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UCRL-AR-123370

Contingency Plan for the Lawrence Livermore National Laboratory Livermore Site

Technical Editors

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Summary

Lawrence Livermore National Laboratory (LLNL) and the U.S. Department of Energy (DOE) are currently designing and operating remediation systems to remove contaminants, including volatile organic compounds, fuel hydrocarbons and metals, from both ground water and sediments beneath the LLNL Livermore Site. This Contingency Plan describes how DOE/LLNL and the regulatory agencies plan to address foreseeable problems that may arise during the remediation of sediments and ground water at the Livermore Site. This document also describes plans for modifying remediation systems as the site cleanup progresses and additional information is collected.

As described in the Remedial Action Implementation Plan (Dresen et al., 1993), this Contingency Plan is one of the final post-Record of Decision documents for the Livermore Site. There are no Contingency Plan CERCLA guidance documents; thus, the scope and content of this report were determined by DOE, LLNL, and the regulatory agencies with input from the community.

Potential contingencies are presented in Section 2 and are divided into technical and logistical contingencies. Technical contingencies are related to the physical remediation of both ground water and sediments at the Livermore Site. These include incomplete hydraulic containment of the contaminant plumes, unanticipated increases in contaminant concentrations, and the effects of ground water remediation on neighboring plumes. Possible responses to these contingencies include adjusting ground water extraction flow rates, reinjecting treated ground water, or adding additional extraction wells.

Other technical contingencies include the development of innovative remedial technologies and uncontrollable events such as earthquakes or storm-related damage. If these affect implementation or operation of Livermore Site remediation systems, the systems will be modified, replaced, or decommissioned.

To better understand the dominant fate and transport processes that are occurring beneath the Livermore Site, LLNL has developed both ground water and soil vapor models. To practically apply these models, many simplifying assumptions were necessary. The results of the modeling efforts have been used to plan and design remediation systems, and the models are continuously updated with new data. If, during remediation, it becomes apparent that some of these assumptions are not valid, DOE/LLNL will re-evaluate the model and modify the remediation systems, if necessary.

Logistical contingencies include changes in personnel, funding, regulations, and/or the mission and operation of LLNL. If these significantly affect the remediation effort, they will be evaluated when they occur. Development of any response to a technical or logistical contingency will involve both the regulatory agencies and the community.

A summary of potential contingencies and responses is presented in Table SUMM-1.

Table SUMM-1. Summary of contingencies and potential responses.

Contingency	Response
Technical	
Insufficient hydraulic containment.	**Adjust extraction flow rates and/or number/location of extraction wells.**
Ground water containing tritium not hydraulically contained or isolated.	**Adjust extraction flow rates, employ ground water reinjection to create a hydraulic barrier, install other ground water barriers (e.g., slurry walls), and/or apply innovative technologies.**
Increasing chemical concentration.	**Adjust extraction flow rates and/or number/location of wells. Conduct additional source investigations, if necessary.**
Model validation suggests remedial plan modification(s). Chemical mass removal rate less than expected removal rate.	**Modify treatment facilities and/or expand remedial wellfield(s). Use alternate remedial strategies or new technologies, if feasible.**
Model assumptions not valid.	**Update model and re-evaluate remedial plan.**
Remedial action affects non-LLNL, offsite plume(s).	**Adjust extraction flow rates, employ ground water barriers (e.g., reinjection, slurry walls), and/or apply innovative technologies.**
Improved technologies are developed.	**Conduct cost-benefit analysis and employ economical- and technology-based actions that are acceptable.**
Chemicals in vadose zone impact ground water.	**If vadose zone cleanup is in progress, modify remediation system, if possible. If no vadose zone remediation in progress, conduct source investigation and/or implement remedial action, if necessary.**
Additional contaminant sources discovered.	**Conduct source investigations where necessary to assess extent of contamination. If ground water is impacted, develop a remedial action plan. If ground water is not impacted, conduct transport modeling to evaluate need for vadose zone remediation.**
Uncontrollable events impact monitoring and/or remediation efforts.	**Assess damage to infrastructure and, if appropriate, modify, replace, or decommission monitoring and/or remediation system(s).**
Logistical	
Personnel changes.	**A phase-in/phase-out period will be employed, if appropriate, to ensure smooth transitions during personnel changes. Review project documentation at transitions and learn current positions on site-related issues that have major impacts.**
Insufficient funding affects planned remediation.	**Established Livermore Site remediation priority list will be followed. If necessary, milestone dates will be revised through coordination with the regulatory agencies.**
Regulations change.	**DOE/LLNL, regulators, and the community will be included in the process to determine if and how regulatory changes affect the Livermore Site cleanup.**
Land/ground water use and demand affect monitoring/remediation.	**Alter the remedial pumping scheme, and/or negotiate with land owners.**
Changes to the mission and operation of LLNL.	**Future mission and operation of LLNL will include Comprehensive Environmental Response, Compensation, and Liability Act compliance and cleanup implementation as specified in the Federal Facility Agreement and Record of Decision documents.**

1. Introduction

This Contingency Plan (CP) for the Lawrence Livermore National Laboratory (LLNL) Livermore Site was prepared to comply with requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986. This CP describes how the U.S. Department of Energy (DOE), LLNL, and the regulatory agencies plan to address foreseeable problems that may arise during the remediation of sediments and ground water at the Livermore Site. This document also generally describes plans for modifying remediation systems as the site cleanup progresses and additional information is collected.

This document was prepared by LLNL for DOE with oversight from the U.S. Environmental Protection Agency (EPA), the California Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board (RWQCB)–San Francisco Bay Region. No CERCLA CP guidance documents are currently available; hence, the scope of this report is based on input provided by DTSC (1993) and subsequent discussions with DTSC, EPA, RWQCB, and the community.

The site history is briefly summarized below. Potential contingencies are presented in Section 2 and are divided into technical and logistical issues. Technical issues are related to the physical remediation of both ground water and sediments at the Livermore Site. Logistical contingencies include regulatory, planning, and personnel issues.

1.1. Background

The LLNL Livermore Site is located about 40 miles east of San Francisco, California (Fig. 1). During the 1940s, the site was occupied by the U.S. Navy and was used as the Livermore Naval Air Station. During that time and subsequently, releases of hazardous materials, including volatile organic compounds (VOCs), fuel hydrocarbons, metals, and radionuclides occurred. Some of these releases have impacted sediments onsite and ground water onsite and offsite. Current practices at the Livermore Site are intended to ensure that no additional hazardous materials are released to the environment.

A more detailed description of the subsurface distribution of these materials is presented in the Remedial Investigation (RI) Report for the Livermore Site (Thorpe et al., 1990). The Applicable or Relevant and Appropriate Requirements for cleanup of the Livermore Site are described in the Feasibility Study (FS) (Isherwood et al., 1990a) and the Record of Decision (ROD) (U.S. DOE, 1992).

In 1987, the Livermore Site was placed on the EPA's National Priorities List. Since that time, LLNL has prepared the following CERCLA reports: the RI, the FS, the ROD, the Remedial Action Implementation Plan (RAIP) (Dresen et al., 1993), five Remedial Design (RD) Reports (Boegel et al., 1993; Berg et al., 1993; Berg et al., 1994a; Berg et al., 1994b; and Berg et al., 1995), and the Compliance Monitoring Plan (CMP) (Nichols et al., 1996).

As described in the RAIP, this CP is one of the final CERCLA-required post-ROD documents for the Livermore Site. The final post-ROD document, RD Report No. 4, is currently being prepared and is scheduled for issuance in 1998. The first Five-Year Review under CERCLA will be submitted in 1997.

2. Potential Contingencies

Technical and logistical contingencies that might affect the planned remediation of the Livermore Site are discussed in this section. Technical contingencies are related to the physical remediation of both ground water and sediments at the site. Logistical contingencies include regulatory, planning, and personnel issues.

2.1. Technical Contingencies

Potential technical contingencies that may arise during the remediation of sediments and ground water at the Livermore Site, and a discussion of uncontrollable events, such as natural disasters, are presented below. DOE/LLNL's planned response is described with each issue.

2.1.1. Ground Water Remediation

As described in both the ROD (U.S. DOE, 1992) and RAIP (Dresen et al., 1993), DOE/LLNL are extracting ground water to remove and hydraulically control contaminated ground water beneath the Livermore Site and areas where contaminated ground water has migrated offsite. Ground water modeling and extensive hydraulic tests have been conducted to understand the ground water flow system beneath the site. However, there are uncertainties regarding the effectiveness of any ground water extraction and treatment system, as discussed below.

2.1.1.1. Hydraulic Control of Plumes

As discussed in the CMP (Nichols et al., 1996), the effectiveness of the Livermore Site ground water extraction and treatment facilities will be determined by measuring ground water elevations in extraction wells and surrounding monitor wells and measuring chemical concentrations in ground water extracted from these wells. A list of the wells in each treatment facility area and their respective sampling frequencies are presented in the RD reports. Details of the ground water monitoring program are discussed in the CMP.

Ground water elevation contour maps showing the estimated hydraulic capture area of each extraction well are constructed at least quarterly. In conjunction with models and isoconcentration contour maps that show the distribution of contaminants in each hydrostratigraphic unit (HSU), these estimated capture areas are used to determine whether the plumes are being successfully contained. HSUs and their use in monitoring, mitigating, and evaluating the distribution of contaminants in soil and ground water beneath the Livermore Site are discussed in Berg et al. (1994a) and Blake et al. (1996).

If ground water elevation contour maps from two consecutive quarters indicate insufficient plume hydraulic capture in a particular HSU, the flow rates of nearby extraction wells will be adjusted to increase the overall hydraulic capture area and/or eliminate stagnation zones within that HSU. If monitoring for an additional two consecutive quarters indicates inadequate plume capture, DOE/LLNL will modify the remedial strategies (e.g., increase treatment facility capacity, expand the remedial wellfield by constructing new pipelines, or locate portable treatment units [PTUs] at new extraction locations). The regulatory agencies will be informed of any problems and potential modifications to the remedial system at Livermore Site Remedial Project Manager (RPM) meetings.

Previous investigations have identified the Building 292 (B-292) and Trailer 5475 (T-5475) areas (Fig. 2) as locations where tritium concentrations in ground water are elevated (Isherwood et al., 1990a). As described in RD Report No. 2 (Berg et al., 1993), eight monitor wells are used to monitor tritium movement beneath the B-292 area. Similarly, the forthcoming RD Report No. 4 will identify wells for monitoring the tritium plume beneath the T-5475 area as future ground water extraction occurs in downgradient Treatment Facility E (TFE) extraction wells (Fig. 2). In addition, the impact of nearby extraction on ground water containing tritium will continue to be evaluated by examining the estimated hydraulic capture areas as described above.

If ground water monitoring indicates that tritium concentrations are increasing in wells downgradient from known source areas, DOE/LLNL will inform and consult with the regulatory agencies. Tritium migration will be considered significant if tritium concentrations increase for two consecutive quarters above the Maximum Contaminant Level (MCL), which is currently 20,000 picocuries per liter. Further study will determine if a response is warranted. The initial response to remediation-induced tritium migration would be to stop or limit ground water extraction in the areas adversely affecting the tritium plume. Other methods of isolating the tritium plume from nearby ground water remediation may include, but are not limited to, ground water reinjection and/or the creation of physical ground water barriers such as slurry walls. If these or similar methods are not feasible, DOE/LLNL will review innovative technologies that could be used to isolate the tritium plume. Changes to the remedial system will be made only with regulatory concurrence and after community concerns are reviewed.

2.1.1.2. Increases in Chemical Concentrations in Ground Water

Ground water chemistry data are inherently variable. Concentration fluctuations over time occur in response to climatic changes (variable precipitation and infiltration rates), changes within the aquifer (variable hydraulic gradients, water levels, sorption/desorption, and contaminant transport rates in response to onsite and offsite ground water extraction), and changes in conditions unrelated to the site environment (minor variations inherent in analytic methods and analytical laboratory procedures). Therefore, not all fluctuations in contaminant concentration necessitate extraction well/treatment facility modification.

As described in the CMP, LLNL uses a cost-effective sampling (CES) algorithm to quantitatively analyze trends and variability of chemical concentrations, and to estimate the most cost-effective sampling schedule for ground water monitoring. The CES algorithm evaluates trends, variability, and toxicity characteristics for the chemicals in each well (Johnson et al., 1995). Currently, each LLNL well is sampled annually, semiannually, or quarterly. If the chemical concentration in a well increases, and results from the CES algorithm indicate that the sampling frequency should increase (e.g., from semiannually to quarterly), then the concentration increase is considered consistent and significant. If the well is already being sampled quarterly, then the least-squares regression trend index used in the CES algorithm will be examined to determine if the increase is significant.

If ground water contaminant concentrations above MCLs are increasing in a consistent and significant manner as defined above, the need for a remedial response will be considered. If possible, extraction rates will be adjusted to obtain better hydraulic control of the contaminant plume. However, if adjusting the flow rate(s) does not effectively improve hydraulic control of the plume, DOE/LLNL will modify the remedial strategies (e.g., increase treatment facility capacity, expand the remedial wellfield, or place PTUs in strategic locations).

If contaminant concentrations increase in areas outside of active remediation, DOE/LLNL will conduct additional field investigations, if warranted. Based on these investigations, the need for additional remedial actions will be evaluated in consultation with the regulatory agencies.

2.1.1.3. Ground Water Modeling

To monitor progress of the cleanup, the amount of contaminant mass removed from ground water will be compared to Livermore Site fate and transport modeling results. Uncertainties exist in all modeling results. At the Livermore Site, these are directly related to uncertainties in the estimated amount of contaminant mass beneath the site. Therefore, as discussed in the CMP, the amount of contaminant mass remaining in the subsurface will be revised during remediation using site-specific chemical data. In addition, DOE/LLNL will also examine the mass removal rates of treatment facilities and evaluate if contaminants are effectively being removed using the selected remedial alternative.

If results of these analyses indicate that the selected remedial alternative is not effectively removing contaminant mass, the following options will be considered:

- Modifying or expanding the existing treatment facilities and remedial wellfields,
- Placing PTUs in strategic locations,
- Using alternative cleanup strategies, or
- Renegotiating ground water cleanup objectives with the regulatory agencies.

Similarly, additional data collected during remediation are used to validate and adjust the fate and transport model. When site-specific data indicate that the model assumptions are no longer valid, both the conceptual model and calibrations are updated. In turn, simulations are conducted to ensure that model results are representative of field observations. As described in the CMP, if the updated model results suggest that changes to the remediation strategy are necessary, DOE/LLNL will consult the regulatory agencies. Remediation strategy changes will be made only with regulatory concurrence and after community concerns are reviewed.

2.1.1.4. Neighboring Plumes

As discussed in Iovenitti et al. (1991), ground water northwest of LLNL in the vicinity of Vasco Road and Patterson Pass Road (Fig. 2) contains VOCs from a source off DOE property. These VOCs are not the result of any DOE-related activities, and DOE is not responsible for their cleanup. Although modeling results suggest that ground water extraction near Treatment Facility C (TFC) should not affect this offsite plume (Tompson et al., 1995; U.S. DOE, 1992), monitor wells in this area will be sampled to monitor changes in VOC concentrations and distribution (Nichols et al., 1996; Berg et al., 1993). In addition, the hydraulic capture areas of TFC ground water extraction wells will be estimated using measured ground water elevations, as described above in Section 2.1.1.1.

If these observations indicate that the offsite plume northwest of the Livermore Site is adversely affected by LLNL ground water remediation, certain extraction wells may be shut down or their flow rates adjusted to mitigate the adverse effect. If cleanup goals cannot be met with reduced pumping rates, then additional actions will be considered. Methods to counteract the effects of LLNL ground water extraction on the offsite plume include, but are not limited to, the use of injection wells and/or physical barriers, such as slurry walls. Future innovative technologies may also replace or be used in combination with the existing ground water extraction system.

2.1.1.5. New Technologies

New technologies and remediation techniques for ground water cleanup are being proposed by various entities, including DOE/LLNL. While many of these techniques and technologies may not be economically feasible, it is possible that a rapid and cost-effective cleanup strategy may be developed that could potentially reduce cleanup time or residual contaminant concentrations. If a new technology is proven to be effective in laboratory and field studies, and is cost effective, DOE/LLNL will seek regulatory approval to implement such technologies. The community will be informed of any change in technology and their concerns will be reviewed.

2.1.2. Source Remediation

As discussed in the ROD (U.S. DOE, 1992), LLNL will use vapor extraction to remove soil vapor containing VOCs from unsaturated sediments (the vadose zone) in select locations beneath the Livermore Site. VOCs in soil vapor will be treated at aboveground treatment facilities unless new, cost-effective technologies are developed that will provide *in situ* treatment. Soil vapor extraction will be used only in source areas where modeling results indicate that volatile contaminants, if not removed, would migrate downward and impact ground water in concentrations above MCLs.

As discussed in the CMP, data from ongoing field monitoring and periodic model recalibration will be used to estimate when vadose zone remediation will be considered complete. The following sections describe possible source remediation issues and planned responses in the event that known or undiscovered vadose zone sources unexpectedly impact ground water beneath the Livermore Site.

2.1.2.1. Known Sources

As described in the RAIP (Dresen et al., 1993), known vadose zone VOC source areas that require remediation include the T-5475 and Building 518 (B-518) areas (Fig. 2). VOCs also exist in the vadose zone near Building 511 (B-511) (Fig. 2); however, modeling results indicate that this source should not impact ground water above MCLs (Isherwood et al., 1990a). Tritium also exists in concentrations above background levels in unsaturated sediment near T-5475; B-292; Building 514; Building 419; and the West Traffic Circle, Old Salvage Yard, and Eastern Landing Mat Storage Areas (Isherwood et al., 1990b; Macdonald et al., 1991; Dresen et al., 1993; McConachie and Brown, 1996).

To ensure that contaminants in unsaturated sediment are not adversely impacting ground water beneath the Livermore Site, LLNL will continue to monitor ground water as remediation progresses. If ground water monitoring data indicate that vadose zone contaminants are impacting ground water above MCLs, as defined in Section 2.1.1.2, additional remedial actions will be evaluated and discussed with the regulatory agencies.

If monitoring indicates that ground water is being impacted in concentrations above MCLs beneath a known source area undergoing active vadose zone remediation, operation of the remedial system will be modified to increase the VOC mass removal rate and the extent of pressure influence, if possible. If monitoring results indicate continued significant ground water impact, as defined in Section 2.1.1.2, or if the system cannot be modified, additional measures such as installation of additional soil vapor or ground water extraction wells will be evaluated with regulatory oversight.

If monitoring indicates that vadose zone contaminants may be impacting ground water in a source area where no vadose zone remediation is occurring nor is planned, additional investigations will be considered. The need for supplemental remedial actions will be evaluated with regulatory oversight and with public notification.

2.1.2.2. Vadose Zone Modeling

Results from a quantitative, semi-analytical analysis of the B-511 and B-518 areas indicate that VOCs may impact ground water in concentrations above MCLs in the B-518 area only (Isherwood et al., 1990a). Results from a subsequent, two-dimensional numerical model of the B-518 area confirmed the results of the semi-analytical analysis. The numerical model was also used to evaluate the efficiency of the vapor extraction system operating at B-518 (TF518; Fig. 2), and to estimate cleanup times (Berg et al., 1994b; Vogele and Nitao, 1996).

The primary uncertainties in both the semi-analytical and numerical models are related to the assumptions made regarding physical soil properties, source VOC concentrations, and environmental factors such as precipitation and recharge patterns. The models were calibrated by adjusting these parameters until site-specific field measurements were reproduced. Calibration is an ongoing process, and the numerical model will be updated and recalibrated as new site-specific field data become available. Should future field measurements indicate that VOCs in unsaturated sediments are migrating to ground water in areas other than the B-518 area, a more detailed analysis of migration processes, followed by implementation of the appropriate source remediation measures, will be evaluated.

In the B-518 area, VOCs in both soil vapor and ground water will be monitored throughout the remediation process (Berg et al., 1994b). Modeling results will be compared to field measurements and the model will be updated and recalibrated using the new data (Nichols et al., 1996). If the updated model results indicate that existing vadose zone conditions are not protective of ground water, DOE/LLNL will continue to operate the soil vapor extraction system and/or make necessary modifications to the system until vadose zone cleanup is complete.

2.1.2.3. New Sources

As discussed in Section 2.1.1.2, previously undetected contaminant sources resulting from past releases of hazardous materials may be identified by increasing contaminant concentrations in ground water. If ground water contaminant concentrations increase for three consecutive quarters in an area with little or no previous vadose zone characterization, DOE/LLNL will assess the need to investigate for a previously undetected source. Most documented past releases have already been identified (Thorpe et al., 1990); hence, an extensive document review will likely not be needed. New contaminant sources from recent releases will be identified by notification from the LLNL department documenting the release. Following initial health and safety assessment by the LLNL Hazards Control Department, samples will be collected to delineate the lateral extent and depth of contamination and if the release is of sufficient quantity to potentially affect ground water quality.

Previously undetected sources may also be identified by high concentrations of contaminants in soil samples collected from boreholes or during preconstruction activities. If source investigation results indicate that a previously undetected contaminant source has impacted ground water in concentrations above MCLs, DOE/LLNL will develop a remedial action plan in consultation with the regulatory agencies. If ground water has not been impacted in concentrations exceeding MCLs, or if contaminants are not detected in the ground water, DOE/LLNL may conduct fate and transport modeling to determine if vadose zone remediation of the potential source is warranted.

2.1.3. Uncontrollable Events

Natural disasters may occur during the LLNL ground water cleanup. Natural disasters may include large magnitude earthquakes, floods, or severe atmospheric storm events that could disrupt monitoring or remedial activities. If significant damage occurs to treatment facilities or remedial wellfields, ground water cleanup in particular areas of LLNL may temporarily cease. DOE/LLNL will then evaluate the damage to the remedial infrastructure, estimate the time and funding needed to return to normal operation, and report to the regulatory agencies. When DOE/LLNL and the regulatory agencies agree it is appropriate, damaged infrastructure will be modified, replaced, or decommissioned.

2.2. Logistical Contingencies

Logistical contingencies include but are not limited to, changes in personnel, funding, regulations, and land/ground water use and demand, as described below.

2.2.1. Personnel

As with any long-term project, personnel changes will occur during the Livermore Site cleanup. Past personnel changes at DOE, LLNL, and regulatory agencies have been accommodated while minimizing adverse impact to the project. RPMs and other knowledgeable staff will continue to assist new personnel to familiarize them with the project. This teamwork approach will be employed for any future RPM or LLNL Environmental Restoration Division (ERD) personnel changes. New personnel can refer to the Livermore Site ROD (U.S. DOE, 1992), RAIP schedule (Dresen et al., 1993), Priority List (Liddle, 1994), the Consensus Statement, and Standard Operating Procedures (Dibley, 1995) as guidance for the approved cleanup plan and schedule.

Changes in LLNL contractors have been successfully implemented in the past (e.g., analytical laboratories), and LLNL procurement practices will continue to enable smooth transitions in the future. If DOE/LLNL believe that an outgoing incumbent contractor can provide valuable knowledge to help ensure a smooth transition, LLNL will request a phase-in/phase-out period to allow the incumbent to work directly with the new contractor for a specified period of time.

2.2.2. Funding

DOE will take all necessary steps to request timely and sufficient funding to meet its obligations under the ROD. The regulatory agencies will be notified at the RPM meetings of any potential budget shortfalls that may affect RAIP deliverables.

If DOE does not have sufficient funding to meet RAIP milestones, DOE will present information showing that the budget approved by Congress for DOE was less than the budget submitted by DOE to the Office of Management and Budget. If mutually agreed by the regulatory agencies that Congressional budget cuts constitute *force majure* as outlined in Article XXIX of the Federal Facility Agreement (FFA), or “good cause” pursuant to FFA Article XIX(B)(6), an extension for RAIP deliverables may be granted. Interested community representatives will be provided an opportunity to provide input to this process.

Any revision of RAIP deliverables will follow the priorities established for site remediation. The current overall priority for remediation of areas of concern at the Livermore Site is: 1) western plume capture, 2) southern plume capture, and 3) internal source control/mass removal. Tasks based on these priorities will be accomplished in an order established by the RPMs, independent of budget. Thus, if project funding is less than projected, tasks will be performed in the same relative order as funding allows, but over a longer period of time. To formalize the priority of these tasks, a Consensus Statement was signed by the RPMs in September 1996 that allows reprioritization of tasks at the request of any of the parties. The Community Work Group will be informed of significant actions and provided an opportunity to remain involved throughout this process.

2.2.3. Regulatory Environment

As discussed in the RD reports and as observed at LLNL treatment facilities, high concentrations of VOCs in ground water decrease rapidly during the first several months or years of remediation. As remediation continues, and VOC mass removal rates decline and VOC concentrations decrease, the configurations of Livermore Site plumes are expected to become fairly stable (Tompson et al., 1995). As a result, the risk to human health and the environment will also decrease. If at that time DOE/LLNL can demonstrate that contaminants in ground water beneath all or portions of the Livermore Site no longer pose a significant threat to human health and the environment, Containment Zone (SWRCB, 1995) or similar policies, if promulgated, may be applied. Similarly, if future remediation technologies do not significantly improve cleanup of dilute contaminant plumes, Technical Impracticability (U.S. EPA, 1993) waiver(s) may be requested for some or all of the site, or cleanup levels may be renegotiated with the regulatory agencies. As described below, changes to remediation plans will be made only with regulatory concurrence.

A ROD change may be necessary if new information affects how the Livermore Site cleanup should be implemented. Following EPA guidelines (U.S. EPA, 1991), the lead agency (EPA) will determine if the proposed ROD change is 1) non-significant or minor, 2) significant, or 3) fundamental. A non-significant change generally reflects modifications to optimize performance and minimize cost. Non-significant changes are recorded in the post-ROD document file. A significant change is generally a change to a component that does not fundamentally alter the overall remedial approach. For a significant change, an Explanation of Significant Differences (ESD) will be prepared, and a brief description and notice of availability of the ESD will be published in a major local newspaper. The ESD will be available to the public through the Administrative Record and information repository. A fundamental change requires reconsideration of the approach selected in the ROD. For a fundamental change, the public participation and documentation procedures include preparing a Proposed Plan, providing a public comment period, and preparing a Responsiveness Summary.

Community recommendations regarding Livermore Site cleanup will be discussed by the regulatory agencies and DOE/LLNL. The regulatory agencies and DOE/LLNL will evaluate community suggestions based on cost and benefit, and will report their findings publicly. As regulations change (e.g., discharge requirements, MCLs, cleanup requirements, etc.), target cleanup levels may increase or decrease accordingly. DOE/LLNL and the regulatory agencies will determine how these changes may affect the cleanup. The community will be informed of any regulatory changes that affect the Livermore Site cleanup.

2.2.4. Land/Ground Water Use and Demand

Increased ground water use near LLNL may be associated with continued population growth and development. If routine monitoring indicates that others may be using contaminated ground water originating from the Livermore Site or if ground water use by others is adversely affecting the cleanup, DOE/LLNL: 1) will notify the EPA, RWQCB, DTSC, and the Alameda County Flood Control and Water Conservation District (Zone 7); 2) will acquire all available information on location, magnitude, and duration of the private ground water use; 3) may conduct modeling to further assess the impact of ground water withdrawal on the cleanup; and 4) will develop a mitigation plan, if necessary. Possible mitigations include altering the remedial pumping scheme, negotiating with land owners, or seeking regulatory intervention.

Future onsite and offsite development may restrict available locations for piezometers, and monitor and extraction wells. Current onsite LLNL planning procedures require thorough environmental review and sampling prior to any significant construction activities, which mitigates the potential for inadvertent development of critical remedial locations.

Offsite land restrictions are expected to have less impact on remedial activities because of the diffuse nature of the offsite ground water plume. In general, modeling results suggest that placing a well within 100 ft of a desired location may be sufficient to monitor the distal portions of the contaminant plume. Thus it is likely that a suitable well location in a city street will be possible. Where proper siting of a well is not possible, alternative locations will be considered.

2.2.5. LLNL Mission and Operation

LLNL's current and future mission and operation will include CERCLA compliance and cleanup implementation as specified in the FFA and ROD. In addition, DOE is committed to honoring its responsibilities for environmental cleanup independent of any possible future decisions regarding the continued existence of LLNL. Recent statements from Congressional representatives and the Administration regarding the importance of the National Laboratories to the nation's continued scientific and defense interests indicate that LLNL will continue to exist at its Livermore Site for the foreseeable future.

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Figures

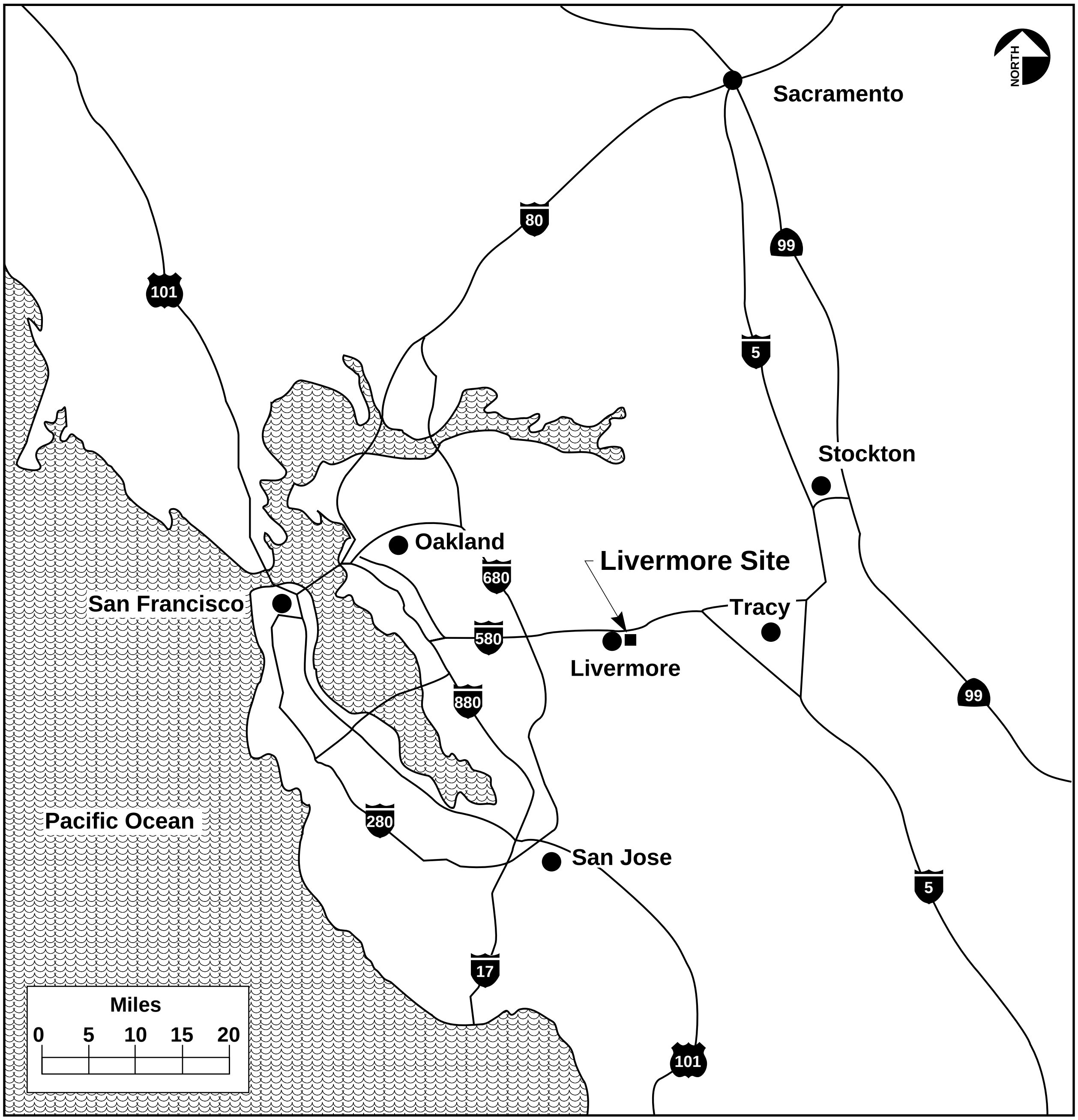

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Figure 1. Location of the LLNL Livermore Site.

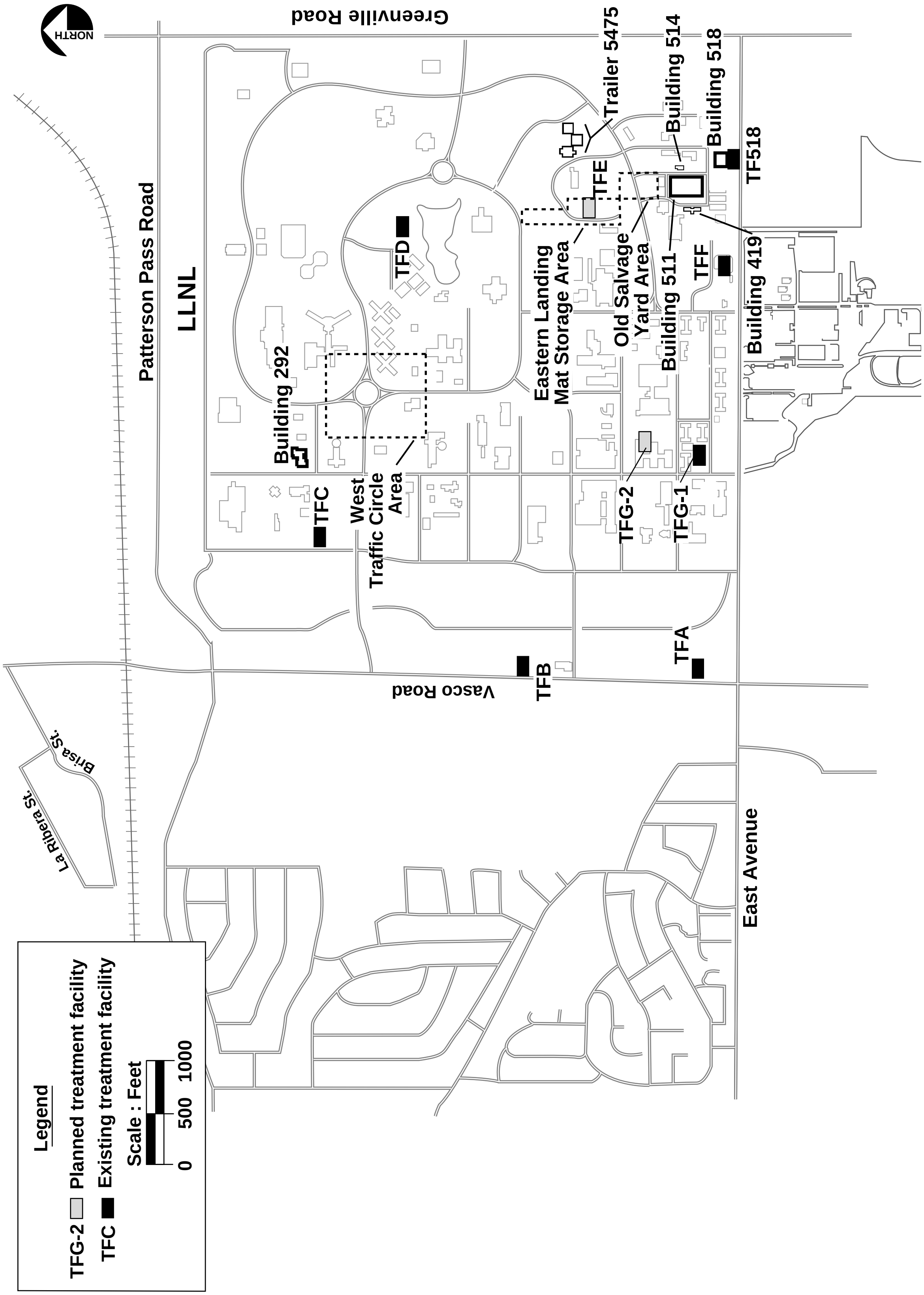

Figure 2. The LLNL Livermore Site showing select treatment facilities, buildings, and investigation areas.

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