toxic Substances Control and any successor departments, or agencies or instrumentalities.

"DTSC Future Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that DTSC incurs in connection with the Site in reviewing or developing plans, reports, and other deliverables submitted pursuant to this Consent Decree, in overseeing implementation of the Work, or otherwise implementing, overseeing, or enforcing this Consent Decree, including, but not limited to, payroll costs, contractor costs, travel costs and laboratory costs, and the costs incurred pursuant to Section VII (Remedy Review), Section VIII (Property Requirements) (including, but not limited to, the cost of attorney time and any monies paid to secure access), and Paragraph 12 (Community Involvement). DTSC Future Response Costs shall also include all DTSC Interim Response Costs.

"DTSC Interim Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, (a) paid by DTSC in connection with the Site between January 1, 2018 and the Effective Date, or (b) incurred by DTSC prior to the Effective Date but paid after that date.

"Effective Date" shall mean the date upon which the approval of this CD is recorded on the Court's docket.

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

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

"Federal Future Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that the United States incurs in reviewing or developing deliverables submitted pursuant to this CD, in overseeing implementation of the Work, or otherwise implementing, overseeing, or enforcing this CD, including, but not limited to, payroll costs, contractor costs, travel costs, laboratory costs, the costs incurred pursuant to Paragraph 11 (Emergencies and Releases), Paragraph 12 (Community Involvement) (including the costs of any technical assistance grant under Section 117(e) of CERCLA, 42 U.S.C. § 9617(e)), Section VII (Remedy Review), Section VIII (Property Requirements) (including the cost of attorney time and any monies paid to secure or enforce access or land, water, or other resource use restrictions and/or to secure, implement, monitor, maintain, or enforce Institutional Controls including the amount of just compensation), and Section XII (Dispute Resolution), and all litigation costs. Federal Future Response Costs shall also include all Federal Interim Response Costs.

"Federal Interim Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs: (a) paid by the United States in connection with the Site between October 1, 2017 and the Effective Date, or (b) incurred by the United States prior to the Effective Date but paid after that date.

"Institutional Controls" or "ICs" shall mean Proprietary Controls and state or local laws, regulations, ordinances, zoning restrictions, or other governmental controls or notices that:

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

"Interest" shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year. Rates are available online at https://www.epa.gov/superfund/superfund-interest-rates.

"Laboratory for Energy-Related Health Research ("LEHR") Special Account" shall mean the special account, within the EPA Hazardous Substance Superfund, established for the Site by EPA pursuant to Section 122(b)(3) of CERCLA, 42 U.S.C. § 9622(b)(3), and the Administrative Order on Consent for Removal and Remedial Investigation and Feasibility Study (University of California Operable Unit), U.S. EPA Docket No. 99-16 (September 1999).

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

"Non-Settling Owner" shall mean any person, other than the University, that owns or controls any Affected Property. The clause "Non-Settling Owner's Affected Property" means Affected Property owned or controlled by Non-Settling Owner.

"Operation and Maintenance" or "O&M" shall mean all activities required to operate, maintain, and monitor the effectiveness of the RA as specified in the SOW or any EPA-approved O&M Plan.

"Paragraph" or "¶" shall mean a portion of this CD or, if so indicated, a portion of the Statement of Work (Appendix C) identified by an Arabic numeral or an upper or lower case letter.

"Parties" shall mean the United States, DTSC, and the University.

"Performance Standards" shall mean the cleanup levels and other measures of achievement of the remedial action objectives, as set forth in the ROD and the Explanation of Significant Differences.

"Plaintiffs" shall mean the United States and DTSC.

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

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

"Record of Decision" or "ROD" shall mean the EPA Record of Decision relating to Soil/Solid Waste and Soil Gas for OU2 at the Site signed on September 29, 2016, by the Acting Assistant Director, California Site Cleanup and Enforcement Branch, Superfund Division, EPA Region 9, and all attachments thereto. The ROD is attached as Appendix A.

"Remedial Action" or "RA" shall mean the remedial action selected in the ROD.

"Remedial Design" or "RD" shall mean those activities to be undertaken by the University to develop final plans and specifications for the RA as stated in the SOW.

"Section" shall mean a portion of this CD or, if so indicated, a portion of the Statement of Work (Appendix C) identified by a Roman numeral.

"Site" shall mean the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site, located south of the city of Davis, Solano County, California, and depicted generally on the map attached as Appendix D.

"State" shall mean the State of California.

"Statement of Work" or "SOW" shall mean the document describing the activities the University must perform to implement the RD, the RA, and O&M regarding the soil/solid waste and soil gas at OU2 of the Site, which is attached as Appendix C.

"Supervising Contractor" shall mean the principal contractor retained by the University to supervise and direct the implementation of the Work under this CD.

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

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

"University" shall mean the Regents of the University of California.

"Waste Material" shall mean: (1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); and (3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27).

"Work" shall mean all activities and obligations the University is required to perform under this CD, except the activities required under Section XVIII (Retention of Records).

V. GENERAL PROVISIONS

5. **Objectives of the Parties**. The objectives of the Parties in entering into this CD are to protect public health or welfare or the environment by the design and implementation of

response actions for the soil/solid waste and soil gas at OU2 of the Site by the University, to reimburse the response costs of Plaintiffs, and to resolve the claims of Plaintiffs against the University as provided in this CD.

6. **Commitments by University**. The University shall finance and perform the Work in accordance with this CD and all deliverables developed by the University and approved or modified by EPA pursuant to this CD. The University shall pay the United States for Federal Future Response Costs and DTSC for DTSC Future Response Costs, as provided in this CD.

7. **Compliance with Applicable Law**. Nothing in this CD limits the University's obligations to comply with the requirements of all applicable federal and state laws and regulations. The University must also comply with all applicable or relevant and appropriate requirements of all federal and state environmental laws as set forth in the ROD and the SOW. The activities conducted pursuant to this CD, if approved by EPA, shall be deemed to be consistent with the NCP as provided in Section 300.700(c)(3)(ii) of the NCP.

8. **Permits**.

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

b. The University may seek relief under the provisions of Section XI (Force Majeure) for any delay in the performance of the Work resulting from a failure to obtain, or a delay in obtaining, any permit or approval referenced in Paragraph 8.a and required for the

Work, provided that it has submitted timely and complete applications and taken all other actions necessary to obtain all such permits or approvals.

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

VI. PERFORMANCE OF THE WORK

9. **Coordination and Supervision**.

a. **Project Coordinators**.

(1) The University's Project Coordinator must have sufficient technical expertise to coordinate the Work. The University's Project Coordinator may not be an attorney representing the University in this matter and may not act as the Supervising Contractor. The University's Project Coordinator may assign other representatives, including other contractors, to assist in coordinating the Work.

(2) EPA shall designate and notify the University of EPA's Project Coordinator and any Alternate Project Coordinators. EPA may designate other representatives, which may include its employees, contractors and/or consultants, to oversee the Work. EPA's Project Coordinator/Alternate Project Coordinator will have the same authority as a remedial project manager and/or an on-scene coordinator, as described in the NCP. This includes the authority to halt the Work and/or to conduct or direct any necessary response action when he or she determines that conditions at the Site constitute an emergency or may present an immediate threat to public health or welfare or the environment due to a release or threatened release of Waste Material.

(3) DTSC shall designate and notify EPA and the University of its Project Coordinator and Alternate Project Coordinator. DTSC may designate other representatives, including its employees, contractors and/or consultants to oversee the Work. For

any meetings and inspections in which EPA's Project Coordinator participates, DTSC's Project Coordinator also may participate. The University shall notify DTSC reasonably in advance of any such meetings or inspections.

(4) The University's Project Coordinator shall meet or have a conference call with EPA's and DTSC's Project Coordinators at least monthly, or as otherwise directed by EPA.

b. **Supervising Contractor**. The University's proposed Supervising Contractor must have sufficient technical expertise to supervise the Work and a quality assurance system that complies with the most current EPA-adopted ANSI/ASQC E4, Quality Systems for Environmental Data and Technology Programs: Requirements with Guidance for Use (American National Standard).

c. **Procedures for Disapproval/Notice to Proceed**.

(1) The University shall designate, and notify EPA, within ten (10) days after the Effective Date, of the names, contact information, and qualifications of the University's proposed Project Coordinator and Supervising Contractor.

(2) EPA, after a reasonable opportunity for review and comment by DTSC, shall issue notices of disapproval and/or authorizations to proceed regarding the proposed Project Coordinator and Supervising Contractor, as applicable. If EPA issues a notice of disapproval, the University shall, within thirty (30) days, submit to EPA a list of supplemental proposed Project Coordinators and/or Supervising Contractors, as applicable, including a description of the qualifications of each. EPA shall, after a reasonable opportunity for review and comment by DTSC, issue a notice of disapproval or authorization to proceed regarding each supplemental proposed coordinator and/or contractor. The University may select any

coordinator/contractor covered by an authorization to proceed and shall, within twenty-one (21) days, notify EPA of the University's selection.

(3) The University may change its Project Coordinator and/or Supervising Contractor, as applicable, by following the procedures of Paragraphs 9.c(1) and 9.c(2).

10. **Performance of Work in Accordance with SOW**. The University shall: (a) develop the RD; (b) perform the RA; and (c) operate, maintain, and monitor the effectiveness of the RA; all in accordance with the SOW and all EPA-approved, conditionally-approved, or modified deliverables as required by the SOW. All deliverables required to be submitted for approval under the CD or SOW shall be subject to approval by EPA in accordance with ¶ 6.6 (Approval of Deliverables) of the SOW.

11. **Emergencies and Releases**. The University shall comply with the emergency and release response and reporting requirements under ¶ 4.3 (Emergency Response and Reporting) of the SOW. Subject to Section XIV (Covenants by Plaintiffs), nothing in this CD, including ¶ 4.3 of the SOW, limits any authority of Plaintiffs: (a) to take all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site, or (b) to direct or order such action, or seek an order from the Court, to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Site. If, due to the University's failure to take appropriate response action under ¶ 4.3 of the SOW, EPA or, as appropriate, DTSC, takes such action instead, the University shall reimburse EPA and DTSC under Section IX (Payments for Response Costs) for all costs of the response action.

12. **Community Involvement**. If requested by EPA, the University shall conduct community involvement activities under EPA's oversight as provided for in, and in accordance with, Section 2 (Community Involvement) of the SOW. Such activities may include, but are not limited to, designation of a Community Involvement Coordinator. Costs incurred by the United States under this Section constitute Federal Future Response Costs to be reimbursed under Section IX (Payments for Response Costs). Costs incurred by DTSC under this Section constitute DTSC Future Response Costs to be reimbursed under Section IX (Payments for Response Costs).

13. **Modification of SOW or Related Deliverables**.

a. If EPA determines that it is necessary to modify the work specified in the SOW and/or in deliverables developed under the SOW in order to achieve and/or maintain the Performance Standards or to carry out and maintain the effectiveness of the RA, and such modification is consistent with the Scope of the Remedy set forth in ¶ 1.2 of the SOW, then EPA may notify the University of such modification. If the University objects to the modification it may, within thirty (30) days after EPA's notification, seek dispute resolution under Section XII (Dispute Resolution).

b. The SOW and/or related work plans shall be modified: (1) in accordance with the modification issued by EPA; or (2) if the University invokes dispute resolution, in accordance with the final resolution of the dispute. The modification shall be incorporated into and enforceable under this CD, and the University shall implement all work required by such modification. The University shall incorporate the modification into the deliverable required under the SOW, as appropriate.

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

14. Nothing in this CD, the SOW, or any deliverable required under the SOW constitutes a warranty or representation of any kind by Plaintiffs that compliance with the work requirements set forth in the SOW or related deliverable will achieve the Performance Standards.

VII. REMEDY REVIEW

15. **Periodic Review**. The University shall support EPA's reviews under Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), and applicable regulations, of whether the RA is protective of human health and the environment.

VIII. PROPERTY REQUIREMENTS

16. **Agreements Regarding Access and Non-Interference**. The University shall, with respect to any Non-Settling Owner's Affected Property, use best efforts to secure from such Non-Settling Owner an agreement, enforceable by the University and by Plaintiffs, providing that such Non-Settling Owner shall; and the University shall, with respect to the University's Affected Property: (i) provide Plaintiffs, and their representatives, contractors, and subcontractors with access at all reasonable times to such Affected Property to conduct any activity regarding the CD, including those listed in Paragraph 16.a (Access Requirements); and (ii) refrain from using such Affected Property in any manner that EPA determines will pose an unacceptable risk to human health or to the environment due to exposure to Waste Material, or interfere with or adversely affect the implementation, integrity, or protectiveness of the RA, including the restrictions listed in Paragraph 16.b (Land, Water, or Other Resource Use Restrictions). The University shall provide a copy of such access and use restriction agreement(s) to EPA and DTSC.

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

(1) Monitoring the Work;

(2) Verifying any data or information submitted to the United States or DTSC;

(3) Conducting investigations regarding contamination at or near the Site;

(4) Obtaining samples;

(5) Assessing the need for, planning, or implementing additional response actions at or near the Site;

(6) Assessing implementation of quality assurance and quality control practices as defined in the approved construction quality assurance quality control plan as provided in the SOW;

(7) Implementing the Work pursuant to the conditions set forth in Paragraph 57 (Work Takeover);

(8) Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by the University or its agents, consistent with Section XVII (Access to Information);

(9) Assessing the University's compliance with the CD;

(10) Determining whether the Affected Property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted under the CD; and

(11) Implementing, monitoring, maintaining, reporting on, and enforcing any land, water, or other resource use restrictions and Institutional Controls.

b. **Land, Water, or Other Resource Use Restrictions**. The following is a list of land, water, or other resource use restrictions applicable to the Affected Property: implementation of Institutional Controls to protect remedy components, prohibit residential land

use, and restrict non-residential land use. This includes the requirement for a soil management plan for post-remediation earthwork activities. These controls are described in more detail in Appendix A (ROD) (including Section 12.0, Selected Remedy).

17. **Proprietary Controls**. The University shall, with respect to any Non-Settling Owner's Affected Property, use best efforts to secure Non-Settling Owner's cooperation in executing and recording; and the University, with respect to the University's Affected Property, shall execute and record, in accordance with the procedures of this Paragraph 17, Proprietary Controls that: (i) grant a right of access to conduct any activity regarding the CD, including those activities listed in Paragraph 16.a (Access Requirements); and (ii) grant the right to enforce the land, water, or other resource use restrictions set forth in Paragraph 16.b (Land, Water, or Other Resource Use Restrictions).

a. **Grantees**. The Proprietary Controls, in the form of land use covenants pursuant to state law, must be recorded with DTSC as grantee, and EPA as "third-party beneficiary," and expressly grant the right of access and the right to enforce the covenants allowing EPA and DTSC to maintain the right to enforce the Proprietary Controls without acquiring an interest in real property.

b. **Initial Title Evidence**. The University shall, within forty-five (45) days after the Effective Date:

(1) Record Title Evidence. Submit to EPA a title insurance commitment or other title evidence acceptable to EPA that: (i) names the proposed insured or the party in whose favor the title evidence runs, or the party who will hold the real estate interest, or if that party is uncertain, names the United States, DTSC, the University, or "To Be Determined;" (ii) covers the Affected Property that is to be encumbered; (iii) demonstrates that the person or entity that will execute and record the Proprietary Controls is the owner of such

Affected Property; (iv) identifies all record matters that affect title to the Affected Property, including all prior liens, claims, rights (such as easements), mortgages, and other encumbrances (collectively, "Prior Encumbrances"); and (v) includes complete, legible copies of such Prior Encumbrances; and

(2) Non-Record Title Evidence. Submit to EPA a report of the results of an investigation, including a physical inspection of the Affected Property, which identifies non-record matters that could affect the title, such as unrecorded leases or encroachments.

c. **Release or Subordination of Prior Liens, Claims, and Encumbrances**.

(1) The University shall secure the release, subordination, modification, or relocation of all Prior Encumbrances on the title to the Affected Property revealed by the title evidence or otherwise known to the University, unless EPA waives this requirement as provided under Paragraphs 17.c(2)-(4).

(2) The University may, by the deadline under Paragraph 17.b (Initial Title Evidence), submit an initial request for waiver of the requirements of Paragraph 17.c(1) regarding one or more Prior Encumbrances, on the grounds that such Prior Encumbrances cannot defeat or adversely affect the rights to be granted by the Proprietary Controls and cannot interfere with the remedy or result in unacceptable exposure to Waste Material.

(3) The University may, within ninety (90) days after the Effective Date, or if an initial waiver request has been filed, within forty-five (45) days after EPA's determination on the initial waiver request, submit a final request for a waiver of the requirements of Paragraph 17.c(1) regarding any particular Prior Encumbrance on the grounds that the University could not obtain the release, subordination, modification, or relocation of such Prior Encumbrance despite best efforts.

(4) The initial and final waiver requests must include supporting evidence including descriptions of and copies of the Prior Encumbrances and maps showing areas affected by the Prior Encumbrances. The final waiver request also must include evidence of efforts made to secure release, subordination, modification, or relocation of the Prior Encumbrances.

(5) The University shall complete its obligations under Paragraph 17.c(1) regarding all Prior Encumbrances: within one hundred eighty (180) days after the Effective Date; or if an initial waiver request has been filed, within one hundred thirty-five (135) days after EPA's determination on the initial waiver request; or if a final waiver request has been filed, within ninety (90) days after EPA's determination on the final waiver request.

d. **Update to Title Evidence and Recording of Proprietary Controls**.

(1) The University shall submit to EPA for review and approval, by the deadline specified in Paragraph 17.c(5), all draft Proprietary Controls and draft instruments addressing Prior Encumbrances.

(2) Upon EPA's approval of the proposed Proprietary Controls and instruments addressing Prior Encumbrances, the University shall, within fifteen (15) days, update the original title insurance commitment (or other evidence of title acceptable to EPA) under Paragraph 17.b (Initial Title Evidence). If the updated title examination indicates that no liens, claims, rights, or encumbrances have been recorded since the effective date of the original commitment (or other title evidence), the University shall secure the immediate recordation of the Proprietary Controls and instruments addressing Prior Encumbrances in the appropriate land records. Otherwise, the University shall secure the release, subordination, modification, or relocation under Paragraph 17.c(1), or the waiver under Paragraphs 17.c(2)-(4), regarding any

newly-discovered liens, claims, rights, and encumbrances, prior to recording the Proprietary Controls and instruments addressing Prior Encumbrances.

(3) If the University submitted a title insurance commitment under Paragraph 17.b(1) (Record Title Evidence), then upon the recording of the Proprietary Controls and instruments addressing Prior Encumbrances, the University shall obtain a title insurance policy that: (i) is consistent with the original title insurance commitment; (ii) is for $100,000 or other amount approved by EPA; (iii) is issued to the United States, the University, or other person approved by EPA; and (iv) is issued on a current American Land Title Association ("ALTA") form or other form approved by EPA.

(4) The University shall, within thirty (30) days after recording the Proprietary Controls and instruments addressing Prior Encumbrances, or such other deadline approved by EPA, provide to the United States and to all grantees of the Proprietary Controls: (i) certified copies of the recorded Proprietary Controls and instruments addressing Prior Encumbrances showing the clerk's recording stamps; and (ii) the title insurance policy(ies) or other approved form of updated title evidence dated as of the date of recording of the Proprietary Controls and instruments.

e. The University shall monitor, maintain, enforce, and annually report on all Proprietary Controls required under this CD.

f. The University shall not Transfer its Affected Property unless it has executed and recorded all Proprietary Controls and instruments addressing Prior Encumbrances regarding such Affected Property in accordance with this Paragraph.

18. **Best Efforts**. As used in this Section, "best efforts" means the efforts that a reasonable person in the position of the University would use so as to achieve the goal in a timely manner, including the cost of employing professional assistance and the payment of

reasonable sums of money to secure access and/or use restriction agreements, Proprietary Controls, releases, subordinations, modifications, or relocations of Prior Encumbrances that affect the title to the Affected Property, as applicable. If the University is unable to accomplish what is required through "best efforts" in a timely manner, it shall notify the United States, and include a description of the steps taken to comply with the requirements. If the United States deems it appropriate, it may assist the University, or take independent action, in obtaining such access and/or use restrictions, Proprietary Controls, releases, subordinations, modifications, or relocations of Prior Encumbrances that affect the title to the Affected Property, as applicable. All costs incurred by the United States in providing such assistance or taking such action, including the cost of attorney time and the amount of monetary consideration or just compensation paid, constitute federal Future Response Costs to be reimbursed under Section IX (Payments for Response Costs).

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

20. **Notice to Successors-in-Title**.

a. The University shall, within fifteen (15) days after the Effective Date, submit for EPA approval a notice to be filed regarding the University's Affected Property in the appropriate land records. The notice must: (1) include a proper legal description of the Affected Property; (2) provide notice to all successors-in-title: (i) that the Affected Property is part of, or related to, the Site; (ii) that EPA has selected a remedy for the Site; and (iii) that a PRP has entered into a CD requiring implementation of such remedy; and (3) identify the U.S. District

Court in which the CD was filed, the name and civil action number of this case, and the date the CD was entered by the Court. The University shall record the notice within ten (10) days after EPA's approval of the notice and submit to EPA, within ten (10) days thereafter, a certified copy of the recorded notice.

b. The University shall, prior to entering into a contract to Transfer the University's Affected Property, or sixty (60) days prior to Transferring the University's Affected Property, whichever is earlier:

(1) Notify the proposed transferee that EPA has selected a remedy regarding the Site, that a PRP has entered into a Consent Decree requiring implementation of such remedy, and that the United States District Court has entered the CD (identifying the name and civil action number of this case and the date the CD was entered by the Court); and

(2) Notify EPA and DTSC of the name and address of the proposed transferee and provide EPA and DTSC with a copy of the notice that it provided to the proposed transferee.

21. In the event of any Transfer of the Affected Property, unless the United States otherwise consents in writing, the University shall continue to comply with its obligations under the CD, including its obligation to secure access and ensure compliance with any land, water, or other resource use restrictions regarding the Affected Property and to implement, maintain, monitor, and report on Institutional Controls.

22. Notwithstanding any provision of the CD, Plaintiffs retain all of their access authorities and rights, as well as all of their rights to require land, water, or other resource use restrictions and Institutional Controls, including enforcement authorities related thereto, under CERCLA, RCRA, and any other applicable State or federal statute or regulations.

IX. PAYMENTS FOR RESPONSE COSTS

23. **Payments by the University for Federal Future Response Costs and DTSC Future Response Costs**. The University shall pay to EPA all Federal Future Response Costs and to DTSC all DTSC Future Response Costs not inconsistent with the NCP.

a. **Periodic Bills**.

(1) On a periodic basis, EPA will send the University a bill requiring payment that includes an EPA Region 9 Cost Summary Report, which includes direct and indirect costs incurred by EPA, its contractors, subcontractors, and DOJ. The University shall make all payments within thirty (30) days after the University's receipt of each bill requiring payment, except as otherwise provided in Paragraph 25, in accordance with Paragraph 24.a (instructions for Federal Future Response Costs Payments).

(2) On a periodic basis, DTSC will send the University a bill requiring payment of DTSC Future Response Costs, that includes a DTSC cost summary, which includes direct and indirect costs incurred by DTSC and its contractors. DTSC shall use its best efforts to submit bills requiring payment no less often than quarterly. Failure by DTSC to submit quarterly bills shall not affect DTSC's right to reimbursement under this Consent Decree. The University shall make all payments of DTSC Future Response Costs within sixty (60) days after the date of the billing, except as otherwise provided in Paragraph 26, in accordance with Paragraph 24.b (instructions for all payments to DTSC).

b. **Deposit of Federal Future Response Costs Payments**. The total amount of Federal Future Response Costs to be paid by the University pursuant to Paragraph 23.a (Periodic Bills) shall be deposited by EPA in the Laboratory for Energy-Related Health Research Special Account to be retained and used to conduct or finance response actions at or in connection with the Site, or to be transferred by EPA to the EPA Hazardous Substance

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

24. **Payment Instructions for the University**.

a. **Federal Future Response Costs Payments and Stipulated Penalties**.

(1) For all payments subject to this Paragraph 24.a, the University shall make such payment in accordance with instructions to be provided to the University by the United States following lodging of the CD.

(2) For all payments made under this Paragraph 24.a, the University must include references to the Site/Spill ID (097J) and DOJ case number (DOJ No. 90-11-3-1606/2). At the time of any payment required to be made in accordance with Paragraph 24.a, the University shall send notices that payment has been made to the United States and the EPA Cincinnati Finance Center, all in accordance with Paragraph 79 (Notices and Submissions). All notices must include references to the Site/Spill ID and DJ numbers.

b. **DTSC Future Response Costs Payments and Stipulated Penalties**. All payments to DTSC under this CD shall reference Site Code Number 101566-11. The University shall make all payments to DTSC that are required pursuant to this CD in the form of a check or checks made payable to:

Department of Toxic Substances Control
Accounting Office/Cashier
1001 I Street, 21st Floor
P.O. Box 806
Sacramento, CA 95812-0806

or as DTSC subsequently notifies the University in a bill or in accordance with Section XIX (Notices and Submissions). A photocopy of the check shall also be sent to DTSC's Project Coordinator designated under Paragraph 9.a.

25. **Contesting Federal Future Response Costs**. The University may submit a Notice of Dispute, initiating the procedures of Section XII (Dispute Resolution), regarding any Federal Future Response Costs billed under Paragraph 23 (Payments by the University for Federal Future Response Costs and DTSC Future Response Costs) if it determines that EPA has made a mathematical error or included a cost item that is not within the definition of Federal Future Response Costs, or if it believes EPA incurred excess costs as a direct result of an EPA action that was inconsistent with a specific provision or provisions of the NCP. Such Notice of Dispute shall be submitted in writing within thirty (30) days after receipt of the bill and must be sent to the United States pursuant to Section XIX (Notices and Submissions). Such Notice of Dispute shall specifically identify the contested Federal Future Response Costs and the basis for objection. If the University submits a Notice of Dispute, the University shall within the thirty (30)-day period, also as a requirement for initiating the dispute, (a) pay all uncontested Federal Future Response Costs to the United States, and (b) establish, in a duly chartered bank or trust company, an interest-bearing escrow account that is insured by the Federal Deposit Insurance Corporation ("FDIC"), and remit to that escrow account funds equivalent to the amount of the contested Federal Future Response Costs. The University shall send to the United States as provided in Section XIX (Notices and Submissions), a copy of the transmittal letter and check paying the uncontested Federal Future Response Costs, and a copy of the correspondence that

establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account. If the United States prevails in the dispute, the University shall pay the sums due (with accrued interest) to the United States within seven (7) days after the resolution of the dispute. If the University prevails concerning any aspect of the contested costs, the University shall pay that portion of the costs (plus associated accrued interest) for which it did not prevail to the United States within seven (7) days after the resolution of the dispute. The University shall be disbursed any balance of the escrow account. All payments to the United States under this Paragraph shall be made in accordance with Paragraph 24.a (instructions for Federal Future Response Costs payments). The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set forth in Section XII (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding the University's obligation to reimburse the United States for Federal Future Response Costs.

26. **Contesting DTSC Future Response Costs**. If the University determines that DTSC has made a mathematical error or included a cost item that is not within the definition of DTSC Future Response Costs, or it believes DTSC incurred excess costs as a direct result of a DTSC action inconsistent with a specific provision of the NCP, the University may dispute the billing. If the University disputes a DTSC billing, or any part thereof, the University shall notify DTSC's Project Coordinator and shall attempt to informally resolve the dispute with DTSC's Project Coordinator.

a. If the dispute cannot be resolved informally, then the University shall provide a written request for formal dispute resolution within forty-five (45) days of the billing in dispute, which shall describe all issues in dispute and shall set forth the reasons for the

dispute. The written request shall describe all issues in dispute and shall set forth the reasons for the dispute, both factual and legal. If the dispute pertains only to a portion of the costs included in the invoice, the University shall pay all costs which are undisputed in accordance with Paragraph 24.b. The filing of a written request for dispute resolution pursuant to this Paragraph shall not stay the accrual of Interest on any unpaid costs pending resolution of the dispute. The written request shall be sent to:

Department of Toxic Substances Control
Chief, Collections and Resolution Unit
1001 I Street, 21st Floor
P.O. Box 806
Sacramento, CA 95812-0806

b. A copy of the written request for dispute resolution shall also be sent to the person designated by DTSC to receive submittals under this Consent Decree. A decision on the billing dispute will be rendered by the Chief of the Collections and Resolution Unit or other DTSC designee applying the terms of this Consent Decree and applicable federal and state law.

c. The decision by the Chief of the Collections and Resolution Unit or other DTSC designee shall be binding on the University unless, within thirty (30) days of the receipt of the decision, the University files with the Court and serves on DTSC a motion for judicial review of the decision setting forth the matter in dispute, the efforts made by the Parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Decree.

27. **Interest**. In the event that any payment for Federal Future Response Costs or DTSC Future Response Costs required under this Section is not made by the date required, the University shall pay Interest on the unpaid balance. The Interest on Federal Future Response Costs and DTSC Future Response Costs shall begin to accrue on the date of the bill. The Interest shall accrue through the date of the University's payment. Payments of Interest made under this

Paragraph shall be in addition to such other remedies or sanctions available to Plaintiffs by virtue of the University's failure to make timely payments under this Section including, but not limited to, payment of stipulated penalties pursuant to Paragraph 43 (Stipulated Penalty Amounts – Payments, Major Deliverables, and Other Milestones).

X. INDEMNIFICATION AND INSURANCE

28. **The University's Indemnification of the United States and DTSC**.

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

b. The United States and DTSC, respectively, shall give the University notice of any claim for which the United States or DTSC plans to seek indemnification pursuant to this Paragraph 28, and shall consult with the University prior to settling such claim.

29. The University covenants not to sue and agrees not to assert any claims or causes of action against the United States and DTSC, respectively, for damages or reimbursement or for set-off of any payments made or to be made to the United States or DTSC, arising from or on account of any contract, agreement, or arrangement between the University and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays. In addition, the University shall indemnify, save and hold harmless the United States and DTSC with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between the University and any person for performance of Work on or relating to the Site, including, but not limited to, claims on account of construction delays.

30. **Insurance**. No later than fifteen (15) days before commencing any on-site Work, the University shall secure, and shall maintain until the first anniversary after the RA has been performed in accordance with this CD and the Performance Standards have been achieved, commercial general liability insurance with limits of $1,000,000 per occurrence, automobile liability insurance with limits of $1,000,000 per accident, and umbrella liability insurance with limits of liability of $5,000,000 in excess of the required commercial general liability and automobile liability limits, naming the United States and DTSC as additional insureds with respect to all liability arising out of the activities performed by or on behalf of the University pursuant to this CD. In addition, for the duration of this CD, the University shall satisfy, or shall ensure that its contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing the Work on behalf

of the University in furtherance of this CD. Prior to commencement of the Work, the University shall provide to EPA and DTSC certificates of such insurance and a copy of each insurance policy. The University shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. If the University demonstrates by evidence satisfactory to EPA and DTSC that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then, with respect to that contractor or subcontractor, the University need provide only that portion of the insurance described above that is not maintained by the contractor or subcontractor. The University shall ensure that all submittals to EPA or DTSC under this Paragraph identify the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site, Davis, California and the civil action number of this case.

XI. FORCE MAJEURE

31. "Force majeure," for purposes of this CD, is defined as any event arising from causes beyond the control of the University, of any entity controlled by the University, or of the University's contractors that delays or prevents the performance of any obligation under this CD despite the University's best efforts to fulfill the obligation. The requirement that the University exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure and best efforts to address the effects of any potential force majeure: (a) as it is occurring and (b) following the potential force majeure such that the delay and any adverse effects of the delay are minimized to the greatest extent possible. "Force majeure" does not include financial inability to complete the Work or a failure to achieve the Performance Standards.

32. If any event occurs or has occurred that may delay the performance of any obligation under this CD for which the University intends or may intend to assert a claim of

force majeure, the University shall notify EPA's Project Coordinator orally or, in his or her absence, EPA's Alternate Project Coordinator or, in the event both of EPA's designated representatives are unavailable, the Director of the Superfund Division, EPA Region 9, within seventy-two (72) hours of when the University first knew that the event might cause a delay. Within ten (10) days thereafter, the University shall provide in writing to EPA and DTSC an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; the University's rationale for attributing such delay to a force majeure; and a statement as to whether, in the opinion of the University, such event may cause or contribute to an endangerment to public health or welfare, or the environment. The University shall include with any notice all available documentation supporting its claim that the delay was attributable to a force majeure. The University shall be deemed to know of any circumstance of which the University, any entity controlled by the University, or the University's contractors or subcontractors knew or should have known. Failure to comply with the above requirements regarding an event shall preclude the University from asserting any claim of force majeure regarding that event, provided, however, that if EPA, despite the late or incomplete notice, is able to assess to its satisfaction whether the event is a force majeure under Paragraph 31 and whether the University has exercised its best efforts under Paragraph 31, EPA may, in its unreviewable discretion, excuse in writing the University's failure to submit timely or complete notices under this Paragraph.

33. If EPA, after a reasonable opportunity for review and comment by DTSC, agrees that the delay or anticipated delay is attributable to a force majeure, the time for performance of the obligations under this CD that are affected by the force majeure will be extended by EPA,

after a reasonable opportunity for review and comment by DTSC, for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure shall not, of itself, extend the time for performance of any other obligation. If EPA, after a reasonable opportunity for review and comment by DTSC, does not agree that the delay or anticipated delay has been or will be caused by a force majeure, EPA will notify the University in writing of its decision. If EPA, after a reasonable opportunity for review and comment by DTSC, agrees that the delay is attributable to a force majeure, EPA will notify the University in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure.

34. If the University elects to invoke the dispute resolution procedures set forth in Section XII (Dispute Resolution) regarding EPA's decision, it shall do so no later than fifteen (15) days after receipt of EPA's notice. In any such proceeding, the University shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that the University complied with the requirements of Paragraphs 31 and 32. If the University carries this burden, the delay at issue shall be deemed not to be a violation by the University of the affected obligation of this CD identified to EPA and the Court.

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

XII. DISPUTE RESOLUTION

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

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

38. **Statements of Position**.

a. In the event that the University and the parties to the dispute cannot resolve a dispute by informal negotiations under the preceding Paragraph, then the position advanced by EPA shall be considered binding unless, within thirty (30) days after the conclusion of the informal negotiation period, the University invokes the formal dispute resolution procedures of this Section by serving on the United States and DTSC a written Statement of Position on the matter in dispute, including, but not limited to, any factual data, analysis, or opinion supporting that position and any supporting documentation relied upon by the University. The Statement of Position shall specify the University's position as to whether formal dispute resolution should proceed under Paragraph 39 (Record Review) or Paragraph 40.

b. Within thirty (30) days after receipt of the University's Statement of Position, EPA will serve on the University its Statement of Position, including, but not limited to, any factual data, analysis, or opinion supporting that position and all supporting

documentation relied upon by EPA. EPA's Statement of Position shall include a statement as to whether formal dispute resolution should proceed under Paragraph 39 (Record Review) or Paragraph 40. Within twenty (20) days after receipt of EPA's Statement of Position, the University may submit a Reply. DTSC may submit a Statement of Position, within thirty (30) days after receipt of EPA's Statement of Position, and DTSC's Statement of Position shall be part of the administrative record.

c. If there is disagreement between EPA and the University as to whether dispute resolution should proceed under Paragraph 39 (Record Review) or Paragraph 40, the parties to the dispute shall follow the procedures set forth in the Paragraph determined by EPA to be applicable. However, if the University ultimately appeals to the Court to resolve the dispute, the Court shall determine which Paragraph is applicable in accordance with the standards of applicability set forth in Paragraphs 39 and 40.

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

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

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

b. The Director of the Superfund Division, EPA Region 9, will issue a final administrative decision resolving the dispute based on the administrative record described in Paragraph 39.a. This decision shall be binding upon the University, subject only to the right to seek judicial review pursuant to Paragraphs 39.c and 39.d.

c. Any administrative decision made by EPA pursuant to Paragraph 39.b shall be reviewable by this Court, provided that a motion for judicial review of the decision is filed by the University with the Court and served on all Parties within ten (10) days after receipt of EPA's decision. The motion shall include a description of the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this CD. The United States may file a response to the University's motion.

d. In proceedings on any dispute governed by this Paragraph, the University shall have the burden of demonstrating that the decision of the Superfund Division Director is arbitrary and capricious or otherwise not in accordance with law. Judicial review of EPA's decision shall be on the administrative record compiled pursuant to Paragraph 39.a.

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

a. The Director of the Superfund Division, EPA Region 9, will issue a final decision resolving the dispute based on the statements of position and reply, if any, served under Paragraph 38. The Superfund Division Director's decision shall be binding on the University unless, within ten (10) days after receipt of the decision, the University files with the Court and

serves on the parties to the dispute a motion for judicial review of the decision setting forth the matter in dispute, the efforts made by the parties to the dispute to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of the CD. The United States may file a response to the University's motion.

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

41. The invocation of formal dispute resolution procedures under this Section does not extend, postpone, or affect in any way any obligation of the University under this CD, except as provided in Paragraph 25 (Contesting Federal Future Response Costs), as agreed by EPA, or as determined by the Court. Stipulated penalties with respect to the disputed matter shall continue to accrue, but payment shall be stayed pending resolution of the dispute, as provided in Paragraph 49. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this CD. In the event that the University does not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XIII (Stipulated Penalties).

XIII. STIPULATED PENALTIES

42. The University shall be liable for stipulated penalties in the amounts set forth in Paragraphs 43 and 44 to the United States for failure to comply with the requirements of this CD specified below, other than the requirements regarding payments for DTSC Future Response Costs, unless excused under Section XI (Force Majeure). The University shall be liable to DTSC for stipulated penalties in the amounts set forth in Paragraph 43 for failure to comply with the requirements of this CD specified below related to DTSC Future Response Costs, unless excused under Section XI (Force Majeure). "Comply" as used in the previous sentence includes

compliance by the University with all applicable requirements of this CD, within the deadlines established under this CD. If an initially submitted or resubmitted deliverable contains a material defect, and the deliverable is disapproved or modified by EPA under ¶ 6.6(a) (Initial Submissions) or 6.6(b) (Resubmissions) of the SOW due to such material defect, then the material defect shall constitute a lack of compliance for purposes of this Paragraph 42.

43. **Stipulated Penalty Amounts – Payments, Major Deliverables, and Other Milestones**.

a. The following stipulated penalties shall accrue per violation per day for any noncompliance identified in Paragraph 43.b:

Period of Noncompliance	Penalty Per Violation Per Day
1st through 14th day	$ 1,000
15th through 30th day	$ 2,500
31st day and beyond	$ 5,000

b. **Obligations**

(1) Payment of any amount due under Section IX (Payments for Response Costs). The stipulated penalties listed in Paragraph 43.a for the University's failure to meet its payment obligation may accrue separately to each of the United States and DTSC. If the University fails to meet its obligations with respect to payments owed to the United States, stipulated penalties owed to the United States are: $1,000 per day for the 1st day through the 14th day, $2,500 per day for the 15th through the 30th day, and $5,000 per day for the 31st day and beyond. If the University fails to meet its obligations with respect to payments owed to DTSC to reimburse DTSC's Future Response Costs, stipulated penalties owed to DTSC are: $1,000 per day for the 1st day through the 14th day, $2,500 per day for the 15th through the 30th day, and $5,000 per day for the 31st day and beyond.

(2) Establishment of an escrow account to hold disputed Federal Future Response Costs under Paragraph 25 (Contesting Federal Future Response Costs).

(3) The following major deliverables and other milestones in the SOW: (i) Preliminary (45%) Remedial Design, ¶ 3.3 of the SOW; (ii) Final (100%) Remedial Design, ¶ 3.5 of the SOW; (iii) Remedial Action Work Plan, ¶ 4.1 of the SOW; (iv) Start of Construction; and (v) Remedial Action Report, ¶ 4.5(b) of the SOW.

44. **Stipulated Penalty Amounts – Other Deliverables and Milestones**. The following stipulated penalties shall accrue per violation per day for failure to submit timely or adequate deliverables pursuant to the CD other than those specified in Paragraph 43.b:

Period of Noncompliance	Penalty Per Violation Per Day
1st through 14th day	$ 500
15th through 30th day	$ 1,000
31st day and beyond	$ 3,000

45. In the event that EPA assumes performance of a portion or all of the Work pursuant to Paragraph 57 (Work Takeover), the University shall be liable to the United States for a stipulated penalty in the amount of $1,500,000. Stipulated penalties under this Paragraph are in addition to the remedies available under Paragraph 57 (Work Takeover).

46. All penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: (a) with respect to a deficient submission under ¶ 6.6 (Approval of Deliverables) of the SOW, during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies the University of any deficiency; (b) with respect to a decision by the Director of the Superfund Division, EPA Region 9, under Paragraph 39.b or 40.a of Section XII (Dispute Resolution), during the period, if any, beginning

on the 21st day after the date that the University's reply to EPA's Statement of Position is received until the date that the Director issues a final decision regarding such dispute; or (c) with respect to judicial review by this Court of any dispute under Section XII (Dispute Resolution), during the period, if any, beginning on the 31st day after the Court's receipt of the final submission regarding the dispute until the date that the Court issues a final decision regarding such dispute. Nothing in this CD shall prevent the simultaneous accrual of separate penalties for separate violations of this CD.

47. Following EPA's determination, after providing DTSC with a reasonable opportunity for review and comment, that the University has failed to comply with a requirement of this CD, EPA may give the University written notification of the same and describe the noncompliance. EPA and DTSC may send the University a written demand for payment of the penalties. However, penalties shall accrue as provided in this Section regardless of whether EPA has notified the University of a violation.

48. All penalties owed to the United States under this Section shall be due and payable to the United States within thirty (30) days after the University's receipt from EPA of a demand for payment of the penalties, unless the University invokes the Dispute Resolution procedures under Section XII (Dispute Resolution) within the thirty (30)-day period. All penalties owed to DTSC under this Section shall be due and payable to DTSC within thirty (30) days after the University's receipt from DTSC of a demand for payment of the penalties, unless the University invokes the dispute mechanism for contesting DTSC Future Response Costs under Paragraph 26. All payments to the United States or DTSC under this Section shall indicate that the payment is for stipulated penalties and shall be made in accordance with Paragraphs 24.a and 24.b (instructions for Federal Future Response Costs and DTSC Future Response Costs payments).

49. Penalties shall continue to accrue as provided in Paragraph 46 during any dispute resolution period, but need not be paid until the following:

a. If the dispute is resolved by agreement of the Parties or by a decision of EPA that is not appealed to this Court, accrued penalties determined to be owed shall be paid to EPA and DTSC within fifteen (15) days after the agreement or the receipt of EPA's decision or order;

b. If the dispute is appealed to this Court and the United States prevails in whole or in part, the University shall pay all accrued penalties determined by the Court to be owed to EPA and DTSC within sixty (60) days after receipt of the Court's decision or order, except as provided in Paragraph 49.c;

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

50. If the University fails to pay stipulated penalties when due, the University shall pay Interest on the unpaid stipulated penalties as follows: (a) if the University has timely invoked dispute resolution such that the obligation to pay stipulated penalties has been stayed pending the outcome of dispute resolution, Interest shall accrue from the date stipulated penalties are due pursuant to Paragraph 49 until the date of payment; and (b) if the University fails to timely invoke dispute resolution, Interest shall accrue from the date of demand under Paragraph 48 until

the date of payment. If the University fails to pay stipulated penalties and Interest when due, the United States or DTSC may institute proceedings to collect the penalties and Interest.

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

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

53. Notwithstanding any other provision of this Section, either Plaintiff may, in its unreviewable discretion, waive any portion of stipulated penalties payable to that Plaintiff that have accrued pursuant to this CD.

XIV. COVENANTS BY PLAINTIFFS

54. **Covenants for the University by United States**. Except as provided in Paragraph 56 (General Reservations of Rights), the United States covenants not to sue or to take administrative action against the University pursuant to Sections 106 and 107(a) of CERCLA for the Work and Federal Future Response Costs. These covenants shall take effect upon the Effective Date. These covenants are conditioned upon the satisfactory performance by the University of its obligations under this CD. These covenants extend only to the University and do not extend to any other person.

55. **Covenants for the University by DTSC**. In consideration of the actions that will be performed and the payments that will be made by the University under the terms of this CD,

and except as specifically provided in Paragraph 56 (General Reservations of Rights) of this Section, DTSC covenants not to sue the University pursuant to Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), and California Health and Safety Code Sections 25355.5, 25358.3, and 25360, or to take administrative action against the University under California Health and Safety Code Section 25358.3, for the Work and DTSC Future Response Costs. These covenants shall take effect upon the Effective Date. These covenants are conditioned upon satisfactory performance by the University of its obligations under this CD. These covenants extend only to the University and do not extend to any other person.

56. **General Reservations of Rights**. The United States and DTSC reserve, and this CD is without prejudice to, all rights against the University with respect to all matters not expressly included within Plaintiffs' covenants. Notwithstanding any other provision of this CD, the United States and DTSC reserve all rights against the University with respect to:

a. liability for failure by the University to meet a requirement of this CD;

b. liability arising from the past, present, or future disposal, release, or threat of release of Waste Material outside of the Site;

c. liability based on the ownership of the Site by the University when such ownership commences after signature of this CD by the University;

d. liability based on the operation of the Site by the University when such operation commences after signature of this CD by the University and does not arise solely from the University's performance of the Work;

e. liability based on the University's transportation, treatment, storage, or disposal, or arrangement for transportation, treatment, storage, or disposal of Waste Material at or in connection with the Site, other than as provided in the ROD, the Work, or otherwise ordered by EPA, after signature of this CD by the University;

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

g. criminal liability;

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

i. liability, prior to achievement of Performance Standards, for additional response actions that EPA determines are necessary to achieve and maintain Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the ROD, but that cannot be required pursuant to Paragraph 13 (Modification of SOW or Related Deliverables);

j. liability for additional operable units at the Site or the final response action;

k. liability for costs that the United States and/or DTSC will incur regarding the Site but that are not within the definition of Federal Future Response Costs or DTSC Future Response Costs;

l. liability for previously incurred costs of response above the amounts already paid to the United States and/or DTSC; and

m. liability for costs incurred or to be incurred by other federal or state agencies regarding the Site.

57. **Work Takeover**.

a. In the event EPA, after providing DTSC with a reasonable opportunity for review and comment, determines that the University: (1) has ceased implementation of any portion of the Work; (2) is seriously or repeatedly deficient or late in its performance of the Work; or (3) is implementing the Work in a manner that may cause an endangerment to human

health or the environment, EPA may issue a written notice ("Work Takeover Notice") to the University. Any Work Takeover Notice issued by EPA will specify the grounds upon which such notice was issued and will provide the University a period of ten (10) days within which to remedy the circumstances giving rise to EPA's issuance of such notice.

b. If, after expiration of the ten (10)-day notice period specified in Paragraph 57.a, the University has not remedied to EPA's satisfaction the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, EPA may at any time thereafter assume the performance of all or any portion(s) of the Work as EPA deems necessary ("Work Takeover"). EPA will notify the University in writing (which writing may be electronic) if EPA determines that implementation of a Work Takeover is warranted under this Paragraph 57.b.

c. The University may invoke the procedures set forth in Paragraph 39 (Record Review), to dispute EPA's implementation of a Work Takeover under Paragraph 57.b. However, notwithstanding the University's invocation of such dispute resolution procedures, and during the pendency of any such dispute, EPA may in its sole discretion commence and continue a Work Takeover under Paragraph 57.b until the earlier of: (1) the date that the University remedies, to EPA's satisfaction, the circumstances giving rise to EPA's issuance of the relevant Work Takeover Notice, or (2) the date that a final decision is rendered in accordance with Paragraph 39 (Record Review) requiring EPA to terminate such Work Takeover.

58. Notwithstanding any other provision of this CD, the United States and DTSC retain all authority and reserve all rights to take any and all response actions authorized by law.

XV. COVENANTS BY THE UNIVERSITY

59. **Covenants by the University**. Subject to the reservations in Paragraph 61, the University covenants not to sue and agrees not to assert any claims or causes of action against

the United States or DTSC with respect to the Work, past response actions regarding the Site, and this CD, including, but not limited to:

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

b. any direct or indirect claim for reimbursement from the California Toxic Substances Control Account;

c. any claims under Sections 107 or 113 of CERCLA (42 U.S.C. §§ 9607 or 9613), Section 7002(a) of RCRA (42 U.S.C. § 6972(a)), or state law regarding the Work, past response actions regarding the Site, Federal Future Response Costs, DTSC Future Response Costs, the University's future response costs, and this CD; or

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

60. Except as provided in Paragraphs 63 (Waiver of Claims by the University) and 70 (Res Judicata and Other Defenses), the covenants in this Section shall not apply if the United States or DTSC brings a cause of action or issues an order pursuant to any of the reservations in Section XIV (Covenants by Plaintiffs), other than in Paragraphs 56.a (claims for failure to meet a requirement of the CD), 56.g (criminal liability), and 56.h (violations of federal/state law during or after implementation of the Work), but only to the extent that the University's claims arise from the same response action, response costs, or damages that the United States or DTSC is seeking pursuant to the applicable reservation.

61. The University reserves, and this CD is without prejudice to, claims against the United States, subject to the provisions of Chapter 171 of Title 28 of the United States Code, and

brought pursuant to any statute other than CERCLA or RCRA and for which the waiver of sovereign immunity is found in a statute other than CERCLA or RCRA, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States, as that term is defined in 28 U.S.C. § 2671, while acting within the scope of his or her office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, the foregoing shall not include any claim based on EPA's selection of response actions, or the oversight or approval of the University's deliverables or activities.

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

63. **Waiver of Claims by the University**.

a. Solely with respect to the matters addressed in this CD, the University agrees not to assert any claims and to waive all claims or causes of action (including but not limited to claims or causes of action under Sections 107(a) and 113 of CERCLA) that it may have:

(1) De Micromis Waiver. For all matters relating to the Site against any person where the person's liability to the University with respect to the Site is based solely on having arranged for disposal or treatment, or for transport for disposal or treatment, of hazardous substances at the Site, or having accepted for transport for disposal or treatment of hazardous substances at the Site, if all or part of the disposal, treatment, or transport occurred before April 1, 2001, and the total amount of material containing hazardous substances

contributed by such person to the Site was less than 110 gallons of liquid materials or 200 pounds of solid materials.

b. **Exceptions to Waiver**.

(1) The waiver under this Paragraph 63 shall not apply with respect to any defense, claim, or cause of action that the University may have against any person otherwise covered by such waiver if such person asserts a claim or cause of action relating to the Site against the University.

(2) The waiver under Paragraph 63.a(1) (De Micromis Waiver) shall not apply to any claim or cause of action against any person otherwise covered by such waiver if EPA determines that: (i) the materials containing hazardous substances contributed to the Site by such person contributed significantly or could contribute significantly, either individually or in the aggregate, to the cost of the response action or natural resource restoration at the Site; or (ii) such person has failed to comply with any information request or administrative subpoena issued pursuant to Section 104(e) or 122(e)(3)(B) of CERCLA, 42 U.S.C. § 9604(e) or 9622(e)(3)(B), or Section 3007 of RCRA, 42 U.S.C. § 6927, or has impeded or is impeding, through action or inaction, the performance of a response action or natural resource restoration with respect to the Site; or if (iii) such person has been convicted of a criminal violation for the conduct to which the waiver would apply and that conviction has not been vitiated on appeal or otherwise.

64. The University agrees not to seek judicial review of the final rule listing the Site on the NPL based on a claim that changed site conditions that resulted from the performance of the Work in any way affected the basis for listing the Site.

XVI. EFFECT OF SETTLEMENT; CONTRIBUTION

65. Except as provided in Paragraph 63 (Waiver of Claims by the University), nothing in this CD shall be construed to create any rights in, or grant any cause of action to, any

person not a Party to this CD. Except as provided in Section XV (Covenants by the University), each of the Parties expressly reserves any and all rights (including, but not limited to, pursuant to Section 113 of CERCLA, 42 U.S.C. § 9613), defenses, claims, demands, and causes of action that each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto. Nothing in this CD diminishes the right of the United States or DTSC, pursuant to Section 113(f)(2) and (3) of CERCLA, 42 U.S.C. § 9613(f)(2)-(3), to pursue any such persons to obtain additional response costs or response action and to enter into settlements that give rise to contribution protection pursuant to Section 113(f)(2).

66. The Parties agree, and by entering this CD this Court finds, that this CD constitutes a judicially-approved settlement pursuant to which the University has, as of the Effective Date, resolved liability to the United States and DTSC within the meaning of Section 113(f)(2) of CERCLA, 42 U.S.C. § 9613(f)(2), and is entitled, as of the Effective Date, to protection from contribution actions or claims as provided by Section 113(f)(2) of CERCLA, or as may be otherwise provided by law, for the "matters addressed" in this CD. The "matters addressed" in this CD are the Work, Federal Future Response Costs, and DTSC Future Response Costs.

67. The Parties further agree, and by entering this CD this Court finds, that the Complaint filed by the Plaintiffs in this action is a civil action within the meaning of Section 113(f)(1) of CERCLA, 42 U.S.C. § 9613(f)(1), and that this CD constitutes a judicially-approved settlement pursuant to which the University has, as of the Effective Date, resolved liability to the United States and DTSC within the meaning of Section 113(f)(3)(B) of CERCLA, 42 U.S.C. § 9613(f)(3)(B).

68. The University shall, with respect to any suit or claim brought by it for matters related to this CD, notify the United States and DTSC in writing no later than sixty (60) days prior to the initiation of such suit or claim.

69. The University shall, with respect to any suit or claim brought against it for matters related to this CD, notify in writing the United States and DTSC within ten (10) days after service of the complaint on the University. In addition, the University shall notify the United States and DTSC within ten (10) days after service or receipt of any motion for summary judgment and within ten (10) days after receipt of any order from a court setting a case for trial.

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

XVII. ACCESS TO INFORMATION

71. The University shall provide to EPA and DTSC, upon request, copies of all records, reports, documents, and other information (including records, reports, documents, and other information in electronic form) (hereinafter referred to as "Records") within the University's possession or control or that of its contractors or agents relating to activities at the Site or to the implementation of this CD, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information regarding the Work. The University shall

also make available to EPA and DTSC, for purposes of investigation, information gathering, or testimony, its employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

72. **Privileged and Protected Claims**.

a. The University may assert that all or part of a Record requested by Plaintiffs is privileged or protected as provided under federal law, in lieu of providing the Record, provided the University complies with Paragraph 72.b, and except as provided in Paragraph 72.c.

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

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

73. **Business Confidential Claims**. The University may assert that all or part of a Record provided to Plaintiffs under this Section or Section XVIII (Retention of Records) is

business confidential to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). The University shall segregate and clearly identify all Records or parts thereof submitted under this CD for which the University asserts business confidentiality claims. Records submitted to EPA determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies Records when they are submitted to EPA and DTSC, or if EPA has notified the University that the Records are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such Records without further notice to the University.

74. If relevant to the proceeding, the Parties agree that validated sampling or monitoring data generated in accordance with the SOW and reviewed and approved by EPA shall be admissible as evidence, without objection, in any proceeding under this CD.

75. Notwithstanding any provision of this CD, Plaintiffs retain all of their information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA, and any other applicable statutes or regulations.

XVIII. RETENTION OF RECORDS

76. Until ten (10) years after EPA's Certification of Work Completion under ¶ 4.6 (Certification of Work Completion) of the SOW, the University shall preserve and retain all non-identical copies of Records (including Records in electronic form) now in its possession or control or that come into its possession or control that relate in any manner to its liability under CERCLA with respect to the Site, provided, however, that the University, which is potentially liable as an owner or operator of the Site, must retain, in addition, all Records that relate to the liability of any other person under CERCLA with respect to the Site. The University must also retain, and instruct its contractors and agents to preserve, for the same period of time specified

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

77. At the conclusion of this record retention period, the University shall notify the United States and DTSC at least ninety (90) days prior to the destruction of any such Records, and, upon request by the United States or DTSC, and except as provided in Paragraph 72 (Privileged and Protected Claims), the University shall deliver any such Records to EPA or DTSC.

78. The University certifies that, to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed, or otherwise disposed of any Records (other than identical copies) relating to its potential liability regarding the Site since notification of potential liability by the United States or DTSC and that it has fully complied with any and all EPA and DTSC requests for information regarding the Site pursuant to Sections 104(e) and 122(e)(3)(B) of CERCLA, 42 U.S.C. §§ 9604(e) and 9622(e)(3)(B), and Section 3007 of RCRA, 42 U.S.C. § 6927, and state law.

XIX. NOTICES AND SUBMISSIONS

79. All approvals, consents, deliverables, modifications, notices, notifications, objections, proposals, reports, and requests specified in this CD must be in writing unless otherwise specified. Whenever, under this CD, notice is required to be given, or a report or other document is required to be sent, by one Party to another, it must be directed to the person(s)

specified below at the address(es) specified below. Any Party may change the person and/or address applicable to it by providing notice of such change to all Parties. All notices under this Section are effective upon receipt, unless otherwise specified. Notices required to be sent to EPA, and not to the United States, should not be sent to the DOJ. Except as otherwise provided, notice to a Party by electronic mail (if that option is provided below), Federal Express, or by regular mail in accordance with this Section satisfies any notice requirement of the CD regarding such Party.

As to the United States:

(1): EES Case Management Unit
U.S. Department of Justice
Environment and Natural Resources Division
P.O. Box 7611
Washington, DC 20044-7611
eescdcopy.enrd@usdoj.gov
Re: DJ # 90-11-3-1606/2

(2): Deborah Gitin, Senior Counsel
U.S. Department of Justice
Environmental Enforcement Section
301 Howard St., Suite 1050
San Francisco, CA 94105
Deborah.Gitin@usdoj.gov

(3): Enrique Manzanilla
Director, Superfund Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street (SFD-1)
San Francisco, CA 94105
manzanilla.enrique@epa.gov

and

(4): Holly Hadlock
EPA Project Coordinator
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street (SFD-7-3)
San Francisco, CA 94105
hadlock.holly@epa.gov
(415) 972-3171

As to EPA:

(1): Enrique Manzanilla
Director, Superfund Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street (SFD-1)
San Francisco, CA 94105
manzanilla.enrique@epa.gov

and

	(2): Holly Hadlock EPA Project Coordinator U.S. Environmental Protection Agency Region 9 75 Hawthorne Street (SFD-7-3) San Francisco, CA 94105 hadlock.holly@epa.gov (415) 972-3171
At to EPA Cincinnati Finance Center:	EPA Cincinnati Finance Center 26 W. Martin Luther King Drive Cincinnati, OH 45268
As to DTSC:	(1) John Bystra State Project Coordinator 8800 Cal Center Drive Sacramento, CA 95826 john.bystra@dtsc.ca.gov and (2) Andrew Wiener Deputy Attorney General 1515 Clay Street, Suite 20 Oakland, CA 94612 Andrew.Wiener@doj.ca.gov
As to the University:	(1): Chris Wright The University's Project Coordinator 175 Hoagland Hall One Shields Avenue Davis, CA 95616 cvwright@ucdavis.edu (530) 752-3044 (2): Barton Lounsbury Senior Counsel University of California Office of the General Counsel 1111 Franklin St., 8th Fl. Oakland, CA 94607 barton.lounsbury@ucop.edu (510) 987-0976 and

(3): Peggy Otum
Arnold & Porter
Three Embarcadero Center, 10th Floor
San Francisco, CA 94111-4024
peggy.otum@arnoldporter.com
(415) 471-3119

XX. RETENTION OF JURISDICTION

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

XXI. APPENDICES

81. The following appendices are attached to and incorporated into this CD:

"Appendix A" is the ROD.

"Appendix B" is the Explanation of Significant Differences.

"Appendix C" is the SOW.

"Appendix D" is the map generally depicting the Site.

XXII. MODIFICATION

82. Except as provided in Paragraph 13 (Modification of SOW or Related Deliverables), material modifications to this CD, including the SOW, shall be in writing, signed by the United States, DTSC, and the University, and shall be effective upon approval by the Court. Except as provided in Paragraph 13, non-material modifications to this CD, including the SOW, shall be in writing and shall be effective when signed by duly authorized representatives of the United States and the University. A modification to the SOW shall be considered material

if it implements a ROD amendment that fundamentally alters the basic features of the selected remedy within the meaning of 40 C.F.R. § 300.435(c)(2)(ii). Before providing its approval to any modification to the SOW, the United States will provide DTSC with a reasonable opportunity to review and comment on the proposed modification.

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

XXIII. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

84. This CD shall be lodged with the Court for at least thirty (30) days for public notice and comment in accordance with Section 122(d)(2) of CERCLA, 42 U.S.C. § 9622(d)(2), and 28 C.F.R. § 50.7. The United States and DTSC reserve the right to withdraw or withhold their consent if the comments regarding the CD disclose facts or considerations that indicate that the CD is inappropriate, improper, or inadequate. The University consents to the entry of this CD without further notice.

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

XXIV. SIGNATORIES/SERVICE

86. The undersigned representative of the University, the Acting Assistant Attorney General for the Environment and Natural Resources Division of the Department of Justice, and the undersigned representative for DTSC certify that they are fully authorized to enter into the terms and conditions of this CD and to execute and legally bind such Party to this document.

87. The University agrees not to oppose entry of this CD by this Court or to challenge any provision of this CD unless the United States has notified the University in writing that it no longer supports entry of the CD.

88. This CD may be signed in counterparts, and its validity may not be challenged on that basis. The University shall identify, on the attached signature page, the name, address, and telephone number of an agent who is authorized to accept service of process by mail on behalf of that Party with respect to all matters arising under or relating to this CD. The University agrees to accept service in that manner and to waive the formal service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any applicable local rules of this Court, including, but not limited to, service of a summons. All other court filings will be served through the Court's electronic filing system. The University need not file an answer to the Complaint in this action unless or until the Court expressly declines to enter this CD.

XXV. FINAL JUDGMENT

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

90. Upon entry of this CD by the Court, this CD shall constitute a final judgment between and among the United States, DTSC, and the University. The Court enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58.

SO ORDERED THIS ____ DAY OF _____, 2018.

_____
United States District Judge

Signature Page for CD regarding soil/solid waste and soil gas at OU 2 of the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site

FOR THE UNITED STATES OF AMERICA:

Dated: 9/25/18

JEFFREY H. WOOD
Acting Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice
Washington, DC 20530

Dated: 9/25/18

DEBORAH A. GITIN (CA Bar No. 284947)
Senior Counsel
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
301 Howard St., Suite 1050
San Francisco, CA 94105
Telephone: (415) 744-6488
E-mail: Deborah.Gitin@usdoj.gov

Signature Page for CD regarding soil/solid waste and soil gas at OU 2 of the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY:

Dated: 23 August 2018

ENRIQUE MANZANILLA
Director, Superfund Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

Dated: August 27, 2018

REBEKAH REYNOLDS
Assistant Regional Counsel
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

Signature Page for CD regarding soil/solid waste and soil gas at OU 2 of the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site

FOR PLAINTIFF THE STATE OF CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL:

Dated: August 24, 2018

MOHSEN NAZEMI, M.S., P.E.
Deputy Director
Site Mitigation and Restoration Program

APPROVED AS TO FORM.

XAVIER BECERRA
Attorney General of California

SUSAN FIERING
Supervising Deputy Attorney General

Dated: _____

ANDREW WIENER
Deputy Attorney General
Attorneys for Plaintiff State of California
Department of Toxic Substances Control

Signature Page for CD regarding soil/solid waste and soil gas at OU 2 of the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site

FOR PLAINTIFF THE STATE OF CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL:

Dated: _____

MOHSEN NAZEMI, M.S., P.E.
Deputy Director
Site Mitigation and Restoration Program

APPROVED AS TO FORM.

XAVIER BECERRA
Attorney General of California

SUSAN FIERING
Supervising Deputy Attorney General

Dated: 8/28/18

ANDREW WIENER
Deputy Attorney General
Attorneys for Plaintiff State of California
Department of Toxic Substances Control

Signature Page for CD regarding soil/solid waste and soil gas at OU 2 of the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site

FOR DEFENDANT REGENTS OF THE UNIVERSITY OF CALIFORNIA:

Dated: 9/17/18

CHARLES F. ROBINSON
Office of the General Counsel
University of California
Office of the President
1111 Franklin St., 8th Fl.
Oakland, CA 94607

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

Barton Lounsbury
Senior Counsel
University of California, Office of the General Counsel
1111 Franklin St., 8th Fl.
Oakland, CA 94607
Telephone: (510) 987-0976
Email: barton.lounsbury@ucop.edu

Appendix A to Consent Decree
Record of Decision

Record of Decision
Soil/Solid Waste and Soil Gas
Operable Unit 2

Laboratory for
Energy-Related Health Research/Old
Campus Landfill Superfund Site

University of California
Davis, California

U.S. Environmental Protection Agency
Region 9
San Francisco, California

September 2016
Table 4 revised January 2017

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Acronyms and Abbreviations

°C	degrees Celsius
µg/L	microgram per liter
µg/m^3	microgram per cubic meter
ACGIH	American Conference of Governmental Industrial Hygienists
ARAR	applicable or relevant and appropriate requirement
BBL	Blasland, Bouck, & Lee, Incorporated
BC	Brown & Caldwell
bgs	below ground surface
Cal-EPA/the State	State of California Environmental Protection Agency
CAMU	corrective action management unit
CCR	California Code of Regulations
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHE	Center for Health and the Environment
CHHSL	California Human Health Screening Level
COC	contaminant of concern
COPC	contaminant of potential concern
CSM	Conceptual Site Model
DCA	dichloroethane
DCE	dichloroethene
DCP	dichloropropane
DDC	density-driven convection
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DL	designated level
DOE	United States Department of Energy
DTSC	California Department of Toxic Substances Control
EPC	exposure point concentration
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FS	feasibility study
ft	feet
GHG	greenhouse gas
HDPE	high-density polyethylene
HFSDA	Hopland Field Station Disposal Area
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
HSU	hydrostratigraphic unit
IARC	International Agency for Research on Cancer
IC	institutional control
IRA	interim removal action
IRIS	Integrated Risk Information System
LCRS	leachate collection and recovery system
LCY	loose cubic yard
LEHR	Laboratory for Energy-related Health Research
LFU	landfill unit

LLRW	low-level radioactive waste
LRDP	Long-Range Development Plan Final Environmental Impact Report
LUC	land use control
mg/kg	milligram per kilogram
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goals
MIP	membrane interface probe
MMP	Materials Management Plan
MS4	Storm Water Discharges from Small Municipal Separate Storm Sewer Systems
MWH	Montgomery Watson Harza
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
No.	number
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NUFT	Non-isothermal Unsaturated Flow and Transport
O&M	operations and maintenance
OCL	Old Campus Landfill
OEHHA	Office of Environmental Health Hazard Assessment
OU	operable unit
OWTP	Old Wastewater Treatment Plant
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PHC	principal hazardous constituent
PRG	preliminary remediation goal
QA/QC	quality assurance/quality control
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RfC	reference concentration
RfD	reference dose
RI	remedial investigation
RSL	regional screening level
ROD	record of decision
RWQCB	Central Valley Regional Water Quality Control Board
SARA	Superfund Amendment and Reauthorization Act
SCDS	South Campus Disposal Site
SF	slope factor
SVOC	semi-volatile organic compound
SWERA	Side-Wide Ecological Risk Assessment
SWPPP	stormwater pollution prevention plan
SWRCB	State Water Resources Control Board
TBC	to be considered
TCA	trichloroethene
TCP	trichloropropane
TLV	Threshold Limit Value
UC Davis	University of California, Davis
UCOP	University of California Office of the President
URF	unit risk factor
USC	United States Code
U.S. EPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

VELB	Valley Elderberry Longhorn Beetle
VISL	Vapor Intrusion Screening Level
VOC	volatile organic compound
WBH	Waste Burial Holes
WDR	waste discharge requirement
Weiss	Weiss Associates

PART 1: THE DECLARATION

1.0 SITE NAME AND LOCATION

This Record of Decision (ROD) addresses the Soil/Solid Waste and Soil Gas contamination for Operable Unit (OU) 2 at the Laboratory for Energy-related Health Research/Old Campus Landfill Superfund Site, University of California, Davis, California (the LEHR/OCL Site or the Site). OU 2 is defined as the portion of the Site for which the University of California, Davis is responsible, whereas OU 1 is defined as the portion of the Site for which the U.S. Department of Energy is responsible. The Site is located in Solano County, south of the city of Davis, California (Figure 1). This ROD covers contamination associated with the Soil/Solid Waste at OU 2, and selects a remedy for the following portions of the Site, defined as disposal units: the Eastern Trenches, Landfill Unit 1 (LFU-1), LFU-2, LFU-3, the Southern Trenches, the Hopland Field Station Disposal Area (HFSDA), and the Waste Burial Holes (WBH). This ROD also addresses public comments on the Proposed Plan. The Groundwater associated with OU 2 will be addressed in a later ROD.

The Site was listed on the U.S. Environmental Protection Agency's (U.S. EPA) National Priorities List (NPL) and an Administrative Order on Consent is in effect that establishes the framework for Remedial Investigations (RIs) and Feasibility Studies (FSs). The Site was listed on the NPL on May 31, 1994, National Superfund database identification number CA2890190000.

2.0 STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for the soil/solid waste and soil gas portions of OU 2 for the LEHR/OCL Site, in Davis, California, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record file for this Site. The State of California concurs with the selected remedy.

In 2004 and 2006, the University of California, Davis (UC Davis) completed two risk assessments to evaluate the risk to human health and to ecological receptors from exposure to contaminated soil, solid waste, and soil gas that are associated with the past use of Site areas as landfills. The *Final Remedial Investigation Report LEHR/SCDS* [South Campus Disposal Site] *Environmental Restoration, University of California, Davis* (the RI Report) was published in December 2004. UC Davis completed the *Feasibility Study Data Gaps Technical Report* (the FS Data Gaps Report) in February 2010, and *the Final Feasibility Study for the University of California, Davis Areas Volume 1, Soil/Solid Waste and Soil Gas* (the Soil FS) in April 2012. Risk summaries were generated; however, given the heterogeneous nature of landfill wastes and unknown disposal practices, the risk and hazard were likely underestimated.

The remedy addresses landfill waste and contaminants of concern (COCs) left at the LEHR/OCL Site, including radiological contaminants (strontium-90, cesium-137, carbon-14, tritium, and potassium-40), polychlorinated biphenyls (PCBs; Aroclor-1260), metals (lead, arsenic, cadmium, barium, manganese, selenium, copper, etc.), volatile organic compounds (VOCs), and various semi-volatile organic compound (SVOC) contaminants (benzo(a)pyrene, benzo(a)anthracene, benzo(a)fluoranthene, naphthalene, etc.). The selected remedy presented in this document leaves soil and waste largely undisturbed, and uses containment in on-site corrective action management units (CAMUs) to prevent direct contact with landfill wastes and potentially unknown risks and hazards. The remedy also minimizes infiltration and the resulting leaching of contaminants to groundwater, and controls surface water runoff and erosion. The

remedy includes excavation and off-site disposal of the two VOC "hot spot" areas, and includes implementation of institutional controls (ICs) and ongoing groundwater monitoring in order to protect human health and ecological receptors. The selected remedy is consistent with the presumptive remedy for landfills (containment), which does not require complete characterization, so further characterization of the LEHR/OCL Site is not required. However, exploratory excavations in the HFSDA and the Southern Trenches will be conducted as part of the selected remedy to determine if these areas need to be capped.

3.0 ASSESSMENT OF THE SITE

As a result of past Site activities, hazardous substances and pollutants or contaminants were buried in the landfills and disposal units. Contaminants have been released to the soil and groundwater in the area. The response action selected in this ROD is necessary to protect public health or welfare and the environment from actual or threatened releases of hazardous substance into the environment.

4.0 DESCRIPTION OF SELECTED REMEDY

U.S. EPA selected the remedy for the LEHR/OCL Site, Alternative SW-6, based on the Site characterization and risk information detailed in the RI Report (Geomatrix, 2004), the Site-Wide Human Health Risk Assessment (HHRA) Part A (Montgomery Watson Harza [MWH], 2004) and Part C (Blasland, Bouck, & Lee, Inc. [BBL], 2006), the Site-Wide Ecological Risk Assessment (SWERA) (Brown & Caldwell [BC], 2006), the Feasibility Study (Weiss Associates [Weiss], 2012), and the FS Data Gaps Report (Weiss, 2010). The response action selected in this ROD is necessary to protect human health and the environment.

The selected remedy addresses areas of the LEHR/OCL Site with soil, solid waste, and soil gas contamination by excavation of VOC "hot spots" and containment of the disposal units. The ICs will restrict land use such that the contaminated portion of the property may not be used for sensitive uses such as homes, day care centers, health care centers, or public or private schools for persons under 18 years of age. A ROD addressing soil contamination in the United States Department of Energy (DOE) area was finalized in December 2009 (DOE, 2009; the 2009 DOE ROD), and remedial actions consisting of ICs and groundwater monitoring began in January 2011. Groundwater cleanup will be addressed separately in a future ROD.

The selected remedy includes the following components:

- Removal and off-site disposal of two VOC "hot spot" areas to a depth of 20 feet below ground surface (ft bgs), to reduce potential migration to groundwater and to minimize the potential for vapor intrusion into buildings;
- Excavation of contaminated soil and solid waste from the northeastern corner of LFU-2 and the Eastern Trenches, creation of drainage swales and ditches and stormwater retention ponds, and the consolidation of the excavated materials into the CAMUs.
- Installation of multiple-layer caps at CAMUs and other areas where contaminated soils and solid waste remain in place to reduce infiltration and leaching of contaminants to groundwater and to limit human exposure;
- Expansion of the storm water drainage system to divert water away from the soil/solid waste remaining in place and reduce infiltration;

- Implementation of ICs to protect remedy components, prohibit residential land use, and restrict non-residential land use. This includes the requirement for a soil management plan for post-remediation earthwork activities; and
- Long-term groundwater monitoring to verify the efficacy of groundwater protection and operations and maintenance (O&M) of the landfill cover and other components to maintain the functionality of the remedy.

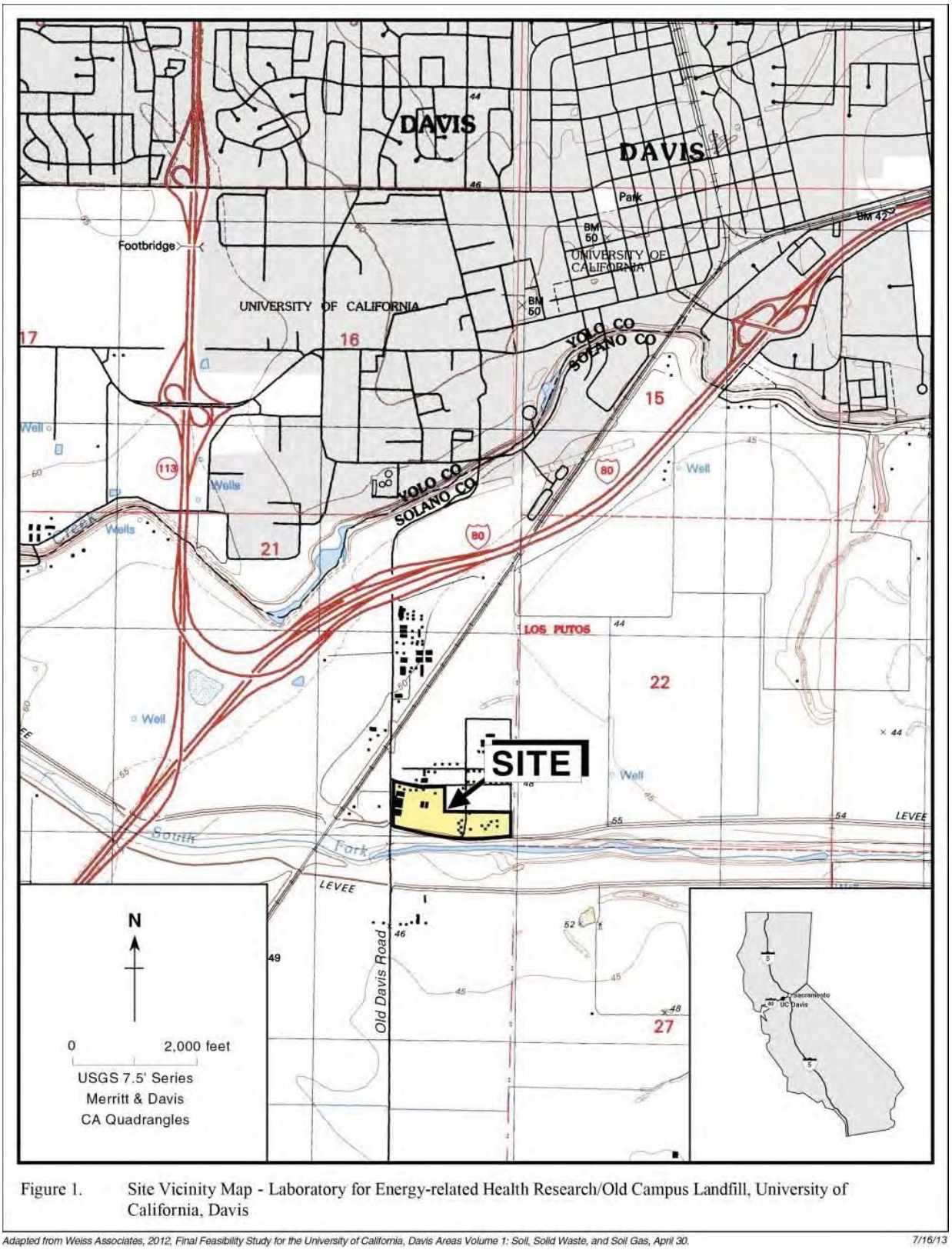


Figure 1. Site Vicinity Map - Laboratory for Energy-related Health Research/Old Campus Landfill, University of California, Davis

Adapted from Weiss Associates, 2012, Final Feasibility Study for the University of California, Davis Areas Volume 1: Soil, Solid Waste, and Soil Gas, April 30. 7/16/13

Figure 1 LEHR/OCL Site Location

5.0 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedy, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

This remedy does not satisfy the statutory preference for treatment as a principal element of the remedy because it will result in untreated hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure in accordance with the presumptive remedy for landfills, containment. Consistent with EPA Guidance on the selection of a remedy for landfills, the selected remedy is a containment remedy with long-term groundwater monitoring. U.S. EPA is not making a determination as to whether the contamination in the soil is low-level threat waste or principal threat waste because the types and quantity of chemicals used by UC Davis research laboratories and disposed onsite are unknown. Because the remedy will leave contaminated soil and waste on-site, a statutory review will be conducted within five years after initiation of the selected remedy to ensure that the remedy is, or will be, protective of human health and the environment.

6.0 DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD:

- COCs and their respective concentrations (Section 7.1.1)
- Baseline risk represented by the COCs (Sections 7.1.4 and 7.1.6)
- Cleanup levels established for COCs and the basis for these levels (Section 8.3)
- How source materials constituting principal threats are addressed (Section 11)
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessment and ROD (Section 6.0)
- Potential land use that will be available at the Site as a result of the selected remedy (Section 12.4)
- Estimated capital, annual O&M, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 12.3 and Table 8)
- Key factor(s) that led to selecting the remedy (Section 12.1)

Additional information can be found in the Administrative Record file for this Site.

7.0 AUTHORIZING SIGNATURES

This ROD documents the selected remedy for solid waste, soil gas, and soil contamination at the LEHR/OCL Site. The remedy was selected by EPA with the concurrence of the California Department of Toxic Substances Control. The Acting Assistant Director of the Superfund Division, Region 9, has been delegated the authority to approve this ROD.

JOHN LYONS
Acting Assistant Director
California Site Cleanup and Enforcement Branch
Superfund Division
U.S. EPA, Region 9

September 29, 2016
Date

PART 2: THE DECISION SUMMARY

This Decision Summary describes the site-specific factors and analyses based on which U.S. EPA has selected a remedy for the OU 2, the soil/solid waste area of LEHR/OCL Site. It includes background information about the nature and extent of contamination and the rationale for the selection of the remedy.

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The LEHR/OCL Site covers approximately 25 acres and is part of the UC Davis South Campus in Solano County (Figure 1). It is south of Interstate 80, west of Old Davis Road, and about 250 feet north of the South Fork of Putah Creek. The Site is separated from Putah Creek by a levee, but is located in an historical floodplain. The property is a mix of laboratory and research buildings and animal facilities. The surrounding land is largely agricultural.

The LEHR/OCL Site was added to the U.S. EPA NPL on May 31, 1994, National Superfund database identification number CA2890190000. The primary regulatory agencies overseeing the Site cleanup are the U.S. EPA and Cal-EPA, represented by the DTSC and the RWQCB. Funding for the selected remedy will be provided by the Regents of the University of California.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The LEHR/OCL Site contains laboratory buildings and undeveloped land owned and maintained by UC Davis. The LEHR/OCL Site was used as the location of multiple landfills; UC Davis operated three landfill disposal units, LFU-1, LFU-2, and LFU-3, that received municipal-type waste from the main campus between the early 1940s and 1967 (Figure 2). In addition to receiving municipal-type waste, UC Davis burned and/or buried campus wastes, including laboratory wastes, within trenches. Information specific to each of the disposal units can be found in the paragraphs below. From the 1950s until the 1980, the LEHR/OCL Site was also used for studies of the long-term health effects of low-level radiation on laboratory animals. The radiation studies at the Site were largely funded by DOE.

LFU-1 was used to dispose of campus refuse, sewage sludge, and, possibly, laboratory waste in the 1940s and 1950s. The landfill occupies 1.9 acres and approximately 10,150 cubic yards of waste were deposited in LFU-1. No inventory records were located for LFU-1; however, geophysical anomalies were identified throughout the unit. According to the RI Report, waste observed at LFU-1 includes glass, metals, and burned material including ash, charcoal, and melted glass (Geomatrix, 2004). Sludge from the adjacent sewage treatment plant was also reportedly disposed of in this landfill (DOE, 1988). The solid waste is presumed to be located throughout the entirety of LFU-1.

LFU-2 received campus wastes between 1956 and 1967. A 1986 UC Davis employee questionnaire indicated 19,260 cubic yards of waste were placed within twelve east-west trending cells (DOE, 1988). No records were found that indicated waste type; however, UC Davis personnel noted that municipal, construction, laboratory, chemical, petroleum, and campus incinerator waste were likely disposed in LFU-2. The Eastern Dog Pens were constructed between 1968 and 1970 on top of the southern portion of the area previously used as LFU-2 and were used to house beagles that were used for radioactive experimentation. The Eastern Dog Pens were addressed through the 2009 DOE ROD's land use restrictions remedy and a soil management plan. Residual soil contamination in the area of the dog pens is addressed in this ROD.

LFU-3 was used for disposal between 1963 and 1967 in two distinct cells. The landfill occupies 1.1 acres and approximately 3,351 cubic yards of waste were deposited in LFU-3. According to the RI Report,

waste observed at LFU-3 includes glass, rusted metal, concrete, bricks, ceramic material, and other household and laboratory waste (Geomatrix, 2004).

Eleven waste burial trenches located along the eastern site of LFU-2 were identified in the Eastern Trenches. The Eastern Trenches occupy approximately 0.8 acres, hold approximately 426 cubic yards of waste, and were used for disposal between 1957 and 1965. Waste observed at the Eastern Trenches include laboratory waste, pesticide containers, gravel with bones and feces, and low-level radioactive waste (LLRW).

Historical records for the WBH indicate that LLRW material was buried in 49 10-foot-deep holes within the WBH area between 1956 and 1974 (Geomatrix, 2004). Waste was removed from 32 of the 49 discrete waste burial holes during a 1999 removal action and disposed of off-site. The waste included LLRW, laboratory chemicals, vials, syringes, laboratory glassware, and animal carcasses. The WBH occupy approximately 0.2 acres.

Historical records for the Southern Trenches indicate that LLRW was placed in this area between 1957 and 1965 in three waste burial trenches. The Southern Trenches occupy approximately 0.16 acres and contain approximately 111 cubic yards of waste. Waste observed at the Southern Trenches includes gravel with bones, animal feces, and laboratory waste. The southwestern corner of the Southern Trenches, defined by its historical boundary, was removed during a 1998 DOE Southwest Trenches Removal Action.

Between 1965 and 1968, two experiments, including radionuclide injections into deer and sheep, were performed at the Hopland Field Station, a 5,300-acre UC Davis research facility located in Mendocino County. Historical records suggest that experimental animals were buried at the Site in the area designated as the HFSDA (Weiss, 2012a).

Characterization investigations began at the LEHR/OCL Site in 1984 and have been ongoing. Studies began with an Initial Assessment Survey in 1984 (Rockwell International, 1984). The most recent investigation to evaluate data gaps was conducted in 2009 to study chromium contamination in groundwater. General groundwater and soil gas impacts from the UC Davis landfills were also investigated, as LFU-1, LFU-2, and LFU-3 are sources of groundwater contamination. UC Davis completed two risk assessments in 2004 and 2006 to evaluate the risk to human health and to ecological receptors from exposure to contaminated soil, solid waste, and soil gas that are associated with the past use of Site areas as landfills. The RI Report was published in December 2004. UC Davis completed two FS documents: the FS Data Gaps Report in February 2010, and the Soil FS in April 2012.

3.0 COMMUNITY PARTICIPATION

In January 2015, U.S. EPA released to the site information repositories a Proposed Plan and Proposed Plan Summary Fact Sheet for public review and published a public notice in the Davis Enterprise on January 27, 2015. On February 10, 2015, U.S. EPA convened a public meeting at Hoagland Hall on the UC Davis Campus and presented the Proposed Plan to address soil/solid waste and soil gas contamination on the Site and recorded verbal comments. The public comment period was from January 28, 2015, through February 26, 2015. Comments received from the public are addressed in the Responsiveness Summary of this ROD. The transcript of this meeting is in the LEHR/OCL Administrative Record.

In 2011, U.S. EPA issued a fact sheet by mail to inform the public about progress at the site. Additionally, U.S. EPA performed community and Site worker interviews in November 2011 to gather local perspectives to incorporate in a future Community Involvement Plan update.

4.0 SCOPE AND ROLE AND RESPONSE ACTIONS

The LEHR Site is divided into two separate areas of responsibility, the UC Davis areas (referred to as the LEHR/OCL Site) and the DOE areas, based on an agreement between the parties allocating responsibility for remediation of environmental impacts associated with their respective past activities. UC Davis is responsible for groundwater; LFU-1, LFU-2, and LFU-3; the WBH; the HFSDA; the Eastern Trenches; and the Southern Trenches. UC Davis is also responsible for the Old Wastewater Treatment Plant (OWTP) and Putah Creek. However, results from the Site-Wide Human Health Risk Assessment and the Site-Wide Ecological Risk Assessment for these two areas indicate that exposure to contaminants of potential concern (COPCs) would not result in adverse health effects and EPA agreed these areas needed no further evaluation in the Soil FS (Weiss, 2012a). The DOE areas include the former Eastern Dog Pens, which was constructed on top of LFU-2, Dry Wells A-3, the Radium/Strontium Treatment Area, the Western Dog Pens, and several domestic septic systems. Soil contamination associated with the former Eastern Dog Pens was addressed in the DOE ROD with ICs, while soil, solid waste, and soil gas contamination at the UC Davis areas (the LEHR/OCL Site) are addressed in this ROD. The Eastern Dog Pens were addressed by the 2009 DOE ROD's selection of land use restrictions to prevent exposure as the remedy, pending selection of the remedy for LFU-2 (DOE, 2009b). The contamination associated with this area was left in place based on the assumption that the area would be capped when LFU-2 was addressed. Groundwater will be addressed separately under a future ROD.

The groundwater at the LEHR Site has been divided into four hydrostratigraphic units (HSUs), numbered in descending order of depth. In 1997 UC Davis began a groundwater extraction interim removal action from the second hydrostratigraphic unit to remove VOCs from groundwater and control plume migration. This system is located downgradient of LFU-1 and LFU-2 and is still in operation. In 1999 UC Davis initiated a removal action at the WBH, excavating containers and other items from soil and disposing of them at an off-site landfill; excavated soil was returned to the excavations. In 2000, a pilot test to remove VOCs from the upper HSU groundwater in the chloroform source area began in the northern LFU-2 area. This system was expanded and is still operating to remove chloroform from the source area to minimize contaminant migration.

RODs completed or planned for the LEHR Site include:

- The 2009 DOE ROD (DOE, 2009), which addresses the soil contamination at the Eastern Dog Pens. The remedy under the DOE Area ROD consists of ICs, including implementation of a soil management plan, and groundwater monitoring. The remedy was implemented in January 2011.
- The LEHR/OCL ROD (this ROD) addresses contaminants in soil, solid waste, and soil gas at the LEHR/OCL Site.
- The future Groundwater ROD will address contaminants in groundwater at the LEHR Site.

It is anticipated that these three RODs will address all of the contamination at the LEHR Site.

5.0 SITE CHARACTERISTICS

The LEHR/OCL Site contains laboratory buildings and undeveloped land (Figure 2). Of the 25 acres, approximately 35 percent is paved or covered by structures; approximately 55 percent is unpaved and relatively free of vegetation; and approximately 10 percent is covered by large, deep-rooted vegetation, which include elderberry trees and shrubs (Geomatrix, 2004). On-Site elderberry trees and shrubs are

known to provide habitat for the special-status Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*; VELB) (BBL, 2006).

The land and buildings are owned and maintained by the Regents of the University of California, which is the governing board for the University of California System; UC Davis is one campus within this system. Investigations at the LEHR/OCL Site have been conducted over 20 years to characterize the contamination. Site characterization information is detailed in the RI Report (Geomatrix, 2004) and the FS Data Gaps Report (Weiss, 2010). Characterization sampling included analysis of soil and solid waste samples, including VOCs, SVOCs, pesticides, PCBs, metals, radionuclides, and inorganic compounds. The volume of contamination and solid waste deposited in each UC Davis area was calculated using geophysical, exploratory trench, and soil boring data and totals approximately 102,973 loose cubic yards (LCY) (Geomatrix, 2004). This volume was updated in the Soil FS to 123,386 LCY (Weiss, 2012a).

Additional investigations were conducted prior to completion of the Soil FS to address data gaps that needed to be filled. These investigations addressed data gaps related to the: 1) areas of elevated hexavalent chromium in groundwater; 2) potential impact to groundwater from constituents present at the LEHR/OCL Site; and, 3) potential vapor intrusion into indoor air for volatile constituents present at the LEHR/OCL Site. (Weiss, 2010). Recent investigations conducted in the groundwater source areas in the northern portions of LFU-2 and the Eastern Trenches found that the source areas are more extensive laterally and vertically than previously identified.

The State Historic Preservation Officer has indicated that there are no known historic or cultural resources identified within or adjacent to the LEHR/OCL Site.

The development of remedial alternatives to address soil, solid waste, and soil gas at the LEHR/OCL Site are detailed in the Soil FS (Weiss, 2012a). U.S. EPA, the California Department of Toxic Substances Control (DTSC), and the Central Valley Regional Water Quality Control Board (RWQCB) concurred on these findings.

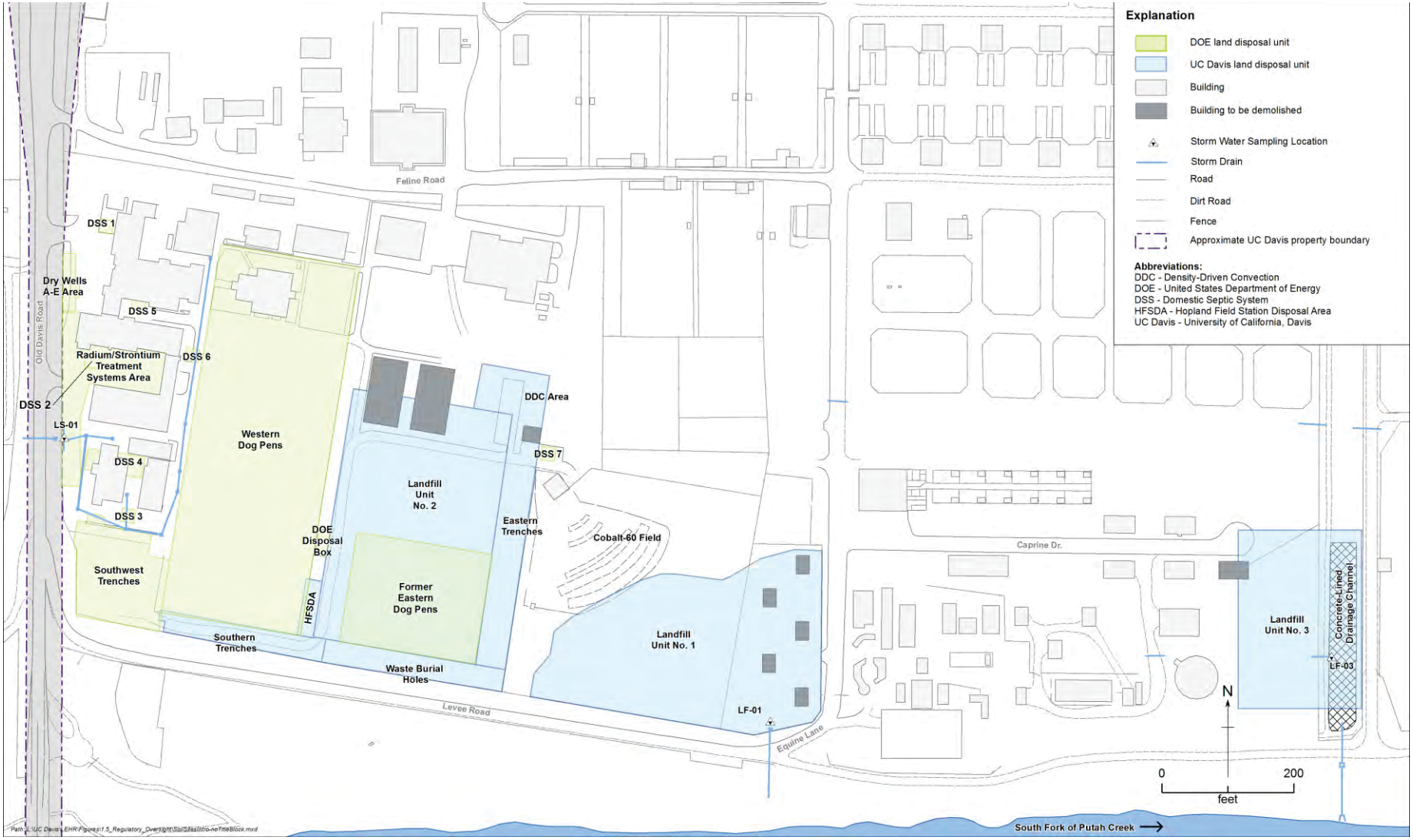


Figure 2 LEHR/OCL Site Features

5.1 NATURE AND EXTENT OF LANDFILLS AND CONTAMINATION

A summary is provided below of the nature and extent of the landfills and other areas of contamination for which UC Davis is responsible and which are addressed in this ROD. COCs in soil and solid waste have the potential to migrate through the vadose zone, contaminating the soil and potentially impacting groundwater, while COCs in soil gas potentially pose risk via the vapor inhalation pathway. COCs in surface soil have the potential to impact surface water and sediment via stormwater runoff. The information found in these subsections was taken from the Soil FS (Weiss, 2012b), unless otherwise noted.

5.1.1 Landfill Unit 1

Disposal of wastes occurred at LFU-1 during the 1940s and 1950s and included campus wastes (e.g., glass, metal, ash, charcoal, etc.), sewage treatment plant sludge, and, potentially, laboratory chemical waste. No inventory records are available for LFU-1 so waste was identified in the exploratory trenches and by the correlation of sample results with geophysical data. LFU-1 is approximately 1.9 acres and waste is presumed to be located throughout the entirety of this unit (Geomatrix, 2004). Contamination and wastes at LFU-1 are found in north-south trending trenches located south of the former cobalt-60 field and in east-west trending trenches in the eastern portion of the unit. The top of the waste is between 1 and 5 ft bgs and waste extends to depths of 4 to 8 ft bgs. The estimated volume of contaminated material is 39,204 LCY.

Known chemical wastes found by exploratory trenching included blue and green crystalline material. Soil COCs identified in the Soil FS include arsenic, lead, carbon-14, and benzo(a)pyrene; soil gas COCs include 1,3-butadiene; and soil COCs with the potential to impact groundwater include carbon-14, copper, and selenium. However, given the heterogeneous nature of landfill waste, other chemicals may be present.

5.1.2 Landfill Unit 2

Based on interviews with UC Davis employees, EPA determined that disposal of wastes occurred at LFU-2 from 1956 through 1967 and included municipal and campus general refuse, animal parts, campus incinerator waste, and laboratory chemicals. LFU-2 is approximately 2.1 acres. Contamination and wastes at LFU-2 are found in 12 east-west trending disposal trenches in the eastern portion of the unit. The top of the waste depth is between 1 and 4 ft bgs and waste extends to depths of 8 to 14 ft bgs. The estimated volume of contaminated material is 41,095 LCY. Geophysical surveys were not conducted in the majority of the southern part of LFU-2 because, at the time of the survey, the Eastern Dog Pens were located in the area. However, geophysical anomalies identified towards the southwestern part of the unit indicate that waste likely continues beneath the former Eastern Dog Pens. In addition to soil/solid waste, elevated VOC concentrations in soil gas samples (specifically chloroform) suggest the presence of a VOC “hot spot” in the northern portion of LFU-2, south of Geriatrics Building H-293.

Known chemical wastes identified by exploratory trenching included lead (possibly a battery), ampules, and a lead casing with white crystalline powder. Soil COCs identified in the Soil FS include lead, carbon-14, cesium-137, potassium-40, strontium-90, Aroclor-1260, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. Soil gas COCs include 1,2-dichloropropane (DCP), chloroform, and tetrachloroethene (PCE). Soil COCs with the potential to impact groundwater include cadmium, carbon-14, and chloroform. However, given the heterogeneous nature of landfill waste, other chemicals may be present.

The Eastern Dog Pens, formerly used to house beagles for radioactive experimentation, was constructed on top of LFU-2. The primary sources of contamination in the Eastern Dog Pens were related to feces and

urine (containing radioactive material) and flea control material (containing pesticides). In 1999, samples were collected from the upper two feet of soil but did not include waste associated with LFU-2 underneath; gravel and concrete curbing materials were also sampled. Residual cancer risk for the hypothetical on-site resident at the Eastern Dog Pens was estimated at 4 x 10^{-6} (DOE, 2009b). The Eastern Dog Pens were addressed by the 2009 DOE ROD's selection of land use restrictions to prevent exposure as the remedy, pending selection of the remedy for LFU-2 (DOE, 2009b); the contamination associated with this area was left in place based on the assumption that the area would be capped when LFU-2 was addressed.

5.1.3 Landfill Unit 3

Disposal of wastes occurred at LFU-3 from 1963 through 1967 and included general municipal waste (mainly glass), construction debris (e.g., rusted metal, concrete, bricks, and ceramic material), and potentially minor quantities of laboratory waste. LFU-3 is approximately 1.1 acres, and contamination at LFU-3 is found in two east-west trending cells approximately 60 feet wide by 120 feet long. A north-south trending ditch located along the east side of the unit was lined with concrete to prevent erosion of the waste. The top of the waste is between 1 and 4 ft bgs and waste extends to depths of 3 to more than 11 ft bgs. The estimated volume of contaminated material is 12,153 LCY. Geophysical data were obtained from the west side of the unit. Based on soil sample results, it is likely that waste is not widespread throughout the unit, but exists primarily within the two cell boundaries.

Soil COCs identified in the Soil FS included lead, manganese, carbon-14, cesium-137, strontium-90, and Aroclor-1260. No soil gas COCs were identified. Soil COCs with the potential to impact groundwater include barium, cadmium, copper, and carbon-14. However, given the heterogeneous nature of landfill waste, other chemicals may be present.

5.1.4 Waste Burial Holes

Disposal of wastes occurred at the WBH from 1956 through 1974 and included LLRW, laboratory chemicals, vials, animal carcasses, and laboratory glassware. The WBH area is approximately 0.2 acres. Contamination at the WBH was buried in 49 10-foot deep holes that were filled with waste material; however, an interim removal action (IRA) was conducted in 1999 due to high carbon-14 and tritium activities. Waste, including LLRW, was removed from 32 of 49 burial holes to a depth of 12 ft bgs. It is believed that some of the excavated burial holes were contiguous (i.e., that the excavations did not identify all of the separate burial holes). Contaminated soil was used to backfill the holes following excavation of waste material. The estimated volume of contaminated soil is 3,488 LCY.

Most radiological debris is no longer present at the WBH because it was removed during the 1999 interim removal. However, the contaminated soil surrounding the debris still remains because it was placed back in the excavation areas after the interim removal. No geophysical surveys were performed in the WBH area after completion of the interim removal action. Soil COCs identified in the Soil FS include carbon-14, cesium-137, strontium-90, tritium, and naphthalene. No soil gas COCs were identified. Soil COCs with the potential to impact groundwater include carbon-14 and tritium. However, given the heterogeneous nature of landfill waste, other chemicals may be present.

5.1.5 Eastern Trenches

Disposal of wastes occurred at the Eastern Trenches from 1957 through 1965 and included LLRW, general laboratory chemicals, pesticide containers, bones, and dog pen waste. Contamination at the Eastern Trenches is found in six north-south trending trenches and five east-west trending trenches. The top of the waste is between less than 1 and 4 ft bgs and waste extends to depths of 5 to 6 ft bgs. The

estimated volume of contaminated material is 5,777 LCY. Little sampling or exploratory trenching has been performed in the northern portion of the Eastern Trenches. However, in the southern portion of the area, north-south-trending geophysical anomalies are common and waste is presumed to be located throughout the entirety of this unit. Elevated VOC concentrations in soil gas samples (specifically chloroform) suggest the presence of a second VOC "hot spot" in the northern portion of the Eastern Trenches.

Known chemical wastes identified by exploratory trenching included bottles/vials with clear/amber/reddish-brown liquids, orange/yellow/yellowish-olive/white powders, light green solids, jars with white crystalline powder, large ceramic crocks with white granular powder, olive-colored glass bottles with volatile liquid, wide-mouth bottles with thick liquid, a 5-gallon bucket of "weedkiller," and large glass bottles containing fluid. Soil COCs identified in the Soil FS include carbon-14 and tritium. Soil gas COCs include 1,2-dichloroethane (1,2-DCA), 1,2-DCP, 1,3-butadiene, and chloroform. Soil COCs with the potential to impact groundwater include carbon-14, tritium, 1,2-DCA, and chloroform. However, given the heterogeneous nature of landfill waste, other chemicals may be present.

5.1.6 Southern Trenches

Disposal of wastes occurred at the Southern Trenches from 1957 through 1965 and included low-level radioactive material, bones, animal feces, and laboratory waste mixed with gravel. The Southern Trenches area is approximately 0.16 acres and contamination at the Southern Trenches is found in two east-west trending trenches, each approximately 250 feet long and 2 to 4 feet wide. The top of the waste is between less than 0.5 and 1.5 ft bgs and waste extends to depths of 3 to 5.5 ft bgs. The estimated volume of contaminated material is 1,274 LCY. The Southern Trenches consist of mostly gravel and sand with some bones; only limited waste was found during exploratory trenching. The southwestern corner of the historical boundary of the Southern Trenches was removed during the 1998 DOE Southwest Trenches Removal Action (DOE, 2001). Therefore, this portion of the Southern Trenches does not need to be addressed in this ROD.

The primary COC identified in the Soil FS was carbon-14. No soil gas COCs were identified. The primary soil COC with the potential to impact groundwater is carbon-14. However, given the heterogeneous nature of landfill waste, other chemicals may be present.

5.1.7 Hopland Field Station Disposal Area

In 1965 and 1968, experiments with radionuclide injections into deer and sheep were performed at the Hopland Field Station, a 5,300-acre UC Davis research facility in Mendocino County. Historical information suggests that the animal carcasses are buried in the HFSDA, which is located adjacent to the southwestern edge of LFU-2 and north of the western end of the Southern Trenches (DOE, 1988). Sampling has not been performed in this area, and the single trench that crosses from LFU-2 into the HFSDA did not indicate the presence of waste. Geophysical anomalies suggest that disturbance to the soil has occurred. No information is available about wastes or contaminants in this area; this area will be investigated during the Remedial Design (RD) phase and if it contains contamination above industrial Regional Screening Levels, it will be remediated. The investigation may include limited trenching to evaluate the presence or absence of wastes.

5.2 TOPOGRAPHY AND GEOLOGY

Land at the LEHR/OCL Site is typical of the broad, relatively flat Sacramento Valley. Ground surface elevations are approximately 50 feet above mean sea level, and relief across the LEHR/OCL Site is approximately two feet. According to the Federal Emergency Management Agency (FEMA) Flood

Insurance Map, updated in May 2009, the LEHR/OCL Site is within a Zone A area, meaning it is subject to inundation by the one-percent annual chance flood event. This conclusion was made using approximate methodologies; no detailed hydraulic analyses have been performed (FEMA, 2010).

Subsurface geology below the LEHR/OCL Site consists of two units: the Putah Creek Fan and the Pliocene-Pleistocene Tehama Formation. The Putah Creek Fan consists primarily of silt and clay, with coarse-grained sediments occurring locally. The Tehama Formation, which lies beneath the Putah Creek Fan, primarily consists of clayey silt to silty clay, with deeper coarse-grained sand and gravel. A more detailed discussion of LEHR/OCL Site geology is presented in Section 1.5.3 of the RI Report (Geomatrix, 2004).

5.3 HYDROLOGY

5.3.1 Surface Water

There are no surface water bodies located on the LEHR/OCL Site. The nearest surface water body is the South Fork of Putah Creek, an east-flowing, engineered channel that lies 250 feet from the southern boundary of the LEHR/OCL Site and is separated from the LEHR/OCL Site by a levee that was constructed during the 1940s and 1950s. This levee is approximately 30 feet high, forms the southern boundary of the LEHR/OCL Site, and is used as a road for vehicular traffic. The southern levee of the creek is located several hundred feet south of the LEHR/OCL Site. The creek flow rate is regulated by releases from the Monticello Dam and the Putah Creek Diversion Dam. The South Fork of Putah Creek receives a minimum water flow rate of 31,000 acre-feet during non-dry years, as required in the settlement agreement between the Solano County Water Agency (and other Solano County parties) and the Putah Creek Council (and other Yolo County parties) (BBL, 2006). The UC Davis wastewater treatment plant discharges up to 2.7 million gallons per day of treated wastewater to the South Fork of Putah Creek at a location just west of the Old Davis Road Bridge (RWQCB, 2003). The South Fork of Putah Creek is a losing stream that recharges shallow (HSU-1) groundwater (Geomatrix, 2004). The Creek serves as habitat for many aquatic and riparian biota, including amphibians, fish, birds, and benthic invertebrates.

5.3.2 Storm Water Drainage

Runoff at the LEHR/OCL Site is collected at three locations: storm water sampling locations LS-01, LF-01, and LF-03. Water flows in these areas only after moderate to heavy winter storms. LS-01 captures runoff from buildings and parking lots; when runoff is present, it is pumped to a drainage swale along Old Davis Road. The occasional runoff from the other two surface drainages (LF-01 and LF-03) eventually flows through discharge pipes into Putah Creek. It is estimated that the pipe from LF-01 discharges an average of eight days per year into Putah Creek; discharges from LF-03 occur less frequently (Geomatrix, 2004). A concrete-lined drainage channel overlays the eastern portion of LFU-3, but runoff rarely occurs in this area.

5.3.3 Groundwater

The HSUs at the LEHR/OCL Site include, in order of descending depths, HSU-1, HSU-2, HSU-3, HSU-4, and an unnamed aquitard (see Figure 3). HSU-2 and HSU-4 are the most permeable of these HSUs, consisting predominantly of sand and gravel deposits. HSU-1 and HSU-2 form the upper and lower units, respectively, of the Putah Creek Fan. HSU-3, HSU-4, and the unnamed aquitard form the upper, intermediate, and lower units, respectively, of the Tehama Formation. HSU-1, HSU-3, and the unnamed aquitard are generally composed of silt and clay and are less permeable than HSU-2 and HSU-4. Hydraulic conductivity is estimated to be between 2 and 11 feet per day in HSU-1, and the horizontal

seepage velocity is estimated to be approximately four feet per year. HSU-2 is estimated to have a hydraulic conductivity of approximately 1,020 feet per day and a horizontal seepage velocity of 1,500 feet per year (Geomatrix, 2004).

Groundwater levels have been monitored in LEHR/OCL Site wells for over 20 years. Levels are typically highest in March (first quarter) and April (second quarter), decline rapidly from April (second quarter) to August (third quarter) due to pumping of off-site agricultural wells, and recover from September (third quarter) to March (first quarter). During this annual cycle, groundwater depths in HSU-1 and HSU-2 wells typically fluctuate between 20 and 40 ft bgs (Weiss, 2012b). The solid wastes in the landfills at the Site do not extend into groundwater, but groundwater sampling indicates that some leachate has migrated to groundwater based on concentrations of total dissolved solids, chromium, nitrate, chloroform and other VOCs, 1,4-dioxane, carbon-14, and tritium.

The groundwater flow direction generally is to the northeast in HSU-1, east/northeast in HSU-2, and east in HSU-4, but can be locally influenced by irrigation wells during the agricultural pumping season. In 2010, horizontal groundwater gradients varied between 0.0001 feet per foot (winter) and 0.01 feet per foot (fall) in HSU-1; between 0.0003 feet per foot (winter) and 0.003 feet per foot (fall) in HSU-2; and between 0.0001 feet per foot (winter) and 0.001 feet per foot (spring/summer) in HSU-4 (Weiss, 2012b).

Seasonal trends show upward vertical gradients between HSU-1 and HSU-2 in the fall and downward gradients in the spring (Weiss, 2012b). The variation in vertical groundwater gradients by season is largely attributable to seasonal and weather-related use of irrigation wells in the area.

5.4 CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) was used to develop an understanding of the disposal units at the Site and to evaluate potential risks to human health and the environment. The CSM is a three-dimensional "picture" of site conditions that illustrates contaminant sources, release mechanism, exposure pathways, migration routes, and potential human and ecological receptors.

The seven disposal units at the LEHR/OCL Site pose varying degrees of potential risks to human health and the environment from chemicals and radiological constituents related to past Site activities. These constituents may be present in the Site soil matrix as a result of historical waste disposal practices or the activities associated with the radiological studies. Other activities associated with the radiological investigations are also thought to be a source for both radionuclide and chemical contaminants: residual radionuclides may have been released to the soil matrix via dog excreta, and pesticides were applied to the dogs outside where release onto soil was possible (BBL, 2006). Although removal activities have occurred at some of the Site disposal units, residual chemical and/or radioactive constituents are still present.

COCs in soil and solid waste have the potential to migrate through the vadose zone, contaminate the soil and create a secondary source. This secondary source then has the potential to leach, migrate, and impact groundwater. COCs in soil gas (i.e., VOCs) potentially pose a risk through the vapor inhalation pathway. COCs in surface soil have the potential to impact surface water and sediment via erosion from stormwater runoff and may be available to ecological receptors. The CSM considered contamination from organic and inorganic chemicals and radiological constituents in soil and solid waste, and VOC contamination in soil gas. The CSM was developed in accordance with U.S. EPA guidance and included known and suspected sources of contamination, types of contaminants and affected media, known and potential routes of migration, and known and potential human and ecological receptors. Figure 3 depicts the

contaminant sources and transport pathways and Figure 4 presents the exposure pathway analysis applicable to the HHRA. For the ecological risk assessment, Figure 5 depicts the CSM for the Terrestrial Exposure Pathways.

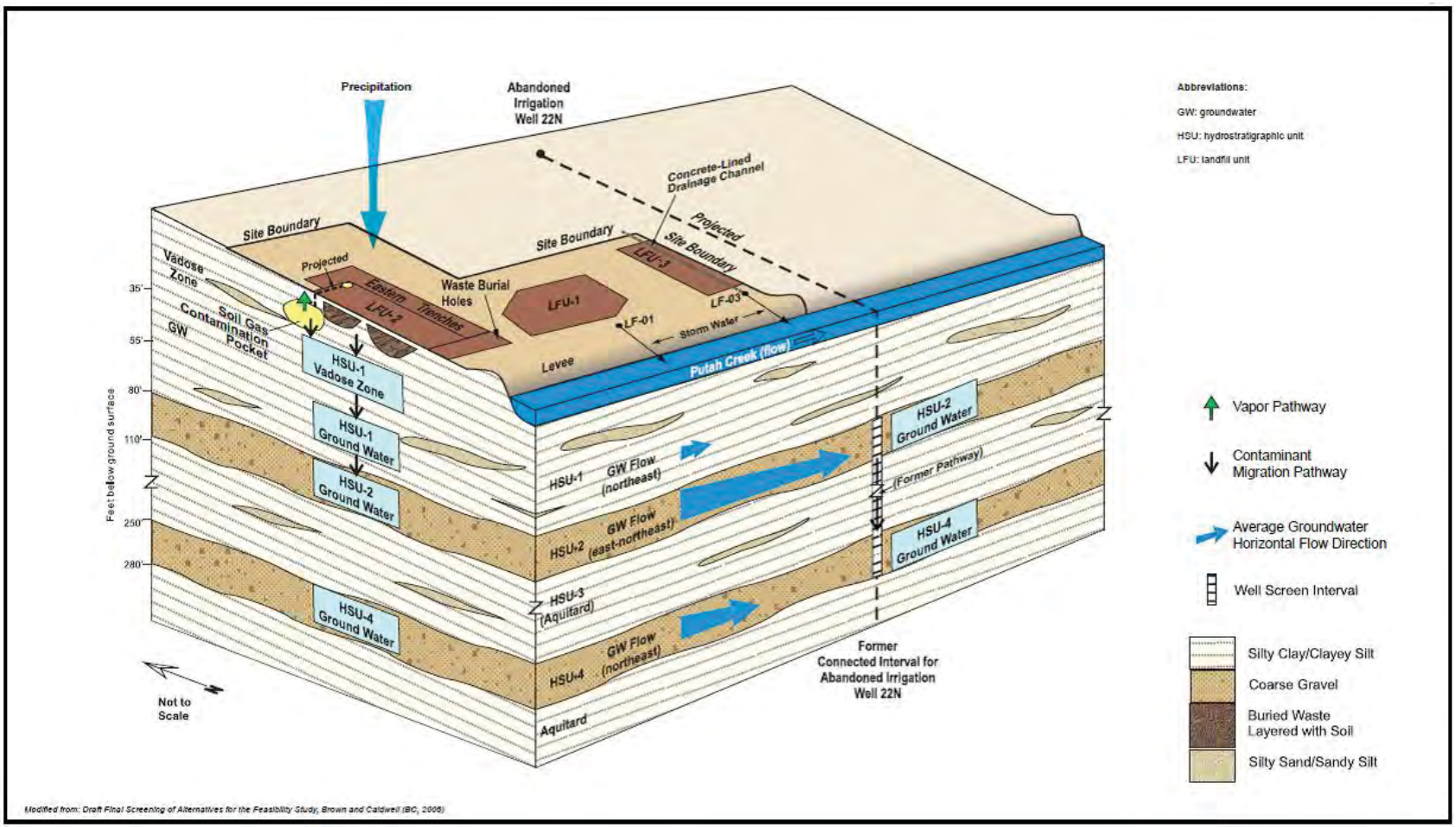


Figure 3 Conceptual Site Model for the LEHR/OCL Site

6.0 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

The LEHR/OCL Site currently has one- and two-story laboratory and office buildings, animal handling facilities, and vegetated open areas. Specific land uses on the LEHR/OCL Site and in the immediate adjacent areas are under the control of UC Davis and are consistent with the Long-Range Development Plan Final Environmental Impact Report (LRDP) (UC Davis, 2003). The areas adjacent to the LEHR/OCL site include veterinary facilities associated with the School of Veterinary medicine, the campus wastewater treatment plant, Putah Creek, and farm fields. The LRDP indicates that the Central Campus area, two miles to the north of the Site and separated from the LEHR/OCL Site by a waterway, an interstate highway, and railroad tracks, will continue to be the portion of campus most intensely developed for academic and co-curricular activities. The LEHR/OCL Site is identified for low-density academic/administrative purposes and it is anticipated that land use will remain the same.

UC Davis currently operates the Center for Health and the Environment (CHE) at the former LEHR/OCL facility. Research activities at CHE focus on the effect of environmental agents, including chemicals and radiation, on the health of humans, animals, and other organisms (UC Davis, 2010a). Also, currently located on the LEHR/OCL Site is the California Raptor Center, an educational and research facility dedicated to the rehabilitation of injured and orphaned birds of prey (UC Davis, 2010b). Various laboratories for the School of Veterinary Medicine, such as the Center for Equine Health and the Animal Resource Service V, are also located on the LEHR/OCL Site. These organizations are likely to continue their activities for the foreseeable future, based on the LRDP.

7.0 SUMMARY OF SITE RISKS

Potential risks posed to human health and the environment at the LEHR/OCL Site include:

- Exposure to chemicals and radiological constituents in soil and soil gas that are related to past Site activities
- Exposure to buried landfill contents
- Leaching of chemicals present in soil, soil gas, and solid waste to groundwater
- Migration of COCs in surface soil to surface water and sediment via stormwater runoff

7.1 HUMAN HEALTH RISKS

The baseline risk assessment estimates the risks a site would pose if no further action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. There are four elements required in a baseline risk assessment process: identification of COCs, exposure assessment, toxicity assessment, and risk characterization. A baseline HHRA for the LEHR/OCL Site was completed in 2004 (MWH, 2004), refined in 2006 (BC, 2006), and updated in 2012 (Weiss, 2012a) as summarized below.

7.1.1 Identification of Contaminants of Concern

For human health risks, COCs were determined for two depth ranges: 0 to 10 ft bgs and 10 to 20 ft bgs.

Soil and Solid Waste

The 2004 *Site-Wide Risk Assessment, Volume 1: Human Health Risk Assessment* (MWH, 2004; HHRA Part A) established a list of COPCs using procedures outlined in U.S. EPA's Risk Assessment Guidance for Superfund: Volume I—Human Health Evaluation Manual (U.S. EPA, 1989). The COPC list was further refined to a list of COCs in the *Site-Wide Risk Assessment, Volume I Human Health Risk Assessment (Part C – Risk Characterization for UC Davis Areas)* (BC, 2006; HHRA Part C).

Since publication of the HHRA Part A and HHRA Part C, additional data were collected and the risk-based screening values for soil constituents were updated. Therefore, the previously-identified COCs were re-evaluated. Soil/solid waste data from each disposal unit were evaluated in a five-step process. COCs retained through this qualitative evaluation were designated as Soil FS COCs. This evaluation identified new COCs and eliminated some of the COCs identified in the earlier risk assessments (Weiss, 2012a). This approach is fundamentally flawed because of uncertainties related to the heterogeneous nature of landfills and disposal units and is discussed in more detail in Section 7.1.5, Uncertainty Analysis. Therefore, any chemical exceeding its applicable screening level is retained as a COC for the purposes of addressing contamination related to disposal activities.

Soil Gas

The risk screening was conducted in two phases using soil gas data collected from depths of 5 ft bgs, 15 ft bgs, and 25 ft bgs in the Eastern Trenches, LFU-1, LFU-2, LFU-3, the Southern Trenches, and the WBH areas in September 2008. Maximum detected soil gas concentrations were compared with soil gas screening values. If the maximum detected concentration of a particular constituent was greater than the screening value, then the constituent was retained as a COPC.

7.1.2 Exposure Assessment

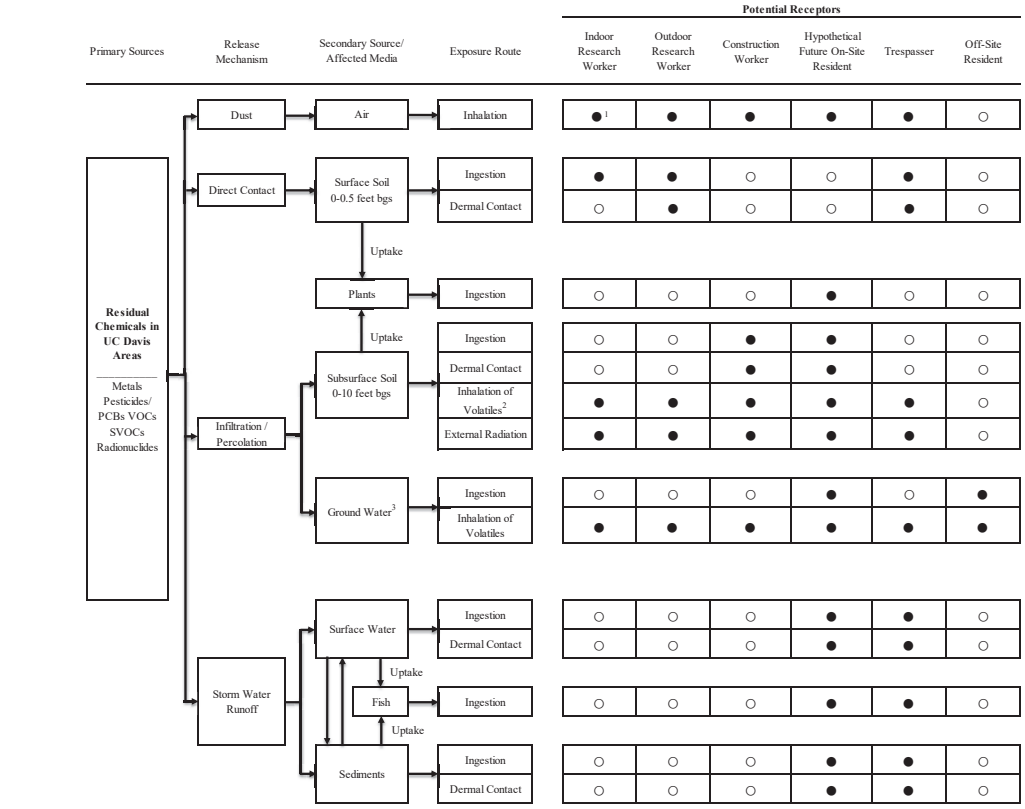
The exposure pathways that were considered in assessing human health risks are illustrated on Figure 4.

Soil and Solid Waste

Risks were originally evaluated for six on-site receptor groups in the HHRA Part A and HHRA Part C: age-adjusted adults, resident children, indoor researchers, outdoor researchers, construction workers, and trespassers. Exposure pathways that were evaluated included soil ingestion, soil dermal exposure, ingestion of homegrown produce, external radiation, dust inhalation, and inhalation of vapors from soil and groundwater in indoor and outdoor air. As part of later revisions to the HHRA, the Soil FS Appendix C re-evaluated risk only for a residential exposure scenario because it is the most conservative, and used default exposure parameters built into the Regional Screening Levels (RSLs), preliminary remediation goals (PRGs), and lead California Human Health Screening Levels (CHHSLs).

Soil Gas

Human receptors that could be exposed to the VOCs in indoor air include on-site indoor researchers and hypothetical future on-site residents (MWH, 2004). Research facility buildings currently overlie the northernmost part of LFU-2, the north end of the Eastern Trenches, and the northeast corner of LFU-2 areas as shown on Soil FS Appendix Figure B-1. Building H-292 is regularly occupied by workers.



Definitions:
● Potentially complete exposure pathway.
○ Incomplete exposure pathway.

bgs	below ground surface
HHRA	Human Health Risk Assessment
HSU	Hydrostratigraphic Unit
PCBs	polychlorinated biphenyls
SVOCs	semivolatile organic compounds
VOCs	volatile organic compounds

Notes:
- Figure reproduced from Figure 1-4 in the HHRA Part C (BC, 2006). Although the risk characterization in the HHRA Part C has since been discredited, the exposur pathway analysis presented above shows possible exposure pathways that were evaluated and currently apply.

1 This pathway is complete but was not included in the quantitative risk calculations because the contribution to risk is negligible. Using the risk for outdoor research worker as a surrogate fro the indoor research worker, the total risk for the indoor research worker would not increase if inhalation of dust is included.

2 Evaluated using soil gas data

3 HSU-1, 2, and 4

Figure 4 Exposure Pathway Analysis for Human Receptors

7.1.3 Toxicity Assessment

The toxicity assessment provides information regarding the potential of a chemical to cause cancer and other adverse health effects. Toxic chemical effects are separated into carcinogenic effects and non-carcinogenic effects based on the understanding that the mechanisms of action for cancer-causing and non-cancer-causing chemicals differ.

Soil and Solid Waste

The sources discussed below provide the basis for evaluating the toxicity of various substances and identifying COCs.

The Soil FS COCs were identified based on a qualitative evaluation of risks from constituents that passed initial screening based on comparison to residential 2011 RSLs, 2010 PRGs (radionuclides only), and CHHSLs (lead only). The RSLs for chemical toxicity were developed using toxicity values from six sources in hierarchical order. The risk-based PRGs for radionuclides are based on the carcinogenicity of the contaminants estimated using cancer slope factors by the Center for Radiation Protection Knowledge (U.S. EPA, 2015b). Lead toxicity is measured by blood lead levels. Lead health effects are based on estimate blood-lead concentrations in people exposed to lead in the environment. CHSSLs were developed to estimate a concentration of lead in soil that would lead to an incremental increase in blood-lead concentrations of up to 1 microgram per deciliter in people exposed to that soil (Office of Environmental Health Hazard Assessment [OEHHA], 2009).

Soil Gas

Inhalation unit risk factors (URFs) and non-cancer toxicity reference concentrations (RfCs) were obtained from U.S. EPA and Cal EPA sources.

7.1.4 Risk Characterization

For carcinogens, risks are generally expressed as the incremental probability of a population of individuals developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk due to exposures to carcinogens through ingestion and skin contact is calculated from the following equation:

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

where:

Risk = a unitless probability (e.g., 2×10^{-5}) of a population of individuals developing cancer
CDI = chronic daily intake averaged over 70 years (milligrams per kilograms per day [mg/kg-day])
SF = slope factor, expressed as $(\text{mg/kg-day})^{-1}$

Quantitative estimates of risk due to inhalation are evaluated using the URF. Using the same equation shown immediately above, dose is replaced by the exposure level based on the contaminant concentration in air and the length of exposure. The exposure level is multiplied by the URF instead of the SF. An excess lifetime cancer risk of 1×10^{-6} indicates that a population of individuals experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of exposure to site-related contaminants. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of a population of individuals developing cancer from all other

causes has been estimated to be as high as one in three. U.S. EPA's risk management range for site-related exposures is 1 x 10^{-6} to 1 x 10^{-4}. Determination of what constitutes acceptable levels of residual risk within this range is made on a site-specific basis.

Health effects due to exposures to non-carcinogens are estimated using the hazard quotient (HQ) approach. The HQ is the ratio of exposure to toxicity. An HQ less than 1 indicates that toxic non-carcinogenic effects from that chemical are unlikely. The hazard index (HI) is generated by adding the HQs for all COCs that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given population of individuals may reasonably be exposed. An HI less than 1 indicates that toxic non-carcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

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

where:

CDI = chronic daily intake
RfD = reference dose

As in risk estimates due to inhalation of carcinogens, the hazard quotient due to inhalation of a non-carcinogen is calculated by replacing the dose with the exposure level based on the COPC concentration in air and the length of exposure. The RfD is replaced by the RfC.

In general, calculated cumulative cancer risks greater than 1 x 10^{-4} and HIs greater than 1 require consideration of cleanup alternatives. Cancer risks between 1 x 10^{-4} and 1 x 10^{-6} (between 1 in ten-thousand and 1 in one-million) fall within EPA's risk management range. Cumulative incremental lifetime cancer risk related to site contamination below 1 x 10^{-6} is considered a *de minimis* level and typically does not warrant active risk/exposure mitigation.

Soil and Solid Waste

Potentially unacceptable risks and hazards were estimated in both the HHRA Part C and the Soil FS HHRA. After selecting COCs, the Soil FS compared the results to those of the original human health risk assessments and eliminated some of the final 2006 HHRA Part C COCs. COCs common to both were included in the final list of COCs in the Soil FS. The most recent estimate of these risks is from the Soil FS and is presented as Table 1. However, it should be noted that this approach was flawed because of the heterogeneous nature of landfill contents. Because landfills are heterogeneous, limited sampling is not likely to have identified all COCs or the maximum extent of contamination. As a result, all COCs are retained.

Soil Gas

The estimated vapor intrusion risks to on-site indoor researchers and hypothetical future residents that were calculated for soil gas in the Soil FS are summarized in Table 2. Risks are highest at the north end of LFU-2, in the vicinity of the Geriatrics buildings and the known VOC "hot spot" location. Significant risks are also posed by the Eastern Trenches area, near the other known VOC "hot spot" area. Risks in the remaining areas are near or below 1 x 10^{-6}. The HI estimated for each receptor at each disposal area was less than 1.0. The Soil FS selected the following COCs for soil gas:

- 1,2-DCA, 1,2-DCP, 1,3-butadiene, and chloroform in the Eastern Trenches;
- 1,3-butadiene in LFU-1; 1,2-DCP, chloroform, and PCE in LFU-2; and
- Formaldehyde in the WBH.

The approach used in the Soil FS identified new COCs and eliminated some of the COCs identified in the earlier risk assessments. There are issues with this approach as discussed below. Also, recent investigations have identified additional chemicals in soil and groundwater.

Table 1 Summary of Cancer Risks and Non-Carcinogenic Hazards for Soil for the Hypothetical Residential Receptor at the LEHR/OCL Site

Disposal Unit	Depth Interval (ft bgs)	Total Residential Risk[1] or Hazard[2]
Eastern Trenches	0-10	**6.8×10^{-5}**
	10-20	**1.4×10^{-5}**
	Total Depth 0-20	**8.2×10^{-5}**
Landfill Unit 1	0-10	**1.4×10^{-4}**
	10-20	**5.3×10^{-6}**
	Total Depth 0-20	**1.4×10^{-4}**
Landfill Unit 2	0-10	**2.3×10^{-5}**
	10-20	**1.4×10^{-4}**
	Total Depth 0-20	**1.6×10^{-4}**
Landfill Unit 3	0-10	**2.0×10^{-5}** **2.2 (total hazard)**
	10-20	**1.4×10^{-6}**
	Total Depth 0-20	**2.2×10^{-5}**
Southern Trenches	0-10	**1.1×10^{-5}**
	Total Depth 0-20	**1.1×10^{-5}**
Waste Burial Holes	0-10	**2.0×10^{-2}**
	10-20	**5.7×10^{-4}**
	Total Depth 0-20	**2.1×10^{-2}**

Notes:

gray indicates risk above the risk management range or a Hazard Index greater than one.

[1] Total calculated risk posed by current EPCs to a potential on-site resident.

[2] Total calculated hazard quotient posed by current EPCs to a potential on-site resident; hazards denoted with italic font. Note that hazards were indicated only at Landfill Unit 3.

Acronyms/Abbreviations:

bgs – below ground surface
EPC – exposure point concentration
ft - feet

Table 2 Summary of Elevated Soil Gas Risks and Hazards from the Vapor Intrusion Risk Assessment at the LEHR/OCL Site

Disposal Unit	Receptor	Total Risk or Hazard[1]	Risk Drivers[2]	Depth (ft bgs)
Eastern Trenches	Indoor Researcher	9.1×10^{-6}	1,3-Butadiene; Chloroform	5
		3.3×10^{-5}	1,2-DCP; Chloroform	15
		1.4×10^{-6}	Chloroform	25
	Age-Adjusted Adult	1.9×10^{-5}	1,3-Butadiene; Chloroform	5
		7.0×10^{-5}	1,2-DCA; 1,2-DCP; Chloroform	15
		3.0×10^{-6}	Chloroform	25
	Resident Child	7.2×10^{-6}	Chloroform	5
		2.6×10^{-5}	Chloroform; 1,2-DCP	15
		1.1×10^{-6}	Chloroform, Formaldehyde[3]	25
Landfill Unit 1	Indoor Researcher	2.7×10^{-6}	1,3-Butadiene	15
	Age-Adjusted Adult	5.7×10^{-6}	1,3-Butadiene	15
	Resident Child	2.1×10^{-6}	1,3-Butadiene	15
Landfill Unit 2	Indoor Researcher	1.3×10^{-5}	Chloroform	5
		1.5×10^{-5}	Chloroform	15
	Age-Adjusted Adult	1.6×10^{-4}	1,2-DCP; Chloroform; PCE	5
		1.2×10^{-4}	Chloroform; PCE	15
		4.3×10^{-6}	Chloroform	25
	Resident Child	5.9×10^{-5}	1,2-DCP; Chloroform; PCE	5
		4.4×10^{-5}	Chloroform	15
		1.6×10^{-6}	Chloroform	25
Landfill Unit 3	Age-Adjusted Adult	1.2×10^{-6}	1,3-Butadiene; Formaldehyde[3]	25
Waste Burial Holes	Age-Adjusted Adult	1.4×10^{-6}	Formaldehyde	5

Notes: red indicates risk above the risk management range.

[1] Sum of risks from all constituents. Only risks greater than 10^{-6} are shown. The hazard index estimated for each receptor at each disposal area was less than 1.0.

[2] Risk drivers shown are those constituents contributing more than 10^{-6} toward total risk unless otherwise noted.

[3] Primary contributors to risk that are shown contribute less than 10^{-6} each.

Acronyms/Abbreviations:

DCA – dichloroethane
DCP – dichloropropane
PCE – tetrachloroethene

7.1.5 Uncertainty Analysis

The HHRA Part C and the Soil FS each present an interpretation of the risks and hazards that exist should no action be taken. These risks were estimated so that a range of potential remedial alternatives could be evaluated. Although potentially unacceptable risks and hazards are identified in each risk assessment,

these likely are not representative of actual risks because of uncertainties which may have overestimated or underestimated Site risks. The following uncertainties associated with prior site investigations and risk calculations may have overestimated Site risks.

- Use of generic screening levels such as RSLs, PRGs, and CHHSLs to screen detected chemicals and then estimate risks and hazards inherently introduces uncertainty and may have overestimated actual risks (as compared to calculating site-specific risks) because the default exposure parameters built into the RSLs, PRGs, and lead CHSSL are conservative and intended to represent the worst case scenario.
- The exposure assessment assumed Site receptors are exposed to the same contaminant concentrations for the entire period of exposure and did not account for decreases in concentrations over time. Risks attributed to VOCs will decrease as VOCs degrade or volatilize. Similarly, as tritium decays, risk attributed to tritium will be reduced and then eliminated because it has a half-life of 11.3 years.
- Toxicity data is based largely on animal studies. Toxicity data from animal studies typically is adjusted conservatively to extrapolate effects on humans, which could overestimate risks.

Several other factors may have contributed to an underestimation of Site risks, as summarized below.

- Any experimental chemicals generated by laboratories and disposed of in the landfills may have undergone transformation through mixing with other chemicals. There may not be any analytical methods that would detect these chemicals. Therefore, risk estimates would not include contributions from these chemicals.
- A limited number of characterization samples were collected and analyzed.
- Analysis of samples from past investigations may not have detected some chemicals because of elevated reporting limits.
- Risks could be underestimated for a worker who is present at the Site for longer durations (i.e., longer than 25 years or more than 8 hours per day regularly, the standard worker exposure used for risk estimates) than a standard worker.
- Toxicity data (screening values) were not available for some analytes detected in soil gas when the HHRAs were conducted, including 1,3-dichlorobenzene and 4-ethyltoluene; therefore an evaluation of their contribution to vapor intrusion risk was not possible.

However, the most significant uncertainty that may have contributed to an underestimation of Site risks is the inability to fully characterize landfills and land disposal units because of their heterogeneous nature. Although the Soil FS refined the list of COCs, there are significant uncertainties associated with this approach because historical sampling conducted at the Site was not sufficient to fully characterize all the disposal units (i.e., to detect all of the chemicals and their maximum concentrations) and homogeneity across the disposal units cannot be assumed. For example, LEHR UCD is a research institution and each laboratory conducted unique research. Thus, each contributed varied and unique “waste streams” to the landfills. In addition, the disposal units are known to have received typical domestic and commercial wastes. Lack of historical documentation makes it impossible to know every type of waste that may have been placed into the landfills and disposal units as well as waste distribution patterns. Based on these uncertainties, it can be concluded that the Soil FS HHRA failed to consider the heterogeneity of the landfills and the standard statistical analyses that were used to eliminate COCs are not valid. The HHRA Parts A and C used even older datasets with the same limitations, which were subsequently updated with current data and used to calculate risks and hazards in the Soil FS HHRA. As a result, it is likely that Site risks were underestimated.

Since heterogeneity is common to most landfills, including the land disposal units at LEHR OCL, U.S. EPA has developed containment as the presumptive remedy for CERCLA municipal landfills. Although the LEHR OCL land disposal units are also known to contain hazardous wastes, the locations of all of the hazardous wastes are unknown and the risk of exposure associated with completely excavating and testing the disposal units to find all of the hazardous waste is high. The presumptive remedy (containment) specifies that as a matter of policy, for the source area of municipal landfills, a quantitative risk assessment that considers all chemicals, their potential additive effects, etc., is not necessary to establish a basis for action if ground-water data are available to demonstrate that contaminants clearly exceed established standards or if other conditions exist that provide a clear justification for action (U.S. EPA, 2015c). The potential unacceptable risks and hazards identified in the risk assessments combined with the uncertainties above provide a clear justification for action.

7.2 ECOLOGICAL RISKS

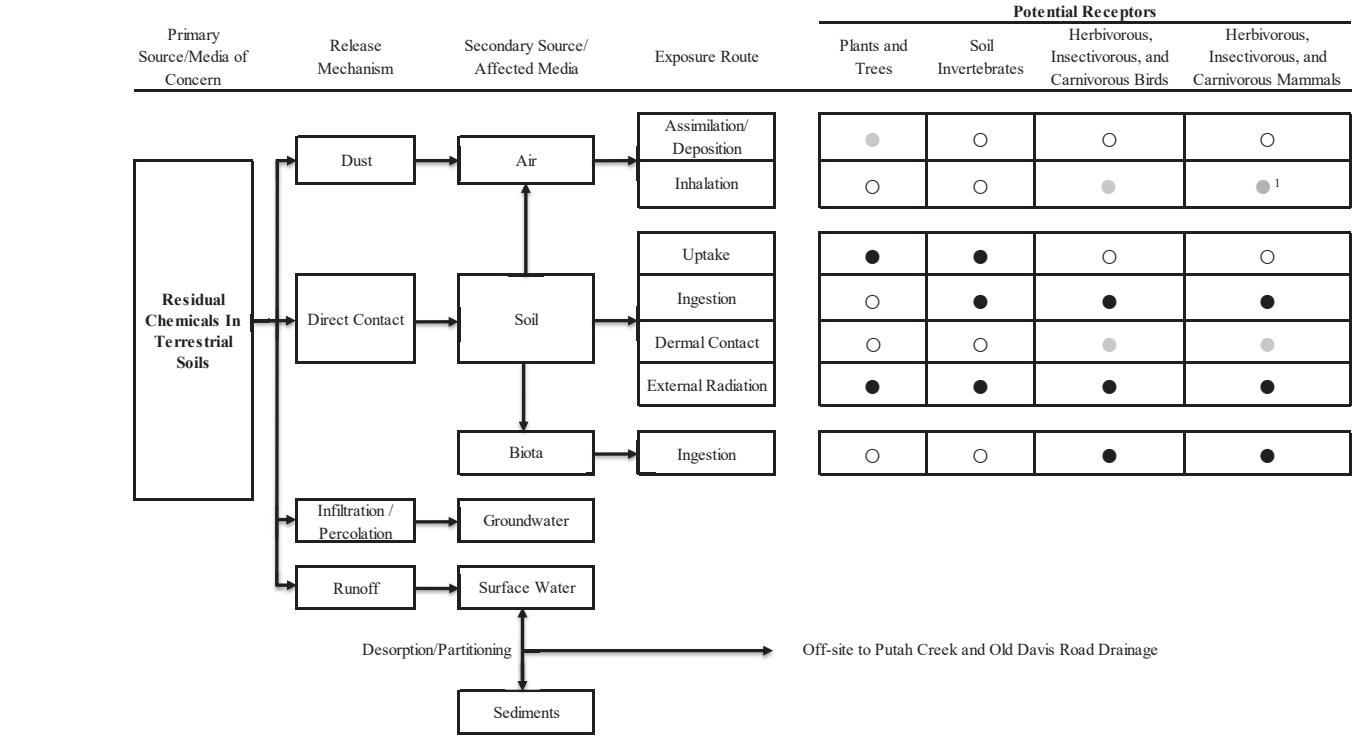
A site-wide ecological risk assessment (SWERA) was conducted for 14 on-site areas in 2006, including the LEHR/OCL Site (BBL, 2006). The primary objective of the SWERA was to evaluate potential on-site and offsite ecological risks associated with the Site using existing Site data and characterization reports. The CSM for evaluating ecological risks to terrestrial receptors for the soil/solid waste areas is presented on Figure 5.

For the on-site ecological risk evaluation, as described briefly in the subsections below, the SWERA consisted of a problem formulation, an exposure and effects assessment, a risk characterization, and an uncertainty analysis. Ecological COCs were selected based on a comparison of maximum detected concentrations to conservative benchmarks protective of ecological receptors. Potential risk was evaluated using ecological COCs occurring in the 0 to 10 foot depth interval bgs, rather than the standard ecological risk evaluation depth interval 0 to 6 ft bgs; this was done to maintain consistency with exposure estimates used in the human health risk assessment and to minimize rework that would not substantially change the results of the SWERA.

For the off-site ecological risk evaluation, the only identified ecological risk exposure pathway was from the desorption and partitioning of sediments in stormwater run-off; however, there is no indication the LEHR/OCL Site stormwater discharges significantly impact the sediment or the benthic community adjacent to or downstream (e.g., Putah Creek) of the Site (BBL, 2006).

7.2.1 SWERA Conclusions

Ecological risks were found to be acceptable for the Eastern Trenches, the Southern Trenches, and the WBH, and no further evaluation of ecological receptors was recommended for these parts of the Site. The risk evaluation identified ecological COCs in soil at LFU-1, LFU-2, and LFU-3 (Weiss, 2012a). The ecological COCs are presented in Table 3. In addition to the risks calculated for soil in LFU-2, a hazard quotient of 3.6 was calculated for chloroform in soil gas for the burrowing mammal receptor. This was the only soil gas ecological COC.



Definitions:
● Potentially complete exposure pathway.
○ Incomplete exposure pathway.
● Potentially complete, but minor exposure pathway.

Notes:
- Figure reproduced from Figure 2-5 in the SWERA (BBL, 2006).
1 Potentially complete exposure pathway for burrowing mammals only at Eastern Trenches and Landfill Unit No. 2.

Figure 5 Exposure Pathway Analysis for Terrestrial Habitat Ecological Receptors

Table 3 Summary of Ecological COCs from Exposure to Soil/Solid Waste Constituents at the LEHR/OCL Site

Receptor	Landfill Unit 1	Landfill Unit 2	Landfill Unit 3
Plants	As, Cu, Pb, Mn, Se, Ag, Tl, Zn	Cu, Pb, Mn, Mo, Ag, Tl, Zn	Sb, Cu, Pb, Mn, Mo, Se, Ag, Zn
Soil Invertebrates	Ba, Cu, Zn	Cu, Zn	Ba, Cu, Pb, Zn
Botta's Pocket Gopher	Cd, Cu, Pb, Se, Zn	Cd, Cu, Pb, Zn	Sb, Cd, Cu, Pb, Mn, Mo, Se, Zn
Ornate Shrew	As, Cd, Cu, Pb, Mn, Se, Zn	Sb, Cd, Cu, Pb, Mn, Zn	Sb, Cd, Cu, Pb, Mn, Mo, Se, Zn
American Robin	Cd, Cu, Pb, Mn, Se, Zn, 4,4'-DDE	Cd, Cu, Pb, Mn, Zn, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT	Cd, Cu, Pb, Mn, Se, Zn, Aroclor-1260
Horned Lark	Cd, Cu, Pb, Mn, Se, Zn, 4,4'-DDE	Cd, Cu, Pb, Mn, Zn, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT	Cd, Cu, Pb, Mn, Se, Zn, Aroclor-1260

Acronyms/Abbreviations:

Ag – silver
As – arsenic
Ba – barium
Cd – cadmium
COC – contaminant of concern
Cu – copper
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethene
DDT – dichlorodiphenyltrichloroethane
Mn – manganese
Mo – molybdenum
PB – lead
Sb – antimony
Se – selenium
Tl – thallium
Zn – zinc

7.2.2 Uncertainty Analysis

Uncertainties were inherent in each phase of the SWERA process. However, the ecological risk values are likely to overestimate the true risk associated with the Site because protective assumptions were made at many different steps during the ecological risk evaluation process and are compounded in the calculation of the risk estimates. For example, ecological COPCs were selected based on a comparison of maximum detected concentrations to conservative benchmarks protective of ecological receptors. In addition, the Tier 1 problem formulation identified receptors of concern that are representative species for each assessment endpoint. Receptors of concern were selected conservatively with consideration of their life history characteristics to maximize estimates of potential exposure. Finally, in the effects assessment, toxicological effects data were compared to ecological COPC concentrations or modeled doses. Benchmarks were selected as conservative estimates of potential toxic effects to minimize the possibility of reaching a finding of no risk when risk actually exists (BBL, 2006). To reiterate, the quantitative risk results of the SWERA were estimated based on modeled exposure and non-site-specific, literature-based toxicity benchmarks, and therefore are screening-level in nature. Thus, any determinations of potential risk based on the quantitative evaluation should not be considered definitive conclusions but should be interpreted as conservative estimates of potential risk.

7.2.3 Biological Assessment and U.S. FWS Biological Opinion

Because elderberry trees and shrubs are known habitat for the threatened VELB, and elderberry trees and shrubs located over land disposal areas will be impacted by the remedy, ICF International prepared a

biological assessment to determine to what extent the actions specified in the remedy may affect the VELB and its habitat. The biological assessment reported that 20 of the 81 elderberry shrubs located in proposed remedial action areas had exit holes on live stems that were similar in size and shape to those exit holes made by VELB, which suggests that the species occurs within the remedial action area. It should be noted that although elderberry trees and shrubs are designated critical habitat in some areas of the Sacramento River Valley, the biological assessment states, "The action area is not located within designated critical habitat" for the VELB (ICF International, 2016).

The biological assessment concluded that the remedy is likely to adversely affect the VELB (ICF International, 2016). This biological assessment triggered formal consultation with the U.S. Fish and Wildlife Service (USFWS). USFWS evaluated potential impacts to the VELB and prepared a biological opinion. The biological opinion noted that construction and activities associated with the remedy will directly affect 17 elderberry shrubs, some of which showed evidence of the VELB being present. To address these effects, UC Davis will transplant the eight shrubs located outside the areas to be remediated to a designated mitigation area. UC Davis also will purchase conservation credits to offset the uprooting and destruction of 9 elderberry shrubs rooted in the areas affected by remedial action. For these reasons, the USFWS concluded that the remedy is not likely to jeopardize the continued existence of the VELB (USFWS, 2016).

7.3 GROUNDWATER IMPACT ASSESSMENT

An appropriate evaluation of remedial options for the UC Davis disposal units requires consideration of protection of groundwater from COCs because of the potential for their migration from the disposal units to groundwater. For this reason, a groundwater impact assessment was performed to assess the current and potential future impacts to groundwater by COCs identified in the UC Davis disposal units (Weiss, 2012a).

A number of VOCs were added as COPCs based on their detection in data gap soil gas samples collected at 5, 10, and 15 ft bgs. With the exception of isopropanol, hexane, and ethanol, all VOCs detected in soil gas were retained as COPCs for evaluation through vadose zone modeling to simulate contaminant transport from the vadose zone to groundwater. The results of this vadose zone modeling were used to estimate the time required for UC Davis area source material to migrate through the vadose zone and to determine soil cleanup levels protective of groundwater quality (designated levels [DLs]). The primary source of groundwater goals was the California Maximum Contaminant Levels (MCLs) for drinking water. If MCLs were unavailable, the U.S. EPA RSLs for tap water were used. The Cal EPA risk-based target of 1.1 microgram per liter (µg/L) for groundwater was used for chloroform. California notification levels were used as goal concentrations for carbon disulfide, 1,4-dioxane and formaldehyde. Background levels for inorganic constituents and sample detection limits for organic constituents were also used to provide baseline goals (Weiss, 2010).

To facilitate risk management decisions, the risk characterization evaluated and made recommendations on whether groundwater COPCs should be evaluated as a COCs in the Soil FS. Groundwater COPCs were examined on an individual basis to evaluate the lines of evidence indicating whether a threat to groundwater resources exists.

Once the modeling was completed, the resultant DLs were used, along with Site groundwater monitoring data and disposal unit soil/soil gas characterization data, to conduct a three-step risk estimate procedure for each DL COPC in each disposal unit. DL COPCs whose peak impact was predicted to occur in less than 500 years were identified as groundwater COPCs and carried forward into the risk characterization, while those with longer peak impact times were eliminated (Weiss, 2010).

Based on the results of the risk characterization, the following COCs with the potential to impact groundwater were identified:

- **Eastern Trenches:** carbon-14; tritium; chloroform; 1,1-DCA; 1,2-DCA; 1,2-DCP; 1,4-dioxane
- **LFU-1:** copper; selenium; carbon-14
- **LFU-2:** cadmium; carbon-14; acetone; chloroform; 1,1-DCA; 1,2-DCP; 1,4-dioxane
- **LFU-3:** barium; cadmium; copper; carbon-14, formaldehyde
- **WBHs:** carbon-14; tritium; 1,4-dioxane
- **Southern Trenches:** none identified

Soil gas COCs that were identified in the groundwater impact assessment as having the potential to impact groundwater were evaluated in conjunction with additional groundwater data collected during the first quarter of 2010. As a result of this evaluation, acetone, formaldehyde, 1,1-DCA, 1,2-DCP, and 1,4-dioxane were eliminated as Soil FS COCs (Weiss, 2012a); however, these contaminants may be retained as groundwater COCs in the future. The final soil gas COCs with the potential to impact groundwater are chloroform and 1,2-DCA at the Eastern Trenches and chloroform at LFU-2. It should be noted that although the Soil FS established preliminary soil cleanup goals for these COCs in order to evaluate alternatives other than containment with engineered covers, the cleanup goals are not applicable if engineered covers are installed over the landfills because a containment-based remedy does not treat or reduce concentrations.

7.4 SUMMARY OF SITE RISKS AND BASIS FOR REMEDIAL ACTION

The response action selected in this ROD is necessary to protect public health or welfare and the environment from actual or threatened releases of hazardous substances into the environment, which may present an imminent and substantial endangerment to public health or welfare. The response action is warranted because:

- Soil contamination in the waste disposal units has the potential to migrate via precipitation infiltration through the vadose zone and affect groundwater quality, or surface water via erosion and stormwater run-off. In addition, humans may be exposed to contaminants and buried waste.
- VOC soil gas concentrations exceed screening levels for the protection of on-site workers and potential future residents.
- Metals, non-metals, pesticides, and PCBs pose unacceptable risk to on-site ecological receptors.

8.0 REMEDIAL ACTION OBJECTIVES

U.S. EPA has developed remedial action objectives (RAOs) to describe how the remedy is expected to address Site risks. These RAOs take into consideration current and reasonably anticipated future land uses and address exposure risks based on the removal of contamination and the isolation of potential receptors from remaining contamination. RAOs for the Site include those for the protection of human health, groundwater quality, and the environment as described below:

- Prevent human contact (ingestion, inhalation, and dermal) with contamination in soil/solid waste, and soil gas which poses an excess cumulative cancer risk greater than the risk

management range of 1 x 10^{-6} to 1 x 10^{-4}, or a cumulative cancer risk greater than 1 x 10^{-6} for persons (i.e., students) living in the dairy goat barn.

- Prevent human contact (ingestion, inhalation, and dermal) with contamination in soil/solid waste and soil gas which poses a non-cancer hazard with an HI greater than 1.0;
- Prevent landfill waste and contaminated soil and soil gas from migrating and affecting groundwater quality;
- Minimize ecological receptor exposure, including, but not limited to, sensitive and critical habitats of species protected under the state and federal Endangered Species Acts; and
- Prevent surface water or storm water contact with landfill waste or soil contaminated above cleanup levels.

8.1 BASIS AND RATIONALE FOR REMEDIAL ACTION OBJECTIVES

RAOs provide a general description of what the cleanup will accomplish at the Site. These objectives serve as the design bases for the remedial alternatives, which are presented in Section 9.

Additionally, the RAOs were selected in consideration of the Site's current and reasonably anticipated future land use for the construction of low-density buildings serving academic and administrative purposes[1].

8.2 HOW THE REMEDIAL ACTION OBJECTIVES ADDRESS RISKS

The RAOs address unacceptable risks identified in the risk assessments by targeting the minimization of exposure to ensure that the risks remaining after implementation of the remedy will be below or within the U.S. EPA's risk management range (1 x 10^{-6} to 1 x 10^{-4}) for the reasonably anticipated future land use. Because the selected remedy involves leaving contamination in place that is acceptable for industrial/commercial use, the RAOs for residential exposure will be achieved by ICs which prevent residential use until cleanup levels are achieved.

8.3 BASIS OF CLEANUP LEVELS

As described further in the subsection below, Site-specific cleanup levels for soil/solid waste and soil gas were developed for the VOC "hot spot" excavation areas needed to achieve protection of human health and groundwater resources. Existing soil gas data indicate that the "hot spots" are located above a depth of 15 ft bgs and excavation to 20 ft bgs is planned. The lateral extent of the excavation areas will be determined by sampling during the RD stage.

8.3.1 Cleanup Levels – Soil/Solid Waste and Soil Gas

Cleanup levels in the two VOC "hot spot" areas for the identified VOCs in soil and VOCs in soil gas that potentially could impact groundwater quality and pose unacceptable human health risks are presented in Table 4. The list of VOCs includes additional chemicals that have been detected during sampling conducted at the Site after the Soil FS sampling was completed in 2010. U.S. EPA industrial RSLs for soil and indoor air were selected as the final cleanup levels for VOCs of concern in soil gas. RSLs are calculated at a 10^{-6} risk and a Hazard Index less than 1. Due to the uncertainty associated with the time

[1] Residential use and use by sensitive receptors (e.g., day care centers, public or private schools for persons under 18 years of age, hospitals, etc.) on the Site will be prohibited.

elapsed since cleanup levels were developed in the soil vapor risk assessment and the groundwater impact assessment, U.S. EPA industrial RSLs (U.S. EPA, 2016a) were selected as the final cleanup levels for VOCs of concern for soil and soil gas. RSLs for industrial indoor air, with an attenuation factor, will be used as a screening tool to define the lateral extent of each VOC "hot spot" excavation. RSLs for industrial soil will be used to confirm whether or not excavation of "hot spots" is complete. Further, because of the heterogeneous nature of the landfills, there is potential that sampling may identify other contaminants that are not currently identified as COCs during excavation of the VOC "hot spots." These contaminants will be addressed as follows:

- For portions of the landfill or burial areas that are excavated and placed under a multiple-layer cap, the soil cleanup levels will be industrial RSLs.

- For metals and non-metals, the higher of background or the industrial soil RSLs will be used, except for lead. The commercial/industrial CHSSL will be the soil cleanup level for lead.

- For other contaminants, the industrial soil RSLs will be used.

The cleanup levels apply only during excavation of the VOC "hot spots," unless VOCs are detected in soil when the retention basins or drainage channels are excavated. Cleanup levels are documented as the May 2016 RSLs for soil and indoor air (except lead as noted above) and are included in Attachment A. The RSLs are based on a risk of 1×10^{-6} and a hazard index of 1.0.

Importantly, U.S. EPA did not develop chemical-specific cleanup levels for other Site COCs (e.g., copper) outside the VOC "hot spots" because of (1) uncertainties related to the heterogeneous nature of the contents of the landfills, (2) uncertainties associated with the HHRA methodology, and (3) the invalid elimination of COCs in the Soil FS. To address these uncertainties and to minimize the potential for contact with buried wastes, the selected remedy specifies construction of multiple-layer caps and drainage enhancements and utilizes land use controls. The multiple-layer caps will protect current and potential future receptors by preventing exposure to soil/soil gas contaminants and landfill wastes. The multiple-layer caps and drainage enhancements will also protect groundwater quality by minimizing precipitation infiltration through soil contamination and buried wastes, thereby minimizing the potential for leaching and transport of Site COCs to groundwater.

Similarly, EPA did not develop COC-specific cleanup levels for the protection of ecological receptors because of the uncertainties in the risk estimates (BBL, 2006). Nevertheless, the selected presumptive containment remedy will protect ecological receptors by preventing exposure to contaminated soil and landfill wastes.

Table 4 VOC Cleanup Levels for the LEHR/OCL Site
Updated January 2017 per Memo to File

COC	Soil Cleanup Level (mg/kg)	Indoor Air Screening Level (ug/m^3)	Basis
1,1-DCA	16	7.7	Industrial RSL
1,1-DCE	1000	880	"
1,1,2-TCA	5	0.77	"
1,2-DCA	2	0.47	"
1,2-DCP	4.4	1.2	"
1,2,3-TCP	0.11	1.3	"
1,3-Butadiene	0.26	0.41	"
Bromodichloromethane	1.3	0.33	"
Chloroform	1.4	0.53	"
PCE	100	47	"

Notes:

The list of VOCs of concern includes additional chemicals that have been detected during sampling conducted at the Site after the Soil FS sampling was completed in 2010, in addition to those previously identified as COCs. Due to the uncertainty with the time elapsed since cleanup levels developed in soil vapor risk assessment and the groundwater impact assessment, as a conservative measure, the U.S. EPA industrial RSLs for soil and indoor air were selected as the final cleanup levels for VOCs of concern in soil gas. RSLs are calculated at a 10^{-6} risk.

To determine an appropriate cleanup level for gas in soil, EPA uses the indoor air value and calculates an appropriate concentration using the following formula: soil gas = indoor air/attenuation coefficient. The current attenuation co-efficient used by EPA is 0.03, (OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air, June 2015).

Acronyms/Abbreviations:

ug/m^3 – microgram per cubic meter
COC – contaminant of concern
DCA – dichloroethane
DCE – dichloroethene
DCP – dichloropropane
mg/kg – milligram per kilogram
PCE – tetrachloroethene
RSL – Regional Screening Level
TCA – trichloroethane
TCP – trichloropropane

References:

U.S. EPA, 2016a. Regional Screening Level (RSL) Summary Table (TR=1E-6, HQ=1) May 2016.

9.0 DESCRIPTION OF ALTERNATIVES

Ten remedial alternatives were considered for the LEHR/OCL Site. Alternatives were screened out if they were not protective of human health and the environment or if they did not comply with applicable or relevant and appropriate requirement (ARARs). The alternatives that met these two criteria are described in detail below. A No Further Action alternative (SW-1), which is not protective of human health and does not comply with ARARs, is included as a baseline for comparative analysis.

The ten evaluated alternatives are as follows:

- SW-1 – No Action/No Further Action;
- SW-2 – Institutional Controls and Groundwater Monitoring;
- SW-3 – Soil, Solid Waste, and VOC "Hot Spot" Removal, Three CAMUs with Graded Covers, Institutional Controls, Drainage Controls, Groundwater Monitoring;
- SW-4 – Soil, Solid Waste, and VOC "Hot Spot" Removal, Three CAMUs with Evapotranspiration Covers, Institutional Controls, Drainage Controls, Groundwater Monitoring;
- SW-5 – Soil, Solid Waste, and VOC "Hot Spot" Removal, Three CAMUs with Asphalt Covers, Institutional Controls, Drainage Controls, Groundwater Monitoring;
- SW-6 – VOC "Hot Spot" Removal, Three CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Controls, Groundwater Monitoring;
- SW-7 – Soil, Solid Waste, and VOC "Hot Spot" Removal, Two CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Controls, Groundwater Monitoring;
- SW-8 – Soil, Solid Waste, and VOC "Hot Spot" Removal, One CAMU with Multiple-Layer Cap, Institutional Controls, Drainage Controls, Groundwater Monitoring;
- SW-9 – Excavate and Dispose of Most Soil and Solid Waste Off-Site, One CAMU with Multiple-Layer Cap, Institutional Controls, Drainage Controls, Groundwater Monitoring; and
- SW-10 – Excavate and Dispose Soil and Solid Waste Off-Site, Institutional Controls, Drainage Controls, Groundwater Monitoring.

9.1 COMMON ELEMENTS, SW-2 THROUGH SW-10

All of the alternatives, with the exception of Alternatives SW-1 and SW-10, include the following common elements (Alternative SW-10 includes all the elements discussed below with the exception of leaving waste in place):

Leaving contamination and waste in place: All of the alternatives considered for LEHR/OCL Site are containment remedies, meaning contamination and/or solid waste, to varying degrees, would be left in place. COCs would be left in the subsurface.

Groundwater Monitoring: Long-term groundwater monitoring will be conducted to confirm that the remedy remains protective of migration to groundwater and contamination does not migrate off-site. A remedy for groundwater will be selected in a future groundwater ROD.

Elderberry Shrub Mitigation: Elderberry shrubs, the sole host plant for the VELB, which is listed as threatened under the Endangered Species Act (ESA), grow on the Site. In compliance with the Biological Opinion issued by the USFWS pursuant to the ESA, mitigation is required for the nine shrubs that will be destroyed during the remedial action. Eight shrubs will be moved to a mitigation area.

Stormwater Monitoring: Long-term storm water monitoring will be required.

Institutional Controls: Land use covenants and ICs will prevent future development or activities incompatible with the designated land use. ICs include the following components:

- Codified land use restriction in coordination with the University of California Office of the President (UCOP), Real Estate Services Group, and the UC Davis Office of Administrative and Resource Management;
- Recordation with Solano County of a land use covenant to prohibit residential and other land use by sensitive populations, and to restrict the non-residential use of the approximately 6.4 acres of disposal areas including LFU-1, LFU-2, LFU-3, the Eastern Trenches, the Southern Trenches, WBH, the HFSDA, and any other co-located areas. This includes:
    - Access to designated monitoring wells;
    - Restriction of drilling or other subsurface penetration and access to groundwater;
    - Restriction to surface changes affecting drainage, infiltration, and potential COC mobilization;
- Assessment and mitigation of potential vapor intrusion hazards to buildings during remedial design;
- A soil management plan to manage future excavations, drainage repair and enhancements, and any other future soil work; and
- Signs to notify workers of potential subsurface hazards.

Five-year Reviews: Because the property will not be cleaned up to allow for unrestricted future use, five-year reviews will be required in perpetuity.

Other Common Elements: The following elements are included in most but not all alternatives. None of these elements are included in Alternatives SW-1 and SW-2.

Engineered Cap: Alternatives SW-4 through SW-9 include one or more engineered caps.

Corrective Action Management Units: Alternatives SW-3 through SW-9 include "CAMUs", which are on-site areas for management/containment of wastes generated during environmental cleanup activities.

Removal of Known Soil Contamination and Solid Waste: All Alternatives except SW-2 and SW-6 include excavation of known chemical wastes and solid waste.

Removal of VOC "Hot Spots": Alternatives SW-3 through SW-10 include excavation of VOC "hot spots."

Building Removal: Alternative SW-3 includes the removal of one building [Cobalt-60 Annex (H-290)] to allow for excavation, construction, and proper grading of a CAMU. Alternatives SW-4 through SW-10 include removal of at least nine buildings [Cobalt-60 Annex (H-290), Geriatrics Building No. 1 (H-292), Geriatrics Building No. 2 (H-293), X-1, X-2, X-3, X-4, X5, and W3] to allow for excavation, construction, and proper grading of one or more CAMUs.

Data Gap Investigation: Alternatives SW-3 through SW-6 include further investigation of the Hopland Field Station Disposal Area and Southern Trenches during the remedial design to determine the extent of wastes. If soil does not meet Regional Screening Levels, it will be excavated or capped.

Backfill and Grading: Alternatives SW-3 through SW-10 include backfilling of excavated areas with clean soil followed by grading.

Drainage Enhancement: Alternatives SW-3 through SW-10 include drainage enhancements. Monitoring and maintenance of drainage enhancements are also required.

Monitoring Requirements: Alternatives SW-3 through SW-9 require cover/cap monitoring and maintenance. Long-term maintenance is required to ensure cap integrity.

9.2 DESCRIPTION OF ALTERNATIVES, UNIQUE FEATURES

This section presents each of the cleanup alternatives and describes the features that are unique to each remedial option. For each alternative the key components, O&M activities, monitoring requirements, length of time for implementation, and present value costs are included. A summary of the components of Alternatives SW-2 through SW-10 is provided in Table 5.

Alternative SW-1 – No Action/No Further Action.

U.S. EPA is required to consider a no action alternative. Under this alternative, no more steps would be taken to reduce the risk to human health and the environment and no use restrictions would be placed on the property.

Alternative SW-2 – Institutional Controls and Groundwater Monitoring

- Soil, waste, and soil gas left largely undisturbed
- 332 cubic yards excavated to investigate HFSDA and Southern Trenches
- Groundwater monitoring

This alternative has an estimated time frame of 1 year and a present value cost of approximately $6.4 million.

Alternative SW-3 – Soil, Solid Waste, and VOC "Hot Spot" Removal, Three CAMUs with Graded Covers, Institutional Controls, Drainage Controls, Groundwater Monitoring

- Excavation and off-site disposal of known chemical wastes, solid waste, and two soil gas VOC "hot spot" areas to a depth of 20 ft bgs (approximately 3,360 cubic yards)
- Most soil and waste left on-Site in three CAMUs with graded soil covers (10,895 cubic yards excavated and placed in CAMUs)
- Two storm water retention basins and numerous drainage swales

This alternative has an estimated time frame of 1 year and a present value cost of approximately $13.1 million.

Alternative SW-4 – Soil, Solid Waste, and VOC "Hot Spot" Removal, Three CAMUs with Evapotranspiration Covers, Institutional Controls, Drainage Controls, Groundwater Monitoring

- Excavation and off-site disposal of known chemical wastes, solid waste, and two soil gas VOC "hot spot" areas to a depth of 20 ft bgs (approximately 3,360 cubic yards)
- Most soil and waste left on-Site in three CAMUs with evapotranspiration covers (16,109 cubic yards excavated; the difference from SW-3 is the soil/solid waste that will be excavated from drainage channels adjacent to LFU-1 and from within the boundaries of LFU-3 and placed in CAMUs)
- Two storm water retention basins and numerous drainage swales

This alternative has an estimated time frame of 1 year and a present value cost of approximately $18.2 million.

Alternative SW-5 – Soil, Solid Waste, and VOC "Hot Spot" Removal, Three CAMUs with Asphalt Covers, Institutional Controls, Drainage Controls, Groundwater Monitoring

- Excavation and off-site disposal of known chemical wastes, solid waste, and two soil gas VOC "hot spot" areas to a depth of 20 ft bgs (approximately 3,360 cubic yards)
- Most soil and waste left on-Site in three CAMUs with high density polyethylene-lined asphalt pavement covers (16,109 cubic yards excavated and placed in CAMUs)
- Two storm water retention basins and numerous drainage swales

This alternative has an estimated time frame of 1 year and a present value cost of approximately $20.7 million.

Alternative SW-6 – VOC "Hot Spot" Removal, Three CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Controls, Groundwater Monitoring

- Excavation and off-site disposal of two soil gas VOC "hot spot" areas to a depth of 20 ft bgs (approximately 2,420 cubic yards)
- Excavation of the northern portions of LFU-2 and the Eastern Trenches and consolidation of the excavated materials under a CAMU cover and leave known chemical wastes in place
- Most soil and waste left on-Site in three CAMUs with multiple-layer covers (foundation layer, low-permeability synthetic layer, compacted clay layer, drainage layer, bio-protection layer, and upper soil layer) (21,883 cubic yards excavated, including the northeastern portion of LFU-2 and the Eastern Trenches, and placed in CAMUs)
- Two storm water retention basins and numerous drainage swales

This alternative has an estimated time frame of 1 year and a present value cost of approximately $15.7 million.

Alternative SW-7 – Soil, Solid Waste, and VOC "Hot Spot" Removal, Two CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Controls, Groundwater Monitoring

- Excavation and off-site disposal of known chemical wastes, solid waste, and two soil gas VOC "hot spot" areas to a depth of 20 ft bgs (approximately 3,360 cubic yards)
- Most soil and waste left on-Site in two CAMUs with multiple-layer covers (36,576 cubic yards excavated, including all of LFU-3, and placed in CAMUs)
- One storm water retention basin and fewer drainage swales than SW-5 or SW-6

This alternative has an estimated time frame of 1 year and a present value cost of approximately $20.4 million.

Alternative SW-8 – Soil, Solid Waste, and VOC "Hot Spot" Removal, One CAMU with Multiple-Layer Cap, Institutional Controls, Drainage Controls, Groundwater Monitoring

- Excavation and off-site disposal of known chemical wastes, solid waste, and two soil gas VOC "hot spot" areas to a depth of 20 ft bgs (approximately 3,360 cubic yards)
- Most soil and waste left on-Site in one CAMU with multiple-layer cover, bottom liner, and leachate collection system (270,931 cubic yards and placed in CAMUs)

- Underground culverts, one storm water retention basin and fewer drainage swales than SW-7

This alternative has an estimated time frame of 2 years and a present value cost of approximately $32.7 million.

Alternative SW-9 – Excavate and Dispose of Most Soil and Solid Waste Off-Site, One CAMU with Multiple-Layer Cap, Institutional Controls, Drainage Controls, Groundwater Monitoring

- Excavation and off-site disposal of most waste (approximately 114,326 cubic yards) to a depth of 20 feet, including soil from the VOC "hot spot" areas
- Excavation and consolidation of wastes from the HFSDA and Southern Trenches into the Waste Burial Holes CAMU with a multiple-layer cover (2,832 cubic yards excavated and placed in CAMU)
- Limited drainage enhancements

This alternative has an estimated time frame of 2 years and a present value cost of approximately $101.7 million.

Alternative SW-10 – Excavate and Dispose of Soil and Solid Waste Off-Site, Institutional Controls, Drainage Controls, Groundwater Monitoring;

- Excavation and off-site disposal of all known chemical wastes and solid waste, including soil from the VOC "hot spot" areas (approximately 123,386 cubic yards) to a depth of 20 feet
- Limited drainage enhancements

This alternative has an estimated time frame of 2 years and a present value cost of approximately $108.3 million.

Table 5 Major Components of the Remedial Alternatives for the LEHR/OCL Site

Components Included in the Remedial Alternatives[1]	SW-2	SW-3	SW-4	SW-5	SW-6[2]	SW-7	SW-8	SW-9	SW-10
Elderberry Shrub Cluster Relocation		✓	✓	✓	✓	✓	✓	✓	✓
Data Gap Investigation (HFSDA and Southern Trenches)	✓	✓	✓	✓	✓				
Demolish Cobalt-60 Annex		✓							
Demolish Animal Buildings X-1 through X-5, Geriatrics Building No. 1 (H-292), Geriatrics Building No. 2 (H-293), Storage Building W-3, and the Cobalt-60 Annex			✓	✓	✓	✓	✓	✓	✓
Decommissioning of Groundwater Monitoring Wells			✓	✓	✓	✓	✓	✓	✓
Area Excavation for CAMU Construction		✓	✓	✓	✓	✓	✓	✓	
Known Chemical Waste Excavation		✓	✓	✓		✓	✓	✓	✓
Excavation of VOC "hot spots," Confirmation Sampling, Backfill		✓	✓	✓	✓	✓	✓	✓	✓
Establish Graded Cover		✓							
Consolidate Waste and Evapotranspiration Cover			✓						
Consolidate Waste and Asphalt Cap				✓					
Consolidate Waste and Multiple-Layer Cap					✓	✓	✓	✓	
Levee Easement Setback		✓	✓	✓	✓	✓	✓	✓	
Landfill Liner							✓		
LFU-3 Concrete-Lined Drainage Channel Sealed		✓							
LFU-3 Concrete-Lined Drainage Channel Demolition/Reconstruction - Portion of concrete-lined drainage channel demolished, concrete re-established after excavation			✓	✓	✓				
LFU-3 Concrete-Lined Drainage Channel - Entire concrete-lined drainage channel demolished, replaced with a vegetated drainage channel after excavation. Erosion controls would be installed as appropriate, and may include geotextiles and/or rip-rap						✓	✓	✓	✓
LFU-3 East-West-Trending Drainage Ditch Relocation		✓	✓	✓	✓	✓	✓	✓	✓
LFU-1 Concrete-Lined Drainage Channel		✓							
LFU-1 Drainage/Vegetated Swale			✓	✓	✓	✓	✓	✓	✓
Storm Water Collection and Conveyance System		✓	✓	✓	✓	✓	✓		
Storm Water Lift Station at LFU-2/WBH/Eastern Trenches		✓	✓	✓	✓	✓	✓		
Storm Water Lift Station at LFU-3		✓	✓	✓	✓				
Extended Detention Basin		✓	✓	✓	✓	✓	✓		
Cover/Cap Monitoring and Maintenance		✓	✓	✓	✓	✓	✓	✓	
Drainage Controls Monitoring and Maintenance		✓	✓	✓	✓	✓	✓	✓	✓
Groundwater Monitoring Well Installation	✓	✓	✓	✓	✓	✓	✓	✓	✓
Groundwater and Storm Water Monitoring	✓	✓	✓	✓	✓	✓	✓	✓	✓
Land Use/Institutional Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Five-Year Reviews	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes:
1 Alternative SW-01 has not been included in the table because there are no remedy components for the No Action/No Further Action alternative.
2 This alternative has been modified since it was originally presented in the Soil FS to align it more closely with the presumptive remedy for landfills.

Acronyms/Abbreviations:
CAMU – corrective action management unit
LFU – landfill unit
O&M – operations and maintenance
VOC – volatile organic compound
WBH – waste burial holes

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF REMEDY ALTERNATIVES

In accordance with 40 C.F.R. § 300.430(e)(9)(iii), U.S. EPA evaluated and compared the remedial alternatives using nine evaluation criteria to determine which alternative to select.

The nine evaluation criteria, described in greater detail below, are:

1. Overall protection of human health and the environment;
2. Compliance with applicable or relevant and appropriate requirements (ARARs);
3. Long-term effectiveness and permanence;
4. Reduction of toxicity, mobility, or volume through treatment;
5. Short-term effectiveness;
6. Implementability;
7. Cost;
8. State acceptance; and
9. Community acceptance

The first two criteria, overall protection and compliance with ARARs, are defined under CERCLA as "threshold criteria." If an alternative does not meet both of these criteria, it is not eligible for selection. Criteria three through seven are defined as "balancing criteria." These criteria are used to weigh major trade-offs among alternatives. The last two criteria, state and community acceptance, are defined as "modifying criteria." In the final comparison of alternatives, modifying criteria and balancing criteria are of equal importance. Table 6 ranks the alternatives in terms of in terms of whether they satisfy each threshold and balancing criterion.

Alternatives SW-1 through SW-4 do not meet one or both of the threshold criteria and are not eligible for selection; therefore, Alternatives SW-2 through SW-4 are not included in the evaluation of the balancing and modifying criteria. For purposes of comparison as required by the NCP, Alternative SW-1 is included in the evaluation. Table 7 summarizes the comparative analysis of threshold, balancing, and modifying criteria for Alternatives SW-5 to SW-10. Additional information regarding the comparison of alternatives can be found in the Soil FS (Weiss, 2012a).

Table 6 Ranked Comparative Analysis of Alternatives for the LEHR/OCL Site

Remedial Alternative	Overall Protection of Human Health and Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume via Treatment[1]	Short-term Effectiveness	Implementability	Approximate Present Value Cost ($ Millions)
SW-1: No Action/No Further Action	No	No	⊕	⊕	⊕	●	$0
SW-2: Institutional Controls and Groundwater Monitoring	No	No	—[2]	—[2]	—[2]	—[2]	$6.4
SW-3: Soil, Solid Waste, and VOC "Hot Spot" Removal, Three On-Site CAMUs with Graded Covers, Institutional Controls, Drainage Controls, and Groundwater Monitoring	No	No	—[2]	—[2]	—[2]	—[2]	$13.1
SW-4: Soil, Solid Waste, and VOC "Hot Spot" Removal, Three On-Site CAMUs with Evapotranspiration Covers, Institutional Controls, Drainage Controls, and Groundwater Monitoring	No	No	—[2]	—[2]	—[2]	—[2]	$18.2
SW-5: Soil, Solid Waste, and VOC "Hot Spot" Removal, Three On-Site CAMUs with Asphalt Caps, Institutional Controls, Drainage Controls, and Groundwater Monitoring	Yes	Yes	◑	⊕	●	◕	$20.7
SW-6[3]: VOC "Hot Spot" Removal, Three On-Site CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Controls, and Groundwater Monitoring	Yes	Yes	◑	⊕	●	◕	$15.7
SW-7: Soil, Solid Waste, and VOC "Hot Spot" Removal, Two On-Site CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Controls, and Groundwater Monitoring	Yes	Yes	◑	⊕	◕	◑	$20.4
SW-8: Soil, Solid Waste, and VOC "Hot Spot" Removal, One On-Site Lined CAMU with Multiple-Layer Cap, Institutional Controls, Drainage Controls, and Groundwater Monitoring	Yes	Yes	◕	⊕	◕	◑	$32.7
SW-9: Excavate and Dispose Most Soil and Solid Waste Off-Site, One On-Site CAMU with Multiple-Layer Cap, Institutional Controls, Drainage Controls, and Groundwater Monitoring	Yes	Yes	●	⊕	◑	◑	$101.7
SW-10: Excavate and Dispose of Soil and Solid Waste Off-Site, Institutional Controls, Drainage Controls, and Groundwater Monitoring	Yes	Yes	●	⊕	◑	◑	$108.3

Notes:

Not acceptable — More acceptable

1 Alternatives SW-1 and SW-2 do not include the use of treatment technologies. Alternatives SW-3 through SW-10 may include ex situ treatment (e.g., soil solidification/stabilization) of a fraction of the hazardous and mixed waste to render it non-hazardous prior to off-site disposal.

2 Alternatives SW-2 through SW-4 failed to meet the threshold criteria, so the remaining criteria are not evaluated here. Alternative SW-1 also failed to meet the threshold criteria, but is evaluated as a baseline for comparative analysis purposes.

3 This alternative has been modified since it was originally presented in the Soil FS to align it more closely with the presumptive remedy for landfills. Excavation of known chemical wastes was eliminated.

Table 7 Comparative Analysis of Alternatives

Remedial Alternative[1]	SW-5	SW-6[3]	SW-7	SW-8	SW-9	SW-10
Overall Protection of Human Health and Environment	ICs would prohibit residential development and restrict non-residential development. Monitoring would confirm long-term protection of human health and the environment. Additional protectiveness would be achieved through removal of 150 LCY of known chemical wastes, removal of 2,516 LCY of hazardous material (including the two VOC “hot spot” areas), and minimizing infiltration via asphalt caps and storm water drainage enhancements. This alternative meets each RAO.	ICs would prohibit residential development and restrict non-residential development. Monitoring would confirm long-term protection of human health and the environment. Additional protectiveness would be achieved through removal of 15 LCY of known chemical wastes, removal of 3,380 LCY of hazardous and non-hazardous material (including the two VOC “hot spot” areas), and minimizing infiltration via multiple-layer caps and storm water drainage enhancements. This alternative meets each RAO.	ICs would prohibit residential development and restrict non-residential development. Monitoring would confirm long-term protection of human health and the environment. Additional protectiveness would be achieved through removal of 387 LCY of known chemical wastes, removal of 4,550 LCY of hazardous and non-hazardous material (including the two VOC “hot spot” areas), and minimizing infiltration via multiple-layer caps and storm water drainage enhancements. This alternative meets each RAO.	ICs would prohibit residential development and restrict non-residential development. Monitoring would confirm long-term protection of human health and the environment. Additional protectiveness would be achieved through removal of 1,116 LCY of known chemical wastes, removal of 21,471 LCY of hazardous and non-hazardous material (including the two VOC “hot spot” areas), and minimizing infiltration via multiple-layer caps and storm water drainage enhancements. This alternative meets each RAO.	ICs would prohibit residential development and restrict non-residential development. Monitoring would confirm long-term protection of human health and the environment. Additional protectiveness would be achieved through removal of 1,116 LCY of known chemical wastes, removal of 115,231 LCY of hazardous and non-hazardous material (including the two VOC “hot spot” areas), and minimizing infiltration via multiple-layer cap over the WBH. This alternative meets each RAO.	ICs would prohibit residential development and restrict non-residential development. Monitoring would confirm long-term protection of human health and the environment. Additional protectiveness would be achieved through removal of 1,116 LCY of known chemical wastes, removal of 124,269 LCY of hazardous and non-hazardous material (including the two VOC “hot spot” areas) and minimizing infiltration via storm water drainage enhancements. This alternative meets each RAO.
Compliance with ARARs	Compliant with all ARARs. Wastes and/or contaminated soil would remain in place. Potential vertical migration of COCs would be curtailed by limiting infiltration, isolating waste, and removing VOC source material. ARARs for designating and constructing CAMUs at the Site would be met. Action- and chemical-specific ARARs for air emissions would be met by developing and implementing appropriate engineering and administrative controls during demolition, excavation, grading, construction, covering/capping, and maintenance activities, including compliance with levee access requirements.	Compliant with all ARARs. Wastes and/or contaminated soil would remain in place. Potential vertical migration of COCs would be curtailed by limiting infiltration, isolating waste, and removing VOC source material. ARARs for designating and constructing CAMUs at the Site would be met. Action- and chemical-specific ARARs for air emissions would be met by developing and implementing appropriate engineering and administrative controls during demolition, excavation, grading, construction, covering/capping, and maintenance activities, including compliance with levee access requirements.	Compliant with all ARARs. Wastes and/or contaminated soil would remain in place. Potential vertical migration of COCs would be curtailed by limiting infiltration, isolating waste, and removing VOC source material. ARARs for designating and constructing CAMUs at the Site would be met. Action- and chemical-specific ARARs for air emissions would be met by developing and implementing appropriate engineering and administrative controls during demolition, excavation, grading, construction, covering/capping, and maintenance activities, including compliance with levee access requirements.	Compliant with all ARARs. Wastes and/or contaminated soil would remain in place. Potential vertical migration of COCs would be curtailed by limiting infiltration, isolating waste, and removing VOC source material. ARARs for designating and constructing CAMUs at the Site would be met. Action- and chemical-specific ARARs for air emissions would be met by developing and implementing appropriate engineering and administrative controls during demolition, excavation, grading, construction, covering/capping, and maintenance activities, including compliance with levee access requirements.	Compliant with all ARARs. Wastes and/or contaminated soil would remain in place. Potential vertical migration of COCs would be curtailed by limiting infiltration, isolating waste, and removing VOC source material. ARARs for designating and constructing CAMUs at the Site would be met. Action- and chemical-specific ARARs for air emissions would be met by developing and implementing appropriate engineering and administrative controls during demolition, excavation, grading, construction, covering/capping, and maintenance activities, including compliance with levee access requirements.	Compliant with all ARARs. Action- and chemical-specific ARARs for air emissions would be met by developing and implementing appropriate engineering and administrative controls during demolition, excavation, backfilling, and grading, including compliance with levee access requirements.
Long-Term Effectiveness and Permanence	Soil/solid waste would be consolidated within three CAMUs. Sampling in the Southern Trenches and HFSDA would better characterize risk in these disposal areas. The VOC “hot spot” areas would be excavated and hazardous material taken off-site for disposal. Known chemical wastes from historical and proposed trenches would be removed. Asphalt caps and storm water drainage enhancements would be installed to reduce infiltration. Periodic asphalt cap maintenance would be required. Enforcement of ICs and	Soil and waste would be largely undisturbed except where necessary to consolidate solid wastes to facilitate capping. The VOC "hot spot" areas would be excavated and hazardous material taken off-site for disposal. Excavations would be backfilled with clean soil and the CAMUs would be covered with multiple-layer caps and the existing storm water drainage system would be expanded. Multiple-layer cap maintenance would be required to limit infiltration. Development and enforcement of ICs and groundwater monitoring would be conducted to confirm long-term	Soil/solid waste would be consolidated within two CAMUs. The VOC “hot spot” areas would be excavated and hazardous material taken off-site for disposal. Known chemical wastes from historical and proposed trenches would be removed. The Eastern Trenches, Southern Trenches, HFSDA, and LFU-3 waste cells would be excavated and known chemical wastes sent off-site for disposal. Other soil/solid waste from the Eastern Trenches North, LFU-3 waste cells, the Southern Trenches, and HFSDA would be consolidated within the CAMUS, thereby	Soil/solid waste would be consolidated within one lined and capped CAMU. The VOC “hot spot” areas would be excavated and hazardous material taken off-site for disposal. The Eastern Trenches, Southern Trenches, HFSDA, LFU-1, LFU-2, and the LFU-3 waste cells would be excavated and segregated, and known chemical wastes would be sent off-site for disposal. Other soil/solid waste from the Eastern Trenches North, Southern Trenches, HFSDA, and LFU-3 waste cells would be consolidated within the CAMU, thereby permanently removing soil/solid waste from the excavated	The VOC “hot spot areas, Eastern Trenches, LFU-1, LFU-2 waste cells, and LFU-3 waste cells would be excavated and material would be sent off-Site for disposal, thereby permanently removing soil/solid waste from these areas. Known chemical wastes from the Southern Trenches and HFSDA would be sent off-site for disposal, and other soil/solid wastes would be consolidated within the WBH CAMU. A multiple-layer cap over the WBH and storm water drainage enhancements would be installed to reduce infiltration. Multiple-layer cap maintenance would be required to limit infiltration. Enforcement of ICs and	The VOC “hot spot” areas, Eastern Trenches, Southern Trenches, HFSDA, WBH, LFU-1, LFU-2 waste cells, and LFU-3 waste cells would be excavated and material sent off-site for disposal, thereby permanently removing soil/solid waste from these areas. Some leachate-contaminated soil may remain in place. Storm water drainage enhancements would be installed to reduce infiltration. Enforcement of ICs and groundwater monitoring would be conducted to confirm long-term protection of human health and the environment. This alternative is considered effective in the long-term.

Remedial Alternative[1]	SW-5	SW-6[3]	SW-7	SW-8	SW-9	SW-10
	groundwater monitoring would be conducted to confirm long-term protection of human health and the environmental. This alternative is considered effective in the long-term. The potential for CAMU cap failure, resulting in exposure of the public or ecological receptors to COCs, is considered unlikely. The adequacy and reliability of controls would be approximately the same as long as the integrity of the landfill covers/caps is maintained and ICs enforced. This alternative requires periodic O&M for the storm water drainage enhancements asphalt caps and would result in the greatest long-term O&M and periodic requirements due to maintenance of the asphalt caps. Provides moderate future land use options due to the requirement to maintain the capped areas.	protection of human health and the environment. The potential for landfill cap failure, resulting in exposure of the public or ecological receptors to COCs, is considered unlikely. The adequacy and reliability of controls would be approximately the same as long as the integrity of the landfill caps is maintained and ICs enforced. This alternative requires periodic O&M for the storm water drainage enhancements CAMU caps. Provides moderate future land use options due to the requirement to maintain the capped areas.	permanently removing soil/solid waste from these areas. Multiple-layer caps and storm water drainage enhancements would be installed to reduce infiltration. Multiple-layer cap maintenance would be required to limit infiltration. Enforcement of ICs and groundwater monitoring would be conducted to confirm long-term protection of human health and the environment. This alternative is considered effective in the long-term. The potential for landfill cap failure, resulting in exposure of the public or ecological receptors to COCs, is considered unlikely. The adequacy and reliability of controls would be approximately the same as long as the integrity of the landfill caps is maintained and ICs enforced. This alternative requires periodic O&M for the storm water drainage enhancements and CAMU caps. Provides moderate future land use options due to the requirement to maintain the capped areas.	areas. A multiple-layer cap and storm water drainage enhancements would be installed to reduce infiltrations. Multiple-layer cap maintenance would be required to limit infiltration. Additional protection of groundwater would be achieved via the installation of a bottom liner and leachate collection and recovery system (LCRS). Enforcement of ICs and groundwater monitoring would be conducted to confirm long-term protection of human health and the environment. This alternative is considered effective in the long-term. The potential for landfill cap failure, resulting in exposure of the public or ecological receptors to COCs, is considered unlikely. The adequacy and reliability of controls would be approximately the same as long as the integrity of the landfill cap is maintained and ICs enforced. This alternative requires periodic O&M for the storm water drainage enhancements and surface cap and would provide additional protection to groundwater if the integrity of the bottom liner and leachate collection system is compromised. Provides moderate future land use options due to the requirement to maintain the capped areas.	groundwater monitoring would be conducted to confirm long-term protection of human health and the environment. This alternative is considered effective in the long-term. The potential for landfill cap failure, resulting in exposure of the public or ecological receptors to COCs, is considered unlikely. The adequacy and reliability of controls would be approximately the same as long as the integrity of the CAMU cap is maintained and ICs enforced. This alternative requires periodic O&M for the storm water drainage enhancements and CAMU cap. Provides moderate future land use options due to the requirement to maintain the capped area. The second greatest volume of soil/solid waste would be removed, thus providing for additional land use options because there would be fewer land use restrictions, and potential human exposure to residual contamination would be lower than other alternatives.	This alternative includes O&M for the storm water drainage enhancements and would be the least reliant on controls, since all solid waste and most contaminated soil would be removed from the Site. The greatest volume of soil/solid waste would be removed, thus providing for additional land use options because there would be fewer land use restrictions, and potential human exposure to residual contamination would be lower than other alternatives.
Reduction of Toxicity, Mobility, or Volume via Treatment[2]	A fraction of hazardous waste from the VOC "hot spot" excavations only may be treated via ex situ solidification/stabilization prior to off-Site disposal; the actual amount would depend on the hazardous characteristics of the wastes. 86 LCY of material are assumed to be treated.	A fraction of hazardous waste from the VOC "hot spot" excavations only may be treated via ex situ solidification/stabilization prior to off-Site disposal; the actual amounts would depend on the hazardous characteristics of the waste. 95 LCY of material are assumed to be treated.	A fraction of hazardous waste from the VOC "hot spot" excavations only may be treated via ex situ solidification/stabilization prior to off-site disposal; the actual amount would depend on the hazardous characteristics of the wastes. 106 LCY of material are assumed to be treated.	A fraction of hazardous waste from the VOC "hot spot" excavations only may be treated via ex situ solidification/stabilization prior to off-site disposal; the actual amount would depend on the hazardous characteristics of the wastes. 168 LCY of material are assumed to be treated.	A fraction of hazardous waste from the VOC "hot spot" excavations only may be treated via ex situ solidification/stabilization prior to off-site disposal; the actual amount would depend on the hazardous characteristics of the wastes. 5,127 LCY of material are assumed to be treated.	A fraction of hazardous waste from the VOC "hot spot" excavations only may be treated via ex situ solidification/stabilization prior to off-site disposal; the actual amount would depend on the hazardous characteristics of the wastes. 5,129 LCY of material area assumed to be treated.
Short-term Effectiveness	Short-term impacts include fugitive dust generation, air emissions, vehicular traffic, and construction site hazards. Site construction impacts, including localized noise and ground vibrations, would persist for several months during the excavation of known chemical wastes, the VOC "hot spot" areas, and contaminated soil/solid waste.	Short-term impacts include fugitive dust generation, air emissions, vehicular traffic, and construction site hazards. Site construction impacts, including localized noise and ground vibrations, would persist for several months during the excavation of the VOC "hot spot" areas and contaminated soil/solid waste. Air monitoring, dust control, and personal	Short-term impacts include fugitive dust generation, air emissions, vehicular traffic, and construction site hazards. Site construction impacts, including localized noise and ground vibrations, would persist for several months during the excavation of the known chemical wastes, the VOC "hot spot" areas, and contaminated soil/solid waste. Air monitoring, dust	Short-term impacts include fugitive dust generation, air emissions, vehicular traffic, and construction site hazards. Site construction impacts, including localized noise and ground vibrations, would persist for several months during the excavation of known chemical wastes, the VOC "hot spot" areas, and contaminated soil/solid waste for potentially up to two	Short-term impacts include fugitive dust generation, air emissions, vehicular traffic, and construction site hazards. Site construction impacts, including localized noise and ground vibrations, would persist for several months during the excavation of known chemical wastes, the VOC "hot spot" areas, and contaminated soil/solid waste for potentially up to two construction seasons. Air monitoring, dust	Short-term impacts include fugitive dust generation, air emissions, vehicular traffic, and construction site hazards. Site construction impacts, including localized noise and ground vibrations, would persist for several months during the excavation of known chemical wastes, the VOC "hot spot" areas, and contaminated soil/solid waste for potentially up to two construction

Remedial Alternative[1]	SW-5	SW-6[3]	SW-7	SW-8	SW-9	SW-10
	Air monitoring, dust control, and personal protective equipment would be required to identify and mitigate these effects. This alternative would take one year to implement and poses more risk to workers and the community than Alternative SW-6.	protective equipment would be required to identify and mitigate these effects. This alternative would take one year to implement and represents the least risk to site workers and the community because known contamination would not be excavated and less excavated material (i.e., only the VOC "hot spot" areas) would be handled and transported off-site for disposal.	control, and personal protective equipment would be required to identify and mitigate these effects. This alternative would take two years to implement and poses more risk to workers and community than Alternative SW-6.	construction seasons. Air monitoring, dust control, and personal protective equipment would be required to identify and mitigate these effects. This alternative would take two years to implement and represents the third highest risk to workers and the community.	control, and personal protective equipment would be required to identify and mitigate these effects. This alternative would take two years to implement and represents the second highest risk to workers and the community.	seasons. Air monitoring, dust control, and personal protective equipment would be required to identify and mitigate these effects. This alternative would take two years to implement and represents the highest risk to workers and the community.
Implementability	Technically and administratively feasible to implement in one year. The excavation, segregation, and disposal of soil/solid waste would be moderately complex to coordinate and implement. The installation of asphalt caps would only be slightly more complex than the graded covers as the asphalt would be placed on top of a graded cover. Required equipment and contractors are available. Additional land for storm water drainage enhancements is readily available and would not pose a burden to the University's mission.	Technically and administratively feasible to implement in one year. The excavation, segregation, and disposal of soil/solid waste from the VOC "hot spot" and consolidation areas would be moderately complex to coordinate and implement. The consolidation of soil/solid waste and installation of multiple-layer caps would be more complex than some other cover/cap options (e.g., asphalt caps (SW-5)]. Required equipment and contractors are available. Additional land for storm water drainage enhancements is readily available and would not pose a burden to the University's mission.	Technically and administratively feasible to implement in one year. The excavation, segregation, and disposal of soil/solid waste would be moderately complex to coordinate and implement. The excavation and consolidation of soil/solid waste into two CAMUs and installation of two multiple-layer caps would be more complex than other cover/cap options [e.g., asphalt cap (SW-5), one multiple-layer cap (SW-6, SW-8, SW-9)]. Required equipment and contractors are available. Additional land for storm water drainage enhancements is readily available and would not pose a burden to the University's mission.	Technically and administratively feasible to implement in two years. The excavation, segregation, and disposal of soil/solid waste would be moderately complex to coordinate and implement. The excavation and consolidation of all soil/solid wastes into a single CAMU with installation of a bottom liner, LCRS, and multiple-layer cap would be substantially more complex than the other alternatives. Required equipment and contractors are available. Additional land for storm water drainage enhancements and for the installation of the bottom liner and LCRS between LFU-1 and LFU-2/Eastern Trenches/WBH is readily available and would not pose a burden to the University's mission.	Technically and administratively feasible to implement in two years. The excavation, segregation, and disposal of soil/solid waste would be moderately complex to coordinate and implement. Required equipment and contractors are available. Additional land for storm water drainage enhancements and for the installation of the bottom liner and LCRS between LFU-1 and LFU-2/Eastern Trenches/WBH is readily available and would not pose a burden to the University's mission.	Technically and administratively feasible to implement in two years. The excavation, segregation, and disposal of hazardous material would be moderately easy to coordinate and implement. Required equipment and contractors are available. Additional land for storm water drainage enhancements is readily available and would not pose a burden to the University's mission.
Approximate Present Value Cost ($ Millions)	$20.7	$15.7	$20.4	$32.7	$101.7	$108.3
State Acceptance		DTSC supports EPA's selection of Alternative SW-6 for the LEHR/OCL Site.				
Community Acceptance	During the public comment period, the community expressed its support for the Site cleanup.					

Notes:

1 Alternatives SW-1 through SW-4 failed to meet the threshold criteria, so the alternatives are not evaluated here.
2 Alternatives SW-5 through SW-10 may include ex situ treatment (e.g., soil solidification/stabilization) of a fraction of the hazardous and mixed waste to render it non-hazardous prior to off-site disposal.
3 This alternative has been modified since it was originally presented in the Soil FS to align it more closely with the presumptive remedy for landfills.

Acronyms:

ARAR – applicable or relevant and appropriate requirements
CAMU – corrective action management unit
FS – feasibility study
HFSDA – Hopland Field Station Disposal Area
IC – institutional control
LCRS – leachate collection and recovery system

LCY – loose cubic yards
LFU – landfill unit
RAO – remedial action objective
VOC – volatile organic compound
WBH – Waste Burial Holes

Alternatives Key:

SW-1: No Action/No Further Action
SW-2: Institutional Controls and Groundwater Monitoring
SW-3: Soil, Solid Waste, and VOC "Hot Spot" Removal, Three On-Site CAMUs with Graded Covers, Institutional Controls, Drainage Controls, and Groundwater Monitoring
SW-4: Soil, Solid Waste, and VOC "Hot Spot" Removal, Three On-Site CAMUs with Evapotranspiration Covers, Institutional Controls, Drainage Controls, and Groundwater Monitoring
SW-5: Soil, Solid Waste, and VOC "Hot Spot" Removal, Three On-Site CAMUs with Asphalt Caps, Institutional Controls, Drainage Controls, and Groundwater Monitoring
SW-6: VOC "Hot Spot" Removal, Three On-Site CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Controls, and Groundwater Monitoring
SW-7: Soil, Solid Waste, and VOC "Hot Spot" Removal, Two On-Site CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Controls, and Groundwater Monitoring
SW-8: Soil, Solid Waste, and VOC "Hot Spot" Removal, One On-Site Lined CAMU with Multiple-Layer Cap, Institutional Controls, Drainage Controls, and Groundwater Monitoring
SW-9: Excavate and Dispose of Most Soil and Solid Waste Off-Site, One On-Site CAMU with Multiple-Layer Cap, Institutional Controls, Drainage Controls, and Groundwater Monitoring
SW-10: Excavate and Dispose of Soil and Solid Waste Off-Site, Institutional Controls, Drainage Controls, and Groundwater Monitoring

10.1 THRESHOLD CRITERIA

10.1.1 Overall Protection of Human Health and the Environment

This criterion addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through exposure pathways are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

Alternative SW-1 would not protect human health and the environment because it does not address the risks associated with the Site; however, this alternative will be carried forward through the comparison of alternatives to provide a baseline for reference.

The remaining alternatives include ICs to maintain remedy integrity and to restrict the future use of the property to its current uses only. However, even with ICs, Alternative SW-2 would not protect human health and the environment. It relies solely on non-engineered actions such as signs, land use covenants, and monitoring to protect human health and the environment and would not reduce risk. Alternatives SW-3 and SW-4 would provide more protection but not enough to adequately protect human health and the environment. SW-3 would allow for continued production of leachate and both SW-3 and SW-4 could allow burrowing animals to be exposed to hazardous waste.

Alternative SW-10 is the least reliant on ICs because the majority of contamination would be removed and disposed off-site.

The alternatives that rely on excavation and disposal of soil and solid waste off-site provide the most overall protection (Alternatives SW-9 and SW-10), followed by the alternative that consolidates all waste in a lined-CAMU with a leachate collection and recovery system (Alternative SW-8), followed by the alternatives that include excavation of soil and solid waste and on-site containment (Alternatives SW-5 through SW-7). Alternatives SW-5 through SW-10 rely on engineered remedies to provide additional protection through physical removal of contamination and/or isolation under graded covers or surface caps. Alternatives SW-3 through SW-9 provide protection with graded covers or caps, and the multiple-layer cap (Alternatives SW-6 through SW-9) but Alternatives 7 through 9 would provide increased protection because there are fewer CAMUs. SW-5 provides the lowest level of protection and SW-8 provides the most with a bottom liner and leachate collection system. SW-5 through SW-7 provide protection against further groundwater contamination through covering/capping and groundwater monitoring. SW-8 provides greater protection for groundwater by adding a bottom liner and a leachate collection system, while SW-9 and SW-10 provide even greater groundwater protection by disposing of most soil and solid waste off-site and groundwater monitoring. SW-9 and SW-10 provide the most protection against potential flooding by removing most of the waste from the site. All of the caps (SW-5 through SW-9) will require monitoring and maintenance in order to remain protective.

10.1.2 Compliance with ARARs

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations, which are collectively referred to as "ARARs."

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are

identified by a state in a timely manner and are more stringent than federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site.

This criterion addresses whether a remedial alternative will meet all of the applicable or relevant and appropriate federal and state environmental requirements or provides a basis for invoking a waiver. See Attachment B for a complete list of all ARARs.

Under Alternative SW-1, no remedial action would be taken, and therefore, compliance with ARARs is not relevant. Alternatives SW-2, SW-3 and SW-4 are not compliant with RWQCB ARAR Title 27 because they do not include a Resource Conservation and Recovery Act (RCRA)-compliant cover with a biotic barrier. Alternatives SW-3 and SW-4 include waste excavation and placement in a CAMU, but do not include a RCRA-compliant CAMU cover. Because Alternatives SW-2, SW-3 and SW-4 do not comply with ARARS, they are not eligible for selection and are not discussed further in the comparative analysis.

Alternatives SW-5 through SW-10 are compliant with all ARARs. Under each alternative, wastes and/or contaminated soil would remain in place. Potential vertical migration of COCs would be curtailed by limiting infiltration, isolating waste, and removing COC source material. ARARs for designating and constructing CAMUs at the Site would be met for Alternatives SW-5 through SW-9. Although it is expected that net storm water runoff would increase under Alternatives SW-5 through SW-8, each alternative would involve several storm water drainage enhancements designed to address these increases and meet the post-construction requirements of the Draft 2011 Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (MS4) permit (State Water Resources Control Board [SWRCB], 2011). Action- and chemical-specific ARARs for air emissions would be met by developing and implementing appropriate engineering and administrative controls during demolition, excavation, grading, construction, covering/capping, and maintenance activities, including compliance with levee access requirements.

10.2 BALANCING CRITERIA

Only Alternatives SW-5 through SW-10 meet the threshold criteria and are included in the comparative analysis of balancing criteria. Alternative SW-1 is included as a baseline for comparison. Alternatives SW-2 through SW-4 do not meet the threshold criteria and are not evaluated further.

10.2.1 Long-Term Effectiveness and Permanence

This criterion considers residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time, once remedial action objectives have been met. This criterion includes the consideration of residual risk that will remain on site following remediation and the adequacy and reliability of controls.

Alternative SW-1 includes no remedial actions so this alternative would not provide protection of human health and the environment. As the volume of soil and solid waste removal increases, the long-term effectiveness and permanence increases and the reliance on ICs decreases, reducing the residual risk. Alternatives SW-5 and SW-7 through SW-10 rely on removal of areas with known chemical waste and Alternatives SW-5 through SW-9 require installation of surface covers/caps. In the event of IC failure,

these additional remedial actions would lessen the potential for future exposure to hazardous material and the potential for leaching to groundwater. The bottom liner and leachate collection system constructed as part of Alternative SW-8 would further minimize the potential for contaminants to migrate to groundwater, although it could not be replaced if it fails. Uncertainty with respect to unknown hazardous materials within the disposal units also would decrease as more waste is removed and sent off-site for disposal; Alternative SW-10 is the most effective due to the complete removal of soil and solid waste and disposal off-site.

Excavation and off-site disposal of soil/solid waste and the VOC "hot spot" areas in Alternatives SW-5, SW-7, and SW-8, excavation and off-site disposal of the VOC "hot spot" areas under SW-6, and excavation of most soil/solid waste under Alternative SW-9 (except for the WBH, Southern Trenches, and HFSDA) and all solid waste and most contaminated soil under Alternative SW-10 would be effective in reducing risk. Alternative SW-10 permanently removes most contaminated soil and all solid waste from the Site. Alternatives SW-5 and SW-7 through SW-10 would increasingly lower the amount of soil/solid waste with COC concentrations exceeding cleanup levels, while Alternative SW-6 would reduce VOC sources via excavation and off-site disposal of the VOC "hot spot" areas. Alternative SW-10 would provide the greatest long-term effectiveness and permanence because all of the solid waste and the majority of contaminated soil would be removed and sent off-site for disposal.

In addition to the off-site disposal of waste, Alternatives SW-5 through SW-9 would include on-site consolidation of waste in CAMUs. Under Alternatives SW-7, SW-8, and SW-9, the Southern Trenches and HFSDA would be excavated, and soil/solid waste would be consolidated within a capped CAMU after off-site disposal of known chemical wastes. Under Alternatives SW-7 and SW-8, soil/solid waste within the LFU-3 waste cells would be excavated and consolidated within the capped CAMUs that would be constructed over LFU-1 and LFU-2/Eastern Trenches/WBH after segregation of known chemical wastes. Consolidation under these alternatives would lead to greater long-term effectiveness and permanence at the Southern Trenches, HFSDA, and LFU-3 by eliminating future exposure, potential risk, and COC migration in these areas. Under SW-8 the underlying liner and leachate collection system result in increased long-term effectiveness and permanence. Under Alternatives SW-5 through SW-9, LLRW and hazardous waste would likely remain on-site but within the designated CAMUs. These areas would be isolated from human and ecological exposure via engineered surface covers/caps.

The potential for landfill cap failure, resulting in exposure of the public or ecological receptors to COCs, is considered unlikely. The adequacy and reliability of controls for Alternatives SW-5 through SW-10 would be approximately the same as long as the integrity of the landfill covers/caps is maintained and ICs enforced. Alternatives SW-5 through SW-9 would require periodic O&M for the storm water drainage enhancements and surface covers or caps; Alternative SW-10 would include O&M for the storm water drainage enhancements. Alternative SW-5 would result in the greatest long-term O&M and periodic requirements due to maintenance of the asphalt caps. Alternative SW-8 would provide additional protection to groundwater if cap failure occurs due to the bottom liner and leachate collection system. Alternative SW-10 would be the least reliant on controls, since all solid waste and most contaminated soil would be removed from the Site.

10.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion evaluates an alternative's use of treatment to 1) reduce the harmful effects of contaminants; 2) reduce the ability of contaminants to move in the environment; or 3) reduce the amount of contamination present.

None of the alternatives include in-situ treatment as part of the remedy. The actual amount of treated waste would depend on specific volumes of waste generated and the requirements for treatment based on

hazardous characteristics of the excavated materials. Assuming that the total volume of ex-situ treatment is proportional to the waste volume sent off-site for disposal, Alternative SW-10 would involve the greatest potential reduction of toxicity, mobility, or volume of hazardous material. The volume of waste undergoing ex-situ treatment is expected to be a low percentage of the total waste volume for each of the alternatives.

10.2.3 Short-Term Effectiveness

Short-term effectiveness evaluates the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, or the environment during construction and operation of the remedy until cleanup levels are achieved.

Alternative SW-1 includes no remedial actions so this alternative would not provide protection of human health and the environment. Short-term impacts from Alternatives SW-5 through SW-10 include fugitive dust generation, air emissions, vehicular traffic, and construction site hazards. Site construction impacts, including localized noise and ground vibrations, would persist for several months during the excavation of known chemical wastes, the VOC "hot spot" areas, and contaminated soil/solid waste in Alternatives SW-5, SW-6, and SW-7, and, potentially, for up to two construction seasons for Alternatives SW-8, SW-9, and SW-10. Air monitoring, dust control, and personal protective equipment would be required to identify and mitigate these effects. Alternative SW-6 would represent the least risk to site workers and the community because known chemical wastes would not be excavated and less excavated material (i.e., only the VOC "hot spot" areas) would be handled and transported off-site for disposal.

Alternatives SW-5, SW-6, and SW-7 would achieve protection in one construction season, and Alternatives SW-8, SW-9 and SW-10 would achieve protection in two construction seasons.

10.2.4 Implementability

Implementability considers the technical and administrative feasibility of a remedy, from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternative SW-1 is simple to implement because it includes no remedial actions, but this alternative would not provide protection of human health and the environment. Alternatives SW-5 through SW-8 are readily implementable as the technology is available to excavate, segregate, and dispose of soil/solid waste off-site. In addition, the technology is readily available to cap or cover the remaining waste under three asphalt caps (Alternative SW-5); three multiple-layer caps (Alternative SW-6); two multiple-layer caps (Alternative SW-7); or one multiple-layer cap with a liner and leachate collection system (Alternative SW-8). Implementation of Alternative SW-6 is less complex because no known chemical wastes would be excavated. The design of the asphalt covers associated with Alternative SW-5 is less complex than the multiple-layer caps associated with Alternatives SW-6 through SW-9. The large-scale removals proposed in Alternatives SW-9 and SW-10 would be relatively straightforward to implement because they include the fewest design requirements. Because Alternative SW-9 includes a multiple-layer cap over the WBH CAMU, where excavated materials from the Southern Trenches and HFSDA would be consolidated, this alternative is more complex than Alternative SW-10, which involves the excavation and off-site disposal of each disposal unit.

Alternative SW-8 is the most complex of the alternatives, as it would require installation of a bottom liner and leachate collection system. In addition, should monitoring indicate that further remedial action is necessary, implementation of changes under this alternative would be difficult because the constructed

liner, leachate collection system, and CAMU cap could be compromised but could not be repaired or replaced.

The administrative feasibility of each alternative is not a barrier to implementability. Each alternative (SW-5 through SW-10) would require coordinating with the UCOP Real Estate Services Group and UC Davis Office of Administrative and Resource Management to gain approval for recording the required land use control (LUC). Since the Site is located at the southern end of the university, at about two miles from the Main Campus, the implementation of the proposed ICs is not identified as a burden to the university's mission. Additionally, activities conducted in the nine structures that are proposed for removal under Alternatives SW-5 through SW-10 could be relocated in existing structures or are not mission-critical, and as such the structures could be demolished. Some additional land at the Site would be required to implement the storm water drainage enhancements for Alternatives SW-5 through SW-10. Alternative SW-8 would require the use of additional land between the Eastern Trenches and LFU-1 that has no history of waste disposal. This additional land is readily available. However, the off-site disposal proposed in Alternatives SW-5 through SW-10 may expose the University to future CERCLA liability at the off-site disposal facilities.

10.2.5 Cost

A cost summary for all six alternatives is presented in Table 8. It includes the capital cost, O&M costs, and total present value costs, and the number of years over which the remedy cost estimate is projected. The present value costs are calculated using a 2.7% discount rate.

Alternative SW-1 is cost effective because it includes no remedial actions and no cost, but this alternative would not provide protection of human health and the environment. Alternative SW-6 has the lowest overall cost to complete, approximately $15.7 million. Alternative SW-10 has the highest cost to complete, approximately $108.3 million. The primary driver of total cost is related to the total volume of excavated material sent off-site for disposal. Because two of the unlined capping alternatives, Alternatives SW-5 and SW-7, would include the off-site disposal of similar volumes of soil/solid waste and SW-6 would only require disposal of the material excavated from the VOC "hot spot" areas, overall estimated costs are in a narrow range of $15.7 million to $20.7 million. Alternative SW-8 has a higher estimated cost of approximately $32.7 million, reflecting capital costs associated with the much greater excavation volume as well as the installation of a bottom liner and leachate collection system. Alternatives SW-9 and SW-10, with overall costs of approximately $101.7 and $108.3 million, respectively, are about 3 to 17 times more costly than the other alternatives, reflecting the high cost of excavation, import of clean backfill, and off-site disposal of most or all waste.

Long-term O&M and periodic costs play a secondary role in the difference in total cost between each alternative. Comparison of O&M costs shows that there is an approximate 1.4 times difference in these costs: minimum estimated O&M cost of $5.6 million for Alternative SW-10 and maximum estimated O&M cost of $7.8 million for Alternative SW-5. Alternative SW-5 has the highest O&M cost because of the recurring maintenance required for the asphalt cap and the need to periodically resurface or repave the asphalt.

10.3 MODIFYING CRITERIA

10.3.1 State Acceptance

DTSC supports EPA's selection of Alternative SW-6 for the LEHR/OCL Site. DTSC and the RWQCB did not express opinions regarding the other alternatives.

10.3.2 Community Acceptance

U.S. EPA received written comments from three parties during the 30-day comment period and received an oral comment from one party at the Proposed Plan public meeting. However, the oral comment consisted of reading a written letter that was later provided to U.S. EPA.

U.S. EPA has addressed the comments in the Responsiveness Summary section of this ROD Amendment. U.S. EPA does not believe that any of the issues raised in the comments warrant selection of a different remedy to address the contamination at the LEHR/OCL Site.

Table 8 Remedial Alternatives Cost Summary

Remedial Alternative	Description	Period (Years)	Capital Cost ($)	O&M Cost ($)	Periodic Cost ($)	Total Cost ($)	Present Value[1]
SW-1	No Action/No Further Action	No costs are associated with the No Action/No Further Action alternative.					
SW-2	Institutional Controls and Groundwater Monitoring	100	$318,780	$6,018,220	$173,297	$6,510,297	$6,365,443
SW-3	Soil, Solid Waste, and VOC "Hot Spot" Removal, Three On-Site CAMUs with Graded Covers, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring	100	$6,507,885	$6,921,681	$185,523	$13,615,089	$13,117,896
SW-4	Soil, Solid Waste, and VOC "Hot Spot" Removal, Three On-Site CAMUs with Evapotranspiration Caps, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring	100	$11,571,188	$6,893,510	$185,523	$18,680,222	$18,233,303
SW-5	Soil, Solid Waste, and VOC "Hot Spot" Removal, Three On-Site CAMUs with Asphalt Caps, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring	100	$13,176,476	$7,764,868	$185,523	$21,126,868	$20,709,962
Alternate SW-6[2]	VOC "Hot Spot" Removal, Three On-Site CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring	100	$9,691,992	$7,029,624	$185,523	$16,907,140	$15,740,690
SW-7	Soil, Solid Waste, and VOC "Hot Spot" Removal, Two On-Site CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring	100	$13,836,609	$6,842,252	$181,448	$20,860,309	$20,443,387
SW-8	Soil, Solid Waste, and VOC "Hot Spot" Removal, One On-Site Lined CAMU with Multiple-Layer Cap, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring	100	$26,239,041	$6,948,273	$181,448	$33,368,762	$32,738,977
SW-9	Excavate and Dispose of Most Soil and Solid Waste Off-Site, One On-Site CAMU with	100	$95,979,224	$5,990,304	$173,297	$102,142,825	$101,725,897

	Multiple-Layer Cap, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring						
SW-10	Excavate and Dispose of Soil and Solid Waste Off-Site, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring	100	$102,950,982	$5,561,706	$173,297	$108,685,985	$108,269,066

Notes:

1. Discount factor for present value analysis is 2.7%; the period of analysis is 100 years. Per the Office of Management and Budget Circular A-94 Appendix C, 2.7% is the discount factor that was used in the FS, which was the real treasury interest rate in effect in 2009 and 2010 when the FS cost estimates were done.
2. This alternative has been modified since it was originally presented in the Soil FS to align it more closely with the presumptive remedy for landfills.

10.3.3 Summary of Comparative Analysis of Alternatives

Based on the comparative analyses, Alternative SW-6, which includes VOC "Hot Spot" Removal, On-Site CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Controls, and Groundwater Monitoring, satisfies the threshold criteria, is effective in the both the short-term and long-term, is the most implementable, and is the most cost effective remedy for addressing the risks from contaminated soil and solid waste at the LEHR/OCL Site. None of the alternatives reduces toxicity, mobility or volume of waste through treatment. Although Alternatives SW-9 and SW-10 reduce toxicity, mobility and the volume of contaminated media on-site, they do so through excavation and off-site disposal at a cost which is almost three to six times greater than the costs of Alternatives SW-5 through SW-8.

11.0 PRINCIPAL THREAT WASTES

Principal threat wastes are those hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination and are considered to be highly toxic or highly mobile, which generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. The NCP establishes an expectation that U.S. EPA will use treatment to address the principal threats posed by a site wherever practicable.

U.S. EPA is not making a determination as to whether the source materials in the LEHR/OCL landfills and disposal areas are principal threat wastes or low level threat wastes because these potential wastes were not characterized when they were found during trenching. Because U.S. EPA followed its presumptive remedy policy for landfills, thorough characterization of the landfill's contents was not necessary and the toxicity and mobility of contaminants was not assessed. The cap of the selected remedy will reduce mobility of contaminants and contaminant migration to groundwater will be monitored. Groundwater contamination will be addressed in the future Groundwater ROD.

12.0 SELECTED REMEDY

U.S. EPA, in consultation with DTSC and the RWQCB, is selecting the remedial alternative SW-6 as described below for the LEHR/OCL Site. Remedial alternative SW-6 was presented as U.S. EPA's preferred alternative in the Proposed Plan, and no information has come to U.S. EPA's attention which calls into questions its preferred status. U.S. EPA has determined that the selected remedy is protective of human health and the environment, for the current and reasonably anticipated future land use of the LEHR/OCL Site.

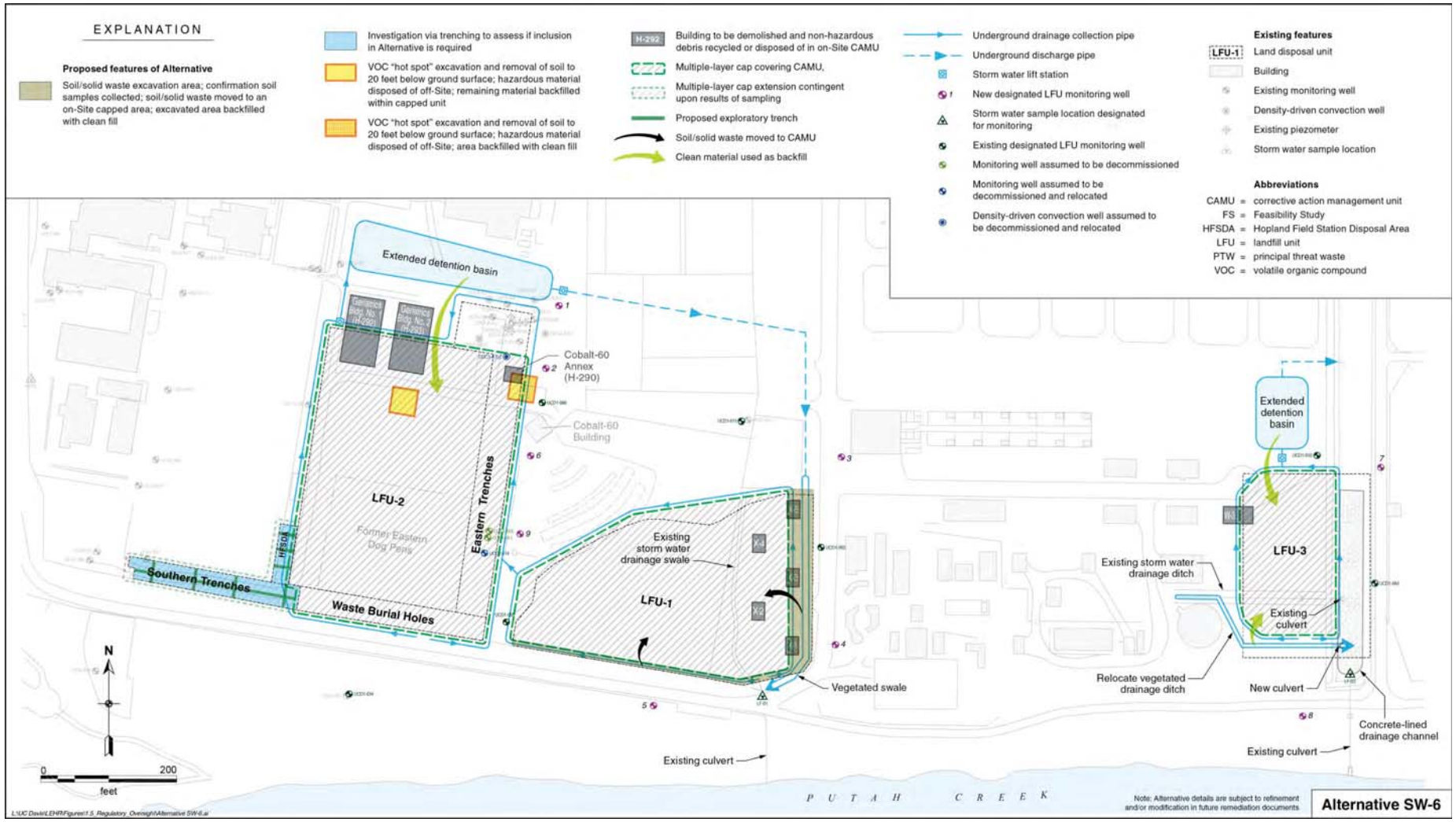


Figure 6 Alternative SW-6 (VOC "Hot Spot" Removal, Three On-Site CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Enhancements, and Groundwater Monitoring)

12.1 SUMMARY OF RATIONALE FOR THE SELECTED REMEDY

Alternative SW-6 is selected as the remedy for the LEHR/OCL Site because it will protect human health and the environment and comply with ARARs, while providing the best balance with respect to the nine NCP criteria compared to the other alternatives. Alternative SW-6 protects human health and the environmental in part by removing the VOC "hot spot" areas. Multiple-layer caps over the CAMUs will reduce potential COC migration to groundwater by limiting infiltration and will limit human exposure to COCs by creating a physical barrier. The multiple-layer caps over the CAMUs will also limit access of deep-rooted vegetation and burrowing animals to contaminated material. Drainage enhancements will further reduce infiltration and will control potential COC migration to surface water. The long-term prevention of human and ecological exposure will be maintained through an IC prohibiting residential land use and restricting non-residential land use and long-term O&M of the remedy components. Alternative SW-6 provides the best short-term protection by limiting the amount of material excavated and requiring transportation for disposal off-site. Alternative SW-6 is cost-effective and implementable. The estimated time to complete implementation of Alternative SW-6 is one construction season, which is comparable to Alternatives SW-5 and SW-7 and less time than Alternatives SW-8, SW-9 and SW-10.

12.2 DETAILED DESCRIPTION OF THE SELECTED REMEDY

Alternative SW-6 has been modified since it was originally presented in the Soil FS to align it more closely with the presumptive remedy for landfills. The original version of the alternative included the additional component excavation of known chemical wastes, but this component was removed because it would not address all hazardous chemical waste. The alternative leaves soil and waste largely undisturbed, but includes excavation and off-site disposal of the two VOC "hot spot" areas. The VOC "hot spot" excavations will be backfilled with clean soil and the CAMUs (LFU-1, LFU-2/WBH/Eastern Trenches, and LFU-3) each will be covered with multiple-layer caps. The existing storm water drainage system will be expanded. Prior to initiation of the remedial action, the Southern Trenches and Hopland Field Station Disposal Area will be investigated and if solid wastes or contamination above ROD cleanup levels are found, the areas will be capped or excavated and backfilled. Each multiple-layer cap will consist of a foundation layer, a low-permeability synthetic liner, a compacted clay layer, a drainage layer, a bio-protection layer, and an upper soil layer to reduce infiltration and leaching of contaminants to groundwater. The LFU-1, LFU-2/WBH/Eastern Trenches/HFSDA, and LFU-3 multiple-layer capped CAMUs will cover areas of approximately 2 acres, 3.4 acres, and 0.7 acres, respectively. In LFU-3, the portion of the waste cells underneath the concrete-lined drainage channel will be excavated and placed into the LFU-3 CAMU, and the concrete-lined drainage channel will be reconstructed to match original conditions. During construction of the vegetated drainage swale in LFU-1, an area overlying the proposed channel location will be excavated to approximately 10 ft bgs and any soil/solid waste, known chemical wastes, or excavated material will be placed within the capped LFU-1 CAMU. Buildings (Cobalt-60 Annex [H-290], Geriatrics Building No. 1 [H-292], Geriatrics Building No. 2 [H-293], X-1, X-2, X-3, X-4, X5, and W3) will be removed to allow excavation, construction, and proper grading of the three on-site CAMUs. Non-recycled building waste and waste excavated for drainage controls will be placed beneath the cap of the adjacent CAMU. Elderberry shrubs will be moved to a mitigation area or, if they are rooted in waste or contaminated soil, will be shredded and placed under the CAMU caps. Additional storm water drainage enhancements, including extended detention basins, will further reduce infiltration in the disposal units.

Alternative SW-6 includes ICs and groundwater monitoring. ICs are non-engineered instruments such as administrative and/or legal controls that minimize the potential for human exposure to contamination by limiting land or resource use (such as permits, zoning, and/or deed restrictions). The ICs associated with Alternative SW-6 are intended to minimize the potential for human exposure to the soil, solid waste, and

soil gas contamination that will remain in place at the LEHR/OCL Site. ICs will also preserve access to monitoring wells and prevent damage to remedy components (e.g., landfill caps, drainage systems, etc.). A codified land use restriction will be implemented in coordination with the UC Davis Office of the President, Real Estate Services Group, and the UC Davis Office of Administrative and Resource Management. A land use covenant will be recorded with Solano County that prohibits residential land use and restricts non-residential use of the disposal units. The maintenance, monitoring, enforcement, and reporting will ensure that the selected ICs will be protective of human health and the environment and comply with ARARs. The ICs will require a soil management plan for post-remediation earthwork activities. Signs will be posted to notify of potential subsurface hazards. Long-term groundwater monitoring will verify the efficacy of groundwater protection under this alternative. Long-term O&M of the groundwater wells, storm water drainage system, and multiple-layer caps will maintain the functionality of the remedy, as designed.

The following elements are part of the SW-6 remedy:

1. Planning and oversight activities will include document preparation of a field sampling plan, a quality assurance project plan, a health and safety plan, a sampling and analysis plan, a quality assurance project plan, a construction quality assurance/quality control (QA/QC) plan, a stormwater pollution prevention plan (SWPPP), O&M Plan, Long-Term Monitoring Plan, and construction site environmental controls (established for demolition, excavation, filling, grading, and capping activities).
2. During pre-remediation activities, monitoring wells will be decommissioned and relocated, as appropriate and in accordance with an approved well decommissioning work plan. Pre-remediation elements include trenching in the HFSDA and Southern Trenches and elderberry shrub cluster relocation and mitigation consistent with the USFWS Biological Opinion for the VELB. New groundwater monitoring wells will be installed at the conclusion of capping and drainage control installation. As the current density-driven convection (DDC) system lies within the boundaries of the Eastern Trenches North, implementation of the remedial action in this area may require its decommissioning. Although the future configuration of the DDC system is subject to change upon further evaluation of HSU-1 groundwater treatment strategies, for alternative comparison and costing purposes, it is assumed that the wells within the Eastern Trenches North boundary will be decommissioned, and that three DDC wells and three nested piezometers will be replaced after capping and construction of the drainage improvements are complete. Integration of future groundwater remedial activities will be considered during the remedial design. The landfill caps will be designed so that remediation of the groundwater VOC source areas that are below the water table or deeper than practical excavation depths can be conducted.
3. A Materials Management Plan (MMP) will be developed for implementation during excavation and disposal phases of the alternative. The MMP will describe procedures for the sorting and screening of excavated materials from the VOC “hot spot” areas, stockpiling, sampling and analysis (i.e., waste characterization), potential treatment, and disposal. Materials sent off-site for disposal will meet the acceptance criteria for the licensed facility. Descriptions of the processes and standards for the ex situ solidification/stabilization of fractions of the hazardous and mixed waste streams, including threshold criteria for its implementation, will be included.
4. Soil at the Southern Trenches and HFSDA will be investigated to assess the extent of contamination in these areas. If contamination is above ROD cleanup levels, these areas will be remediated either by capping or excavation.
5. On-site buildings will be decommissioned and demolished, including the Cobalt-60 Annex [H-290], Geriatrics Building No. 1 [H-292], Geriatrics Building No. 2 [H-293], X-1, X-2, X-3, X-4,

X5, and W3. A utility survey will be completed prior to demolition to identify electrical, sewer, water, fiber optic, gas, storm water, and other utilities that may be present within the area to be excavated. If buildings were used for radiological experimentation, a radiological survey and characterization sampling will be conducted prior to building demolition to determine if material can be recycled. If possible, non-hazardous and non-radiologically impacted material will be recycled. Any remaining non-hazardous demolition debris will be disposed of within the CAMUs; hazardous demolition debris and LLRW will be sent off-site for disposal at licensed facilities. The State Historic Preservation Officer has indicated that there are no known historical or cultural resources identified within or adjacent to the LEHR/OCL Site.

6. Nine elderberry shrubs are on top of the landfills and disposal units (i.e., potentially rooted in wastes); they will be removed and shredded. The shredded materials may be placed under the landfill caps or disposed off-site to minimize methane production. Eight elderberry shrubs located in adjacent areas where drainage improvements will be made or in areas where access is needed will be moved to a mitigation area, as discussed in the biological assessment.

7. The two VOC "hot spots," one south of the Geriatrics Buildings (H-292 and H-293) and one on the east side of the Eastern Trenches, will be excavated to approximately 20 ft bgs to remove the soil and soil gas containing elevated concentrations of VOCs. This ensures excavation of maximum VOC concentrations measured at 15 ft bgs, unless pre-design sampling indicates that soil vapor concentrations are below cleanup levels. VOC contaminated soil will be sent off-site for disposal at licensed facilities. Since the eastern half of the Eastern Trenches VOC "hot spot" will not be graded and covered, it will be backfilled with clean fill.

8. Contaminated soil/solid waste will be left on-site, consistent with the presumptive remedy for landfills.

9. A storm water drainage system will be installed to route precipitation away from the CAMUs. Drainage swales will direct water to a perimeter collection system that includes stormwater retention basins. Soil and solid wastes that are excavated to construct the stormwater drainage system will be placed in the CAMUs. The need for armoring the drainage swales will be determined during the remedial design.

10. In LFU-3, areas of the concrete-lined drainage channel overlying the identified waste cells will be demolished and incorporated into the capped area of LFU-3. The waste and contaminated soil underlying the drainage channel will be excavated, including material as far as 10 feet from the channel's western edge. Additional excavation may be necessary if wastes or significant contamination is found on the east side of the channel. After confirmation samples are collected and evaluated, the excavation will be backfilled with clean fill, and any demolished sections of the concrete channel will be reconstructed to match original conditions.

11. At the Eastern Trenches, soil/solid waste will be excavated within both the northern and southern sections. Wastes and contaminated soil will be placed within the existing footprint of each CAMU to be consistent with the presumptive remedy for landfills. The northern part of the Eastern Trenches is one of the VOC "hot spots" that will be excavated and backfilled with clean fill. Material that is not contaminated with VOCs will be consolidated within the LFU-2/Eastern Trenches/WBH CAMU footprint.

12. A multiple-layer cap will be installed for each of the designated CAMUs. Each multiple-layer cap will consist of a foundation layer, a low-permeability layer comprising a geo-membrane over a compacted clay or geosynthetic clay liner (or an equivalent performance layer), a drainage layer, a biotic barrier and protection layer, and an upper vegetated (topsoil) layer. The cap construction adjacent to the northern landward levee toe of Putah Creek will comply with the levee maintenance easement requirements.

13. ICs will be implemented to prevent future Site development or activities incompatible with the designated land use. Land-use restrictions will consist of implementing a codified land use restriction in coordination with the UCOP, Real Estate Services Group, and the UC Davis Office of Administrative and Resource Management. A land use covenant prohibiting residential and sensitive land use and restricting non-residential use of the approximately 6.4 acres of disposal areas will be recorded with Solano County and will include LFU-1, LFU-2, LFU-3, the Eastern Trenches, the HFSDA, the WBH, and any other co-located areas. ICs will include: 1) maintain access to designated monitoring wells; 2) restrict drilling or other subsurface penetration and access to groundwater; 3) restrict surface changes affecting drainage, infiltration, and potential COC mobilization; and 4) require assessment and mitigation of potential vapor intrusion hazards to buildings. A soil management plan will also be required for post-remediation earthwork and construction activities.
14. Annual inspections and maintenance will be performed on the installed storm water infrastructure and capped areas. Routine maintenance will be performed as needed.
15. New groundwater monitoring wells will be installed surrounding each CAMU to monitor the effectiveness of the remedy and detect potential releases. Because the groundwater flow direction varies, monitoring wells will be installed east, west, north, and south of each of the CAMUs. Existing wells that can be preserved during construction and are appropriately located will be incorporated into the groundwater monitoring network. Groundwater samples for analysis of the full suite of landfill parameters will be collected from these detection and compliance monitoring wells.
16. Post-remediation activities include including storm water monitoring, maintenance of ICs, and five-year reviews. These activities are required in perpetuity because landfill wastes will be left in place. For each five-year period, documents associated with compliance, performance, and ICs will be reviewed. This will include updating and correcting remedial program manuals, specifications, and record documents. The conclusions from each five-year review will be compiled in a summary report for the entire Site.

Alternative SW-6 will be compatible with a future groundwater remedy to be selected for the Site. In addition, the remedy may change somewhat as a result of the remedial design and construction processes. Changes to the remedy described in the ROD will be documented using a technical memorandum in the Administrative Record, an ESD, or ROD amendment, in accordance with the procedures described in Chapter 7 of U.S. EPA's ROD Guidance.

12.3 ESTIMATED REMEDY COSTS

The cost of SW-6 is $15,740,690. The detailed cost summary presented in Attachment C is based on information provided in the Proposed Plan (U.S. EPA, 2015a) and in the FS Addendum (U.S. EPA, 2016b), where complete cost details can be found. The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the selected remedial alternative. Changes in the cost elements may occur as a result of new information and data collected during the engineering design of the remedial alternative. Changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Difference, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

12.4 EXPECTED OUTCOMES

Following implementation of Alternative SW-6, the expected outcomes of the selected remedy will meet all of the remedial action objectives set forth in Section 8.0. The expected outcomes are:

- Prevention of human contact with contamination in soil, solid waste, and soil gas;
- Reduction of migration of contaminants in soil;
- Improved on-site habitat for plants and animals through reduced soil toxicity; and
- Improved quality of surface water and storm water

The remedy is anticipated to require one construction season to implement, once the remedial design is complete. Following implementation of the remedy, the LEHR/OCL Site will be available for low-density academic/administrative purposes, which is consistent with the current land use. Groundwater is not addressed in this ROD and will be addressed separately in a future ROD.

13.0 STATUTORY DETERMINATIONS

This section provides a brief description of how the selected remedy satisfies the CERLA statutory requirements. Under CERCLA §121 and the NCP, the lead agency must a select remedy that is protective of human health and the environment, complies with ARARs (unless a statutory waiver is justified), is cost-effective, and uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes.

13.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will protect human health and the environment through a series of actions, including excavating VOC “hot spot” areas, construction of on-site CAMUs with multiple-layer caps, ICs to restrict land use, drainage enhancements, and groundwater monitoring. The selected remedy will protect human health and the environment by removing the VOC “hot spot” areas. ICs implemented as part of the selected remedy will also protect human health and the environment by restricting Site uses that would allow exposure to contamination left in place. Drainage enhancements will control potential COC migration to surface water and reduce infiltration, and the installation of multiple-layer caps over the CAMUs will reduce potential COC migration to groundwater and limit exposure to contamination left in place. Operation and maintenance of the multiple-layer caps and drainage enhancements, as well as groundwater monitoring, will help maintain the continued protection of human health and the environment. The selected remedy will not pose unacceptable short-term risks or result in cross-media impacts.

13.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Section 121(d) of CERCLA states that remedial actions on CERCLA sites must attain (or justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations that are determined to be ARARs. Applicable requirements are those cleanup standards, criteria, or limitations promulgated under federal or state law that specifically apply to the situation at a CERCLA site. Relevant and appropriate requirements are federal or state cleanup standards, requirements, criteria, or limitations that, while not “applicable” to a hazardous substance, action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those found at the Site. The selected remedy will meet all federal or state standards, requirements, criteria or limitations that have been determined to be ARARs for the LEHR/OCL Site contamination. These ARARS are presented in Attachment B.

13.3 CAMU DESIGNATION CRITERIA AND SPECIFIC INFORMATION

This section discusses the definition of a CAMU, how LFU-1, LFU-2 and LFU-3 at the LEHR/OCL Site satisfy the CAMU designation criteria, and specific information for the three CAMUs. As described in this ROD, designation of the three LFUs as CAMUs will facilitate the cleanup of the Site by allowing UC Davis to dispose on-site of the majority of waste generated during the remedial action. Waste classification requirements in Title 22 California Code of Regulations (CCR) § 66262.11 are ARARs for excavated wastes. Construction of permanent landfill caps over each of the LFUs at the Site is scheduled to follow immediately after completion of excavation and consolidation. UC Davis will not place VOC-contaminated soil into the CAMUs. LLRW will be left in place in the HFSDA, WBH, and Southern Trenches.

13.3.1 Definition of a CAMU

As defined in 22 CCR 66264.552(a), a CAMU is "an area within a facility that is used only for managing CAMU-eligible wastes for implementing corrective action or cleanup at the facility." Wastes placed at a CAMU must be "CAMU-eligible wastes" which are "[a]ll solid and RCRA hazardous wastes, and all media (including ground water, surface water, soils, and sediments) and debris, that are managed for implementing cleanup," 22 CCR 66264.552(a)(1)(A), except as otherwise provided in 22 CCR 66264.552(a)(1)(B). The substantive requirements for CAMUs under RCRA are ARARs for CERCLA actions.

Placement of CAMU-eligible waste in a CAMU does not constitute land disposal, and so does not trigger the land disposal restrictions under 22 CCR Chapter 18. The CAMU regulations identify seven criteria by which to determine the appropriateness of designating a CAMU, 22 CCR 66264.552(c):

- The CAMU facilitates the implementation of reliable, effective, protective, and cost-effective remedies.
- Waste management activities associated with the CAMU do not create unacceptable risks to human health and the environment resulting from exposure to RCRA or non-RCRA hazardous wastes or hazardous constituents.
- The CAMU includes uncontaminated areas of a facility only if including such areas for the purpose of managing CAMU-eligible waste is more protective than management of such wastes using contaminated areas of a facility.
- Areas within the CAMU, where wastes remain in place after closure of the CAMU, are managed and contained to minimize future releases, to the extent practicable.
- The CAMU expedites the implementation timing of the corrective action activity, when appropriate and practicable.
- The CAMU enables the use, when appropriate, of treatment technologies (including innovative technologies) to enhance the long-term effectiveness of corrective actions by reducing the toxicity, mobility, or volume of wastes that will remain in place after closure of the CAMU.
- The CAMU, to the extent practicable, minimizes the land area of the facility upon which wastes will remain in place after closure of the CAMU.

The following section discusses how LFU-1, LFU-2 and LFU-3 satisfy the CAMU designation criteria.

13.3.2 CAMU Criteria Evaluation

Designation of LFU-1, LFU-2 and LFU-3 as CAMUs satisfies the CAMU designation criteria in 22 CCR 66264.552(c) as explained below.

Facilitate Reliable, Effective, Protective and Cost-Effective Remedies. As shown in this ROD, consolidation of wastes, contaminated soil and building and plant debris generated during implementation of the remedial action will provide a reliable remedy that is effective, protective, and cost-effective. Excavation and surface grading are well developed and reliable technologies. Standard construction techniques and earthmoving equipment will be used.

Costs for consolidation are anticipated to be less than for off-site disposal. Excavation and off-site disposal would cost three to six times more than consolidation in CAMUs. Consolidation of wastes to the LFUs also will be more effective than imposing institutional controls across even larger areas of the Site.

Do Not Create Unacceptable Risks. Exposures to construction workers could occur during the excavation and consolidation activities. Excavation of wastes is a potentially hazardous activity. Effective implementation of a health and safety plan, however, will minimize the risk of exposure during excavation and consolidation activities. The Remedial Design/Remedial Action Work Plan will determine the disposition of containers of liquid wastes or identifiable hazardous wastes are excavated.

Use Uncontaminated Areas Only if More Protective. LFU-1, LFU-2 and LFU-3 already are contaminated areas. Uncontaminated areas will not be needed for the consolidation of wastes in to the CAMUs.

Minimize Potential for Future Releases. Consolidating wastes excavated from various areas around the Site in the course of implementing the selected remedy will reduce the overall area occupied by wastes at the Site and so reduce the subsequent potential for exposure. Consolidation of wastes also will help reduce the potential for leachate formation by placing uncapped wastes in the CAMUs and isolating them through the implementation of engineering controls, such as capping. Consolidation of wastes to fewer locations also allows more focused monitoring efforts.

Expedite Remedy Implementation. Excavation and consolidation of wastes into the three LFU CAMUs will facilitate remedy implementation, shorten the timeframe for remedy implementation, and reduce costs.

Enhance Long-Term Effectiveness. Consolidating wastes to the three Site CAMUs will reduce the overall area occupied by wastes at the Site, reduce the subsequent potential for exposure, and enhance the long-term effectiveness of the remedial action. Neither consolidation nor capping involves treatment; therefore, neither will substantially reduce the toxicity or volume of wastes. However, capping of the consolidated wastes will reduce the mobility of contaminants by limiting infiltration of water through the wastes.

Minimize Land Areas Where Wastes Remain After Closure. Consolidation of wastes from various areas around the Site to LFUs -1, -2 and -3 CAMUs will reduce the land area where wastes remain in place and will allow future reuse of the Site that would not be possible if wastes were left in place and addressed, for example, through institutional controls.

Summary of Designation Criteria. Designation of LFUs -1, -2 and -3 as CAMUs satisfy the CAMU designation criteria. Key aspects of the evaluation include (1) the increased reliability of containing the waste at the LFU CAMUs; (2) the increase in long-term effectiveness gained by isolating the wastes; (3) the reduction in total contaminated land area at the Site; and (4) the moderate remediation cost.

13.3.3 Specific Information for the LFU CAMUs

The CAMU regulations require that a CAMU designation include specific information about the CAMU (22 CCR 66264.552(e)). This specific information includes:

- The areal configuration of the CAMU
- Requirements for CAMU-eligible waste management including applicable design, operation [and treatment- if PTW identified]
- Groundwater monitoring and reporting requirements
- Closure and post-closure requirements

The following discussion addresses these requirements.

Areal Configuration. Figure 6 indicates the location of the three LFU CAMUs. These areas are the same general areas proposed to be covered by three separate caps. Minor adjustments to the capped areas and drainage features may be necessary as determined during remedial design of the caps due to engineering design requirements.

Remediation Waste Management Requirements. CAMU-eligible waste management requirements include specification of the appropriate design and operation methods. Design of the LFU CAMU caps will meet the hazardous waste landfill closure performance standards in the applicable substantive portions of 22 CCR § 66264.310 (40 Code of Federal Regulations (CFR) 264.310). The cap performance standards specified in Section 66264.310 require that the final cover be designed and constructed to:

(1) Prevent the downward entry of water into the closed landfill throughout a period of at least 100 years;

(2) Function with minimum maintenance;

(3) Promote drainage and minimize erosion or abrasion of the cover;

(4) Accommodate settling and subsidence so that the cover's integrity is maintained;

(5) Accommodate lateral and vertical shear forces generated by the maximum credible earthquake so that the integrity of the cover is maintained;

(6) Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present; and

(7) Conform to the provisions of subsections (e) through (r) of section 66264.228, except that the Department shall grant a variance from any requirement of subsections (e) through (r) which the owner or operator demonstrates to the satisfaction of the Department is not necessary to protect public health, water quality or other environmental quality.

In addition to the cap requirements, other waste management features which will be incorporated at the Site include an enhanced drainage system that includes stormwater retention basins.

Operations at the Site during excavation and consolidation activities will satisfy requirements that are relevant and appropriate for hazardous waste landfill operations.

Groundwater Monitoring Requirements. According to 22 CCR 66264.552(e)(5), groundwater monitoring at a CAMU must be sufficient to:

> (1) Continue to detect and characterize the nature, extent, concentration, direction, and movement of existing releases of hazardous constituents in groundwater from sources located within the [CAMU]; and
>
> (2) Detect and subsequently characterize releases of hazardous constituents to groundwater that may occur from areas of the [CAMU] in which wastes will remain in place after closure of the [CAMU].

Groundwater monitoring requirements are specified in substantive portions of 22 CCR Division 4.5, Chapter 14, Article 6, and 23 CCR Division 3, Chapter 15, Article 5 and 40 CFR Subpart F and include detailed requirements for evaluating the items described in 22 CCR 66264.552(e)(5). Specific ARARs for groundwater monitoring at the Site are contained in Attachment B.

Closure and Post-Closure Requirements. Closure of a CAMU must:

> (1) Minimize the need for maintenance; and
>
> (2) Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, for areas where wastes remain in place, post-closure escape of RCRA hazardous wastes, hazardous constituents, leachate, contaminated runoff, or RCRA hazardous waste decomposition products to the ground, to surface waters, or to the atmosphere.

For the LFU CAMUs, these requirements focus on capping requirements (closure) and operation and maintenance requirements (post-closure). Title 22 66264.552(e)(4)(C) directs the state to consider the following factors in establishing closure requirements: (1) CAMU characteristics, (2) volume of waste in place after closure, (3) physical and chemical characteristics of the waste, (4) hydrogeological and relevant environmental conditions that may influence the migration of potential releases, and (5) potential risks to human health and environmental receptors if a release were to occur. Similarly, post-closure requirements must be established to protect human health and the environment. For example, monitoring and maintenance activities must be conducted to ensure the integrity of the cap.

The design of the LFU caps will comply with the closure standards listed in 22 CCR § 66264.310 (40 CFR 264.310). The objectives of the Title 22 and RCRA Subtitle C requirements are the same as those for closure of a CAMU: protection of human health and the environment by minimizing the potential for off-site migration of contaminants and minimization of ongoing maintenance needs. The landfill closure standards of Title 22 and RCRA Subtitle C consider similar factors in establishing the closure requirements as are required for CAMU closure. Factors considered for CAMU closure including waste volume, waste characteristics, hydrogeological conditions, and potential risks from a release are all addressed by the Title 22 and 40 CFR 264,310 requirements. Likewise, post-closure requirements for CAMUs such as monitoring and maintenance are contained within the Title 22 and RCRA Subtitle C standards. In addition to the protection, provided by the caps, the storm water drainage control system will help control, minimize or eliminate potential future releases at the Site. Specific ARARs for landfill

closure and post-closure activities at the Site are contained in Attachment B. By satisfying the Title 22 standards, CAMU closure and post-closure requirements will be addressed.

Summary of Specific Information. Requirements for design, operation, closure, and post-closure incorporated into the landfill cap remedial action at Site 1 will meet the requirements for design, operation, closure, and post-closure of the three CAMUs at the Site. Attachment B lists the ARARs for these activities. In achieving the substantive standards of CCR Title 22 and 40 CFR 264.310, whichever are more stringent, the requirements for a CAMU will be met. Designating LFU-1, LFU-2 and LFU-3 as CAMUs will ensure protection of human health and the environment by minimizing the potential for offsite migration of contaminants and will comply with ARARs. The three LFUs therefore satisfy the criteria and requirements for CAMU designation.

CAMU Designation. By concurring on the ROD, EPA and the state designate LFU-1, LFU-2 and LFU-3 as shown on Figure 6 as CAMUs under the selected remedial alternative. The CAMU regulation is an ARAR as discussed in Section 13.2.1 of this ROD. This ROD documents the CAMU designation pursuant to 40 CFR 264.552(c) as implemented through the California EPA, Department of Toxic Substances Control, Hazardous Waste Regulations, Title 22, Chapter 14, § 66264.552. The proposed plan for this ROD shall satisfy public notice requirements under the CAMU regulations. In designating the CAMU, EPA and the state have considered the criteria set forth in Section 66264.552 and determined that the CAMU satisfies each of these criteria.

13.4 COST EFFECTIVENESS

A cost-effective remedy is defined as one in which "costs are proportional to its overall effectiveness" (NCP §300.430(f)(1)(ii)(D). Assessing cost-effectiveness involves comparing costs to overall effectiveness, which is determined by evaluating the following three of the five balancing criteria: 1) longer-term effectiveness and permanence; 2) reduction in toxicity, mobility and volume through treatment; and 3) short-term effectiveness.

Only Alternatives SW-8, SW-9, and SW-10 rank higher in long-term effectiveness and permanence than the selected remedy (SW-6) but these alternatives have much higher costs. The selected remedy has the highest short-term effectiveness and the highest implementability of the alternatives that satisfy the two threshold criteria (i.e., Alternatives SW-5 through SW-10). The selected remedy is cost-effective. It is the lowest cost alternative that satisfies the two threshold criteria.

13.5 USE OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

U.S. EPA has determined that the selected remedy represents the maximum extent to which a permanent solution can be used in a practicable manner at the LEHR/OCL Site. Of those alternatives that are protective of human health and the environment that comply with ARARs, U.S. EPA has determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principle element and bias against off-site treatment and disposal and considering State and community acceptance. The estimated lifespan of the caps is more than 100 years, which is considered permanent. When the caps no longer operate as designed they will need to be reconstructed. The selected remedy does not use alternative treatment technologies because they are not appropriate for Site circumstances. The selected remedy satisfies the criteria for long-term effectiveness by removing the VOC “hot spot” areas and by capping contamination remaining in place. Off-site disposal of contaminated soil effectively reduces the mobility of chemicals and potential for direct contact.

13.6 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The selected remedy does not satisfy the statutory preference for treatment as a principal element because choosing treatment is impracticable and would dramatically increase costs while achieving the same level of risk reduction. This remedy is consistent with the presumptive remedy for landfills.

13.7 REQUIREMENTS FOR FIVE-YEAR REVIEWS

The NCP §300.430(f)(4)(ii) requires a five-year review if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure. Because this remedy will result in contaminants remaining on-site and the future property use will be limited, U.S. EPA will conduct the required statutory five-year reviews to ensure that the remedy is, and will continue to be, protective of human health and the environment.

Because the selected remedy is post-SARA and results in hazardous substances, pollutants, or contaminants remaining on the LEHR/OCL Site above levels that allow for unlimited use and unrestricted exposure, a statutory five-year review will be conducted for the LEHR/OCL Site. UC Davis will consolidate the protectiveness determinations for the remedy at the LEHR/OCL Site with the Five-Year Review for the DOE area. The first five-year review is triggered by completion of the ROD and will occur in January 2021 in coordination with the Five-Year Review being conducted by the DOE and every five years thereafter to ensure that the remedy is, or will be, protective of human health and the environment.

13.8 STATE ACCEPTANCE

The DTSC and the RWQCB have been an integral part of the CERCLA process for the LEHR/OCL Site, including review of the 2015 Proposed Plan and the review of this ROD. Both agencies support EPA's selection of Alternative SW-6 as the remedy for the LEHR/OCL Site.

13.9 COMMUNITY ACCEPTANCE

U.S. EPA issued a final Proposed Plan (U.S. EPA, 2015a) for the LEHR/OCL Site for public comment on January 27, 2015. The public comment period on the Proposed Plan was open from January 28 to February 26, 2015, and a public meeting was held on February 10, 2015. Only three parties commented on the Proposed Plan. In addition, an oral comment from one party was received at the Proposed Plan public meeting; however, the oral comment consisted of reading a written letter that was later provided to U.S. EPA. A summary of the responses to all comments received is presented in Sections 1.0 and 2.0 of Part 3: Responsiveness Summary. The transcript of the public meeting is in the Site Administrative Record. U.S. EPA does not believe that any of the issues raised in the comments warrant selection of a different remedy to address the contamination at the LEHR/OCL Site.

14.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan was released for public comment in January 2015. The Proposed Plan identified Alternative SW-6 as the preferred alternative. U.S. EPA reviewed all written and verbal comments regarding the preferred alternative that were submitted during the public comment period. EPA has determined that no significant changes to the remedy, as originally identified in the Proposed Plan, are necessary or appropriate.

PART 3: RESPONSIVENESS SUMMARY

U.S. EPA received letters from two individuals and one organization and thoroughly reviewed all comments received. This section summarizes key issues expressed by the public during the public comment period (January 28, 2015 through February 26, 2015) and U.S. EPA's responses. The submitted written comments and U.S. EPA's responses are in the Site Administrative Record.

1.0 CONCERNS RELATED TO SUPPORTING INFORMATION

Four comments (I.A.1b through I.A.1d, I.C.10) questioned the need for any action given the remote location, limited access, and the future use of the LEHR/OCL Site.

U.S. EPA Response: Although the location of the Site is remote from the main campus and surrounded by high fences and gates that are locked at night, UC Davis students and staff who care for animals at the Animal Resource Service V and the Equine Health Center have access to the Site 24 hours a day, seven days a week, and there are students who live in the Goat Barn. In addition, a number of professors, researchers, workers, and students have access to the Site during class/working hours and the general public, volunteers, and staff have access to the UC Davis Raptor Center, which is located near Landfill 3. So there is significant human presence at the Site. To ensure protection of persons living and working at the site and because these and other UC Davis buildings are located immediately adjacent to or on top of some of the landfills, a hypothetical on-site resident (i.e., residential receptor) was used in the HHRA as it represents the most sensitive/conservative current and future receptor. Action is needed to protect the students, staff, researchers, workers, and volunteers who work and study at the LEHR/OCL Site due to risk that exceeds the U.S. EPA risk management range (1×10^{-6} to 1×10^{-4}).

Nine comments (I.A.1a and I.B.2 through I.B.9) questioned the appropriateness of EPA's preferred alternative given uncertainty regarding risk calculations and risk assumptions, including the classification of chloroform as a carcinogen and concentrations of airborne chloroform.

U.S. EPA Response: Chloroform is considered by the American Conference of Governmental Industrial Hygienists (ACGIH), U.S. EPA, and the International Agency for Research on Cancer (IARC) as a probable carcinogen in humans. Chloroform is given an overall weight-of-evidence classification of B2 by U.S. EPA and a classification of 2B by IARC. These classifications are based on these organizations' determination that there is sufficient evidence for the carcinogenicity of chloroform in animals and insufficient evidence in humans. Chloroform has been found at 13,000 micrograms per cubic meter ($\mu g/m^3$) in soil gas from the Eastern Trenches and 16,000 $\mu g/m^3$ in soil gas from Landfill 2. These concentrations significantly exceed both the residential RSL for indoor air of 0.12 $\mu g/m^3$ and the industrial RSL for indoor air of 0.53 $\mu g/m^3$. U.S. EPA's Vapor Intrusion Screening Level (VISL) calculator can be used to predict concentrations of VOCs in indoor air and corresponding cancer and non-cancer risks. Using the soil gas-to-indoor air tab of the most current version of the VISL calculator (version 3.4; U.S. EPA, 2015d) with default assumptions and assuming residential use, 16,000 $\mu g/m^3$ of chloroform equates to an excess lifetime cancer risk of 3.9×10^{-3} (i.e., 3.9 in 1000) and a hazard quotient of 4.7. Under commercial use assumptions, the excess lifetime cancer risk is 9.0×10^{-4} (i.e., 9 in 10,000) and the hazard quotient is 1.1. Other VOCs were also detected in landfill gas. The cancer risk associated with potential vapor intrusion under both scenarios is significant.

U.S. EPA acknowledges that uncertainty exists with respect to human response to carcinogens. However, U.S. EPA is required to ensure that an appropriate level of conservatism is used when assessing risk. As discussed in U.S. EPA's Guidelines for Carcinogen Risk Assessment (U.S. EPA, 2005), U.S. EPA generally takes public health-protective, default positions regarding the interpretation of toxicological and

epidemiologic data: animal tumor findings are judged to be relevant to humans, and cancer risks are assumed to conform with low dose linearity.

13 comments (II.B.5 through II.B.7, II.C.8 through II.C.17) were related to concerns regarding landfill leachate.

U.S. EPA Response: As noted in Section I of the Proposed Plan, the intent of the multiple-layer caps is to isolate contaminated soil and waste and limit human exposure to COCs. In addition, the multiple-layer caps will be sloped to enhance drainage and vegetated to minimize precipitation infiltration and subsequent leachate production. Further, the average annual rainfall is approximately 19.66 inches. Since the yearly average monthly rainfall is 1.64 inches per month and the maximum average monthly rainfall is only 3.94 inches per month (January), it is unlikely that significant infiltration would occur that would not be captured by vegetation on the multiple-layer caps. Controlling infiltration will minimize potential leachate production in the event that the geomembrane is breached.

The presumptive remedy does not require extensive studies be conducted to determine whether the landfills are producing leachate that pollutes groundwater. However, the selected remedy includes installation of groundwater monitoring wells around the perimeter of the landfills, collection of baseline groundwater samples, and long-term groundwater monitoring. Comparison of the baseline and subsequent groundwater samples should indicate whether leachate production has been minimized and in the long-term will indicate whether the integrity of the geomembrane liner is maintained.

Two comments (II.D.18, II.D.19) related to uncertainty regarding the nature and extent of contamination at the LEHR/OCL Site.

U.S. EPA Response: As noted in the Presumptive Remedy for CERCLA Municipal Landfill Sites, U.S. EPA 540-F-93-035, dated September 1993, characterization of a landfill's contents is not necessary or appropriate for selecting a response action for these types of sites [municipal landfills] except in limited cases; rather, existing data are used to determine whether the containment presumption is appropriate. Due to the discovery of known chemical wastes during exploratory trenching, additional information regarding the nature and extent of the landfills was not obtained as it is not required to implement the presumptive remedy. The selected remedy was chosen as it leaves soil and waste largely undisturbed within the landfill areas with multi-layer caps to substantially reduce the infiltration of precipitation and production of leachate.

2.0 CONCERNS RELATED TO THE PERFORMANCE OF THE SELECTED REMEDY

13 comments (II.A.1 through II.A.4, III.A.1 through III.A.9) were related to uncertainty regarding the ability of Alternative SW-6 to meet RAOs and/or ARARs.

U.S. EPA Response: Based on Section 300.430 of 40 Code of Federal Regulations (CFR), the analysis of alternatives under review shall reflect the scope and complexity of Site problems and alternatives being evaluated and consider the relative significance of the factors within each criteria. The nine evaluation criteria are as follows: (a) Overall protection of human health and the environment; (b) Compliance with ARARs; (c) Long-term effectiveness and permanence; (d) Reduction of toxicity, mobility, or volume through treatment; (e) Short-term effectiveness; (f) Implementability; (g) Cost; (h) State acceptance; and, (i) Community acceptance. The selected alternative was evaluated and selected based on balancing the results of the comparison of the alternatives using the nine evaluation criteria.

As noted in the paper, Geomembrane Lifetime Prediction: Unexposed and Exposed Conditions, dated June 7, 2005 and updated February 8, 2011 (the White Paper), geomembrane longevity is strongly dependent on field temperature. Section 4.0 of the White Paper indicates that "HDPE [high density polyethylene] decreases its predicted lifetime (as measured by its half-life) from 446-years at 20°C [Celsius], to 69-years at 40°C." Given that groundwater temperatures in the most recent groundwater monitoring report ranged from 16.7 to 22.7°C, the potential exists for the geomembrane longevity to last a minimum of 200 years. The creation of free radicals, which could shorten the expected life-span of a geomembrane, is not anticipated to be an issue as long as the multiple-layer caps are installed during the dry season.

In addition, the multiple-layer caps will be sloped to enhance drainage and vegetated to minimize precipitation infiltration and subsequent leachate production. Further, the average annual rainfall in Davis is approximately 19.66 inches. Since the yearly average monthly rainfall is 1.64 inches per month and the maximum average monthly rainfall is only 3.94 inches per month (January), it is unlikely that significant infiltration would occur that would not be captured by vegetation on the multiple-layer caps. Controlling infiltration will minimize free radical production and in turn extend the life of the geomembrane. Also, the geomembrane liner will be installed on top of a clay layer and several feet of soil that are placed over the landfill wastes, to minimize the potential that wastes or vapors would interact with the geomembrane and reduce its longevity.

Lastly, some of the issues raised are based on Alternative SW-6 from the Final FS rather than the modified Alternative SW-6 (VOC "Hot Spot" Removal, Three On-Site CAMUs with Multiple-Layer Caps, Institutional Controls, Drainage Controls, and Groundwater Monitoring) that was presented in the Proposed Plan and which will be called Alternative SW-6 in these responses. The Soil FS version of Alternative SW-6 included the excavation and disposal of known chemical wastes and soil waste excavated from the Eastern Trenches and a portion of LFU-3 underlying the concrete-lined drainage channel. The known chemical wastes would be sent off-site for disposal while the solid waste would be placed within a nearby CAMU. The commenter appears to have assumed that excavation of this known chemical waste was still included in the Alternative SW-6. Alternative SW-6 proposes leaving soil and solid waste largely undisturbed and protected under landfill caps with the exception excavation of the two VOC "hot spot" areas. As a result of this modification, Alternative SW-6 minimizes excavation, segregation, and characterization of known chemical wastes for disposal at licensed off-site facilities; this is consistent with the presumptive remedy for landfills, since the location of all of the chemical wastes within the landfills is unknown.

Two comments (II.E.20, II.E.21) were related to the implementation of the presumptive remedy, including the need for long-term groundwater monitoring, groundwater remediation, and installation of a new cap.

U.S. EPA Response: The selected remedy includes monitoring and enforcement (e.g., annual site visits/inspections) and inspection and repair of the multiple-layer caps for a minimum of 200 years, as noted in the Alternative SW-6 cost estimate assumptions. Comparison of future groundwater sampling results with baseline groundwater sampling results will indicate whether the landfill caps are effectively minimizing leachate production. The need for groundwater remediation will be addressed in a future FS, Proposed Plan, and ROD.

The selected remedy assumes some erosion and settlement will occur, but does not include costs associated with a large scale failure, since factoring in costs for replacement of the multiple-layer caps would not make a significant difference in O&M costs. Specifically, the present value of a future cost (e.g., replacement of the multiple-layer caps) declines exponentially the further it is in time from the

present (e.g., after 200 or more years). For example, in present dollars, the cost for cap replacement 200 years from now would be insignificant.

Five comments (II.F.22 through II.F.26) were related to uncertainty regarding implementation of Alternative SW-6, including whether annual inspections and five-year reviews would be effective and the long-term ability of UC Davis to implement the ICs.

U.S. EPA Response: Annual inspections and five-year reviews are a required part of the remedy. The selected remedy includes long-term groundwater monitoring and enforcement (e.g., annual site visits/inspections) and inspection and repair of the multiple-layer caps for 200 years or the lifetime of the remedy. The selected remedy includes the prevention of deep-rooted vegetation and addresses deficiencies caused by deep-burrowing animals. In addition, maintenance of the multiple-layer cap and drainage controls, as well as groundwater monitoring, will help ensure the continued protection of human health and the environment. Further, failure of the multiple-layer caps within 30 years is unlikely, as noted in the White Paper. Lastly, the selected remedy includes deed notification and restrictive covenants to ensure land-use controls are carried forward with the Site should the governing organization and/or entity change during the lifetime of the remedy. Although it is true that inspections and five-year reviews cannot visually evaluate the condition of the underlying layers of the caps, long-term groundwater monitoring will provide data to evaluate whether the caps are still effective.

Four comments (III.B.10 through III.B.13) were related to uncertainty regarding the ability of Alternative SW-6 to meet green remediation standards.

U.S. EPA Response: The quantities for Alternative SW-6 presented in the Soil FS were modified for Alternative SW-6 presented in this ROD by eliminating the excavation, segregation, characterization, and off-site disposal of known chemical wastes from the list of alternative components. Because of this, the amount of soil needed, the number of truck trips, and the amount of energy are less than the quantities listed for Alternative SW-6 (FS) in the Soil FS. However, the green remediation evaluation was not updated to capture the elimination of these components and results are expected to be more favorable if green remediation is re-evaluated.

Although green remediation issues are not promulgated regulations that are specifically utilized in the analysis of the alternatives in the ROD, green remediation issues should be considered during the Remedial Design stage. Based on Section 300.430 of 40 CFR, the analysis of alternatives under review shall reflect the scope and complexity of Site problems and alternatives being evaluated and consider the relative significance of the factors within each criterion. The nine evaluation criteria are as follows: (a) Overall protection of human health and the environment; (b) Compliance with ARARs; (c) Long-term effectiveness and permanence; (d) Reduction of toxicity, mobility, or volume through treatment; (e) Short-term effectiveness; (f) Implementability; (g) Cost; (h) State acceptance; and, (i) Community acceptance. As such, these are the only criteria considered in the remedy selection.

Three comments (III.C.14 through III.C.16) were related to concerns regarding the costs and cost assumptions associated with Alternative SW-6 and replacement costs for buildings that will be removed to construct the landfill caps.

U.S. EPA Response: While it is understood that the replacement costs for the nine buildings which will be demolished as a component of Alternative SW-6 are real, the costs cannot be included in the alternative assessment as they are not allowable under CERCLA. Only costs associated with the remedy can be included. As a result, the replacement costs cannot be used for comparison of alternatives.

3.0 PREFERRED ALTERNATIVES

One commenter expressed a preference for Alterative SW-1, one commenter expressed a preference for Alternative SW-3, and one commenter suggested the substitution of a geosynthetic clay liner rather for the compacted clay liner.

U.S. EPA Response: Alternatives SW-1 and SW-3 do not meet the remedy selection threshold requirements due in part to the potential for COCs remaining in place to leach, migrate and contaminate groundwater and the requirement for a RCRA-compliant cap to close the CAMUs. As noted in Section 10 of this ROD, EPA may not select a remedy that does not satisfy the threshold criteria. However, SW-1 was evaluated to provide a baseline for comparison to other alternatives, as required by the NCP.

Although most of the soil and waste would remain in place, the Alterative SW-6 would remove only the VOC "hot spot" areas, in order to reduce the potential for COCs to migrate into groundwater and minimize soil vapor production. The multiple-layer caps would isolate contaminated soil and waste, limiting human exposure to COCs. In addition, deep-rooted vegetation and deep-burrowing animals would not be able to access contaminated material. Maintenance of the multiple-layer caps and drainage controls, as well as groundwater monitoring, would help maintain the continued protection of human health and the environment.

Although a geosynthetic clay liner could be part of the design of the selected remedy rather than a compacted clay layer, the ROD does not mandate specific landfill cap components but instead provides performance standards. Landfill cap components to meet the performance standards specified in the ROD will be determined during the Remedial Design phase following issuance of the ROD.

4.0 TECHNICAL AND LEGAL ISSUES

There are no significant technical changes to the selected remedy other than those identified in the Document of Significant Changes. There are no additional significant technical or legal issues.

5.0 REFERENCES

Blasland, Bouck, & Lee, Inc. (BBL) 2006. *Site-Wide Ecological Risk Assessment, LEHR/SCDS*, Prepared for the University of California, Davis, August.

Brown & Caldwell (BC), 2006a. *Site-Wide Risk Assessment, Volume I Human Health Risk Assessment (Part C – Risk Characterization for UC Davis Areas)*, LEHR/SCDS Environmental Restoration, April.

California Department of Toxic Substances Control (DTSC), 1996. *Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities*. California Environmental Protection Agency. July.

California Regional Water Quality Control Board Central Valley Region (RWQCB) 2003. *Waste Discharge Requirements for University of California*, Davis Campus Wastewater Treatment Plant, Yolo and Solano Counties, Order No. R5-2003-0003, NPDES No. CA0077895, January.

Department of Energy (DOE), 1988. *Environmental Survey Preliminary Report*, Laboratory for Energy-Related Health Research, Davis, California, March.

DOE, 2001. *Final Southwest Trenches Area 1998 Removal Action Confirmation Report, Laboratory for Energy-related Health Research, University of California, Davis*, June.

DOE, 2009. *Record of Decision for DOE Areas at the Laboratory for Energy-Related Health Research, University of California, Davis*, December.

Federal Emergency Management Agency (FEMA), 2010. *Definitions of FEMA Flood Zone Designations*, http://msc.fema.gov/webapp/wcs/stores/servlet/info?storeId=10001&catalogId=10001&langId=-1&content=floodZones&title=FEMA%20Flood%20Zone%20Designations, accessed May 2010.

Geomatrix, 2004. *Final UC Davis Remedial Investigation Report*, LEHR/SCDS Environmental Restoration, December.

ICF International, 2016. *Biological Assessment for the Laboratory for Energy-related Health Research/Old Campus Landfill Remediation Project.* January. (ICF 00583.13) Solano County, California. Prepared for University of California, Davis and U.S. Environmental Protection Agency, San Francisco, California. January.

Koerner, Robert M., Y. Grace Hsuan, and George R. Koerner, 2011. *Geomembrane Lifetime Prediction: Unexposed and Exposed Conditions*, Geosynthetic Institute, June 7, 2005 and updated February 8, 2011

Montgomery Watson Harza (MWH), 2004. *Site-Wide Risk Assessment, Volume I Human Health Risk Assessment (Part A – Risk Estimate) LEHR/SCDS Environmental Restoration*, March.

Office of Environmental Health Hazard Assessment (OEHHA), 2009. *Revised California Human Health Screening Levels for Lead*. September.

Rockwell International, 1984. *Initial Assessment Survey of the DOE LEHR Site of University of California – Davis*, October.

State Water Resources Control Board (SWRCB), 2011. Draft Waste Discharge Requirements (WDRs) for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) (General Permit), Retrieved from http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/phsii2011/draft_order.pdf, June 2015.

UC Davis, 2003. *Long-Range Development Plan Final Environmental Impact Report*, Volume I, October.

UC Davis, 2010a, Center for Health and the Environment, About Us, http://che.ucdavis.edu/about/, accessed August 2015.

UC Davis, 2010b, California Raptor Center, School of Veterinary Medicine. http://www.vetmed.ucdavis.edu/calraptor/, accessed September 2015.

U.S. Environmental Protection Agency (U.S. EPA). 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A). U.S. EPA/540/1-89/002. December.

U.S. EPA, 1993. *Presumptive Remedy for CERCLA Municipal Landfill Sites*, U.S. EPA 540-F-93-035, September.

U.S. EPA, 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*. Interim Final. June.

U.S. EPA, 1998a. Health risk assessment/characterization of the drinking water disinfection byproduct chloroform. Prepared for Health and Ecological Criteria Division, Office of Science and Technology, Washington, DC, by Toxicology Excellence for Risk Assessment, Cincinnati, OH, under Purchase Order No. 8W-0767-NTLX. November 4, 1998.

U.S. EPA, 1998b. National primary drinking water regulations: disinfectants and disinfection byproducts. Notice of data availability; proposed rule. 40 CFR Parts 141-142:15674.

U.S. EPA. 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. Solid Waste and Emergency Response. U.S. EPA 540-R-98-031. July.

U.S. EPA, 2005. *Guidelines for Carcinogen Risk Assessment*, U.S. EPA/630/P-03/001B, March.

U.S. EPA, 2015a. *Proposed Plan for University of California, Davis Area, Soil/Solid Waste and Soil Gas at the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site, University of California, Davis, California*, January.

U.S. EPA, 2015b. Preliminary Remediation Goals for Radionuclides. http://epa-prgs.ornl.gov/radionuclides/. Accessed August 2015.

U.S. EPA, 2015c. Presumptive Remedy for CERCLA Municipal Landfill Sites. http://www.epa.gov/superfund/policy/remedy/presump/clms.htm. Accessed August 2015.

U.S. EPA, 2015d. OSWER Vapor Intrusion Assessment. Vapor Intrusion Screening Level (VISL) Calculator Version 3.4, November 2015 RSLs. Accessed September 2016.

U.S. EPA, 2016a. Regional Screening Level (RSL) Summary Table (TR=1E-6, HQ=1), May 2016.

U.S. EPA, 2016b. *Addendum to the Final Feasibility Study for the University of California, Davis Areas, Volume 1, Soil/Solid Waste and Soil Gas at the Laboratory for Energy-related Health Research/Old Campus Landfill Superfund Site,* University of California, Davis. September 23.

U.S. Fish and Wildlife Service, 2016. Letter addressed to Caleb Shaffer, Manager, Region IX, U.S. Environmental Protection Agency. Subject line: "Consultation on the Proposed U.C. Davis Old Campus Landfill Superfund Site Project, Solano County, California." March 4.

United States Office of Management and Budget (OMB). 2012. Circular A-94 Appendix C. http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c

Weiss Associates, 2010. *Feasibility Study Data Gaps Technical Report at the Laboratory for Energy-Related Health Research/South Campus Disposal Site,* University of California, Davis, February.

Weiss, 2012a. *Final Feasibility Study for the University of California, Davis Areas, Volume 1, Soil/Solid Waste and Soil Gas*, April.

Weiss, 2012b. *2010 Comprehensive Annual Water Monitoring Report*, University of California, Davis, July.

6.0 GLOSSARY/ACRONYMS

Administrative Record—A collection of all the pertinent documents that support the final decisions for each site. This is located at the former McClellan Air Force Base and at U.S. EPA, Region IX.

Applicable or relevant and appropriate requirements (ARARs)— Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)— Legislation passed in 1980 and designed to respond to the past disposal of hazardous substances. The act was extensively amended in 1986 by the Superfund Amendments and Reauthorization Act, which added many provisions and clarified unclear areas in the original law.

Contaminant of concern (COC)—A substance selected for environmental cleanup based on predicted impacts to groundwater resources and a health risk posed by the contaminant.

Exposure pathway—Ways that people can be exposed to contaminants. Common pathways include breathing, ingestion, or absorption through the skin.

Feasibility Study (FS)—A study of a hazardous waste site that must be completed before a cleanup remedy can be chosen and implemented. The Feasibility Study identifies and evaluates alternatives for addressing contamination.

Five-year review—Regular check-ups conducted on certain Superfund sites (where either treatment systems are still operating after 5 years or where waste is left behind) to make sure the site is still safe. Five-year review reports make recommendations on the continuation, modification, or elimination of annual reports and institutional control monitoring frequencies. Five-year reviews also represent an opportunity for the public to voice any concerns.

Groundwater—Underground water that fills pores between particles of soil, sand, and gravel or openings in rocks to the point of saturation. Where groundwater occurs in significant quantity, it can be used as a source of drinking water.

Hazard index (HI)—The ratio of contaminant concentration divided by the safe exposure level. If the hazard index exceeds 1, people are exposed to contaminants that may pose non-cancer health risks. Non-cancer health risks are contaminant-dependent but may include kidney disease, headaches, dizziness, and anemia. For more information, go to ToxFAQs at http://www.atsdr.cdc.gov/.

Industrial Use—When land is used for industrial, commercial, office, retail, or other occupational purposes.

Land Use Covenant (LUC)—A legal document that limits future land use.

Mitigate—The implementation of engineered controls or actions that prevent or make conditions less severe or harsh.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP)—The federal regulation that guides determination of the sites to be cleaned up under the Superfund program. This plan also provides the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances in accordance with CERCLA and the Clean Water Act.

National Priorities List (NPL)—The U.S. Environmental Protection Agency's published list of the highest priority hazardous waste sites in the U.S. for investigation and cleanup, which are subject to the Superfund program.

Non-cancer health risk—Health risks that do not result in cancer and may include kidney disease, headaches, dizziness, and anemia.

Non-volatile organic compounds (non-VOCs)—A group of compounds that do not readily evaporate at room temperature. They include metals, pesticides, SVOCs, petroleum hydrocarbons, dioxins/furans and radionuclides.

Occupational Worker—Includes indoor and outdoor workers who may be exposed to chemicals in soil, air, and water during the course of a workday.

Polychlorinated Biphenyls (PCBs)—A group of man-made compounds that were widely used, mainly in electrical equipment, but were banned at the end of the 1970s in many countries because of environmental concerns.

Preferred Alternative—U.S. EPA's suggested cleanup method(s) for the contaminated site(s). The preferred alternative is protective of human health and the environment, complies with applicable or relevant and appropriate requirements, and is cost-effective.

Proposed Plan—A summary of cleanup alternatives for a contaminated site, including a preferred alternative and the reasons for its selection. This step is the community's opportunity to review and comment on all cleanup alternatives under consideration. The responses to the comments are presented in the Record of Decision. All changes from the Proposed Plan are explained in the Record of Decision.

Radionuclides—Radioactive elements that may be naturally occurring or synthetic. There are hundreds of radionuclides, many of which are rarely encountered. People are much more likely to encounter a few that are used routinely for medical, military, or commercial purposes. Twelve radionuclides are most commonly found at Superfund sites, including cesium-137, radium, radon, and thorium.

Record of Decision (ROD)—A document explaining and legally committing the lead agency to the cleanup alternative(s) that will be used at a site. The Record of Decision is based on information and technical analyses generated during the Remedial Investigation, the Feasibility Study, and consideration of public comments and community concerns.

Remedial Investigation (RI)—A hazardous waste site study to examine the nature and extent of site contamination.

Remediation Goals—Levels set for the protection of human health, groundwater, or surface water. To protect human health, the set risk level is usually one in a million—an additional person in a million people may contract cancer.

Residential Receptor—A resident (child or adult) who may be exposed to chemicals through soil, air, and water from indoor and outdoor exposure.

Residential Use—When land is suitable for use as housing or any other purpose.

Responsiveness Summary—The section within the Record of Decision that summarizes comments received from the public during the public comment period and the responses from the lead agency.

Risk Assessment—A study based on the results of the Remedial Investigation to determine the extent to which chemical contaminants found at a Superfund site pose a risk to public health and the environment.

Semi-volatile organic compounds (SVOCs)—A group of chemical compounds that evaporate in air at a slower rate than VOCs. SVOC is a name for a class of compounds and includes PAHs, PCBs, pesticides, and dioxins/furans.

Soil gas—The air between soil particles that may be contaminated by contaminants that have vaporized in the soil.

Solid Waste—Non-liquid, non-soluble materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes also include sewage sludge, agricultural refuse, demolition wastes, and mining residues.

Total petroleum hydrocarbons—A wide range of liquid hydrocarbons, including gasoline and diesel fuel.

Unrestricted land use—A designation that risk is reduced to such a low level as to allow anything to be built, including homes and public or private schools for persons under 18 years of age.

Vapor inhalation pathway—A pathway used in risk analysis where contaminants in the soil volatilize into soil gas, migrate into buildings, and are inhaled by the occupants.

Volatile organic compound (VOC)—An organic compound containing carbon that evaporates (volatilizes) readily at room temperature. VOCs are used in the manufacturing of paints, pharmaceuticals, and refrigerants. VOCs typically are industrial solvents, such as trichloroethene. Some VOCs are known carcinogens. For more information, go to ToxFAQs at http://www.atsdr.cdc.gov/.

ATTACHMENT A.
CLEANUP LEVELS FOR THE LEHR OCL SITE

(U.S. EPA Regional Screening Levels, May 2016)

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Acephate	30560-19-1	2.6E+02	-
Acetaldehyde	75-07-0	4.9E+01	5.6E+00
Acetochlor	34256-82-1	1.6E+04	-
Acetone	67-64-1	6.7E+05	1.4E+05
Acetone Cyanohydrin	75-86-5	1.2E+07	8.8E+00
Acetonitrile	75-05-8	3.4E+03	2.6E+02
Acetophenone	98-86-2	1.2E+05	-
Acetylaminofluorene, 2-	53-96-3	6.0E-01	9.4E-03
Acrolein	107-02-8	6.0E-01	8.8E-02
Acrylamide	79-06-1	4.6E+00	1.2E-01
Acrylic Acid	79-10-7	4.2E+02	4.4E+00
Acrylonitrile	107-13-1	1.1E+00	1.8E-01
Adiponitrile	111-69-3	3.6E+07	2.6E+01
Alachlor	15972-60-8	4.1E+01	-
Aldicarb	116-06-3	8.2E+02	-
Aldicarb Sulfone	1646-88-4	8.2E+02	-
Aldicarb sulfoxide	1646-87-3	-	-
Aldrin	309-00-2	1.8E-01	2.5E-03
Allyl Alcohol	107-18-6	1.5E+01	4.4E-01
Allyl Chloride	107-05-1	3.2E+00	2.00E+00
Aluminum	7429-90-5	1.1E+06	2.2E+01
Aluminum Phosphide	20859-73-8	4.7E+02	-
Ametryn	834-12-8	7.4E+03	-
Aminobiphenyl, 4-	92-67-1	1.1E-01	2.0E-03
Aminophenol, m-	591-27-5	6.6E+04	-
Aminophenol, p-	123-30-8	1.6E+04	-
Amitraz	33089-61-1	2.1E+03	-
Ammonia	7664-41-7	-	4.4E+02
Ammonium Sulfamate	7773-06-0	2.3E+05	-
Amyl Alcohol, tert-	75-85-4	3.4E+02	1.3E+01
Aniline	62-53-3	4.0E+02	4.4E+00
Anthraquinone, 9,10-	84-65-1	5.7E+01	-
Antimony (metallic)	7440-36-0	4.7E+02	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Antimony Pentoxide	1314-60-9	5.8E+02	-
Antimony Tetroxide	1332-81-6	4.7E+02	-
Antimony Trioxide	1309-64-4	1.2E+06	8.8E-01
Arsenic, Inorganic	7440-38-2	3.0E+00	2.9E-03
Arsine	7784-42-1	4.1E+00	2.2E-01
Asulam	3337-71-1	4.1E+04	-
Atrazine	1912-24-9	1.0E+01	-
Auramine	492-80-8	2.6E+00	4.9E-02
Avermectin B1	65195-55-3	3.3E+02	-
Azinphos-methyl	86-50-0	2.5E+03	4.4E+01
Azobenzene	103-33-3	2.6E+01	4.0E-01
Azodicarbonamide	123-77-3	4.0E+04	3.1E-02
Barium	7440-39-3	2.2E+05	2.2E+00
Barium Chromate	10294-40-3	6.2E+00	8.2E-05
Benfluralin	1861-40-1	3.5E+05	-
Benomyl	17804-35-2	4.1E+04	-
Bensulfuron-methyl	83055-99-6	1.6E+05	-
Bentazon	25057-89-0	2.5E+04	-
Benzaldehyde	100-52-7	8.2E+02	-
Benzene	71-43-2	5.1E+00	1.6E+00
Benzenediamine-2-methyl sulfate, 1,4-	6369-59-1	2.3E+01	-
Benzenethiol	108-98-5	1.2E+03	-
Benzidine	92-87-5	1.0E-02	1.8E-04
Benzoic Acid	65-85-0	3.3E+06	-
Benzotrichloride	98-07-7	2.5E-01	-
Benzyl Alcohol	100-51-6	8.2E+04	-
Benzyl Chloride	100-44-7	4.8E+00	2.5E-01
Beryllium and compounds	7440-41-7	2.3E+03	5.1E-03
Bifenox	42576-02-3	7.4E+03	-
Biphenthrin	82657-04-3	1.2E+04	-
Biphenyl, 1,1'-	92-52-4	2.0E+02	1.8E+00
Bis(2-chloro-1-methylethyl) ether	108-60-1	4.7E+04	-
Bis(2-chloroethoxy)methane	111-91-1	2.5E+03	-
Bis(2-chloroethyl)ether	111-44-4	1.0E+00	3.7E-02
Bis(chloromethyl)ether	542-88-1	3.6E-04	2.0E-04
Bisphenol A	80-05-7	4.1E+04	-
Boron And Borates Only	7440-42-8	2.3E+05	8.8E+01
Boron Trichloride	10294-34-5	2.3E+06	8.8E+01

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Boron Trifluoride	7637-07-2	4.7E+04	5.7E+01
Bromate	15541-45-4	4.7E+00	-
Bromo-2-chloroethane, 1-	107-04-0	1.1E-01	2.0E-02
Bromobenzene	108-86-1	1.8E+03	2.6E+02
Bromochloromethane	74-97-5	6.3E+02	1.8E+02
Bromodichloromethane	75-27-4	1.3E+00	3.3E-01
Bromoform	75-25-2	8.6E+01	1.1E+01
Bromomethane	74-83-9	3.0E+01	2.2E+01
Bromophos	2104-96-3	5.8E+03	-
Bromoxynil	1689-84-5	1.6E+04	-
Bromoxynil Octanoate	1689-99-2	2.3E+04	-
Butadiene, 1,3-	106-99-0	2.6E-01	4.1E-01
Butanol, N-	71-36-3	1.2E+05	-
Butyl alcohol, sec-	78-92-2	1.5E+06	1.3E+05
Butylate	2008-41-5	5.8E+04	-
Butylated hydroxyanisole	25013-16-5	1.1E+04	2.2E+02
Butylated hydroxytoluene	128-37-0	6.4E+02	-
Butylbenzene, n-	104-51-8	5.8E+04	-
Butylbenzene, sec-	135-98-8	1.2E+05	-
Butylbenzene, tert-	98-06-6	1.2E+05	-
Cacodylic Acid	75-60-5	1.6E+04	-
Cadmium (Diet)	7440-43-9	9.8E+02	-
Cadmium (Water)	7440-43-9	-	6.8E-03
Calcium Chromate	13765-19-0	6.2E+00	8.2E-05
Caprolactam	105-60-2	4.0E+05	9.6E+00
Captafol	2425-06-1	1.5E+01	2.9E-01
Captan	133-06-2	1.0E+03	1.9E+01
Carbaryl	63-25-2	8.2E+04	-
Carbofuran	1563-66-2	4.1E+03	-
Carbon Disulfide	75-15-0	3.5E+03	3.1E+03
Carbon Tetrachloride	56-23-5	2.9E+00	2.0E+00
Carbonyl Sulfide	463-58-1	2.8E+02	4.4E+02
Carbosulfan	55285-14-8	8.2E+03	-
Carboxin	5234-68-4	8.2E+04	-
Ceric oxide	1306-38-3	5.4E+06	3.9E+00
Chloral Hydrate	302-17-0	1.2E+05	-
Chloramben	133-90-4	1.2E+04	-
Chloranil	118-75-2	5.7E+00	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Chlordane	12789-03-6	7.7E+00	1.2E-01
Chlordecone (Kepone)	143-50-0	2.3E-01	2.7E-03
Chlorfenvinphos	470-90-6	5.7E+02	-
Chlorimuron, Ethyl-	90982-32-4	1.6E+04	-
Chlorine	7782-50-5	7.8E-01	6.4E-01
Chlorine Dioxide	10049-04-4	3.4E+04	8.8E-01
Chlorite (Sodium Salt)	7758-19-2	3.5E+04	-
Chloro-1,1-difluoroethane, 1-	75-68-3	2.3E+05	2.2E+05
Chloro-1,3-butadiene, 2-	126-99-8	4.4E-02	4.1E-02
Chloro-2-methylaniline HCl, 4-	3165-93-3	5.0E+00	-
Chloro-2-methylaniline, 4-	95-69-2	2.3E+01	1.6E-01
Chloroacetaldehyde, 2-	107-20-0	1.2E+01	-
Chloroacetic Acid	79-11-8	-	-
Chloroacetophenone, 2-	532-27-4	1.8E+05	1.3E-01
Chloroaniline, p-	106-47-8	1.1E+01	-
Chlorobenzene	108-90-7	1.3E+03	2.2E+02
Chlorobenzilate	510-15-6	2.1E+01	4.0E-01
Chlorobenzoic Acid, p-	74-11-3	2.5E+04	-
Chlorobenzotrifluoride, 4-	98-56-6	2.5E+03	1.3E+03
Chlorobutane, 1-	109-69-3	4.7E+04	-
Chlorodifluoromethane	75-45-6	2.1E+05	2.2E+05
Chloroethanol, 2-	107-07-3	2.3E+04	-
Chloroform	67-66-3	1.4E+00	5.3E-01
Chloromethane	74-87-3	4.6E+02	3.9E+02
Chloromethyl Methyl Ether	107-30-2	8.9E-02	1.8E-02
Chloronitrobenzene, o-	88-73-3	7.7E+00	4.4E-02
Chloronitrobenzene, p-	100-00-5	3.8E+01	8.8E+00
Chlorophenol, 2-	95-57-8	5.8E+03	-
Chloropicrin	76-06-2	8.2E+00	1.8E+00
Chlorothalonil	1897-45-6	7.4E+02	1.4E+01
Chlorotoluene, o-	95-49-8	2.3E+04	-
Chlorotoluene, p-	106-43-4	2.3E+04	-
Chlorozotocin	54749-90-5	9.6E-03	1.8E-04
Chlorpropham	101-21-3	1.6E+05	-
Chlorpyrifos	2921-88-2	8.2E+02	-
Chlorpyrifos Methyl	5598-13-0	8.2E+03	-
Chlorsulfuron	64902-72-3	4.1E+04	-
Chlorthal-dimethyl	1861-32-1	8.2E+03	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Chlorthiophos	60238-56-4	6.6E+02	-
Chromium(III), Insoluble Salts	16065-83-1	1.8E+06	-
Chromium(VI)	18540-29-9	6.3E+00	1.5E-04
Chromium, Total	7440-47-3	-	-
Clofentezine	74115-24-5	1.1E+04	-
Cobalt	7440-48-4	3.5E+02	1.4E-03
Coke Oven Emissions	8007-45-2	-	2.0E-02
Copper	7440-50-8	4.7E+04	-
Cresol, m-	108-39-4	4.1E+04	2.6E+03
Cresol, o-	95-48-7	4.1E+04	2.6E+03
Cresol, p-	106-44-5	8.2E+04	2.6E+03
Cresol, p-chloro-m-	59-50-7	8.2E+04	-
Cresols	1319-77-3	8.2E+04	2.6E+03
Crotonaldehyde, trans-	123-73-9	1.7E+00	-
Cumene	98-82-8	9.9E+03	1.8E+03
Cupferron	135-20-6	1.0E+01	1.9E-01
Cyanazine	21725-46-2	2.7E+00	-
Cyanides			
~Calcium Cyanide	592-01-8	1.2E+03	-
~Copper Cyanide	544-92-3	5.8E+03	-
~Cyanide (CN-)	57-12-5	1.5E+02	3.5E+00
~Cyanogen	460-19-5	1.2E+03	-
~Cyanogen Bromide	506-68-3	1.1E+05	-
~Cyanogen Chloride	506-77-4	5.8E+04	-
~Hydrogen Cyanide	74-90-8	1.5E+02	3.5E+00
~Potassium Cyanide	151-50-8	2.3E+03	-
~Potassium Silver Cyanide	506-61-6	5.8E+03	-
~Silver Cyanide	506-64-9	1.2E+05	-
~Sodium Cyanide	143-33-9	1.2E+03	-
~Thiocyanates	NA	2.3E+02	-
~Thiocyanic Acid	463-56-9	2.3E+02	-
~Zinc Cyanide	557-21-1	5.8E+04	-
Cyclohexane	110-82-7	2.7E+04	2.6E+04
Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	1.0E+02	-
Cyclohexanone	108-94-1	1.3E+05	3.1E+03
Cyclohexene	110-83-8	3.1E+03	4.4E+03
Cyclohexylamine	108-91-8	2.3E+05	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Cyfluthrin	68359-37-5	2.1E+04	-
Cyhalothrin	68085-85-8	4.1E+03	-
Cypermethrin	52315-07-8	8.2E+03	-
Cyromazine	66215-27-8	6.2E+03	-
DDD	72-54-8	9.6E+00	1.8E-01
DDE, p,p'-	72-55-9	9.3E+00	1.3E-01
DDT	50-29-3	8.5E+00	1.3E-01
Dalapon	75-99-0	2.5E+04	-
Daminozide	1596-84-5	1.3E+02	2.4E+00
Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	3.3E+03	-
Demeton	8065-48-3	3.3E+01	-
Di(2-ethylhexyl)adipate	103-23-1	1.9E+03	-
Diallate	2303-16-4	3.8E+01	-
Diazinon	333-41-5	5.7E+02	-
Dibenzothiophene	132-65-0	1.2E+04	-
Dibromo-3-chloropropane, 1,2-	96-12-8	6.4E-02	2.0E-03
Dibromobenzene, 1,3-	108-36-1	4.7E+02	-
Dibromobenzene, 1,4-	106-37-6	1.2E+04	-
Dibromochloromethane	124-48-1	3.9E+01	-
Dibromoethane, 1,2-	106-93-4	1.6E-01	2.0E-02
Dibromomethane (Methylene Bromide)	74-95-3	9.9E+01	1.8E+01
Dibutyltin Compounds	NA	2.5E+02	-
Dicamba	1918-00-9	2.5E+04	-
Dichloro-2-butene, 1,4-	764-41-0	9.4E-03	2.9E-03
Dichloro-2-butene, cis-1,4-	1476-11-5	3.2E-02	2.9E-03
Dichloro-2-butene, trans-1,4-	110-57-6	3.2E-02	2.9E-03
Dichloroacetic Acid	79-43-6	4.6E+01	-
Dichlorobenzene, 1,2-	95-50-1	9.3E+03	8.8E+02
Dichlorobenzene, 1,4-	106-46-7	1.1E+01	1.1E+00
Dichlorobenzidine, 3,3'-	91-94-1	5.1E+00	3.6E-02
Dichlorobenzophenone, 4,4'-	90-98-2	7.4E+03	-
Dichlorodifluoromethane	75-71-8	3.7E+02	4.4E+02
Dichloroethane, 1,1-	75-34-3	1.6E+01	7.7E+00
Dichloroethane, 1,2-	107-06-2	2.0E+00	4.7E-01
Dichloroethylene, 1,1-	75-35-4	1.0E+03	8.8E+02
Dichloroethylene, 1,2-cis-	156-59-2	2.3E+03	-
Dichloroethylene, 1,2-trans-	156-60-5	2.3E+04	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Dichlorophenol, 2,4-	120-83-2	2.5E+03	-
Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	9.6E+03	-
Dichlorophenoxy)butyric Acid, 4-(2,4-	94-82-6	6.6E+03	-
Dichloropropane, 1,2-	78-87-5	4.4E+00	1.2E+00
Dichloropropane, 1,3-	142-28-9	2.3E+04	-
Dichloropropanol, 2,3-	616-23-9	2.5E+03	-
Dichloropropene, 1,3-	542-75-6	8.2E+00	3.1E+00
Dichlorvos	62-73-7	7.9E+00	1.5E-01
Dicrotophos	141-66-2	8.2E+01	-
Dicyclopentadiene	77-73-6	5.4E+00	1.3E+00
Dieldrin	60-57-1	1.4E-01	2.7E-03
Diesel Engine Exhaust	NA	-	4.1E-02
Diethanolamine	111-42-2	1.6E+03	8.8E-01
Diethylene Glycol Monobutyl Ether	112-34-5	2.4E+04	4.4E-01
Diethylene Glycol Monoethyl Ether	111-90-0	4.8E+04	1.3E+00
Diethylformamide	617-84-5	1.2E+03	-
Diethylstilbestrol	56-53-1	6.6E-03	1.2E-04
Difenzoquat	43222-48-6	6.6E+04	-
Diflubenzuron	35367-38-5	1.6E+04	-
Difluoroethane, 1,1-	75-37-6	2.0E+05	1.8E+05
Dihydrosafrole	94-58-6	4.5E+01	9.4E-01
Diisopropyl Ether	108-20-3	9.4E+03	3.1E+03
Diisopropyl Methylphosphonate	1445-75-6	9.3E+04	-
Dimethipin	55290-64-7	1.6E+04	-
Dimethoate	60-51-5	1.6E+02	-
Dimethoxybenzidine, 3,3'-	119-90-4	1.4E+00	-
Dimethyl methylphosphonate	756-79-6	1.4E+03	-
Dimethylamino azobenzene [p-]	60-11-7	5.0E-01	9.4E-03
Dimethylaniline HCl, 2,4-	21436-96-4	4.0E+00	-
Dimethylaniline, 2,4-	95-68-1	1.1E+01	-
Dimethylaniline, N,N-	121-69-7	2.3E+03	-
Dimethylbenzidine, 3,3'-	119-93-7	2.1E-01	-
Dimethylformamide	68-12-2	1.5E+04	1.3E+02
Dimethylhydrazine, 1,1-	57-14-7	2.4E-01	8.8E-03
Dimethylhydrazine, 1,2-	540-73-8	4.1E-03	7.7E-05
Dimethylphenol, 2,4-	105-67-9	1.6E+04	-
Dimethylphenol, 2,6-	576-26-1	4.9E+02	-
Dimethylphenol, 3,4-	95-65-8	8.2E+02	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Dimethylvinylchloride	513-37-1	4.8E+00	9.4E-01
Dinitro-o-cresol, 4,6-	534-52-1	6.6E+01	-
Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	1.6E+03	-
Dinitrobenzene, 1,2-	528-29-0	8.2E+01	-
Dinitrobenzene, 1,3-	99-65-0	8.2E+01	-
Dinitrobenzene, 1,4-	100-25-4	8.2E+01	-
Dinitrophenol, 2,4-	51-28-5	1.6E+03	-
Dinitrotoluene Mixture, 2,4/2,6-	NA	3.4E+00	-
Dinitrotoluene, 2,4-	121-14-2	7.4E+00	1.4E-01
Dinitrotoluene, 2,6-	606-20-2	1.5E+00	-
Dinitrotoluene, 2-Amino-4,6-	35572-78-2	2.3E+03	-
Dinitrotoluene, 4-Amino-2,6-	19406-51-0	2.3E+03	-
Dinitrotoluene, Technical grade	25321-14-6	5.1E+00	-
Dinoseb	88-85-7	8.2E+02	-
Dioxane, 1,4-	123-91-1	2.4E+01	2.5E+00
Dioxins			
~Hexachlorodibenzo-p-dioxin, Mixture	NA	4.7E-04	9.4E-06
~TCDD, 2,3,7,8-	1746-01-6	2.2E-05	3.2E-07
Diphenamid	957-51-7	2.5E+04	-
Diphenyl Sulfone	127-63-9	6.6E+02	-
Diphenylamine	122-39-4	2.1E+04	-
Diphenylhydrazine, 1,2-	122-66-7	2.9E+00	5.6E-02
Diquat	85-00-7	1.8E+03	-
Direct Black 38	1937-37-7	3.2E-01	8.8E-05
Direct Blue 6	2602-46-2	3.1E-01	8.8E-05
Direct Brown 95	16071-86-6	3.4E-01	8.8E-05
Disulfoton	298-04-4	3.3E+01	-
Dithiane, 1,4-	505-29-3	1.2E+04	-
Diuron	330-54-1	1.6E+03	-
Dodine	2439-10-3	3.3E+03	-
EPTC	759-94-4	2.9E+04	-
Endosulfan	115-29-7	7.0E+03	-
Endothall	145-73-3	1.6E+04	-
Endrin	72-20-8	2.5E+02	-
Epichlorohydrin	106-89-8	8.2E+01	4.4E+00
Epoxybutane, 1,2-	106-88-7	6.7E+02	8.8E+01
Ethanol, 2-(2-methoxyethoxy)-	111-77-3	3.3E+04	-
Ethephon	16672-87-0	4.1E+03	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Ethion	563-12-2	4.1E+02	-
Ethoxyethanol Acetate, 2-	111-15-9	1.4E+04	2.6E+02
Ethoxyethanol, 2-	110-80-5	4.7E+04	8.8E+02
Ethyl Acetate	141-78-6	2.6E+03	3.1E+02
Ethyl Acrylate	140-88-5	2.1E+02	3.5E+01
Ethyl Chloride (Chloroethane)	75-00-3	5.7E+04	4.4E+04
Ethyl Ether	60-29-7	2.3E+05	-
Ethyl Methacrylate	97-63-2	7.6E+03	1.3E+03
Ethyl-p-nitrophenyl Phosphonate	2104-64-5	8.2E+00	-
Ethylbenzene	100-41-4	2.5E+01	4.9E+00
Ethylene Cyanohydrin	109-78-4	5.7E+04	-
Ethylene Diamine	107-15-3	1.1E+05	-
Ethylene Glycol	107-21-1	1.6E+06	1.8E+03
Ethylene Glycol Monobutyl Ether	111-76-2	8.2E+04	7.0E+03
Ethylene Oxide	75-21-8	7.9E-01	1.4E-01
Ethylene Thiourea	96-45-7	5.1E+01	9.4E-01
Ethyleneimine	151-56-4	1.2E-02	6.5E-04
Ethylphthalyl Ethyl Glycolate	84-72-0	2.5E+06	-
Fenamiphos	22224-92-6	2.1E+02	-
Fenpropathrin	39515-41-8	2.1E+04	-
Fenvalerate	51630-58-1	2.1E+04	-
Fluometuron	2164-17-2	1.1E+04	-
Fluoride	16984-48-8	4.7E+04	5.7E+01
Fluorine (Soluble Fluoride)	7782-41-4	7.0E+04	5.7E+01
Fluridone	59756-60-4	6.6E+04	-
Flurprimidol	56425-91-3	1.6E+04	-
Flusilazole	85509-19-9	5.7E+02	-
Flutolanil	66332-96-5	4.9E+04	-
Fluvalinate	69409-94-5	8.2E+03	-
Folpet	133-07-3	6.6E+02	-
Fomesafen	72178-02-0	1.2E+01	-
Fonofos	944-22-9	1.6E+03	-
Formaldehyde	50-00-0	7.3E+01	9.4E-01
Formic Acid	64-18-6	1.2E+02	1.3E+00
Fosetyl-AL	39148-24-8	2.5E+06	-
Furans			
~Dibenzofuran	132-64-9	1.0E+03	-
~Furan	110-00-9	1.0E+03	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
~Tetrahydrofuran	109-99-9	9.4E+04	8.8E+03
Furazolidone	67-45-8	6.0E-01	-
Furfural	98-01-1	2.6E+03	2.2E+02
Furium	531-82-8	1.5E+00	2.9E-02
Furmecyclox	60568-05-0	7.7E+01	1.4E+00
Glufosinate, Ammonium	77182-82-2	3.3E+02	-
Glutaraldehyde	111-30-8	4.8E+05	3.5E-01
Glycidyl	765-34-4	2.1E+02	4.4E+00
Glyphosate	1071-83-6	8.2E+04	-
Guanidine	113-00-8	1.2E+04	-
Guanidine Chloride	50-01-1	1.6E+04	-
Haloxyfop, Methyl	69806-40-2	4.1E+01	-
Heptachlor	76-44-8	6.3E-01	9.4E-03
Heptachlor Epoxide	1024-57-3	3.3E-01	4.7E-03
Hexabromobenzene	87-82-1	2.3E+03	-
Hexabromodiphenyl ether, 2,2',4,4',5,5'- (BDE-153)	68631-49-2	1.6E+02	-
Hexachlorobenzene	118-74-1	9.6E-01	2.7E-02
Hexachlorobutadiene	87-68-3	5.3E+00	5.6E-01
Hexachlorocyclohexane, Alpha-	319-84-6	3.6E-01	6.8E-03
Hexachlorocyclohexane, Beta-	319-85-7	1.3E+00	2.3E-02
Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	2.5E+00	4.0E-02
Hexachlorocyclohexane, Technical	608-73-1	1.3E+00	2.4E-02
Hexachlorocyclopentadiene	77-47-4	7.5E+00	8.8E-01
Hexachloroethane	67-72-1	8.0E+00	1.1E+00
Hexachlorophene	70-30-4	2.5E+02	-
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	2.8E+01	-
Hexamethylene Diisocyanate, 1,6-	822-06-0	1.3E+01	4.4E-02
Hexamethylphosphoramide	680-31-9	3.3E+02	-
Hexane, N-	110-54-3	2.5E+03	3.1E+03
Hexanedioic Acid	124-04-9	1.6E+06	-
Hexanone, 2-	591-78-6	1.3E+03	1.3E+02
Hexazinone	51235-04-2	2.7E+04	-
Hexythiazox	78587-05-0	2.1E+04	-
Hydramethylnon	67485-29-4	2.5E+02	-
Hydrazine	302-01-2	1.1E+00	2.5E-03
Hydrazine Sulfate	10034-93-2	1.1E+00	2.5E-03

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Hydrogen Chloride	7647-01-0	1.2E+08	8.8E+01
Hydrogen Fluoride	7664-39-3	4.7E+04	6.1E+01
Hydrogen Sulfide	7783-06-4	1.2E+07	8.8E+00
Hydroquinone	123-31-9	3.8E+01	-
Imazalil	35554-44-0	1.1E+04	-
Imazaquin	81335-37-7	2.1E+05	-
Imazethapyr	81335-77-5	2.1E+05	-
Iodine	7553-56-2	1.2E+04	-
Iprodione	36734-19-7	3.3E+04	-
Iron	7439-89-6	8.2E+05	-
Isobutyl Alcohol	78-83-1	3.5E+05	-
Isophorone	78-59-1	2.4E+03	8.8E+03
Isopropalin	33820-53-0	1.8E+04	-
Isopropanol	67-63-0	2.4E+04	8.8E+02
Isopropyl Methyl Phosphonic Acid	1832-54-8	8.2E+04	-
Isoxaben	82558-50-7	4.1E+04	-
JP-7	NA	1.8E+09	1.3E+03
Lactofen	77501-63-4	1.6E+03	-
Lead Compounds			
~Lead Chromate	7758-97-6	6.2E+00	8.2E-05
~Lead Phosphate	7446-27-7	3.8E+02	1.0E+00
~Lead acetate	301-04-2	2.7E+02	1.0E+00
~Lead and Compounds	7439-92-1	3.2E+02 [1]	-
~Lead subacetate	1335-32-6	2.7E+02	1.0E+00
~Tetraethyl Lead	78-00-2	1.2E-01	-
Lewisite	541-25-3	5.8E+00	-
Linuron	330-55-2	1.6E+03	-
Lithium	7439-93-2	2.3E+03	-
MCPA	94-74-6	4.1E+02	-
MCPB	94-81-5	8.2E+03	-
MCPP	93-65-2	8.2E+02	-
Malathion	121-75-5	1.6E+04	-
Maleic Anhydride	108-31-6	8.0E+04	3.1E+00
Maleic Hydrazide	123-33-1	4.1E+05	-
Malononitrile	109-77-3	8.2E+01	-
Mancozeb	8018-01-7	2.5E+04	-
Maneb	12427-38-2	4.1E+03	-
Manganese (Diet)	7439-96-5	-	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Manganese (Non-diet)	7439-96-5	2.6E+04	2.2E-01
Mephosfolan	950-10-7	7.4E+01	-
Mepiquat Chloride	24307-26-4	2.5E+04	-
Mercury Compounds			
~Mercuric Chloride (and other Mercury salts)	7487-94-7	3.5E+02	1.3E+00
~Mercury (elemental)	7439-97-6	4.6E+01	1.3E+00
~Methyl Mercury	22967-92-6	1.2E+02	-
~Phenylmercuric Acetate	62-38-4	6.6E+01	-
Merphos	150-50-5	3.5E+01	-
Merphos Oxide	78-48-8	2.5E+01	-
Metalaxyl	57837-19-1	4.9E+04	-
Methacrylonitrile	126-98-7	1.0E+02	1.3E+02
Methamidophos	10265-92-6	4.1E+01	-
Methanol	67-56-1	1.2E+06	8.8E+04
Methidathion	950-37-8	8.2E+02	-
Methomyl	16752-77-5	2.1E+04	-
Methoxy-5-nitroaniline, 2-	99-59-2	4.7E+01	8.8E-01
Methoxychlor	72-43-5	4.1E+03	-
Methoxyethanol Acetate, 2-	110-49-6	5.1E+02	4.4E+00
Methoxyethanol, 2-	109-86-4	3.5E+03	8.8E+01
Methyl Acetate	79-20-9	1.2E+06	-
Methyl Acrylate	96-33-3	6.1E+02	8.8E+01
Methyl Ethyl Ketone (2-Butanone)	78-93-3	1.9E+05	2.2E+04
Methyl Hydrazine	60-34-4	6.2E-01	1.2E-02
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	1.4E+05	1.3E+04
Methyl Isocyanate	624-83-9	1.9E+01	4.4E+00
Methyl Methacrylate	80-62-6	1.9E+04	3.1E+03
Methyl Parathion	298-00-0	2.1E+02	-
Methyl Phosphonic Acid	993-13-5	4.9E+04	-
Methyl Styrene (Mixed Isomers)	25013-15-4	2.6E+03	1.8E+02
Methyl methanesulfonate	66-27-3	2.3E+01	4.4E-01
Methyl tert-Butyl Ether (MTBE)	1634-04-4	2.1E+02	4.7E+01
Methyl-1,4-benzenediamine dihydrochloride, 2-	615-45-2	2.5E+02	-
Methyl-5-Nitroaniline, 2-	99-55-8	2.6E+02	-
Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7	2.8E-01	5.1E-03
Methylaniline Hydrochloride, 2-	636-21-5	1.8E+01	3.3E-01

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Methylarsonic acid	124-58-3	8.2E+03	-
Methylbenzene,1-4-diamine monohydrochloride, 2-	74612-12-7	1.6E+02	-
Methylbenzene-1,4-diamine sulfate, 2-	615-50-9	2.3E+01	-
Methylcholanthrene, 3-	56-49-5	1.0E-01	1.9E-03
Methylene Chloride	75-09-2	1.0E+03	1.2E+03
Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	2.3E+01	2.9E-02
Methylene-bis(N,N-dimethyl) Aniline, 4,4'-	101-61-1	5.0E+01	9.4E-01
Methylenebisbenzenamine, 4,4'-	101-77-9	1.4E+00	2.7E-02
Methylenediphenyl Diisocyanate	101-68-8	3.6E+06	2.6E+00
Methylstyrene, Alpha-	98-83-9	8.2E+04	-
Metolachlor	51218-45-2	1.2E+05	-
Metribuzin	21087-64-9	2.1E+04	-
Metsulfuron-methyl	74223-64-6	2.1E+05	-
Mineral oils	8012-95-1	3.5E+06	-
Mirex	2385-85-5	1.7E-01	2.4E-03
Molinate	2212-67-1	1.6E+03	-
Molybdenum	7439-98-7	5.8E+03	-
Monochloramine	10599-90-3	1.2E+05	-
Monomethylaniline	100-61-8	1.6E+03	-
Myclobutanil	88671-89-0	2.1E+04	-
N,N'-Diphenyl-1,4-benzenediamine	74-31-7	2.5E+02	-
Naled	300-76-5	2.3E+03	-
Naphtha, High Flash Aromatic (HFAN)	64742-95-6	3.5E+04	4.4E+02
Naphthylamine, 2-	91-59-8	1.3E+00	-
Napropamide	15299-99-7	8.2E+04	-
Nickel Acetate	373-02-4	8.1E+03	4.7E-02
Nickel Carbonate	3333-67-3	8.1E+03	4.7E-02
Nickel Carbonyl	13463-39-3	1.1E+04	4.7E-02
Nickel Hydroxide	12054-48-7	1.1E+04	4.7E-02
Nickel Oxide	1313-99-1	1.2E+04	4.7E-02
Nickel Refinery Dust	NA	1.1E+04	5.1E-02
Nickel Soluble Salts	7440-02-0	2.2E+04	4.7E-02
Nickel Subsulfide	12035-72-2	1.9E+00	2.6E-02
Nickelocene	1271-28-9	8.1E+03	4.7E-02
Nitrate	14797-55-8	1.9E+06	-
Nitrate + Nitrite (as N)	NA	-	-
Nitrite	14797-65-0	1.2E+05	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Nitroaniline, 2-	88-74-4	8.0E+03	2.2E-01
Nitroaniline, 4-	100-01-6	1.1E+02	2.6E+01
Nitrobenzene	98-95-3	2.2E+01	3.1E-01
Nitrocellulose	9004-70-0	2.5E+09	-
Nitrofurantoin	67-20-9	5.7E+04	-
Nitrofurazone	59-87-0	1.8E+00	3.3E-02
Nitroglycerin	55-63-0	8.2E+01	-
Nitroguanidine	556-88-7	8.2E+04	-
Nitromethane	75-52-5	2.4E+01	1.4E+00
Nitropropane, 2-	79-46-9	6.0E-02	4.5E-03
Nitroso-N-ethylurea, N-	759-73-9	8.5E-02	1.6E-03
Nitroso-N-methylurea, N-	684-93-5	1.9E-02	3.6E-04
Nitroso-di-N-butylamine, N-	924-16-3	4.6E-01	7.7E-03
Nitroso-di-N-propylamine, N-	621-64-7	3.3E-01	6.1E-03
Nitrosodiethanolamine, N-	1116-54-7	8.2E-01	1.5E-02
Nitrosodiethylamine, N-	55-18-5	1.5E-02	2.9E-04
Nitrosodimethylamine, N-	62-75-9	3.4E-02	8.8E-04
Nitrosodiphenylamine, N-	86-30-6	4.7E+02	4.7E+00
Nitrosomethylethylamine, N-	10595-95-6	9.1E-02	1.9E-03
Nitrosomorpholine [N-]	59-89-2	3.4E-01	6.5E-03
Nitrosopiperidine [N-]	100-75-4	2.4E-01	4.5E-03
Nitrosopyrrolidine, N-	930-55-2	1.1E+00	2.0E-02
Nitrotoluene, m-	99-08-1	8.2E+01	-
Nitrotoluene, o-	88-72-2	1.5E+01	-
Nitrotoluene, p-	99-99-0	1.4E+02	-
Nonane, n-	111-84-2	7.2E+01	8.8E+01
Norflurazon	27314-13-2	3.3E+04	-
Octabromodiphenyl Ether	32536-52-0	2.5E+03	-
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	5.7E+04	-
Octamethylpyrophosphoramide	152-16-9	1.6E+03	-
Oryzalin	19044-88-3	4.1E+04	-
Oxadiazon	19666-30-9	4.1E+03	-
Oxamyl	23135-22-0	2.1E+04	-
Oxyfluorfen	42874-03-3	2.5E+03	-
Paclobutrazol	76738-62-0	1.1E+04	-
Paraquat Dichloride	1910-42-5	3.7E+03	-
Parathion	56-38-2	4.9E+03	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Pebulate	1114-71-2	5.8E+04	-
Pendimethalin	40487-42-1	3.3E+04	-
Pentabromodiphenyl Ether	32534-81-9	2.3E+03	-
Pentabromodiphenyl ether, 2,2',4,4',5-(BDE-99)	60348-60-9	8.2E+01	-
Pentachlorobenzene	608-93-5	9.3E+02	-
Pentachloroethane	76-01-7	3.6E+01	-
Pentachloronitrobenzene	82-68-8	1.3E+01	-
Pentachlorophenol	87-86-5	4.0E+00	2.4E+00
Pentaerythritol tetranitrate (PETN)	78-11-5	5.7E+02	-
Pentane, n-	109-66-0	3.4E+03	4.4E+03
Perchlorates			
~Ammonium Perchlorate	7790-98-9	8.2E+02	-
~Lithium Perchlorate	7791-03-9	8.2E+02	-
~Perchlorate and Perchlorate Salts	14797-73-0	8.2E+02	-
~Potassium Perchlorate	7778-74-7	8.2E+02	-
~Sodium Perchlorate	7601-89-0	8.2E+02	-
Perfluorobutane Sulfonate	375-73-5	2.3E+04	-
Permethrin	52645-53-1	4.1E+04	-
Phenacetin	62-44-2	1.0E+03	1.9E+01
Phenmedipham	13684-63-4	2.1E+05	-
Phenol	108-95-2	2.5E+05	8.8E+02
Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1	3.3E+03	-
Phenothiazine	92-84-2	4.1E+02	-
Phenylenediamine, m-	108-45-2	4.9E+03	-
Phenylenediamine, o-	95-54-5	4.9E+01	-
Phenylenediamine, p-	106-50-3	1.6E+05	-
Phenylphenol, 2-	90-43-7	1.2E+03	-
Phorate	298-02-2	1.6E+02	-
Phosgene	75-44-5	1.3E+00	1.3E+00
Phosmet	732-11-6	1.6E+04	-
Phosphates, Inorganic			
~Aluminum metaphosphate	13776-88-0	5.7E+07	-
~Ammonium polyphosphate	68333-79-9	5.7E+07	-
~Calcium pyrophosphate	7790-76-3	5.7E+07	-
~Diammonium phosphate	7783-28-0	5.7E+07	-
~Dicalcium phosphate	7757-93-9	5.7E+07	-
~Dimagnesium phosphate	7782-75-4	5.7E+07	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
~Dipotassium phosphate	7758-11-4	5.7E+07	-
~Disodium phosphate	7558-79-4	5.7E+07	-
~Monoaluminum phosphate	13530-50-2	5.7E+07	-
~Monoammonium phosphate	7722-76-1	5.7E+07	-
~Monocalcium phosphate	7758-23-8	5.7E+07	-
~Monomagnesium phosphate	7757-86-0	5.7E+07	-
~Monopotassium phosphate	7778-77-0	5.7E+07	-
~Monosodium phosphate	7558-80-7	5.7E+07	-
~Polyphosphoric acid	8017-16-1	5.7E+07	-
~Potassium tripolyphosphate	13845-36-8	5.7E+07	-
~Sodium acid pyrophosphate	7758-16-9	5.7E+07	-
~Sodium aluminum phosphate (acidic)	7785-88-8	5.7E+07	-
~Sodium aluminum phosphate (anhydrous)	10279-59-1	5.7E+07	-
~Sodium aluminum phosphate (tetrahydrate)	10305-76-7	5.7E+07	-
~Sodium hexametaphosphate	10124-56-8	5.7E+07	-
~Sodium polyphosphate	68915-31-1	5.7E+07	-
~Sodium trimetaphosphate	7785-84-4	5.7E+07	-
~Sodium tripolyphosphate	7758-29-4	5.7E+07	-
~Tetrapotassium phosphate	7320-34-5	5.7E+07	-
~Tetrasodium pyrophosphate	7722-88-5	5.7E+07	-
~Trialuminum sodium tetra decahydrogenoctaorthophosphate (dihydrate)	15136-87-5	5.7E+07	-
~Tricalcium phosphate	7758-87-4	5.7E+07	-
~Trimagnesium phosphate	7757-87-1	5.7E+07	-
~Tripotassium phosphate	7778-53-2	5.7E+07	-
~Trisodium phosphate	7601-54-9	5.7E+07	-
Phosphine	7803-51-2	3.5E+02	1.3E+00
Phosphoric Acid	7664-38-2	2.9E+07	4.4E+01
Phosphorus, White	7723-14-0	2.3E+01	
Phthalates			
~Bis(2-ethylhexyl)phthalate	117-81-7	1.6E+02	5.1E+00
~Butyl Benzyl Phthalate	85-68-7	1.2E+03	-
~Butylphthalyl Butylglycolate	85-70-1	8.2E+05	-
~Dibutyl Phthalate	84-74-2	8.2E+04	-
~Diethyl Phthalate	84-66-2	6.6E+05	-
~Dimethylterephthalate	120-61-6	1.2E+05	-
~Octyl Phthalate, di-N-	117-84-0	8.2E+03	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
~Phthalic Acid, P-	100-21-0	8.2E+05	-
~Phthalic Anhydride	85-44-9	1.6E+06	8.8E+01
Picloram	1918-02-1	5.7E+04	-
Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3	8.2E+01	-
Picric Acid (2,4,6-Trinitrophenol)	88-89-1	7.4E+02	-
Pirimiphos, Methyl	29232-93-7	8.2E+03	-
Polybrominated Biphenyls	59536-65-1	7.7E-02	1.4E-03
Polychlorinated Biphenyls (PCBs)			
~Aroclor 1016	12674-11-2	2.7E+01	6.1E-01
~Aroclor 1221	11104-28-2	8.3E-01	2.1E-02
~Aroclor 1232	11141-16-5	7.2E-01	2.1E-02
~Aroclor 1242	53469-21-9	9.5E-01	2.1E-02
~Aroclor 1248	12672-29-6	9.5E-01	2.1E-02
~Aroclor 1254	11097-69-1	9.7E-01	2.1E-02
~Aroclor 1260	11096-82-5	9.9E-01	2.1E-02
~Aroclor 5460	11126-42-4	4.4E+02	-
~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	5.2E-01	1.1E-02
~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	5.1E-01	1.1E-02
~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	5.0E-01	1.1E-02
~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	5.0E-01	1.1E-02
~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	5.1E-04	1.1E-05
~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	4.9E-01	1.1E-02
~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	4.9E-01	1.1E-02
~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	4.9E-01	1.1E-02
~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	5.0E-01	1.1E-02
~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	1.5E-04	3.2E-06
~Polychlorinated Biphenyls (high risk)	1336-36-3	9.4E-01	2.1E-02
~Polychlorinated Biphenyls (low risk)	1336-36-3	-	1.2E-01
~Polychlorinated Biphenyls (lowest risk)	1336-36-3	-	6.1E-01
~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	1.6E-01	3.2E-03
~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	4.8E-02	1.1E-03

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9	3.6E+06	2.6E+00
Polynuclear Aromatic Hydrocarbons (PAHs)			
~Acenaphthene	83-32-9	4.5E+04	-
~Anthracene	120-12-7	2.3E+05	-
~Benz[a]anthracene	56-55-3	2.9E+00	1.1E-01
~Benzo(j)fluoranthene	205-82-3	1.8E+00	1.1E-01
~Benzo[a]pyrene	50-32-8	2.9E-01	1.1E-02
~Benzo[b]fluoranthene	205-99-2	2.9E+00	1.1E-01
~Benzo[k]fluoranthene	207-08-9	2.9E+01	1.1E-01
~Chloronaphthalene, Beta-	91-58-7	6.0E+04	-
~Chrysene	218-01-9	2.9E+02	1.1E+00
~Dibenz[a,h]anthracene	53-70-3	2.9E-01	1.0E-02
~Dibenzo(a,e)pyrene	192-65-4	1.8E-01	1.1E-02
~Dimethylbenz(a)anthracene, 7,12-	57-97-6	8.4E-03	1.7E-04
~Fluoranthene	206-44-0	3.0E+04	-
~Fluorene	86-73-7	3.0E+04	-
~Indeno[1,2,3-cd]pyrene	193-39-5	2.9E+00	1.1E-01
~Methylnaphthalene, 1-	90-12-0	7.3E+01	-
~Methylnaphthalene, 2-	91-57-6	3.0E+03	-
~Naphthalene	91-20-3	1.7E+01	3.6E-01
~Nitropyrene, 4-	57835-92-4	1.8E+00	1.1E-01
~Pyrene	129-00-0	2.3E+04	-
Potassium Perfluorobutane Sulfonate	29420-49-3	1.6E+04	-
Prochloraz	67747-09-5	1.5E+01	-
Profluralin	26399-36-0	7.0E+03	-
Prometon	1610-18-0	1.2E+04	-
Prometryn	7287-19-6	3.3E+03	-
Propachlor	1918-16-7	1.1E+04	-
Propanil	709-98-8	4.1E+03	-
Propargite	2312-35-8	1.6E+04	-
Propargyl Alcohol	107-19-7	2.3E+03	-
Propazine	139-40-2	1.6E+04	-
Propham	122-42-9	1.6E+04	-
Propiconazole	60207-90-1	1.1E+04	-
Propionaldehyde	123-38-6	3.1E+02	3.5E+01
Propyl benzene	103-65-1	2.4E+04	4.4E+03
Propylene	115-07-1	9.3E+03	1.3E+04

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Propylene Glycol	57-55-6	1.6E+07	-
Propylene Glycol Dinitrate	6423-43-4	1.6E+06	1.2E+00
Propylene Glycol Monomethyl Ether	107-98-2	3.7E+05	8.8E+03
Propylene Oxide	75-56-9	9.7E+00	3.3E+00
Propyzamide	23950-58-5	6.2E+04	-
Pyridine	110-86-1	1.2E+03	-
Quinalphos	13593-03-8	4.1E+02	-
Quinoline	91-22-5	7.7E-01	-
Quizalofop-ethyl	76578-14-8	7.4E+03	-
Refractory Ceramic Fibers	NA	1.8E+08	1.3E+02
Resmethrin	10453-86-8	2.5E+04	-
Ronnel	299-84-3	5.8E+04	-
Rotenone	83-79-4	3.3E+03	-
Safrole	94-59-7	1.0E+01	1.9E-01
Selenious Acid	7783-00-8	5.8E+03	-
Selenium	7782-49-2	5.8E+03	8.8E+01
Selenium Sulfide	7446-34-6	5.8E+03	8.8E+01
Sethoxydim	74051-80-2	7.4E+04	-
Silica (crystalline, respirable)	7631-86-9	1.8E+07	1.3E+01
Silver	7440-22-4	5.8E+03	-
Simazine	122-34-9	1.9E+01	-
Sodium Acifluorfen	62476-59-9	1.1E+04	-
Sodium Azide	26628-22-8	4.7E+03	-
Sodium Dichromate	10588-01-9	6.2E+00	8.2E-05
Sodium Diethyldithiocarbamate	148-18-5	8.5E+00	-
Sodium Fluoride	7681-49-4	5.8E+04	5.7E+01
Sodium Fluoroacetate	62-74-8	1.6E+01	-
Sodium Metavanadate	13718-26-8	1.2E+03	-
Sodium Tungstate	13472-45-2	9.3E+02	-
Sodium Tungstate Dihydrate	10213-10-2	9.3E+02	-
Stirofos (Tetrachlorovinphos)	961-11-5	9.6E+01	-
Strontium Chromate	7789-06-2	6.2E+00	8.2E-05
Strontium, Stable	7440-24-6	7.0E+05	-
Strychnine	57-24-9	2.5E+02	-
Styrene	100-42-5	3.5E+04	4.4E+03
Styrene-Acrylonitrile (SAN) Trimer	NA	2.5E+03	-
Sulfolane	126-33-0	8.2E+02	8.8E+00
Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9	6.6E+02	-

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Sulfur Trioxide	7446-11-9	6.0E+06	4.4E+00
Sulfuric Acid	7664-93-9	6.0E+06	4.4E+00
Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	140-57-8	9.2E+01	1.7E+00
TCMTB	21564-17-0	2.5E+04	-
Tebuthiuron	34014-18-1	5.7E+04	-
Temephos	3383-96-8	1.6E+04	-
Terbacil	5902-51-2	1.1E+04	-
Terbufos	13071-79-9	2.9E+01	-
Terbutryn	886-50-0	8.2E+02	-
Tetrabromodiphenyl ether, 2,2',4,4'-(BDE-47)	5436-43-1	8.2E+01	-
Tetrachlorobenzene, 1,2,4,5-	95-94-3	3.5E+02	-
Tetrachloroethane, 1,1,1,2-	630-20-6	8.8E+00	1.7E+00
Tetrachloroethane, 1,1,2,2-	79-34-5	2.7E+00	2.1E-01
Tetrachloroethylene	127-18-4	1.0E+02	4.7E+01
Tetrachlorophenol, 2,3,4,6-	58-90-2	2.5E+04	-
Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	1.6E-01	-
Tetraethyl Dithiopyrophosphate	3689-24-5	4.1E+02	-
Tetrafluoroethane, 1,1,1,2-	811-97-2	4.3E+05	3.5E+05
Tetryl (Trinitrophenylmethylnitramine)	479-45-8	2.3E+03	-
Thallic Oxide	1314-32-5	2.3E+01	-
Thallium (I) Nitrate	10102-45-1	1.2E+01	-
Thallium (Soluble Salts)	7440-28-0	1.2E+01	-
Thallium Acetate	563-68-8	1.2E+01	-
Thallium Carbonate	6533-73-9	2.3E+01	-
Thallium Chloride	7791-12-0	1.2E+01	-
Thallium Selenite	12039-52-0	1.2E+01	-
Thallium Sulfate	7446-18-6	2.3E+01	-
Thifensulfuron-methyl	79277-27-3	1.1E+04	-
Thiobencarb	28249-77-6	8.2E+03	-
Thiodiglycol	111-48-8	7.9E+04	-
Thiofanox	39196-18-4	2.5E+02	-
Thiophanate, Methyl	23564-05-8	6.6E+04	-
Thiram	137-26-8	4.1E+03	-
Tin	7440-31-5	7.0E+05	-
Titanium Tetrachloride	7550-45-0	6.0E+05	4.4E-01
Toluene	108-88-3	4.7E+04	2.2E+04

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Toluene-2,4-diisocyante	584-84-9	2.7E+01	3.5E-02
Toluene-2,5-diamine	95-70-5	1.3E+01	-
Toluene-2,6-diisocyante	91-08-7	2.2E+01	3.5E-02
Toluidine, o- (Methylaniline, 2-)	95-53-4	1.4E+02	2.4E-01
Toluidine, p-	106-49-0	7.7E+01	-
Total Petroleum Hydrocarbons (Aliphatic High)	NA	3.5E+06	-
Total Petroleum Hydrocarbons (Aliphatic Low)	NA	2.2E+03	2.6E+03
Total Petroleum Hydrocarbons (Aliphatic Medium)	NA	4.4E+02	4.4E+02
Total Petroleum Hydrocarbons (Aromatic High)	NA	3.3E+04	-
Total Petroleum Hydrocarbons (Aromatic Low)	NA	4.2E+02	1.3E+02
Total Petroleum Hydrocarbons (Aromatic Medium)	NA	6.0E+02	1.3E+01
Toxaphene	8001-35-2	2.1E+00	3.8E-02
Tralomethrin	66841-25-6	6.2E+03	-
Tri-n-butyltin	688-73-3	3.5E+02	-
Triacetin	102-76-1	6.6E+07	-
Triadimefon	43121-43-3	2.5E+04	-
Triallate	2303-17-5	1.5E+04	-
Triasulfuron	82097-50-5	8.2E+03	-
Tribenuron-methyl	101200-48-0	6.6E+03	-
Tribromobenzene, 1,2,4-	615-54-3	5.8E+03	-
Tributyl Phosphate	126-73-8	2.6E+02	-
Tributyltin Compounds	NA	2.5E+02	-
Tributyltin Oxide	56-35-9	2.5E+02	-
Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	1.7E+05	1.3E+05
Trichloroacetic Acid	76-03-9	3.3E+01	-
Trichloroaniline HCl, 2,4,6-	33663-50-2	7.9E+01	-
Trichloroaniline, 2,4,6-	634-93-5	2.5E+01	-
Trichlorobenzene, 1,2,3-	87-61-6	9.3E+02	-
Trichlorobenzene, 1,2,4-	120-82-1	1.1E+02	8.8E+00
Trichloroethane, 1,1,1-	71-55-6	3.6E+04	2.2E+04
Trichloroethane, 1,1,2-	79-00-5	5.0E+00	7.7E-01
Trichloroethylene	79-01-6	6.0E+00	3.0E+00
Trichlorofluoromethane	75-69-4	3.5E+05	-
Trichlorophenol, 2,4,5-	95-95-4	8.2E+04	-
Trichlorophenol, 2,4,6-	88-06-2	2.1E+02	4.0E+00

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	8.2E+03	-
Trichlorophenoxypropionic acid, -2,4,5	93-72-1	6.6E+03	-
Trichloropropane, 1,1,2-	598-77-6	5.8E+03	-
Trichloropropane, 1,2,3-	96-18-4	1.1E-01	1.3E+00
Trichloropropene, 1,2,3-	96-19-5	3.1E+00	1.3E+00
Tricresyl Phosphate (TCP)	1330-78-5	1.6E+04	-
Tridiphane	58138-08-2	2.5E+03	-
Triethylamine	121-44-8	4.8E+02	3.1E+01
Triethylene Glycol	112-27-6	1.6E+06	
Trifluoroethane, 1,1,1-	420-46-2	6.2E+04	8.8E+04
Trifluralin	1582-09-8	4.2E+02	-
Trimethyl Phosphate	512-56-1	1.1E+02	-
Trimethylbenzene, 1,2,3-	526-73-8	2.1E+02	2.2E+01
Trimethylbenzene, 1,2,4-	95-63-6	2.4E+02	3.1E+01
Trimethylbenzene, 1,3,5-	108-67-8	1.2E+04	-
Trimethylpentene, 2,4,4-	25167-70-8	1.2E+04	-
Trinitrobenzene, 1,3,5-	99-35-4	3.2E+04	-
Trinitrotoluene, 2,4,6-	118-96-7	9.6E+01	-
Triphenylphosphine Oxide	791-28-6	1.6E+04	-
Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8	1.6E+04	-
Tris(1-chloro-2-propyl)phosphate	13674-84-5	8.2E+03	-
Tris(2,3-dibromopropyl)phosphate	126-72-7	1.3E+00	1.9E-02
Tris(2-chloroethyl)phosphate	115-96-8	1.1E+02	-
Tris(2-ethylhexyl)phosphate	78-42-2	7.2E+02	-
Tungsten	7440-33-7	9.3E+02	-
Uranium (Soluble Salts)	NA	3.5E+03	1.8E-01
Urethane	51-79-6	2.3E+00	4.2E-02
Vanadium Pentoxide	1314-62-1	2.0E+03	1.5E-03
Vanadium and Compounds	7440-62-2	5.8E+03	4.4E-01
Vernolate	1929-77-7	1.2E+03	-
Vinclozolin	50471-44-8	2.1E+04	-
Vinyl Acetate	108-05-4	3.8E+03	8.8E+02
Vinyl Bromide	593-60-2	5.2E-01	3.8E-01
Vinyl Chloride	75-01-4	1.7E+00	2.8E+00
Warfarin	81-81-2	2.5E+02	-
Xylene, P-	106-42-3	2.4E+03	4.4E+02
Xylene, m-	108-38-3	2.4E+03	4.4E+02
Xylene, o-	95-47-6	2.8E+03	4.4E+02

Contaminant	CAS No.	Soil[1] (mg/kg)	Soil Gas[2] (ug/m^3)
Xylenes	1330-20-7	2.5E+03	4.4E+02
Zinc Phosphide	1314-84-7	3.5E+02	-
Zinc and Compounds	7440-66-6	3.5E+05	-
Zineb	12122-67-7	4.1E+04	-
Zirconium	7440-67-7	9.3E+01	-

Notes:

1 For all contaminants except lead, soil cleanup levels are the May 2016 U.S. EPA RSLs for industrial soil based on a risk of 1 x 10^{-6} and a hazard index of 1.0 (U.S. EPA, 2016a). For lead, the soil cleanup level is the commercial/industrial CHSSL, revised in 2009 (OEHHA, 2009).

2 Soil gas cleanup levels are the May 2016 U.S. EPA RSLs for industrial air based on a risk of 1 x 10^{-6} and a hazard index of 1.0 (U.S. EPA, 2016a).

- indicates that there is no value for this contaminant

Acronyms/Abbreviations:

ug/m^3	microgram per cubic meter
mg/kg	milligram per kilogram
CAS	Chemical Abstract Service
CHSSL	California Human Health Screening Level
NA	not applicable
RSL	Regional Screening Level

ATTACHMENT B.
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Requirement	ARAR Determination	Description of Requirement	Applicability
CHEMICAL-SPECIFIC ARARs - FEDERAL			
U.S. EPA Industrial Regional Screening Levels ("Industrial RSLs;" May 2016)	To Be Considered (TBC)	Industrial RSLs are chemical-specific concentrations for individual contaminants in air, drinking water and soil used to determine whether further investigation or cleanup of a site used for industrial purposes is necessary or appropriate to protect human health.	Industrial RSLs to be used to determine the sufficiency of excavation of chemical contamination to protect human health in the VOC hot spots, and other areas slated for excavation.
U.S. EPA Preliminary Remediation Goals for Radionuclides ("Radionuclide PRGs;" May 2016)	TBC	Radionuclide PRGs are risk-based calculations that set concentration limits for radioactive contaminants used to determine whether further investigation or cleanup of a site used for industrial purposes is necessary or appropriate to protect human health.	Radionuclide PRGs to be used to determine the sufficiency of excavation of low-level radioactive waste contamination to protect human health in areas slated for excavation.
10 CFR 20, Subpart D, Radiation Dose Limits for Individual Members of the Public, Sections 20.1301(a) & (b), and 20.1302	Relevant and Appropriate	Establishes dose limits for individual members of the public from licensed operations and compliance monitoring requirements.	During soil disturbing activities, members of the public may be exposed to solid waste, soil, soil gas, and dust that may contain licensed radioactive materials that were disposed in Site land disposal units.
CHEMICAL-SPECIFIC ARARs - STATE/LOCAL			
DTSC Human Health Risk Assessment Note 3, DTSC-Modified Screening Levels, June 2016	TBC	DTSC's HERO recommended screening levels (derived using DTSC-modified exposure and toxicity factors) may be considered for constituents in soil and tap water.	DTSC Screening Levels to be used to determine the sufficiency of excavation of chemical contamination to protect human health in the VOC hot spots, and other areas slated for excavation.
LOCATION-SPECIFIC ARARs - FEDERAL			
Endangered Species Act of 1973 (16 USC Section 1536 (a)(1) and (2); Section 1538(a)	Applicable	Requires federal agencies to: utilize their authorities to further the purposes of the ESA through programs for the conservation of endangered and threatened species; and insure that its actions are not likely to jeopardize the continued existence of an endangered or threatened species, or the destruction or adverse modification of critical habitat. Prohibits the take of an endangered species of fish or wildlife, and the removal, destruction, etc., of an endangered plant in violation of state law or regulation.	Elderberry shrubs, designated as critical habitat for the Valley Elderberry Longhorn Beetle (VELB), are located at the site, some of which evidence the presence of the VELB. Substantive provisions of the ESA are ARARs, but EPA voluntarily complies with procedural consultation requirements.
LOCATION-SPECIFIC ARARs - STATE/LOCAL			
California Endangered Species Act (California Fish and Game Code Section 2080, 2080.1(a) and, as applicable, definitions in Sections 20161-2069.	Applicable	Requires action to preserve endangered species or threatened species. Prior to conducting any ground-disturbing activities in areas with potential for presence of such species, surveys are to be conducted for species of concern.	Applies to all remediation, well installation, monitoring, or maintenance activities that may impact the VELB.
ACTION-SPECIFIC ARARs - FEDERAL			
California Hazardous Waste Determination by Generator, 22 CCR 66262.11, 66261.10120 – 66261.24,	Applicable	Generators of waste are required to determine whether the waste is a hazardous waste, including whether it is a non-RCRA hazardous waste.	Implementation of the remedy will generate wastes which must be identified.
Hazardous Waste Determination by Generator, 22 CCR 66262.11, 66261.20 -66261.24 and 66261.30 – 66261.33 (40 CFR 262.11, 261.20 – 261.24 and 261.30 – 261.33)	Relevant and Appropriate	Generators of solid waste are required to determine whether the waste is a RCRA hazardous waste by virtue of exhibiting the characteristic of ignitability, corrosivity, reactivity or toxicity, or being so listed.	Implementation of the remedy will generate wastes which must be identified.

Requirement	ARAR Determination	Description of Requirement	Applicability
CAMU, Resource Conservation and Recovery Act (RCRA), and Non-RCRA Hazardous Wastes, 40 CFR Section 264.552 (22 CCR Section 66264.552)	Applicable	Defines a CAMU as an area within a facility that is used to consolidate, treat, store and/or dispose of waste for implementing Site cleanup (CCR 66264.552(a)). CAMU-eligible wastes are solid and hazardous wastes and media (groundwater, surface water, soils, and sediments), and debris that are managed for implementing cleanup (40 CFR 264.552(a)(1)). Includes minimum design requirements for disposal units including a composite liner and a leachate collection system. However, U.S. EPA can approve alternate requirements if: 1) the alternate design prevents the migration of hazardous constituents into groundwater or surface water at least as effectively as the required liner and leachate collection system; or 2) the CAMU will be established in an area of existing contamination and that the alternate design (including one that does not include a liner) prevents migration that would exceed long-term remedial goals (40 CFR 264.552(e)(3)). Consolidation or placement of cleanup wastes into a CAMU is not considered land disposal and does not trigger land disposal restrictions or create a unit subject to minimum technology requirements (40 CFR 264.552 (a)(5)). Minimum treatment of CAMU-eligible waste is required if principal hazardous constituents (PHCs) are identified in the waste media. PHCs are carcinogens that pose a direct risk from ingestion or inhalation at or above 10-3 or non-carcinogens that pose a potential direct hazard from ingestion or inhalation an order of magnitude or greater above the constituent-specific reference dose (40 CFR 264.552(e)(4)(i)(A)). If waste remains in place, a cap based on performance standards (40 CFR 264.552 (e)(6)(D)) and monitoring and notification program 264.552 (e)(5) will be installed.	The remedy relies on the designation of 3 existing landfills as CAMUs with waste that will be left in place, and for use in consolidating waste excavated at other areas on the Site in the course of the remedial action.
Closure and Post-Closure Requirements, 22 CCR Section 66264.310 (40 CFR Section 264.310)	Applicable	Establishes requirements for the closure and post-closure care of landfills.	Applies to the 3 existing landfills designated as CAMUs in the ROD. The remedy will comply with the standards set forth in 22 CR Section 66264.310.
Asbestos National Emission Standard for Hazardous Air Pollutants, 40 CFR, Subpart M, Section 61.145(a) & (c), 61.150.	Relevant and Appropriate	Establishes requirements for controlling emissions of asbestos in renovation and demolition projects, and for the disposal of asbestos from demolition projects.	Demolition of nine Site structures is required to excavate the VOC hot spots and construct CAMUs. Given the age of the structures requiring demolition, it is possible that they contain asbestos-containing materials.
ACTION-SPECIFIC ARARs - STATE			
Title 22 CCR Division 4.5, Section 66264.25	Applicable	Establishes design requirements for cover and drainage control systems.	Applies to the cover and drainage control systems required as part of the remedy.
Title 27 CCR, Section 20380(e)(2)(c) and Title 23 CCR, Section 2550.0	Relevant and Appropriate	Monitoring for corrective action programs.	Applies to any areas where a corrective action has occurred and monitoring is part of the approved remedy.
Title 27 CCR, Section 20430(b) and Title 23 CCR, Section 2550.10	Relevant and Appropriate	Establishment of a corrective action program that complies with water quality standards.	Applies to any areas where a corrective action has occurred and monitoring is part of the approved remedy.
Title 27 CCR, Section 20410 and Title 23 CCR, Section 2550.6(c)	Relevant and Appropriate	Requires monitoring of all soil cleaning activities for compliance with remedial action objectives for three years from the date of achieving cleanup levels.	Applies to all waste units, other than CAMUs, where residual soil contamination may impact water quality.
Title 27 CCR, Section 20415 and Title 23 CCR, Section 2550.7	Applicable	Requires general soil, surface water, and groundwater monitoring for all areas where waste has been discharged to land.	Applies to all waste units, other than CAMUs, where residual soil contamination may impact water quality.
22 CCR Section 66264.97, Standards for Water Quality Monitoring and System Requirements,	Relevant and Appropriate	Establishes requirements for water quality monitoring for detection, evaluation and corrective action monitoring programs.	Applies to the water quality monitoring component of the remedy.
Standards for Soil Gas Detection Monitoring, 22 CCR Section 66264.706	Relevant and Appropriate	Establishes requirements for monitoring air and soil-pore gas by the owner/operator of a permitted hazardous waste disposal facility.	Although the remedy includes the removal of VOC “hot spots,” it is possible that VOC contaminated areas will remain, or that future deterioration of containers in the landfills could cause the release of contaminants that could create soil gas.
27 CCR Section 21190(g), Post-closure Land Use	Relevant and Appropriate	Establishes requirements for mitigation measures for all post-closure construction within 1000 feet of a disposal area.	Applies to on-site construction within 1000 feet of the boundary of any of the CAMUs or VOC hot spot removal areas.

Requirement	ARAR Determination	Description of Requirement	Applicability
Control of Radioactive Contamination in the Environment (California Health and Safety Code, Section 114715, et seq.)	Applicable	Establishes state surveillance and control programs for activities that could lead to the introduction of radioactive materials into the environment. Requires disposal of radioactive waste in a manner that will not cause significant radioactive contamination of the environment.	Applies to the excavation and disposal activities associated with the remedy.
Porter-Cologne Water Quality Control Act (California Water Code, Div. 7 13000, et seq. and 23 CCR Chap. 15, 2521, 2530 – 2531, 2540 – 2548, 2550.1 – 2550.8, 2550.10 – 2550.9— and 2580	Relevant and Appropriate	Establishes authority for state and regional water boards to determine site-specific waste discharge requirements and to regulate disposal of waste to land. Authorizes regional boards to protect existing and probable future beneficial uses of waters of the state.	The Porter-Cologne Water Quality Control Act establishes the authority of the State Water Resources Control Board and the Regional Water Quality Control Board to regulate discharges into waters of the State. These requirements are relevant and appropriate for the remedy selected in this ROD to the extent that any actions taken under this ROD would impact surface water or groundwater.
Central Valley Regional Water Quality Control Board, Basin Plan, Chapters II and III	Relevant and Appropriate	Chapter II describes water basins in the Central Valley Region, establishes beneficial uses of ground and surface waters, establishes water quality objectives and numerical standards, establishes implementation plans to meet water quality objectives and protect beneficial uses, and incorporates statewide water quality control plans and policies. Chapter III requires that groundwater not contain chemical constituents in concentrations that exceed beneficial uses. At a minimum, groundwater designated for use as municipal or domestic water supplies shall not contain chemical constituents in excess of the MCLs specified in Title 22. Groundwater shall be maintained free of toxic substances in concentrations that produce detrimental physiological response in human, plant, animal, or aquatic life associated with designated beneficial uses. Groundwater shall not contain taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.	The Basin Plan establishes beneficial uses and water quality criteria based upon such beneficial uses (water quality objectives). The Basin Plan serves to protect the beneficial uses and water quality of the surface water and groundwater in the Basin. These requirements are relevant and appropriate for the remedy selected in this ROD to the extent that any actions taken under this ROD would impact surface water or groundwater.[1]
Title 27 CCR, Sections 20200 (c) and 20210	Applicable	Requires that designated waste be discharged to Class I or Class II waste management units.	Applies to discharges of designated waste (non-hazardous waste that could cause degradation of surface water or groundwater) to land for treatment, storage, or disposal. Applies to waste generated during remediation and monitoring activities that is not managed in a CAMU.
Title 27 CCR, Section 20230	Applicable	Provides that inert waste does not need to be discharged at classified units. Applies to discharges of inert waste to land for treatment, storage, or disposal.	Applies to inert waste generated during remediation and monitoring activities.
Title 27 CCR, Sections 20200 (c) and 20220	Applicable	Requires that non-hazardous solid waste be discharged to a classified waste management unit.	Applies to discharges of non-hazardous solid waste to land for treatment, storage, or disposal. Applies to non-hazardous solid waste generated during remediation and monitoring activities.
Yolo-Solano Air Quality Management District Rules and Regulations, Regulation II, Rule 2.3, sections 102, 204 and 206, 300 and 400	Applicable	Establishes a permissible limit on dust emissions (Ringlemann Chart).	Applies to all dust emissions which may be generated during remediation and O& M activities.

[1]The State of California, through the Central Valley Regional Water Quality Control Board ("RWQCB"), also has identified State Water Board Resolution ("SWBR") 92-49 in full as an ARAR for the LEHR/OCL soil remedy. EPA disagrees both with the scope of California's identification of SWBR 92-49 as an ARAR and its identification of SWBR 92-49 in the context of a soil remedy. EPA's position is that only Section III.G of 92-49 has substantive environmental standards which are potentially relevant and appropriate to CERCLA remedies. Section III.G sets a level or standard of control, albeit a narrative one, which can be summarized as follows: "clean up and abate the effects of discharges in a manner that promotes attainment of either background water quality or the best water quality which is reasonable if background levels of water quality cannot be restored…" California, in contrast, contends that all of Resolution 92-49 is a substantive environmental standard and so qualifies as an ARAR in full. EPA also does not consider Section III.G of 92-49 relevant and appropriate to a remedial action that, as with the LEHR/OCL soil ROD, involves only a soil cleanup and not a groundwater cleanup. California, however, asserts that Resolution 92-49 applies to the LEHR/OCL soil remedy because the remedy involves groundwater monitoring to evaluate the performance of the remedy and because the soil cleanup levels will be set at a level that is protective of groundwater quality. Notwithstanding these disagreements, California supports the remedy and the performance standards selected in this ROD. Moreover, EPA and California agree that the selected remedy will be protective of groundwater quality and thus in fact comply with Resolution 92-49. For purposes of the LEHR soil ROD, therefore, the parties agree to disagree on the status of SWBR 92-49 as an ARAR for the LEHR soil remedy, and both parties reserve all of their rights and legal arguments with respect to the status of SWBR 92-49 as an ARAR in any future RODs.

Requirement	ARAR Determination	Description of Requirement	Applicability
Health and Safety Code Section 41700 & 41701)	Applicable	Prohibits discharge of pollutants into the air that will cause injury, detriment, nuisance, or annoyance to any considerable number of persons or the public. Prohibits discharge of pollutants for "a period or periods aggregating more than 3 minutes" which exceeds the specified standard.	Applies to all emissions which may be generated during remediation and O&M activities.
Yolo-Solano Air Quality Management District Rules and Regulations, Regulation II, Rule 2.3, sections 102, 204 and 206, 300 and 400	Applicable	Establishes a permissible limit on dust emissions (Ringlemann Chart).	Applies to all dust emissions which may be generated during remediation and O& M activities.
California Air Resources Board, Rule 403, Fugitive Dusts- Section 403(B) (definitions as applicable), 403(C) and 403(D(2)(a)(i)	Applicable	Requires actions to prevent, reduce or mitigate fugitive dust emissions.	Applies to fugitive dust emissions from any anthropogenic source.
Yolo-Solano Air Quality Management District Rules and Regulations, Regulation II, Rule 2.5. Nuisance	Applicable	Prohibits discharge from any source such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public; or which endanger the comfort, repose, health, or safety of any such persons or the public; or which cause or have a natural tendency to cause an injury or damage to business or property.	Applies to air emissions during; applies to both mobile and stationary sources. During soil disturbing activities such as excavation, demolition, waste segregation, or treatment operations, members of the public may be exposed to contaminated soil gas and dust.
Yolo-Solano Air Quality Management District ("Yolo-Solano AQMD") Rule 2.11, Particulate Matter Concentration	Applicable	Prohibits emissions of total particulate matter in excess of 0.1 grain per cubic foot of gas at dry standard conditions from any source operation (mobile or stationary) which emits, or may emit, dust, fumes, or total suspended particulate matter.	The remedy includes actions that may emit dust and or suspended particulate matter.
Yolo-Solano AQMD Rule 2.19- Particulate Matter Process Emission Rate	Relevant and Appropriate	Prohibits discharge from any process unit particulate matter of a weight in excess of the amount defined in the rule.	Soil sorting activities (i.e., for principle threat waste), may use a vibrating soil screening unit or other similar processing equipment.
Yolo-Solano AQMD Rule 9.9 – Asbestos, Sections 102, 110.2 - .3, 111, 202 (definitions as applicable), 300, 401.1 - .3, and 501	Relevant and Appropriate	Applies to all demolitions where the combined amount of Regulated Asbestos-Containing Material is equal to or greater than, 160 square feet, 260 linear feet (on pipes), or 35 cubic feet (where area or length not measurable in advance). Requires survey for asbestos prior to demolition, establishes requirements to prevent emissions of particulate asbestos material to outside air, and establishes requirements for the disposal of the asbestos material generated during demolition.	Demolition of nine Site structures is required to excavate the VOC hot spots and construct the CAMUs. Given the age of the structures requiring demolition, it is possible that they contain asbestos-containing materials.
State Water Resources Control Board Order No. 2012-0006 DWQ, National Pollution Discharge Elimination System (NPDES) Permit for Storm Water Discharges Associated with Construction Activity	Applicable	Regulates pollutants in discharge to storm water associated with construction activities (clearing, grubbing, or excavation) involving the disturbance of one acre or more. Ensures storm water discharges do not contribute to a violation of surface water quality standards. Includes measures to minimize and/or eliminate pollutants in storm water discharges and monitoring to demonstrate compliance.	The substantive requirements of Order 2012-0006 DWQ are applicable to activities that will disturb one or more acres of the Site.
California Department of Water Resources; Well Decommissioning/Well Destruction, California Well Standards, Bulletin 74-90.	TBC	Pursuant to California Water Code Section 13801, establishes minimum requirements for construction, alteration, maintenance, and destruction of water wells, monitoring wells, and cathodic protection wells in California.	Implementation of the selected remedy will require the destruction and installation of some number of on-site groundwater monitoring wells.
Civil Code Section 1471	Applicable	Establishes requirements for a restrictive land use covenant to run with the land.	Applies to all areas in which land use will be restricted because waste is left in place or the clean-up is not to a residential use standard.
Title 22 CCR, Division 4.5, Chapter 39, Section 67391.1(a), (d), (f) & (i)	Relevant and Appropriate	Provides requirements for land-use covenants.	Applies to all areas in which land use will be restricted because waste is left in place or the clean-up is not to a residential use standard.
Health and Safety Code Section 25227	Applicable	Prohibits construction of residences, hospitals for humans, schools for persons under 21 years of age, day care centers, or any permanently occupied human habitation on hazardous waste property. Restrictions apply to areas zoned for open space, maritime/industrial, and educational/cultural reuses.	Applies to all areas where land use restrictions are required for protection of human health and the environment due to contaminants left in place at concentrations exceeding clean up levels.

ATTACHMENT C.
DETAILED COST INFORMATION FOR THE SELECTED REMEDY

Table C-1 Components of the Selected Remedy

Planning/Oversight/General
Work Planning
Health & Safety
Construction Quality Assurance/Quality Control Program
Construction Site Environmental Controls
Materials Management Plan
Pre-Remediation
Land Surveying
Decontamination Facilities
Pre-Construction Biological Survey
Elderberry Shrub Cluster Relocation
Data Gap Investigation (HFSDA and Southern Trenches)
Building Decommissioning and Demolition
-Animal Buildings X-1 through X-5, Geriatrics Building No. 1 (H-292), Geriatrics Building No. 2 (H-293), Storage Building W-3, and the Cobalt-60 Annex
Decommissioning of Groundwater Monitoring Wells
Remediation – Excavation, Waste Segregation and Disposal, Backfill
Area Excavation
Volatile Organic Compound "Hot Spot" Removal
Non-hazardous material backfilled on-site, except for eastern half of the Eastern Trenches VOC "hot spot," which would be backfilled with clean fill
Confirmation Sampling
Segregation, Stockpiling, and Characterization of Excavated Material
Ex situ Treatment
On-site Disposal
Off-site Disposal
Backfill
Remediation - Capping
Consolidate Waste and Multiple-Layer Cap
Levee Easement Setback
Drainage Controls
LFU-3 Concrete-Lined Drainage Channel Demolition/Reconstruction -Portion of concrete-lined drainage channel demolished, concrete re-established after excavation
LFU-1 Drainage/Vegetated Swale
Storm Water Collection and Conveyance System
Storm Water Lift Station at LFU-2/WBH/Eastern Trenches
Storm Water Lift Station at LFU-3
Extended Detention Basin
Post-Remediation
Cover/Cap Monitoring and Maintenance
Drainage Controls Monitoring and Maintenance
Groundwater Monitoring Well Installation
Groundwater and Storm Water Monitoring
Land Use/Institutional Controls
Five-Year Reviews

Acronyms/Abbreviations:

CAMU – corrective action management unit
LFU – landfill unit
O&M – operations and maintenance
VOC – volatile organic compound
WBH – waste burial holes

Table C-2 Cost Estimate Summary for the Selected Remedy

Description	Quantity	Unit	Unit Cost	Cost
Capital Costs for SW-6				
1. Pre-Remediation Capital Costs				
- Biological Survey		LS		$86,304
- Elderberry Mitigation		LS		$270,000
- Data Gap Investigation		LS		$157,394
- Decontamination Facilities[a]	43,287	SF		$438,797
- Building D&D (including disposal)	13,900	SF		$314,966
- Decommission Groundwater Wells	4			$107,856
- Clearing and Grubbing[b]	2.42	Acre		$52,025
2. Excavation and Backfill Capital Costs				
- ET VOC "Hot Spot" Excavation and Backfill		LS		$181,700
- LFU-1 Drainage Area Excavation and Backfill		LS		$609,893
- LFU-2 VOC 'Hot Spot" Excavation and Backfill		LS		$47,289
3. Materials Management and Disposal Capital Costs				
- Materials Management[c]		LS		$603,548
- Excavated Material Consolidations[d]		LS		$29,794
- Off-Site Transportation and Disposal		LS		$2,271,002
4. CAMU Construction Capital Costs				
- Install LFU-1 Multiple-Layer Cap		LS		$1,113,709
- Install LFU-2/ET/WBH Multiple-Layer Cap		LS		$1,861,724
- Install LFU-3 Multiple Layer Cap		LS		$408,092
5. Post Remediation Capital Costs				
- Install New Groundwater Wells		LS		$180,789
- Storm Drainage[e]		LS		$687,494
- LFU-1 Drainage Channel/Swale		LS		$18,841
- LFU-3 Drainage Channel		LS		$46,737
Total Capital Cost				$9,487,946
Annual Operation and Maintenance Costs for SW-6				
1. Operations and Maintenance Costs				
- Institutional Controls[f]				$1,144,900
- Groundwater and Storm Water Monitoring[g]				$4,383,323
- O&M Drainage System[h, i]				$200,901
- O&M of Caps[j]				$1,300,501
			Total O&M Cost	$7,029,624
2. Periodic Costs				
- Periodic Storm Water Lift Station Repair	0.1	Year	$4,012	$12,225
- Five Year Reviews	0.2	Year	$26,542	$173,297
Total Period Costs				$185,523
Total Present Value of Alternative[k]				**$16,703,093**
3. Contingent Action				
- Install ST and HFSDA Multiple Layer Cap		LS		$204,046

Year	Periodic Review Costs	Capital Cost	Annual O&M	Total Cost	Discount Factor	Present Worth
0		$9,691,992	$612,311	$10,304,303	1.000	$10,304,303
1			$185,192	$185,192	0.974	$180,323
2			$151,434	$151,434	0.948	$143,576
3			$151,434	$151,434	0.923	$139,802
4			$151,434	$151,434	0.899	$136,126
5	26,542		$151,434	$177,976	0.875	$155,779
6			$151,434	$151,434	0.852	$129,063
7			$151,434	$151,434	0.830	$125,670
8			$151,434	$151,434	0.808	$122,366
9			$151,434	$151,434	0.787	$119,149
10	30,554		$151,434	$181,988	0.766	$139,424
11			$151,434	$151,434	0.746	$112,966
12			$151,434	$151,434	0.726	$109,996
13			$151,434	$151,434	0.707	$107,104
14			$151,434	$151,434	0.689	$104,289
15	26,542		$151,434	$177,976	0.671	$119,345
16			$151,434	$151,434	0.653	$98,877
17			$151,434	$151,434	0.636	$96,278
18			$151,434	$151,434	0.619	$93,747
19			$151,434	$151,434	0.603	$91,282
20	30,554		$151,434	$181,988	0.587	$106,815
21			$151,434	$151,434	0.572	$86,545
22			$151,434	$151,434	0.556	$84,270
23			$151,434	$151,434	0.542	$82,055
24			$151,434	$151,434	0.528	$79,897
25	26,542		$151,434	$177,976	0.514	$91,432
26			$151,434	$151,434	0.500	$75,752
27			$151,434	$151,434	0.487	$73,760
28			$151,434	$151,434	0.474	$71,821
29			$151,434	$151,434	0.462	$69,933
30	30,554		$151,434	$181,988	0.450	$81,833
31			$151,434	$151,434	0.438	$66,304
32			$151,434	$151,434	0.426	$64,561
33			$151,434	$151,434	0.415	$62,864
34			$151,434	$151,434	0.404	$61,211
35	26,542		$151,434	$177,976	0.394	$70,048
36			$151,434	$151,434	0.383	$58,035
37			$151,434	$151,434	0.373	$56,509
38			$151,434	$151,434	0.363	$55,023

39		$151,434	$151,434	0.354	$53,577
40	30,554	$151,434	$181,988	0.344	$62,694
41		$151,434	$151,434	0.335	$50,797
42		$151,434	$151,434	0.327	$49,461
43		$151,434	$151,434	0.318	$48,161
44		$151,434	$151,434	0.310	$46,895
45	26,542	$151,434	$177,976	0.302	$53,665
46		$151,434	$151,434	0.294	$44,461
47		$151,434	$151,434	0.286	$43,292
48		$151,434	$151,434	0.278	$42,154
49		$151,434	$151,434	0.271	$41,046
50	30,554	$151,434	$181,988	0.264	$48,031
51		$151,434	$151,434	0.257	$38,916
52		$151,434	$151,434	0.250	$37,893
53		$151,434	$151,434	0.244	$36,897
54		$151,434	$151,434	0.237	$35,927
55	26,542	$151,434	$177,976	0.231	$41,114
56		$151,434	$151,434	0.225	$34,063
57		$151,434	$151,434	0.219	$33,167
58		$151,434	$151,434	0.213	$32,295
59		$151,434	$151,434	0.208	$31,446
60	30,554	$151,434	$181,988	0.202	$36,797
61		$151,434	$151,434	0.197	$29,814
62		$151,434	$151,434	0.192	$29,031
63		$151,434	$151,434	0.187	$28,267
64		$151,434	$151,434	0.182	$27,524
65	26,542	$151,434	$177,976	0.177	$31,498
66		$151,434	$151,434	0.172	$26,096
67		$151,434	$151,434	0.168	$25,410
68		$151,434	$151,434	0.163	$24,742
69		$151,434	$151,434	0.159	$24,091
70	30,554	$151,434	$181,988	0.155	$28,191
71		$151,434	$151,434	0.151	$22,841
72		$151,434	$151,434	0.147	$22,241
73		$151,434	$151,434	0.143	$21,656
74		$151,434	$151,434	0.139	$21,087
75	26,542	$151,434	$177,976	0.136	$24,131
76		$151,434	$151,434	0.132	$19,993
77		$151,434	$151,434	0.129	$19,467
78		$151,434	$151,434	0.125	$18,955
79		$151,434	$151,434	0.122	$18,457
80	30,554	$151,434	$181,988	0.119	$21,598
81		$151,434	$151,434	0.116	$17,499

82				$151,434	$151,434	0.113	$17,039
83				$151,434	$151,434	0.110	$16,591
84				$151,434	$151,434	0.107	$16,155
85	26,542			$151,434	$177,976	0.104	$18,487
86				$151,434	$151,434	0.101	$15,317
87				$151,434	$151,434	0.098	$14,914
88				$151,434	$151,434	0.096	$14,522
89				$151,434	$151,434	0.093	$14,140
90	30,554			$151,434	$181,988	0.091	$16,546
91				$151,434	$151,434	0.089	$13,406
92				$151,434	$151,434	0.086	$13,054
93				$151,434	$151,434	0.084	$12,711
94				$151,434	$151,434	0.082	$12,377
95	26,542			$151,434	$177,976	0.080	$14,163
96				$151,434	$151,434	0.077	$11,734
97				$151,434	$151,434	0.075	$11,426
98				$151,434	$151,434	0.073	$11,126
99				$151,434	$151,434	0.072	$10,833
100	30,554			$151,434	$181,988	0.070	$12,676
TOTAL	570,960	$9,691,992	$	15,789,469	$ 26,052,421.00		$15,740,690

Notes:

Totaled values are rounded up to the nearest whole dollar.
[a] Includes temporary facilities for decontamination of personnel and equipment.
[b] Costs are related to the area to be cleared prior to remedial excavation or installation of a cap.
[c] Includes the cost of stockpiling and management of excavated materials, waste characterization sampling, and sifting/sorting waste streams.
[d] Includes the cost of consolidating non-known chemical wastes excavated material from on-Site excavations within the footprints of on-Site CAMUs and beneath the final caps.
[e] Includes costs of storm water detention basins and infrastructure for storm water conveyance from capped areas to the detention basins and final discharge.
[f] Base Year Cost of $328,407 and Annual Costs of $23,696.
[g] Base Year Cost of $283,904, Year 1 Cost of $161,496, and Annual Costs of $105,283.
[h] Year 2 Cost of $6,000 and Annual Costs of $6,000.
[i] Includes O&M costs for storm water detention basins and associated infrastructure, in addition to storm water drainage channels/swales.
[j] Year 2 Cost of $16,455 and Annual Costs of $39,492.
[k] Discount factor for present value analysis is 2.7%; the period of analysis is 100 years.

Acronyms/Abbreviations:

CAMU – corrective action management unit
D&D – decommissioning and demolition
ET – Eastern Trenches
HFSDA – Hopland Field Station Disposal Area
LFU – landfill unit
LS – lump sum
O&M – operation and maintenance
SF – square feet
ST – Southern Trenches
VOC – volatile organic compound
WBH – Waste Burial Holes

Appendix B to Consent Decree Explanation of Significant Differences

Explanation of Significant Differences

Record of Decision
Soil/Solid Waste and Soil Gas
Operable Unit 2
September 2016

Laboratory for
Energy-Related Health Research/
Old Campus Landfill Superfund Site

University of California
Davis, California

U.S. Environmental Protection Agency
Region 9
San Francisco, California

May 2018

EXPLANATION OF SIGNIFICANT DIFFERENCES

Record of Decision, Soil/Solid Waste and Soil Gas, Operable Unit 2

Laboratory for Energy-Related Health Research
Old Campus Landfill Superfund Site

PART 1: THE DECLARATION

SITE NAME AND LOCATION

Soil/Solid Waste and Soil Gas from Operable Unit (OU) 2
Laboratory for Energy-Related Health Research/Old Campus Landfill (LEHR) Superfund Site
University of California, Davis, California
EPA ID CA2890190000

STATEMENT OF BASIS AND PURPOSE

This decision document sets forth the basis for the determination to issue the Explanation of Significant Differences (ESD) for the Record of Decision (ROD) for Soil/Solid Waste and Soil Gas, Operable Unit 2, September 2016 (2016 ROD), for the LEHR Superfund Site (the Site) at the University of California, Davis.

STATUTORY BASIS FOR ISSUANCE OF THE ESD

Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9617(c), requires that, if any remedial action taken at a site differs in any significant respects from the ROD for that site, the U.S. Environmental Protection Agency (EPA) shall publish an explanation of the significant differences and the reasons such changes were made. The National Contingency Plan (NCP), 40 C.F.R. § 300.435(c)(2)(i), and Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-02, indicate that an ESD, rather than a ROD amendment, is appropriate where the differences in the remedial action significantly change but do not fundamentally alter the remedy selected in the ROD with respect to scope, performance, or cost. EPA has determined that the changes provided in this ESD to the remedial action selected in the 2016 ROD are significant but do not fundamentally alter the selected remedy with respect to scope, performance, or cost.

In accordance with Section 300.825(a)(2) of the NCP, this ESD will become part of the Administrative Record for OU2 of the Site.

OVERVIEW OF THE ESD

This ESD eliminates the hot spot removal from the remedy selected in the 2016 ROD. The Feasibility Study supporting the ROD made the determination that removal of two soil gas hot spots in the land disposal unit, referred to as Landfill Unit (LFU) 2, would protect groundwater by preventing migration of soil gas contaminants down to the groundwater below the landfill.

EPA has now determined that the multi-layer cap that will cover the landfill will adequately reduce soil gas migration and that hot spot removal is not necessary for long-term protection of human health and the environment. With this change, the remedy remains protective and continues to meet applicable or relevant and appropriate requirements (NCP §§300.430(f)(1)(ii)(B)(1) and (2)).

AUTHORIZING SIGNATURE

The Assistant Director of the Superfund Division, Region 9, has been delegated the authority to approve this decision document.

Dana Barton
Assistant Director, Superfund Division
California Site Cleanup and Enforcement Branch
U.S. EPA, Region 9

5/3/18
Date

PART 2: THE DECISION SUMMARY

1. Introduction

This Explanation of Significant Differences (ESD) is for the Laboratory for Energy-Related Health Research/Old Campus Landfill (LEHR) Superfund Site at the University of California, Davis (Site). The ESD explains the difference between the remedial action to be undertaken at the Site and the remedial action set forth in the Record of Decision for Soil/Solid Waste and Soil Gas (Operable Unit (OU2)), dated September 29, 2016 (2016 ROD), and the reasons such changes are being made. The ESD includes a description of the selected remedy, basis for change, and a summary of support agency comments. This ESD is for OU 2 soil/solid waste and soil gas only. The groundwater associated with OU 2 will be addressed in a later ROD.[1]

The remedy selected in the 2016 ROD was based on site characterization and risk information from 2004 to 2008.

The change in this ESD is based on new information regarding the distribution and concentration of volatile organic compounds (VOCs) in the two areas identified as hot spots in the Soil/Solid Waste and Soil Gas feasibility study, dated April 2012. The elimination of hot spot removal from the remedy does not fundamentally alter the overall cleanup approach, will improve the short-term effectiveness, will not affect the long-term effectiveness and permanence of the remedy, and will reduce cost. The revised remedy complies with the NCP and the statutory requirements of CERCLA.

The lead regulatory agency overseeing the Site cleanup is EPA, with the California Department of Toxic Substances Control (DTSC) and the Central Valley Regional Water Quality Control Board providing state oversight.

2. Availability of Documents

This ESD and supporting documentation will become part of the LEHR Administrative Record (AR) for the Site. The AR is available to the public at:

Mary L. Stephens Davis Branch Library, Yolo County
315 E. 14th Street, Davis, California
(530) 757-5593

US EPA Records Center
75 Hawthorne Street, San Francisco, California
(415) 947-8717

[1] Operable Unit (OU) 2 is defined as the portion of the Site for which the University of California (UC) is responsible. OU 1 is defined as the portion of the Site for which the U.S. Department of Energy (DOE) is responsible.

3. Site History and Contamination

The Site covers approximately 25 acres at the southern edge of the University of California, Davis campus in Solano County and is north of the South Fork of Putah Creek (Figure 1). The property is a mix of laboratory and research buildings, animal facilities, waste disposal areas, and undeveloped land. The surrounding land is largely agricultural. The Site was placed on the National Priorities List on May 31, 1994.

From the 1940s through the 1970s, waste from UC was disposed in landfills, burial holes, and trenches. Wastes included general campus refuse (glass, metal, charcoal, ash, etc.), sewage treatment plant sludge, animal remains, and laboratory chemical waste. The waste areas covered by the 2016 ROD total approximately six acres and have an estimated minimum volume of 33,298 cubic yards of material. Radiological debris generated during joint UC and DOE research was also buried; this debris was removed during earlier DOE and UC removal actions (2016 ROD, Part 2, Section 2.0).

4. Site Chronology

Chronology of LEHR Events for Soil

Date	Event
Up to 1967	Landfills, trenches, and burial holes received municipal-type waste from UC Davis
1950's - 1980	Joint UC Davis and Department of Energy radiation studies on lab animals
1984	Initial Assessment Survey (Rockwell International)
1987 - 1988	Phase 1 Groundwater and Soil Investigation
1990	Soil Waste Assessment Test
1991	Waste Burial Trench Investigation
May 31,1994	Site placed on National Priorities List
1996	LFU 1, 2, and 3 Data Gaps Limited Field Investigation
1997	Background Soil Data Investigation
June 1997	Memorandum of Agreement (MOA) between UC and DOE
1998	Additional Background Soil Data Investigation
September 1999	EPA Administrative Order on Consent
1999-2000	Waste Burial Holes Interim Removal Action
2001	Waste Burial Holes Characterization

2002	2002 Data Gaps Investigation
December 2004	Remedial Investigation
2004 and 2006	Human health and ecological risk assessments
2009	Revised MOA between UC and DOE
February 2010	Feasibility Study Data Gaps Report
April 2012	Soil/Solid Waste and Soil Gas Feasibility Study
2014 - 2016	Soil vapor studies
January 2015	Proposed Plan for ROD Soil/Solid Waste and Soil Gas, OU 2
March 2016	U.S. Fish & Wildlife Service Biological Opinion
September 2016	ROD Soil/Solid Waste and Soil Gas, OU 2
February 2018	Density Driven Convection System Investigation Technical Report

5. Selected Remedy and Remedial Action Objectives

The remedy selected in the 2016 ROD includes the following components:

- Excavation and off-site disposal of two VOC "hot spot" areas to a depth of 20 feet below ground surface (approximately 2,420 cubic yards);

- Excavation of the northern portions of LFU-2 and the Eastern Trenches and consolidation of the excavated materials under a corrective action management units (CAMU) cover, leaving known chemical wastes in place;

- Most soil and waste left on-site in three CAMUs with multiple-layer covers (foundation layer, low permeability synthetic layer, compacted clay layer, drainage layer, bio-protection layer, and upper soil layer) (21,883 cubic yards excavated, including the northeastern portion of LFU-2 and the Eastern Trenches and placed in CAMUs).

- Two storm water retention basins and numerous drainage swales;

- Implementation of institutional controls to protect remedy components, prohibit residential land use, and restrict non-residential land use (including the requirement for a soil management plan for post-remediation earthwork activities); and

- Long-term groundwater monitoring to verify the efficacy of groundwater protection and operations and maintenance of the landfill cover and other components to maintain the functionality of the remedy.

EPA developed remedial action objectives (RAOs) to describe how the remedy is expected to address Site risks. These RAOs take into consideration current and reasonably anticipated future land uses and address exposure risks. RAOs for the Site are:

- Prevent human contact (ingestion, inhalation, and dermal) with contamination in soil/solid waste, and soil gas which poses an excess cumulative cancer risk greater than the risk management range of 1×10^{-6} to 1×10^{-4}, or a cumulative cancer risk greater than 1×10^{-6} for persons (i.e., students) living in the dairy goat barn;

- Prevent human contact (ingestion, inhalation, and dermal) with contamination in soil/solid waste and soil gas which poses a non-cancer hazard with a Hazard Index greater than 1.0;

- Prevent landfill waste and contaminated soil and soil gas from migrating and affecting groundwater quality;

- Minimize ecological receptor exposure, including, but not limited to, sensitive and critical habitats of species protected under the state and federal Endangered Species Acts; and

- Prevent surface water or storm water contact with landfill waste or soil contaminated above cleanup levels.

6. Description of Significant Differences and Basis for Change

This ESD eliminates the removal and off-site disposal of VOC hot spot areas from the remedy. Based on soil gas samples collected in 2008, the two VOC hot spot areas were a 1,600-square foot area in the northern portion of LFU- 2 and a 1,600-square foot area in the northern portion of the Eastern Trenches (Figure 2). The risks posed by these hot spot areas were migration of VOCs to groundwater and vapor intrusion into buildings. The rationale for hot spot removal at the time of the 2016 ROD was to reduce the potential migration to groundwater and to minimize the potential for vapor intrusion into buildings. However, the risk assessment and feasibility studies did not evaluate how a cap would mitigate potential migration to groundwater and potential vapor intrusion risks.

Additional soil gas studies were conducted from 2014 to 2016 (Density Driven Convection System Investigation Technical Report, February 2018). Using membrane interface probe technology, EPA determined that VOCs are more widespread in the disposal areas and the hot spot areas comprise a limited portion of total VOC contaminant mass (Figure 3). Because removal of the two VOC hot spot areas would address only a small portion of the VOC contaminant mass and the caps will effectively mitigate risk associated with VOC migration, EPA determined there is no technical justification to excavate the VOC hot spot areas.

By not removing the hot spot areas:

- There would be no decrease in protection to human health and the environment;
- Long-term effectiveness and permanence would be minimally affected (no waste would be excavated and treated but the caps would limit infiltration of precipitation, dissolution of contaminants, and migration to groundwater; soil vapor monitoring and, if necessary, engineering controls would enable EPA to mitigate potential vapor intrusion risk);
- Short-term effectiveness would be improved because there would be no risk from excavation equipment and waste transport to the surrounding community and workers;
- Implementability would be improved because excavation and confirmation sampling in waste disposal areas would not be conducted; and
- Costs would be reduced by $1,600,000.

7. Support Agency Comments

DTSC has participated with EPA in reviewing this remedy change and concurs with EPA's decision (Attachment 1).

8. Statutory Determination

EPA has determined that the remedy remains protective of human health and the environment, complies with all federal and state requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. The modified remedy satisfies CERCLA section 121, 42 U.S.C. § 9621.

9. Public Participation

A formal public comment period is not required for an ESD. EPA will publish a notice of availability in The Davis Enterprise, a major newspaper of general circulation.

REFERENCES

U.S. EPA. 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. Solid Waste and Emergency Response. U.S. EPA 540-R-98-031. July.

Weiss Associates, 2018. Density Driven Convection System Investigation Technical Report, Laboratory for Energy-Related Health Research/South Campus Disposal Site, University of California, Davis, February.

Technical Letter from U.C. Davis to Holly Hadlock, EPA, March 28, 2018.

ATTACHMENT 1

California Department of Toxic Substances Control letter to EPA supporting ESD, September 1, 2017.

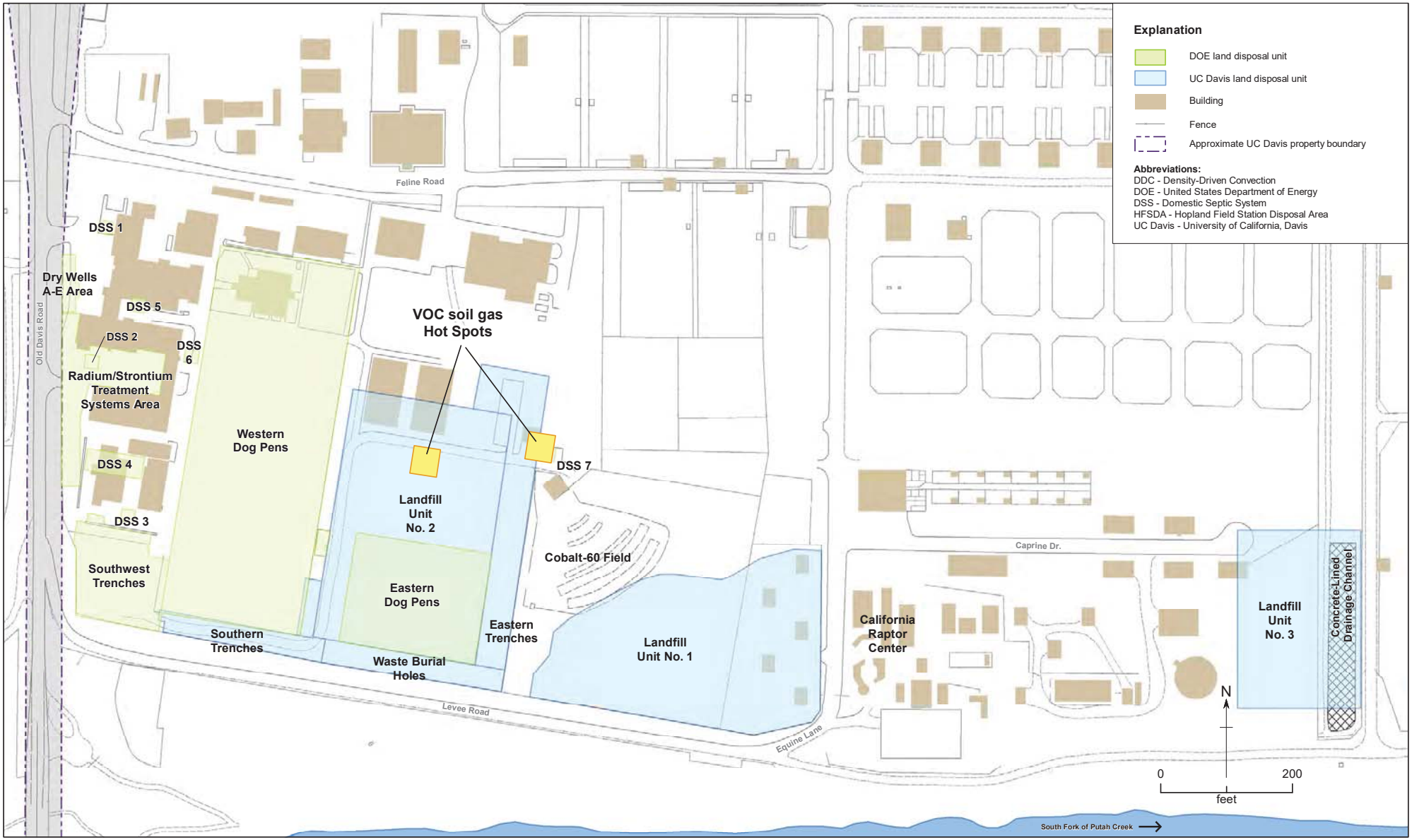
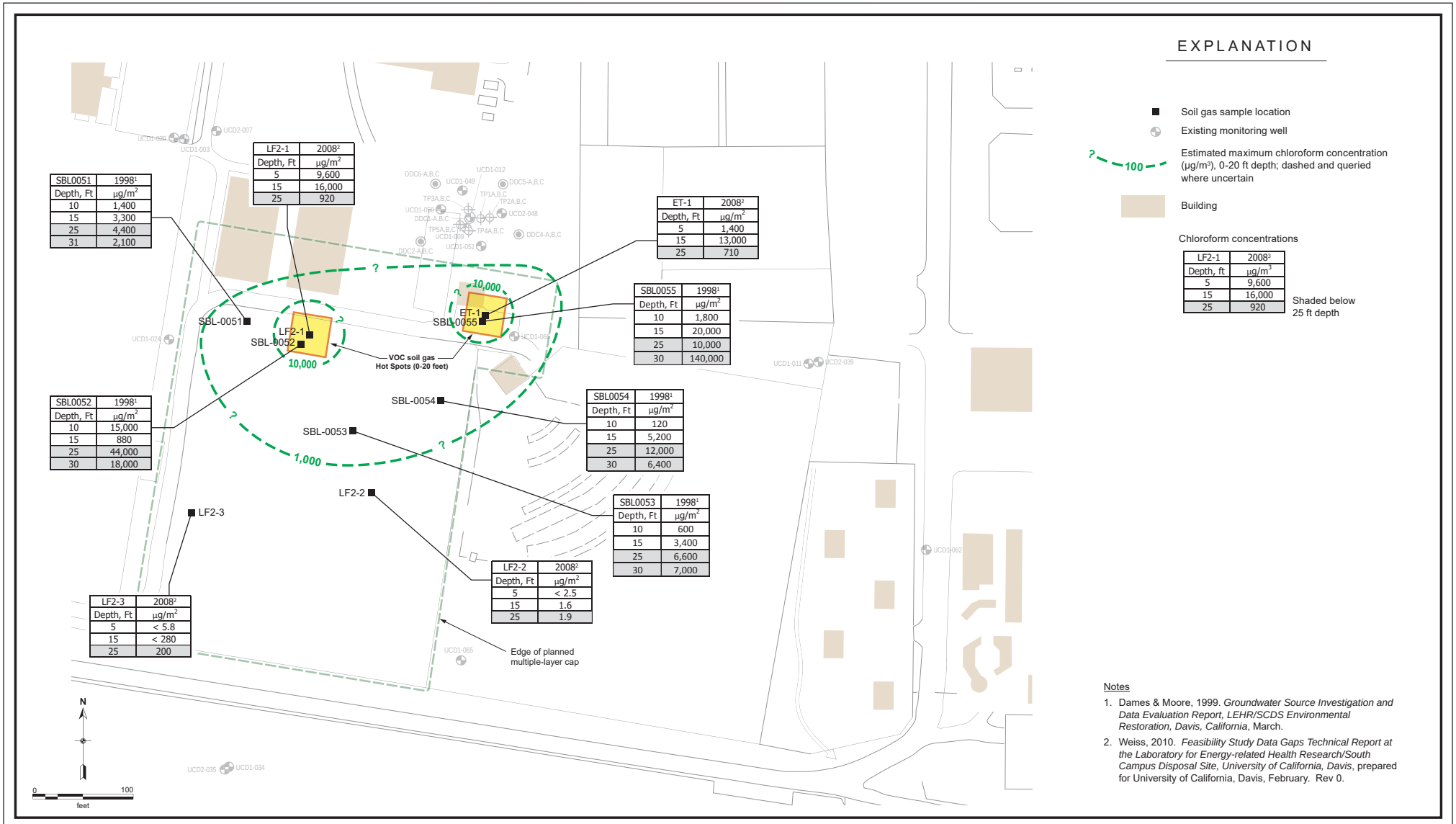


Figure 1. LEHR/OCL Site Features

L:\UC Davis\LEHR\Figures\2016 Organic Data Gaps Report\SoilSitesIntro.mxd 5/1/2018



SBL0051	1998[1]
Depth, Ft	µg/m²
10	1,400
15	3,300
25	4,400
31	2,100

LF2-1	2008[2]
Depth, Ft	µg/m²
5	9,600
15	16,000
25	920

ET-1	2008[2]
Depth, Ft	µg/m²
5	1,400
15	13,000
25	710

SBL0055	1998[1]
Depth, Ft	µg/m²
10	1,800
15	20,000
25	10,000
30	140,000

SBL0052	1998[1]
Depth, Ft	µg/m²
10	15,000
15	880
25	44,000
30	18,000

SBL0054	1998[1]
Depth, Ft	µg/m²
10	120
15	5,200
25	12,000
30	6,400

SBL0053	1998[1]
Depth, Ft	µg/m²
10	600
15	3,400
25	6,600
30	7,000

LF2-2	2008[2]
Depth, Ft	µg/m²
5	< 2.5
15	1.6
25	1.9

LF2-3	2008[2]
Depth, Ft	µg/m²
5	< 5.8
15	< 280
25	200

LF2-1	2008[3]
Depth, ft	µg/m³
5	9,600
15	16,000
25	920

Notes

1. Dames & Moore, 1999. *Groundwater Source Investigation and Data Evaluation Report, LEHR/SCDS Environmental Restoration, Davis, California*, March.
2. Weiss, 2010. *Feasibility Study Data Gaps Technical Report at the Laboratory for Energy-related Health Research/South Campus Disposal Site, University of California, Davis*, prepared for University of California, Davis, February. Rev 0.

Figure 2. Historical Soil Vapor Results for Chloroform in the Landfill Unit 2 Vicinity, 0-20 ft Depth

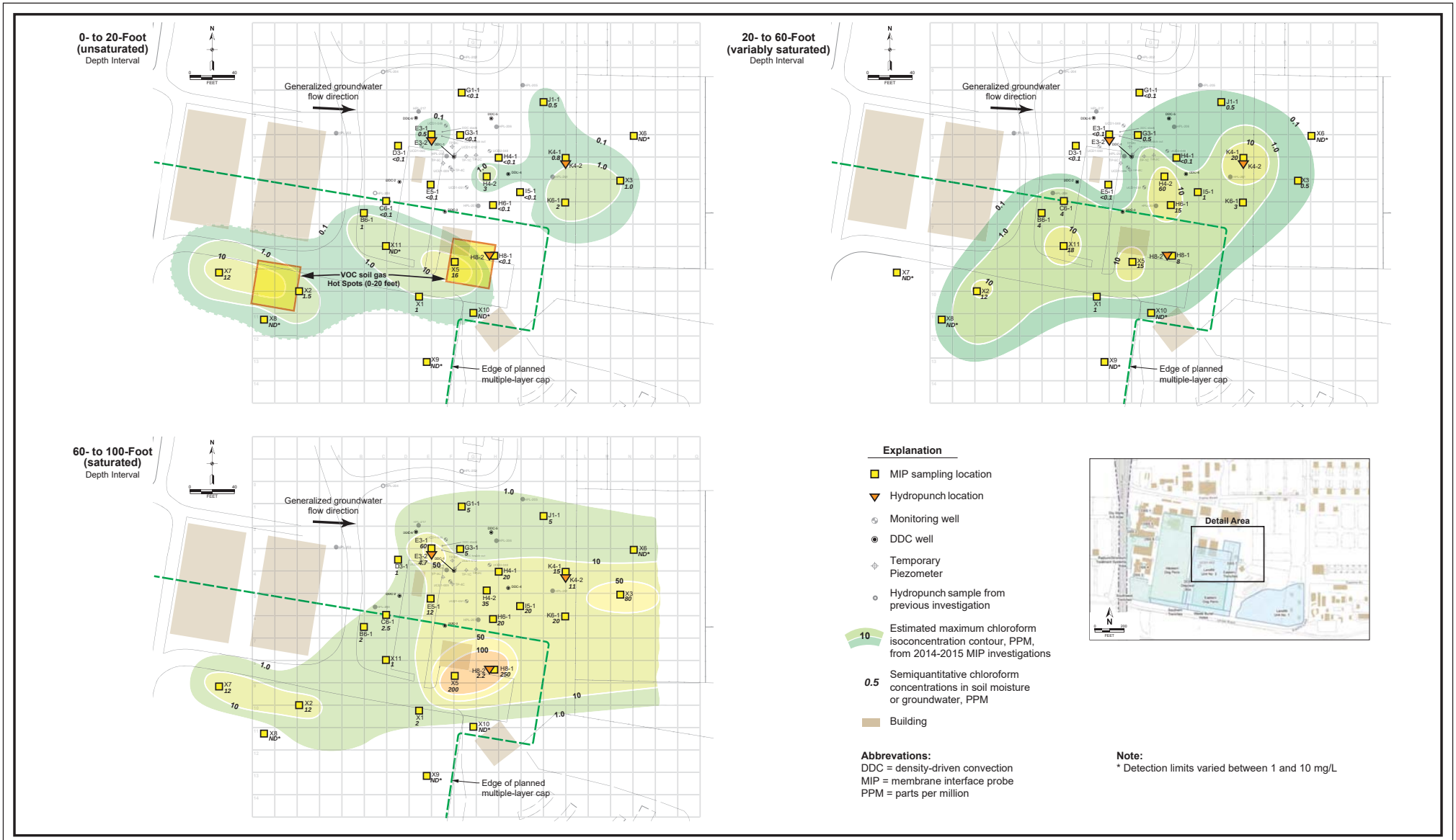


Figure 3. Distribution of Estimated Maximum Chloroform Concentration in Soil Moisture or Groundwater from 0 to 100 Feet below Ground Surface based on 2014-2015 MIP Investigations

Department of Toxic Substances Control

Matthew Rodriquez
Secretary for
Environmental Protection

Barbara A. Lee, Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Edmund G. Brown Jr.
Governor

September 1, 2017

Ms. Holly Hadlock
Project Manager, Superfund Program
United States Environmental Protection Agency, Region 9
75 Hawthorne Street
Mail Code: SFD-7-3
San Francisco, California 94105

THE DEPARTMENT OF TOXIC SUBSTANCES CONTROL APPROVAL OF APPROACH FOR THE EXPLANATION OF SIGNIFICANT DIFFERENCES DOCUMENT AT THE UC DAVIS AREAS AT THE LABORATORY FOR ENERGY-RELATED HEALTH RESEARCH FEDERAL FACILITY, DAVIS, CALIFORNIA, EPA ID. NO. CA2890190000

Dear Ms. Hadlock:

By phone call and email dated April 24, 2017, Holly Hadlock on behalf of the United States Environmental Protection Agency (USEPA) contacted the California Department of Toxic Substances Control (DTSC) to propose general changes to the planned remedy for the Laboratory for Energy Related Health Research (LEHR)/Old Campus Landfill Superfund Site (LEHR Site). The remedy for the soil/solid waste and soil gas is contained within the Record of Decision (ROD) for Soil/Solid Waste and Soil Gas – Operable Unit 2 for the LEHR Site, approved in September 2016 by DTSC. USEPA proposes to make modifications to the ROD through preparing an Explanation of Significant Differences document (ESD). USEPA consulted with DTSC informally to determine whether DTSC thought the approach of using an ESD was appropriate.

DTSC finds that USEPA proposing modifications to the ROD and describing and evaluating them in an ESD is appropriate. Once USEPA prepares the draft ESD, please submit a physical copy and an electronic copy to DTSC. DTSC will have appropriate subject matter experts review the ESD for content and to verify that the proposed modifications to the remedy are also protective. DTSC also assumes that the ESD will be public noticed to verify that the public has a chance to review the

proposed changes to the remedy for the soil/solid waste and soil gas at Operable Unit 2 of the LEHR Site.

If you have any questions regarding this email, please contact me by phone at (916) 255-3669, or at john.bystra@dtsc.ca.gov.

Sincerely,

John Bystra

John Bystra
Hazardous Substances Engineer
Brownfields and Environmental Restoration Program
Department of Toxic Substances Control

cc: (Via email)

Mr. Christopher Wright, UC Davis
Ms. Karla Brasaemle, P.G., TechLaw
Mr. Robert Devany, PG, CEG, CHG, Weiss
Mr. William McIlvride, CEG, CHG, Weiss
Mr. Jeffrey Murl, DOE – LM
Mr. Mike Butherus, Navarro
Mr. Durin Linderholm, CVRWQCB
Mr. Noel Shrum, Unit Chief, DTSC
Dr. Valerie Hanley, DTSC
Mr. Stephen Sterling, PG, PGP, CEG, CHG, DTSC

Appendix C to Consent Decree
Statement of Work

Statement of Work

Remedial Design and Remedial Action

Laboratory for Energy-Related Health Research/

Old Campus Landfill Superfund Site

Operable Unit 2, Soil/Solid Waste and Soil Gas

University of California, Davis, Solano County, California

EPA Region 9

TABLE OF CONTENTS

1. INTRODUCTION

1.1 **Purpose of the SOW**. This Statement of Work (SOW) sets forth the procedures and requirements for implementing the Work to address soil/solid waste and soil gas contamination at Operable Unit (OU) 2 at the Laboratory for Energy-Related Health Research/Old Campus Landfill Superfund Site, University of California, Davis, Solano County, California (Site).

1.2 The Scope of the Remedy includes the actions described in Section 12 of the Record of Decision (ROD), including construction of three corrective action management units (CAMUs) with multiple-layer caps, institutional controls (ICs), enhancement of drainage controls, and groundwater monitoring.

1.3 The terms used in this SOW that are defined in the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), in regulations promulgated under CERCLA, or in the Consent Decree (CD), have the meanings assigned to them in CERCLA, in such regulations, or in the CD, except that the term "Paragraph" or "¶" means a paragraph of the SOW, and the term "Section" means a section of the SOW, unless otherwise stated.

2. COMMUNITY INVOLVEMENT

2.1 Community Involvement Responsibilities

(a) The United States Environmental Protection Agency (EPA) has the lead responsibility for developing and implementing community involvement activities at the Site. Previously, EPA developed a Community Involvement Plan (CIP) for the Site. Pursuant to 40 C.F.R. § 300.435(c), EPA will review the existing CIP and determine whether it should be revised to describe further public involvement activities during the Work that are not already addressed or included in the existing CIP.

(b) If requested by EPA, the Settling Defendant, the Regents of the University of California (University), shall participate in community involvement activities, including participation in (1) the preparation of information regarding the Work for dissemination to the public, with consideration given to mass media and/or Internet notification, and (2) public meetings that may be held or sponsored by EPA to explain activities at or relating to the Site. University's support of EPA's community involvement activities may include providing online access to initial submissions and updates of deliverables to (1) any Community Advisory Groups, (2) any Technical Assistance Grant recipients and their advisors, and (3) other entities to provide them with a reasonable opportunity for review and comment. EPA may describe University's responsibilities for community involvement activities in its CIP. All community involvement activities conducted by University at EPA's request are subject to EPA's oversight. The community information repository is located at the Yolo County Public Library, 315 East 14th Street, Davis.

(c) **University's CI Coordinator**. If requested by EPA, University shall, within 15 days, designate and notify EPA of University's Community Involvement Coordinator (CI Coordinator). University may hire a contractor for this purpose. University's notice must include the name, title, and qualifications of the CI Coordinator. University's CI Coordinator is responsible for providing support regarding EPA's community involvement activities, including coordinating with EPA's CI Coordinator regarding responses to the public's inquiries about the Site.

3. REMEDIAL DESIGN

3.1 **RD Work Plan**. University shall submit a Remedial Design (RD) Work Plan (RDWP) for EPA approval. The RDWP must include:

(a) Plans for implementing all RD activities identified in this SOW, in the ROD, in the RDWP, or required by EPA to be conducted to develop the RD;

(b) A description of the overall management strategy for performing the RD, including a proposal for phasing of design and construction, if applicable;

(c) A description of the proposed general approach to contracting, construction, operation, maintenance, and monitoring of the Remedial Action (RA) as necessary to implement the Work;

(d) A description of the responsibility and authority of all organizations and key personnel involved with the development of the RD;

(e) Descriptions of any issues requiring clarification and/or anticipated problems (e.g., data gaps);

(f) Descriptions of any applicable permitting requirements and other regulatory requirements;

(g) Description of plans for obtaining access in connection with the Work, such as property acquisition, property leases, and/or easements; and

(h) Additional supporting deliverables described in ¶ 6.7(a) and (b).

3.2 University shall meet regularly with EPA to discuss design issues as necessary, as directed or determined by EPA.

3.3 **Preliminary (45%) RD**. University shall submit a Preliminary (45%) RD for EPA's comment. The Preliminary RD must include:

(a) A design criteria report, as described in the *Remedial Design/Remedial Action Handbook*, EPA 540/R-95/059 (June 1995) or the most recent version including project description, design requirements and provisions, preliminary process flow diagrams, and operation and maintenance (O&M) provisions;

(b) A basis of design report, as described in *Remedial Design/Remedial Action Handbook*, EPA 540/R-95/059 (June 1995) or the most recent version including design assumptions, remedial action contracting strategy, permits plan, and preliminary easements/access requirements;

(c) Preliminary drawings and specifications, including an outline of general specifications, drawings and schematics including final piping and instrumentation diagrams, O&M requirements, and chemical and geotechnical data;

(d) Descriptions of permit requirements, if applicable;

(e) Outline of O&M Plan and O&M Manual;

(f) A description of how the RA will be implemented in a manner that minimizes environmental impacts in accordance with EPA's *Principles for Greener Cleanups* (Aug. 2009);

(g) A description of monitoring and control measures to protect human health and the environment, such as air monitoring, sediment and erosion control (e.g., stormwater pollution prevention plan), compensatory mitigation for the valley elderberry longhorn beetle and its habitat, and dust suppression during the RA;

(h) Preliminary RA and O&M cost estimates; and

(i) Draft RA Schedule.

3.4 Pre-final (95%) RD. University shall submit the Pre-final (95%) RD for EPA's comment. The Pre-final RD must be a continuation and expansion of the previous design submittal and must address EPA's comments regarding the Preliminary RD. The University may resubmit the Pre-final RD as the Final (100%) RD, with an appropriate heading, if EPA approves the Pre-final RD without comments. The Pre-final RD must include:

(a) A complete set of construction drawings and specifications that are: (1) certified by a registered professional engineer; and (2) suitable for procurement;

(b) A survey and engineering drawings showing existing Site features, such as elements, property borders, easements, and Site conditions;

(c) Pre-final versions of the same elements and deliverables as are required for the Preliminary RD;

(d) Appendices including calculations, chemical data, geotechnical data, and applicable references;

(e) A specification for photographic documentation of the RA; and

(f) Updates of all deliverables required to accompany the Preliminary (45%) RD (e.g., design criteria report, basis of design report, RA schedule, RA cost estimate).

3.5 **Final (100%) RD**. University shall submit the Final (100%) RD for EPA approval. The Final RD must address EPA's comments on the Pre-final RD and must include final versions of all Pre-final RD deliverables.

4. REMEDIAL ACTION

4.1 **RA Work Plan**. University shall submit a RA Work Plan (RAWP) for EPA approval that includes:

(a) A proposed RA Construction Schedule in a format that identifies critical path items;

(b) Plans for satisfying permitting requirements, including obtaining permits for off-site activity and for satisfying substantive requirements of permits for on-site activity.

(c) **Data Management Plan.** The purpose of the Data Management Plan (DMP) is to ensure that University provides EPA with data in a format that meets EPA quality assurance (QA) requirements and that EPA can upload, utilize, and store. A site-specific DMP must be developed to provide written protocal for data collection, processing, and deliverable submission. All changes to the site-specific DMP are subject to review to ensure consistency with project data quality objectives, and will be documented as a revised site-specific DMP. The DMP must identify expected timetables, data streams and formats, describe data processing procedures, designate roles and permissions for those involved with data management, and describe the process to verify data deliverables.

(d) **Post-Closure Monitoring Plan.** The purpose of the Post-Closure Monitoring Plan (PCMP) is to obtain baseline information regarding the extent of contamination in affected media at the Site; to obtain information, through short- and long- term monitoring, about the movement of and changes in contamination throughout the Site, before and during implementation of the RA; to obtain information regarding contamination levels to determine whether performance standards as defined in the ROD are achieved; and to obtain information to determine whether performing additional action is necessary, including further Site monitoring. The PCMP must include:

(1) Description of the environmental media to be monitored;

(2) Description of the data collection parameters, including existing and proposed monitoring devices and locations, schedule and frequency of monitoring, analytical parameters to be monitored, and analytical methods employed;

(3) Description of how performance data will be analyzed, interpreted, and reported, and/or other Site-related requirements;

(4) Description of verification sampling procedures;

(5) Description of deliverables that will be generated in connection with monitoring, including sampling schedules, laboratory records, monitoring reports, and monthly and annual summary reports to EPA and DTSC; and

(6) Description of proposed additional monitoring and data collection actions (such as increases in frequency of monitoring, and/or installation of additional monitoring devices in the affected areas) in the event that results from monitoring devices indicate changed conditions (such as higher than expected concentrations of the contaminants of concern or groundwater contaminant plume movement).

(e) **Transportation and Off-Site Disposal Plan.** The Transportation and Off-Site Disposal Plan (TODP) describes plans to ensure compliance with ¶ 4.4 (Off-Site Shipments). The TODP must include:

(1) Proposed routes for off-site shipment of Waste Material;

(2) Identification of communities potentially affected by shipment of Waste Material; and

(3) Description of plans to minimize potential impacts on affected communities.

(f) And additional supporting deliverables described in ¶ 6.7 (Monitoring Well Decommissioning and Installation Work Plan, Materials Management Plan).

4.2 Meetings and Inspections

(a) **Preconstruction Conference**. University shall hold a preconstruction conference with EPA and others as directed or approved by EPA and as described in the *Remedial Design/Remedial Action Handbook*, EPA 540/R-95/059 (June 1995). University shall prepare minutes of the conference and shall distribute the minutes to all conference attendees within ten business days.

(b) **Periodic Meetings**. During the construction portion of the RA (RA Construction), University shall meet regularly with EPA, and others as directed or determined by EPA, to discuss construction issues. University shall distribute an agenda and a list of attendees to all Parties prior to each meeting. University shall prepare minutes of the meetings and shall distribute the minutes to all Parties within ten business days.

(c) **Inspections**

(1) EPA or its representative will conduct periodic inspections of, or have an on-site presence during, the Work. EPA or its representative will also conduct pre-final and final inspections. At EPA's request, the Supervising Contractor or other designee shall accompany EPA or its representative during inspections.

(2) Upon notification by EPA of any deficiencies in the RA Construction, University shall submit to EPA for approval its proposal for taking all necessary steps to correct the deficiencies and/or bring the RA Construction into compliance with the approved Final RD, any approved design changes, and/or the approved RAWP. Such proposal shall include a schedule for implementation. Upon approval by EPA, University shall implement this proposal according to the approved schedule.

4.3 Emergency Response and Reporting

(a) **Emergency Response and Reporting**. If any event occurs during performance of the Work that causes or threatens to cause a release of Waste Material on, at, or from the Site and that either constitutes an emergency situation or that may present an immediate threat to public health or welfare or the environment, University shall: (1) immediately take all appropriate action to prevent, abate, or minimize such release or threat of release; (2) within twenty-four (24) hours, notify the authorized EPA officer (as specified in ¶ 4.3(c)) orally; and (3) take such actions in consultation with the authorized EPA officer and in accordance with all applicable provisions of the Health and Safety Plan, the Emergency Response Plan, and any other deliverable approved by EPA under the SOW.

(b) **Release Reporting**. Upon the occurrence of any event during performance of the Work that University is required to report pursuant to Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and Community Right-to-know Act (EPCRA), 42 U.S.C. § 11004, University shall immediately notify the authorized EPA officer orally.

(c) The "authorized EPA officer" for purposes of immediate oral notifications and consultations under ¶ 4.3(a) and ¶ 4.3(b) is the EPA Project Coordinator, the EPA Alternate Project Coordinator (if the EPA Project Coordinator is unavailable), or the EPA Emergency Response Unit, Region 9 (if neither EPA Project Coordinator is available).

(d) For any event covered by ¶ 4.3(a) and ¶ 4.3(b), University shall: (1) within 14 days after the onset of such event, submit a report to EPA describing the actions or events that occurred and the measures taken, and to be taken, in response thereto; and (2) within 30 days after the conclusion of such event, submit a report to EPA describing all actions taken in response to such event.

(e) The reporting requirements under ¶ 4.3 are in addition to the reporting required by Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of EPCRA, 42 U.S.C. § 11004.

4.4 Off-Site Shipments

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

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

4.5 Certification of RA Completion

(a) **RA Completion Inspection**. The RA is "Complete" for purposes of this paragraph when it has been fully performed and the Performance Standards as established in the ROD have been achieved. University shall schedule a pre-final inspection to review the construction and operation of the system and to review whether the system is functioning properly and as designed. The inspection must be attended by University and EPA and/or their representatives. If any incomplete construction items are identified during the pre-final inspection, University shall prepare a "punch list" identifying these items. University shall submit within 14 days after the pre-final inspection a Pre-final Construction Inspection Technical Memorandum (punch list) that describes all outstanding RA construction items, the proposed completion date for these items, and a proposed date for the final inspection, if one is required. If requested by EPA, a final inspection must be conducted.

(b) **RA Report**. Following the inspection, University shall submit an RA Report to EPA requesting EPA's Certification of RA Completion. The report must: (1) include certifications by a registered professional engineer and by University's Project Coordinator that the RA is complete; (2) include as-built drawings signed and stamped by a registered professional engineer; (3) be prepared in accordance with Chapter 2 (Remedial Action Completion) of EPA's *Close Out Procedures for NPL Sites* guidance (May 2011); (4) contain monitoring data to demonstrate

that Performance Standards have been achieved; and (5) be certified in accordance with ¶ 6.5 (Certification).

(c) If EPA concludes that the RA is not Complete, EPA will so notify University. EPA's notice must include a description of any deficiencies. EPA's notice may include a schedule for addressing such deficiencies or may require University to submit a schedule for EPA approval. University shall perform all activities described in the notice in accordance with the schedule.

(d) If EPA concludes, based on the initial or any subsequent RA Report/Monitoring Report requesting Certification of RA Completion, that the RA is Complete, EPA will so certify to University. This certification will constitute the Certification of RA Completion for purposes of the CD, including Section XV of the CD (Covenants by the University). Certification of RA Completion will not affect University's remaining obligations under the CD.

4.6 Certification of Work Completion

(a) **Work Completion Letter**. Following the completion of all institutional control requirements, University shall submit a letter to EPA requesting EPA's Certification of Work Completion with regard to the completion of all required institutional control components (e.g., postings, surveys, recording of deed restrictions) (Work). The letter must: (1) include certifications by a registered professional engineer or geologist and by University's Project Coordinator that the Work is complete; and (2) be certified in accordance with ¶ 6.5 (Certification). If the RA Report submitted under ¶ 4.5(b) includes all elements required under this ¶ 4.6(a), then the RA Report suffices to satisfy all requirements under this ¶ 4.6(a). Note that long-term O&M will be required in perpetuity.

(b) If EPA concludes that the Work is not complete, EPA will so notify University. EPA's notice must include a description of the activities that University must perform to complete the Work. EPA's notice must include specifications and a schedule for such activities or must require University to submit specifications and a schedule for EPA approval. University shall perform all activities described in the notice or in the EPA-approved specifications and schedule.

(c) If EPA concludes, based on the initial or any subsequent letter requesting Certification of Work Completion, that the Work is complete, EPA will so certify in writing to University. EPA's issuance of the Certification of Work Completion does not affect the following continuing obligations: (1) obligations under Sections VIII (Property Requirements) of the CD, XVII (Access to Information) of the CD, and XVIII (Retention of Records) of the CD; (2) Institutional Controls obligations as provided in the Institutional Controls Implementation and Assurance Plan (ICIAP); and (3) reimbursement of EPA's Future Response Costs under Section IX (Payments for Response Costs) of the CD.

5. REPORTING

5.1 **Progress Reports**. Commencing with the month following lodging of the CD and until EPA approves the RA Completion, University shall submit progress reports to EPA on a monthly basis, or as otherwise requested by EPA or agreed to by the Parties. Unless otherwise agreed to by the Parties, the reports must cover all activities that took place during the prior reporting period, including:

(a) The actions that have been taken toward achieving compliance with the CD;

(b) A summary of all results of sampling, tests, and all other data received or generated by University;

(c) A description of all deliverables that University submitted to EPA;

(d) A description of all activities relating to RA Construction that are scheduled for the six weeks following the reporting period;

(e) An updated RA Construction Schedule, together with information regarding percentage of completion, delays encountered or anticipated that may affect the future schedule for implementation of the Work, and a description of efforts made to mitigate those delays or anticipated delays;

(f) A description of any modifications to the work plans or other schedules that University has proposed or that EPA has approved; and

(g) A description of all activities undertaken in support of the CIP during the reporting period and those to be undertaken in the next six weeks.

5.2 **Notice of Progress Report Schedule Changes**. If the schedule for any activity described in the Progress Reports, including activities required to be described under ¶ 5.1(d), changes by seven or more days University shall notify EPA of such change as soon as reasonably practicable, but in any event, no later than the next Progress Report.

6. DELIVERABLES

6.1 **Applicability**. University shall submit deliverables for EPA approval or comment as specified in the SOW. If neither is specified, the deliverable does not require EPA's approval or comment. Paragraphs 6.2 (In Writing) through 6.4 (Technical Specifications) apply to all deliverables. Paragraph 6.5 (Certification) applies to any deliverable that is required to be certified. Paragraph 6.6 (Approval of Deliverables) applies to any deliverable that is required to be submitted for EPA approval.

6.2 **In Writing**. As provided in ¶ 79 of the CD, all deliverables under this SOW must be in writing unless otherwise specified.

6.3 **General Requirements for Deliverables.** All deliverables must be submitted by the deadlines in the RD Schedule or RA Schedule, as applicable. University shall submit all

deliverables to EPA in electronic form, unless otherwise directed by EPA. University shall submit all final work plans and reports on a compact disc. Technical specifications for sampling and monitoring data and spatial data are addressed in ¶ 6.4. All other deliverables shall be submitted to EPA in the electronic form specified by the EPA Project Coordinator. If any deliverable includes maps, drawings, or other exhibits that are larger than 11" by 17", or if otherwise requested by EPA, University shall also provide EPA with paper copies of such exhibits.

6.4 Technical Specifications

(a) Sampling and monitoring data should be submitted in an agreed upon electronic data deliverable (EDD) format, as requested. Other delivery methods may be allowed if electronic direct submission presents a significant burden or as technology changes.

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

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

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

6.5 Certification. All deliverables that require compliance with this ¶ 6.5 (Certification) must be signed by the University's Project Coordinator, or other responsible official of University, and must contain the following statement:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant

penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

6.6 Approval of Deliverables

(a) **Initial Submissions**

(1) After review of any deliverable that is required to be submitted for EPA approval under the CD or the SOW, EPA will: (i) approve, in whole or in part, the submission; (ii) approve the submission upon specified conditions; (iii) disapprove, in whole or in part, the submission; or (iv) any combination of the foregoing.

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

(b) **Resubmissions**. Upon receipt of a notice of disapproval under ¶ 6.6(a) (Initial Submissions), or if required by a notice of approval upon specified conditions under ¶ 6.6(a), University shall, within thirty (30) days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the deliverable for approval. After review of the resubmitted deliverable, EPA may: (1) approve, in whole or in part, the resubmission; (2) approve the resubmission upon specified conditions; (3) modify the resubmission; (4) disapprove, in whole or in part, the resubmission, requiring University to correct the deficiencies; or (5) any combination of the foregoing.

(c) **Implementation**. Upon approval, approval upon conditions, or modification by EPA under ¶ 6.6(a) (Initial Submissions) or ¶ 6.6(b) (Resubmissions), of any deliverable, or any portion thereof: (1) such deliverable, or portion thereof, will be incorporated into and enforceable under the CD; and (2) University shall take any action required by such deliverable, or portion thereof. The implementation of any non-deficient portion of a deliverable submitted or resubmitted under ¶ 6.6(a) or ¶ 6.6(b) does not relieve University of any liability for stipulated penalties under Section XIII (Stipulated Penalties) of the CD.

6.7 Supporting Deliverables. University shall submit each of the following supporting deliverables for EPA approval, except as specifically provided. University shall develop the deliverables in accordance with all applicable regulations, guidance documents, and policies (see Section 9, References). University shall update each of these supporting deliverables as necessary or appropriate during the course of the Work, and/or as requested by EPA.

(a) **Health and Safety Plan**. The Health and Safety Plan (HASP) describes all activities to be performed to protect on-site personnel and area residents from

physical, chemical, and all other hazards posed by the Work. University shall develop the HASP in accordance with EPA's Emergency Responder Health and Safety and Occupational Safety and Health Administration (OSHA) requirements under 29 C.F.R. §§ 1910 and 1926. The HASP should cover RD activities and should be, as appropriate, updated to cover activities during the RA and updated to cover activities after RA completion. EPA does not approve the HASP, but will review it to ensure that all necessary elements are included and that the plan provides for the protection of human health and the environment.

(b) **Emergency Response Plan**. The Emergency Response Plan (ERP) must describe procedures to be used in the event of an accident or emergency at the Site (for example, power outages, water impoundment failure, treatment plant failure, slope failure, etc.). The ERP must include:

(1) Name of the person or entity responsible for responding in the event of an emergency incident;

(2) Plan and date(s) for meeting(s) with the local community, including local, State, and federal agencies involved in the cleanup, as well as local emergency squads and hospitals;

(3) Spill Prevention, Control, and Countermeasures (SPCC) Plan (if applicable), consistent with the regulations under 40 C.F.R. Part 112, describing measures to prevent, and contingency plans for, spills and discharges;

(4) Notification activities in accordance with ¶ 4.3(b) (Release Reporting) in the event of a release of hazardous substances requiring reporting under Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of EPCRA, 42 U.S.C. § 11004; and

(5) A description of all necessary actions to ensure compliance with ¶ 11 (Emergencies and Releases) of the CD in the event of an occurrence during the performance of the Work that causes or threatens a release of Waste Material from the Site that constitutes an emergency or may present an immediate threat to public health or welfare or the environment.

(c) **Field Sampling Plan**. The Field Sampling Plan (FSP) addresses all sample collection activities. The FSP must be written so that a field sampling team unfamiliar with the project would be able to gather the required samples and field information. University shall develop the FSP in accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies*, EPA/540/G 89/004 (Oct. 1988).

(d) **Quality Assurance Project Plan**. The Quality Assurance Project Plan (QAPP) augments the FSP and addresses sample analysis and data handling regarding the Work. The QAPP must include a detailed explanation of University's quality assurance, quality control, and chain of custody procedures for all treatability,

design, compliance, and monitoring samples. University shall develop the QAPP in accordance with *EPA Requirements for Quality Assurance Project Plans*, QA/R-5, EPA/240/B-01/003 (Mar. 2001, reissued May 2006); *Guidance for Quality Assurance Project Plans*., QA/G-5, EPA/240/R 02/009 (Dec. 2002); and *Uniform Federal Policy for Quality Assurance Project Plans*, Parts 1-3, EPA/505/B-04/900A though 900C (Mar. 2005). The QAPP must also include procedures:

(1) To ensure that EPA and California Department of Toxic Substances Control (DTSC) and their authorized representatives have reasonable access to laboratories used by University in implementing the CD (University's Labs);

(2) To ensure that University's Labs analyze all samples submitted by EPA pursuant to the QAPP for quality assurance monitoring (e.g., performance samples);

(3) To ensure that University's Labs perform all analyses using EPA-accepted methods;

(4) To ensure that University's Labs participate in an EPA-accepted QA/QC program or other program QA/QC acceptable to EPA;

(5) For University to provide EPA and DTSC with notice at least 14 days prior to any scheduled sample collection activity;

(6) For University to provide split samples and/or duplicate samples to EPA and DTSC upon request;

(7) For EPA and DTSC to take any additional samples that they deem necessary;

(8) For EPA and DTSC to provide to University, upon request, split samples and/or duplicate samples in connection with EPA's and DTSC's oversight sampling; and

(9) For University to submit to EPA and DTSC all sampling and tests results and other data in connection with the implementation of the CD.

(e) **Construction Quality Assurance/Quality Control Plan (CQA/QCP)**. The purpose of the Construction Quality Assurance Plan (CQAP) is to describe planned and systemic activities that provide confidence that the RA construction will satisfy all plans, specifications, and related requirements, including quality objectives. The purpose of the Construction Quality Control Plan (CQCP) is to describe the activities to verify that RA construction has satisfied all plans, specifications, and related requirements, including quality objectives. The CQA/QCP shall meet requirements provided in *Remedial Design/Remedial Action Handbook*, EPA 540/R-95/059 (June 1995) and shall:

(1) Identify and describe the responsibilities of the organizations and personnel implementing the CQA/QCP, and provide qualifications for key personnel requirements;

(2) Describe the performance standards required to achieve Completion of the RA;

(3) Describe the activities to be performed: (i) to provide confidence that performance standards will be met; and (ii) to determine whether performance standards have been met;

(4) Describe verification activities, such as inspections, sampling, testing, monitoring, and production controls, under the CQA/QCP. The inspection section shall discuss the summary, scope, and frequency of the tests and observations used to monitor the RA and verify compliance with environmental requirements and customary construction practices, OSHA, and building and safety codes;

(5) Describe industry standards and technical specifications used in implementing the CQA/QCP;

(6) Describe procedures for tracking construction deficiencies from identification through corrective action;

(7) Describe procedures for documenting all CQA/QCP activities; including daily summary reports and inspection data sheets; and

(8) Describe procedures for retention of documents and for final storage of documents.

(f) **O&M Plan**. The O&M Plan describes the requirements for inspecting, operating, and maintaining the RA. University shall develop the O&M Plan in accordance with *Operation and Maintenance in the Superfund Program*, OSWER 9200.1 37FS, EPA/540/F-01/004 (May 2001). The O&M Plan must include the following additional requirements:

(1) Description of performance standards to be met to implement the requirements of the ROD;

(2) Description of activities to be performed to: (i) provide confidence that performance standards will be met; and (ii) determine whether performance standards have been met;

(3) O&M Reporting. Description of records and reports that will be generated during O&M, such as daily operating logs, laboratory records, records of operating costs, reports regarding emergencies, personnel and

maintenance records, monitoring reports, and quarterly and annual reports to EPA and DTSC;

(4) Description of corrective action in case of systems failure, including: (i) alternative procedures to prevent the release or threatened release of Waste Material which may endanger public health and the environment or may cause a failure to achieve performance standards; (ii) analysis of vulnerability and additional resource requirements should a failure occur; (iii) notification and reporting requirements should O&M systems fail or be in danger of imminent failure; and (iv) community notification requirements; and

(5) Description of corrective action to be implemented in the event that performance standards are not achieved; and a schedule for implementing these corrective actions.

(g) **O&M Manual**. The O&M Manual serves as a guide to the purpose and function of the equipment and systems that make up the remedy. Respondents shall develop the O&M Manual in accordance with *Guidance for Management of Superfund Remedies in Post Construction*, OLEM 9200.3-105 (Feb. 2017). It can be included as an addendum to the O&M Plan.

(h) **Institutional Controls Implementation and Assurance Plan**. The Institutional Controls Implementation and Assurance Plan (ICIAP) describes plans to implement, maintain, and enforce the Institutional Controls (ICs) at the Site. University shall develop the ICIAP in accordance with *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites*, OSWER 9355.0-89, EPA/540/R-09/001 (Dec. 2012), and *Institutional Controls: A Guide to Preparing Institutional Controls Implementation and Assurance Plans at Contaminated Sites*, OSWER 9200.0-77, EPA/540/R-09/02 (Dec. 2012). The ICIAP will include a discussion of soil management and potential environmental impacts during future excavations, drainage repair and enhancements, and any other soil work during post-remediation earthwork and construction activities. It should include a list of potential future deliverables. The ICIAP must include the following additional requirements:

(1) Specifications for annual inspections and reporting;

(2) Locations of recorded real property interests (e.g., easements, liens) and resource interests in the property that may affect ICs (e.g., surface, mineral, and water rights) including accurate mapping and geographic information system (GIS) coordinates of such interests; and

(3) Legal descriptions and survey maps that are prepared according to current American Land Title Association (ALTA) Survey guidelines and certified by a licensed surveyor.

(i) **Habitat Mitigation Plan (HMP)**. The HMP provides measures to address the anticipated but unavoidable adverse impacts of the remedial action on the valley elderberry longhorn beetle and its habitat as documented in the *Biological Assessment for the Laboratory for Energy-Related Health Research/Old Campus Landfill Remediation Project*, prepared by ICF International (Jan. 2016). The HMP shall follow the U.S. Fish & Wildlife Service *Endangered Species Act Compensatory Mitigation Policy*, Federal Register document number 2016-30929 (effective Dec. 27, 2016).

7. SCHEDULES

7.1 Applicability and Revisions. All deliverables and tasks required under this SOW must be submitted or completed by the deadlines or within the time durations listed in the RD and RA Schedules set forth below. University may submit proposed revised RD Schedules or RA Schedules for EPA approval. Upon EPA's approval, the revised RD and/or RA Schedules supersede the RD and RA Schedules set forth below, and any previously-approved RD and/or RA Schedules.

7.2 RD Schedule

	Description of Deliverable, Task	**¶ Ref.**	**Deadline**
1	Health & Safety Plan	6.7(a)	15 days after EPA's Notice to Proceed (CD ¶ 9.c)
2	RDWP	3.1	60 days after EPA's Notice to Proceed (CD ¶ 9.c)
3	Preliminary (45%) RD	3.3	90 days after Approval of RDWP
4	Pre-final (95%) RD	3.4	150 days after EPA comments on Preliminary RD
5	Final (100%) RD	3.5	30 days after EPA comments on Pre-final RD

7.3 RA Schedule

	Description of Deliverable, Task	¶ Ref.	Deadline
1	Award of RA Contract		120 days after EPA's approval of the Final (100%) RD
2	Progress Report	5.1	15th day of each month
3	RAWP	4.1	120 days after award of RA contract
4	DMP	4.1(c)	Appendix to RAWP
5	PCMP	4.1(d)	Appendix to RAWP
6	TODP	4.1(e)	Appendix to RAWP
7	Emergency Response Plan	6.7(b)	120 days after award of RA contract
8	Field Sampling Plan	6.7(c)	120 days after award of RA contract
9	QAPP	6.7(d)	120 days after award of RA contract
10	CQA/QCP	6.7(e)	120 days after award of RA contract
11	O&M Plan	6.7(f)	120 days after award of RA contract
12	Quarterly Data Summary Report	6.7(f)(3)	90 days after monitoring and data collection
13	O&M Manual	6.7(g)	14 days after Final Inspection
14	ICIAP	6.7(h)	120 days after award of RA contract
15	HMP	6.7(i)	120 days after award of RA contract
16	Pre-Construction Conference	4.2(a)	15 days after approval of RAWP
17	Start of Construction		30 days after approval of RAWP
18	Notification of Construction Completion	4.5(a)	10 days after construction completion
19	Pre-final Inspection	4.5(a)	30 days after submitting Notification of Construction Completion
20	Pre-final Construction Inspection Tech Memo	4.5(a)	14 days after Pre-Final Inspection
21	Final Inspection	4.5(a)	30 days after Completion of Work identified in Pre-Final Construction Inspection Tech Memo
22	RA Report	4.5(b)	90 days after Final Inspection
23	Work Completion Letter	4.6(a)	90 days after land use covenants are recorded
24	Annual Monitoring Report		May 31 of each year

8. DTSC PARTICIPATION

8.1 **Copies**. University shall, at any time it sends a deliverable to EPA, send a copy of such deliverable to DTSC. EPA will, at any time it sends a notice, authorization, comments, approval, disapproval, or certification to University, send a copy of such document to DTSC. For purposes of this Statement of Work, "deliverable" shall include any submission required by this Statement of Work.

8.2 **Review and Comment**. DTSC will have a reasonable opportunity for review and comment prior to:

(a) Any EPA approval or disapproval under ¶ 6.6 (Approval of Deliverables) of any deliverables that are required to be submitted for EPA comment or approval; and

(b) Any disapproval of, or Certification of RA Completion under ¶ 4.5 (Certification of RA Completion), and any disapproval of, or Certification of Work Completion under ¶ 4.6 (Certification of Work Completion).

9. REFERENCES AND GUIDANCE DOCUMENTS

9.1 The following regulations and guidance documents, among others, apply to the Work. University shall review these documents (latest edition/revision) and shall use the information provided therein in performing the RD/RA and preparing all deliverables under this SOW. Any item for which a specific URL is not provided below should be available on one of the two EPA Web pages listed in ¶ 9.2:

(a) A Compendium of Superfund Field Operations Methods, OSWER 9355.0-14, EPA/540/P-87/001a (Aug. 1987).

(b) CERCLA Compliance with Other Laws Manual, Part I: Interim Final, OSWER 9234.1-01, EPA/540/G-89/006 (Aug. 1988).

(c) Guidance for Conducting Remedial Investigations and Feasibility Studies, OSWER 9355.3-01, EPA/540/G-89/004 (Oct. 1988).

(d) CERCLA Compliance with Other Laws Manual, Part II, OSWER 9234.1-02, EPA/540/G-89/009 (Aug. 1989).

(e) Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties, OSWER 9355.5-01, EPA/540/G-90/001 (Apr. 1990).

(f) Guidance on Expediting Remedial Design and Remedial Actions, OSWER 9355.5-02, EPA/540/G-90/006 (Aug. 1990).

(g) Handbook for Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells, EPA160014-891034 (March 1991)

(h) Guide to Management of Investigation-Derived Wastes, OSWER 9345.3-03FS (Jan. 1992).

(i) Permits and Permit Equivalency Processes for CERCLA On-Site Response Actions, OSWER 9355.7-03 (Feb. 1992).

(j) Guidance for Conducting Treatability Studies under CERCLA, OSWER 9380.3-10, EPA/540/R-92/071A (Nov. 1992).

(k) National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule, 40 C.F.R. Part 300 (Oct. 1994).

(l) Guidance for Scoping the Remedial Design, OSWER 9355.0-43, EPA/540/R-95/025 (Mar. 1995).

(m) Remedial Design/Remedial Action Handbook, OSWER 9355.0-04B, EPA/540/R-95/059 (June 1995).

(n) EPA Guidance for Data Quality Assessment, Practical Methods for Data Analysis, QA/G-9, EPA/600/R-96/084 (July 2000).

(o) Operation and Maintenance in the Superfund Program, OSWER 9200.1-37FS, EPA/540/F-01/004 (May 2001).

(p) Comprehensive Five-year Review Guidance, OSWER 9355.7-03B-P, 540-R-01-007 (June 2001).

(q) Guidance for Quality Assurance Project Plans, QA/G-5, EPA/240/R-02/009 (Dec. 2002).

(r) Institutional Controls: Third Party Beneficiary Rights in Proprietary Controls (Apr. 2004).

(s) Quality management systems for environmental information and technology programs -- Requirements with guidance for use, ASQ/ANSI E4:2014 (American Society for Quality, Feb. 2014).

(t) Uniform Federal Policy for Quality Assurance Project Plans, Parts 1-3, EPA/505/B-04/900A though 900C (Mar. 2005).

(u) Superfund Community Involvement Handbook, SEMS 100000070 (Jan. 2016) available at https://www.epa.gov/superfund/community-involvement-tools-and-resources.

(v) EPA Guidance on Systematic Planning Using the Data Quality Objectives Process, QA/G-4, EPA/240/B-06/001 (Feb. 2006).

(w) EPA Requirements for Quality Assurance Project Plans, QA/R-5, EPA/240/B-01/003 (Mar. 2001, reissued May 2006).

(x) EPA Requirements for Quality Management Plans, QA/R-2, EPA/240/B-01/002 (Mar. 2001, reissued May 2006).

(y) USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILM05.4 (Dec. 2006).

(z) USEPA Contract Laboratory Program Statement of Work for Organic Analysis, SOM01.2 (amended Apr. 2007).

(aa) Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites, EPA-833-R-06-004 (May 2007).

(bb) EPA National Geospatial Data Policy, CIO Policy Transmittal 05-002 (Aug. 2008), available at https://www.epa.gov/geospatial/geospatial-policies-and-standards and https://www.epa.gov/geospatial/epa-national-geospatial-data-policy.

(cc) Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, OSWER 9283.1-33 (June 2009).

(dd) Principles for Greener Cleanups (Aug. 2009), available at https://www.epa.gov/greenercleanups/epa-principles-greener-cleanups.

(ee) USEPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods (Multi-Media, Multi-Concentration), ISM01.2 (Jan. 2010).

(ff) Close Out Procedures for National Priorities List Sites, OSWER 9320.2-22 (May 2011).

(gg) Groundwater Road Map: Recommended Process for Restoring Contaminated Groundwater at Superfund Sites, OSWER 9283.1-34 (July 2011).

(hh) Recommended Evaluation of Institutional Controls: Supplement to the "Comprehensive Five-Year Review Guidance," OSWER 9355.7-18 (Sep. 2011).

(ii) Construction Specifications Institute's Master Format 2012, available from the Construction Specifications Institute, http://www.csinet.org/masterformat.

(jj) Updated Superfund Response and Settlement Approach for Sites Using the Superfund Alternative Approach, OSWER 9200.2-125 (Sep. 2012)

(kk) Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites, OSWER 9355.0-89, EPA/540/R-09/001 (Dec. 2012).

(ll) Institutional Controls: A Guide to Preparing Institutional Controls Implementation and Assurance Plans at Contaminated Sites, OSWER 9200.0-77, EPA/540/R-09/02 (Dec. 2012).

(mm) EPA's Emergency Responder Health and Safety Manual, OSWER 9285.3-12 (July 2005 and updates), https://www.epaosc.org/_HealthSafetyManual/manual-index.htm.

(nn) Broader Application of Remedial Design and Remedial Action Pilot Project Lessons Learned, OSWER 9200.2-129 (Feb. 2013).

(oo) Guidance for Evaluating Completion of Groundwater Restoration Remedial Actions, OSWER 9355.0-129 (Nov. 2013).

(pp) Groundwater Remedy Completion Strategy: Moving Forward with the End in Mind, OSWER 9200.2-144 (May 2014).

(qq) U.S. Fish & Wildlife Service Endangered Species Act Compensatory Mitigation Policy, Federal Register document number 2016-30929 (Effective Dec. 27, 2016).

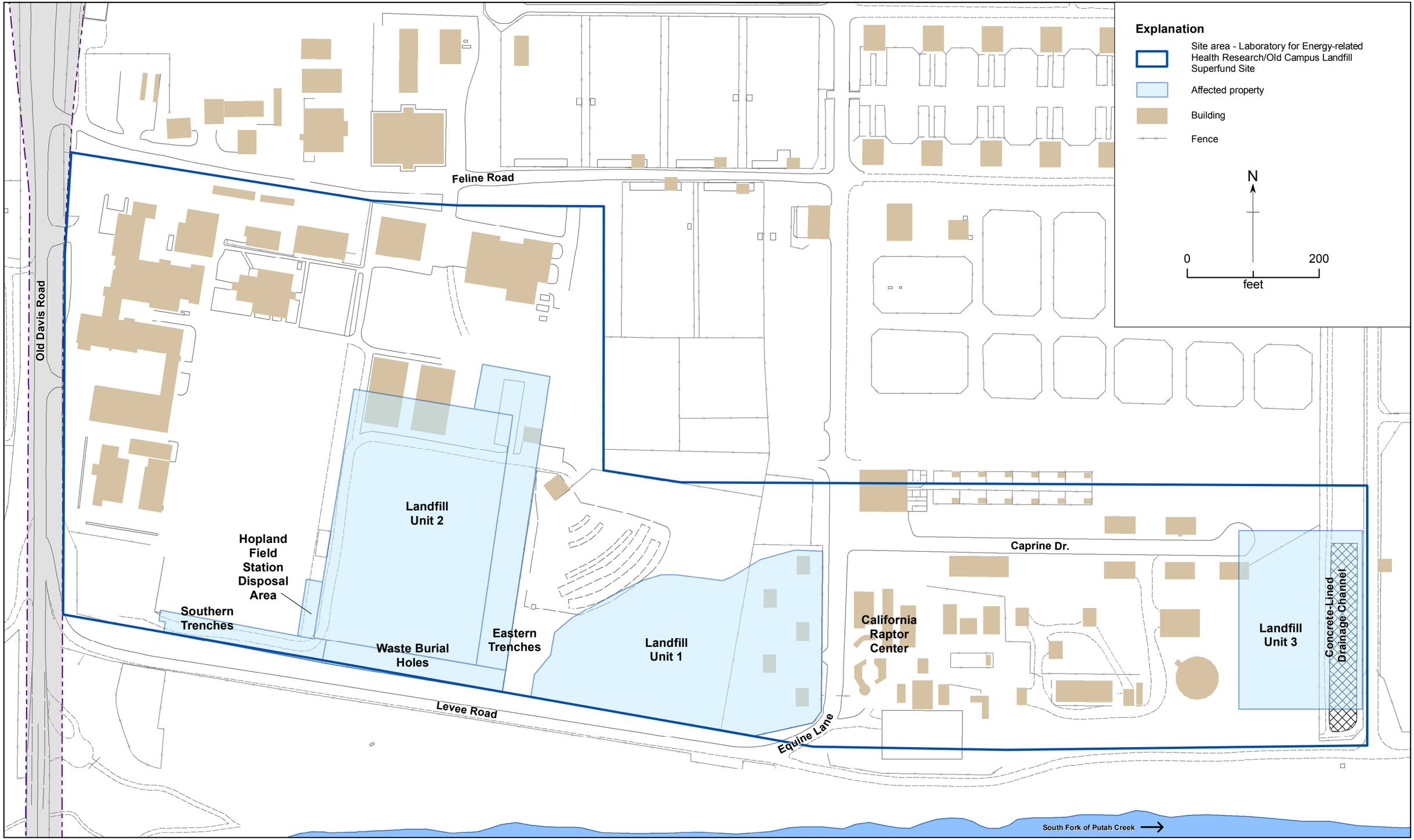
9.2 A more complete list may be found on the following EPA Web pages:

Laws, Policy, and Guidance: https://www.epa.gov/superfund/superfund-policy-guidance-and-laws

Test Methods Collections: https://www.epa.gov/measurements/collection-methods

9.3 For any regulation or guidance referenced in the CD or SOW, the reference will be read to include any subsequent modification, amendment, or replacement of such regulation or guidance. Such modifications, amendments, or replacements apply to the Work only after University receives notification from EPA of the modification, amendment, or replacement.

Appendix D to Consent Decree
Site Map



Consent Decree, Appendix D - Affected Property, Soil/Solid Waste Operable Unit, University of California, Davis, California

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5/25/2018