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Livermore Site Office, Livermore, California 94551

Lawrence Livermore National Laboratory

Lawrence Livermore National Security, LLC, Livermore, California 94551

LLNL-AR-403206

Action Memorandum for the Removal Action at the Building 850 Firing Table Lawrence Livermore National Laboratory Site 300

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September 2008

Environmental Restoration Department

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This Action Memorandum documents the approval of the Non-Time Critical Removal Action remedy for the contaminated surface soil and sand pile at the Building 850 Firing Table at Lawrence Livermore National Laboratory, Site 300.

Approved: _____ 9/11/08

Michael Brown Date
Assistant Manager for Environmental Stewardship
Livermore Site Office
National Nuclear Security Administration

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1. Purpose

The purpose of this Action Memorandum is to document the approval of the Non-Time-Critical Removal Action (hereafter referred to as "removal action") remedy for the contaminated surface soil and sandpile at the Building 850 Firing Table at the Lawrence Livermore National Laboratory's (LLNL) Site 300. Site 300 is located on Corral Hollow Road in the Altamont Hills near Tracy, California in San Joaquin County (Figure 1-1). The purpose of the removal action is to mitigate exposure risk to onsite workers and the potential hazard to ecological receptors associated with the polychlorinated biphenyl- (PCB), dioxin-, and furan-contaminated surface soil and sandpile.

This Action Memorandum has been prepared in accordance with the agreement between the United States (U.S.) Department of Energy (DOE), U.S. Environmental Protection Agency (U.S. EPA), California Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board (RWQCB) following U.S. EPA guidance (U.S. EPA, 1990). The U.S. DOE is the site owner and lead agency responsible for cleanup of soil contamination at the Building 850 Firing Table, which is part of an ongoing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) cleanup project at Site 300 (EPA identification number CA2890090002). Because DOE, rather than Superfund, is financing the removal action the $2 million and 12-month statutory limits on removal actions do not apply.

2. Site Conditions and Background

This section provides a description of the site location and characteristics (2.1), the removal action evaluation activities (2.2) and remedial actions conducted at the Building 850 Firing Table to date (2.3), and the state and local authorities' roles in the removal action (2.4).

2.1. Site Location, Description, and Characteristics

Site 300 is a restricted-access facility used in the research, development, and testing of high explosives (HE) materials. The site is owned by the U.S. DOE and operated by the Lawrence Livermore National Security, Limited Liability Corporation. Site 300 covers 11 square miles and is located in the Altamont Hills approximately 17 miles east of Livermore California and 8.5 miles southwest of downtown Tracy, California (Figure 1-1).

Land use at Site 300 is zoned as federal facility/industrial. Although DOE is currently evaluating the consolidation of activities throughout the DOE complex that could result in changes to activities conducted at Site 300, DOE control of the site is expected to continue for the foreseeable future. There are no plans to open the land for recreational or residential land use.

The land use on property adjacent to Site 300 includes privately owned ranch land, a motorcycle and off-road vehicle recreation park (Carnegie State Vehicular Recreation Area), an industrial fireworks storage facility (Fireworks America), a State-owned ecological reserve, and

privately owned land where future residential development is proposed (Tracy Hills Development) (Figure 2-1). Current plans for this development include a buffer zone/open space of approximately one and a half miles between residential housing and the Site 300 boundary. The City of Tracy, the nearest population center to the site, currently has approximately 85,000 residents with its closest existing residential development currently located about 6 miles from Site 300.

The Building 850 Firing Table is located in the northwest interior part of Site 300 and is approximately 0.8 miles from the closest site boundary (Figure 2-2). The 6,750 square feet (ft^2) firing table was used to conduct hydrodynamic experiments until early 2008. The firing table is covered with up to 5 feet (ft) of pea gravel used to absorb shot blasts and minimize impact to bunker occupants. The Building 850 bunker is located directly adjacent to the firing table and the rear of the building abuts the elevated firing table. The front of Building 850 is at normal ground surface. The bunker houses equipment used to monitor experiments conducted on the firing table. These facilities were constructed in 1960. From 1962 to 1972, sand was stockpiled near Building 850 and was periodically used during large experiments. The sandpile consists of approximately 460 cubic yards (yd^3) of sand. Figure 2-3 shows the location of buildings, the firing table, the sandpile, and monitor wells in the vicinity of Building 850.

Building 850 and the adjacent firing table are located in a topographic bowl with elevations ranging from about 1,310 ft above mean sea level (MSL) at the firing table to over 1,500 ft above MSL on the surrounding hillside. Much of the hillside surrounding the firing table is covered with a 0 to 5 ft thickness of soil. Native perennial and introduced annual grasses and associated forbs are present, including the Big Tar plant, a California Native Plant Society list 1B species. However, in places there are steep rock outcrops that are generally devoid of both soil and vegetation.

An extensive California ground squirrel colony is present in the Building 850 area. Burrowing owls have also historically used this area for nesting. The Building 850 area is located within 0.6 miles of a known California tiger salamander breeding pool. The proximity to the breeding pool and the presence of the ground squirrel colony makes this area suitable upland habitat for the California tiger salamander.

Tritium, HE, depleted uranium, metals, and capacitors containing PCBs were utilized during experiments at the firing table. Prior to PCBs becoming regulated substances, an estimated 1,000 capacitors were destroyed on the Building 850 Firing Table. The capacitors were used to provide a sudden burst of electrical energy during 10 to 20 experiments (50 to 100 capacitors per experiment) conducted from 1964 to 1967. Experiments utilizing PCB-containing capacitors have not been conducted since that time. Dioxins and furans were created by the combustion of the PCBs during these experiments. The sand stockpiled near Building 850 became contaminated with tritium and PCBs during its use on the firing table. In 1990, the material was covered with plastic sheeting to minimize the infiltration of rainwater. No experiments were conducted with fissile materials such as enriched uranium or plutonium.

2.2. Removal Site Evaluation

Environmental investigation and characterization activities began at the Building 850 Firing Table in the mid-1980s. These activities included:

- Record searches and interviews with current and past employees to identify potential sources of contamination in the area.
- The drilling and installation of ground water monitor wells and the collection and analysis of surface soil, subsurface soil and rock, ground water, and surface water (spring) samples to determine what contaminants had been released and their extent in environmental media.
- The evaluation of geologic and hydrogeologic conditions that could affect the fate and transport of any contaminants released.
- Developing a site conceptual model to identify potential routes of exposure to contamination.
- Conducting a baseline risk assessment to evaluate the risk to human and ecological receptors that could be exposed to the contamination.

Early contaminant characterization work in this area was summarized in Buddemeier et al., 1985; Buddemeier et al., 1987; and Taffet et al., 1990. The results of these and later characterization activities are summarized in the Site-Wide Remediation Investigation (SWRI) report (Webster-Scholten et al., 1994), the Addendum to the SWRI (Taffet et al., 1996), and the Site-Wide Feasibility Study (Ferry et al., 1999).

The contaminants of concern (COCs) and environmental media of concern addressed by this removal action are PCBs, dioxins, and furans in soil and the sandpile at Building 850. The results of the characterization of PCBs, dioxins, and furans in soil and the sandpile are discussed in more detail in Section 2.3.

An interim remedy was selected for COCs in environmental media at the Building 850 Firing Table in the Interim Site-Wide Record of Decision (ROD) (DOE, 2001). Excavation and offsite disposal of contaminated soil and sandpile was selected as part of the remedy to mitigate the risk to onsite workers and ecological receptors posed by the PCBs, dioxins, and furans in soil and the threat to ground water posed by the tritium-contaminated sandpile. EPA Region 9's Preliminary Remediation Goals (PRGs) were selected as the cleanup standards for PCBs and dioxin and furan compounds in Building 850 soil in the Interim Site-Wide ROD.

In 2001, the estimated cost to excavate and dispose of the contaminated soil and sandpile was approximately $1.4 million (M). By the time the Interim Remedial Design Report for the Building 850 Firing Table (Taffet et al., 2004) was prepared, the estimated volume of contaminated soil increased as well as the cost of excavation, transportation, and disposal, increasing the total cost estimate to $4.8 M. The volume of contaminated soil to be excavated increased in part due to a decrease in the EPA PRG for PCBs from 1 milligram per kilogram (mg/kg) at the time of the 2001 Site-Wide Interim ROD to 0.74 mg/kg. As a result, the extent of PCBs in soil above the new 0.74 mg/kg PRG was greater than for the 1 mg/kg PRG that was in effect in 2001.

DOE scheduled the activity to be completed in fiscal year (FY) 2006. As the planning for the FY 2006 activity proceeded, the cost estimates for the excavation, transportation, and disposal of contaminated soil increased to over $8M. As a result, the interim remedy identified for the contaminated soil in 2001 was no longer economically practicable. In addition, during the intervening years, other technologies were identified that were capable of addressing the PCBs, dioxins, and furans in an equally protective and more cost-effective manner.

In 2006, DOE, the U.S. EPA, DTSC, and RWQCB agreed to conduct remediation of the PCB-, dioxin-, and furan-contaminated soil at the Building 850 Firing Table as a Non-Time Critical Removal Action and an Engineering Evaluation/Cost Analysis (EE/CA) (Dibley et al., 2008) was initiated. The EE/CA evaluated several potential removal action alternatives that could be implemented to address contaminated soil at Building 850. The U.S EPA and State regulatory agencies reviewed and commented on the removal action alternatives presented in the EE/CA prepared by DOE, and participated in the selection of the soil removal action presented in this Action Memorandum.

2.2.1. Release or Threatened Release into the Environment of a Hazardous Substance, or Pollutant or Contaminant

As a result of environmental investigations, contaminants of concern (COCs) in environmental media at Building 850 were identified in the Site-Wide Feasibility Study including:

- Ground water: Tritium, depleted uranium, and nitrate.
- Surface soil: PCBs, dioxins, and furans; metals; HMX, and depleted uranium.
- Subsurface soil and rock: Tritium and uranium.
- Surface water: Tritium (Well 8 Spring).

The remedies selected in the Interim Site-Wide ROD and Site-Wide ROD (DOE, 2008) address COCs in subsurface soil/rock, ground water, and surface water. Ground water and surface water have not been impacted by PCBs, dioxins, or furans, and therefore these environmental media are not included in this removal action. Because this removal action only addresses PCB-, dioxin-, and furan-contamination in soil and the sandpile at the Building 850 Firing Table, only this soil contamination is discussed below.

Soil samples were collected and analyzed for PCBs in 1994, 1995, 2003, and 2006 as part of the Building 850 Firing Table CERCLA characterization. As a result of the dispersal of contaminated shrapnel during explosives testing, soil at the Building 850 Firing Table area was contaminated with PCBs, and dioxin and furan compounds to a depth of approximately 3 ft below ground surface (bgs). A maximum PCB concentration of 180 mg/kg was detected in surface soil. The lateral extent of PCBs in surface soil exceeding the 0.74 mg/kg cleanup standard is confined to a 100 to 500 ft radius around the firing table and includes an estimated area of approximately 318,000 ft^2 (Figure 2-4). PCBs were identified at a maximum depth of 2.7 ft bgs (Figure 2-5).

From 1962 to 1972, sand was stockpiled near Building 850 and was periodically used during large experiments. This sand was reused and as a result, gradually became contaminated with tritium and PCBs. The sandpile consists of approximately 460 cubic yards (yd^3) of sand. A

maximum PCB concentration of 50.4 mg/kg was detected in the sandpile. Residual soil tritium activities in the sandpile were compared with Soil Screening Levels (SSLs) for the soil to ground water pathway using EPA soil screening guidance. The 2006 maximum detected tritium activity of 19.2 picoCuries per gram (pCi/g) is an order of magnitude lower than the SSL for a dilution attenuation factor of 20 (165 pCi/g). Based on this analysis, the tritium in the sandpile is not a threat to ground water. Decreasing tritium activities in ground water underlying Building 850 also indicate that there is no longer a significant source of tritium at Building 850.

Surface soil samples were collected and analyzed for dioxin and furan compounds. A total toxicity equivalent concentration (TEC) of the dioxin/furan compounds was calculated for each sample. This approach related the toxicity of the other 209 chloro-di-benzo-p-dioxins (CDD) and chloro-di-benzofurans (CDF) compounds to that of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). Because 2,3,7,8-TCDD is one of the most potent toxic dioxins, it is used as a reference for all other dioxins and furans. The CDD 1,2,3,7,8-pentachlorodibenzo-p-dioxin is of a similar potency, while the other members of the subset are 10 to 10,000 times less toxic. Six samples contained total TCDD equivalent concentrations above the cleanup standard (1.6×10^{-5} mg/kg). The maximum calculated total TCDD equivalent concentration was 6.19×10^{-3} mg/kg. The highest concentrations were found near the firing table. Subsurface soil was not analyzed for dioxin and furan compounds since they are a co-contaminant and it was assumed that the vertical extent was similar to that of PCBs. Verification sampling will conducted to ensure dioxins and furans do not extent deeper than the planned excavation. Figure 2-6 shows the distribution of these compounds and TCDD equivalents in surface soil at the Building 850 Firing Table.

Various metals (beryllium, cadmium, and copper), High Melting Explosive (HMX), and depleted uranium (primarily uranium-238) were also detected in shallow soil at the Building 850 Firing Table. However, the Site-Wide Feasibility Study risk assessment and modeling determined that these constituents did not pose a risk to human or ecological receptors, or a threat to ground water. In addition, concentrations of these constituents are all below U.S. EPA Region 9 industrial soil PRGs. Therefore, the remediation of metals, HMX, and depleted uranium in soil is not an objective of this proposed removal action. However, the implemented design of the removal action will also isolate these constituents from potential human and ecological receptors.

2.2.2. National Priorities List Status

Site 300 was placed on the National Priorities List (NPL) in August 1990 and received a Hazard Ranking System rating of 31.6. A Federal Facility Agreement (FFA) was signed by DOE, EPA, DTSC, and RWQCB in June 1992. Remedial actions are ongoing. Remedial action construction completion has been reached for OUs 1 through 4 and 6 through 8. Upon completion of this removal action, construction completion will be achieved in operable unit (OU) 5. Remedial action construction has not been implemented in OU 9.

Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, or Superfund) section 104(i)(6), the Agency for Toxic Substances and Disease Registry is required to conduct a health assessment for every site included on the National Priorities List. The Agency for Toxic Substances and Disease Registry performed this assessment at Site 300 in 2005. The assessment concluded that there are no past or current

exposures to contaminants associated with LLNL Site 300, and the potential for future exposure is unlikely.

2.3. Other Actions to Date

This section discusses current and previous remedial actions and community relations related to the Building 850 Firing Table.

2.3.1. Previous Actions to Date

The following remediation work has been completed in the Building 850 Firing Table:

- From 1988 to 1994, six former water-supply wells were sealed and abandoned in the Building 850 Firing Table area (Wells 1, 3, 8, 15, 16, and 17). The wells were sealed to prevent contaminants from migrating into other aquifers.
- In 1990, soil contaminated with fuel hydrocarbons from a leaking underground storage tank at Building 850 (850-D1-U1) was excavated and treated using enhanced soil bioremediation and reused onsite. The tank site was closed in accordance with environmental regulations (Copland and Lamarre, 1990).
- In 1990, workers removed and disposed visible fragments of metallic debris from the slopes above the firing table area that might contain PCBs and depleted uranium.

In 2001, the monitoring, risk and hazard management, and the monitored natural attenuation of tritium in ground water components of the remedy selected for the Building 850 area in the Interim Site-Wide Record of Decision were implemented. There was no risk to human or ecological receptors associated with the metals, HMX, or depleted uranium in surface soil or tritium or uranium in subsurface soil. Active measures were not selected for uranium in ground water because uranium activities in ground water were below drinking water Maximum Contaminant Levels (MCLs) and decreasing. Active measures were not selected for nitrate in ground water and included in the remedy because data do not indicate a significant source of nitrate at Building 850, and the extent of nitrate exceeding MCLs is limited.

In 2006, the interim remedy components for the other COCs in surface soil, subsurface soil, ground water, and surface water at Building 850 were evaluated for their effectiveness and protectiveness in the Site-Wide Remediation Evaluation Summary Report (Ferry et al., 2006). Because the interim remedy components for the other COCs were found to be effective and protective of human health and the environment, they were selected as the final remedies in the Draft Site-Wide Record of Decision (DOE, 2007). Therefore, other COCs in surface soil and in subsurface soil, ground water, and surface water at Building 850 are not included or discussed further in this Action Memorandum.

The 2006 site-wide remediation evaluation also identified the presence of perchlorate in Building 850 ground water at concentrations exceeding the 6 μg/L State MCL. Plans to implement an *in situ* bioremediation treatability study for perchlorate are underway.

Several Public Workshops and Public Meetings have been held to discuss proposed cleanup actions for Site 300. An Administrative Record File has been established and is available for public review pursuant to the requirements set forth in the National Contingency Plan (NCP).

Information repositories for Site 300 are established at the following locations:

Tracy Public Library
20 East Eaton Avenue
Tracy, CA 95377
(209) 835-22214

LLNL Discovery Center
Greenville Road at Eastgate Drive
Livermore, CA 94551
(925) 422-9797

2.3.2. Current Actions

Ground water and surface water monitoring are ongoing to evaluate the effectiveness of the remedy selected for ground water, surface water, and subsurface soil in the Building 850 area in the Interim Site-Wide and Site-Wide RODs. Monitored natural attenuation continues to be effective in reducing tritium activities in ground water. Uranium activities in ground water remain below the MCL and the extent of depleted uranium has not changed. In addition, institutional/land use controls are being maintained to prevent human exposure to contamination and to protect the integrity of the remedy. DOE is in the process of implementing an *in situ* bioremediation treatability study for perchlorate in ground water and will discuss possible remedial measures with the regulatory agencies. Public input will be solicited prior to the selection of any remedial action for perchlorate in ground water.

A fact sheet was mailed to interested community members February 19, 2008 and a notice was published in two local newspapers describing the selected removal action and announcing a public comment period and workshop. The public comment period started February 20, 2008 and ended March 20, 2008. The Building 850 Firing Table EE/CA public workshop was held March 6, 2008. Public comments concerning the proposed removal action have been considered and used, as appropriate, in the preparation of this Action Memorandum. Public comments are addressed in the Responsiveness Summary contained in Appendix A.

2.4. State and Local Authorities' Roles

Prior to August 1990, investigations of potential contamination at Building 850 were conducted under the oversight of the RWQCB. Since then, all investigations have been conducted in accordance with CERCLA under the oversight of the three supervising regulatory agencies: U.S. EPA, the RWQCB, and DTSC. DOE is the lead agency for all environmental restoration activities at Site 300.

2.4.1. State and Local Actions to Date

As signatories to the FFA representing the State of California, the RWQCB and DTSC monitor and approve the progress of all site investigations and cleanup activities along with the U.S. EPA.

2.4.2. Potential for Continued State/Local Response

No State or local response actions are anticipated other than continued oversight of site cleanup activities under CERCLA. DOE will provide the necessary funding and support for the removal action, future monitoring and maintenance, and any required future contingency actions.

3. Threats to Public Health or Welfare or the Environment, and Statutory and Regulatory Authorities

This section explains how this incident meets the requirement of a threat to public health or welfare or a threat to the environment for initiating a removal.

In accordance with the NCP, the following criteria must be considered in determining the appropriateness of a non-time-critical removal action (40 Code of Federal Regulations [CFR], Section 300.415[b][2]) in addressing threats to public health or welfare or the environment:

(i)* Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants,

(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems,

(iii) Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release,

(iv)* High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate,

(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released,

(vi) Threat of fire or explosion,

(vii) The availability of other appropriate Federal or State response mechanisms to respond to the release, and

(viii) Other situations or factors that may pose threats to public health or welfare or the environment.

Criteria indicated with an asterisk (*) are relevant in determining the appropriateness of the proposed removal action at the Building 850 Firing Table to protect public health and welfare and the environment and are the threats that will be addressed by the removal action as discussed in Sections 3.1 and 3.2.

EPA, with the support of the State, agrees that implementing a non-time-critical removal action is appropriate for the Building 850 Firing Table soil.

3.1. Threats to Public Health or Welfare

The baseline risk assessment (Ferry et al., 1999) estimated an excess cancer risk of 5×10^{-4} to onsite workers resulting from the potential inhalation or ingestion of re-suspended particulates and direct dermal exposure to surface soil contaminated with PCBs at the Building 850 Firing Table. In addition, a risk of 1×10^{-4} was calculated for potential inhalation/ingestion of re-

suspended particulates and direct dermal exposure to surface soil contaminated with dioxins and furans. Therefore criteria (i) and (iv) in Section 3 apply to the removal action.

PCBs, dioxins, and furans have not been detected in ground water and modeling indicates that PCBs in soil will not impact ground water in the future. Therefore, there is no risk of exposure to PCBs, dioxins, and furans in ground water.

3.2. Threats to the Environment

An ecological risk assessment of PCBs, dioxins, and furans at Building 850 was conducted in 2004 (Dibley et al., 2005). The results of this evaluation showed burrowing owls were at risk from exposure to PCBs in surface soil at Building 850. Therefore criteria (i) and (iv) in Section 3 apply to the removal action.

4. Endangerment Determination

Actual or threatened releases of pollutants and contaminants from the Building 850 Firing Table, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

5. Proposed Actions and Estimated Costs

Section 5 describes the removal action alternatives considered and the proposed actions, including the rational for selection of the removal action alternative, estimated costs, and project schedule.

5.1. Proposed Actions

This section describes the removal action objectives and soil cleanup standards (5.1.1), the proposed removal action (5.1.2), the contributions to remedial performance (5.1.3), a description of the alternative technologies considered (5.1.4) the EE/CA (5.1.5), the applicable or relevant and appropriate requirements for the removal action (5.1.6), and the project schedule (5.1.7).

5.1.1. Removal Action Objectives and Soil Cleanup Standards

The Removal Action Objectives (RAOs) for this removal action are to:

1. Mitigate risk to onsite workers by remediating the Building 850 Firing Table soil and sandpile that contains PCB concentrations in excess of EPA Region 9 industrial soil PRG of 0.74 mg/kg and dioxin and furan compounds in excess of the industrial soil PRG of 1.6×10^{-5} mg/kg for 2,3,7,8-TCDD.
2. Mitigate potential hazard to burrowing owls associated with the PCB-, dioxin-, and furan-contaminated surface soil. The EPA Region 9 industrial soil PRG soil cleanup levels for PCBs, dioxins, and furans are sufficiently low to protect ecological receptors.

The soil cleanup standards that were selected in the Interim Site-Wide ROD are the EPA Region 9 industrial soil PRGs described in the RAOs above. The proposed action described in Section 5.1.2. is designed to achieve these RAOs and meet cleanup standards.

5.1.2. Proposed Action Description

The primary components of proposed removal action include:

1. Engineering, institutional, and land use controls to prevent exposure of humans and ecological receptors to PCBs, dioxins, and furans in soil.
2. Excavation and onsite solidification and consolidation of contaminated soil and sandpile.
3. Placement of a protective layer or layers to act as a biological barrier.

These components are described in Subsection 5.1.2.1 through 5.1.2.5. The rationale for selection of the removal action is presented in Subsection 5.1.2.6. A summary of public concerns related to the removal action is presented in Subsection 5.1.2.7.

5.1.2.1. Engineering, Institutional, and Land Use Controls

As part of proposed removal action, engineering, institutional, and land use controls will be implemented as necessary to:

1. Ensure RAOs are achieved.
2. Manage risk and/or hazard by preventing exposure of humans and ecological receptors to PCBs, dioxins, and furans.

The following engineering, institutional, and land use controls will be maintained to prevent exposure to the contaminated soil at the Building 850 Firing Table:

- Prevent inadvertent exposure to contaminated soil at the Building 850 Firing Table by non-authorized personnel by controlling access to Site 300.
- Maintain exposure control activities in the vicinity of the Building 850 Firing Table until remediation of the PCB-, dioxin-, and furan-contaminated soil and sandpile reduces the risk to onsite workers to less than 10^{-6}.
- Control activities to prevent onsite worker exposure to contaminants in soil during removal action excavation and soil solidification activities. Controls may consist of a combination of engineered controls (e.g., wetting soil during excavation and covering excavated soil prior to solidification), personal protective equipment, and institutional controls (e.g., preventing access to personnel not involved in removal action).
- Control excavation activities to prevent onsite worker exposure to contaminants in subsurface soil until it can be verified that subsurface soil does not pose an exposure risk to onsite workers.
- Maintain the integrity of the solidified soil as long as it remains in place.
- Inspect for the presence of animals in stockpiled soil prior to solidification.

- Prohibit the transfer of lands with unmitigated contamination that could cause potential harm under residential or unrestricted land use until and unless a risk assessment is performed that shows no unacceptable risk for residential or unrestricted land use.

The controls are described in further detail in Table 1.

5.1.2.2. Excavation of Contaminated Soil and Sandpile

Impacted soils containing PCBs at concentrations above 0.74 mg/kg will be excavated from areas around Building 850 Firing Table to depths of up to 3 ft bgs. The total volume of soil is estimated to be 15,422 yd^3, but is expected to increase to 18,432 yd^3 due to "fluffing". Because the volume of characterized soil that contains TCDD equivalent concentrations in excess of the PRGs is constrained within the volume of soil that contains PCBs above PRG concentrations, the planned removal and solidification will also remediate soils containing the TCDD equivalent concentrations above the PRG. The sandpile adjacent to Building 850 will be excavated to the ground surface (approximately 8 ft).

Once excavation is complete, verification sampling and analysis of exposed soil for PCBs, dioxins, and furans will be performed using the methodology approved in the Interim Remedial Design for the Building 850 area as outlined in the verification sampling plan presented in the Appendix D of the EE/CA. PCB concentrations in the soil verification samples will be compared to EPA's industrial PRG of 0.74 mg/kg. The dioxin/furan samples will be composited and the composite TEC will be compared to the PRG for 2,3,7,8-TCDD of 1.6×10^{-5} mg/kg. If analytical results indicate that PCBs, dioxins, or furan occur in the soil at concentrations in excess of these cleanup standards, additional soil will be excavated until these standards are met. Once analytical data confirm that the concentrations in the surface soils meet cleanup standards, the excavated area will be restored to prevent erosion. The restoration procedures will be described in the detailed design and may include backfilling the excavated area with purchased or local borrowed soil, terracing and installation of drains, and/or reseeding with native grasses.

The excavation work will be conducted in accordance with substantive provisions of the National Pollutant Discharge Elimination System requirements for storm water discharges from construction activities to minimize erosion and to prevent enhanced sediment load from entering ephemeral stream drainages. These measures could include the use of fiber rolls, silt fences, and other best management practices to prevent sediment transport, and drainage structures and sedimentation structures to convey, attenuate, and reduce the sediment load of runoff water.

5.1.2.3. Solidification of Contaminated Soil and Sandpile

The excavated soil and sandpile material will be solidified onsite using a pug mill system. The solidification technology will encapsulate the PCB-, dioxin-, and furan-contaminated particles in a concrete-like matrix that will render them unavailable for onsite worker exposure through the dermal contact or inhalation of resuspended particulate pathways, and ecological receptor exposure through inhalation or ingestion pathways, thereby meeting the RAOs for this removal action.

To determine the most appropriate solidification agent and the amount of solidification agent required, a treatability study was conducted and described in the EE/CA. Both the 5 percent Portland cement mix or 2.5 percent Portland cement mix and 2.5 percent cement kiln dust (CKD)

mixture resulted in a unconfined compressive strength greater than 100 pounds per square inch (psi) and will be suitable for the strength requirements of the consolidation area. Since CKD is less expensive than Portland cement, it is recommended that the 2.5 percent Portland cement and 2.5 percent CKD mix be used for solidification.

5.1.2.4. Consolidation of Solidified Contaminated Soil and Sandpile

After solidification, the soils will be consolidated onsite. The primary proposed onsite consolidation area under consideration for placement of the solidified soil is the Building 850 Firing Table Upper Corporation Yard, within the area of PCB contamination (Figure 5-1). This area is currently used for equipment storage and parking lot.

Volume calculations have been made to determine the area and height necessary to ensure adequate capacity for the solidified soil at the Upper Corporation Yard. The area of the solidified material at this location will be approximately 59,980 ft^2. The disposal area will be a maximum of about 20 ft high. The total volume of soil after solidification is estimated to be about 22,000 yd^3. If the soil does not expand as much as conservatively estimated, the solidified soil will be consolidated within smaller total dimensions.

If, due to soil expansion or requirements to excavate additional soil, the volume of solidified soil is too large to be contained in the footprint of the Building 850 Upper Corporation Yard, it may be necessary to place the remaining solidified soil in the Lower Corporation Yard, which is adjacent to the limit of excavation of PCB-bearing soil (Figure 5-1).

The most highly contaminated soils will be solidified and consolidated first to minimize the ecological risk of exposure. Monitoring of tritium, nitrate, perchlorate, and uranium activities/concentrations in ground water downgradient of the consolidation area will continue to be conducted in the Building 850 Firing Table area per the requirements of the Compliance Monitoring Plan (Ferry et al., 2002).

The consolidated soil unit would be designated as a Corrective Action Management Unit (CAMU) and managed in accordance with Federal CAMU regulations (40 Code of Federal Regulation [CFR] 264.552). The CAMU site location is shown in Figure 5-1.

CAMU requirements as they apply to the PCB soil cleanup at Building 850 are as follows:

CAMU designation - 40 Code of Federal Regulation [CFR] 264.552 (b) allows for the designation of a CAMU to enhance implementation of site cleanup.

The Building 850 removal action meet the CAMU designation requirements of 40 CFR 264.552(c) in that:

1. The CAMU will facilitate implementation of an effective and protective remedy.
2. It will not create unacceptable risks to humans or the environment from exposure to hazardous constituents, rather will mitigate these risks.
3. The CAMU will not include uncontaminated areas of Site 300.
4. The CAMU will be managed and contained to minimize future releases.
5. The CAMU designation will expedite implementation of this removal action.
6. The soil will be treated to reduce the mobility of contaminants prior to placement.

7. The design will minimize the land area of the facility upon which waste will remain in place after closure of the CAMU.

DOE/LLNL has provided information to EPA for designation of a CAMU consistent with 40 CFR 264.552(d) including:

(1) A description of the waste origin and the timing and circumstances of release.

(2) Information demonstrating that the waste (soil) was not listed or identified as RCRA hazardous at the time of release.

(3) Information demonstrating that the waste (soil) release occurred before the land disposal requirements of 40 CFR Part 268 were in effect.

Waste requirements - The contaminated soil at Building 850 meets the Federal definition of CAMU-eligible waste (solid and RCRA hazardous wastes, and all media [including soils and sediment] that are managed for implementing cleanup [40 CFR 264.552(a)(1)].

Land Disposal Restrictions - The Federal regulations [40 CFR 264.552(a)(4)] state that placement of CAMU-eligible wastes into or within a CAMU does not constitute land disposal of hazardous waste, therefore the RCRA Land Disposal Restrictions do not apply.

Design Requirements - The Federal regulations [40 CFR 264.552 (e)(3)(ii)(B)] contain provisions for an alternate CAMU design, subject to approval by EPA, and require that the alternate design prevent the migration of any hazardous constituents into ground water at least as effectively as a liner and leachate collection system.

Because PCB leaching is very low in the untreated soil sample, PCBs have low solubility, and there is no current or potential future impacts to ground water from PCBs in Building 850 soil, even without remediation, the soil solidification technology would exceed Federal CAMU requirements under 40 CFR 264.552 to prevent ground water impacts. The leachability tests conducted on the proposed solidification media mixed with the PCB-contaminated soil confirmed that the solidification process does not adversely affect the solubility or leachability of the PCBs.

The preliminary design for closure and post-closure maintenance activities for the soil consolidation CAMU, and CAMU characteristics per 40 CFR 264.552(e)(6) provided in this section and Section 6.3.2.3. More specific design and maintenance details would be provided to the regulatory agencies prior to implementation of the removal action. Any post-closure CAMU monitoring requirements as agreed to by DOE and the regulatory agencies would be incorporated into the revised Site-Wide Compliance Monitoring Plan.

Treatment Requirements - Title 40 CFR 264.552 (e)(4)(iv) states that CAMU-eligible wastes that EPA determines contain principal hazardous constituents shall be treated to achieve a 90% reduction in concentrations or to 10 times the Universal Treatment Standard (UTS) for the principal hazardous constituent.

The NCP establishes an expectation that the lead agency will use treatment to address the principal threats posed by a site wherever practicable. Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the

environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The manner in which principal threat wastes are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied. The Interim Record of Decision designated the PCB, dioxin, and furan contaminated surface soil at Building 850 as a principal threat waste. However, while PCBs are toxic, Title 40 CFR 264.552 (e)(4)(i)(A)(1) states that, in general, EPA will designate, as a principal hazardous constituent, carcinogens that pose a potential direct risk from ingestion or inhalation at the site at or above 10^{-3}. The baseline risk assessment identified a cancer risk of 5×10^{-4} and 1×10^{-4} to onsite workers for potential inhalation, ingestion, or direct dermal contact with PCBs, and dioxins and furans in contaminated surface soil, respectively. In addition, it has been demonstrated at numerous sites throughout the U.S. that PCB-contaminated soil can be contained in a reliable manner, such as through soil solidification. However, leachability testing conducted on the untreated control soil from Building 850 indicates that PCB (Aroclor 1254) concentrations in the leachate (0.021 mg/L) are less than ten times the 0.10 mg/L Universal Treatment Standard (UTS) for PCBs. Conservatively, the untreated PCB-bearing soil therefore meets the treatment requirement for CAMU-eligible wastes that the concentrations must be less than 10 times the UTS. Test results for untreated soil also indicate that the TCLP concentrations for beryllium (0.00058 mg/L) and cadmium (0.0017 mg/L) were well below the UTSs of 1.22 mg/L and 0.11 mg/L, respectively. The TCLP concentration for copper in the untreated sample was 0.19 mg/L. There is no UTS (TCLP) concentration for copper. TCLP concentration in treated soils ranged from 0.015 mg/L to 0.024 mg/L for PCBs, less than 0.004 mg/L for beryllium, and from less 0.005 mg/L to 0.0029 mg/L for cadmium. These concentrations are also all well below 10 times the UTS standards. In addition, Title 40 CFR 264.552 (e)(4)(iii)(B) states that U.S. EPA may adjust the treatment level or method to a higher or lower level if an adjusted level is protective of human health and the environment, cost effective treatment has been used, and the hazardous constituents in the waste are of very low mobility. PCBs have very low water solubility and tend to readily adsorb to soil.

5.1.2.5. Placement of a Protective Layer

A protective layer that will act as a biological barrier to burrowing animals will be installed on top of the solidified and consolidated soil. This layer may include cobbles, geogrid, or other suitable material to be determined during the detailed design phase. The final design of the consolidation area will be dependent on the intended use of the area by the LLNL Programs managing the Building 850 Firing Table.

Regular inspections of the consolidation area will be made to assess the integrity of the solidification treatment and maintenance/repairs will be conducted as necessary. An annual inspection and maintenance program will be implemented following completion of the removal action. The primary objective of the inspection and maintenance program will be to ensure that the solidified soil remains competent and that any repairs are made to the protective layer in a timely manner to prevent impacts to ecological receptors. However, in the unlikely event that a breach of the cover system occurs and there is exposure to the underlying solidified soils, the low bioavailability of the material will not result in a significant impact to ecological receptors.

Based on the treatability study, the unconfined compressive strength values obtained were greater than 100 psi for the recommended solidification agents and thus indicate that the treated material is extremely strong. It is expected that the hardness of the material will deter any animal from ingesting the soil even if the protective layer could be breached. The contaminants will be bound in the cement-sediment matrix and therefore will not readily metabolize. In the unlikely event that a lump of solidified material were to break free and be ingested by an animal, the work of Ghosh et al. (2004) shows that the PCB will likely not be bioavailable and will pass through the gut of an animal without being incorporated into biomass. This work indicates that PCBs that are bound by adsorption to soil organic material pass directly through the guts of benthic invertebrates. It is expected that binding the PCB to the soil matrix with cement will have a similar effect to adsorption of the PCB by organic matter and that the solidified PCB material will not be bioavailable.

5.1.2.6. Rationale for Selection of the Removal Action

The proposed removal action will provide long-term effective protection of human health and the environment by excavating soil with PCB, dioxin, and furan concentrations exceeding EPA's industrial soil PRG cleanup standards and encapsulating the soil in a concrete-like matrix that will render the contaminants unavailable for onsite worker and ecological receptor exposure, thereby meeting the Removal Action Objectives. Engineering, institutional, and land use controls described in Table 1 will prevent exposure during and after implementation of the removal action. The proposed removal action complies with the applicable or relevant and appropriate requirements (ARARs) presented in Table 2. An inspection and maintenance program will be implemented to ensure the integrity of the removal action.

5.1.2.7. Public Concerns Related to the Removal Action

Comments and concerns submitted by the public during the 30-day comment period about the Building 850 removal action and other Site 300 activities are presented and addressed in the Public Responsiveness Summary in Appendix A.

5.1.3. Contribution to Remedial Performance

The removal action is consistent with the overall Remedial Action Objectives of the Site 300 Environmental Restoration Project as described in the Site-Wide ROD and the Removal Action Objectives for cleanup of PCB-, dioxin-, and furan-contaminated soil at Building 850 as described in Section 5.1.1. This removal action will be considered the final, long-term remedy for the PCB-, dioxin-, and furan-contaminated soil at Building 850 Firing Table.

5.1.4. Description of Alternative Technologies

The EE/CA compared three removal action alternatives to meet RAOs and address PCBs, dioxins, and furans in soil at Building 850:

1. No further action.
2. Excavation and offsite soil disposal.
3. Excavation and onsite solidification and consolidation (the proposed action).

A No Further Action alternative is generally required by EPA guidance to provide a basis for comparison with other remedial actions and is the postulated basis of the baseline risk assessment. All ongoing activities will cease and no measures will be taken to remove, contain, or prevent exposure to the PCB-, dioxin-, and furan-contaminated soil. The No Further Action alternative will not meet RAOs.

None of the alternatives will achieve unrestricted land use because the selected cleanup standard is the industrial PRG. Both Alternatives 2 and 3 are equally protective of human health and the environment as the inhalation, ingestion, and dermal risk to onsite workers and ecological receptors is mitigated, and meet RAOs and applicable or relevant and appropriate requirements (ARARs). However, Alternative 2 is four times as expensive as Alternative 3 due to the high cost of offsite disposal of the soil. Therefore, based on the evaluation of the alternatives, DOE proposes Alternative 3 as the preferred removal action alternative for remediation of PCB-, dioxin-, and furan-contaminated soil at Building 850.

5.1.5. Engineering Evaluation/Cost Analysis

The regulatory agencies approved the EE/CA on February 15, 2008. A fact sheet was mailed to interested community members February 19, 2008 and a notice was published in two local newspapers describing the selected removal action and announcing a public comment period and workshop. The public comment period started February 20, 2008 and ended March 20, 2008. The Building 850 Firing Table EE/CA public workshop was held on March 6, 2008 in Tracy, California. Public comments concerning the proposed removal action have been considered and used, as appropriate, in the preparation of this Action Memorandum. Public comments on the EE/CA alternatives and proposed removal action are addressed in the Responsiveness Summary presented in Appendix A.

5.1.6. Applicable or Relevant and Appropriate Requirements

Table 2 presents the Federal and State ARARs for the PCB-, dioxin-, and furan-contaminated soil at the Building 850 Firing Table.

5.1.7. Project Schedule

The removal action design will be initiated following approval of this Action Memorandum. The construction of the removal action is currently scheduled to be initiated by September 30, 2008.

5.2. Estimated Costs

There is no cost associated with the no further action alternative.

The present-worth cost of Alternative 2 is $8,449,922 for excavation, handling, transportation, and offsite disposal of the contaminated soil and sandpile adjacent to the Building 850 Firing Table.

The present-worth cost of Alternative 3 is $2,042,282 based on the excavation of PCB-, dioxin-, and furan-impacted soil, solidification and consolidation of impacted soil to a designated

area of Site 300, and placement of a protective layer over the solidified soil. Detailed cost estimates were presented in Appendix C of the EE/CA.

6. Expected Change in the Situation Should Action Be Delayed or Not Taken

Institutional/land use controls have been implemented to prevent onsite worker and ecological exposure to PCB-, dioxin-, and furan-contaminated soil at the Building 850 Firing Table. Should the removal action be delayed there will be no impact other than increased costs to perform the removal action due to inflation.

7. Outstanding Policy Issues

There are no outstanding policy issues.

8. Enforcement

DOE is committed to performing the proposed removal action in entirety. The removal action will be undertaken in compliance with CERCLA and in accordance with the January 2008 FFA Appendix A.

9. Recommendation

This decision document represents the selected removal action for the PCB-, dioxin-, and furan-contaminated soil at the Building 850 Firing Table in OU 5 at LLNL Site 300, San Joaquin County, California, developed in accordance with CERCLA as amended, and consistent with the NCP. This decision is based on the administrative record for the site. Conditions at the site meet the NCP, 40 CFR Section 300.415(b)(2) criteria for a removal action. The estimated total cost for the removal action, including 30 years of monitoring is $2.04 million, which will be funded in entirety by DOE.

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11. Acronyms and Abbreviations

ARARs	Applicable or relevant and appropriate requirements
bgs	Below ground surface
CAMU	Corrective Action Management Unit
CDD	Chloro-di-benzo-p-dioxins
CDF	Chloro-di-benzofurans
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CKD	Cement Kiln Dust
COCs	Contaminants of concern
DOE	U.S. Department of Energy
DTSC	California Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
ft	Feet
ft^2	Square feet
FY	Fiscal year
HE	High explosives
HMX	High Melting Explosive
LLNL	Lawrence Livermore National Laboratory
M	Million
MCL	Maximum contaminant level
mg/kg	Milligrams per kilogram
MSL	Mean Sea Level
NCP	National Contingency Plan
NPL	National Priorities List
OU	Operable Unit
PCB	Polychlorinated biphenyls
pCi/g	PicoCuries per gram
PRG	Preliminary Remediation Goal
psi	Pounds per square inch
RAOs	Removal Action Objectives
ROD	Record of Decision
RWQCB	California Regional Water Quality Control Board
SSLs	Soil Screening Levels
SWRI	Site-Wide Remediation Investigation
TCDD	Tetrachloro-di-benzodioxin
TCDF	Tetrachloro-di-benzofuran
TEC	Toxicity Equivalence Concentration
TEF	Toxicity Equivalence Factor
yd^3	Cubic yards

Figures

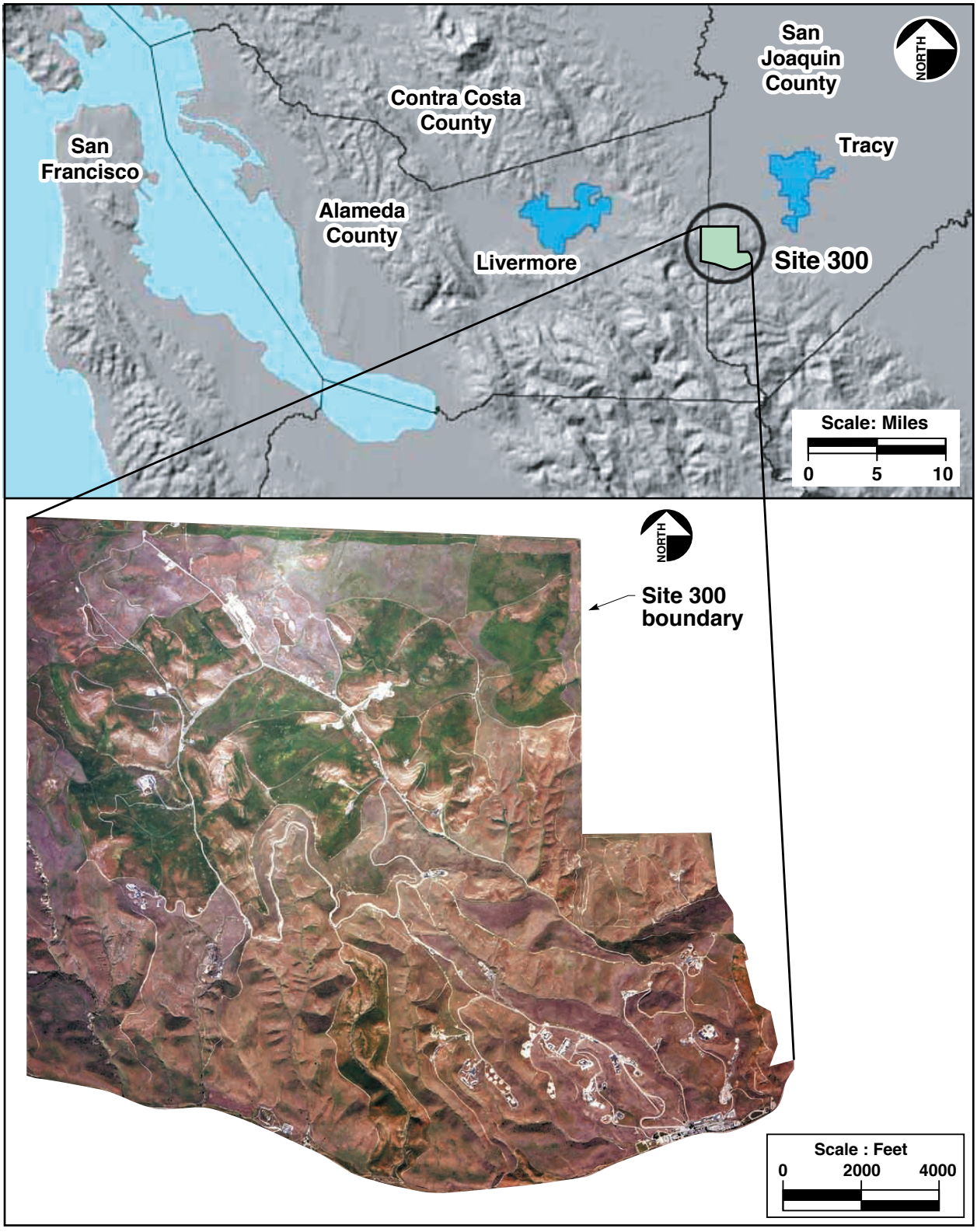

Figure 1-1. Location of LLNL Site 300.

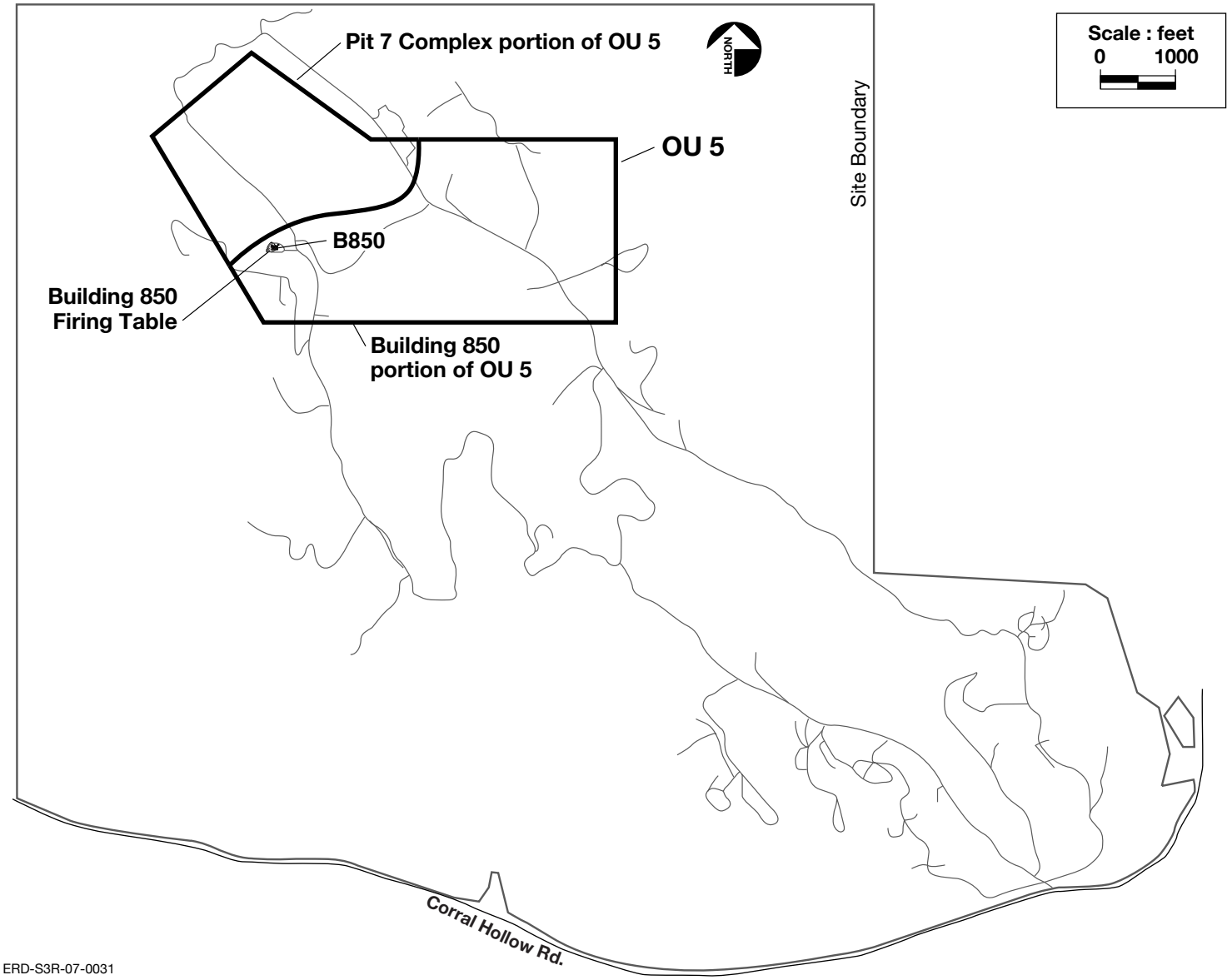

Figure 2-1. Site 300 map showing the location of Operable Unit 5 and the Building 850 Firing Table area.

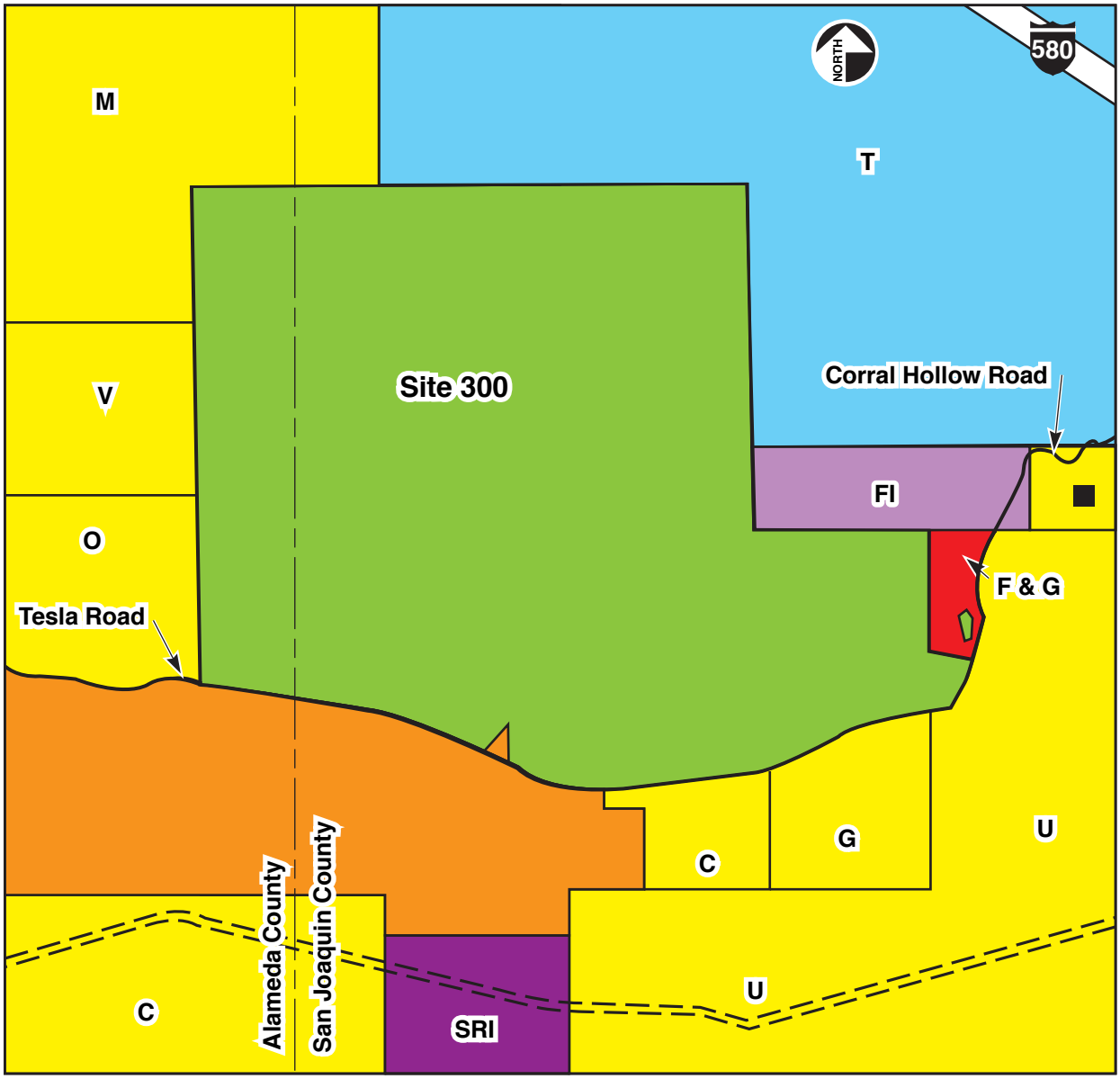

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Figure 2-2. Land use in the vicinity of Site 300.

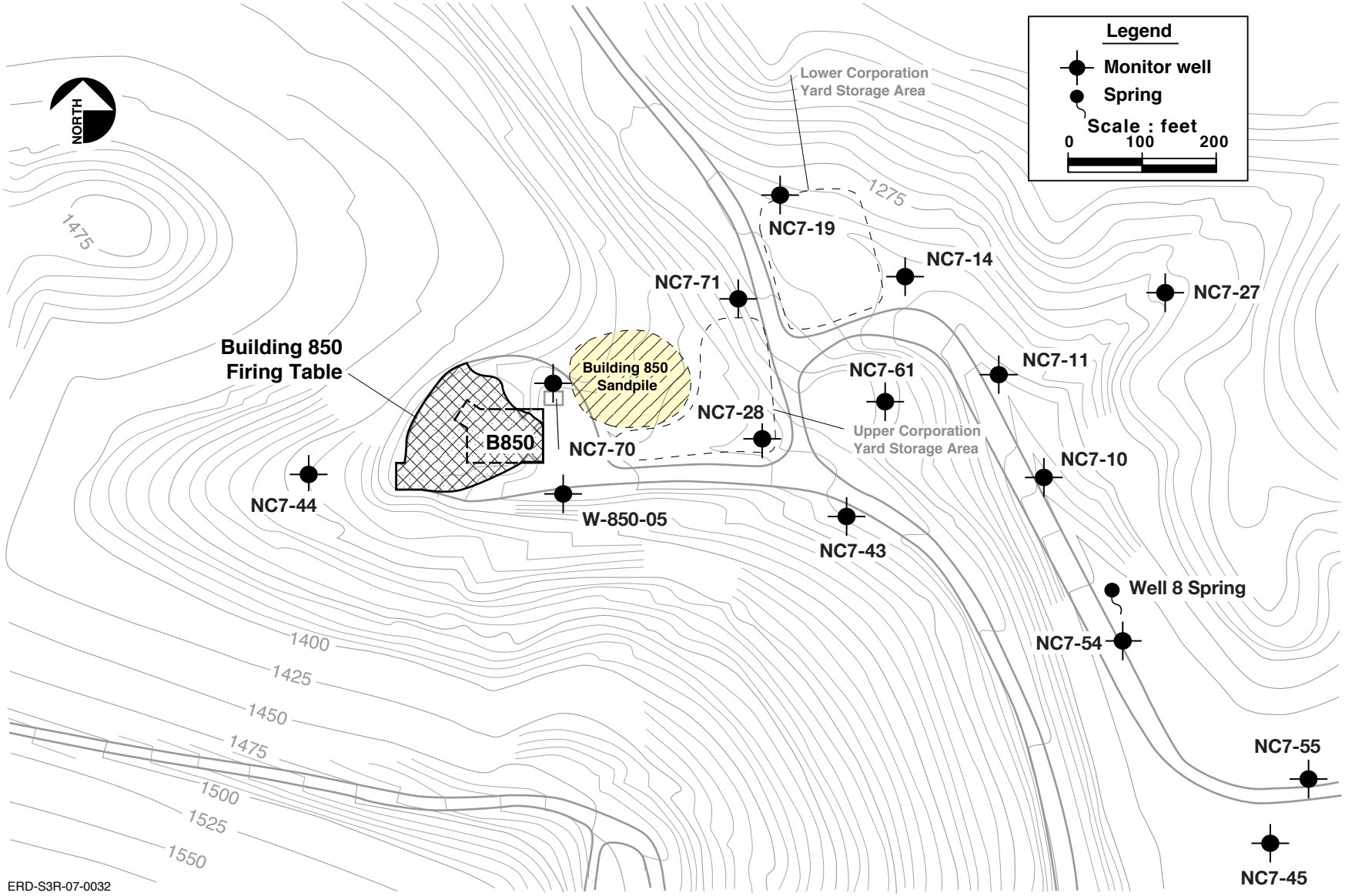

Figure 2-3. Building 850 Firing Table area site map showing topography, buildings, sandpile, and monitor wells.

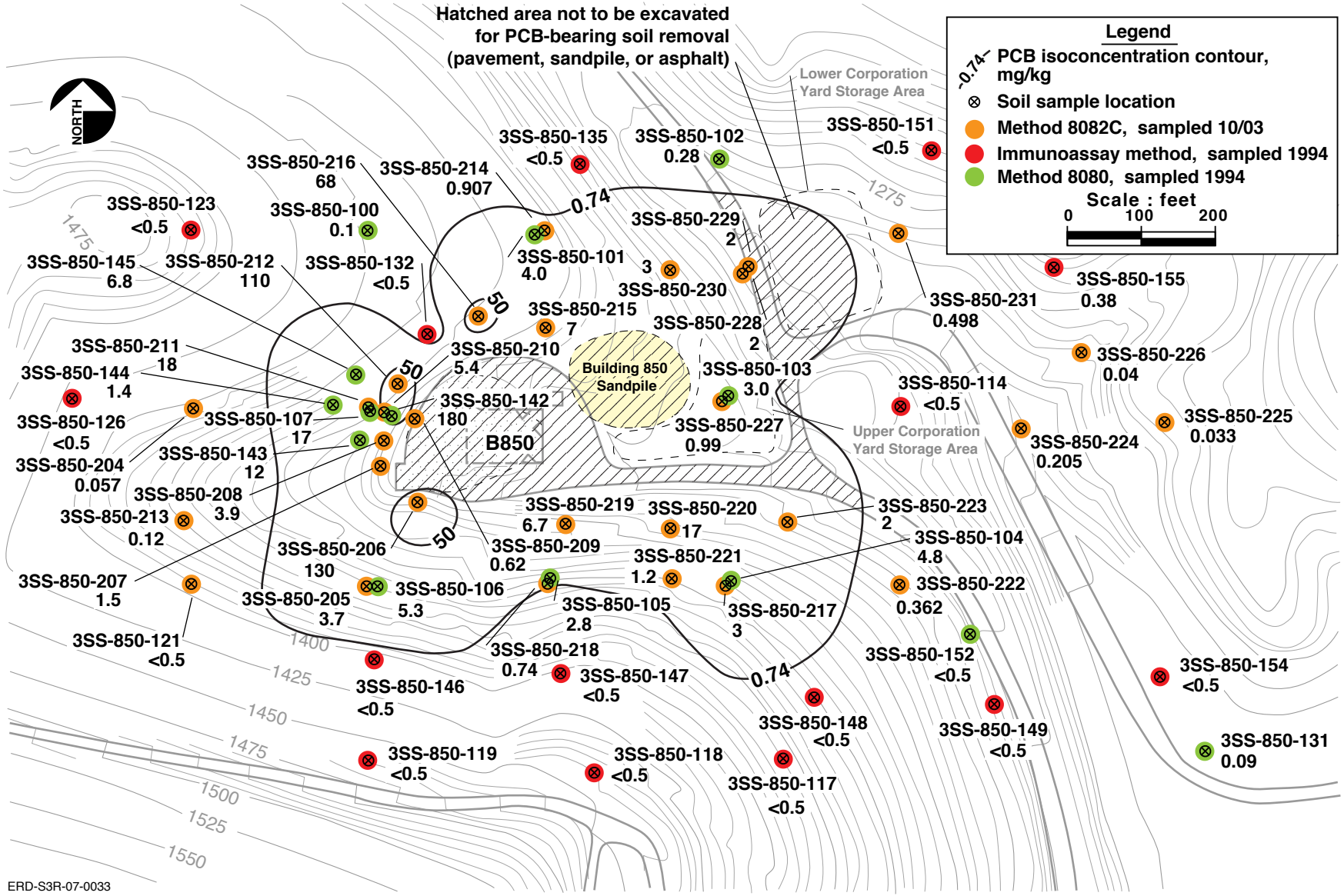

Figure 2-4. Map of the Building 850 (B850) Firing Table and sandpile area delineating areas of surface soil containing polychlorinated biphenyls (PCBs) above 0.74 milligrams per kilogram (mg/kg) and 50 mg/kg.

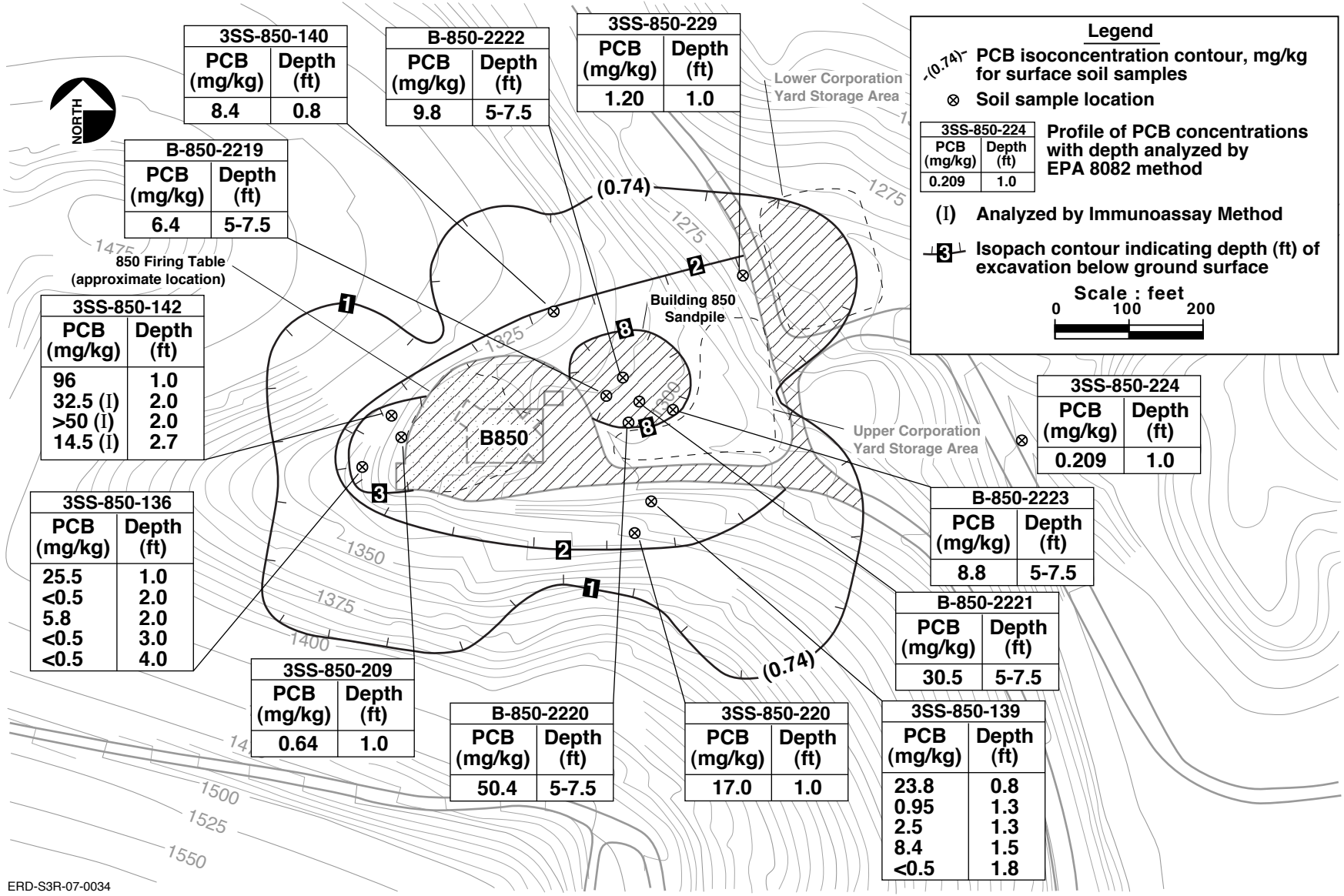

Figure 2-5. Map of the Building 850 Firing Table and sandpile area delineating areas of subsurface soil containing polychlorinated biphenyls (PCBs) above the 0.74 milligrams per kilogram (mg/kg).

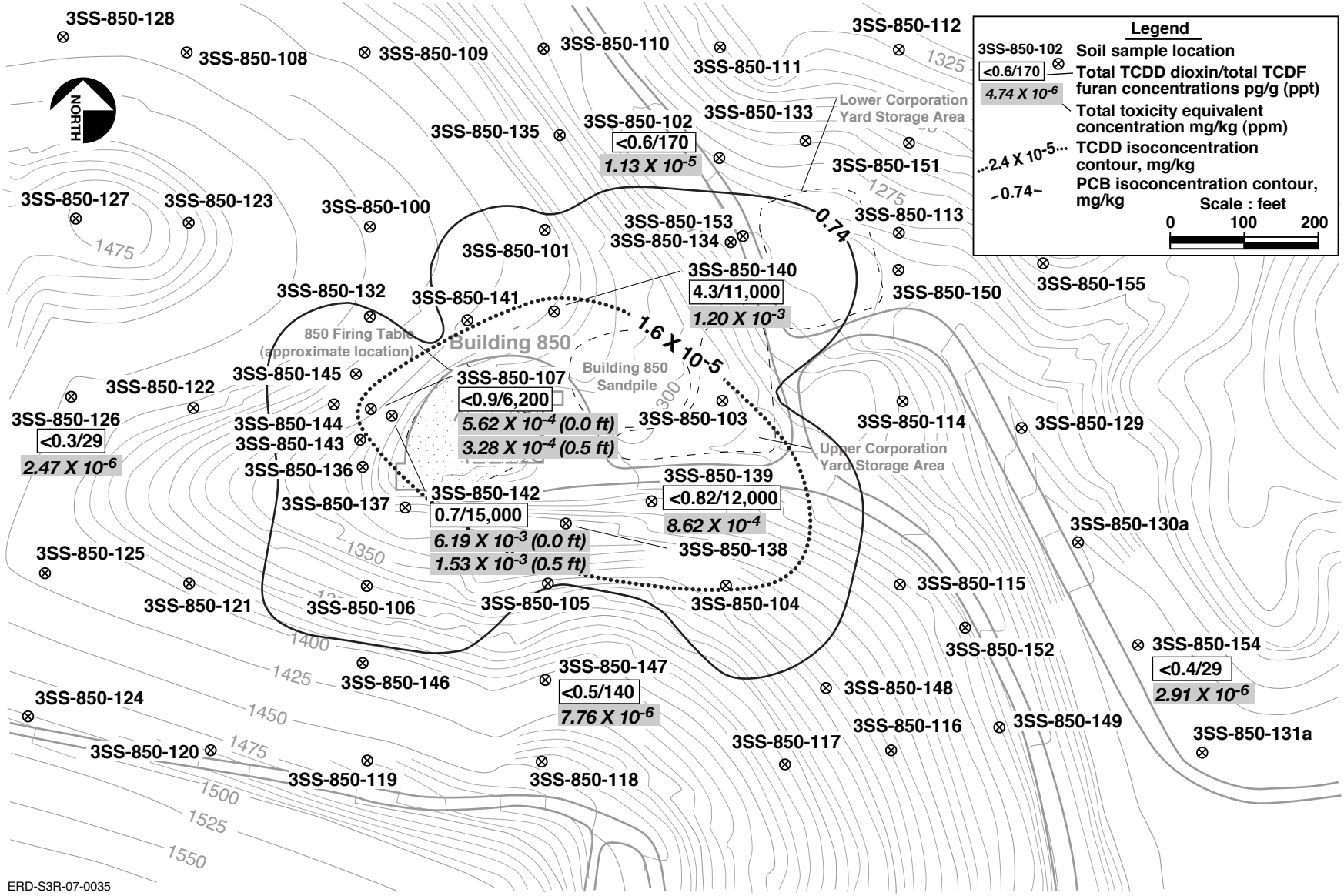

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Figure 2-6. Total tetrachloro-di-benzodioxin (TCDD), total tetrachloro-di-benzofuran (TCDF), and total toxicity equivalent factor concentrations in surface soil (0.0 - 0.5 feet [ft]) in the Building 850 Firing Table area (showing preliminary remediation goal [PRG] contours for polychlorinated biphenyls [PCBs] and TCDD).

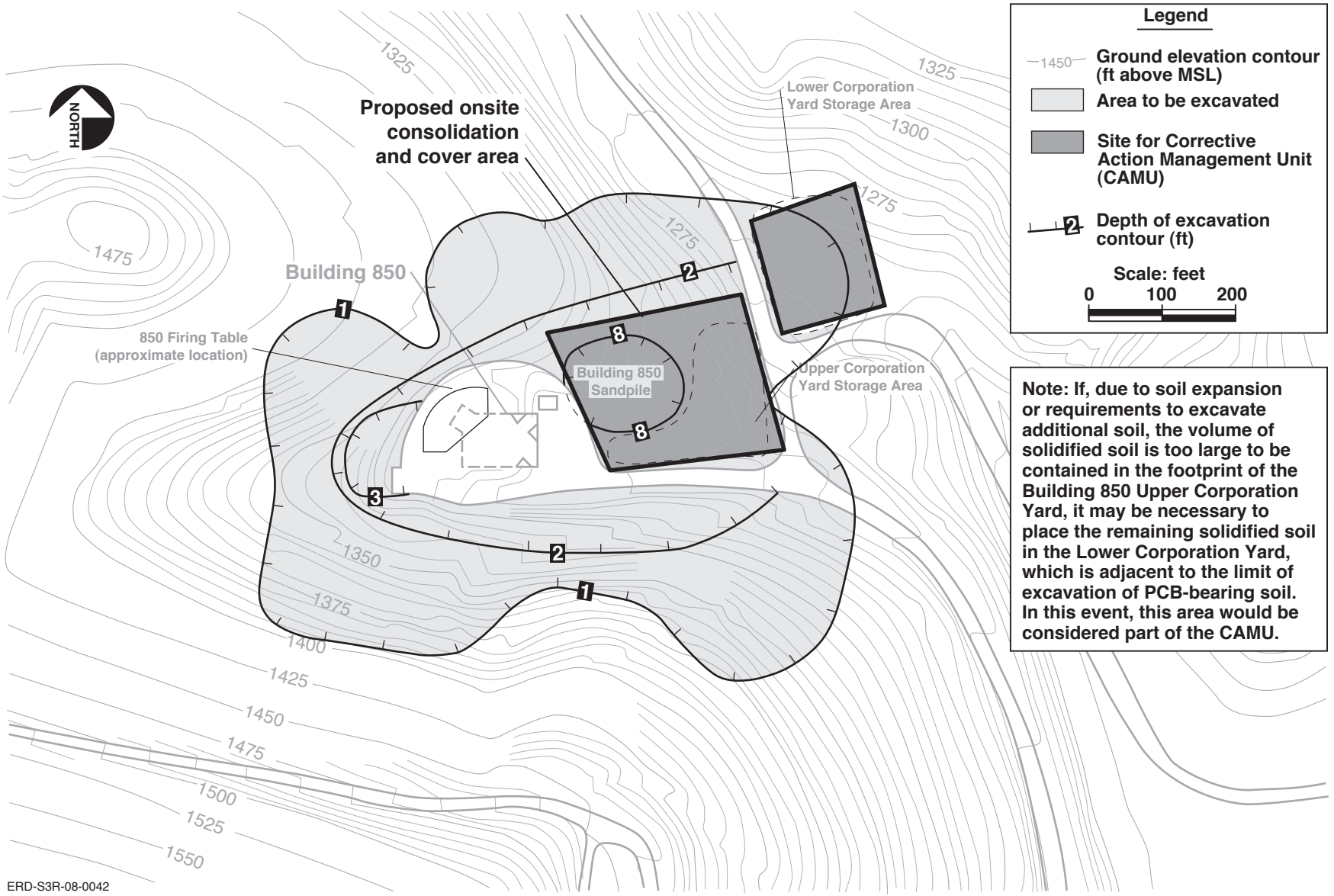


Figure 5-1. Location map for Removal Action Alternative 3 (Excavation and Onsite Soil Solidification).

Tables

Table 1. Description of institutional/land use controls for the Building 850 Firing Table Soil Removal Action.

Institutional/land use control performance objective and duration	Risk necessitating institutional/land use control	Institutional/land use controls and implementation mechanism
Control excavation activities to prevent onsite worker exposure to contaminants in subsurface soil until it can be verified that subsurface soil does not pose an exposure risk to onsite workers.	Potential exposure to tritium and depleted uranium at depth in subsurface soil at the Building 850 Firing Table[a].	All proposed excavation activities must be cleared through the LLNL Work Induction Board and require an excavation permit. The Work Induction Board coordinates with LLNL Environmental Restoration to identify if there is a potential for exposure to contaminants in the proposed construction areas. If a potential for contaminant exposure is identified, LLNL Hazards Control ensures that hazards are adequately evaluated and the necessary controls are identified and implemented prior to the start of work. The Work Induction Board including the LLNL Environmental Analyst will also work with the Program proposing the construction project to determine if the work plans can be modified to move construction activities outside of areas of contamination. Controls for excavation activities will be incorporated into the LLNL Site 300 Integrated Strategic Plan or other appropriate institutional planning documents.
Maintain land use restrictions in the vicinity of Building 850 Firing Table until remediation of PCB-, dioxin-, and furan-contaminated soil reduces the risk to onsite workers to less than 10^{-6}.	5×10^{-4} and 1×10^{-4} risk for onsite workers from inhalation or ingestion of resuspended particulates and dermal contact with PCBs, and dioxin and furan compounds in surface soil at the Building 850 Firing Table, respectively.	Current activities in the vicinity of the Building 850 Firing Table are well below the exposure scenario for which the unacceptable exposure risk was calculated, which assumed a worker would spend 8 hours a day, 5 days a week for 25 years on the firing table. Any significant changes in activities conducted in the Building 850 Firing Table must be cleared through the LLNL Work Induction Board. The Work Induction Board coordinates with LLNL Environmental Restoration.

Table 1. Description of institutional/land use controls for the Building 850 Firing Table. (Continued)

Institutional/land use control performance objective and duration	Risk necessitating institutional/land use control	Institutional/land use controls and implementation mechanism
Prohibit transfer of lands with unmitigated contamination that could cause potential harm under residential or unrestricted land use.	Potential exposure to contaminated environmental media.	The Site 300 Federal Facility Agreement contains provisions that assure DOE will not transfer lands with unmitigated contamination that could cause potential harm. In the event that the Site 300 property is transferred in the future, DOE will execute a land use covenant at the time of transfer in compliance with Title 22 California Code of Regulations, Division 4.5, Chapter 39, Section 67391.1. Development will be restricted to industrial land usage. These restrictions will remain in place until and unless a risk assessment is performed in accordance with current U.S. EPA risk assessment guidance and is agreed by the DOE, U.S. EPA, DTSC, and RWQCB as adequately showing no unacceptable risk for residential or unrestricted land use. These restrictions will be incorporated into the LLNL Site 300 Integrated Strategic Plan or other appropriate institutional planning document.

Notes:

DOE = United States Department of Energy.

DTSC = California Department of Toxic Substances Control.

LLNL = Lawrence Livermore National Laboratory.

RWQCB = California Regional Water Quality Control Board.

PCB = Polychlorinated biphenyl.

U.S. EPA = United States Environmental Protection Agency.

[a] **Risk for onsite worker exposure to tritium and depleted uranium at depth in subsurface soil during excavation activities was not calculated as this was not considered a long-term exposure scenario. As a result, land use controls based on the potential exposure to tritium and depleted uranium in subsurface soil during excavation/construction activities conservatively assume that the tritium and depleted uranium in subsurface soil may pose a risk to human health.**

Table 2. Potential Applicable or Relevant and Appropriate Requirements (ARARs) for Alternative 3 (soil excavation, solidification, and consolidation).

Action(s)	ARAR Source	Description	Comments
Remediation of PCB-contaminated soil at Building 850	***Federal:*** **40 CFR 761.61(a)(1)(ii)** **(Applicable, action-specific)**	**Federal implementing regulations for PCB waste under Toxic Substances Control Act (TSCA).**	**While the PCB-contaminated soil at Building 850 meets the definition of bulk PCB remediation wastes under the Federal regulations, 40 CFR 761.61(a)(1)(ii) states that "the self-implementing cleanup provisions shall not be binding upon cleanups conducted under other authorities, including but not limited to actions conducted under Section 104 or 106 of CERCLA." The cleanup actions at LLNL Site 300 are conducted under Section 104 of CERCLA.**
Placement of contaminated soil from Building 850 in a Corrective Action Management Unit (CAMU)	***Federal:*** **40 CFR 264.552(a)(1)** **(Applicable, action-specific)**	**Defines CAMU-eligible waste as solid and RCRA hazardous wastes, and all media (including soils and sediment) that are managed for implementing cleanup.**	**The contaminated soil at Building 850 meets the Federal definition of CAMU-eligible waste.**
	Federal: **40 CFR 264.552(a)(4)** **(Applicable, action-specific)**	**Placement of CAMU-eligible wastes into or within a CAMU does not constitute land disposal of hazardous waste, therefore the RCRA Land Disposal Restrictions [40 CFR 264.552(a)(4)] do not apply.**	**Because the contaminated soil at Building 850 is CAMU-eligible waste, placement of the solidified soil into a CAMU does not constitute land disposal of hazardous waste and the RCRA Land Disposal Restrictions do not apply.**
	Federal: **40 CFR 264.552 (b)** **(Applicable, action-specific)**	**Allows for the designation of a CAMU to enhance implementation of site cleanup.**	**Contaminated soil at Building 850 will be solidified to mitigate the ingestion and inhalation risk to onsite workers and consolidated into a CAMU.**

Table 2. Potential Applicable or Relevant and Appropriate Requirements (ARARs) for Alternative 3 (soil excavation, solidification, and consolidation). (Continued)

Action(s)	ARAR Source	Description	Comments
Placement of contaminated soil from Building 850 in a CAMU (*continued)*	***Federal:*** **40 CFR 264.552(c) (1-7)** **(Applicable, action-specific)**	**Lists several prerequisites for designation of a CAMU. The cleanup action must meet the CAMU-designation requirements.**	**The designation of a CAMU for the Building 850 soil removal action will: (1) facilitate implementation of an effective and protective remedy, (2) not create unacceptable risks to humans or the environment, (3) not include uncontaminated areas of the site, (4) be managed and contained to minimize future releases, (5) expedite implementation of this removal action, (6) meet treatment requirements, and (7) designed to minimize the land area of the facility upon which waste will remain in place after closure of the CAMU.**
	Federal: **40 CFR 264.552(d)** **(Applicable, action-specific)**	**Requires submittal of information to EPA to support the designation of a CAMU.**	**DOE/LLNL has provided information to EPA including: (1) a description of the waste origin and the timing and circumstances of release, (2) information demonstrating that the waste (soil) was not listed or identified as RCRA hazardous at the time of release, and (3) information demonstrating that the waste (soil) release occurred before the land disposal requirements of 40 CFR Part 268 were in effect.**
	Federal: ***40 CFR 264.552 (e)(3)(ii)(B)*** **(Applicable, action-specific)**	**The regulations contain provisions for an alternate CAMU design, subject to approval by EPA, and require that the alternate design prevent the migration of any hazardous constituents into ground water at least as effectively as a liner and leachate collection system.**	**There is no potential for impacts to ground water from PCBs, dioxins, furans, HE compounds, and metals in Building 850 soil, even without remediation. The excavation, solidification, and consolidation of the Building 850 soil would mitigate any minimal potential threats to ground water posed by uranium because it would isolate the soil from**

Table 2. Potential Applicable or Relevant and Appropriate Requirements (ARARs) for Alternative 3 (soil excavation, solidification, and consolidation). (Continued)

Action(s)	ARAR Source	Description	Comments
Placement of contaminated soil from Building 850 in a CAMU (*continued)*			**further contact with any water source. Therefore, the soil solidification technology would exceed Federal CAMU requirements under 40 CFR 264.552 to prevent ground water impacts.**
	Federal: **Title 40 CFR 264.552 (e)(4)(iv) (Applicable, action-specific)**	**Requires that CAMU-eligible wastes that EPA determine contain principal hazardous constituents shall be treated to achieve a 90% reduction in concentrations or to 10 times the Universal Treatment Standard (UTS) for the principal hazardous constituent.**	**Leachability testing conducted on the untreated control soil from Building 850 indicates that PCB and metals concentrations are below 10 times the UTS standards.**
	Federal: **40 CFR 264.552(e)(6) (Applicable, action-specific)**	**Contains closure and post-closure requirements for CAMUs.**	**The preliminary design for closure and post-closure maintenance activities for the solidified soil consolidation is provided in the EE/CA. More specific design and maintenance details would be provided to the regulatory agencies prior to implementation of the removal action. Any post-closure monitoring requirements, as agreed to by DOE and the regulatory agencies, would be incorporated into the revised Site-Wide Compliance Monitoring Plan.**
Closure/Construction of soil consolidation waste management unit	***State:*** **Title 27, Sections 21090(b) and 21142 (Relevant and appropriate, action-specific)**	**Final grading requirements for a waste management unit.**	**The solidified soil CAMU will be designed and maintained such that the final grading will reduce impacts to health and safety.**

Table 2. Potential Applicable or Relevant and Appropriate Requirements (ARARs) for Alternative 3 (soil excavation, solidification, and consolidation). (Continued)

Action(s)	ARAR Source	Description	Comments
Closure/Construction of soil consolidation waste management unit (*continued)*	***State:*** **Title 27, Section 21145** **(Relevant and appropriate, action-specific)**	**Final slope stability requirements including slope stability analyses.**	**The solidified soil CAMU will be designed and maintained to meet slope stability requirements.**
	State: **Title 27, Section 20365** **(Relevant and appropriate, action-specific)**	**Drainage and erosion control requirements.**	**The solidified soil CAMU will be designed to meet drainage and erosion control requirements. The 65% Design for the Removal Action will include calculations showing that the drainage system is adequate to meet the drainage and erosion control requirements.**
Post-closure	***State:*** **Title 27, Section 21180(a) and 21090(c)(1)** **(Relevant and appropriate, action-specific)**	**Post closure maintenance requirements.**	**The solidified soil CAMU will be maintained to protect the integrity of the removal action and reduce impacts to health and safety, and security of the site.**
Storm water controls	***Federal:*** **40 CFR Parts 122, 123, 124, National Pollution Discharge Elimination System, implemented by California Storm Water Permit for Industrial Activities, State Water Resources Control Board Order No. 97-03-DWQ.** **(Applicable, action-specific)**	**Regulates pollutants in discharges of storm water associated with hazardous waste treatment, storage, and disposal facilities, wastewater treatment plants, landfills, land application sites, and open dumps. Requirements to ensure storm water discharges do not contribute to a violation of surface water quality standards.**	**Applies to storm water discharges from the Building 850 CAMU area. Includes measures to minimize and/or eliminate pollutants in storm water discharges and monitoring to demonstrate compliance.**

Table 2. Potential Applicable or Relevant and Appropriate Requirements (ARARs) for Alternative 3 (soil excavation, solidification, and consolidation). (Continued)

Action(s)	ARAR Source	Description	Comments
Storm water controls (*continued*)	***Federal:*** **40 CFR Parts 122, 123, 124, National Pollution Discharge Elimination System, implemented by State Water Resources Control Board Order No. 99-08 DWQ** **(Applicable, action-specific)**	**Regulates pollutants in discharges of storm water associated with construction activity (clearing, grading, or excavation) involving the disturbance of 1 acre or more. Requirements to ensure storm water discharges do not contribute to a violation of surface water quality standards.**	**Applies to construction areas over 1 acre or more in size. Includes measures to minimize and/or eliminate pollutants in storm water discharges and monitoring to demonstrate compliance. Projects meeting the disturbance threshold will develop project- specific construction Storm Water Pollution Prevention Plans.**
Protection of endangered species	***Federal:*** **Endangered Species Act of 1973, 16 USC Section 1531 et seq. 50 CFR Part 200, 50 CFR Part 402 [40 CFR 257.3-2]** **(Applicable, location-specific)**	**Requires that facilities or practices not cause or contribute to the taking of any endangered or threatened species of plants, fish, or wildlife.**	**Prior to any well installation, facility construction, or similar potentially disruptive activities, wildlife surveys will be conducted and mitigation measures implemented if required.**
	State: **California Endangered Species Act, California Fish and Game Code Sections 2050-2068** **(Applicable, location-specific)**	**Requires that facilities or practices not cause or contribute to the taking of any endangered or threatened species of plants, fish, or wildlife.**	**Prior to any well installation, facility construction, or similar potentially disruptive activities, wildlife surveys will be conducted and mitigation measures implemented if required.**
Land use	***State:*** **Hazardous Waste Property (22 CCR 67391.1 (a)(1) and (2), (d), and (e)(1) and (2))** **(Relevant and appropriate, action-specific)**	**Prohibits the federal government from transferring land where hazardous substances remain at levels that do not allow unrestricted use of the land, unless a land use covenant or other institutional control is used to ensure that future land use will be compatible with the levels of remaining hazardous materials.**	**Would apply in the event that DOE transfers property at Site 300 to a nonfederal entity.**

Table 2. Potential Applicable or Relevant and Appropriate Requirements (ARARs) for Alternative 3 (soil excavation, solidification, and consolidation). (Continued)

Action(s)	ARAR Source	Description	Comments
Land use (*continued*)	***State:*** **California Water Code Section 13307.1(c)** **(Applicable, action-specific)**	**Requires that a land use restriction for property not suitable for unrestricted use be recorded pursuant to Section 1471 of the Civil Code.**	**Applicable to closure of waste management units.**
	State: **Title 27, Section 21190(a)(1) and (2); and (b)** **(Relevant and appropriate, action-specific)**	**Post-closure land use requirements.**	**Post-closure land uses will protect health and safety, prevent damage to structures, roads, and utilities, and prevent public contact with the waste.** **The CAMU will be designed to address site land use.**

Notes:

ARARs = Applicable or Relevant and Appropriate Requirements.
CAMU = Corrective Action Management Unit.
CCRs = California Code of Regulations.
CFRs = Code of Federal Regulations.
DOE = U.S. Department of Energy.
EE/CA = Engineering Evaluation/Cost Analysis.
LLNL = Lawrence Livermore National Laboratory.
PCBs = Polychlorinated biphenyls.
RCRA = Resource Conservation and Recovery Act.
ROD = Record of Decision.
TSCA = Toxic Substances Control Act.

Appendix A

Responsiveness Summary

Appendix A

Responsiveness Summary

Appendix A responds to public comments directed to DOE/LLNL, U. S. EPA, and the State of California regarding the *Engineering Evaluation/Cost Analysis for PCB-, Dioxin-, and Furan-Contaminated Soil at the Building 850 Firing Table, Lawrence Livermore National Laboratory Site 300*, issued in February 2008. Responses to community comments and questions are incorporated into this Action Memorandum.

The 30-day public comment period began on February 20, 2008 and ended on May 20, 2008. On March 6, 2008, DOE/LLNL and the regulatory agencies held a public workshop at the Community Center in Tracy, California to present the proposed removal action plan to the public. In addition, a Fact Sheet was mailed to interested community members on the Site 300 Environmental Restoration Project mailing list that requested comments from the public on the proposed removal action. Public comments and DOE responses are presented in Section A-1.

Community acceptance was measured by both the magnitude and substance of comments received. The interested public at Site 300 is made up of residents who live within about a mile of the Site, the nearby community of Tracy, and the local environmental community represented primarily by Tri-Valley CAREs. Three Tri-Valley CAREs representatives and six local community members signed the Public Workshop attendance sheet.

The primary concerns expressed by the public about the Building 850 removal action during the comment period are summarized as follows:

A concern was expressed in several comments about: (1) when and why PCB-containing capacitors were destroyed at the Building 850 firing table, (2) if this practice continues, and (3) the source of dioxins and furans detected in Building 850 soil. Prior to PCBs becoming regulated substances, an estimated 1,000 capacitors were destroyed on the Building 850 Firing Table. The capacitors were used to provide a sudden burst of electrical energy during experiments conducted from 1964 to 1967. Dioxins and furans are created when PCBs burn. Experiments utilizing PCB-containing capacitors have not been conducted since that time.

Several comments expressed concern that placement of a parking lot on top of the solidified/consolidated soil might compromise its integrity and result in exposure to contamination. While the removal action could be designed and constructed to prevent erosion and to withstand the weight of heavy vehicles, the current plan does not include placement of a parking lot on top of the solidified/consolidated soil.

DOE consulted with EPA, and the State of California on the responses to the following comments and agree on their content.

A-1. Public Comments and Responses

A-1.1. Written comments from Peter Strauss and Marylia Kelley on behalf of Tri-Valley CAREs — 2582 Old First Street, Livermore, California

Tri-Valley CAREs comment #1: *This EE/CA alludes to the fact that Pits 8 and 9 may require some consolidation. The Draft-Final Engineering Evaluation/Cost Analysis (EE/CA) alludes to the fact that the above named waste pits may require consolidation. The Dept. of Energy (DOE) needs to specify why and under what circumstances it would seek approval of consolidation. Tri-Valley CAREs (TVC) is surprised that this would be mentioned in this EE/CA, as Pits 8 and 9 are part of Operable Unit 8. Please explain why this subject has come up in the context of the EE/CA, and what benefits DOE believes would result from consolidation of these Pits. In addition, these Pits are part of the Proposed Plan for Operable Unit 8, as described in the Draft Record of Decision (ROD). TVC believes that consolidation would require additional, legally mandated analysis, e.g., a ROD Amendment or Explanation of Significant Difference. Please confirm that this would be the case.*

Response to Tri-Valley CAREs comment #1: There are no plans or need to consolidate the contents of Pits 8 and 9. Pits 8 and 9 were discussed in the EE/CA as potential alternate locations for consolidation of the solidified soil from the Building 850 Firing Table, should consolidation of the soil in the vicinity of Building 850 (e.g., at the corporation yards) prove infeasible. However, the Building 850 corporation yards remain the preferred location for consolidation of the solidified soil. If the Pit 8 and/or 9 locations were to be used, the solidified soil from Building 850 would be placed on top of Pits 8 or 9 only upon approval from the regulatory agencies.

Tri-Valley CAREs comment #2: *Areas around all past and existing Firing Tables (801, 802, 845, 851) need to be reviewed anew to see if they present similar problems as was evidenced at Building 850 (i.e., an underestimate of amount of contamination that was spread through unconfined explosive testing on the firing table). TVC requests that DOE review the characterization information for all existing and past firing tables to determine whether the characterization was adequate at those locations and whether it needs to be improved. If new characterization is required at one or more of those locations, it should be formally scheduled, and soon. We note that at Building 850, in the Year 2000, the amount of contaminated sand and soil estimated for disposal was 1,260 cubic yards. In 2006, the amount of contaminated material was estimated at 15,422 cubic yards, an increase of more than 10 times. Only a small fraction of this is associated with the sand pile; most of the contaminated soil that needs to be removed is going to be scraped from existing hillsides around Building 850. If this (i.e., underestimation of the extent of soil contamination) is a problem at other firing tables, then the remedies need to reflect that.*

Response to Tri-Valley CAREs comment #2: The EPA Preliminary Remediation Goal (PRG) for PCBs in soil decreased to a lower level (0.74 mg/kg) from the PCB soil PRG in the 2001 Site-Wide Interim ROD (1.0 mg/kg). As a result, the extent of PCBs in soil above the revised 0.74 mg/kg PRG was not fully delineated. Additional soil samples were collected in 2003 to constrain the areal and vertical extent of PCBs in soil exceeding the revised PRG. The 2003 sampling event also provided additional data for the Remedial Design.

The areas surrounding the firing tables at Buildings 801, 802, 845, and 851 were characterized as part of the remedial investigations, including the sampling of surface and

subsurface soil/rock, and ground water. No contaminants of concern were identified in surface soil at the firing tables at Buildings 801, 802, or 845. This determination was based on the:

- Frequency with which a contaminant was detected.
- Concentration of the contaminant relative to background concentrations.
- Risk or hazard presented by the contaminant.
- Potential for a contaminant present in soil or rock to affect ground water.

Research Department Explosive (RDX), metals (cadmium, copper, and zinc) and uranium were identified as surface soil contaminants of concern (COCs) at the Building 851 Firing Table. However, there were no risks to human or ecological receptors or threat to ground water associated with these surface soil COCs at Building 851. Because the highest contaminant concentrations in soil are found near firing tables and were included in the COC evaluation, there is no reason to believe that the extent of contamination has not been delineated at these firing table.

Tri-Valley CAREs comment #3: *Please describe when and why more than 1,000 capacitors containing PCBs were destroyed at the Building 850 firing table. In addition to weapons-related materials, over 1,000 capacitors laden with PCBs were destroyed at Building 850. The EE/CA and other documents have not stated whether this was an outdoor waste disposal method or part of a series of program-related experiments. The EE/CA and other documents have also neglected to state when this practice ceased (assuming it has). TVC requests that the DOE provide information regarding the origin(s) of the 1,000 capacitors, what they were used for, whether the practice of destroying them on a firing table was program-related (and for what purpose) or a waste disposal technique, and the beginning and ending dates when destruction occurred. Also, please provide information about the air monitoring systems used when the capacitors were destroyed. Additionally, was the practice of destroying capacitors done at other firing tables? If so, please provide similar information to that requested above.*

Response to Tri-Valley CAREs comment #3: The PCB-containing capacitors were not destroyed at the Building 850 Firing Table as a waste disposal technique. The capacitors were destroyed during 10 to 20 experiments (50 to 100 capacitors per experiment) conducted from 1964 to 1967. The capacitors were used to provide a sudden burst of electrical energy for these experimental shots. Air monitoring systems were not in place during the time period (1960s) when the capacitors were destroyed. Some PCB-containing capacitors were used during experiments at the Building 801, 812, 845, and 851 firing tables. However, these were limited to 1 to 2 experiments using 1 to 2 capacitors each.

Tri-Valley CAREs comment #4: *The documents do not state the source of the dioxins and furans found in the soil. We have assumed that these compounds were the result of partial combustion of the PCB capacitors. However, there are also compounds used at the firing tables that may have undergone incomplete combustion - the origins of dioxins and furans. Please provide this information, as TVC is concerned that this problem may be much wider spread than soils at Building 850.*

Response to Tri-Valley CAREs comment #4: Dioxins and furans are chlorinated compounds that are produced when PCBs burn. The dioxins and furans detected in soil at the Building 850 Firing Table are the result of the detonation of the PCB capacitors.

Tri-Valley CAREs comment #5: *The selected alternative will consolidate and solidify excavated soil and the sand pile, and dispose of it in the upper corporation yard. Total volume*

of soil after solidification is 22,000 cubic yards. The resulting mound would be about 20 feet high. DOE has stated that this may be used as a parking lot. A protective layer such as asphalt would be placed over the top, and cobbles will be placed around the sides to prevent biotic intrusion. We have several concerns regarding the viability and long-term protectiveness of this alternative (listed in comments 5A – 5F below).

Response to Tri-Valley CAREs comment #5: See responses to comments 5A through 5F below.

Tri-Valley CAREs comment #5A: *The Remedial Action Objectives for the site include cleaning up to industrial soil levels and mitigating the hazards to burrowing owls. The site would not be suitable for residential use. This EE/CA did not evaluate the amount of soil that would be excavated if the site were to be cleaned up to residential requirements. TVC feels strongly that residential standards should be the principle cleanup standard for Site 300, although as in previous comments, we have stated that we recognize that small areas cannot be cleaned up to this level. Therefore, we request that DOE provide an estimate of required excavation and additional costs if the soil was cleaned up to residential standards for all relevant contaminants, including but not limited to PCBs, dioxins and furans.*

Response to Tri-Valley CAREs comment #5A: Because Site 300 is considered an industrial site, industrial cleanup standards have been selected for soil cleanup. It would cost the taxpayers significantly more money to fund cleanup to lower levels with no added level of protection under the current land use scenario. While DOE is evaluating the consolidation of activities throughout the DOE complex that could result in changes to activities conducted at Site 300, DOE control of the site is expected to continue for the foreseeable future. There are no plans to open the land for recreational or residential uses. There are provisions in the Site 300 Federal Facility Agreement that ensure that DOE will not transfer lands with unmitigated contamination that could cause potential harm. If the land use changes, the cleanup remedies and standards would be reviewed to ensure they are consistent with its intended use in accordance with Federal and State laws. Additionally, the Five-Year Review Process and the Site-Wide Compliance Monitoring Plan/Contingency Plan specifically evaluate changes that have either occurred or can be foreseen for the future, including potential changes in land use.

Tri-Valley CAREs comment #5B: *Future use of the site and environmental conditions may erode the materials used to stabilize contaminants, thus affecting their capacity to immobilize contaminants. We strongly recommend that the covered area not be used as a parking facility because it will increase the potential for release due to and wear and tear on the cover (e.g., cracks in the asphalt, soil being spread by automobiles).*

Response to Tri-Valley CAREs comment #5B: Regardless of the final use of the soil consolidation area, the solidified soil will be covered with low permeability materials and a biotic barrier that will prevent water and the elements from coming in contact with it, preventing erosion and/or animal burrowing that could result in degradation of the solidified mass. The multilayer cover provides additional levels of safety. The integrity of the consolidation area will be monitored regularly. Any cracks, tears, or other breaches will be corrected quickly. The unconfined compressive strength of the solidified soil, as tested and presented in the EE/CA document, can withstand the weight of heavy vehicles or loads that could be generated from similar uses. Therefore, there is no potential for soil to be spread by automobiles, water, or wind. The soil solidification technology has been successfully used at many sites across the U.S. to

mitigate soil contamination; in many cases parking lots have been placed on top of the solidified soil to return the land to productive uses.

Tri-Valley CAREs comment #5C: *Very little data exist to support S/S products' durability over an indefinite disposal life. The solidified soil will contain depleted uranium, PCBs and dioxins and furans, all of which do not easily degrade. There is not enough discussion in the EE/CA about the type of material that is going to be used as a solidifying agent, nor is there information which leads one to have confidence that it will remain in place for an extended period of time.*

Response to Tri-Valley CAREs comment #5C: The consolidation area will be covered with a layer of impermeable material, to prevent weathering and erosion, and a biotic barrier, which may be composed of concrete or cobbles, to prevent animals from undermining its integrity. A cover material and design will be selected that will prevent water from coming in contact with the solidified soil. The cover will be inspected and repaired (if necessary) at least annually. These annual inspections and maintenance will provide for the long term durability of the cover. An analysis of load, slip plane, and toe failure with a high factor of safety (2) is also a required component of the design. Calculations will be made to assure that the consolidation area does not deform over time, possesses adequate lateral support to maintain its geometry over time, and can withstand an earthquake with a 500-year return period. These calculations are being done to assure that the consolidated soil is durable for the long term. The unconfined compressive strength of the solidified soil, in excess of 100 psi, does provide certainty that the consolidated soil is strong enough to support its own weight. The inspection and maintenance program and engineering calculations should provide for the long term durability and integrity of the solidified area. The recommended solidification agents to be added to the soil, by volume, are 2.5% Portland cement and 2.5% cement kiln dust (CKD). The treatability test results for samples created with this mixture are discussed in detail in Appendix E and are compared to results for soils solidified with other agents.

Tri-Valley CAREs comment #5D: *A more thorough treatability study demonstrating the long-term ability to solidify the contaminants should be undertaken prior to final design of the stabilization process. Certain waste streams are incompatible with variations of solidification processes. The particular process should be tested for long-term compatibility with the waste stream before it is used. For example, inorganic salts may affect the set rate either through acceleration or retardation. Cracks extending through the stabilized mass have been observed at some other sites, the cause of which is suspected to be the high temperature rise during curing. If the process fails to solidify the material, it could result in a pathway for release of contaminants. Additionally, Appendix E limits the discussion of stabilization to PCBs and co-located metals. No mention is made of the sand pile containing tritium.*

Response to Tri-Valley CAREs comment #5D: The waste stream that will be treated (solidified) is the PCB-bearing soil from Building 850. This soil was used in the treatability testing documented in Appendix E of the EE/CA. The soil was found to be compatible with the treatment process. The material comprising the sand pile is equivalent chemically to the soil on the slopes. It contains a higher fraction of sand than the sandy clay loam and clay loam soils to be solidified, but is otherwise equivalent texturally. Therefore, it will also meet the UCS criteria discussed in the response to Tri-Valley CAREs comment #5C. Setting of the solidified soil was complete in less than one day. Heat generation was not noted during the solidification process and thus should not be a factor that would create cracks or limit integrity. During the actual

construction of the consolidation area, samples for unconfined compressive strength will be taken at 500 cubic yard intervals and analyzed to ensure that the process adequately solidifies that material throughout the consolidation process.

Section 3.1.1 of the EE/CA discusses the tritium activities detected in the sandpile. Because tritium concentrations detected at Building 850 do not pose an ecological or human health risk nor a threat to ground water, the treatment of tritium is not an objective of the solidification process.

Tri-Valley CAREs comment #5E: *Long term monitoring is necessary to ensure that contaminants have not been re-mobilized. A description of the monitoring plan should be included in the EE/CA. We are not only concerned about releases due to long-term wear, but also releases due to animal intrusion. It is uncertain that placing cobbles on a 20-foot vertical rise will effectively limit burrowing animals from digging into the solidified mass.*

Response to Tri-Valley CAREs comment #5E: An inspection and maintenance plan will be provided as part of the Title II design that will ensure that integrity of the removal action. The details of this plan cannot be determined and provided until specifics of the design are defined. The Building 850 EE/CA document specifically addresses soil contamination and remediation to mitigate human and ecological risk from exposure to the contaminated soil. Data presented in previous reports such as the Site-Wide Remedial Investigation and the Addendum to the Site-Wide Remedial Investigation Report: Building 850/Pit 7 Complex Operable Unit documented that there have been no impacts to ground water from PCBs, dioxins, and furans in Building 850 soil and modeling indicates that there is no threat to ground water from these soil contaminants. Therefore, ground water is not a media of concern for the purposes of this removal action and EE/CA. However, the monitoring of tritium, nitrate, perchlorate, and uranium concentrations in ground water downgradient of the consolidation area will continue to be conducted in the Building 850 Firing Table area per the requirements of the Compliance Monitoring Plan/Contingency Plan (Ferry, 2002). The results of this ground water monitoring are reported in the semi-annual Compliance Monitoring Reports.

There will be no vertical faces to the consolidation area. The sides will be sloped a maximum of 2:1 and more likely about 2%. Cobbles are one of several materials that may be proposed by the design firm to prevent animal intrusion. The method used will be proven to be effective. Over the years, inspection and maintenance will verify that the biotic barrier maintains effectiveness.

Tri-Valley CAREs comment #5F: *The thickness of the protective cover should be at least 2 feet. The depth of protective cover material is one-foot thick, a combination of asphalt and a gravel layer. We think it is prudent that it be at least two feet thick, because of the long life of the contaminants.*

Response to Tri-Valley CAREs comment #5F: The design presented in the EE/CA is conceptual in nature. As presented in the EE/CA report, the protective cover is a one-foot thick layer underlain by geogrid material. The actual design will likely include a low permeability layer composed of concrete and/or clay that will be at least 1 foot thick and will maintain integrity indefinitely with periodic inspection and maintenance. Please also see the response to Tri-Valley CAREs comment #5B above.

Tri-Valley CAREs comment #6: *Additional methods that may make the selected alternative more hardy and robust were not analyzed, and should be. TVC requests that DOE analyze the*

addition of an impermeable barrier placed like a box (with a bottom and sides) in which the solidified soil would reside. This would provide additional long-term protection against contaminant migration over time. We note that in addition to the PCBs, depleted uranium, dioxins and furans, there are significant concentrations of tritium (radioactive hydrogen) in the soil moisture around Building 850. Tritium has proven particularly mobile at other dump sites across the country. The analysis in the EE/CA fails to take this into account.

Response to Tri-Valley CAREs comment #6: The additional method TVC is referring to is called a "vault." DOE/LLNL performed a screening-level evaluation of this technology, which does not involve mixing the soil with a solidifying agent and uses the walls, top, and bottom to isolate the soils from the environment. The detailed screening analysis concluded that this technology was very expensive and would not provide any additional protection to that provided by onsite solidification and consolidation. The soil solidification technology will isolate the soil and all contaminants in it from the environment, including underlying ground water.

The maximum tritium activities in the material to be solidified and consolidated are present in the sand pile material. The maximum detected tritium activity of 19.2 picoCuries per gram (pCi/g) in samples collected in 2006 is an order-of magnitude lower than the soil screening level (SSL) for a dilution attenuation factor (DAF) of 20 (165 pCi/g). SSLs are used to evaluate direct-exposure to contaminated soil, leaching of contaminants from soil and subsequent impacts to ground water. DAFs were developed by the EPA and the State to account for dilution and attenuation that occur as leachate moves through the unsaturated zone and mix with ground water. Based on this analysis, the tritium in the sand pile is not a threat to ground water, even if it were not isolated from the environment in the solidified consolidation area. An evaluation was also conducted to assess the potential for PCBs, dioxins, and furans in Building 850 soil to impact ground water. These contaminants have not been detected in Building 850 ground water and the modeling evaluation indicated that they would not impact ground water in the future.

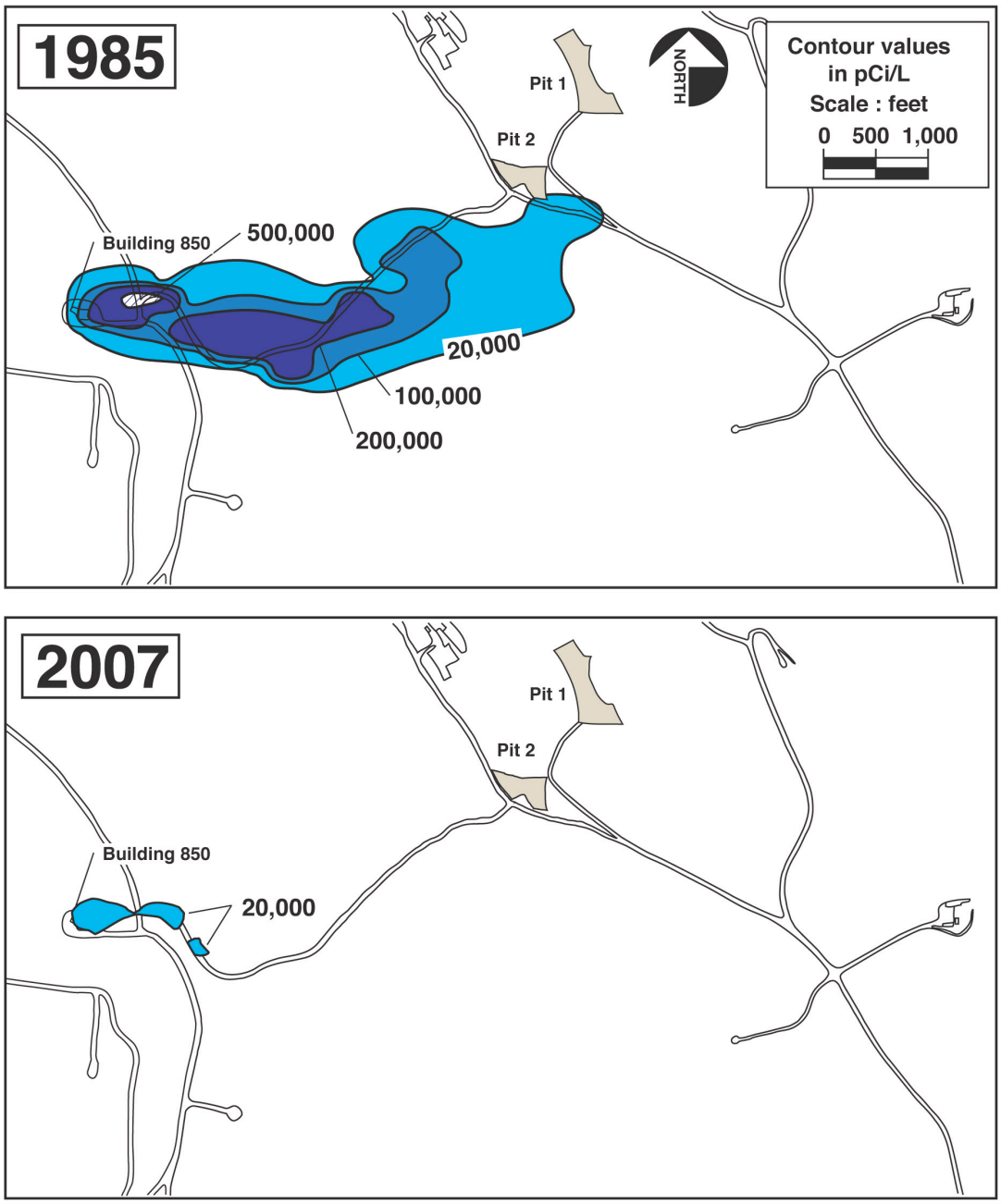
Tri-Valley CAREs comment #7: *In general, the EE/CA fails to adequately consider the tritium contamination in the environment around the Building 850 firing table. According to Appendix A, Table A-6 in the EE/CA, tritium samples taken from boreholes contained a concentration of up to seven million pCi/L of tritium in soil moisture. TVC considers the tritium contamination significant and requests that DOE detail the fate and potential transport of tritium under the selected alternative.*

Response to Tri-Valley CAREs comment #7: The Building 850 soil removal action addresses PCB-, dioxin-, and furan-contamination in surface soil in the vicinity of the firing table. The objective of the EE/CA is to present and evaluate remedial alternatives for the PCBs, dioxins, and furans in Building 850 surface soil.

Tritium in surface soil, subsurface soil/rock, surface water, and ground water at Building 850 was addressed in the Site-Wide Remedial Investigation (SWRI) (1994), the SWRI Addendum for Building 850 (1998), the Site-Wide Feasibility Study (SWFS) (1999), the Interim Site-Wide Record of Decision (2001), the Site-Wide Remediation Evaluation Summary Report (SWESR) (2006), the Proposed Plan for Remediation of LLNL Site 300 (2007), and the Draft Site-Wide ROD (2007). The fate and transport of tritium has been evaluated and the results presented in the SWFS and SWERS. Tri-Valley CARES has received, commented, and participated in the discussion of draft, draft final, and final versions of all the documents listed above.

Tritium has not been detected in surface soil at Building 850 and therefore does not pose a risk to human or ecological receptors. Ground water tritium data from 1995 to 2008 and ground

water fate and transport modeling indicate that there is no longer a significant source of tritium in subsurface soil/rock at Building 850 (Figure 1 on next page). The tritium in subsurface soil at the firing table is radioactively decaying and activities will decrease by half every 12.3 years. Ground water tritium data from 1995 to 2008 and ground water fate and transport modeling indicate that there is no longer a significant source of tritium in Building 850 subsurface soil/rock. For these reasons, Monitored Natural Attenuation (MNA) was selected as the interim remedy for the tritium in ground water at Building 850 in the Interim Site-Wide ROD and is proposed as the final remedy in the Draft Site-Wide ROD. As shown in Figure 1 below, natural attenuation has significantly reduced tritium activities in Building 850 ground water. Please see the response to Tri-Valley comment #6, above, for an analysis of the impacts of tritium in solidified soil on underlying ground water.



ERD-S3R-08-0025

Figure 1. Monitored natural attenuation has significantly reduced tritium activities in Building 850 ground water.

A-1.2. Written comments summarized from a form letter submitted to the Department of Energy by:

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Jedidyah SeVries and Mary Cerner, 3717 Carrigan Common, Livermore, California

Robert Schwartz, 2582 Old First St., Livermore, California

Thad Binkley and Phyllis Jardine, 4132 Cristobal Way, Pleasanton, California

Ena Aguirre, 404 East Vine St., Stockton, California

Pel Uples, 1316 St. Mary Dr., Livermore, California

Patricia Moore and Keith Rothenberg, 23 Diamond Dr., Livermore, California

Matthew Swyers, 1020 Dolores St., Livermore, California

Rachel Foust, 2914 Montana Ave., Flint, Michigan

Savanna Meyer, 119 Elvira St., Livermore, California

Joshua Green, 1146 Megan Rd., Livermore, California

Form Letter comment #1: *Do not continue to use the firing table for bomb tests. According to the permit application submitted by Livermore Lab to the San Joaquin Valley Air Pollution Control District, The Building 850 Firing Table would be used for new bomb tests. These tests would include up to 5,000 pounds per year of uranium-238 and approximately 60 additional radioactive and toxic contaminants. We call on Livermore Lab to withdraw the permit application. We call on DOE to stop all present and planned bomb tests at Site 300, whether the tests are paid for by DOE or by another agency, such as the Dept. of Homeland Security. The contamination from past tests is a harbinger of contamination to come. These tests must be stopped.*

Response to Form Letter comment #1: The status of the air permit is being reviewed while DOE is reviewing ongoing explosive testing at Site 300. At present (April 2008), the Building 851 and Building 812 Firing Tables are the only locations where outdoor firing tables are being used to conduct explosives testing for the DOE Weapons Program. Under the current plan, use of outdoor firing tables for the DOE Weapons Program explosives testing will be discontinued by the end of 2009. The Building 851 Firing Table area was characterized as part of the Site-Wide Remedial Investigations conducted at Site 300. No risk or hazard associated with surface soil, subsurface soil/rock, or ground water was identified for the Building 851 Firing Table in the baseline risk assessment. Uranium activities in ground water at Building 851 are a fraction of the 20 pCi/L drinking water standard. The maximum 2007 uranium activity was 0.8 pCi/L which is within the range of background levels.

Use of the Building 850 Firing Table for DOE Weapons Program explosives testing was discontinued in January 2008. Plans are underway to implement cleanup of contaminated soil at the Building 850 Firing Table in 2008-2009. The cleanup remedy to address contamination in ground water and surface water at Building 850 was implemented in 2001.

A ground water extraction and treatment system was constructed as a treatability test in 2007 to begin ground water cleanup in the Building 812 area. A Feasibility Study is currently

underway to formulate cleanup alternative options for long-term contaminant cleanup in the Building 812 area.

While use of some firing tables at Site 300 is being considered for LLNS Work-for-Others Projects (e.g., Department of Homeland Security, Department of Defense), LLNS will evaluate these projects for potential environmental impacts prior to approval of the experiments, and any necessary controls will be implemented to minimize and mitigate contamination.

Form Letter comment #2: *The contamination at the Building 850 "Firing Table" is 10 times worse than what had been disclosed. In 2000, the amount of contaminated sand and soil that was estimated for disposal around the Building 850 Firing Table was 1,260 cubic yards. In 2006, the amount of contaminated material was estimated to be 16,000 cubic yards, an increase of more than 10 times. Most of the contaminated soil that needs to be removed is going to be scraped from hillsides around the Firing Table. Again, this should be taken into account when considering more bomb blasts on the Building 850 Firing Table.*

Response to Form Letter comment #2: The extent of contamination at the Building 850 Firing Table has been discussed in the Building 850 EE/CA. As discussed in the response to Tri-Valley CAREs comment #2, the amount of soil to be excavated has increased since the original estimate presented in the 1999 Feasibility Study due to the lowering of the EPA PCB PRG.

Form Letter comment #3: *If contamination is worse at other Firing Tables too, then the cleanup plan needs to address that problem. Areas around all the other Firing Tables (such as Buildings 801, 802, 845, 851) need to be reviewed to see if they present similar problems as was evidenced at Building 850, e.g., the underestimate of the amount of contamination.*

Response to Form Letter comment #3: As discussed in the response to Tri-Valley CAREs comment #2, the areas surrounding the other firing tables at Buildings 801, 802, 845, and 851 were characterized as part of the remedial investigations, including the sampling of surface and subsurface soil/rock, and ground water. No contaminants of concern were identified in surface soil at the firing tables at Buildings 801, 802, or 845. RDX, metals (cadmium, copper, zinc) and uranium were identified as surface soil COCs at the Building 851 Firing Table. However, there were no risks to human or ecological receptors or threat to ground water associated with these surface soil COCs at Building 851. Because the highest contaminant concentrations in soil are found near firing tables and were included in the COC evaluation, there is no reason to believe that the extent of contamination has not been delineated at these firing table.

Form Letter comment #4: *Somebody needs to explain why more than 1,000 capacitors containing PCBs were destroyed at the Building 850 Firing Table. In addition to weapons-related materials, over 1,000 capacitors laden with PCBs were destroyed at Building 850. The cleanup plan has not explained this. Nor has the cleanup plan stated the date when this practice ended. This information needs to be made public. Further, if this happened at other Firing Tables too, the cleanup plan needs to address that.*

Response to Form Letter comment #4: As discussed in the response to Tri-Valley CAREs comment #3, the capacitors were destroyed during 10 to 20 experiments (50 to 100 capacitors per experiment) conducted from 1964 to 1967. The capacitors were used to provide a sudden burst of electrical energy for these experimental shots. The Action Memorandum contains this information. Some PCB-containing capacitors were used during experiments at the Building 801, 812, 845, and 851 firing tables. However, these were limited to 1 to 2 experiments using 1 to 2 capacitors each.

Form Letter comment #5: *The cleanup plan does not explain the source of the dioxins and furans found in the soil. Are they all the result of partial combustion of the PCB capacitors? Or, are there other compounds also used at the Site 300 Firing Tables that may have undergone incomplete combustion and generated dioxins and furans? If so, have you looked for dioxins and furans at the other Firing Tables? This is important to know when considering future activities.*

Response to Form Letter comment #5: Please see the response to Tri-Valley CAREs comment #4.

Form Letter comment #6: *The plan to build a parking lot on top of the contaminated soil should be abandoned. The present idea for cleanup would consolidate and solidify excavated soil and dispose of it in the upper corporation yard. Total volume of soil after solidification is 22,000 cubic yards. The resulting mound would be about 20 feet high. DOE has stated in prior documents that this may be used as a parking lot. A layer such as asphalt would be placed over the top, and cobbles would be placed around the sides. This plan may not actually contain the contaminants over time. The cars and people walking around on top could spread contamination. The burrowing owls and other wildlife may also be exposed over time.*

Response to Form Letter comment #6: Please see the response to Tri-Valley CAREs comment #5B.

Form Letter comment #7: *The cleanup plan fails to adequately consider the radioactive contamination at the Building 850 Firing Table. For example, radioactive tritium samples found in boreholes around Building 850 contained concentrations of up to seven million picocuries per liter of tritium in soil moisture. The radioactive contamination should be considered in the cleanup remedy.*

Response to Form Letter comment #7: Please see the response to Tri-Valley CAREs comment #7.

A-1.3. Written comments submitted to the Department of Energy by Trish Kaspar — 234 Elm St., San Mateo, California

Ms. Kaspar comment #1: *I favor Alternative 3.*

Response to Ms. Kaspar comment #1: DOE and the regulatory agencies have selected Alternative 3, soil excavation and solidification, as the remedy for the Building 850 soil.

A-1.4. Written comments submitted to the Department of Energy by David Lee — 1706 Wall St., Tracy, California

Mr. Lee comment #1: *I would like to see Alternative 3 implemented as a safer method of disposal of contaminated soil. I don't want the transportation of the contaminated soil elsewhere in fear of spreading it further. The sooner the job can be completed, the safer the communities will be.*

Response to Mr. Lee comment #1: DOE and the regulatory agencies have selected Alternative 3, soil excavation and solidification, as the remedy for the Building 850 soil. The remedy is scheduled to begin implementation in 2008 with completion in 2009.

A-1.5. Written comments submitted to the Department of Energy by Glenn S. Fuller — 2365 Pine Knoll Dr., #7, Walnut Creek, California

Mr. Fuller comment #1: *I vote for number 3 if it truly protects humans and the environment. I am against nuclear energy and feel it is unsafe for workers and the community, plus being a constant incentive for other nations to compete with us. I would close the*

Livermore, Las Alamos, and other labs and encourage all nations that have them to give them up or if they do not have them to not get them. They are terribly expensive.

Response to Mr. Fuller comment #1: DOE and the regulatory agencies have selected Alternative 3, soil excavation and solidification, as the remedy for the Building 850 soil. It is protective of human health and the environment because when the soil is solidified, it can no longer be inhaled or ingested and it cannot migrate in the environment.

DOE is currently reevaluating its weapons program, referred to as the Nuclear Weapons Complex Transformation and is proposing reducing these activities at LLNL. Additional information on the Nuclear Weapons Complex Transformation can be found on the website www.nnsa.doe.gov/complextransformation.htm.

A-1.6. Written comments submitted to the Department of Energy by Beatrice Eisman — 158 Valley St. San Francisco, California

Ms. Eisman comment #1: *I believe Site 300 must be cleaned up and checked in the future. But I object to the plan for new U.S. nuclear weapons. I want the U.S. to fully comply with the non-proliferation treaty and use our funds for civilian scientific missions at the Livermore Lab.*

Response to Ms. Eisman comment #1: While it is a long, difficult, and time-consuming process to investigate and characterize site contamination, and evaluate, select, and implement cleanup technologies for a large site such as Site 300, we would like to assure you that much has already been done to clean up contamination at Site 300. Since contamination was first discovered in the early 1980s, DOE has been working with Federal and State regulatory agencies to implement an environmental restoration program to clean up soil and ground water contamination at Site 300. Cleanup activities at Site 300 were initiated in the mid-1980s to begin addressing contamination and have included:

- Installing over 21 remediation systems to extract and treat contaminated ground water and soil vapor.
- Removing contaminated soil.
- Capping and closing landfills, rinsewater lagoons and burn pits.
- Removing contaminated firing table gravels.

Through these efforts, considerable progress has been made in cleaning up the site. One ground water contaminant plume has already been fully remediated. Contaminant concentrations in both soil and ground water have been significantly reduced throughout the site. The cleanup effort at Site 300 will continue until cleanup standards are met.

DOE is currently reevaluating its weapons program, referred to as the Nuclear Weapons Complex Transformation and is proposing reducing these activities at LLNL. Additional information on the Nuclear Weapons Complex Transformation can be found on the website www.nnsa.doe.gov/complextransformation.htm.

A-1.7. Written comments submitted to the Department of Energy by Gloria Kershner — 305 W. Main St. Apt. 203, Grass Valley, California

Ms. Kershner comment #1: *When I spill something I clean it up. But to purposely do something which you know will contaminate a large area with toxic waste which would then need to be cleaned up I am unable to understand. However since the mess has already been*

created, I think alternative 3 would be the preferred method for removal of the contaminated soil.

Response to Ms. Kershner comment #1: DOE and the regulatory agencies have selected Alternative 3, soil excavation and solidification, as the remedy for the Building 850 soil.

LLNL was established in 1952 to help ensure national security through the design, development, and stewardship of nuclear weapons. When the PCB-contamination of the Building 850 Firing Table area soil occurred in the 1960s, the dangers associated with many chemicals were not yet known and there were no regulations governing PCB use. DOE did not purposefully contaminate the hillside with PCBs. PCBs are not used in experiments any longer.

A-1.8. Written comments submitted to the Department of Energy by Dolores Rodriguez — 5917 Arlington Blvd., Richmond, California

Ms. Rodriguiz comment #1: *I am concerned that there may be an underestimation of soil contamination; Firing Tables 801, 802, 845, and 851 need to be reviewed.*

- *There should be info. on the source of dioxins and furans found.*
- *Residential standards (not industrial) should be applied to Site 300.*
- *Using covered area as a parking lot could hasten cracks, erosion.*
- *Could you provide back-up info. on durability of sealing products over, and what thickness is optimal?*
- *Containment of tritium should be addressed.*

Your presentation of the information is very readable and clear. Thank you for breaking down a technical subject into understandable form.

Response to Ms. Rodriguiz comment #1: Thank you for the compliment. Your comments are similar to the written comments from Peter Strauss and Marylia Kelley on behalf of Tri-Valley CAREs. Please see responses to Tri-Valley CAREs comments #2, through #5, and #7.

A-1.9. Written comments submitted to the Department of Energy by Emma Sarvey — 30,000-94 Kasson Rd., Tracy, California

Ms. Sarvey comment #1: *I believe you should remove the contaminated soil and do not take any action that could cause this problem again. If you take half measures that do not work you have wasted more money and possibly give the public false information.*

Response to Ms. Sarvey comment #1: DOE and the regulatory agencies have selected Alternative 3, soil excavation and solidification, as the remedy for the Building 850 soil. This remedy will remove the contaminated soil from the hillsides and render it inert and harmless to human health and the environment. When the PCB-contamination of the Building 850 Firing Table area soil occurred in the 1960s, the dangers associated with many chemicals were not yet known and there were no regulations governing PCB use. DOE did not purposefully contaminate the hillside with PCBs. PCBs are not used in experiments any longer. Soil solidification is a proven method of treatment of contaminated soil and has been used at other sites around the country such as, the Former Rockwell International Corporation Superfund Site, Allegan, Michigan (2001-2006), Lakeside Refinery Site Kalamazoo, Michigan (1999), and Riverside Ravine Site, Memphis, Tennessee (2007).

A-1.10. Written comments submitted to the Department of Energy by Robert Sarvey — 501 W. Grantline Rd., Tracy, California

Mr. Sarvey comment #1: *I request that you remove the soil from the site and take it to a proper disposal site. Keeping the contaminated debris on site is unacceptable.*

Response to Mr. Sarvey comment #1: DOE and the regulatory agencies have selected Alternative 3, excavation and on-site solidification and consolidation as the remedy for the Building 850 soil contamination because it is as protective of the public and environment as off-site disposal while being half the cost. The solidification technology would encapsulate the PCB-, dioxin-, and furan-contaminated particles in a concrete-like matrix that would render them unavailable for onsite worker exposure through the dermal contact or inhalation of resuspended particulate pathways, and ecological receptor exposure through inhalation or ingestion pathways. Onsite consolidation also does not present the risks associated with transportation of the contaminated soil, upwards of 200 trucks, to the disposal location in Utah.

Mr. Sarvey comment #2: *The DOE and all other Federal Agencies should abandon outdoor detonation of explosives at Site 300. The current contamination is proof positive that blasting activities have contaminated the firing table and the surrounding area.*

Response to Mr. Sarvey comment #2: The PCB-contamination of the Building 850 Firing Table area soil occurred in the 1960s, prior to the regulation of these chemicals. PCBs are not used in experiments any longer. However, DOE is currently reevaluating its weapons program, referred to as the Nuclear Weapons Complex Transformation and is proposing reducing these activities at LLNL. Additional information on the Nuclear Weapons Complex Transformation can be found on the website www.nnsa.doe.gov/complextransformation.htm. Please also see the response to Form Letter comment #1.

Mr. Sarvey comment #3: *The University of California must terminate their permit for increased explosives testing with the San Joaquin Valley Air district. The City of Tracy is rapidly encroaching on Site 300 and the application calls for increasing bomb yields from 100 pounds per blast to 350 pounds per blast. The California Environmental Quality Act does not allow these types of activities that damage the environment and are a public nuisance. The very fact that you now need to exhume contamination around the firing tables is fatal to any argument that these blast do not harm the environment.*

Response to Mr. Sarvey comment #3: The status of the air permit is being reviewed while DOE is reviewing ongoing explosive testing at Site 300. DOE is proposing ceasing all outdoor and indoor explosive testing at Site 300 by 2009 and 2015, respectively, however, DOE is still evaluating whether the permit may be necessary for testing performed by non-DOE entities (Work For Others). As mention in the above response, the PCB-contamination of the Building 850 Firing Table area soil occurred in the 1960s, prior to the regulation of these chemicals. PCBs are not used in experiments any longer. Please also see the response to Form Letter comment #1.

Mr. Sarvey comment #4: *The DOE needs to fully fund all cleanup activities at Site 300 as the yearly fight to get adequate funding for cleanup is unfair to the communities that have been the host to this Site for over 60 years.*

Response to Mr. Sarvey comment #4: Site 300 was established in 1955 for explosives testing. In October 1955 the first outdoor explosives test was conducted at Building 801. DOE has been funding Site 300 cleanup activities since the mid-1980s. DOE submits annual funding

requests to Congress for the cleanup of the LLNL Livermore Site and Site 300. The funding requests for the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) cleanup effort submitted to Congress are separate from funding requests made for other activities conducted at LLNL. The funding requests are based on cleanup commitments and regulatory deliverables agreed upon with the regulatory agencies and contained in the Federal Facility Agreement, the Records of Decision, and other CERCLA cleanup documents. Actual funding levels received for DOE site cleanup, which do not always match the funding requests, are based on decisions made and allocated at the Congressional level based on national priorities, not at the local DOE office level.

Mr. Sarvey comment #5: *The complex transformation proposal recognizes that Site 300's activities are no longer compatible with the encroaching urban environment. Pleas discontinue your blasting operation immediately.*

Response to Mr. Sarvey comment #5: Please see the response to Mr. Sarvey comment #2.

Mr. Sarvey comment #6: *Much of the contamination that is being removed is being scrapped from the surrounding hillsides this is evidence that the contamination from this and other firing tables is far more widespread than previously admitted. Further characterization is necessary to eliminate the possibility of contamination has already spread outside the borders of Site 300.*

Response to Mr. Sarvey comment #6: Please see the response to Tri-Valley CAREs comment #2.

Mr. Sarvey comment #7: *A human health risk assessment of the removal of these contaminates on site 300 workers should be performed.*

Response to Mr. Sarvey comment #7: A human health baseline risk assessment was performed for the soil contamination and reported in the Site-Wide Feasibility Report (1999). An estimated excess cancer risk of 5×10^{-4} to onsite workers resulting from the potential inhalation or ingestion of re-suspended particulates and direct dermal exposure to surface soil contaminated with PCBs at the Building 850 Firing Table was calculated. In addition, a risk of 1×10^{-4} was calculated for potential inhalation/ingestion of re-suspended particulates and direct dermal exposure to surface soil contaminated with dioxins and furans. It is because of the risk to onsite workers, and potential impacts to ecological receptors, that the contaminated soil will be excavated and solidified and consolidated onsite. Workers performing this remedial action will wear Personal Protective Equipment to prevent exposure to the contaminants during excavation and construction of the consolidation area. In addition, a Health Physicist and Industrial Hygienist will monitor the working environment.

A-1.11. Written comments submitted to the Department of Energy by Pamela Richard — 4382 Fitzwilliam St., Dublin, California

Ms. Richard comment #1: *From the alternatives you have proposed, there is no actual clean-up or detoxifying of the soil at Site 300. None of them are acceptable, they don't leave the land uncontaminated.*

Response to Ms. Richard comment #1: DOE and the regulatory agencies have selected Alternative 3, excavation and on-site solidification and consolidation as the remedy for the Building 850 soil contamination because it is as protective of the public and environment as off-site disposal while being half the cost. The solidification technology would encapsulate the PCB-, dioxin-, and furan-contaminated particles in a concrete-like matrix that would render them

unavailable for onsite worker exposure through the dermal contact or inhalation of resuspended particulate pathways, and ecological receptor exposure through inhalation or ingestion pathways. Onsite consolidation also does not present the risks associated with transportation of the contaminated soil, upwards of 200 trucks, to the disposal location in Utah.

Ms. Richard comment #2: *You need to stop exploding these dangerous substances, the poisons from them are now in our air and water too. I am afraid when I take my grandchildren to play at the parks in the area.*

Response to Ms. Richard comment #2: Please see the response to Form Letter comment #1 for a discussion of DOE's future plans for Site 300's firing tables. The Agency for Toxic Substances and Disease Registry conducted an independent health assessment of Site 300 contamination in 2005 that concluded that there are no past or current exposures to contaminants associated with LLNL – Site 300, and the potential for future exposure is unlikely. This report is available online at www-envirinfo.llnl.gov/.

Ms. Richard comment #3: *Why haven't you tested for radioactive contamination too?*

Response to Ms. Richard comment #3: DOE has tested for radioactivity as part of the environmental restoration activities at Building 850. As discussed in the response to Tri-Valley CAREs comment #7, the Building 850 soil removal action addresses PCB-, dioxin-, and furan-contamination in surface soil in the vicinity of the firing table. The objective of the EE/CA is to present and evaluate remedial alternatives for the PCBs, dioxins, and furans in Building 850 surface soil. Various metals (beryllium, cadmium, and copper), High Melting Explosive (HMX), and depleted uranium (primarily uranium-238) were also detected in shallow soil at the Building 850 Firing Table. However, the Site-Wide Feasibility Study risk assessment and modeling determined that these constituents did not pose a risk to human or ecological receptors, or a threat to ground water. In addition, concentrations of these constituents are all below U.S. EPA Region 9 industrial soil Preliminary Remediation Goals (PRGs). Therefore, the remediation of metals, HMX, and depleted uranium in soil is not an objective of this proposed removal action. However, the implemented design of the removal action will also isolate these constituents from potential human and ecological receptors.

A-1.12. Written comments submitted to the Department of Energy by Martha Priebat — 3375 Norton Way, Pleasanton, California

Ms. Priebat comment #1: *It is very clear that the contamination at Bldg 850 must be cleaned up. Considering the relative cost of alternatives 2 and 3, #3 is much preferred. Any future use of this area must include consideration of damage to the protective barrier. Thus any use of this area for storage of heavy vehicles or use as a firing table must be avoided.*

Response to Ms. Priebat comment #1: DOE and the regulatory agencies have selected Alternative 3, soil excavation and solidification, as the remedy for the Building 850 soil.

As discussed in the response to Tri-Valley CAREs comment #5B, the unconfined compressive strength of the solidified soil, as tested and presented in the EE/CA document, can withstand the weight of heavy vehicles. The soil solidification technology has been successfully used at many sites across the U.S. to mitigate soil contamination; in many cases parking lots have been placed on top of the solidified soil to return the land to productive uses.

A-1.13. Written comments submitted to the Department of Energy by Janis Turner — 749 Hazel St., Livermore, California

Ms. Turner comment #1: *I support alternative #3, to excavate all contaminated soil and solidify/consolidate onsite. I request more information about the tritium found in boreholes – how will it be contained during excavation and transport operations? I request a plan for long-term monitoring of solidified soil.*

Response to Ms. Turner comment #1: DOE and the regulatory agencies have selected Alternative 3, soil excavation and solidification, as the remedy for the Building 850 soil.

Please see the response to Tri-Valley CAREs comment #7 for more information on tritium in the Building 850 area. Tritium has not been detected in surface soil at Building 850 and therefore does not pose a risk to human or ecological receptors, therefore it will not present a risk during excavation and transport operations.

Please see the response to Tri-Valley CAREs comment #5E for information on the inspection and maintenance plan for the solidified soils.

A-1.14. Written comments submitted to the Department of Energy by Mildred Livingston — 11251 Tahoe St., Auburn, California

Ms. Livingston comment #1: *I urge support of Alternative 3; Excavation and onsite solidification and consolidation.*

Response to Ms. Turner comment #1: DOE and the regulatory agencies have selected Alternative 3, soil excavation and solidification, as the remedy for the Building 850 soil.

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