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Partial Closure Report for the Area 514 Treatment and Storage Facility

Mohammad Abri

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This work was performed under the auspices of the U.S. Department of Energy by University of California, Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

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Abri Environmental Engineering, Inc.

Environmental Management and Compliance Consultants

Partial Closure Report for the Area 514 Treatment and Storage Facility

April 2005

Lawrence Livermore National Laboratory
University of California Livermore, California 94551

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PARTIAL CLOSURE REPORT FOR THE AREA 514 TREATMENT AND STORAGE FACILITY

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Executive Summary

The purpose of this partial closure report is to inform the Department of Toxic Substances Control (DTSC) of the status of final closure of the Area 514 Treatment and Storage Facility (Area 514) and fulfill the DTSC requirements to proceed with the implementation of the interim action. Area 514 is located at the Livermore main site of Lawrence Livermore National Laboratory (LLNL).

LLNL is owned by the U.S. Department of Energy (DOE) and operated jointly by DOE and the University of California. LLNL received its permit to operate hazardous waste facilities from DTSC in 1997. The hazardous waste treatment and storage operations of Area 514 were transferred to a newly constructed complex, the Decontamination and Waste Treatment Facility (DWTF), in 2003. Once the DWTF was operational, the final closure of Area 514 began in accordance with the DTSC-approved closure plan in June 2004. Abri Environmental Engineering, Inc., was retained by LLNL to observe the A514 closure process and prepare this partial closure report and certification.

Prior to closure, the configuration of the Area 514 Treatment and Storage Facility consisted of Building 514, the Area 514-1 Container Storage and Treatment unit, the Area 514-2 Container Storage Unit (CSU), the Area 514-3 CSU, Building 513, the Wastewater Treatment Tank Farm unit, and the associated Area 514 yard area. The fenced area of Area 514 included approximately 27,350 ft^2 on the LLNL Livermore site.

To date, except for the 514-3 CSU, all of the other Area 514 structures have been demolished; and sampling and analysis have taken place. The non-hazardous wastes have been disposed of. At the time of writing this report, the hazardous, mixed, and low-level radioactive wastes are in the process of profiling for final disposition. Once the disposition of all wastes has been finalized, the implementation of the approved closure plan will be completed. As a part of the closure process, LLNL is required to submit a closure report and a certification by a qualified independent engineer within 60 days of closure completion.

As a result of the sampling and analysis process, contamination was found at Area 514. The results for the concrete and structural samples have been used for characterization of the wastes that were generated for disposal purposes. No soils have been removed, except for the incidental removal of the soil immediately under the concrete and asphalt pavement, and the results for soil samples have been used to characterize the site and conduct fate and transport modeling.

The entire LLNL Livermore site is a CERCLA site; however, the levels of soil contamination found at Area 514 are relatively low, and fate and transport modeling shows that the existing

contamination will not impact ground water for hundreds of years. Consequently, LLNL has decided to leave the contamination in place. LLNL is currently conducting a comprehensive risk assessment to possibly attain a risk-based clean-closure determination. LLNL has identified paving the area with asphalt as an interim action to stabilize the site, prevent the surface contamination from becoming airborne, and minimize the movement of the contaminants in soil. This partial closure report is submitted based on DTSC's request.

PARTIAL CLOSURE REPORT FOR THE AREA 514 TREATMENT AND CONTAINER STORAGE FACILITY

1.0 Introduction

1.1 Purpose

The purpose of this partial closure report is to document the closure activities conducted at the Area 514 Treatment and Storage Facility (A514) at the Livermore main site of Lawrence Livermore National Laboratory (LLNL), and to inform the DTSC of the findings and status of the project to date. The closure project completion is pending primarily due to final disposition of hazardous, mixed and radioactive wastes generated as a result of the closure activities.

Abri Environmental Engineering, Inc., was retained by LLNL to observe the A514 closure process and prepare this partial closure report and, when closure activities are completed, the certification of compliance with the approved closure plan. As required by the regulations and as stated in Department of Toxic Substances Control (DTSC) guidance documents, this report contains the following:

- Supervisory personnel description (Section 1.3)
- Modification and amendments to closure plan. (Section 1.4)
- Summary of closure activities (Section 4)
- Sampling data and analysis (Section 4.3)
- Discussion of analytical results (Section 5)
- Field Engineer observation reports (Appendix A)
- Shipping documents showing disposition of waste inventory (Appendix N)
- Photographs.

1.2 Background

LLNL is owned by the U.S. Department of Energy (DOE) and operated jointly by DOE and the University of California. The U.S. Environmental Protection Agency (EPA) identification number for LLNL is CA 2890012584.

LLNL received a permit to operate its hazardous waste facilities at its Livermore site in November 1999 (LLNL, 1999). As a permit condition and through a transition plan, LLNL transferred the hazardous waste activities that had been conducted at A514 and other LLNL hazardous waste management units to the newly constructed Decontamination and Waste Treatment Facility (DWTF).

The Closure Plan for the Area 514 Treatment and Storage Facility was submitted in May 2000 (LLNL, 2000) to DTSC in compliance with the Special Condition as outlined in Part IV, Item Number 4, of the LLNL Hazardous Waste Facility permit (DTSC, 1999).

The final closure plan for A514 was approved in April 2004, and closure activities began in May 2004.

1.3 Description of Supervisory Personnel

Abri Environmental Engineering was hired to monitor the closure activities. A field engineer was present at the site to observe the closure activities (see **Appendix A** for Daily Observation Reports). Abri Engineering also provided the independent qualified registered professional engineer certification. Mr. William W. Moore, a California-licensed civil engineer (P.E.), supervised the process and provided the certification for the report. Mr. Moore is also a licensed geotechnical engineer (GE).

The LLNL project management team included the following:

- The Project Manager who, as the responsible individual, had overall responsibility for the project.
- The Environmental Assurance Manager responsible for compliance with the approved Closure Plan.
- The Construction Coordinator responsible for coordinating subcontractors and disposition of wastes.
- LLNL's Hazards Control Team Leader responsible for reviewing and approving health and safety plans, and integration of Environmental, Safety and Health (ES&H) resources.
- The Project industrial safety engineer responsible for defining the controls necessary, including personnel protective equipment (PPE), ergonomic safety, Occupational Safety and Health Administration (OSHA) compliance, electrical safety, traffic safety, and fall protection.
- A LLNL project health physicist responsible for health physics issues, including PPE, monitoring, etc.
- A fire safety engineer responsible for fire safety issues and implementation of necessary controls.
- An Environmental Analyst responsible for waste characterization and regulatory issues.
- A waste manager responsible for management of generated waste.
- A Hazards Control Technician responsible for overall ES&H controls implementation at the site and for documentation.

LLNL hired Clauss Construction (CC) to implement the approved final closure plan. The Clauss Construction team consisted of the following companies and their responsibilities:

- **Clauss Construction, license no. 630564:**

  Clauss Construction was responsible for the overall management of the project and for equipment removal and demolition, including asbestos removal. The company has asbestos certification, Hazardous Substances Removal and Remedial Action certification, and a Certificate of Registration for Asbestos Work from the California Department of Industrial Relations, Division of Occupational Safety and Health.

- **Earth Tech, Inc.:**

  The Earth Tech team was responsible for hazardous and radiological sampling, including the quality assurance/quality control (QA/QC) processes.

- **Severn Trent Laboratory:**

  Severn Trent Analytical Laboratories (STL) was responsible for analyzing the samples and verification processes. STL possesses California state certification for the project-pertinent EPA methods.

Hazardous, mixed, and low-level radioactive wastes and nonhazardous liquid wastes were processed through LLNL Environmental Protection Department (EPD) and handled on site at Waste Accumulation Areas (WAA), the DWTF and/or shipped off site as appropriate.

Nonhazardous wastes were transported to a local landfill.

1.4 Modifications and Amendments to the Approved Closure Plan

As described below, unexpected field conditions, changes in the EPA methods to be used for analyzing certain parameters, and other considerations dictated changing some parameters of the approved closure plan. LLNL adhered to prescribed processes to notify the DTSC of the changes.

1.4.1 Concrete, Asphalt, Soil Sample Changes

Field conditions necessitated changing the following sampling locations:

- Concrete, Asphalt and Soil (CAS) sampling location #29 was moved approximately 6 ft northwest from the location that was given in the closure plan due to the discovery of underground utility lines at the original location and because of restricted drill rig access.
- CAS sampling locations #25 and #26 were located approximately 7 ft from the center of the room because of access limitation for the sampling equipment.
- CAS #9 was moved approximately 5 ft to the north because of the discovery of underground utility lines.

In addition, soil samples immediately below asphalt surfaces were not analyzed for total petroleum hydrocarbons (TPH) due to the high probability for contamination by hydrocarbons

in the asphalt pavement and the former construction practice of preparing underlying soil with petroleum products. The certified laboratory that analyzed the samples was concerned that the presence of high levels of TPH in the samples would damage its laboratory equipment. Consequently, LLNL assumed that these soils were TPH-contaminated and managed them accordingly.

1.4.2 Changes in Analytical Methods

The changes to the analytical methods listed in the approved closure plan were as follows:

- SW846 Method 8080 for polychlorinated biphenyl (PCB) analysis has been delisted; EPA method SW846 method 8082 was used instead.
- American Society for Testing and Materials (ASTM) method D-2476 for tritium analysis has been withdrawn; EPA method SW846 906 was used instead.
- For pH analysis, SW846 Method 9040A is current standard, instead of SW846 Method 9040.

The analytical methods substituted are EPA-approved and are industry standard for these parameters. See **Appendix B** for a letter from Severn Trent Laboratory, the certified laboratory.

1.4.3 Notification of DTSC

As stated in Section 1.2 of the approved closure plan (LLNL, 2004), LLNL followed the appropriate processes to amend the closure plan after closure activities began by notifying the DTSC and by amending the document. (See **Appendix C** for the LLNL letter amending the Closure plan**.**)

2.0 Facility Information

EPA Identification Number:	CA2890012584
Name:	Lawrence Livermore National Laboratory
Location:	7000 East Avenue Livermore, Alameda County, California
Mailing Address:	Lawrence Livermore National Laboratory P.O. Box 808, Livermore, CA 94551
Facility Operator 1:	Regents, University of California, Lawrence Livermore National Laboratory
Facility Operator 2:	U.S. Department of Energy
Facility Owner:	U.S. Department of Energy
Facility Contact Person and Title:	C. Susi Jackson Division Leader, Operations and Regulatory Affairs Division (ORAD), Environmental Protection Department

LLNL is owned by the DOE and is jointly operated by the University of California (UC) and DOE. The LLNL Livermore Site is an approximately 821-acre facility located in County of Alameda, California, just outside of the city of Livermore boundaries in the Livermore Valley (see **Figure 2-1**).

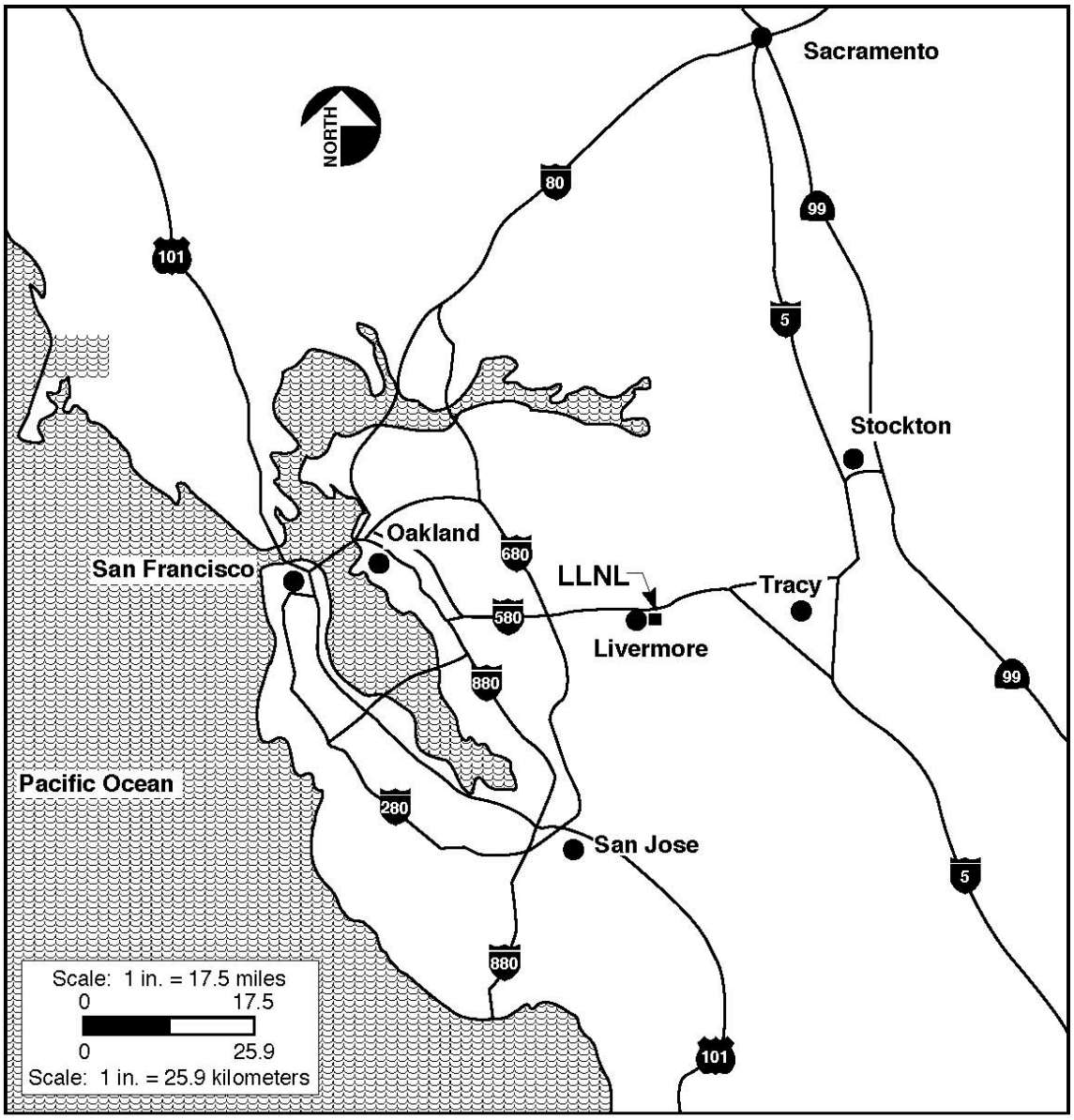

Figure 2-1. LLNL Location Map

As a government laboratory, LLNL conducts a wide variety of research. The hazardous wastes generated are managed on site at the Radioactive and Hazardous Waste Management Division (RHWM) facilities. A514 facilities had been part of the RHWM complex until they were replaced by the newly constructed DWTF.

According to LLNL, the U.S. Navy had constructed Building 514 in 1943 for use as an aircraft test and repair facility. LLNL began using the area as a hazardous, mixed, and radioactive waste management facility in 1952. Since 1983, the area had been operated as a waste management area under interim status issued by the DTSC.

3.0 Condition of Area 514 Units before the Closure Activities Began

Prior to closure, the configuration of the Area 514 Treatment and Storage Facility consisted of Building 514, the Area 514-1 Container Storage and Treatment Unit (CSTU) area, the Area 514-2 Container Storage Unit (CSU), the Area 514-3 CSU, Building 513 (B513), the Wastewater Treatment Tank Farm (WTTF) unit, and the associated A514 yard area. As shown in **Figure 3-1**, the fenced area of A514 included approximately 27,350 ft^2 on the LLNL Livermore site.

Before the closure activities began, all wastes and most of the treatment equipment had been transferred to other onsite, permitted waste management areas as authorized by the transition plan (LLNL, 2004). A preliminary inspection of the A514 hazardous waste management areas determined that they were in good condition; treatment and storage areas were epoxy-coated with no free visible cracks and deterioration. The following sections describe the different waste management areas within the Area 514 Treatment and Storage Facility before the closure activities began.

3.1 Building 513

Building 513 was a pre-engineered, one-story building that covered an area 35 ft by 100 ft (**Figure 3-2**). It was located on the south end of A514. The building was constructed of steel columns, beams, girts, purlins, and bracing. The structure was totally enclosed and had sheet metal roof and walls. The inside floor was a concrete slab that sloped to the south; and it was surrounded by an 8-in.-wide, concrete curb on the south, east, and west sides.

The building had been divided into two rooms: Room 1002, measuring 23 ft by 39 ft, had housed the shredder unit, which had been removed; and Room 1000, measuring 90 ft by 40 ft, had contained solidification equipment and had been used as a container storage area.

The solidification equipment was moved to the DWTF complex except for the "treatability laboratory," a prefabricated wooden building with its footprint measuring approximately 14 ft by 16 ft. The inside of the laboratory included countertops and a fume hood. The fume hood was exhausted through ducting and a high-efficiency, particulate air (HEPA) filter.

The shredder room was located on the east side of Building 513 and had housed a shredder used to size-reduce solid waste. The shredder had previously been removed from B513 as a part of an incident response. No wastes remained in the building at the beginning of closure activities.

3.2 Wastewater Treatment Tank Farm (WTTF)

The WTTF unit consisted of six 1850-gal treatment tanks (514-RA-1, -2, -3, -4, -5, and -6), a covered bulking/rinsing area, and associated ancillary equipment and piping. See **Figure 3-3**.

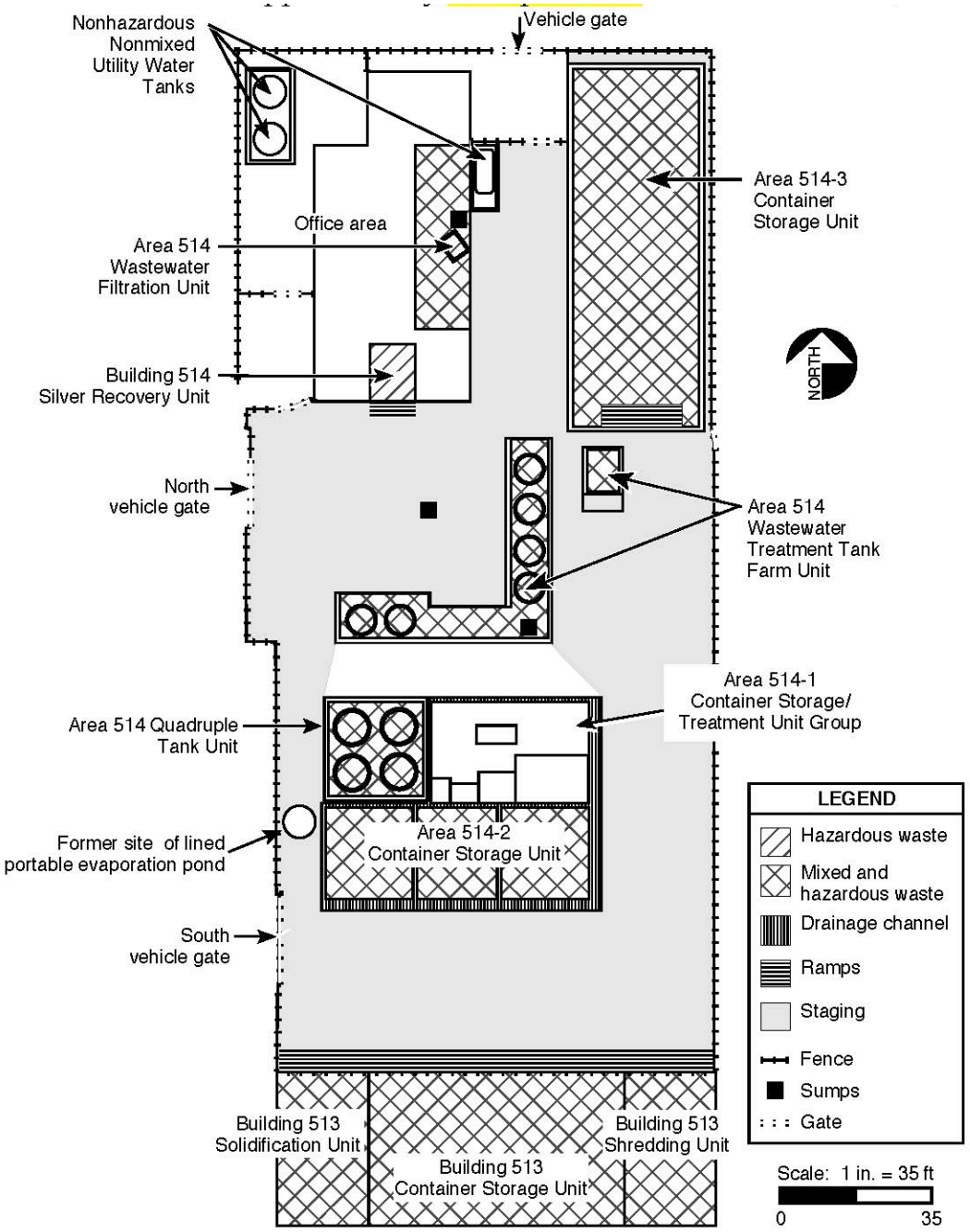

Figure 3-1. Area 514 Treatment and Storage Facility

Figure 3-2. Building 513

Figure 3-3. Wastewater Treatment Tank Farm

Six open-top treatment tanks were located in a bermed concrete area that was covered with sheet metal roofing. An elevated walkway allowed access to the top of the tanks and the controls.

The bulking/rinsing station consisted of a covered, stainless steel "trough" and two drum-dumper devices. The trough had a cover that was operated hydraulically and was located within a concrete floor that measured approximately 11 ft by 14 ft and was bermed on four sides (**Figure 3-4**). The bulking/rinsing station was used to bulk and transfer wastes into the treatment tanks and to triple-rinse waste containers. No wastes remained in the tanks or in the bulking/rinsing station when closure activities began.

3.3 Quadruple Tank Unit

The A514 Quadruple Tank Unit consisted of four closed-top, fiber-reinforced, vinyl ester storage tanks and ancillary equipment. The tanks were located on a concrete floor that measured approximately 21 ft by 21 ft and surrounded by masonry block walls (**Figure 3-5**). Two of the storage tanks, 514-R5A7 and 514-R5A9, had been used to process regulated waste; and the other two tanks, 514-R5A8 and 514-R5AA, had contained non-DTSC-regulated wastes. These tanks had been used to store and transfer wastes into the treatment tanks. The tanks were marked "empty" when closure activities began.

Figure 3-4. Bulking/Rinsing Station

Figure 3-5. Quadruple Tank Unit

3.4 Building 514

Building 514 (B514) was located in the northwest quadrant of A514 and measured approximately 35 ft by 69 ft (**Figure 3-6**). B514 had been used as an office area, equipment rooms, and a shop; the wastewater filtration unit had been housed in Room 108. B514 also housed a silver recovery unit that was closed under a partial closure in 1997, see appendix C-2 of the approved final closure plan (LLNL 2004). (Note: the closure of the silver recovery unit was certified by an independent engineer and is not a part of this certification.) Lead-contaminated soil was discovered during the silver recovery unit closure process, but further action was deferred until this final closure of the facilities.

3.5 Wastewater Filtration Unit

The wastewater filtration unit was a rotary drum filter that had received treated wastewaters from the WTTF before the wastewater was released to the sewer (**Figure 3-7**). According to LLNL staff, the rotary drum filter had been removed for maintenance purposes before the closure activities began. There were no wastes remaining in the building to be filtered. The closure of the waste filtration equipment is not a part of this report.

Figure 3-6. Building 514

Figure 3-7. Wastewater Filtration Unit

3.6 Area 514-1 Container Storage and Treatment Unit

The Area 514-1 CSTU was located near the center of A514. It had a 36-ft-by-24-ft concrete floor that sloped in an east-west direction; and the unit was surrounded by a berm on the north, south, and west sides (**Figure 3-8**). The unit had housed a centrifuge, a cold vapor evaporator, a tank blending unit, a portable tank blending unit, and a carbon adsorption unit. According to LLNL staff, the treatment units had been removed in accordance with a transition plan (LLNL, 2004) as part of the LLNL hazardous waste permit issued by the DTSC. The area had also been used to store waste containers. No wastes remained in the unit at the beginning of closure activities.

Figure 3-8. Area 514-1 Container Storage and Treatment Unit

3.7 Area 514-2 Container Storage Unit

The Area 514-2 CSU consisted of three separate, covered, concrete-floored cells that measured 19.5 ft by 18.5 ft. The floors of the cells sloped toward the north; and the unit was surrounded by concrete berms on the north, east, and west sides (**Figure 3-9**). No wastes remained in the unit at the beginning of closure activities.

3.8 Area 514-3 Container Storage Unit

The Area 514-3 CSU consisted of a covered, concrete floor that measured 83 ft by 28 ft (**Figure 3-10**). The concrete floor sloped in a northwest direction to a small sump. Concrete berms

surrounded the area on the north, east, and west sides. No wastes remained in the unit at the beginning of closure activities.

Figure 3-9. Area 514-2 Container Storage Unit

Figure 3-10. Area 514-3 Container Storage Unit

3.9 Area 514 Yard

Area 514 also included a fenced, concrete- and asphalt-paved yard that had been used for the occasional staging and transporting of waste between the different units. No wastes remained in the area at the beginning of closure activities.

4.0 Closure Activities

4.1 Preparations before Closure Activities Began

Before the closure activities started, the following activities took place:

In April and May 2004, LLNL staff located underground utilities and marked them. LLNL staff also identified the utilities that came into site and had been used at A514. They disconnected the utilities in preparation for closure activities. Three areas outside A514 and one area inside the A514 yard area required excavation to locate underground utilities before drilling operations began. For safety reasons, the areas were excavated by saw-cutting the concrete section and using an air knife to expose the piping.

The Clauss Construction team set up staging areas, portable toilets, signage, and equipment checkouts. They also prepared a Site Health and Safety Plan in compliance with Section 9.0, and Appendix D of the approved closure plan (LLNL, 2004). The Site Safety and Health Plan was reviewed and approved by industrial safety, health physics, fire protection and environmental disciplines in the LLNL Hazards Control Department.

The CC team also submitted a current training plan for the personnel who would be involved in the closure activities for LLNL review. LLNL conducted site- and closure-specific training for these workers.

Clauss Construction also obtained permits for abatement and demolition work from the Bay Area Air Quality Management District. See **Appendix D** for copies of the permits.

The Earth Tech team identified the number of samples to be taken and the sampling locations in accordance with Appendix B, Sampling Plan, of the approved closure plan (LLNL, 2004).

4.2 Decontamination

The Building 514 filtration room was cleaned by mopping and vacuuming areas where surveying revealed radioactive contamination.

After sampling was completed, the floor, walls and ceiling of Building 513 Room 1002, where the shredder had been located, were sprayed with "CC Fixative Media" to immobilize any possible residual radioactive contamination (**Figure 4-1**). See **Appendix E** for a copy of material safety data sheets (MSDS) for CC Fixative Media.

Figure 4-1. Building 513 Room 1002 (Shredder Room)

4.3 Sampling and Sampling Collection

Sampling and analysis occurred as described in Appendix B, Sampling and Analysis Plan, of the approved closure plan (LLNL, 2004) except for the deviations explained in **Section 1.4** of this report. A map of each area was used to identify the location of each sample taken (**Appendix F**, Figures F-1 through F-17.)

Sampling IDs were written on each location before the sampling teams arrived. The Earth Tech team prepared the sampling log book, Chain of Custody (COC) forms and sample labels. Complete sets of the COCs and log books have not been included in this report due to a large number of samples resulting in large volume of documentation. However, they are available upon request. Example copies of the COC and log books have been included in **Appendix G**. The sampling lead person was in charge of the documents and issued them to personnel as needed.

Three Earth Tech teams took swipe samples at the predetermined locations in the structures and tanks during the period of June 9, 2004, through June 22, 2004. The swipe samples were

obtained and analyzed for metals, including mercury, alpha, beta, and tritium. Swipe samples were also collected for polychlorinated biphenyls (PCB) analysis where there was evidence of staining. Dry filter paper was used to collect samples to be analyzed for alpha and beta. Filter paper wetted with dionized water was used to sample for tritium and hexavalent chrome. Filter paper wetted with 5 percent nitric acid was used to collect sample metals. Filter paper wetted with hexane was used to collect samples to be analyzed for PCB. (PCB samples were taken where there was evidence of staining.)

Samples were taken of the 10-cm-by-10-cm area for each swipe. The swipe samples were put in ziplock bags, placed in an ice chest, and shipped to the laboratory for analysis. The samples were handled in accordance with QA/QC processes and sample custody chain procedures.

The structural samples were obtained from metal, concrete, and sheet rock material, depending on the structures.

Soil sampling activities commenced on June 18, 2004, and ended on August 6, 2004. Concrete core and asphalt samples were collected, where appropriate, and analyzed for alpha, beta, tritium, metals and volatile compounds contamination. Soil samples were collected at the surface, and at 2-, 5-, 10-, 15-, and 20-ft depths. Even though samples were collected at all these depths, they were not all analyzed. The samples from the surface, at 2 ft and 5 ft were analyzed in order of increasing depth. If two consecutive locations showed no contamination, the remaining samples were not analyzed; and the bore hole location was considered "clean" below that depth.

The concrete core samples were collected using a drill; soil samples were collected using the direct push method (**Figure 4-2**). The direct push method to obtain soil samples is preferable because it minimizes waste generation of excess soil cuttings.

Concrete, Asphalt and Soil (CAS) samples were taken in accordance with the approved closure plan (LLNL, 2004). The exact locations of the sample locations were selected according to observations of areas where any spilled materials would have accumulated, such as the low ends of the floor areas, and where it was possible to reach with sampling equipment. Bore hole logs were maintained during sampling (**Appendix H**).

EPA Method 5035 was used for collecting soil samples for volatile analysis. Samples were placed in ziplock bags, stored in an ice chest, and shipped to the laboratory.

In addition to samples taken in accordance with the sampling plan (LLNL, 2004), LLNL surveyed, sampled, and analyzed the areas to be closed in accordance with DOE and LLNL internal policies. These samples generally focused on radioactive characterization of structures and hazardous waste management units and other supporting equipment.

The sections below explain the samples taken at each area.

4.3.1 Building 514 and Associated Areas

The B514 sampling area included the B514 office area, rotary drum filtration unit, Room 108, former silver recovery unit, Room 105, and the support areas, Rooms 110 and 124. For locations of the samples, see **Figures F-1, F-2,** and **F-3** in **Appendix F**.

Figure 4-2. Direct Push Sampling Rig

The following table summarizes the media, types, and numbers of samples from B514 and associated areas:

Table 1. B514 Sampling

Medium	Type of samples	Number of samples and sample locations
Concrete structure and metal surfaces, including ceilings, walls, and miscellaneous equipment	Swipe	19 samples (one sample taken at every 20-ft interval of ceiling and walls. Three samples were taken from electrical boxes and the water heater housed inside the filtration unit room.)
Structure material	Bulk	3 samples
Roof	Swipe	4 samples (one sample for every 20-ft interval)
Concrete floor	Core	8 samples
Soil	Core	48 samples from 6 sample locations

4.3.2 Building 513

Structure, concrete and soil samples that were obtained at B513 included two rooms: Room 1002, the shredder room; and Room 1000, which had housed the solidification unit and a container storage area. The solidification unit to be closed included the treatability laboratory, a prefabricated structure. See **Figures F-4, F-5** and **F-6** in **Appendix F** for the location of the samples.

The following table summarizes the media, types, and numbers of samples from B513:

Table 2. B513 Sampling

Medium	Type of samples	Number of samples and sample locations
Metal structure and metal surfaces, including beams, ceilings, walls, and miscellaneous equipment	Swipe	24 samples (one sample for each beam; one sample for approximately every 20-ft interval of walls; three wall samples were taken from electrical boxes and PPE cabinets inside Room 1000)
Structure material	Bulk	3 samples (one sample from a beam; one sample from the wall panel; and one sample from the partition wall)
Roof	Swipe	5 samples (one sample from the center of the roof at 20-ft intervals)
Treatability laboratory	Swipe	4 samples (one sample inside of the hood, one sample from an inside wall, and two samples from the outside walls)
Concrete	Core	3 samples
Soil	Core	18 samples from 3 sample locations

4.3.3 Wastewater Treatment Tank Farm Unit, Associated Bulking/Rinsing Station and the Chemical Reagent Shed

The Waste Water Treatment Tank Farm included six 1850-gal treatment tanks, associated structure, elevated walkway, a canopy, a secondary containment area, a bulking/drum rinsing station, piping used to transfer waste to and from the tanks, and a shed where the reagent feed system into the treatment tanks was located. The piping for the tank farm also included the piping in the drum filtration unit. See **Figures F-7, F-8, F-9**, and **F-10** in **Appendix F** for the sample locations.

The bulking/rinsing station included a stainless steel "trough" to receive the waste and drum rinsate. According to LLNL staff, the stainless steel trough was never used; however, confirmatory samples were taken.

The following table summarizes the media, types, and numbers of samples from the waste water treatment tank farm unit and associated areas:

Table 3. Tank Farm Unit and Associated Areas Sampling

Medium	Type of samples	Number of samples
Structure, including beams, supports, walkways, and miscellaneous equipment	Swipe	29 samples (one sample for each beam, one sample for each support, one sample from walkway in front of each tank, one sample from the shed area)
Roof	Swipe	4 samples (one sample from the center of the roof at 20-ft intervals)
Treatment tanks exterior	Swipe	6 samples (one sample per tank)
Treatment tanks interior	Swipe	6 samples (one sample per tank)
Treatment tanks interior grout and epoxy	Core	6 samples (one sample per tank)
Piping	Swipe	Samples (one at every 20 ft of pipe and elbows)
Bulking/rinsing station interior	Swipe	1 sample from the bottom of the tank
Bulking/rinsing station exterior	Swipe	1 sample at the mid-point height of the tank
Concrete	Core	4 samples (three samples in the secondary containment area for the tanks, one sample in the drum dumping/rinsing station area)
Soil	Core	24 samples from 4 sample locations, 3 samples in the secondary containment area for the tanks, 1 sample in the drum dumping/rinsing station area

4.3.4 Quadruple Tank Unit

The sampling area for the Quadruple Tank Unit included four 9200-gal tanks, the associated secondary containment, and associated piping to and from the tanks within the secondary containment area. **Figures F-11, F-12,** and **F-13** in **Appendix F** show the sample locations.

The following table summarizes the media, types, and numbers of samples from the quad tank unit:

Table 4. Quadruple Tank Unit Sampling

Medium	Type of samples	Number of samples
Hazardous waste storage tanks (514–R5A-7 and 514-R5A-9 interior)	Core	2 samples (one sample from the bottom of each tank)
Nonhazardous waste storage tanks (514–R5A-8 and 514-R5A-9 exterior)	Swipe	4 samples (one sample from midpoint height, one sample from the bottom of each tank)
Tanks 514-R5A-7, -R5A-8, -R-5A-9, and R5-AA exterior	Swipe	4 samples (one sample per tank)
Tanks 514-R5A-7, -R5A-8, -R5A-9, and -R5-AA “cat walk”	Swipe	4 samples (one sample per tank)
Piping	Swipe	Samples (one at every 20 ft of pipe and elbows)
Secondary containment walls	Swipe	1 sample from the east wall of the sump located within the secondary containment area
Concrete	Core	1 sample
Soil	Core	6 samples from one sample location
Liquid waste residues drained from the associated piping	Liquid	2 samples (one of the wastes drained from the hazardous waste tanks; one of the wastes drained from the nonhazardous waste tanks) Note**:** The waste drained from the nonhazardous waste tanks was sampled and analyzed for volatiles because the waste had a strong odor.

4.3.5 Area 514-1 Container Storage Unit

The sampling area for the Area 514-1 Container Storage Unit included the secondary containment area for the unit and associated structure and canopy. Sampling locations are shown in **Figures F-11, F-12,** and **F-13** in **Appendix F**.

The following table summarizes the media, types, and numbers of samples from the Area 514-1 CSU:

Table 5. 514-1 CSU Sampling

Medium	Type of samples	Number and sample locations
Structure, including beams and support columns	Swipe	9 samples, 3 beam samples (one sample for each beam); 6 samples (one for each support column)
Roof	Swipe	2 samples (one sample per 20-ft interval)
Concrete	Core	1 sample
Soil	Core	6 samples from 1 sample location

4.3.6 Area 514-2 Container Storage Unit

The sampling area for Area 514-2 CSU included three cells, A through C, as well as secondary containment areas and associated structures and canopy area. Sampling locations are shown in **Figures F-11, F-12,** and **F-13** in **Appendix F**.

The following table summarizes the media, types, and numbers of samples from the 514-2 CSU:

Table 6. 514-2 CSU Sampling

Medium	Type of samples	Number and sample locations
Metal structure, including beams and support columns	Swipe	9 samples, 4 samples (one sample for each beam) 5 samples (one for each support column)
Roof	Swipe	3 samples (one sample per 20-ft interval)
Concrete	Core	3 samples
Soil	Core	18 samples from 3 sample locations

4.3.7 Area 514-3 Container Storage Unit

The sampling area for Area 514-3 CSU included the secondary containment and associated structure and canopy. Sampling locations are shown in **Figures F-14, F-15,** and **F-16** in **Appendix F**.

The following table summarizes the media, types, and numbers of samples from the 514-3 CSU:

Table 7. 514-3 CSU Sampling

Medium	Type of samples	Number and sample locations
Structure including beams, and support columns.	Swipe	15 samples, 5 samples (one sample for each beam), 10 samples (one sample for each support)
Roof	Swipe	4 samples (one sample from the center of the roof at 20-ft intervals)
Concrete	Core	1 sample
Soil	Core	6 samples from 1 sample location

4.3.8 Area 514 Yard Area

The A514 yard sampling area included the fenced area, the rest area for workers, and the nonhazardous waste tank area. According to LLNL staff, the A514 yard areas were not used as locations for treatment or storage of hazardous wastes. In addition to the rest area and the nonhazardous waste tank area, the yard was used for occasional waste staging and transporting of wastes to different units. See **Figures F-2** and **F-17** in **Appendix** F for sampling locations.

The following table summarizes the media, types, and numbers of samples from the Area 514 yard area:

Table 8. Area 514 Yard Area Sampling

Medium	Type of samples	Number and sample locations
Asphalt	Core	8 samples
Concrete	Core	4 samples
Soil	Core	72 samples from 12 sample locations
Nonhazardous waste tanks (R4-A1, R4-A2), and brown tank east of B514	Swipe	3 samples (one sample per tank)

4.4 Area and Structure Demolition and Removal

4.4.1 Building 514

B514, including the office area, the rotary drum filtration room, the support rooms, and the break area, was demolished beginning June 26, 2004. The process began by removing equipment and furniture from the building. The equipment and furniture, including office furniture, were surveyed for any radioactive contamination before being removed from A514. Wastes from the filtration room, including waste piping and ancillary equipment, were removed, packaged, and staged in the 514-3 CSU.

A "Bobcat" machine was then used to demolish and remove the wood parts of the office and support areas, including partition walls. Next, roofing materials were removed with an excavator, and the concrete structure was demolished (**Figure 4-3**).

During this process, water spray was used to minimize dust from the operations. The Clauss Construction staff then separated wood and metal from the concrete rubble and loaded the demolition debris into roll-off bins for storage at the waste accumulation areas (WAAs) set up at an LLNL site (See **Section 6.0** for more detail on these WAAs.)

The filtration unit room and a support room north of B514 were demolished on June 29. The demolition debris piles were kept separate because the filtration room had been used to handle hazardous, mixed, and radioactive waste. The roofing material for the support room was kept separate as well because the room was constructed during a period when arsenic was used in roofing material as a rodent control method. The demolition for this area followed the same procedures as the office area except that there was no wood to be removed. The demolition debris for the filtration room was loaded into lined bins and stored at the T6498 WAA.

Figure 4-3. Building 514 Demolition

The concrete floor of the entire B514 area was removed using an excavator. The concrete floor from the filtration room was kept separate from the rest of building pending further characterization. A lined, cylindrical sump measuring approximately 3 ft in diameter and 4 ft deep was uncovered during the floor removal operations in the filtration room. The sump was located approximately 15 ft from the north wall and 10 in. from the west wall of the room. The stainless steel liner was removed from the sump and placed in a roll-off bin. The concrete wall of the sump was penetrated by underground piping in three locations (**Figure 4-4**). The soil beneath the sump was sampled (CAS #32), See **Section 5.0** for sample results.

4.4.2 Building 513

B513 demolition occurred in two stages: first, the container storage unit and the solidification unit area were demolished, and then the shredder room.

On July 19, the B513 CSU and the solidification unit areas were mechanically demolished with a shearing device used to cut the supports and beams (**Figure 4-5**). The treatability laboratory was demolished separately on July 20.

Figure 4-4. The In-Ground Sump Found in the Building 514 Filtration Room

Figure 4-5. Building 513 Demolition

Because the shredder room was considered radioactively contaminated, it was dismantled using hand tools. The dismantling of the shredder room began July 13 and ended July 27. The shredder room had been sprayed using CC Fixative Media to fix any radioactive contamination on the floor, walls, and ceiling.

The demolition debris consisting of steel beams, purlins, and sheet metal siding for walls and roof was loaded into bins and transferred to the T6498 WAA located on site for preparation for shipment off site.

The concrete floor of the area was considered radioactive contaminated, and LLNL had planned to remove it in sections. The concrete was saw-cut 3 to 4 in. deep in 4-ft-by-4-ft sections. Claus Construction staff then tried to remove the slab in sections; however, because the concrete was thicker than originally estimated, it had to be broken up and removed using an excavator. Water spray was used to minimize dust during this operation.

4.4.3 Wastewater Treatment Tank Farm (WTTF) Unit

The WTTF Unit consisted of six treatment tanks, a canopy, a metal walkway, concrete berm, and a concrete floor. After the waste-conveying pipes and other ancillary equipment were removed, the steel canopy, supports, and the elevated walkway were dismantled mechanically on July 10. The demolition is shown in **Figure 4-6**.

Figure 4-6. Wastewater Treatment Tank Farm Demolition

The tops of the steel treatment tanks were covered with plastic, and then the tanks were removed intact from the site on July 30, 2004, and placed in the WAA near Building 412. Because the tanks were stored in the WAA for more than 90 days, LLNL applied for and received approval from the DTSC for an extension for longer than 90-day storage (see **Appendix I-1**). The treatment tanks were brought back to the project site on October 13, 2004, and crushed using an excavator. For more information, see **Section 6.3**.

The piping was removed in 20-ft sections and placed into a bin. The bin was then moved to the Building 412 WAA on July 19, 2004. LLNL applied to the DTSC for an extension to store the waste for more than 90 days; however, the application was denied (see **Appendix I**). The waste was moved back to the project on September 30, 2004, for size reduction (see **Section 6.3** for more information).

The concrete berm and floor were removed using an excavator. The area around the sump within the bermed area was saw-cut, and the sump was removed using the excavator to facilitate sampling beneath it.

4.4.4 Area 514-1 Container Storage and Treatment Unit (CSTU)

Area 514-1 CSTU consisted of steel supports, beam, purlins, sheet metal roofing, concrete berm, and concrete floor. On July 9, the structure was demolished mechanically using a shearing device to cut the supports and roofing. The concrete floor was removed using an excavator.

4.4.5 Area 514-2 Container Storage Unit

Area 514-2 CSU consisted of steel supports, beam, purlins, sheet metal roofing, concrete berms, and a concrete floor. On July 9, the structure was demolished mechanically using a shearing machine to cut the supports and roofing. The concrete floor was removed using an excavator.

4.4.6 Area 514-3 Container Storage Area

The Area 514-3 CSU, including the concrete slab floor, was left standing for future nonhazardous waste activities use.

4.4.7 Quadruple Tank Unit

The Quadruple Tank Unit consisted of four storage tanks, (514-R5-A7, -A8, -A9, and 514-R5AA), cinderblock secondary containment walls, and a concrete floor. The tanks were removed intact (**Figure 4-7**) using a crane and stored in T6498 WAA for further processing. The tanks were stored at the WAA for longer than 90 days. LLNL submitted an extension request to the DTSC for the two hazardous waste tanks, 514-R5-A7 and 514-R5-A9; however, the DTSC denied the requests (see **Appendix I**). The tanks were later brought back to the project site and size-reduced. For more information, see **Sections 6.2** and **6.3**.

The secondary containment walls and floor of the Quadruple Tank Unit were removed using an excavator. The secondary containment area had two floors. One floor had been installed on top of another when a 25,000-gal tank had been removed to install the quad tanks. The 25,000-gal tank was closed under a partial closure. The report and certification for that closure was a part of the approved closure plan (Appendix C-3).

4.4.8 Area 514 Yard Area

The concrete and asphalt areas in the A514 yard were removed using an excavator. The concrete around the sump located within the yard north of the tank farm was saw-cut and pulled out intact to facilitate sampling the sump and the soil beneath it. Two underground pipes, 4 and 6 in. in diameter, penetrated the south and west walls of the sump. Both pipes had been plugged with concrete.

Figure 4-7. Quadruple Tank Unit Removal

5.0 Sampling Results

Severn Trent Laboratory (STL), which is certified by the state of California for the analysis performed, analyzed the samples. Due to a large number of samples generating large volumes of sample results, a complete copy of the laboratory documentation has not been provided in this report; however, the documentation is available upon request. This section summarizes the analytical results.

5.1 Concrete, Asphalt and Soil (CAS) Sample Results

CAS sample results for hazardous constituents were compared against tables in the approved closure plan (LLNL, 2004) for maximum allowable concentrations for volatile organic compounds (VOCs) in soil, and for maximum allowable concentrations for metals in soil calculated at 99.5 percent confidence level. For convenience, these tables from the closure plan are included in this report as **Tables 9** and **10**.

Table 9. Maximum Allowable Concentrations for VOCs in Soil

Organic Constituent	Maximum Constituent Concentration (mg/kg)
Acetone	0.24
Benzene	0.044
Carbon tetrachloride	0.012
Chloroform	0.098
Chloromethane	0.29
Cyanide	100
Endrin	0.00065
Ethylene dichloride	0.0045
Heptachlor	0.014
Methyl ethyl ketone	3.9
Methylene chloride	0.077
PCB	0.22
Pentachlorophenol	4.4
Tetrachloroethylene	0.088
Toluene	2.9
1,1,2 Trichloroethane	0.033
Trichloroethylene	0.26
Trichlorofluoromethane	0.556
Xylene	1.5

Table 10. Maximum Allowable Concentrations for Metals in Soil Calculated at the 99.5% Confidence Level

Metal	Maximum Total Concentration (mg/kg)
Antimony	1.12
Arsenic	8.51
Barium	308
Beryllium	0.62
Cadmium	1.59
Chromium	72.4
Chromium VI	NA[a]
Cobalt	14.6
Copper	62.5
Lead	43.7
Mercury	0.14
Molybdenum	2.5
Nickel	82.8
Selenium	0.4
Silver	2.5
Thallium	0.5
Vanadium	65.2
Zinc	75.3

[a] Any detection of Chromium VI is considered above background.

Source: Folks 1997.

Hazardous constituents found above clean-closure levels in soil included primarily heavy metals. CAS #27 showed volatile organic (perchloroethene, and trichloroethylene) and CAS #16, 17 and 24 showed PCB contamination above "clean closure" levels. In addition to heavy metals, CAS #15 and #13 showed acetone levels above clean-closure levels.

Figure 5-1 shows the sample locations, sample numbers, hazardous constituents detected above clean-closure levels for VOCs in CAS (**Table 9**) and metals (**Table 10**), and the depth at which the constituents were found. **Figures 5-2** and **5-3** are pictorial depictions of metals and volatiles found above maximum allowable concentration in soil and concrete at Area 514.

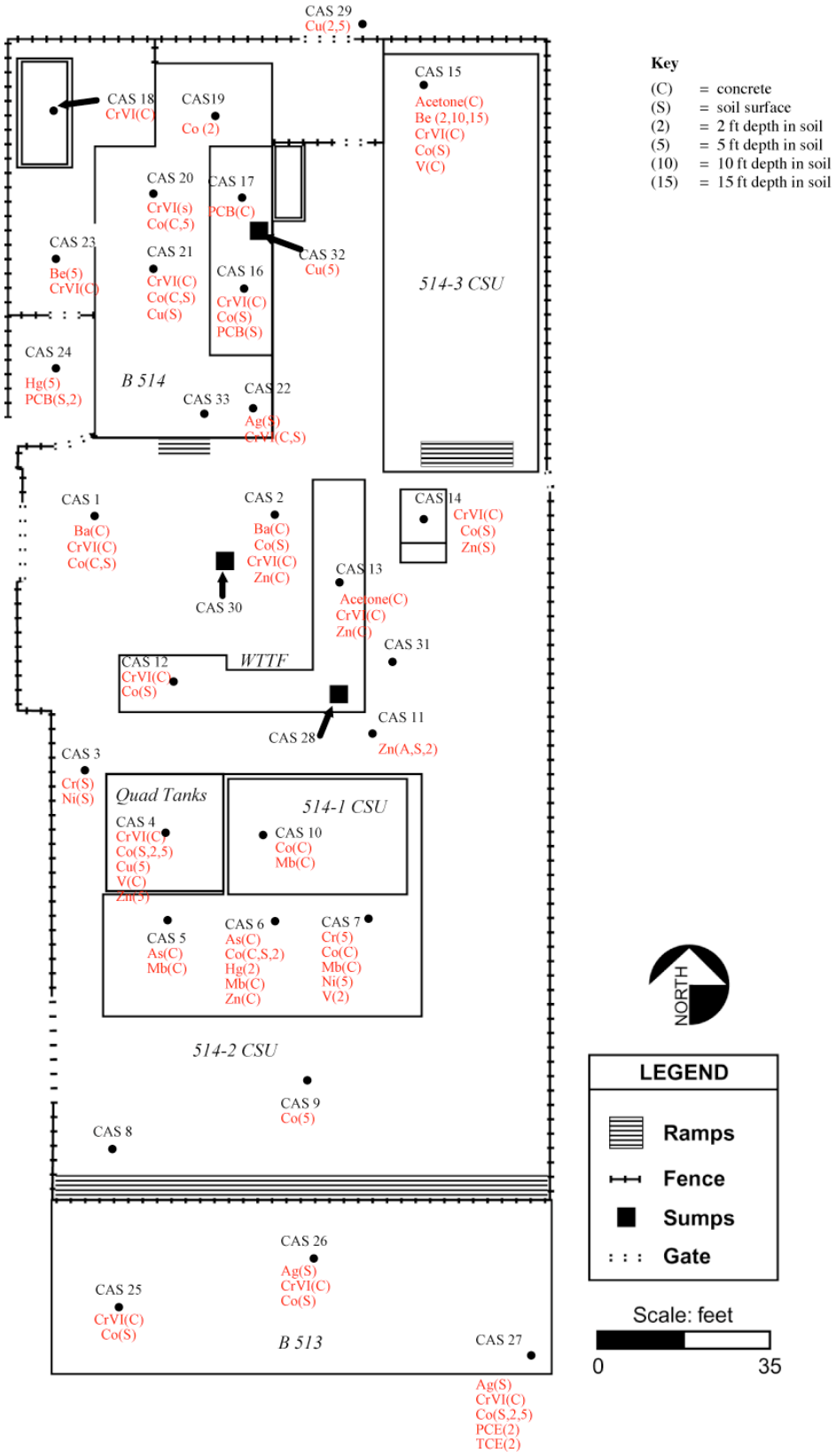

Figure 5-1. Area 514 above Clean Closure Standards CAS Sample Results

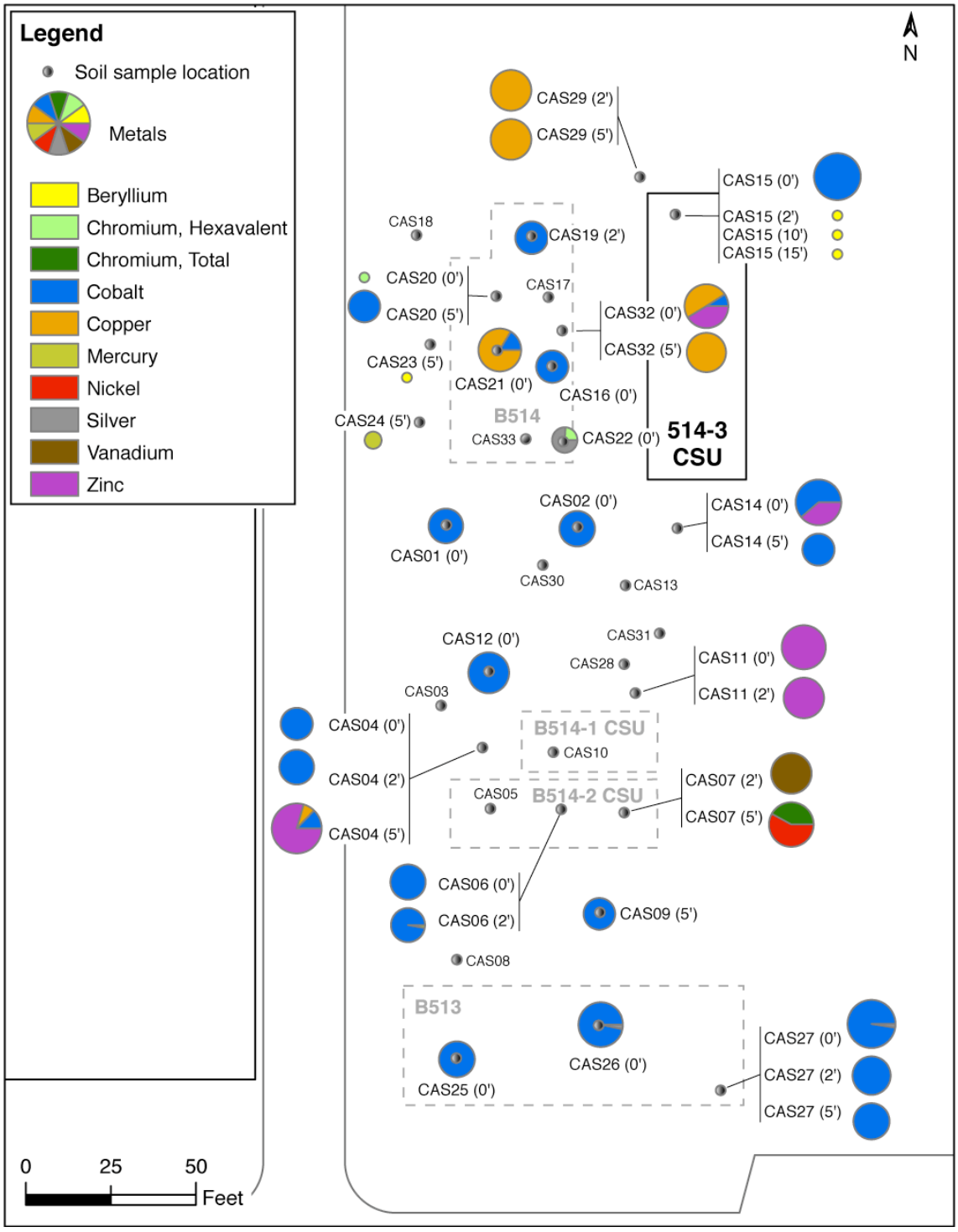

Figure 5-2. Locations of Metals above Maximum Allowable Concentrations in Soil and Concrete at Area 514

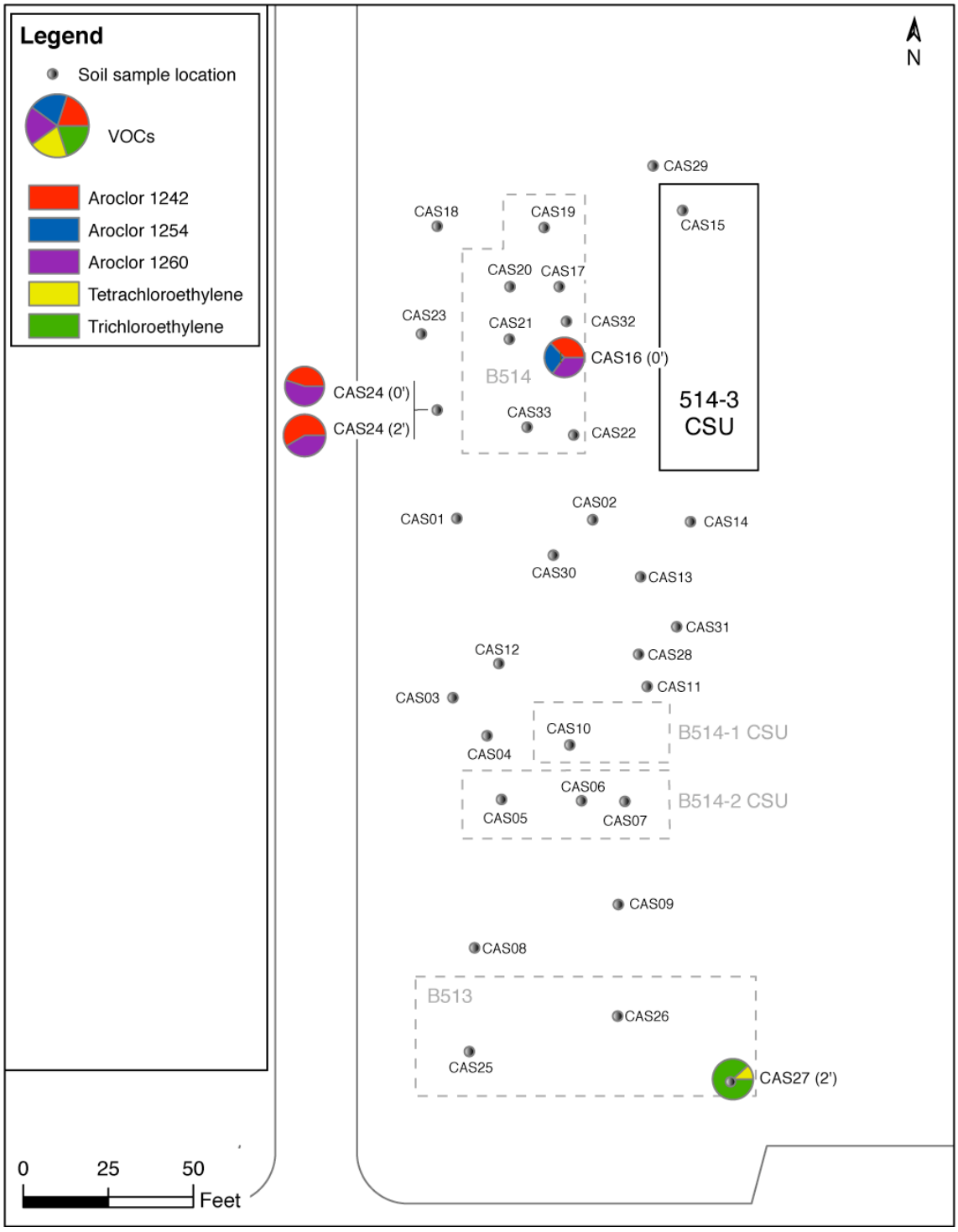

Figure 5-3. Locations of Volatiles above Maximum Allowable Concentrations in Soil and Concrete at Area 514

For more detail on the contaminants, concentrations, and their respective sample location, see **Appendix J**. The tables show only the constituents that were detected above clean-closure levels. The tables also include results of radioactive analysis as gross alpha, gross beta and tritium above 1 pCi/gr, 3 pCi/gr and 5 pCi/gr respectively. The samples showing gross alpha above 1 pCi/gr and gross beta above 3 pCi/gr were further analyzed to identify the species contributing to the results.

Waste characterization for further handling and disposal of the wastes used the sampling results for the concrete floors and asphalt areas that were removed. The only concrete area left in place is the slab floor for the Area 514-3 CSU.

LLNL has decided to leave the contaminated soils in place and potentially demonstrate clean-closure by performing a risk assessment to show that the contamination is not a threat to human health or the environment. This decision was made because LLNL Livermore site has been on the National Priority List since 1987 and cleanup is ongoing; contamination at A514 is at relatively low levels, and some of the A514 contamination is as deep as 15 ft deep in the soil. This risk assessment will also include the requirements of the California Environmental Quality Act Initial Study for potential cumulative risks. The Initial Study (DTSC, 2004), on page 3 of 29, states, "In order to address potential cumulative risks from multiple chemicals, there is a limitation that no more than three carcinogenic chemicals or five chemicals with similar non-carcinogenic health effects are present in the sample results." If the risk assessment does not support the clean-closure determination, LLNL will submit a post-closure permit application to the DTSC.

LLNL has also proposed to pave the A514 site with asphalt as an interim measure. LLNL staff has performed a one-dimensional model in support of implementing the interim measure. The model showed that the worst-case contaminant, most mobile, at the deepest location that any contaminant was found, would move 5 ft in 5 years in worst-case rainfall events. (See **Appendix K** for details). LLNL informed the DTSC in a letter (see **Appendix L**) dated January 21, 2005, regarding the interim measure implementation.

5.2 Non-CAS Sample Results

Because the A514 structures (including buildings, tanks, equipment, and concrete floors) were removed, the swipe and bulk sample analysis results for hazardous constituents were used for characterization of wastes for handling and disposal purposes. For swipe samples, LLNL considered the amount of hazardous constituent detected on the surface of the sample location and the thickness of the material to characterize the wastes. **Table 11** lists sample results that exceeded thresholds for hazardous determination.

LLNL determined that the B513 structural samples that showed high levels of metals were an artifact of the materials themselves and were not as a result of hazardous waste management activities. The WTTF tanks were characterized as mixed waste. See **Section 4.7** for information on waste characterization.

The results for radioactive constituent analysis were used to characterize based on DOE regulations and policies (see **Appendix M**).

Table 11. Structure Sample Results Exceeding Hazardous Waste Thresholds

Location/ Sample ID	Contaminant (MG/KG)											
	2-butanone (MEK)	Beryllium	Cadmium	Chromium, total	Chrmium, hexavelent	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
Building 513 Beam structure F4F120155002	—(a)	—	—	217	148	279	—	—	212	15.9	—	—
Building 513 Exterior wall F4F150253001	—	—	—	215	—	—	182	—	—	—	—	57100
QTU Tank Bottom F4F160138002	—	58.7	14.7	—	444	1320	532	632	451	—	83.3	—
WTTF Tank Bottom F4G140304001	—	—	—	—	—	—	258	—	—	—	—	—
WTTF Tank Bottom F4G140304002	—	—	—	—	—	—	162	—	—	—	—	—
WTTF Tank Bottom F4G140304003	12000	—	11.7	86.1	—	—	3890	2.2	—	—	—	30800
WTTF Tank Bottom F4G140304004	—	—	—	—	—	—	—	2.3	—	—	—	—
WTTF Tank Bottom F4G140304005	—	—	—	99.5	—	—	217	—	—	—	—	3320
WTTF Tank Bottom F4G140304006	—	—	—	—	75.5	—	—	—	—	—	—	—
WTTF Tank Bottom F4H260149003	12000	—	—	—	—	—	—	—	—	—	—	—

(a) — indicates that contaminants were not found above levels that could have render the material hazardous waste.

6.0 Disposition of Waste Generated

The closure activities generated nonhazardous, hazardous, low-level, and mixed wastes.

LLNL staff produced "Review of Radiochemical Data" (radioactive declaration) and a "Release Memo" for every waste stream. The process behind these documents consisted of a radiochemist reviewing the radiological sampling results and issuing a radioactive declaration

memo. A LLNL Environmental Analyst then reviewed the sampling results for hazardous constituents, the radioactive data, and the radioactive declaration and issued a letter release memo for the waste. See **Appendix M** for copies of the waste release memos.

The Area 514-3 CSU and the A514 yard areas were used as satellite accumulation areas for closure-generated wastes. The wastes were moved into a WAA at T6498 that was set up for this purpose. The T6498 WAA is shown in **Figure 6-1**. LLNL established an additional WAA at Building 412 as waste accumulated awaiting further characterization and handling.

Figure 6-1. T4798 Waste Accumulation Area

In the WAAs, liquid hazardous, mixed and low-level wastes were stored in drums on secondary containment pallets. Solid mixed wastes were stored in closed drums or bins with lids lined with plastic sheeting. Solid low-level wastes were stored in bins with either lids or covered with tarps. Nonhazardous construction debris was stored in open and closed bins.

Table 12 lists the quantities of waste, the containers used to transport the waste, and the planned waste disposal facilities for each type of waste generated from the closure activities. The liquid and solid non-hazardous wastes have already been disposed. LLNL is in the process of profiling and shipping the solid hazardous, mixed, and radioactive wastes. The hazardous and mixed wastes are currently stored in permitted hazardous waste facilities on site.

See **Appendix N** for solid non-hazardous waste shipping documents. The section below describes the wastes generated by category.

Table 12. Wastes Generated as a Result of the Closure Activities

Type of waste	Quantity	Container type	Size of Container	# of Containers	Disposal Facility
Liquid nonhazardous	2,300 gal	Drum	55 gal.	42	LLNL, DWTF
Solid hazardous	36,000 lb	Roll-off Bin	15 ft × 8 ft × 5 ft	1	Kettleman Hills (planned)
Solid Low level Radioactive	785,100 lb	Transportainer	20 ft × 8 ft × 8 ft	2	Nevada Test Site and/or Envirocare (planned)
		Lift Liner	8 ft × 6 ft × 4 ft	49	
Solid Mixed	83,775 lb	Transportainer	20 ft × 8 ft × 8 ft‘	2	Envirocare (planned)
		Lift Liner	8 ft × 6 ft‘ × 4 ft	3	
		Steel Box	7 ft × 4 ft × 4 ft	10	
Solid nonhazardous	1,583,060 lb	Truck	Various	40	Altamont Landfill

6.1 Liquid Hazardous, Radioactive, Mixed, and Nonhazardous Wastes

Because all wastes had been removed from the Area 514 Treatment and Storage Facility prior to commencement of the closure activities, the amount of liquid wastes generated was minimal. Nonhazardous liquid waste, including rainwater that was generated from intact B513 secondary containment areas was handled at the DWTF. No liquid hazardous, radioactive, or mixed waste was generated during the closure activities.

6.2 Solid Low-Level Radioactive Waste

Solid low-level radioactive waste consisted of Tanks 514-R5-A8 and -RAA of the Quadruple Tank Unit, the B513 high bay (shredder room) structure and siding, the B513 concrete floor debris, part of the B514 structure, part of the B514 roof, and the yard area west of the treatment tanks.

The two tanks of the Quadruple Tank Unit that had been used for non-DTSC regulated wastes; these tanks were disposed of as radioactive waste. Samples taken of the structures of the tanks showed elevated levels of MEK; however, after researching the issue, LLNL decided that the MEK was used in the manufacturing process for the tanks and was not a result of waste handling operations. The tanks were size-reduced to fit into 20-ft-by-8-ft-by-8-ft transportainers for storage and transportation. The tanks were size-reduced using a circular saw in the B514-3 CSU. Plastic sheeting was installed approximately 8 ft up the sides and on the floor of the 514-3 CSU. At the end of the process, this plastic sheeting was collected and disposed of as waste.

The structure and the siding of B513 Room 1002 were characterized as low-level waste because the surveying and samples in the area had shown radioactive contamination and because an earlier radioactive waste incident in the room could have contaminated the area. Surveying resulted in detection of radioactive contamination on the siding on the east side of the B513 low

bay. The contaminated siding was removed and handled as low-level waste. This waste was wrapped in plastic and placed in a 20-ft-by-8-ft-by-8-ft transportainer.

The concrete floor of the entire B513, including the shredder and solidification rooms, was demolished and managed as low-level waste. The shredder room floor debris was handled as low-level waste for the reasons stated above, and surveying had shown localized radioactive contamination in other floors in the building. To be conservative, LLNL handled the waste as low-level waste because the area floors were epoxied and painted every year, and the paint could have covered over contamination areas.

The concrete slab west of the treatment tank farm and part of the B514 roof were managed as low-level waste because the CAS #2 and sample B514-RF-70 analysis revealed plutonium contamination.

After the concrete rubble was processed to remove the rebar, the rubble was loaded into 8-ft-by-6-ft-by-6-ft lift liner bags for storage and transportation (**Figure 6-2**). The rebar was surveyed and sampled and disposed of as nonhazardous debris.

6.3 Solid Mixed Waste

Solid mixed wastes consisted of the six treatment tanks, two tanks of the quadruple tank unit, piping, and ancillary equipment associated with the WTTF and the B514 office area floor slab.

The B514 office area floor was characterized as mixed waste because the area had been used by the U.S. Navy for engine testing and cleaning, and the concrete samples had shown tritium contamination. The concrete rubble was loaded into 8-ft-by-6-ft-by-6-ft lift liner bags for storage and transportation. The six treatment tanks, 514-RA1 through -6, were characterized as mixed waste because sampling results had shown hazardous and radioactive contamination, and because the tanks had handled listed wastes. The tanks were brought back to the project site and crushed using an excavator in the B513 area to fit 20-ft-by-8-ft-by-8-ft transportainers for further handling and disposal.

The two tanks in the Quadruple Tank Unit that had been used for processing mixed wastes (i.e., R5A7 and R5A9) showed hazardous constituents and radioactive contamination. The tanks also had been used to handle listed wastes and were characterized as mixed waste. The tanks were sized-reduced in the 514-3 CSU as explained in **Section 6.2**. However, the mixed waste tanks were reduced into smaller pieces to fit 7-ft-by-4-ft-by-4-ft steel boxes for storage, transportation, and disposal.

Figure 6-2. Lift liners Used for Management of Low-level Radioactive and Mixed Waste Concrete Rubble

Piping, fittings, and ancillary equipment associated with the WTTF were characterized as mixed waste because they were used in treatment of listed wastes. The pipes were originally cut into 20-ft sections for removal and sampling purposes; later the pipes were brought back to the project site from the WAA and size-reduced using a saw to fit the pieces into 7-ft-by-4-ft-by-4-ft metal boxes for further handling.

6.4 Solid Hazardous Waste

Solid hazardous waste consisted of concrete rubble generated from demolition of B514 Waste Filtration Unit. Samples of the concrete floor and soil surface had shown low levels of volatile organics, such as acetone as high as 0.16 mg/kg. Because the U.S. Navy had used the site in the 1940s and early 1950s to test and clean engines, the volatiles in the concrete could have been from solvents used for cleaning purposes. The concrete floor from the area was kept separate from the rest of the demolition debris, loaded into a roll-off bin for further handling.

6.5 Solid Nonhazardous, Nonradioactive Waste

The remaining solid wastes—including slab floors, nonhazardous waste tanks, metal and concrete structures, and rebar from concrete slabs—were characterized as nonhazardous waste and transported by end dump trucks to a local landfill.

7.0 References

California Code of Regulations (CCR), Title 22, Chapter 11, Section 66265.115, Certification of Closure (22 CCR 66260.10).

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8.0 Acronyms

A514	Area 514
ASTM	American Society for Testing and Materials
CAS	Concrete-Asphalt-Soil
CC	Clauss Construction
CCR	California Code of Regulations
CFR	Code of Federal Regulations
COC	Chain of custody
CSTU	Container storage and treatment unit
CSU	Container storage unit
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DTSC	California Department of Toxic Substances

DWTF	Decontamination and Waste Treatment Facility
EPA	U.S. Environmental Protection Agency
EPD	Environmental Protection Department
ES&H	Environmental, safety, and health
ESL	Environmental screening levels
GE	Geothermal engineer
HEPA	High-efficiency particulate air (filters)
LLNL	Lawrence Livermore National Laboratory
LLW	Low-level radioactive waste
MSDS	Material Safety Data Sheet
ORAD	Operations and Regulatory Affairs division
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated biphenyl
P.E.	Professional engineer
PPE	Personnel protective equipment
QA/QC	Quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RHWM	Radioactive and Hazardous Waste Management Division
SAP	Sampling and Analysis Plan
SSO	Site Safety Officer
SSHP	Site Safety and Health Plan
STL	Severn Trent Laboratory
STLC	Soluble threshold leachate concentration
TPH	Total petroleum hydrocarbons
TSDF	Treatment, storage, and disposal facility
TTLC	Total threshold limit concentration
UC	University of California
U.S.	United States

VOC	Volatile organic compound
WAA	Waste accumulation area
WAC	Waste Acceptance Criteria
WTTF	Wastewater Treatment Tank Farm

Appendix A
Daily Observation Reports

A safety tailgate meeting was held mornings of every working day prior to beginning work to discuss the day's tasks. Topics covered in the meeting included PPE, emergency response, evacuation routes, safety equipment, fire extinguisher location and use and work practices relative to the day's activities were reviewed. Other non-safety related topics included specific tasks for the day. For example on the days sampling was occurring sample handling, preservation methods, log books, requirements of the sampling plan and sample custody were covered.

A meeting was held at the end of each working day was held to discuss the day's events and lessons learned.

Daily Observation Report

Date: 6/9/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 1

Daily activities and observations:

Swipe sampling of structures and tanks began today. Equipment on site included a man lift to be used to reach the sampling locations.

Three sampling teams were set up; each sampling team consisted of two samplers. Sampling Lead, Stephen Rowe Krumdick, issued sampling labels, log books and QC documents to the teams. Each sampling team was issued a logbook.

Daily Observation Report

Date: 6/10/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast in the morning, sunny later in the day, light breeze

Temperature: 50s-70s

Report Number: 2

Daily activities and observations:

Swipe sampling of structures and tanks continued. An air knife, vacuum truck and a jackhammer were at the site for "potholing" and a man lift was used to reach the sampling locations.

Three sampling teams continued taking swipe samples of the structures and tanks. A pothole was excavated to find the exact location and identify the type of underground utility lines. A "pothole" was excavated outside of the Area 514 facilities perimeter fence to the west of 514-3 container storage area. Two other potholes were excavated previously on the street to the west of Area 514 outside of the perimeter fence area. Another trench excavation is planned within the yard to locate more utility lines before soil samples can be taken.

Daily Observation Report

Date: 6/11/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast in the morning, sunny later in the day, light breeze

Temperature: 50s-70s

Report Number: 3

Daily activities and observations:

The sampling teams continued the sampling activities. Main areas of sampling included the quad tanks and B513. Using handheld field instruments, rad. meter and a PID, the hazardous and mixed tanks of the quad tanks show no contamination. Piping associated with the hazardous waste tanks of the quad tank were dismantled and sampled. Part of the piping associated with the radioactive only tanks of the quad tanks were drained and analyzed with a PID shows VOC readings. A VOC sample from the liquid was requested.

The shredder room part of Building 513 was sampled today. Currently entry to the room is controlled and requires personnel protective equipment. The room will be sprayed using CC Fix to seal the surface areas in the room to "lock down" any radioactive materials contamination.

LLNL staff are preparing to saw cut the concrete in the yard area to the south side of the silver recovery room and excavate the soil using an air knife to locate utility lines before drilling activities begin.

The sampling of the liquids in the radioactive tanks of the quad tank did not occur today due to the weekend coming up and the holding time limits on the VOC analysis. The liquids are in the feed pipe to the tank, and tanks and piping have not been compromised for the compounds to escape.

Daily Observation Report

Date: 6/14/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 4

Daily activities and observations:

LLNL sprayed the shredder room on Saturday, 6/13/2004, to "lock down" any possible radioactive contamination on the walls, ceiling and floor surfaces. The entry restrictions into the room have been lifted,

Swipe sampling of the structures continued.

A project meeting was held today. The following was discussed:

- Mechanical isolation of the site including high pressure gas, water and compressed air,
- The HEPA filter on the treatability laboratory within Building 513,
- Asbestos pipe wrap on the elbow of the piping outside of Building 514,
- The exterior and partition walls of B514 will be removed in the week of 23rd,
- HWM will survey the cabinets and office furniture in B514 office area at time removal to be able to access the currently unreachable surfaces,

Daily Observation Report

Date: 6/15/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast in the morning, sunny later in the day, light breeze

Temperature: 60s-90s

Report Number: 5

Daily activities and observations:

Swipe sampling of the structures continued. Also, tank material sampling occurred for the hazardous waste tanks of the quad tanks.

LLNL staff completed the excavation in the yard and as expected found three, relatively shallow pipes beneath the concrete.

Daily Observation Report

Date: 6/16/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 6

Daily activities and observations:

Swipe sampling of the structures continued. One team continued working on dismantling the remaining quad tank piping.

The HEPA filter for the treatability laboratory has been taken down and placed on the floor of building 513.

Discussed the requirements of the NOD response to using brass sleeves and method 5035 for taking soil samples with Charles, Steve and Mark. Also discussed the advantages use of stainless steel for the activity. Stan Terusaki and I called Mike Stanek and followed up with an e-mail to be able to use stainless sleeves instead of brass.

Daily Observation Report

Date: 6/17/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 7

Daily activities and observations:

Hazards Control (HC) Department and RHWM Division personnel are decontaminating the B514 filtration room. Swipe sampling and tank piping dismantling continued.

CAS sampling will not occur today, as originally scheduled. Earth Tech (ET) staff are waiting for method 5035 appropriate sample bottles to arrive.

Daily Observation Report

Date: 6/18/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 8

Daily activities and observations:

CAS sampling activities began today. The sampling equipment was inspected including sample bottles with Earth Tech staff. Decontamination operations are ongoing in the B-514 filtration unit room.

Earth Tech. staff continued dismantling the tank farm piping starting from inside the B514 filtration room.

Two CAS sampling location, #31 and #11, were completed today. CAS #8 and #9 were attempted, however, the drillers encountered a hard surface beneath the asphalt and loose base material. Samples of the asphalt and base material were obtained; other equipment is needed to continue with the two sampling locations.

Daily Observation Report

Date: 6/21/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 9

Daily activities and observations:

Earth Tech staff began drilling through the concrete in 514-2 cell B. The drill is encountering difficulty going through the concrete. It is decided to discontinue drilling for now and bring a more suitable drill for the purpose.

It was discovered that CAS sample location # 3 has another layer of asphalt beneath the asphalt and base material.

LLNL RHWM and HC staff have removed the radioactive contaminated cabinets and other equipment from B 514 filtration unit into 514-3 CSU. The contaminated areas have been cleaned and vacuumed.

Earth Tech. staff continued with draining piping system under the tank farm. Beads of mercury have been collected from the pipes. LLNL RHWM and HC staff have managed the mercury using mercury clean-up kits.

A meeting with LLNL project staff including HC staff regarding the project status was held at 1:30. The following was discussed:

- Building 514 demolition is scheduled for this Saturday, 6/26. No foundation will be removed.
- The Quad Tanks will be taken down intact,
- The demolition of Building 513 is scheduled in 4 weeks. The entire concrete floor will be considered radioactive contaminated
- The B514 office area and furniture are being processed, all equipment and furniture will be surveyed and swiped before release,
- RHWM and HC sampling of the treatability laboratory have shown the structure to be free of contamination.

Daily Observation Report

Date: 6/22/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 10

Daily activities and observations:

Earth Tech staff continued dismantling tank farm piping. The drillers brought other equipment to drill through the hard layer at CAS 8 and 9. This attempt was unsuccessful to penetrate the hard layer. Another piece of equipment will be brought in. It appears that the hard layer in the area is thicker than 10 inches deep.

LLNL staff continue removing furniture, light fixtures, bulbs, etc. from the B514 office area.

Concrete drilling operations are proceeding slowly.

A few of the swipe preliminary results have been received from the laboratory. The sampling results show no contamination of the structures so far according to Earth Tech staff.

The drilling of the hard layer at CAS and 8 and 9 and the coring of the 514-2 cell C have been unsuccessful.

Daily Observation Report

Date: 6/23/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast in the morning, sunny later in the day, light breeze

Temperature: 50s-70s

Report Number: 11

Daily activities and observations:

ET staff continued dismantling the tank farm piping. I was informed that the drill rig might have a problem erecting its mast in B513 low bay. The sample location might have to be changed to accommodate.

Stan Terusaki called Mike Stanek, DTSC permit writer, to let him know about the sample location rational and deviation from it for B513 samples. Mike Stanek asked for a summary of the deviation to date and a summary was faxed to him.

CAS #27 has been obtained; the HC Technician is concerned that the drillers did not follow the procedures for entering the room. He surveyed the equipment and personnel before allowing exit from the area. No contamination of personnel or equipment was found.

All work at the site has been stopped to review the drillers training documents and the other safety procedures. By 4:00 p.m. the issues were resolved and the work will start tomorrow morning.

Daily Observation Report

Date: 6/24/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 12

Daily activities and observations:

The drilling and sampling operations continued. LLNL staff continued removing electrical equipment, wires and furniture from building 514. The equipment and furniture were surveyed before releasing for further handling. LLNL personnel continued sampling and surveying building 514.

The drillers made the top of the hole for CAS # 8 and 9 larger in order to reach and remove the debris to continue drilling. The soil under the asphalt had an odor that was not familiar. A sample will be taken from the material. The action was successful and the drillers reached the native soil beneath the hard layer after lunch. Apparently the hard layer was approximately 24 inches thick and it was a compacted fill material and not concrete as originally thought. I was also informed that a sample had been taken from the material under the asphalt layer and that the odor was probably from the asphalt layer covering the fill material.

Daily Observation Report

Date: 6/25/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 13

Daily activities and observations:

The drillers continue taking soil samples. Mark Divoky delivered a letter from the state to NNSA that B 514 is not historically significant and can be demolished. Stan Terusaki called Mike Stanek, DTSC permit writer, and gave notification as required by the initial study and faxed him the letter.

Clauss Construction staff began removing the remaining equipment and furniture from building 514. Demolition of the building will begin tomorrow. ET and LLNL staff have completed the sampling for the structure.

Daily Observation Report

Date: 6/26/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 14

Daily activities and observations:

Clauss Construction staff began by removing items from the building exterior. Two elbows insulation materials for hot water piping were determined to contain asbestos; Clauss staff removed the elbows intact and bagged them for disposal. All piping including waste piping had been disconnected to the building. Clauss Construction staff began the demolition by breaking up the front wood side of the building with an excavator. Using a "Bobcat" the debris was removed, and the inside of the building was cleared of any remaining wooden and metal objects. Water spray was used for dust suppression throughout the process. The excavator was used to crush the concrete remove the rebar and other metal materials from the concrete.

Approximately at 6:00 PM the excavator was damaged by hitting a hydraulic line fitting against one of the walls. The incident released less than a gallon of hydraulic oil. Some of the oil sprayed on the concrete rubble, most of the oil leaked down the shaft of the arm. LLNL and Clauss staff minimized the spread of the oil by putting absorbent material on the spilled oil and placing plastic sheeting under the shaft and covering it with absorbent materials.

Daily Observation Report

Date: 6/28/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-80s

Report Number: 15

Daily activities and observations:

Mechanics are on site this morning to assess the damage to the excavator. ET staff continue dismantling and sampling the piping associated with the Waste water treatment tank farm.

The mechanics returned to the site with the necessary parts to repair the excavator. The demolition work resumed at about 1:30 pm.

Meeting was held at 1:30 with LLNL hazards control staff and Project manager. The following was discussed:

- WTTU demolition is expected to begin on July 8th.
- QUAD tank removal is expected to begin on July 6th.
- The F listed tanks will be wrapped in plastic and placed in the waste accumulation area to set up.
- Part of the B514 room addition to the north was in the time frame when arsenic was added to the roofing material for rodent control. The roofing material will be assumed contaminated and handled as such until the sampling results are received.

Daily Observation Report

Date: 6/29/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 16

Daily activities and observations:

Clauss Construction staff continue separating metal and wood materials from demolition debris. The filtration unit room will be demolished when the office area demolition debris can be safely segregated, because the filtration room material is assumed to be radioactive contaminated.

Earth Tech staff continue dismantling non-hazardous tank piping. Another team of ET staff continues to dismantle and sample the piping associated with the treatment tank farm.

The filtration unit room has been demolished and the demolition debris is kept separately, adjacent to the office debris. The CAS sample locations 1, 2 and the seam where the exploratory trench was excavated are grouted to minimize cross contamination.

The room addition to the north of B 514 has been demolished. The roof debris from this room is kept separately for possible arsenic contamination.

Daily Observation Report

Date: 6/30/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 17

Daily activities and observations:

Bins are arriving on site for the demolition debris to be moved from the site. Bins are lined with plastic sheeting before the concrete rubble is loaded in them. The full bins are moved to building 222 area for storage awaiting complete characterization by LLNL and disposal.

ET staff continue dismantling and sampling the piping under the tank farm. It is discovered that a pipe penetrated a footing next to the sump within the tank farm secondary containment. According to ET staff the pipe is open and they were able to pull the open ended pipe from the concrete. Insulation is visible where the pipe had penetrated the concrete.

According to Steve Rowe Krumdick, the swipe samples do not show contaminant levels above hazardous waste levels. In looking at some of the CAS results, CAS # 3 and 29 show copper and chromium concentration levels above the values stated in table B-4 of the approved closure plan.

Daily Observation Report

Date7/1/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 18

Daily activities and observations:

Clauss Construction staff continue loading the B 514 demolition debris into bins and storing them in the waste accumulation area setup for the project.

Earth Tech. staff have completed removing piping from underneath the tanks and have moved upstairs to remove the piping. Soil sampling continued today. The water truck was moved so that the exhaust from the truck does not impact the samples. CAS # 1, 2, and 24 were completed today.

Daily Observation Report

Date: 7/6/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-80s

Report Number: 19

Daily activities and observations:

Clauss Construction staff continued loading remaining demolition debris into bins. The bins are being stored at a waste accumulation area on site until further characterization and disposal. Earth Tech staff continue removing piping from the tank farm.
The non-hazardous tanks and the packing cooling water tank were removed from the site. LLNL staff continued removing electrical wire and equipment from B 513. The quad tanks footings are being unbolted in preparation for removal.

Daily Observation Report

Date: 7/7/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 20

Daily activities and observations:

Clauss Construction staff moved the demolition debris out of the way to clear the way for taking soil samples from B 514 footprint.
Earth Tech staff cut up piping associated with the tank farm for containerizing and storage.
Tank RA5AA was removed using a crane. The tank was put on a truck and moved to the waste accumulation area.
CAS # 22, 16, 21 and 23 were sampled today. CAS Sample location # 21 was covered with approximately 2.5 feet of concrete.

Daily Observation Report

Date: 7/8/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-70s

Report Number: 21

Daily activities and observations:

Earth Tech staff prepared a hazardous waste roll-off bin to load the piping associated with the tank farm for storage in the waste accumulation area. The roll-off bin was lined with absorbent pad on the bottom and two layers of plastic on the bottom and sides. The top of the bin can be closed, which completely encloses the container. The pipes were loaded with two people outside and on two people on the inside of the bin. The pipes are considered f-listed and contaminated with mercury. Mercury was found in the piping during the dismantling process.

The remaining three tanks of the quad tanks were removed using a crane. The tanks were put on a truck and moved to the waste accumulation area.
CAS # 17, 19, and 20 were completed today.
Building 513, 514-1 and 514-2 are being prepared for demolition by removing the remaining electrical wiring and equipment.

Daily Observation Report

Date: 7/9/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-70s

Report Number: 22

Daily activities and observations:

Earth Tech staff loaded the tank farm piping in the lined hazardous waste bin.
Building 513, 514-1 and 514-2 are being prepared for demolition by removing the remaining electrical wiring and equipment.
Earth Tech staff began draining and dismantling the equipment in the chemical reagent shed.
Clauss Construction staff dismantled 514-1 and 514-2 CSUs using a shearing device. The debris was segregated and piled awaiting bins for loading and transfer to the waste accumulation area.

Daily Observation Report

Date: 7/10/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 23

Daily activities and observations:

Clauss Construction staff dismantled the tank farm structure including the canopy and elevated walkway. The debris was segregated and left in piles awaiting container bins and transfer to the waste accumulation area.

Clauss Construction staff also dismantled B513 room 1000 including the CSU and the solidification area. The purlins in the ceiling at B513 room 1000 were cut approximately five feet from where they attached to the shredder room, room 1002, before demolition of room 1000 in order to segregate the potentially radiologically contaminated areas from non-contaminated area. The treatability laboratory was left standing to be taken down separately since the structure is made of wood.

Daily Observation Report

Date: 7/12/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 24

Daily activities and observations:

Clauss Construction staff are awaiting bins to remove the construction debris from the site.

Meetings were held to discuss and review the process for hand dismantling the shredder room.

Daily Observation Report

Date: 7/13/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 25

Daily activities and observations:

Earth Tech staff are collecting tank epoxy and grout samples from the bottom of the treatment tanks.

Clauss Construction staff began dismantling the B513 shredder room by removing the wall panels from top to bottom.

A project meeting was held today. The following was discussed:

- The pad and foundation of B513 will be cut to 4X4 sections by LLNL staff and removed since the area is considered radioactive contaminated. The cuts will penetrate 2 to 3 inches deep into concrete.
- The remaining soil in the area that will be left behind will be MARSSIM surveyed at the end of the project.

Daily Observation Report

Date: 7/14/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-80s

Report Number: 26

Daily activities and observations:

Clauss Construction staff continued removing wall panels from the shredder room. Clauss staff also removed the bolts from the footings of the treatment tanks in preparation of removal.

Two of the tanks were removed from their pads and set on the asphalt area in the area.

Daily Observation Report

Date: 7/15/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-80s

Report Number: 27

Daily activities and observations:

Clauss Construction staff continued removing wall panels from the shredder room. Two bins arrived in the afternoon, which were loaded with metal debris from B 513 demolition and taken to the WAA.

Daily Observation Report

Date: 7/16/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 28

Daily activities and observations:

Clauss Construction and Earth Tech staff continued removing wall panels from the shredder room.

One of the waste drums at the WAA had corroded and leaked into the secondary containment. The leak was discovered during the daily inspection and the waste was transferred into another drum. The waste in the drum was a result of draining fluids in the pipes under the tank farm.

Daily Observation Report

Date: 7/19/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 29

Daily activities and observations:

Clauss Construction and ET staff continued removing wall panels from the shredder room. More bins arrived today which were filled with metal debris and moved to the WAA.

Paid a visit to the WAA. The low-level and suspected low-level materials are kept in roll-off bins that are covered with tarp. Non-hazardous construction debris is kept in open roll-offs outside and inside the fenced WAA area. The solid mixed waste is placed in the WAA in roll-off bins that have tops. The liquid waste is stored in drums and placed on secondary containment pallets.

Daily Observation Report

Date: 7/19/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 30

Daily activities and observations:

Clauss Construction and ET staff continued dismantling B513 shredder room by hand.
Clauss Construction staff continued loading bins to be stored at the WAA.
Clauss Construction demolished the treatability lab and loaded it into roll-off bins for further handling.

Daily Observation Report

Date: 7/20/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 31

Daily activities and observations:

Clauss Construction and ET staff continued dismantling B513 shredder room.
Clauss Construction staff continued loading roll-off bins with metal and concrete demolition debris.
Clauss Construction demolished the treatability lab and loaded it into roll-off bins for further handling.

Daily Observation Report

Date: 7/21/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 70s-90s

Report Number: 32

Daily activities and observations:

Clauss Construction and ET staff continued dismantling B513 shredder room.
Clauss Construction staff continued loading roll-off bins with metal and concrete demolition debris. The roll-off bins are marked for the type and the origin of the contents before moving into the WAA.
The B513 room 1000 floor area was cleaned of debris and dust in preparation for saw cutting and removal.

Daily Observation Report

Date: 7/22/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 70s-90s

Report Number: 33

Daily activities and observations:

Clauss Construction and ET staff continued loading construction debris into roll-off bins.
Earth Tech and Clauss Construction staff removed the roof panels off of the shredder room.
Two of the treatment tanks were moved to open access for the equipment for the soil sampling of the tank area.
The saw cutting of B513 pad began today. The cutting is wet operation and LLNL staff use drums and vacuum to collect the water.
The north wall of the quad tanks berm area has been removed in preparation for soil sampling.

Daily Observation Report

Date: 7/23/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 34

Daily activities and observations:

Clauss Construction and Earth Tech staff continued loading bins for storage in the WAA.
LLNL staff continued cutting B513 concrete floor. The east wall of the quad tanks secondary containment was demolished and the pad was cleared of demolition rubble in preparation for taking the soil samples.
Clauss Construction staff removed two remaining treatment tanks from their pad and placed them on the asphalt in the yard.

Daily Observation Report

Date: 7/24/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light breeze

Temperature: 60s-80s

Report Number: 35

Daily activities and observations:

Clauss Construction staff continued loading demolition debris into roll-off bins. LLNL staff continued cutting the B 513 pad.

Daily Observation Report

Date: 7/26/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 70s-90s

Report Number: 36

Daily activities and observations:

LLNL staff continued saw cutting B513 pad.

A project meeting was held in the afternoon. The following was discussed:

- MARSSIM survey of the entire site will be performed after the asphalt and concrete floor of the area is removed.
- Soil sampling will occur on Thursday and Friday.

Daily Observation Report

Date: 7/27/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 37

Daily activities and observations:

Clauss Construction staff brought the shredder room frame down using a shearing device on an excavator. The metal was loaded into roll-off bins for storage at the WAA.

Daily Observation Report

Date: 7/29/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 38

Daily activities and observations:

Clauss Construction staff removed the concrete floor from building 514. A sump that measures approximately 3 feet in diameter and 5 feet deep was uncovered within the filtration room, approximately 15 feet from the north wall and 10 inches from the west wall of the room. The sump's stainless steel liner was removed and placed in a roll-off bin. The sump's concrete wall was penetrated in 3 locations by pipes.
LLNL staff continue cutting the B 513 pad.
The drillers are on-site for collecting CAS samples.
Additional capacity at Building 412 WAA is being used since the T-4698 is at capacity.

Daily Observation Report

Date: 7/30/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light breeze

Temperature: 60s-80s

Report Number: 39

Daily activities and observations:

Clauss Construction staff continued removing concrete and asphalt floor in the B514 slab and non-hazardous waste tank floor area.
The top of the treatment tanks were wrapped in plastic and moved to 412 WAA.
Saw cutting of the B513 concrete floor has been completed.

Daily Observation Report

Date: 8/2/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast in the morning, sunny later in the day, light breeze

Temperature: 60s-70s

Report Number: 40

Daily activities and observations:

Clauss Construction and ET staff continued removing yard, tank farm and quad area floors. The piles from the different areas are being kept separate. There is a concrete pile from the floor of the filtration room, and one from the rest of the yard. There is a pile of asphalt from the walkways within the yard.

Daily Observation Report

Date: 8/3/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 41

Daily activities and observations:

Clauss Construction and ET staff continued removing yard, tank farm and quad area floors. The quad tank area had two concrete pads. The bottom pad was used for the 25K gallon tank. The top pad was installed when the quad tanks replaced the 25K gallon tank.

Daily Observation Report

Date: 8/4/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 42

Daily activities and observations:

Clauss Construction staff continued removing floor areas. Two sumps, one from the tank farm area and one from the yard area, were partially pulled out and left in place.

A project meeting was held today. Status of the project was discussed, soil sampling will conclude on Friday.

Daily Observation Report

Date: 8/5/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 43

Daily activities and observations:

Clauss Construction staff continued excavating the concrete and asphalt floor areas.
BAAQMD inspectors arrived this morning and inspected the site.
Inspected the partially pulled sumps in the area, from the visible parts of outside of the sump that was in the yard, it appears that 2 pipes, approximately 4 and 6 inches in diameter, penetrated the side-walls of the sump. The bottom of the sump could not be inspected at this time.

Daily Observation Report

Date: 8/6/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 44

Daily activities and observations:

The last of the CAS samples were collected today. The soil under the silver recovery room and DO sump was sampled.

CC staff removed the asphalt yard areas to the east of the tank farm and west of the 514-3 CSU. The excavator was taken away today.

Daily Observation Report

Date: 8/11/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 70s-90s

Report Number: 45

Daily activities and observations:

The asphalt, west and south side areas adjacent to the 514-2 CSU were excavated today to expose the footings for the CSU.

Daily Observation Report

Date: 8/12/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 46

Daily activities and observations:

CC staff continued to excavate and expose the footings for 514-2 CSU. The area excavated was a layer of asphalt, fill and concrete in that order.

Daily Observation Report

Date: 8/18/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast in the morning, sunny later in the day, light breeze

Temperature: 60s-90s

Report Number: 47

Daily activities and observations:

A roll-off bin containing structural steel from 514-1 and 514-2 CSUs were sent off site to Altamont landfill. Also, two roll-off bins containing asphalt from the yard areas had been sent to the Altamont landfill.

CC staff continued loading asphalt from the yard areas onto trucks for disposal off-site.

Daily Observation Report

Date: 8/24/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-70s

Report Number: 48

Daily activities and observations:

Met with the project team. The following was discussed:
Size reduction of the tanks and the piping. The tanks and piping cannot be size reduced in the WAA since size reduction of hazardous wastes is considered treatment.

Sampling of the Building 514 roof material has shown plutonium contamination.

The concrete pad for Building 513 is thicker than originally thought. The floor is not breaking at the saw cuts in sections. It is now planned to break up the floor and remove like other concrete areas.

Daily Observation Report

Date: 8/30/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 49

Daily activities and observations:

CC staff began breaking up the concrete floor for 514 CSU cell A area. CC staff also began to process the concrete rubble to break the pieces into smaller sections and separate the rebar from concrete.

Daily Observation Report

Date: 9/2/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 50

Daily activities and observations:

CC staff continued processing concrete rubble.

Daily Observation Report

Date: 9/7/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-90s

Report Number: 51

Daily activities and observations:

ET staff have began surveying the 514-3 CSU pad. No other activities are ongoing.

Daily Observation Report

Date: 9/30/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light wind

Temperature: 60s-70s

Report Number: 52

Daily activities and observations:

The roll-off bin containing contaminated piping, pumps, etc., from the tank farm and the quad tanks has been brought back to the 514 area from the WAA for size reduction purposes. LLNL staff have devised a stand with a saw mounted on it, to cut the pipes to be put into boxes for off-site shipment. The asphalt walkway in the yard has been covered with plastic and is being used for the operations.

Daily Observation Report

Date: 10/8/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-70s

Report Number: 53

Daily activities and observations:

CC construction staff have resumed breaking up the 514-2 CSU.

Daily Observation Report

Date: 10/13/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 54

Daily activities and observations:

The six treatment and four quad tanks have been brought back to the 514 Area from the WAA for size reduction purposes. It is planned to cut the quad tanks using a saw and to crush the steel tanks so that they can be placed in transportainers for further handling. The metal pieces are being removed from the quad tanks in preparation for size reduction.

LLNL had applied for a 30 day extension to store the quad tanks and the contaminated piping in addition to 90 days allowed by the regulations. The DTSC denied the extension request. The 90-day storage limit for these wastes was October 7th.

Daily Observation Report

Date: 10/15/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 60s-80s

Report Number: 55

Daily activities and observations:

LLNL staff is lining 514-3 CSU with plastic to begin size reducing the quad tanks. The floor of the CSU is being covered as well as the east and west sides of the CSU with 8 feet high plastic sheeting.

Daily Observation Report

Date: 10/16/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast in t he morning, sunny later in the day, light wind

Temperature: 50s-60s

Report Number: 56

Daily activities and observations:

The size reduction activities of tank 514-R5A7 have begun. This tank has shown mercury contamination. The tank is being size reduced to fit 7'X4'X4' steel boxes. The size reduction activities began by using a reciprocating saw and a vacuum to control particulates as the saw cuts through the tank.

The reciprocating saw is cutting slowly so the crew began using a circular saw. Personnel are suited up in Tyvek and full-face respirators for this job.

Daily Observation Report

Date: 10/18/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light breeze

Temperature: 50s-60s

Report Number: 57

Daily activities and observations:

Size reduction of the tanks continued. The radioactive tanks are being cut into larger pieces since they are going to be placed in transportainers for storage and shipment. The three remaining FRP tanks were cut up today. The pieces were left in 514-3 CSU awaiting a transportainer to be brought in.

Daily Observation Report

Date: 10/20/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light breeze

Temperature: 50s

Report Number: 58

Daily activities and observations:

LLNL and Clauss Construction staff tried to crush the tank farm tanks with an excavator today. One of the tanks was moved onto the B513 pad shredder room concrete pad and was laid on a plastic sheet. The excavator could not crush the tanks. It was decided that the cover plates partially covering the tanks need to be removed before crushing the tanks.

Daily Observation Report

Date: 10/21/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 50s-60s

Report Number: 59

Daily activities and observations:

LLNL and Clauss Construction staff continued crushing the tanks. The tank covers have been unbolted. The front of the tank is covered with plastic before proceeding with the crushing. The open end of the tank is crushed, however, the conical end of the tank will not collapse. The tank is moved onto a dirt area of B513, where the concrete floor has been excavated, to stop the tank from slipping on the concrete floor. The conical end of the tank did not collapse and it was decided to bring in a larger excavator.

LLNL staff suited up in the afternoon to cut up one of the quad tanks, 514-R5A9, that handled mixed waste. This tank is being cut into smaller pieces to fit a 7'X4'X4' steel box.

Daily Observation Report

Date: 10/22/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light breeze

Temperature: 50s-60s

Report Number: 60

Daily activities and observations:

LLNL staff wrapped the tank and the ancillary equipment that was being crushed in plastic and began pumping the accumulated rain water from the Building 513 secondary containment area into portable tanks.

Daily Observation Report

Date: 10/27/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light breeze

Temperature: 40s-50s

Report Number: 61

Daily activities and observations:

Clauss Construction staff brought a larger excavator to the site for crushing the tanks. The excavator successfully crushed the steel treatment tanks. The crushed tanks were placed into transportainers as they were crushed.

Daily Observation Report

Date: 10/28/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light breeze

Temperature: 40s-60s

Report Number: 62

Daily activities and observations:

Clauss Construction staff continued crushing the remaining treatment tanks. The crushed tanks were placed into transportainers as they were crushed. The grout and epoxy layer that lined the tanks came off. However, they have stayed in larger pieces as opposed to crumpling since they have been applied on what appears to be fiberglass mesh. The crushed tanks and parts that stayed outside of the transportainer were wrapped in plastic.

Daily Observation Report

Date: 11/1/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light wind

Temperature: 30s-60s

Report Number: 63

Daily activities and observations:

LLNL staff began moving the cut up pieces of the quad tanks that remained in 514-3 into the transportainers.

Daily Observation Report

Date: 11/2/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 40s-60s

Report Number: 64

Daily activities and observations:

LLNL staff continued loading the transportainers with the quad tank pieces. The transportainers are full and there are still pieces of the quad tanks that need to be loaded. LLNL staff have put miscellaneous items such as PPE, plastic sheeting, etc. that was used to process the treatment and the quad tanks into bags. The bags have been loaded into the transportainer as well.

Daily Observation Report

Date: 11/3/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light wind

Temperature: 50s

Report Number: 65

Daily activities and observations:

Clauss Construction staff resumed hammering the remaining 514-1, 514-2 and B513 concrete floors.

Daily Observation Report

Date: 11/4/04

Weather Conditions: overcast, light breeze

Temperature: 40s-50s

Report Number: 66

Daily activities and observations:

Clauss Construction staff continued hammering Building 513 concrete floor.

Daily Observation Report

Date: 11/5/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: sunny, light breeze

Temperature: 40s-60s

Report Number: 67

Daily activities and observations:

Clauss Construction staff continued hammering and processing Building 513 concrete floor.

Daily Observation Report

Date: 11/8/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light breeze

Temperature: 50s

Report Number: 68

Daily activities and observations:

Clauss Construction staff continued processing the concrete rubble by breaking the concrete in smaller pieces and separating the rebar.

Daily Observation Report

Date: 12/9/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light breeze

Temperature: 50s

Report Number: 69

Daily activities and observations:

Clauss Construction staff continued processing the rubble from 514-1, 514-2, quad tank and building 513 concrete floor areas. Also, Clauss Construction staff began rough grading the entire closure site.

Daily Observation Report

Date: 12/10/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast in the morning, sunny later in the day

Temperature: 50s

Report Number: 70

Daily activities and observations:

Clauss Construction staff loaded non-hazardous rubble, debris, tanks, etc. into end-dump trucks to be taken to a local landfill.

Daily Observation Report

Date: 12/20/04

Project: LLNL Area 514 Treatment and Storage RCRA Closure

Weather Conditions: overcast, light breeze

Temperature: 40s-50s

Report Number: 71

Daily activities and observations:

Clauss Construction and LLNL staff loaded low level and mixed waste concrete rubble into lift liners. The process involved placing "super sacks" into cages and loading them using an excavator. The sacks were then lifted out of the cages by use of a forklift and loaded onto a truck. The closed sacks were then taken into the T-4698 WAA for storage.

Appendix B
Letter from the Severn Trent Laboratory

SEVERN TRENT STL

STL St. Louis
13715 Rider Trail North
Earth City, MO 63045

Tel: 314 298 8566 Fax: 314 298 8757
www.stl-inc.com

June 9, 2004

Mark Divoky
Lawrence Livermore National Laboratory
LLNL # L-499
7000 East Avenue
Livermore, California 94551

RE: STL St. Louis analysis methods for the LLNL Area 514 RCRA Closure project

Dear Mr. Divoky,

STL St. Louis has prepared a list of the following substitutions based on detection limits or outdated methods relative to the Sampling and Analysis Plan (SAP) provided in Appendix B of the Closure Plan for LLNL Area 514.

STL St. Louis will perform PCBs by SW-846 Method 8082. Table B-1 of the SAP lists SW-846 Method 8080 for PCBs. The 8080 method has been delisted by SW-846 and it is no longer utilized. SW-846 Method 8082 is the industry standard analysis for this parameter.

STL St. Louis will perform Tritium by EPA Method 906. Table B-1 of the SAP lists ASTM D-2476. ASTM has withdrawn this method and it is no longer utilized. EPA Method 906 is the industry standard analysis for this parameter.

STL St. Louis will perform pH analysis for liquids by SW-846 method 9040A and solids by SW-846 Method 9045C. Table B-1 of the SAP only specifies the generic SW-846 method 9040. Method 9040A is the current revision of this method and is the industry standard analysis for liquids for pH. Table B-1 of the SAP does not address the pH in solids. Method SW-846 Method 9045C is essentially SW-846 method 9040A. A 5 gram soil aliquot is taken, 5 ml of DI water is added, and the pH of the water layer is taken in the same manner as directed in method 9040A.

Arsenic and Selenium will be analyzed using methods 7060 and 7741, respectively. Methods 7060 and 7741 are graphite furnace atomic absorption (GFAA) methods. Historically, GFAA methods were needed to achieve low level reporting limits. Advancements in ICP instrumentation, have drastically reduced the need for GFAA analyses. As noted in the attached spreadsheet containing STL St. Louis reporting limits and method detection limits (MDLs), SW-846 ICP method 6010 can meet the action levels required in the SAP for Arsenic and Selenium for this project. For this project, Arsenic and Selenium results will be provided by GFAA Methods 7060 and 7741 and by ICP method 6010.

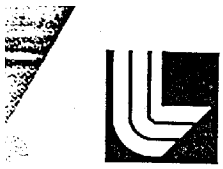
Regards,

Elaine Wild

Elaine Wild
QA Manager
STL St. Louis

cc: William Musbach – Clauss Construction
Steve Rowe-Krumdick – Earth Tech
Linda Raabe – Earth Tech
Charles Williams – Earth Tech
Mark Loeb – STL St. Louis
Ed Kao – STL St. Louis

Appendix C
LLNL Letter Amending Area 514 Closure Plan



Lawrence Livermore National Laboratory

Environmental Protection Department

July 21, 2004

Mr. Mike Stanek, Hazardous Substance Engineer
Standardized Permits & Corrective Action Branch
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826-3200

Subject: Closure Plan Amendments for the Area 514 Treatment and Storage Facility Lawrence Livermore National Laboratory (LLNL)

Dear Mr. Stanek:

This letter and attachments are in compliance with section 1.2 of the approved closure plan for the Area 514 Treatment and Storage Facility dated February 2004. Section 1.2, Closure Plan Amendments, states, "If an unexpected event occurs during closure activities which affects the Plan, DTSC will be notified immediately, and an amendment will be submitted within 30 days."

Lawrence Livermore National Laboratory (LLNL) informed you of the following amendments on the telephone and in a follow up e-mail on 6/24/2004. This amendment submittal is being made within 30 days of the initial notification.

The following amendments have been made to the approved sample analysis methods:

- SW 846 method 8080 for PCB analysis has been replaced by SW 846 method 8082. Method 8080 has been de-listed by the EPA.
- ASTM method D-2476 for tritium analysis has been replaced by SW 846 method 906. ASTM method D-2476 has been withdrawn.
- The approved closure plan lists SW 846 method 9040 for pH analysis. The current version of the method 9040A will be used.

Concrete, Asphalt and Soil (CAS) samples have been taken in the areas as specified in the approved closure plan. The exact locations of the samples are chosen based on where any spilled materials would have accumulated such as low ends of the floor areas, and where it would be possible to reach with sampling equipment.

PRA04-050
July 21, 2004

Mr. Mike Stanek
Subject: Closure Plan Amendments for the Area 514 Treatment and Storage Facility
Lawrence Livermore National Laboratory (LLNL)

In addition, soils immediately underlying asphalt areas will not be analyzed for petroleum hydrocarbons. LLNL will assume that these soils are contaminated with petroleum hydrocarbons. The analytical laboratory has informed LLNL that analyzing these soils for petroleum hydrocarbons could damage their instruments.

Attachment A contains pages of the effected sections of the final closure plan with the changes highlighted for ease of your review. Attachment B contains two sets of replacement pages for the effected sections. Please call Stan Terusaki of my staff at (925) 422-1539 if you have any questions.

Sincerely,

C. Susi Jackson, Division Leader
Operations and Regulatory Affairs Division

Attachments:
Attachment A Highlighted changes of the Area 514 Final Closure Plan
Attachment B Two sets of replacement pages

CSJ/MA:cp

cc w/attachments:
Wen Kao, NNSA/LSO L-574

Appendix D
Copies of Permits

AY AREA AIR QUALITY MANAGEMENT DISTRICT

COMPLIANCE & ENFORCEMENT DIVISION

Regulation 11, Rule 2

Acknowledgement of Notification and Payment of Fees

RECEIVED
JUN 0 1 2004
BY:----------

5/28/2004

Clauss Construction
8956 Winter Gardens Blvd
Lakeside, CA 92040

Job No: **2A058**
Invoice No: **0VN02**

The Bay Area Air Quality Management District (BAAQMD) acknowledges receipt of your payment and your Asbestos Removal or Demolition Plan described as: **Demolition**

Site address	7000 East Ave Livermore, CA 94550
Start Date	June 9, 2004
Completion Date	July 31, 2004

Removal amounts of friable ACM 0 linear feet 0 square feet 0 cubic feet

Should it become necessary to revise this plan, please do so in the spaces provided below and immediately copy the District by fax or by mail.

REGULATION 11-2 REVISION	BAAQMD J# **2A058**

REVISION #	START DATE	COMPLETION DATE
1	____/____/____	____/____/____
2	____/____/____	____/____/____
3	____/____/____	____/____/____
4	____/____/____	____/____/____
5	____/____/____	____/____/____

***NOTE:** This form is not intended as a verification of either the completeness of your original notification or of its compliance with BAAQMD Regulation 11-2. If you have any questions about this acknowledgment, please call our office at (415) 749-4762.*

442-04

DEMOLITION

REGULATION 11, Rule 2

Notification Form

For Office Use Only
J#
I#

Site of Demolition

Site Address: 7000 EAST AVE Cross Street: N/A
City: Livermore Zip: 94551
Owner/Operator Univ. of CA/DOE Dale Jose Phone (925) 424-5204
Specific Location of Project within Building/Address: AREA 514 (Bldg 513, 514, outside Yard)
Check One: ☐ Single Family Dwelling ☐ Commercial ☐ Multifamily Dwelling ☒ Govt Bldg ☐ School

Contractor/Individual Performing Demolition

Name: Company/Individual Clauss Construction Contact: William Musbach
Mailing Address: 8956 Winter Gardens Blvd.
City: Lakeside Zip: 92040 Phone: (619) 390-4940
Have you previously submitted notifications for other sites? ☐ Yes ☒ No

Description of Demolition

Is this Demolition by Fire for Fire Training purposes? ☐ yes ☒ No
Is this Demolition ordered by a Government Agency? ☐ yes ☒ No
(Emergency only – attach copy of order)
If not Demolition for Fire Training, check applicable method:
☒ Heavy Equipment ☐ Implosion ☐ By Hand ☐ Other

Dates of Demolition: (*Actual* dates must be entered, *"ASAP"* or *"SOON"* will be rejected.)
Start: June 9th 2004 Completion: July 31 2004 ☐ Weekend Work? ☐ Night Work *(After 5 PM)?*

Asbestos Survey Report

Name of company that conducted survey: Lawrence Livermore National Lab
Address: 7000 EAST AVE
City: Livermore Zip: 94551 Phone: (925) 423-5887
Name of person who completed the survey: Sue Ballik CAC/SST #: 3195 CA-002-03
(Is)/was asbestos present? ☒ Yes ☐ No
If yes, who will (remove)/has removed prior to demo? Clauss Construction

Form Preparation Information

This form prepared by: William Musbach Title: Project Manager
Name: Company/Individual Clauss Construction Phone: (619) 390-4940
Address: 8956 Winter Gardens Blvd City: Lakeside State: CA Zip: 92040

See Page Two to Complete This Form

Pd $173.00 5/26/04 JD Disk

Required Information

Payment must be received before J# will be assigned. See Schedule L of Regulation 3 for appropriate fees.

Payment type: ☐ Cash ☐ Check ☐ Money Order ☒ Credit Card (*Visa, MasterCard Only*)
(*Complete attached authorization form*)

I certify that an individual trained in the provisions of Regulation 11, Rule 2, will be on site during thfffe renovation and evidence that the required training has been accomplished by this person will be available for inspection during normal business hours.
Signature of Contractor or Person Performing Renovation: William Musbach - WM

I certify that the above information is correct and that I will comply with all of the requirements of the BAAQMD's regulations, as well as all other applicable federal, state and local requirements.
Signature of Contractor or Person Performing Renovation: _____

G:\\Form\RENOV-01:5/1/2001

GENERAL INFORMATION

- This notification form shall be used to notify the BAAQMD of asbestos removal (**renovation**) operation only. Notification is required for each renovation where the amount of Regulated Asbestos-Containing Material (RACM) is greater than or equal to 100 square/linear feet, or for any dry removal. All boxes must be completed. Appropriate fee payment must accompany each notification. Notifications may be faxed to (415) 749-4658, but faxed notifications will only be accepted if accompanied by a valid credit card authorization for applicable fees.
- Notification shall be provided to the District at least 10 working days prior to commencement of renovation, or as early as possible prior to commencement of emergency renovation. The notification period will not start until a complete notification is submitted.
- An Acknowledgement Letter is mailed to the contractor/person listed within 3 days of receipt of a complete notification. This should be checked for accuracy of data.
- If the job is postponed or cancelled, the District **must** be notified by a revision; the Acknowledgement Letter should be used to fax or mail the revision information. When cancelled, a cancellation fee will apply.
- For specific "Emergency" conditions, the 10 working day period will be waived. Notification must be made by fax but the job number will not be issued until the applicable fees are received by a valid credit card authorization. Following authorization approval, the job number will be issued and the notification form must be completed and returned, with the job number (" J#_____") filled in.
- For 4 or fewer unit residences, the 10 working day period may be reduced to 72 hours for an additional fee.

INSTRUCTIONS

- **SPECIFIC LOCATION OF PROJECT**: Identify where the renovation is taking place if the site contains more than one building, or if the building has multiple floors.
- **START AND COMPLETION DATES**: The start date is the date on which removal commences. Any revision to the start or completion dates must be submitted prior to the previously notified date(s). Under no circumstances may the revised start date be earlier than the 10th working day following the postmark or fax date of the original notification. If the start date is unknown, enter an estimated start date and revise the notification when the actual start date is known, but not later than the estimated start date.
- **MATERIAL DESCRIPTION**: Indicate the type of RACM being removed, e.g., pipe lagging, acoustical ceiling, thermal system insulation, asbestos insulated heating ducts.
- **METHODS OF REMOVAL**: Indicate the methods and procedures you will use to comply with the standards in Reg. 11-2. If the method involves dry removal, follow the instructions on the form.
- **REMOVAL AMOUNT**: Indicate the amount of RACM to be removed. If the job involves wet and dry removal, indicate the total for both. Indicate how much of this total amount involved dry removal on the line marked **. Non-friable asbestos removal is exempt from notification unless it is made friable during renovation activity.
- **DISPOSAL SITE INFORMATION**: Indicate the name of the disposal site where the RACM will be deposited.
- **WASTE TRANSPORTER INFORMATION**: Indicate the name of the transporter of RACM. The State of California considers RACM a hazardous waste, therefore, a contractor is required to obtain an EPA number (ID#) to qualify as a waste hauler.

AY AREA AIR QUALITY MANAGEMENT DISTRICT

COMPLIANCE & ENFORCEMENT DIVISION

Regulation 11, Rule 2

Acknowledgement of Notification and Payment of Fees

5/28/2004

Clauss Construction
8956 Winter Gardens Blvd
Lakeside, CA 92040

Job No: **2A057**
Invoice No: **0VN01**

The Bay Area Air Quality Management District (BAAQMD) acknowledges receipt of your payment and your Asbestos Removal or Demolition Plan described as: **Renovation**

Site address: 7000 East Ave
Livermore, CA 94550

RECEIVED
JUN 0 1 2004
BY:.....

Start Date: June 9, 2004
Completion Date: July 31, 2004

Removal amounts of friable ACM 100 linear feet 0 square feet 0 cubic feet

Should it become necessary to revise this plan, please do so in the spaces provided below and immediately copy the District by fax or by mail.

REGULATION 11-2 REVISION	BAAQMD J# **2A057**

REVISION #	START DATE	COMPLETION DATE
1	____/____/____	____/____/____
2	____/____/____	____/____/____
3	____/____/____	____/____/____
4	____/____/____	____/____/____
5	____/____/____	____/____/____

***NOTE:** This form is not intended as a verification of either the completeness of your original notification or of its compliance with BAAQMD Regulation 11-2. If you have any questions about this acknowledgment, please call our office at (415) 749-4762.*

442-04

RENOVATION

REGULATION 11, Rule 2

Notification Form

For Office Use Only
J#
I#

Site of Renovation

Site Address: 7000 EAST AVE Cross Street: N/A
City: LIVERMORE Zip: 94551
Owner/Operator Univ. of CA/DOE Dept Dept Phone (925) 424-5204
Specific Location of Project within Building/Address: AREA 514 (Bldg 513, 514, outside Yard)
Check One: ☐ Single Family Dwelling ☐ Commercial ☐ Multifamily Dwelling ☒ Govt Bldg ☐ School

Contractor/Individual Performing Renovation

Name: Company/Individual Clauss Construction Contact: William Musbach
Mailing Address: 8956 Winter Gardens Blvd.
City: Lakeside Zip: 92040 Phone: (619) 390-4940
Have you previously submitted notifications for other sites? ☐ Yes ☒ No

Description of Renovation

☒ Renovation ☐ Planned Renovation (attach work schedule) ☐ Cumulative Renovations (each < 100 sq or lin ft).
Material Description: Joint Compound Composite 41% / THERMAL INSULATION (TSI)
Method(s) of Removal: * TSI- WET METHODS - Glovebag - Joint Compound- WET METHODS - Remove with Bldg.
Total removal amounts ** of ***friable*** **asbestos material** only: 100 lin ft OR _____ sq ft OR _____ cu ft

* If method is Dry Removal, attach a letter to this form requesting conditional approval for dry removal. (Dry removal includes, but is not limited to, shot/bead blasting of mastic.)
** Indicate how much of this, if any, involves dry, bead blast, or shot-blast removal: 0

Dates of Renovation: (Actual dates must be entered, ***"ASAP"*** or ***"Soon"*** will be rejected.)
Start Date: 6-9-04 Completion Date: 7-31-04 ☐ Weekend Work ☐ Night Work *(After 5 PM)*

Waste Transporter Information

Name: World Environmental Inc EPA ID# _____
Address PO Box 256
City West Sacramento CA Zip: 95691
Contact: _____ Phone (916) 371-3617

Disposal Site Information

Landfill Name: Altamont Landfill
Address: 10840 Altamont Pass Rd
City: Livermore
State: CA Zip: 94550

Emergency Renovation Only

Date of Emergency: _____ Time: _____ Description of event and an explanation of how the event has caused unsafe conditions or would cause equipment damage: _____

Form Preparation Information

This form prepared by: William Musbach Title: Project Manager
Name: Company/Individual Clauss Construction Phone: (619) 390-4940
Address: 8956 Winter Gardens Blvd. City: Lakeside State: CA Zip: 92040

See Page Two to Complete This Form

Pd 5/26/04 Visa $242.00 JD.

Required Information

Payment must be received before J# will be assigned. See Schedule L of Regulation 3 for appropriate fees.

Payment type: ☐ Cash ☐ Check ☐ Money Order ☒ Credit Card (*Visa, MasterCard Only*)
(*Complete attached authorization form*)

I certify that the above information is correct and that I will comply with all of the requirements of the BAAQMD's regulations, as well as all other applicable federal, state and local requirements.

Signature of Contractor or Person Performing Demolition: _____

G:\\Form:Demo-01:5/1/2001

GENERAL INFORMATION

- This notification form shall be used to notify the BAAQMD of a **demolition** operation only. Notification is required for every demolition. All boxes must be completed. Appropriate fee payment must accompany each notification. Notifications may be faxed to (415) 749-4658, but faxed notifications will only be accepted if accompanied by a valid credit card authorization for applicable fees.
- Notification shall be provided to the District at least 10 working days prior to commencement of demolition, or as early as possible prior to commencement of emergency demolition. The notification period will not start until a complete notification is submitted (see above).
- An Acknowledgement Letter is mailed to the contractor/person listed within 3 days of receipt of a complete notification. This should be checked for accuracy of data.
- If the job is postponed or cancelled, the District **must** be notified of a revision; the Acknowledgement Letter should be used to fax or mail the revision information. When cancelled, a cancellation fee will apply.
- For specifically-defined "Emergency" conditions, the 10 working day period will be waived. Notification must be made by fax, but the job number will not be issued until the applicable fees are received by a valid credit card authorization. Following authorization approval, the job number will be issued and the notification form must be completed and returned, with the job number (" J#_____") filled in.
- For 4 or fewer unit residences, the 10 working day period may be reduced to 72 hours for an additional fee.

INSTRUCTIONS

- **SPECIFIC LOCATION OF PROJECT:** Identify where the demolition is taking place if the site contains more than one building.
- **START AND COMPLETION DATES:** The start date is the date on which demolition of the facility or structure commences. Any revision to the start or completion dates must be submitted prior to the previously notified date(s). Under no circumstances may the revised start date be earlier than the 10th working day following the postmark or fax date of the original notification. If the start date is unknown, enter an estimated start date and revise the notification when the actual start date is known, but not later than the estimated start date.
- **FIRE TRAINING:** Reg. 11-2-206 includes "intentional burning" in the definition of demolition. Notification is required, the 10 working day requirement must be met and all Asbestos-Containing Material (ACM) >1% must be removed prior to fire training. The District's Open Burning Notification form must also be filed and the applicable requirements of Regulation 5 must be met.
- **SURVEY REPORT:** Provide information showing that prior to commencement of the demolition, a survey was performed to determine the presence of Regulated ACM (RACM). Indicate if there was/was not suspected ACM.
- **GOVERNMENT ORDERED DEMOLITION:** If an "Emergency" demolition (see above) is the result of a state or local agency declaring the building a public nuisance or structurally unsound and in danger of imminent collapse, a copy of the written order must accompany this notification.

Appendix E
Material Safety Data Sheet for
CC Fixative Media

MATERIAL SAFETY DATA SHEET

Trade Name: CC Fix Media

Section I – General Information:

Item Name: CC Fixative Media
Product Code: SC4521/Blue
Manufactured by: InstaCote, INC.
160 C Lavoy Rd.
Erie, MI 48133
Date MSDS Prepared: May 23, 2001
Last Review Date: May 23, 2001
MSDS Preparer's Name: Charles J. Smith Chemist/ M.S.
Product Description: Vinyl Latex/Modified Poly Acrylate Coating
CAS Name and Number: None, Mixture
D.O.T. Hazard Classification and Shipping Name: None
NFPA Ratings: Hazard: 0 Health: 0 Fire: 0 Reactivity: 0
Scale 3 = extreme, 2 = high, 1 = moderate, 0 = insignificant

Section II – Ingredient/Identity Information:

Proprietary (Y/N): Y

Ingredient	Composition:	CAS #	Exposure Limits (TWA)
Ammonia	<0.04%	7664-41-7	35 ppm STEL ACGIH 35 mg/m^3 TWA8 OSHA
2-Ethylhexyl Acrylate	<0.01%	103-11-7	5 ppm TWA8 UCC

Section III – Physical/Chemical Properties:

Appearance:	Blue Liquid	Color:	Blue
State:	Liquid	pH:	7.3
Specific Gravity:	1.10	Viscosity:	250 cP@72°F
Vapor Pressure:	18 mm Hg, 20°C	Odor:	Pleasant

Vapor Density: 0.6 (Air=1)
Water Solubility: Completely
Evaporation Rate: 0.8 (Butyl Acetate=1)

Section IV – Fire and Explosion Hazard Data:

Flash Point: N/A Flammable Limits: Upper – N/A
Lower: - N/A

Extinguishing Media: As for surrounding fire. This product is a very low fire hazard. This product is a water-based material and while it may not burn, it can splatter and froth. Do not spray water into hot material; use water fog to cool surrounding fire.

Section V – Reactivity Data:

Stability (Y/N) Y

Conditions to Avoid: **Do not allow freezing**.

Materials to Avoid: Strong Acids or Strong Alkalis

Hazardous Decomposition Products: Oxides of Carbon

Section VI – Health Hazard Data:

Primary Routes of Exposure: Skin Contact, Ingestion and Inhalation

Skin Contact: Prolonged and repeated skin contact may cause irritation.

Ingestion: Ingestion of product will cause irritation of the mouth, pharynx, esophagus and stomach.

Inhalation: Breathing atomized vapors may cause headaches, nausea, irritation of the nose, throat and lungs.

Section VII – Emergency First Aid:

Eye Contact: Flush eyes with a large amount of water for at least 15 minutes. Consult a physician if irritation persists.

Skin Contact: Wash area with soap and water.

Ingestion: No special precautions

Inhalation: Move individual to fresh air. Consult a physician if irritation persists or breathing becomes labored.

Section VIII – Precautions for Safe Handling, Storage and Use:

Personal Protective Equipment for Routine Use:

Respiratory Protection: Respirators are not routinely required when using this product indoors or outdoors. In any case when excessive mist and atomization of product occurs such as pressurized air spraying, use NIOSH/MSHA approved full or half face respirator with dust cartridge.

Gloves: Gloves are not normally required for routine use. If an individual is known to have skin susceptible to irritation by other chemicals, this individual should wear butyl or nitrile type gloves.

Eye Protection: Safety goggles or glasses with side shields should always be worn.

Other: Applicator should wear a Tyvek suit or coveralls.

Work Practices: Do not eat, drink or smoke while applying this product. Wash hands immediately upon leaving the work site. Treat this product with caution as you would any other chemical.

Spill/Release Procedures: Large spills can be vacuumed. Small spills can be treated with absorbent clay, earth, sand or other material, shoveled into a DOT approved container and disposed of according to all local, state and Federal regulations.

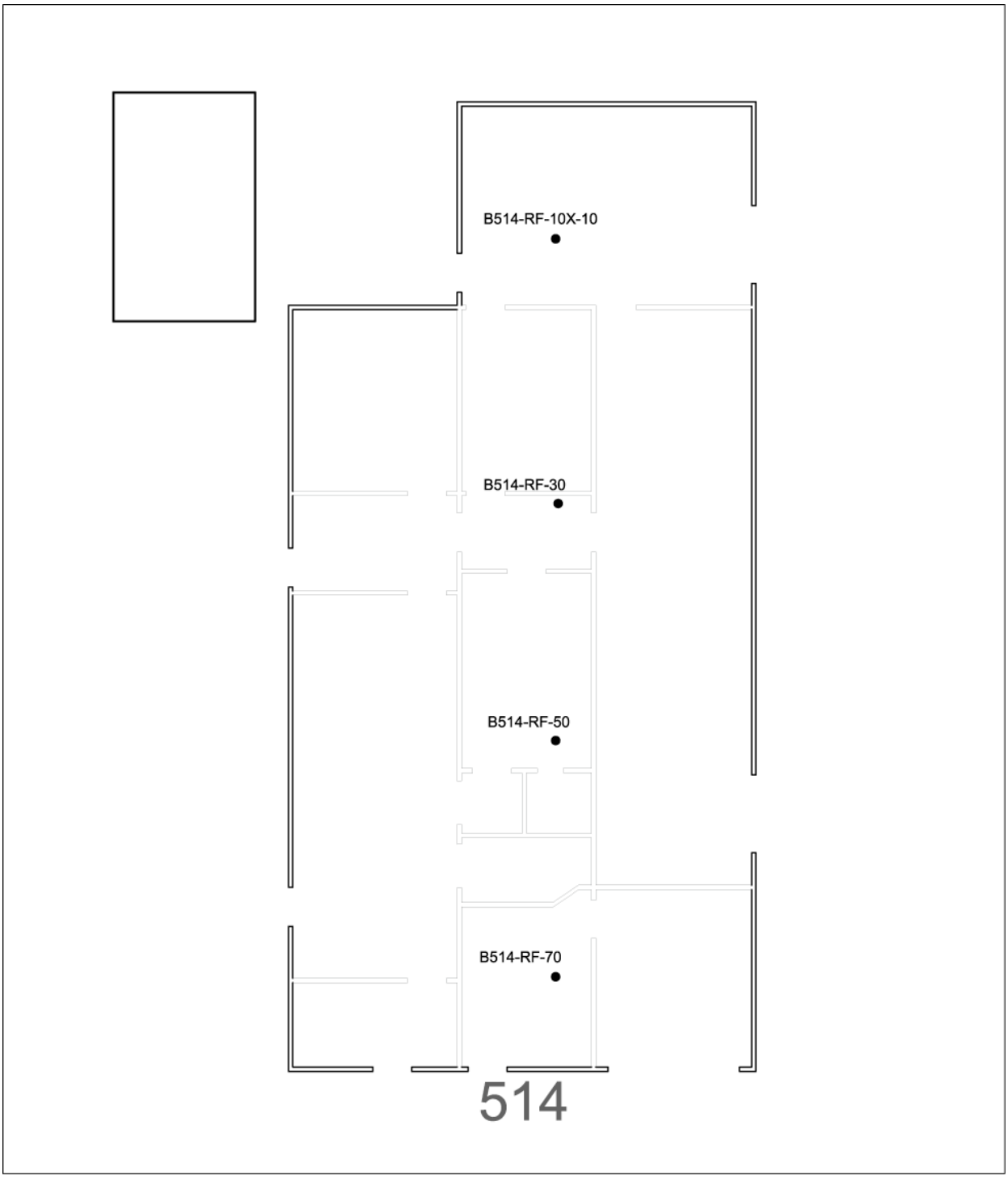
Waste Disposal Procedure: Coagulate the waste material by addition of sand, clay or other earth material. Allow to dry if time permits. Coagulated solids may be incinerated in accordance with local, state and federal regulations.

Storage and Handling: Store product in a dry environment.. Protect product from extremes in temperatures, **Do Not Freeze.**

Other Health Hazard Precautions: None

Complete

Appendix F
Sample Locations



Scale: 1:125

N

Sample locations indicated are approximate. Sample locations were not surveyed.

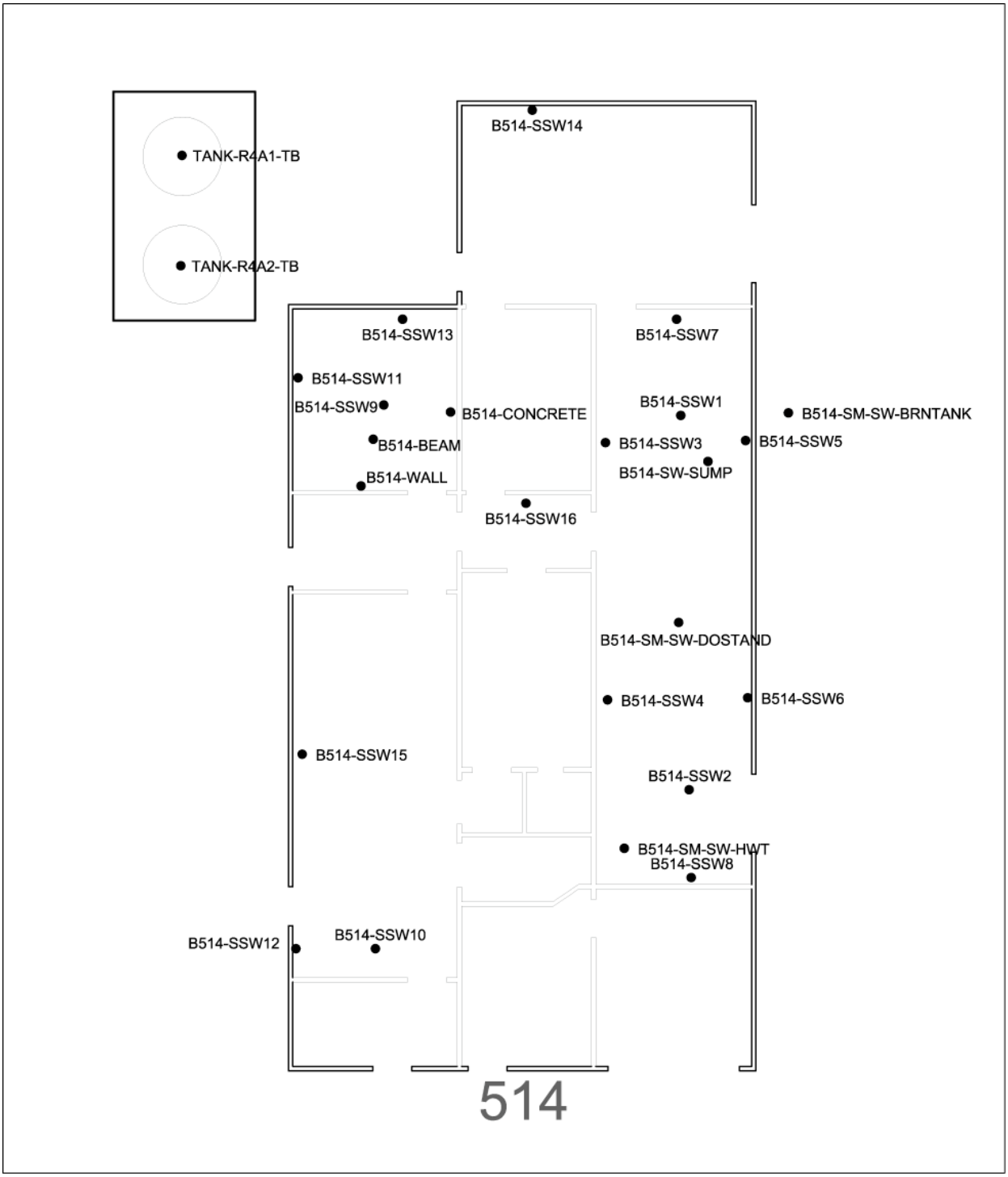
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 514
Roof Wipe Samples

8-04

Figure F-1



Scale: 1:125

Sample locations indicated are approximate. Sample locations were not surveyed.

N

EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 514 Wall/Ancillary Structure Wipe and Structure Samples

8-04

Figure F-2

Scale: 1:125

Sample locations indicated are approximate. Sample locations were not surveyed.

N

EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 514 & Water Tank CAS Samples

8-04

Figure F-3

EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

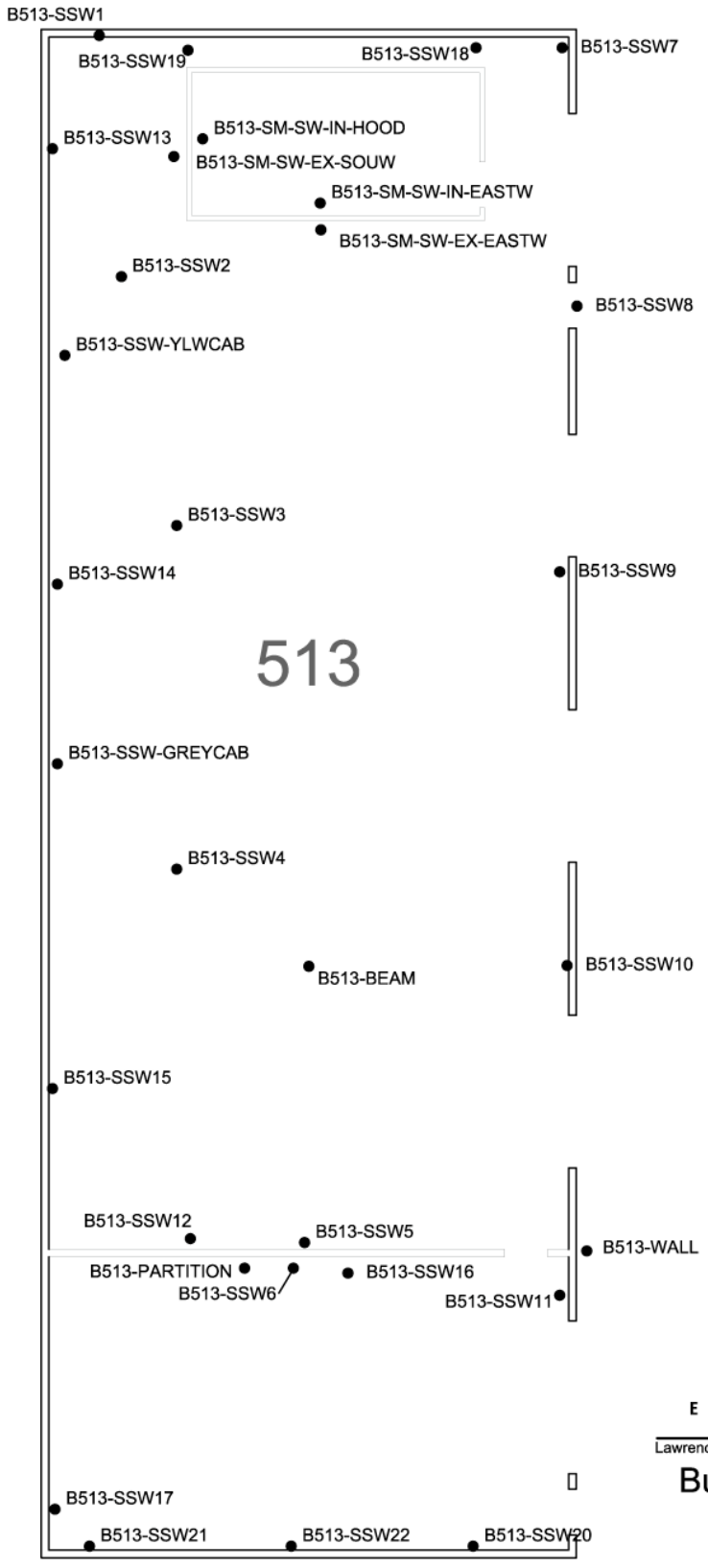
Building 513
Roof Wipe Samples

8-04

Sample locations indicated are approximate. Sample locations were not surveyed.

Scale: 1:125

Figure F-4



Sample locations indicated are approximate. Sample locations were not surveyed.

Scale: 1:125

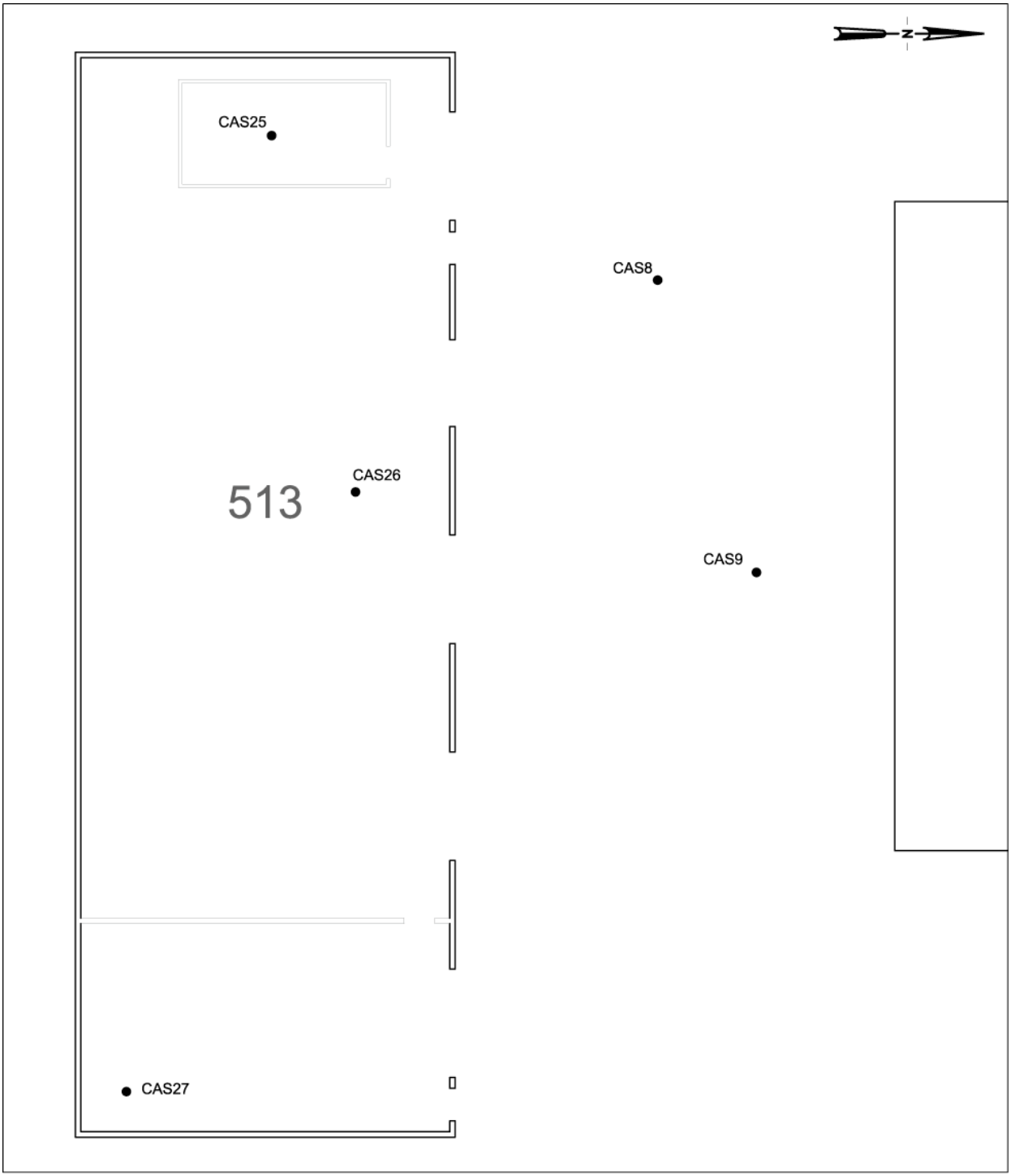
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 513 Wall/Ancillary Structure Wipe and Structure Samples

8-04

Figure F-5



Scale: 1:150

Sample locations indicated are approximate. Sample locations were not surveyed.

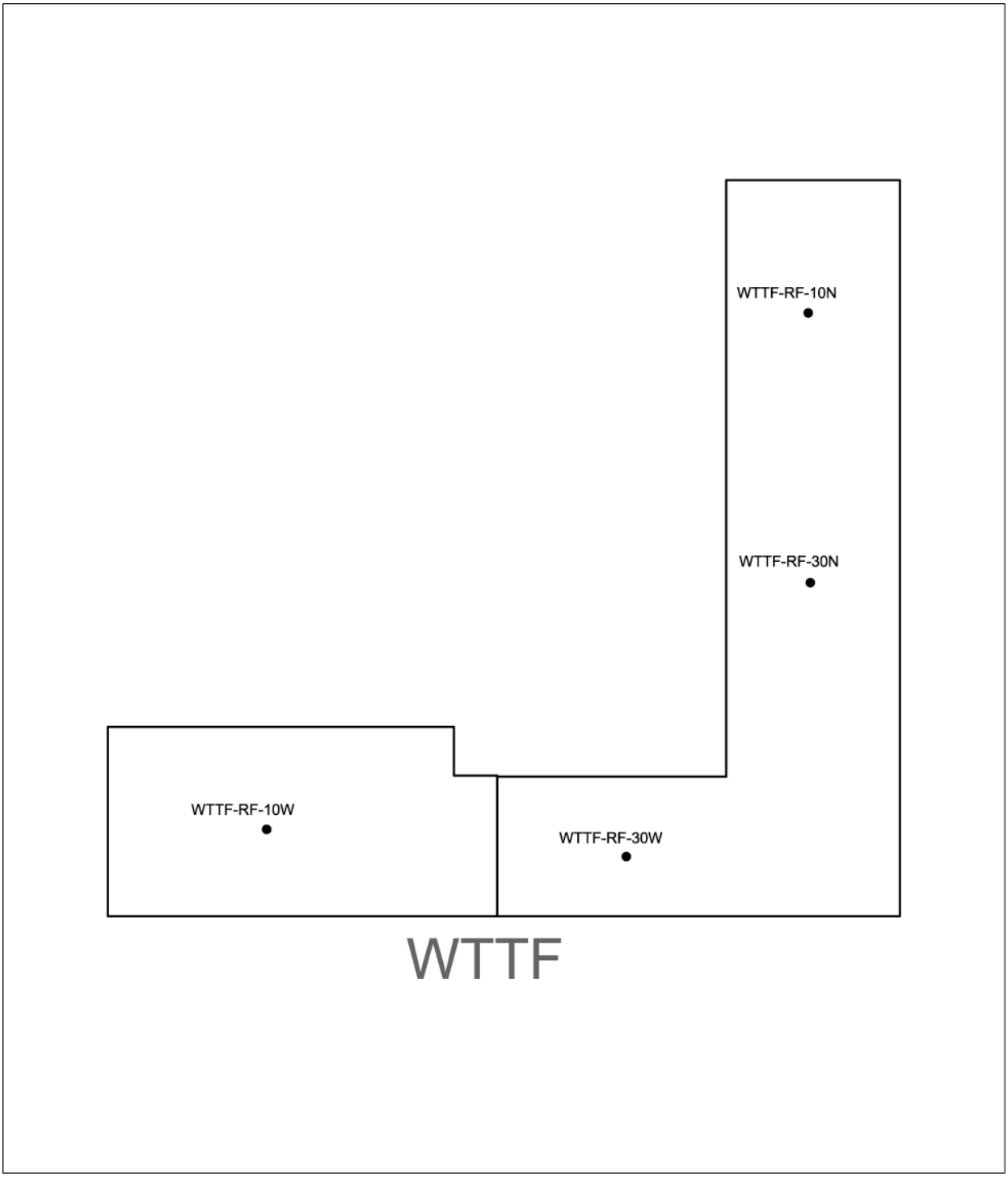
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 513
CAS Samples

8-04

Figure F-6



Scale: 1:100

N

Sample locations indicated are approximate. Sample locations were not surveyed.

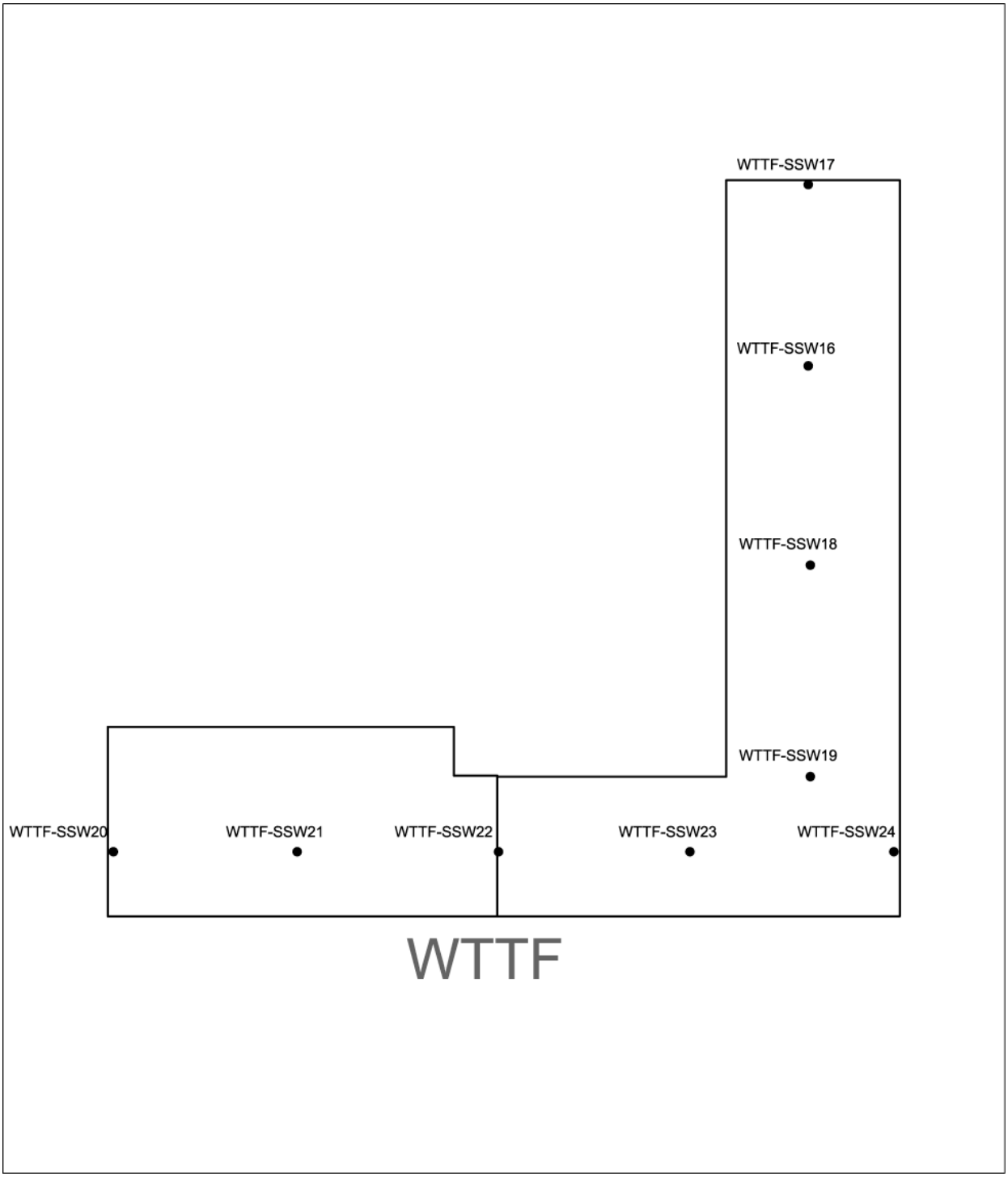
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

WTTF
Roof Wipe Samples

8-04

Figure F-7



Scale: 1:100

Sample locations indicated are approximate. Sample locations were not surveyed.

N

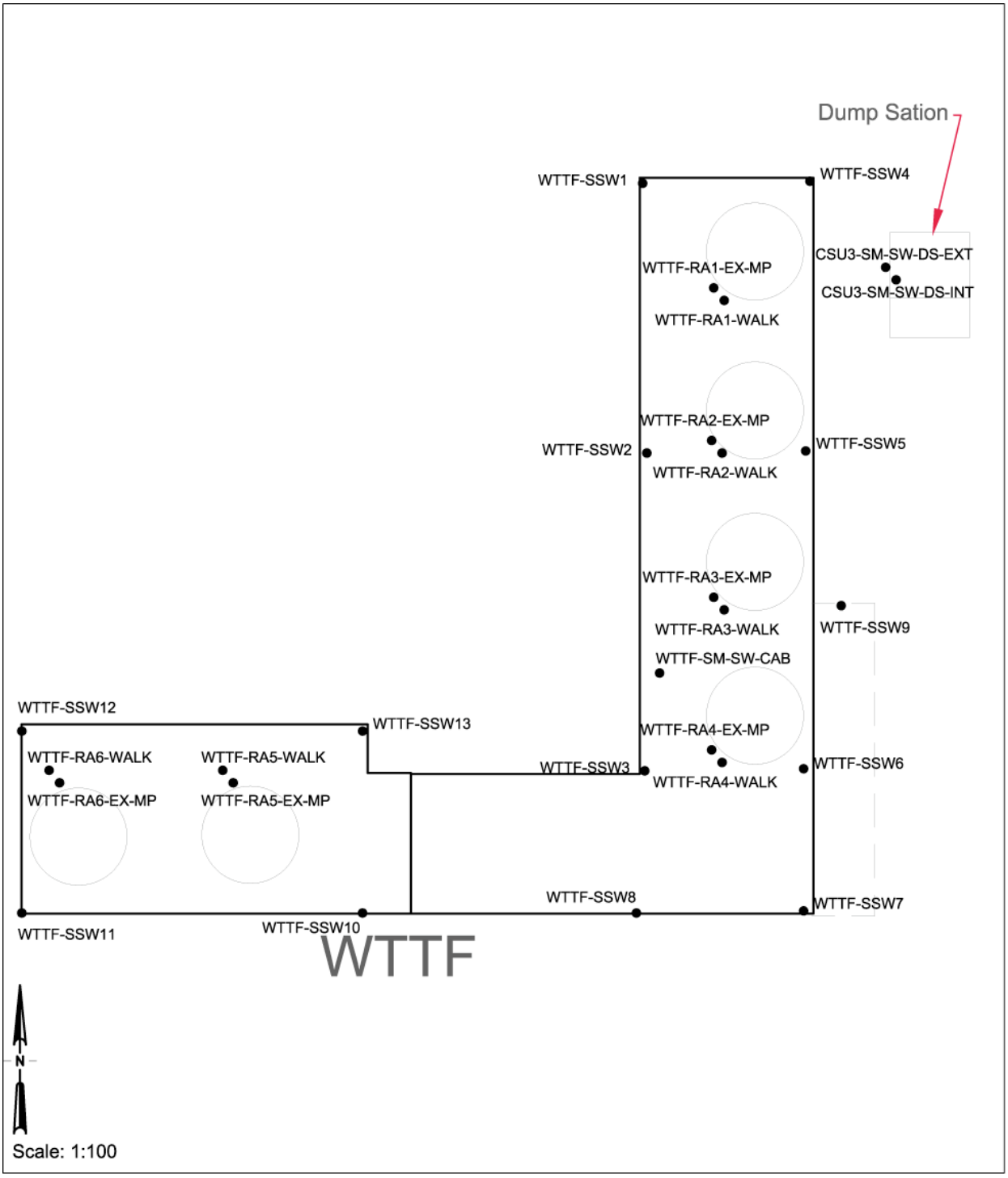
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

WTTF
Beam Wipe Samples

8-04

Figure F-8



Sample locations indicated are approximate. Sample locations were not surveyed.

Note: Not all of the WTTF tank sample locations are illustrated due to the large number of samples in a small area. The interior wipe samples were collected inside the tanks opposite the exterior wipe samples (illustrated with the name "WTTF-RA__-EX-MP"). The tank bottom wipe samples and the tank core samples were collected from the inside of each tank near the center.

Note: the sample nomenclature for the Dump Station wipe samples is misleading in that they incorrectly contain the pre-fix "CSU3". This structure was not associated with the containment storage at Building 514-3.

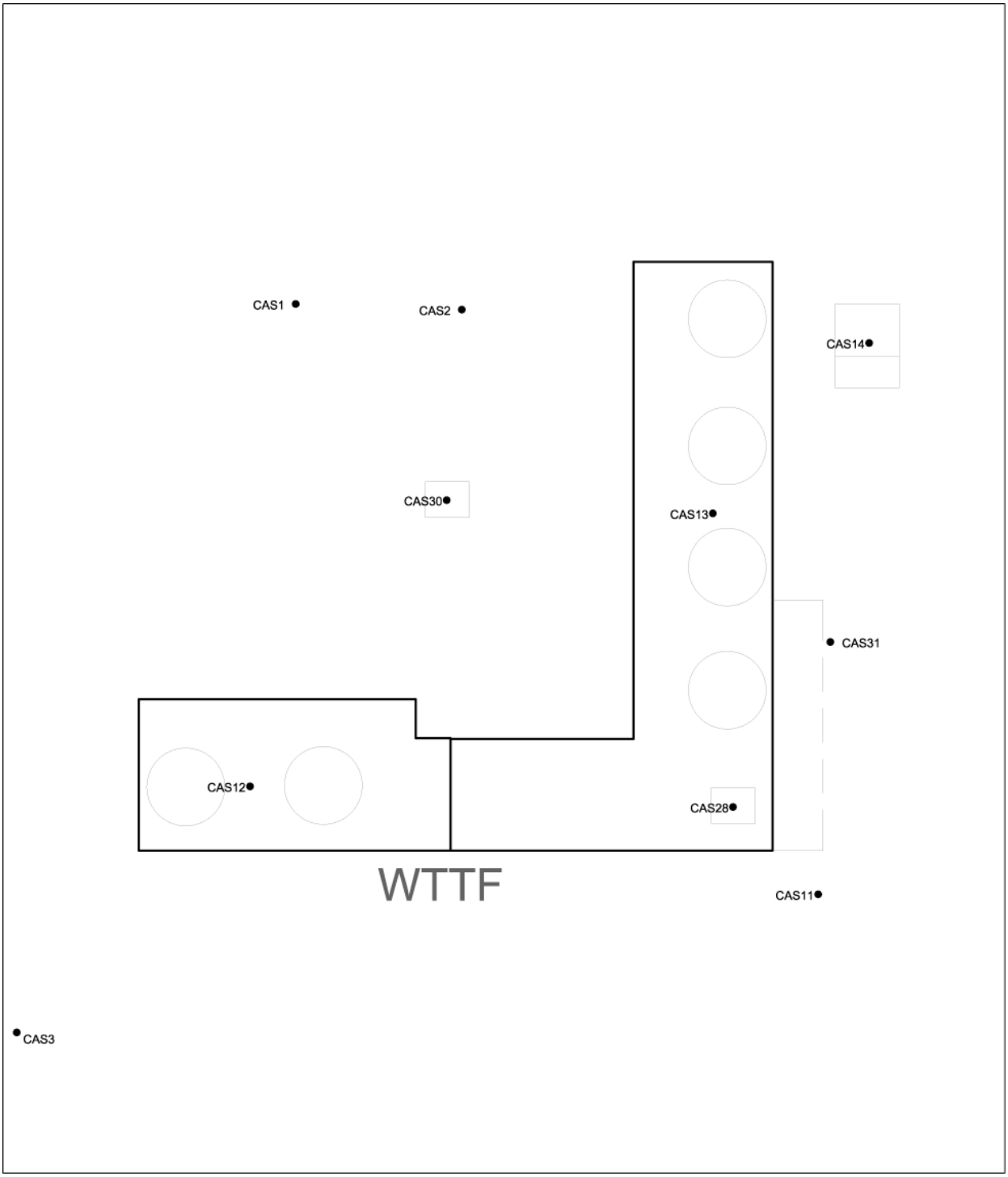
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

WTTF Support Column/Tank and Dump Station Samples

8-04

Figure F-9



Scale: 1:125

Sample locations indicated are approximate. Sample locations were not surveyed.

N

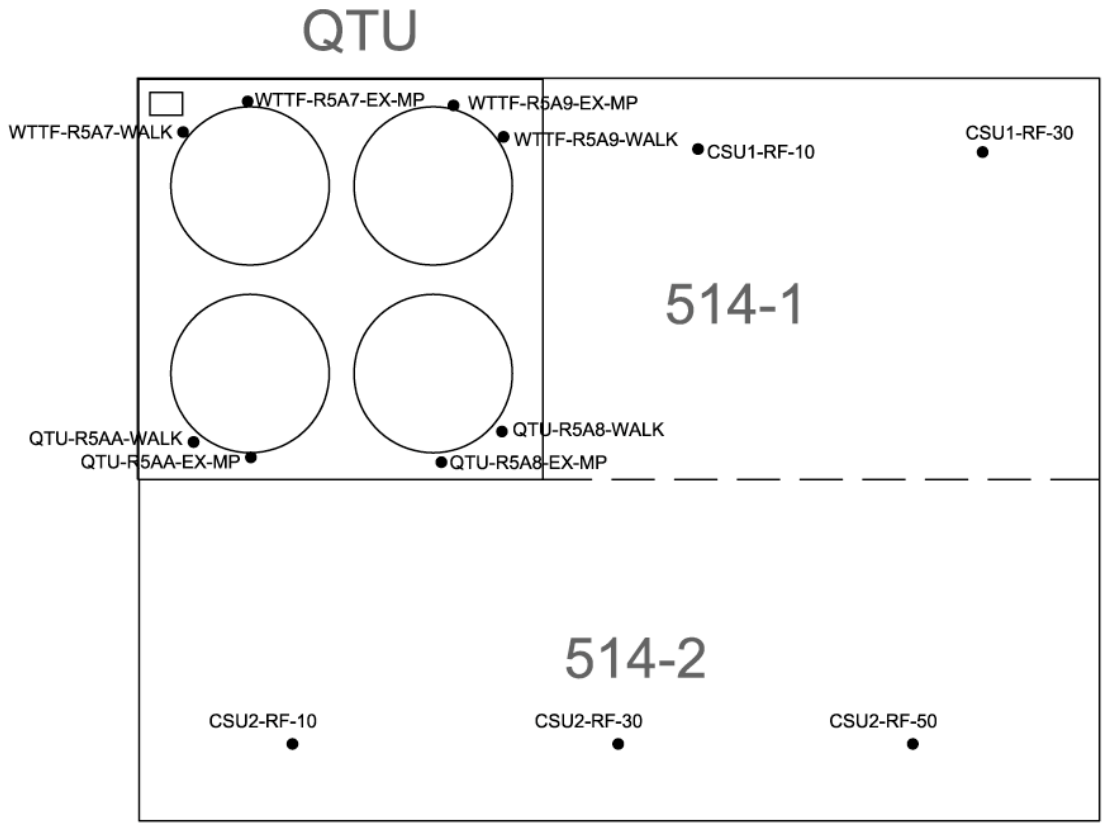
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

WTTF and Dump Station CAS Samples

8-04

Figure F-10



Scale: 1:125

N

Sample locations indicated are approximate. Sample locations were not surveyed.

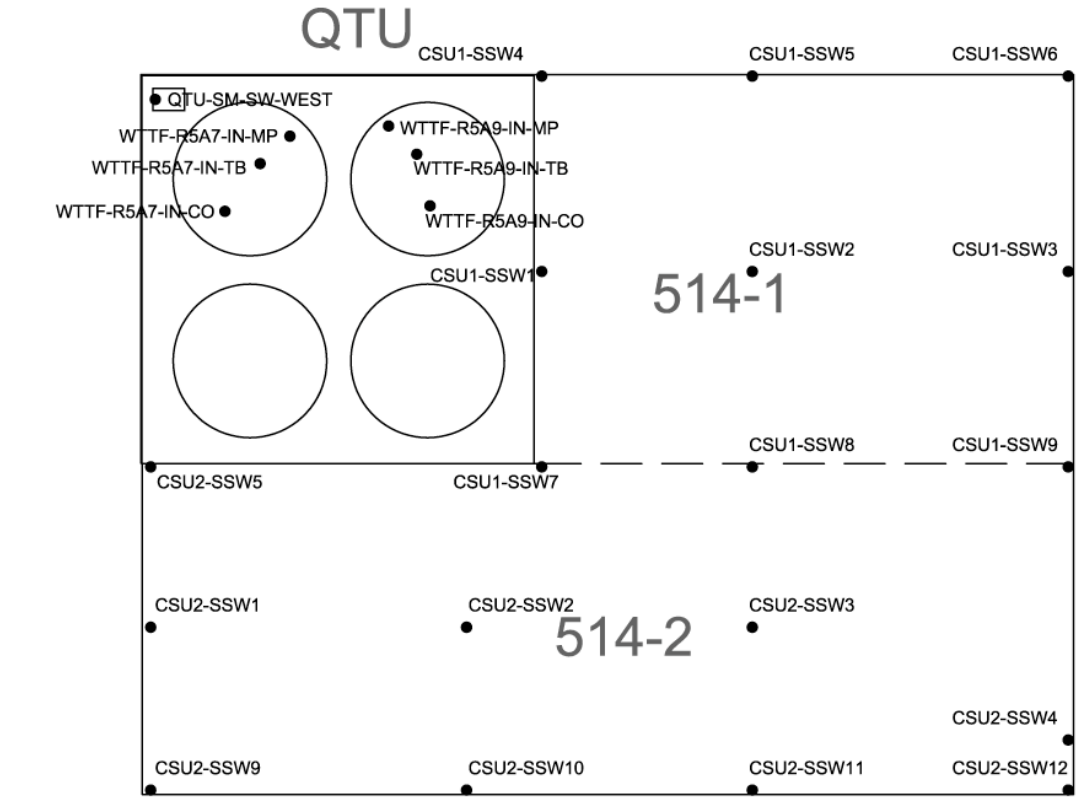
Note: the sample nomenclature for the QTU tanks may be misleading in that the ladder wipe samples for all four QTU tanks are listed as "-walk" and the samples for tanks 514-R5A7 and 514-R5A9 incorrectly contain the pre-fix "WTTF-" rather than "QTU".

EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 514-1 & 514-2
Roof Wipe Samples and
QTU Exterior Samples 8-04

Figure F-11



Scale: 1:125

Sample locations indicated are approximate. Sample locations were not surveyed.

The following numbers were not assigned as the support columns were shared in common with support colums of 514-1: Not used CSU2-SSW6, CSU2-SSW7, and CSU2-SSW8

Note: the sample nomenclature for the QTU tanks may be misleading in that the samples for tanks 514-R5A7 and 514-R5A9 incorrectly contain the pre-fix "WTTF-" rather than "QTU".

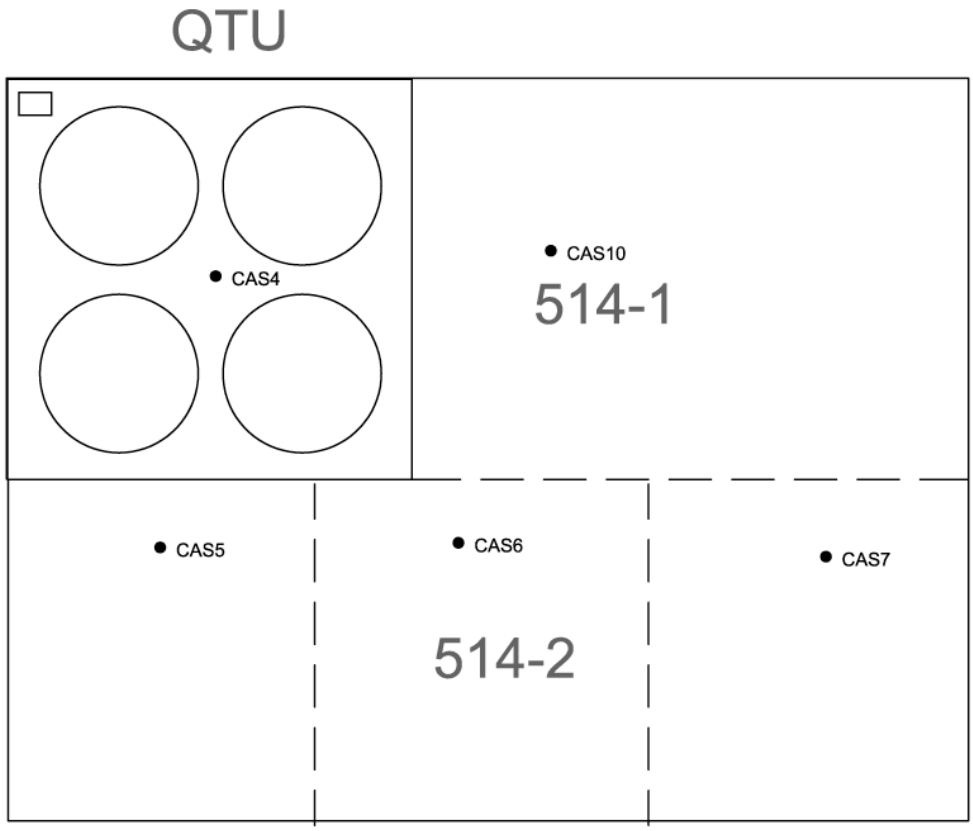
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 514-1 & 514-2 Support Column & Beam Wipe Samples & QTU Interior Samples

8-04

Figure F-12



Scale: 1:125

Sample locations indicated are approximate. Sample locations were not surveyed.

N

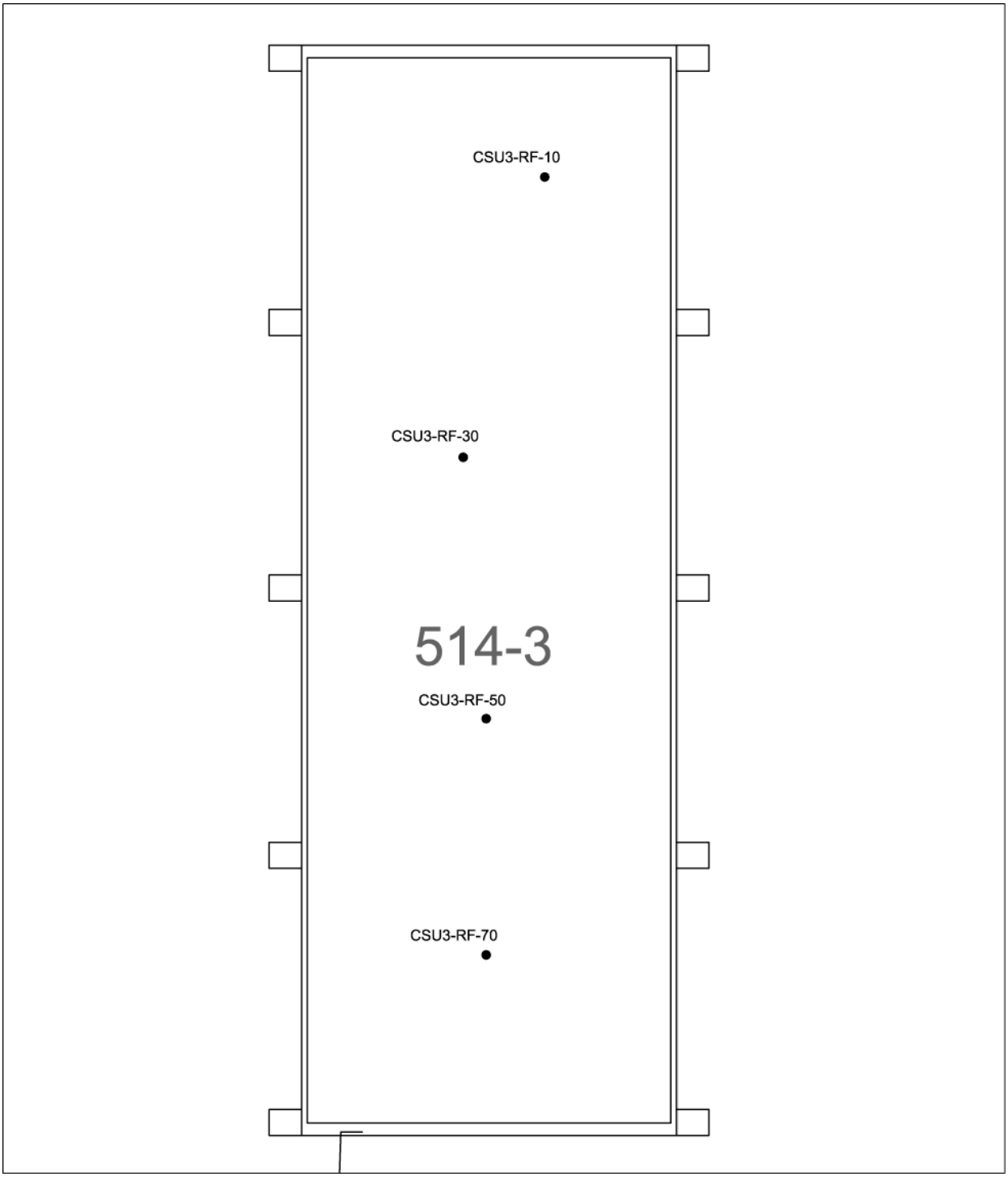
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 514-1, 514-2
and
QTU CAS Samples

8-04

Figure F-13



Scale: 1:125

Sample locations indicated are approximate. Sample locations were not surveyed.

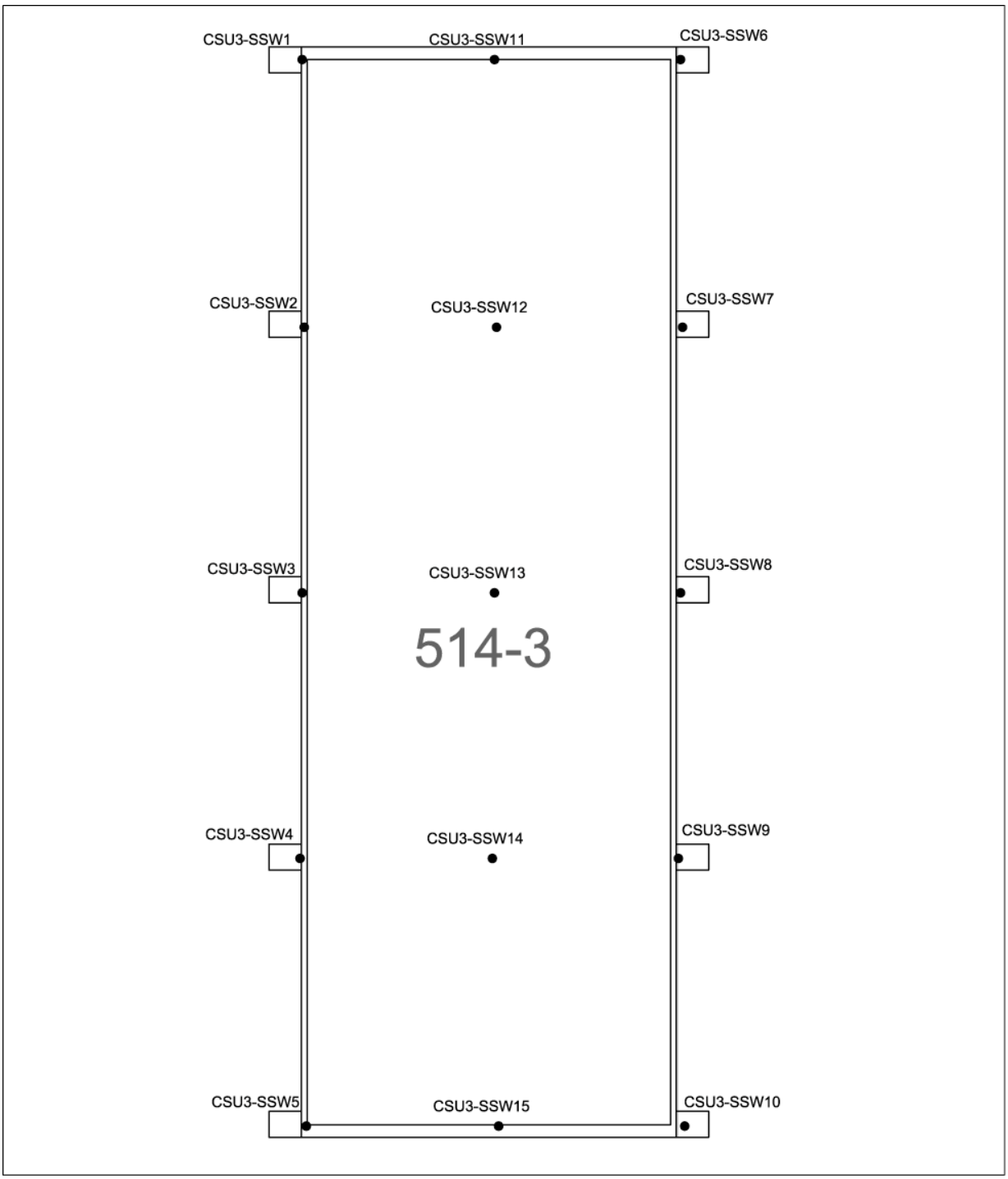
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 514-3
Roof Wipe Samples

8-04

Figure F-14



Scale: 1:125

Sample locations indicated are approximate. Sample locations were not surveyed.

N

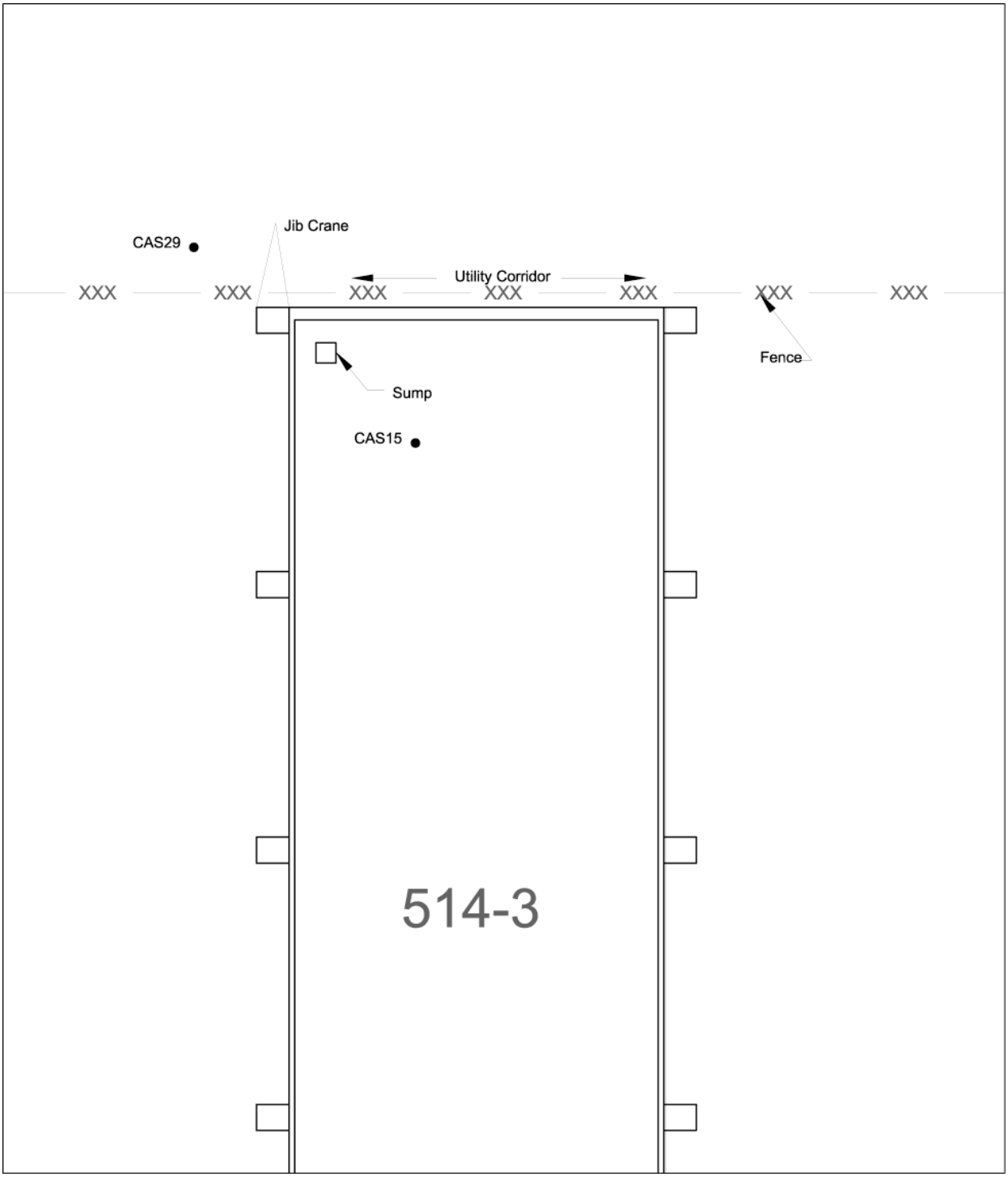
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 514-3 Beam and Support Column Wipe Samples

8-04

Figure F-15



Scale: 1:125

Sample locations indicated are approximate. Sample locations were not surveyed.

N

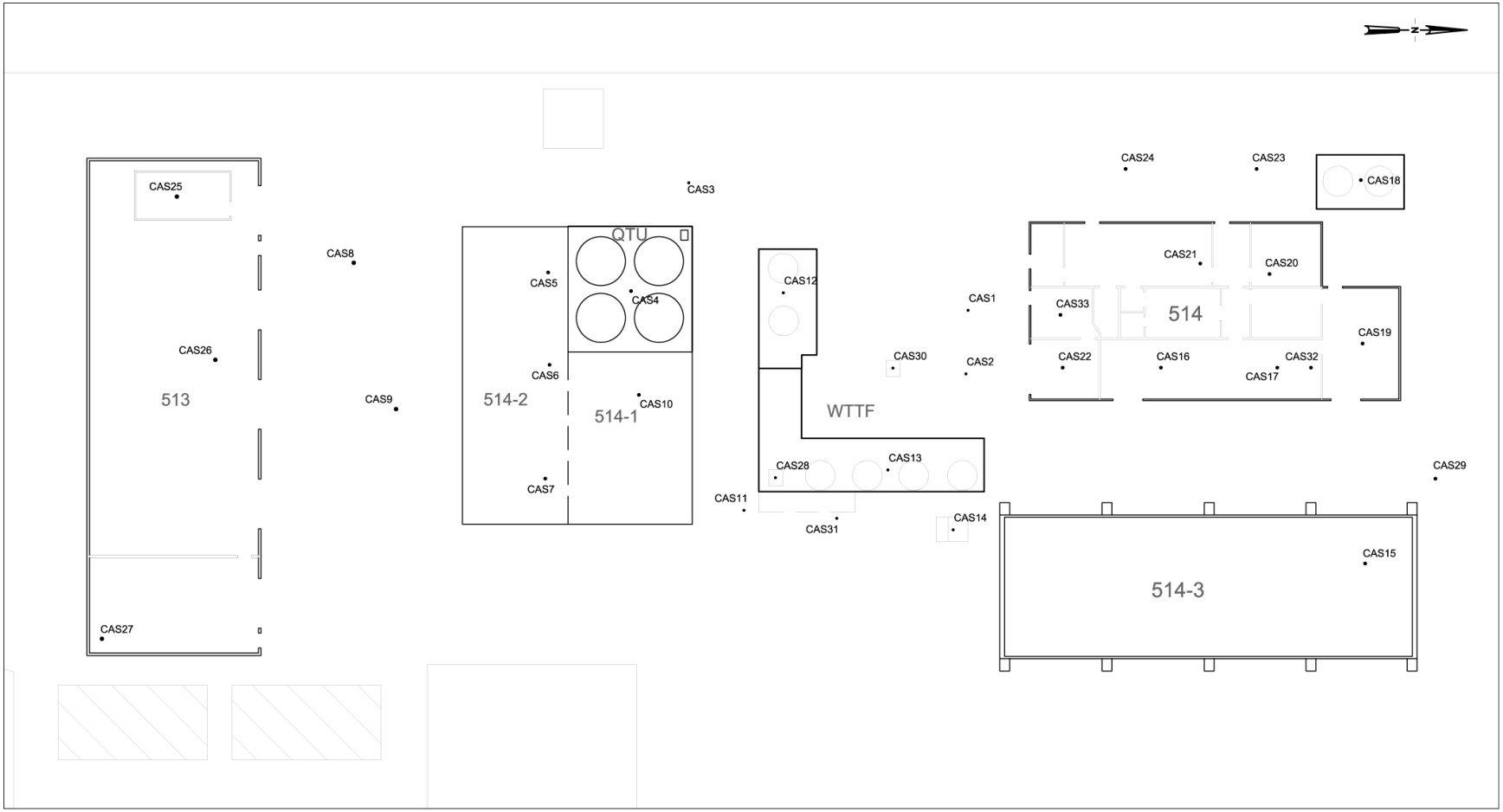
EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

Building 514-3
CAS Samples

8-04

Figure F-16



Scale: 1:225

Sample locations indicated are approximate. Sample locations were not surveyed.

EARTH TECH

Lawrence Livermore National Laboratory, Livermore, CA

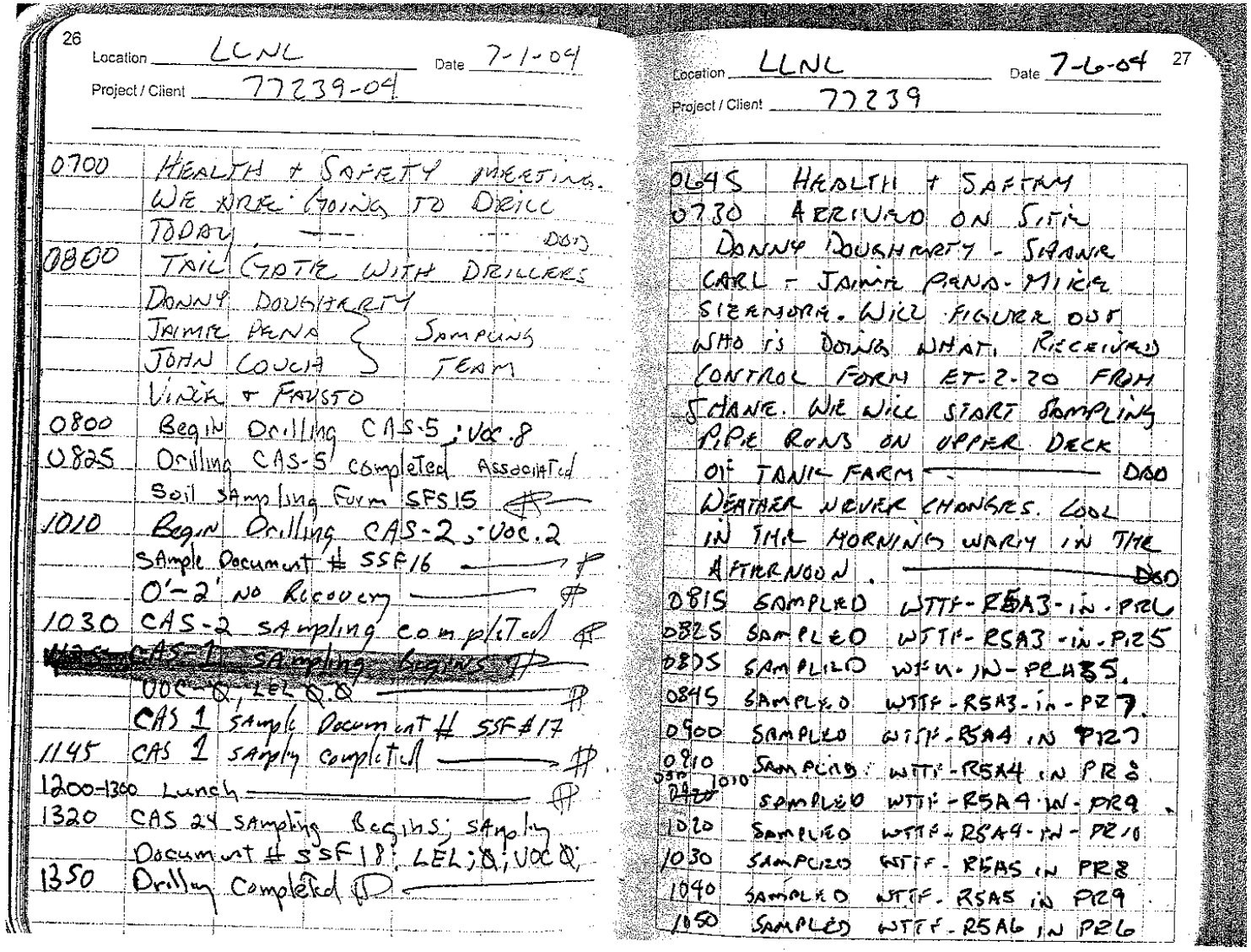
CAS Location Distribution Map

8-04

Figure F-17

Appendix G
Sample of Sample Logbook and Chain of Custody Form

Sample Logbook and Chain of Custody Form are attached. Additional Sample Logbook and Chain of Custody Forms are available upon request.



26
Location LLNL Date 7-1-04
Project / Client 77239-04

0700	HEALTH + SAFETY MEETING. WE WERE GOING TO DRILL TODAY --- DOD
0800	TAIL GATE WITH DRILLERS DONNY DOUGHERTY JAIME PENA } SAMPLING JOHN COUCH } TEAM VINCE + FAUSTO
0800	Begin Drilling CAS-5 ; VOC-8
0825	Drilling CAS-5 completed Associated Soil Sampling Form SFS15
1010	Begin Drilling CAS-2 ; VOC-2 Sample Document # SSF16
	0'-2' NO Recovery
1030	CAS-2 sampling completed
	~~CAS-1 sampling begins~~
	VOC-0 LEL-0.0
	CAS 1 Sample Document # SSF#17
1145	CAS 1 sampling completed
1200-1300	Lunch
1320	CAS 24 sampling Begins; sampling Document # SSF18; LEL;0; VOC 0;
1350	Drilling Completed

Location LLNL Date 7-6-04 27
Project / Client 77239

0645	HEALTH + SAFTY
0730	ARRIVED ON SITE DONNY DOUGHERTY - SHANE CARL - JAIME PENA - MIKE SIERRA - WILL FIGURE OUT WHO IS DOING WHAT. RECEIVED CONTROL FORM ET-2-20 FROM SHANE. WE WILL START SAMPLING PIPE RUNS ON UPPER DECK OF TANK FARM ---------- DOD
	WEATHER NEVER CHANGES. COOL IN THE MORNING WARM IN THE AFTERNOON. ---------- DOD
0815	SAMPLED WTTF-RSA3-IN-PR6
0825	SAMPLED WTTF-RSA3-IN-PR5
0835	SAMPLED WTTF-IN-PR#35.
0845	SAMPLED WTTF-RSA3-IN-PR7.
0900	SAMPLED WTTF-RSA4 IN PR7
0910	SAMPLED WTTF-RSA4 IN PR8
DSN 29-30 1010	SAMPLED WTTF-RSA4-IN-PR9
1020	SAMPLED WTTF-RSA4-IN-PR10
1030	SAMPLED WTTF-RSA5 IN PR8
1040	SAMPLED WTTF-RSA5 IN PR9
1050	SAMPLED WTTF-RSA6 IN PR6

LOT # FAFL4036

STL ST. LOUIS

[redacted]

Chain of Custody Record

CHAIN OF CUSTODY NUMBER

030589

SEVERN TRENT STL

Severn Trent Laboratories, Inc.

STL4149 (1202)

Client	Project Manager	Date	Page of

Address	Telephone Number (Area Code)/Fax Number	Lab Location

City	State	Zip Code	Site Contact	Lab Contact

Project Number/Name	Carrier/Waybill Number

Contract/Purchase Order/Quote Number

Sample I.D. Number and Description	Date	Time	Sample Type	Containers: Volume	Containers: Type	Containers: No.	Preservative	Condition on Receipt/Comments	Analysis

Special Instructions

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☑ Archive For ____ Months
(A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required
☐ Normal ☐ Rush ☑ Other Return 5 days

QC Level
☐ I. ☐ II. ☐ III. ☑ IV.

Project Specific Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
				6-6-05	1110
2. Relinquished By	Date	Time	2. Received By	Date	Time
	6-11-05	1650			
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

DISTRIBUTION: WHITE - Stays with the Sample, CANARY - Returned to Client with Report; PINK - Field Copy

180

Appendix H
Borehole Logs

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 33**
Location: Bldg 514 Silver Recovery Room
Completion Date 8/06/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Base Material	
1			Silty Clay	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 32**
Location: Near Sump in Dorr Oliver Room
Completion Date 8/06/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Silty Clay	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 31**
Location: In Front of Reagent Shed
Completion Date 6/18/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Asphalt	CAS31 SURF-ASP 0-4"
1			Base Material	
2				
3			Silty Clay	
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

E A R T H T E C H
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 30**
Location:Sump Between Bldg 514 and WTTF
Completion Date 8/06/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Asphalt	CAS30 SURF-CON 0-6"
1			Silty Clay	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 29**
Location: Outside Fence NE End Area 514
Completion Date:6/21/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Asphalt	CAS29 SURF-ASP 0-9"
			Base Materials	
2			Silty Clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 28**
Location: Sump in Corner of WTTF Slab
Completion Date:8/06/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS28 SURF-CON 0-3"
			Base Materials	
2			Silty Clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 27**
Location: Inside Shredder Room Bldg 513
Completion Date:6/25/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS27 SURF-CON 0-13"
2			Base Materials	
3			Silty Clay with asphalt base materials mixed in	
4				
5				
6			Silty Clay	
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 25**
Location: West End of Bldg 513 Slab
Completion Date:7/30/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS25 SURF-CON 0-12"
2			Base Materials	
3			Silty Clay	
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 24**
Location: Covered Patio Area of Bldg 514
Completion Date:7/01/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Asphalt	CAS24 SURF-ASP 0-3"
1			Base Materials	
2				No recovery 3" to 2 ft
3			Silty Clay	
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 23**
Location: North End of Bldg 514 Patio
Completion Date:7/07/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS23 SURF-CON 0-5"
			Base Materials	
2			Dark Brown Clay	
3				
4				
5				
6				
7			Silty Clay	
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 22**
Location: Southeast Corner of Bldg 514 Pad
Completion Date:7/07/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS22 SURF-CON 0-6"
			Base Materials	
2			Silty clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 21**
Location: Center of Main Office of Bldg. 514
Completion Date:7/07/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **23 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
3			Concrete	CAS21 SURF-CON 0-36"
4			Dark Clay	Per Mohamed w/Lab Boring Log differs from Sampling Form by 3 feet
5				
6				
7				
8			Gravelly Clay	
9				
10			Silty Clay	
11				
12			Gravelly Clay	
13				
14				
15				
16				
17				
18				
19				
20				
22				
23			**TD at 23 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 20**
Location: North End Main Office of Bldg. 514
Completion Date:7/08/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS20 SURF-CON 0-6"
			Base Materials	
2			Silty clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 19**
Location: Northeast End of Bldg. 514
Completion Date:7/08/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Concrete	CAS19 SURF-CON 0-6"
1			Silty clay	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 18**
Location: Slab Between Green Water Tanks
Completion Date:7/29/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Concrete	CAS18SURF-CON 0-6"
1			Silty clay	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 17**
Location: North End of Dorr Oliver Room
Completion Date:7/8/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Concrete	CAS17-SURF-CON 0-6"
1			Silty clay	
2				
3			Grey Brown Pea Gravel	
4				
5			Silty clay	
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 16**
Location: South End of Dorr Oliver Room
Completion Date:7/7/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Concrete	CAS16-SURF-CON 0-6"
1			Silty clay	
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 15**
Location: North End of CSU 514-3
Completion Date:6/23/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **18.5 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS15-SURF-CON 0-4"
			Concrete and Base Material	
2			Silty clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19			**TD at 18.5 feet below grade.**	
20			**Refusal at 18.5 feet.**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 14**
Location: Center of Drum Cleaner Slab
Completion Date:8/06/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS14-SURF-CON 0-6"
			Base Material	
2			Silty clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 13**
Location: Middle of WTTF North-South Slab
Completion Date:7/30/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Concrete	CAS13-SURF-CON 0-6"
1			Base Material	
2			Silty clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 12**
Location: West End of WTTF Slab
Completion Date:7/29/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS12-SURF-CON 0-10"
			Base Material	
2			Silty clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 11**
Location: South Side of Reagent Shed
Completion Date: 6/18/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Asphalt	CAS11-SURF-ASP 0-2"
1			Base Material	
2			Silty clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 10**
Location: Inside Bay of 514-1
Completion Date: 6/24/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS10-SURF-CON 0-11"
			Sandy Silt, Black Soil	
2			Silty clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 09**
Location: 15 ft South of Middle Bay of 514-2
Completion Date: 6/24/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Asphalt	CAS9-SURF-ASP 0-6"
1			Base Material	
2				
3			Silty clay	
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 08**
Location: North of West Door of Bldg. 513
Completion Date: 6/24/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Asphalt	CAS8-SURF-ASP 0-6"
1			Base Material	
2				
3			Silty clay	
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 07**
Location: East Bay of CSU 514-2
Completion Date: 6/24/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS7-SURF-CON 0-10"
2			Silty clay	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 06**
Location: Middle Bay of CSU 514-2
Completion Date: 6/22/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Concrete	CAS6-SURF-CON 0-4"
1			Base Material	
2			Sand and Pebbles	
3			Silty clay	
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 05**
Location: West Bay of CSU 514-2
Completion Date: 7/1/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS 5-SURF-CON 0-14"
2			Base Material	
3			Brown Sand	
4			Silty clay	
5				
6				Small Recovery
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 04**
Location: Center of Quad Tank Area
Completion Date: 7/29/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Concrete	CAS 4-SURF-CON 0-22"
2			Base Material	
3			Silty Clay	
4				
5				
6				
7				
8				
9				
10				
11				Very little recovery
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade.**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 03**
Location: West of North End of Tank Farm
Completion Date: 6/21/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **18.5 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
1			Asphalt	CAS 3-SURF-ASP 0-8"
			Base Material	
			Asphalt	
2			Silt (Fill Dirt)	
3				
4				
5				
6				
7			Base Material	
8				
9				
10			Silty Clay	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 18.5 feet below grade. Refusal at 18.5 feet**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 02**
Location: West of North End of Tank Farm
Completion Date: 7/1/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Concrete	CAS 2-SURF-CON 0-6"
1			Base Material	
2				Very little recovery
3				
4			Silty clay	
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Boring Number: **CAS 01**
Location: 20 feet North of Tank Farm Shed
Completion Date: 7/1/04

Project Name: **LLNL**
Project Number: 77239

Client: LLNL
Location: **Livermore, CA**

Sampler Type:	Split Spoon	Rig Type: Direct Push	Drilling Co.: Gregg Drilling
Inside Diameter:	1 1/2 "	Bit Type: NA	Driller: Vince P
Hammer Weight (LB):	NA	Total Depth: **20 feet**	
Hammer Fall (IN):	NA		

DEPTH FROM GRADE (FT)	SAMPLE INTERVALS	Soil Matrix	LITHOLOGIC DESCRIPTION (Feet Below Surface Grade)	REMARKS
0				
			Concrete	CAS 1-SURF-CON 0-6"
1			Base Material	
2				
3				Very little recovery
4			Silty clay	
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20			**TD at 20 feet below grade**	

Appendix I
90-Day Extension Requests and DTSC Responses

Lawrence Livermore National Laboratory

Environmental Protection Department

October 1, 2004

Ms. Asha Arora
Statewide Compliance Division
Department of Toxic Substances Control
700 Heinz Avenue Suite 210
Berkeley, CA 94710-2721

SUBJECT: **Storage Extension Application for Lawrence Livermore National Laboratory (LLNL), Main Site (EPA ID No. CA2890012584)**

Dear Ms. Arora:

Lawrence Livermore National Laboratory (LLNL) is submitting the attached completed form (*DTSC 1313 [5/03]*) to request a 30-day storage extension for the mixed wastes generated from the closure of Building 514 (B514) at its Livermore Main Site. The Laboratory is in the process of preparing these mixed wastes for shipment to an offsite facility. The wastes are awkward in both composition and shape and are difficult to process. The additional 30 days is needed to complete processing this waste for offsite shipment.

As shown in the completed form, LLNL is requesting storage extension for the following three groups of mixed wastes that were generated during closure of building 514 (B514). A detailed description for each waste, including storage area, accumulation start and end dates, and reason for storage extension request are given in this completed form. Photographs of these waste types are also attached.

As shown in the completed form, LLNL is requesting storage extension for the following three groups of mixed wastes generated during the closure of B514:

1. A 20-yard roll-off bin of stainless steel. The accumulation start date for this waste was July 9, 2004.
2. Six steel tanks currently located in the Building 412 Waste Accumulation Area. The accumulation start date for this waste is July 30, 2004.
3. Two of the four quad tanks (Tanks R5A7 and R5A9) that were identified in the B514 Closure Plan as F-listed. They have been found to contain radioactive contamination. The accumulation start date on these two tanks is July 9, 2004.

An Equal Opportunity Employer • University of California • P.O. Box 808, L-626, Livermore, California 94551
(925) 422-3985 — Fax (925) 423-9365

PRA04-075
October 1, 2004

Ms. Asha Arora
Subject: Storage Extension Application for
Lawrence Livermore National Laboratory (LLNL), Main Site
(EPA ID No. CA2890012584)

A detailed description of each waste, including storage area, accumulation start and end dates, and the reason for storage extension request, is provided in enclosed form. Photographs of these waste types are also attached.

Please contact Peter Yimbo of my staff at (925) 424-3897 if you have any questions regarding this response. Thank you for your help in addressing this issue.

Sincerely,

Ellen Raber

Ellen Raber
Department Head

ER/PY:cp

Attachments

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY — DEPARTMENT OF TOXIC SUBSTANCES CONTROL

HAZARDOUS WASTE STORAGE EXTENSION APPLICATION

FOR OFFICE USE ONLY	
APPLICATION #:	
☐ APPROVED	EXP. DATE
☐ DENIED (COMMENTS ON FOLLOWING PAGE)	
PREPARED BY	DATE:

Please type the following information

Generator Name			EPA ID #
Lawrence Livermore National Laboratory			CA2890012584
Site Address	**City**	**State**	**Zip Code**
7000 East Avenue	Livermore	CA	94550
Mailing Address	**City**	**State**	**Zip Code**
P.O. Box 808	Livermore	CA	94551
Name of Applicant	**Title**		**Telephone Number**
Sav Mancieri	Group Leader		(925) 422-6920
Signature of Applicant			**Date**
Sav Mancieri			10-1-04

A. DESCRIPTION OF WASTE:

(Note: A separate application must be used for wastes with different accumulation start dates)

Waste Component (s)	Waste Code	Concentration	(Gal/Drum)
1. Steel pipes, valves, wires	D009 and F-listed	Hg < 260 mg/kg	20 yd Roll-Off Bi
2. Six steel tanks*	D009	Hg < 260 mg/kg	1850 gal. each
3. Two quad tanks	D009	Hg < 260 mg/kg	4600 gal. each (quad tanks)
4.			

*These empty tanks have 1.5 in steel with 0.13 to 0.25 in. coating of grout.

B. DESCRIPTION OF STORAGE:

All these wastes are stored in temporary WAA

- ☐ Drums — Type:
- ☐ Tank — Type:
- ☒ Bins — Type: See photograph
- ☒ Others (specify) — Type: Roll-Off Bin - See photograph

HAZARDOUS WASTE STORAGE EXTENSION APPLICATION

C. BRIEF DESCRIPTION OF STORAGE AREA:
(i.e., containment system, berms, warning signs, etc.):

1. Contaminated steel pipes, valves, and wires are in a roll-off bin at the T-6498 Temporary WAA is located in the southeast quadrant of the LLNL Main Site, on an outdoor asphalt area east of Avenue K that includes Tents T-6498 and T-6499. The T-6498 WAA is used by the Space Action Team (SAT) for the storage of waste generated from the decontamination and decommissioning (D&D) of the B-514 Area and other D&D project areas.
2. The six contaminated steel tanks are in the B-412 Temporary WAA is located in the southeast quadrant of the LLNL Main Site, on an outdoor asphalt area adjacent to the north end of B-412, and south of South Outer Loop Road. The B-412 Temporary WAA is used by the Space Action Team (SAT) of the Environmental Protection Department (EPD). The B-412 Temporary WAA is approximately 75 feet by 170 feet and is surrounded by a locked chain link fence. Access to the B-412 Temporary WAA is through locked gates on the west and south sides of the B-412 Temporary WAA. Only authorized personnel have access to the B-412 Temporary WAA.
3. The two contaminated quad tanks are in T-6498 WAA described under item 1 above.

D. ACCUMULATION START
DATE: July 9, 2004

E. DATE OF 90-DAY STORAGE LIMIT: October 14, 2004

F. NUMBER OF ADDITIONAL DAYS REQUESTED: 30 days
(30-DAY MAXIMUM)

G. REASON FOR STORAGE EXTENSION:

LLNL needs additional time to prepare the awkward wastes for transportation and disposal at an offsite facility.

If you have any questions or concerns regarding the HAZARDOUS WASTE STORAGE EXTENSION APPLICATION contact Ms. Asha Arora at (510) 540-3874. The signed APPLICATION should be sent to the following address:

Department of Toxic Substances Control
Statewide Compliance Division
State Oversight and Enforcement Branch
700 Heinz Avenue, Suite 210
Berkeley, California 94710 – 2721
Attention: Ms. Asha Arora

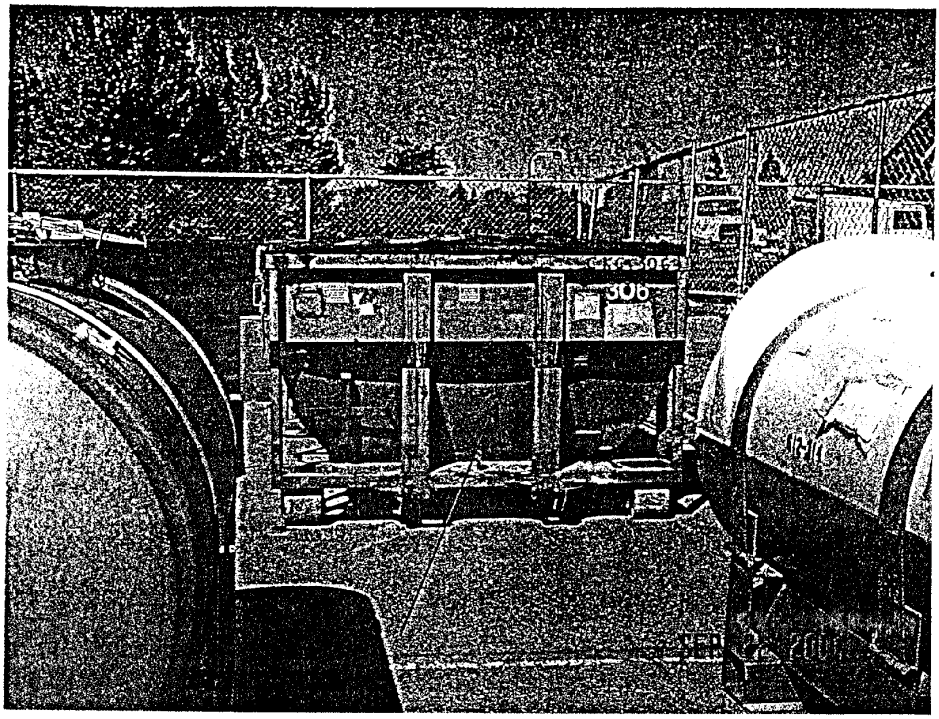
FOR OFFICE USE ONLY

Reason for Denial:

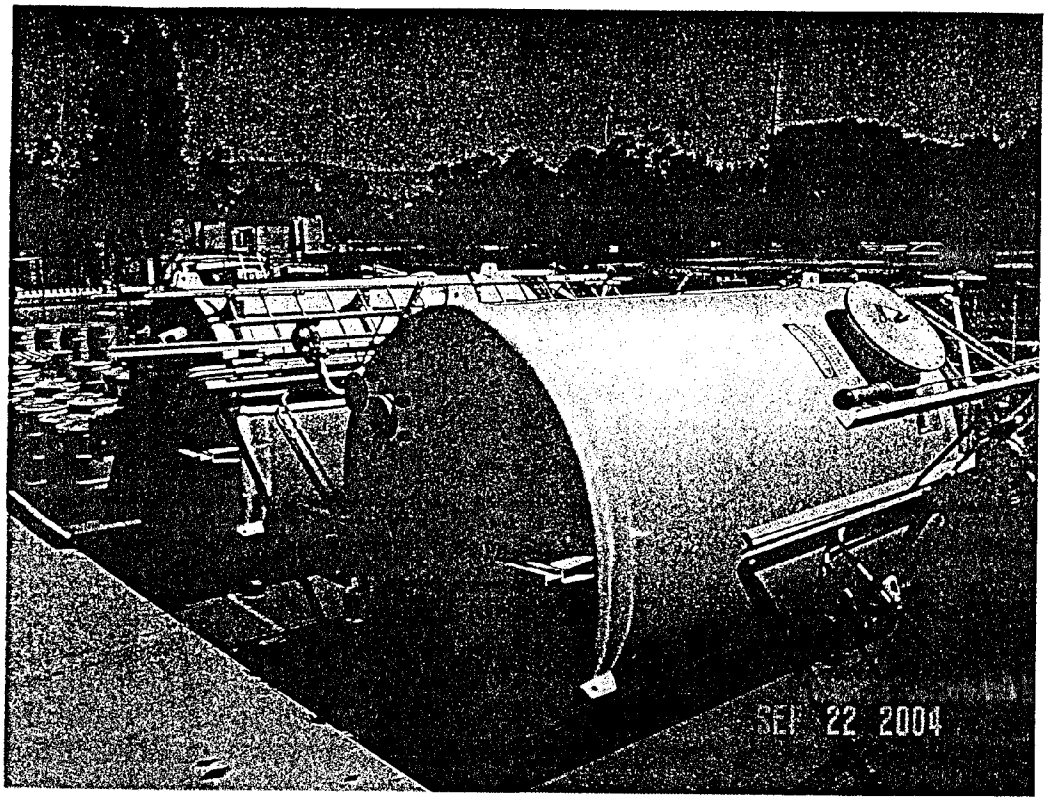
☐ Does not meet California Code of Regulations, title 22, section 66262.34 (c)

☐ Other (Specify)

Six Steel Tanks Contaminated by Depleted Uranium and Mercury Wastes



Roll-off Bin with Steel Pipes, Valves, & Wires Contaminated by Depleted Uranium, Mercury and F-listed Wastes



Two of the Four Quad Tanks Contaminated by Depleted Uranium, Mercury, and F-listed Wastes

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY — DEPARTMENT OF TOXIC SUBSTANCES CONTROL

HAZARDOUS WASTE STORAGE EXTENSION APPLICATION

DEPARTMENT OF TOXIC SUBSTANCES CONTROL — STATEWIDE COMPLIANCE BRANCH — BERKELEY — OCT 04 2004 — STATE OF CALIFORNIA EPA — RECEIVED

FOR OFFICE USE ONLY
APPLICATION #: E-837
☐ APPROVED EXP. DATE
☒ DENIED (COMMENTS ON FOLLOWING PAGE)
Alma Arias — PREPARED BY — 10/8/04 — DATE:

Please type the following information

Generator Name			EPA ID #
Lawrence Livermore National Laboratory			CA2890012584
Site Address	**City**	**State**	**Zip Code**
7000 East Avenue	Livermore	CA	94550
Mailing Address	**City**	**State**	**Zip Code**
P.O. Box 808	Livermore	CA	94551
Name of Applicant	**Title**		**Telephone Number**
Sav Mancieri	Group Leader		(925) 422-6920
Signature of Applicant			**Date**

A. DESCRIPTION OF WASTE:

(Note: A separate application must be used for wastes with different accumulation start dates)

Waste Component (s)	Waste Code	Concentration	(Gal/Drum)
1. Steel pipes, valves, wires	D009 and F-listed	Hg < 260 mg/kg	20 yd Roll-Off Bin
2. Six steel tanks*	D009	Hg < 260 mg/kg	1850 gal. each
3. Two quad tanks	D009	Hg < 260 mg/kg	4600 gal. each (quad tanks)
4.			

*These empty tanks have 1.5 in steel with 0.13 to 0.25 in. coating of grout.

B. DESCRIPTION OF STORAGE:

All these wastes are stored in temporary WAA

☐ Drums Type:

☐ Tank Type:

☒ Bins Type: See photograph

☒ Others (specify) Type: Roll-Off Bin - See photograph

DTSC 1313 (5/03) — Page 3 of 4

HAZARDOUS WASTE STORAGE EXTENSION APPLICATION

C. **BRIEF DESCRIPTION OF STORAGE AREA:**
(i.e., containment system, berms, warning signs, etc.):

1. Contaminated steel pipes, valves, and wires are in a roll-off bin at the T-6498 Temporary WAA is located in the southeast quadrant of the LLNL Main Site, on an outdoor asphalt area east of Avenue K that includes Tents T-6498 and T-6499. The T-6498 WAA is used by the Space Action Team (SAT) for the storage of waste generated from the decontamination and decommissioning (D&D) of the B-514 Area and other D&D project areas.
2. The six contaminated steel tanks are in the B-412 Temporary WAA is located in the southeast quadrant of the LLNL Main Site, on an outdoor asphalt area adjacent to the north end of B-412, and south of South Outer Loop Road. The B-412 Temporary WAA is used by the Space Action Team (SAT) of the Environmental Protection Department (EPD). The B-412 Temporary WAA is approximately 75 feet by 170 feet and is surrounded by a locked chain link fence. Access to the B-412 Temporary WAA is through locked gates on the west and south sides of the B-412 Temporary WAA. Only authorized personnel have access to the B-412 Temporary WAA.
3. The two contaminated quad tanks are in T-6498 WAA described under item 1 above.

D. **ACCUMULATION START DATE:** July 9, 2004

E. **DATE OF 90-DAY STORAGE LIMIT:** October 14, 2004

F. **NUMBER OF ADDITIONAL DAYS REQUESTED:** 30 days
(30-DAY MAXIMUM)

G. **REASON FOR STORAGE EXTENSION:**
LLNL needs additional time to prepare the awkward wastes for transportation and disposal at an offsite facility.

If you have any questions or concerns regarding the HAZARDOUS WASTE STORAGE EXTENSION APPLICATION contact Ms. Asha Arora at (510) 540-3874. The signed APPLICATION should be sent to the following address:

Department of Toxic Substances Control
Statewide Compliance Division
State Oversight and Enforcement Branch
700 Heinz Avenue, Suite 210
Berkeley, California 94710 – 2721
Attention: Ms. Asha Arora

FOR OFFICE USE ONLY

Reason for Denial:

☐ Does not meet California Code of Regulations, title 22, section 66262.34 (c)

☒ Other (Specify) See denial letter. AA.

Terry Tamminen
Agency Secretary
Cal/EPA

Department of Toxic Substances Control

B.B. Blevins, Director
700 Heinz Avenue, Suite 200
Berkeley, California 94710-2721

Arnold Schwarzenegger
Governor

October 8, 2004

Mr. Sav Mancieri
Group Leader
Lawrence Livermore National Laboratory
7000 East Avenue
Livermore, California 94501
Facsimile: (925) 423-5490

Dear Mr. Mancieri:

The Department of Toxic Substances Control (DTSC) received an unsigned request from Livermore National Laboratory (LLNL) for a 30-day extension to the 90-day storage of hazardous waste submitted on October 4, 2004. This request was for the following mixed waste streams:

1. 20-yard roll-off bin stored at the waste accumulation area (WAA), T6498 with 7/9/04 as the initial date of accumulation.

2. Two (2) quad tanks contain radioactive and F-listed wastes stored in WAA, T6498 with 7/9/04 as the initial date of date of accumulation

3. Six (6) steel tanks stored in the bldg, B412 with 7/30/04 as the initial date of accumulation

This extension request is being denied for the for the waste streams 1 and 2 due to the following reasons:

- The extension is for the mixed waste generated from the closure of Building 514 (B514) at its Livermore site. The wastes are contaminated steel pipes, valves, and wires in a roll-off bin; six (6) steel tanks, and two (2) quad tanks. Under the closure plan, LLNL was aware of the types of wastes that would be generated. DTSC does not consider this to be unforeseen, temporary, and uncontrollable circumstances.

- DTSC received the extension request on the 87th day, October 4, 2004. The extension processing time is approximately 10 days as specified in the application and so the request should have been submitted to DTSC by the 80th day, i.e. September 27, 2004.

- The extension request was missing an original signature as specified in the extension request application. DTSC received a faxed copy of the signature page with a signature on October 6, 2004, and an original signature page on October 8, 2004.

For clarification, the correct 90th day limit is on October 7, 2004 from July 9, 2004 as the initial date of accumulation. LLNL marked October 14, 2004 as the 90th day limit.

Please submit a separate extension request for the six (6) steel tanks. The 90th day for these tanks will be on October 27, 2004.

If you have additional questions or need further assistance in this matter, I may be reached at (510) 540-3874.

Sincerely,

Asha Arora

Asha Arora
Hazardous Substance Scientist
Statewide Compliance Division

Enclosure

cc Ms. Luz Castillo
Sr. Hazardous Substance Scientist
Statewide Compliance Division
Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, California 94710

Mr. Michael Stanek
Hazardous Substance Engineer
Permitting and Corrective Action Division
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95812

Part 2

Lawrence Livermore National Laboratory

Environmental Protection Department

October 12, 2004

Ms. Asha Arora
Statewide Compliance Division
Department of Toxic Substances Control
700 Heinz Avenue Suite 210
Berkeley, CA 94710-2721

SUBJECT: Storage Extension Application for Lawrence Livermore National Laboratory (LLNL) Main Site (EPA ID No. CA2890012584)

Dear Ms. Arora:

Lawrence Livermore National Laboratory (LLNL) is in the process of preparing its mixed waste for shipment to an offsite facility and is submitting the attached completed form (*DTSC 1313 (5/03)*) to request a 30-day storage extension. This additional time is needed to process wastes for offsite shipment and disposal and because the wastes are awkward in both composition and shape and the analytical laboratory has been having difficulty running samples due to the composition of some bulk tank samples.

As shown in the completed form, LLNL is requesting storage extension for six waste steel tanks that were generated during closure of building 514 (B514). A detailed description of the waste, including storage area, accumulation start and end dates, and reason for the storage extension request, are given in this completed form. A photograph of the six waste steel tanks is also attached.

The following is the category of waste for which LLNL is requesting storage extension:

- Six steel tanks are currently located in the B412 WAA. The accumulation start date for this waste is July 30, 2004.

Please contact Peter Yimbo at (925) 424-3897 if you have any questions regarding this request.

Sincerely,

Ellen Raber

Ellen Raber, Department Head
Environmental Protection Department

ER/PY:cp

Attachment

An Equal Opportunity Employer • University of California • P.O. Box 808, L-626, Livermore, California 94551
(925) 422-9985 Fax (925) 423-9365

Six Steel Tanks Contaminated by Depleted Uranium and Mercury Wastes

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

HAZARDOUS WASTE STORAGE EXTENSION APPLICATION

DEPARTMENT OF TOXIC SUBSTANCES CONTROL STATEWIDE COMPLIANCE BRANCH BERKELEY OCT 14 2004 STATE OF CALIFORNIA EPA RECEIVED

FOR OFFICE USE ONLY

APPLICATION #: E-238

☒ APPROVED EXP. DATE 11/26/04

☐ DENIED (COMMENTS ON FOLLOWING PAGE)

Asha Anand 10/21/04

PREPARED BY DATE

Please type the following information

Generator Name		EPA ID #
Lawrence Livermore National Laboratory		CA2890012584
Site Address	**City**	**State / Zip Code**
7000 East Avenue	Livermore	CA 94551
Mailing Address	**City**	**State / Zip Code**
P.O. Box 808	Livermore	CA 94551-0808
Name of Applicant	**Title**	**Telephone Number**
Sav Mancieri		(925) 422-6920
Signature of Applicant		**Date**
Sav Mancieri		10/12/04

A. DESCRIPTION OF WASTE:

(Note: A separate application must be used for wastes with different accumulation start dates)

Waste Component (s)	Waste Code	Concentration	(Gal/Drum)
1. Six steel tanks*	D009	Hg <260mg/kg	1850 gal. each
2.			
3.			
4.			

*These empty tanks have 1.5 in. steel with 0.13 to 0.25 in. coating of grout.

B. DESCRIPTION OF STORAGE:

☐ Drums Type:

☐ Tank Type:

☒ Bins Type: See photograph

☐ Others (specify) Type:

DTSC 1313 (5/03)

HAZARDOUS WASTE STORAGE EXTENSION APPLICATION

C. BRIEF DESCRIPTION OF STORAGE AREA:
(i.e., containment system, berms, warning signs, etc.):

1. The six contaminated steel tanks are in the B412 Temporary WAA, located in the southeast quadrant of the LLNL Main Site, on an outdoor asphalt area adjacent to the north end of B412, and south of South Outer Loop Road. The B412 Temporary WAA is used by the Space Action Team (SAT) of the Environmental Protection Department (EPD). The B412 Temporary WAA is approximately 75 feet by 170 feet and is surrounded by a locked chain link fence. Access to the B412 Temporary WAA is through locked gates on the west and south sides of the B412 Temporary WAA. Only authorized personnel have access to the B412 Temporary WAA.

D. ACCUMULATION START DATE: July 30, 2004

E. DATE OF 90-DAY STORAGE LIMIT: October 27, 2004

F. NUMBER OF ADDITIONAL DAYS REQUESTED: 30 days
(30-DAY MAXIMUM)

G. REASON FOR STORAGE EXTENSION:

If you have any questions or concerns regarding the HAZARDOUS WASTE STORAGE EXTENSION APPLICATION contact Ms. Asha Arora at (510) 540-3874. The signed APPLICATION should be sent to the following address:

Department of Toxic Substances Control
Statewide Compliance Division
State Oversight and Enforcement Branch
700 Heinz Avenue, Suite 210
Berkeley, California 94710 – 2721
Attention: Ms. Asha Arora

FOR OFFICE USE ONLY

Reason for Denial:

☐ Does not meet California Code of Regulations, title 22, section 66262.34 (c)

☐ Other (Specify)

Appendix J
Tables for Contaminants

Sample # CAS1

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	<	<	20.3 ± 6.2	<	<	<	1.0	pCi/g
	Gross beta	17.7 ± 7	<	27.1 ± 6.3	<	<	<	3.0	pCi/g
	Tritium	<	<	7.25 ± 0.98	<	<	<	5.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	25.9	<	<	<	<	<	14.60	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS2
Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	8.6 ± 5.7	<	15.9 ± 5.5	<	<	<	1.0	pCi/g
	Gross beta	23.9 ± 7.5	<	20.1 ± 4.6	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	31.2	<	<	<	<	<	14.60	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS4

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	13.3 ± 5.7	24.3 ± 7	19.0 ± 5.8	<	<	<	1.0	pCi/g
	Gross beta	22.3 ± 6.1	23.1 ± 6.9	27.6 ± 5.5	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	16.7	26.8	112	<	<	<	14.60	mg/kg
	copper	<	<	69.5	<	<	<	62.50	mg/kg
	zinc	<	<	702	<	<	<	75.3	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS5

Sample Matrix - Soil

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	14.7 ± 5.6	14.2 ± 5.6	17.5 ± 5.8	<	<	<	1.0	pCi/g
	Gross beta	19.9 ± 4.9	26.5 ± 6.1	26.2 ± 6.1	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	17.1	<	<	<	<	<	14.60	mg/kg
	copper	93.7	<	67.1	<	<	<	62.50	mg/kg
	zinc	78.1	<	<	<	<	<	75.3	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS6

Sample Matrix - Soil & concrete

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	9.1 ± 4.8	22.4 ± 6.7	26.7 ± 7.6	<	<	<	1.0	pCi/g
	Gross beta	17.6 ± 5.6	25.2 ± 6.8	36.5 ± 8.1	<	<	<	3.0	pCi/g

Metals Summary	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	cobalt	29.6	22.8	<	<	<	<	14.60	mg/kg
	mercury	<	0.7	<	<	<	<	0.14	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS7

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	16.2 ± 6	8.6 ± 4.4	17.9 ± 5.8	<	<	<	1.0	pCi/g
	Gross beta	13.9 ± 3.5	22.5 ± 5.3	19.0 ± 3.7	<	<	<	3.0	pCi/g
	Tritium	<	65 ± 15	15.6 ± 3.6	<	<	<	5.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	chromium, total	<	<	96.4	<	<	<	72.40	mg/kg
	cobalt	<	<	15.5	<	<	<	14.60	mg/kg
	nickel	<	<	133	<	<	<	82.80	mg/kg
	vanadium	<	89.2	<	<	<	<	65.20	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS8

Sample Matrix - Soil & asphalt

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	<	20.7 ± 6.4	19.0 ± 6	<	<	<	1.0	pCi/g
	Gross beta	<	25.0 ± 4.3	22.0 ± 4.3	<	<	<	3.0	pCi/g
	Tritium	<	20.9 ± 5.8	17.3 ± 6.5	<	<	<	5.0	pCi/g

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS9

Sample Matrix - Soil & asphalt

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	<	15.6 ± 5.3	14.4 ± 5.4	<	<	<	1.0	pCi/g
	Gross beta	<	24.1 ± 4.8	23.1 ± 5.1	<	<	<	3.0	pCi/g
	Tritium	<	<	10.2 ± 6.3	<	<	<	5.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	<	<	15.5	<	<	<	14.6	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS10

Sample Matrix - Soil

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	15.6 ± 5.2	21.5 ± 6.3	20.2 ± 6.4	<	<	<	1.0	pCi/g
	Gross beta	14.0 ± 3.5	24.0 ± 5.5	22.7 ± 4	<	<	<	3.0	pCi/g
	Tritium	<	238 ± 28	242 ± 29	<	<	<	5.0	pCi/g

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS11

Sample Matrix - Soil & asphalt

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Tritium	<	<	<	<	<	11.2 ± 2	5.0	pCi/g

Metals Summary	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	zinc	202	86.4	<	<	<	<	75.3	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS12

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	9.8 ± 5	16.4 ± 6.2	20.3 ± 6.3	<	<	<	1.0	pCi/g
	Gross beta	20.6 ± 5.5	28.5 ± 7.1	24.9 ± 6.3	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	95.5	<	<	<	<	<	14.60	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS13

Sample Matrix - Soil

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	10.8 ± 5.8	19.7 ± 6.6	10.3 ± 4.6	<	<	<	1.0	pCi/g
	Gross beta	24.7 ± 6.4	27.0 ± 6.5	24.2 ± 6.4	<	<	<	3.0	pCi/g
	Tritium	10.8 ± 5.8	1.98 ± 0.59	2.29 ± 0.62	<	<	<	5.0	pCi/g

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS14

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	10.5 ± 5.9	25.8 ± 8.8	24.5 ± 8.8	<	<	<	1.0	pCi/g
	Gross beta	22.0 ± 5.4	29.8 ± 7.3	28.2 ± 6.6	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	179	<	16.5	<	<	<	14.60	mg/kg
	zinc	113	<	<	<	<	<	75.3	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS15

Sample Matrix - Soil, Concrete

Radioactivity Summary	Analyte	Sample Media							Release Level (RL)	Units
		concrete	soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	12.0 ± 5	21.6 ± 6.4	17.9 ± 5.8	<	<	<	<	1.0	pCi/g
	Gross beta	16.5 ± 5.6	32.0 ± 6.4	25.5 ± 5.7	<	<	<	<	3.0	pCi/g

Metals Summary	Analyte	Sample Media							Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'	concrete		
	beryllium	<	0.7		0.81	0.64	<		0.62	mg/kg
	chromium, hexavalent	<	<	<	<	<	<	0.59	0.01	mg/kg
	copper	393	<	<	<	<	<	<	14.60	mg/kg
	vanadium	<	<	<	<	<	<	69.5	65.20	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS16

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	15.5 ± 7	14.6 ± 6.4	11.2 ± 6.1	<	<	<	1.0	pCi/g
	Gross beta	24.5 ± 4.9	20.9 ± 4.3	24.9 ± 5.1	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Volatile Organic Compounds and PCB	aroclor 1242	0.39	<	<	<	<	<	0.22	mg/kg
	aroclor 1254	0.29	<	<	<	<	<	0.22	mg/kg
	aroclor 1260	0.37	<	<	<	<	<	0.22	mg/kg

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	17.1	<	<	<	<	<	14.60	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS17

Sample Matrix - Soil & concrete

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	<	14.9 ± 5.8	10.5 ± 5.8	<	<	<	1.0	pCi/g
	Gross beta	15.6 ± 3.6	14.9 ± 3.8	22.9 ± 5	<	<	<	3.0	pCi/g
	Tritium	<	<	0.86 ± 0.53	<	<	<	5.0	pCi/g

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS18

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
Radioactivity Summary		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	13.5 ± 4.9	9.6 ± 4.4	21.8 ± 6.4	<	<	13.5 ± 5	1.0	pCi/g
	Gross beta	18.9 ± 4.4	16.1 ± 3.9	21.3 ± 4.8	<	<	29.6 ± 5.2	3.0	pCi/g
	Tritium		5.14 ± 0.86	12.6 ± 1.6	<	<	<	5.0	pCi/g

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS19

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	14.4 ± 7	15.5 ± 7	17.7 ± 6.9	<	<	<	1.0	pCi/g
	Gross beta	12.0 ± 2.8	24.4 ± 4.4	20.9 ± 4	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	<	18.4	<	<	<	<	14.60	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS20

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	19.1 ± 7.1	18.6 ± 6.7	14.2 ± 6.2	<	<	<	1.0	pCi/g
	Gross beta	22.1 ± 4.4	24.7 ± 4.8	24.2 ± 4.5	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	<	<	15.9	<	<	<	14.60	mg/kg
	chromium, hexav	0.78	<	<	<	<	<	0.01	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS21

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	17.1 ± 6.2	11.9 ± 6.2	17.5 ± 7.5	<	<	<	1.0	pCi/g
	Gross beta	20.4 ± 4.9	24.6 ± 4.9	24.7 ± 4.8	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	23.9	<	<	<	<	<	14.60	mg/kg
	copper	122	<	<	<	<	<	62.50	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS22

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	15.1 ± 6.2	20.0 ± 7.2	13.4 ± 5.4	<	<	<	1.0	pCi/g
	Gross beta	28.5 ± 5.9	24.9 ± 5	26.7 ± 5.7	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	chromium, hexva	1.4	<	<	<	<	<	0.01	mg/kg
	silver	4.4	<	<	<	<	<	2.50	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS 23

Sample Matrix - Soil & concrete

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	15.9 ± 6.7	17.5 ± 6.8	30.7 ± 8.8	<	<	<	1.0	pCi/g
	Gross beta	27.5 ± 5.8	25.8 ± 5.1	27.9 ± 5.9	<	<	<	3.0	pCi/g

Metals Summary	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	beryllium	<	<	0.67	<	<	<	0.62	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS24

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	13.2 ± 4.8	14.9 ± 5.3	20.3 ± 6.2	<	<	<	1.0	pCi/g
	Gross beta	15.8 ± 4.3	25.0 ± 5.5	27.3 ± 6.1	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Volatile Organic Compounds and PCB	aroclor 1242	0.4	1.4	<	<	<	<	0.22	mg/kg
	aroclor 1260	0.49	1	<	<	<	<	0.22	mg/kg

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	mercury	<	<	2.2	<	<	<	0.14	mg/kg
	zinc	202	86.4		<	<	<	75.3	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS25

Sample Matrix - Soil & concrete

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	10.2 ± 6	23.0 ± 8.1	23.8 ± 7.5	<	<	<	1.0	pCi/g
	Gross beta	19.0 ± 5.2	42.1 ± 8.3	31.0 ± 7.1	<	<	<	3.0	pCi/g
	Tritium	<	64.0 ± 6.8	238 ± 24	<	<	<	5.0	pCi/g

Metals Summary	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	cobalt	34.3	<	<	<	<	<	14.60	mg/kg
	zinc	202	86.4	<	<	<	<	75.3	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS26

Sample Matrix - Soil & concrete

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	10 ± 5.3	12.9 ± 5.2	12.5 ± 5.6	<	<	<	1.0	pCi/g
	Gross beta	19.8 ± 5.8	16.4 ± 4.5	23.5 ± 5.8	<	<	<	3.0	pCi/g

Metals Summary	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	cobalt	222	<	<	<	<	<	14.60	mg/kg
	silver	<	7.5	<	<	<	<	2.50	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS27

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	8.7 ± 5.6	11.8 ± 6.3	14.5 ± 7.1	<	<	<	1.0	pCi/g
	Gross beta	17.9 ± 4.5	23.2 ± 6.9	19.2 ± 5.4	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Volatile Organic Compounds and PCB	tetrachloroethene (PCE)	<	0.16	<	<	<	<	0.088	mg/kg
	trichloroethene (TCE)	<	1.2	<	<	<	<	0.26	mg/kg

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	544	54.9	36.2	<	<	<	14.60	mg/kg
	silver	14.1	<	<	<	<	<	2.50	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS28

Sample Matrix - Soil & concrete

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	15.8 ± 6.5	14.9 ± 6.3	23.2 ± 7.3	11.8 ± 5.1	19.0 ± 7.4	12.4 ± 5.6	1.0	pCi/g
	Gross beta	27.4 ± 6.1	25.9 ± 6.8	32.1 ± 7.4	24.5 ± 7.1	24.1 ± 7.3	35.2 ± 7.4	3.0	pCi/g

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS29

Sample Matrix - Soil & concrete

Radioactivity Summary	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	Gross alpha	10.8 ± 4.9	20.9 ± 7.8	20.8 ± 6.8	<	<	<	1.0	pCi/g
	Gross beta	19.0 ± 5.6	29.1 ± 8.3	26.6 ± 6.6	<	<	<	3.0	pCi/g

Metals Summary	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
	copper	<	90.6	91.1	<	<	<	62.50	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS30

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	13.9 ± 5.7	19.0 ± 8	10.4 ± 6.6	<	<	<	1.0	pCi/g
	Gross beta	28.0 ± 6.5	25.5 ± 6.4	23.1 ± 7.5	<	<	<	3.0	pCi/g

< indicates a constituent concentration value less than the clean up or release level.

Sample # CAS32

Sample Matrix - Soil & concrete

	Analyte	Sample Media						Release Level (RL)	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Radioactivity Summary	Gross alpha	18.7 ± 6.6	8.7 ± 5.1	12.7 ± 5.7	<	<	<	1.0	pCi/g
	Gross beta	31.1 ± 6.9	24.2 ± 6	21.5 ± 6.4	<	<	<	3.0	pCi/g

	Analyte	Sample Media						Clean Up Level	Units
		soil 0'	soil 2'	soil 5'	soil 10'	soil 15'	soil 20'		
Metals Summary	cobalt	17.1	<	<	<	<	<	14.6	mg/kg
	copper	93.7	<	67.1	<	<	<	62.5	mg/kg
	zinc	78.1	<	<	<	<	<	75.3	mg/kg

< indicates a constituent concentration value less than the clean up or release level.

Appendix K
Analysis of Potential Impact to Ground Water from Residual Soil Contamination in Area 514

Analysis of Potential Impact to Ground Water from Residual Soil Contamination in Area 514

Lawrence Livermore National Laboratory Livermore Site Livermore, California

March 2005

Kayyum Mansoor
Zafer Demir
Charles Noyes

1. Introduction

Lawrence Livermore National Laboratory (LLNL) has prepared this screening level unsaturated (vadose) zone modeling report to support the Building 514 Area Closure activities (Area 514).

The objective of the modeling was to assess the potential impact of residual contaminants present in surface and subsurface soil that could migrate downward through the vadose zone and eventually reach ground water. A conservative screening-level quantitative approach was followed using one-dimensional (1-D) unsaturated flow and transport modeling to determine if contaminants will adversely impact ground water and to assess their migration rate in the soil column. The results of these numerical simulations are not intended to predict actual future concentrations at the water table. Instead, these analyses are intended to represent a conservative worst-case scenario to be used as a screening tool.

Only chemicals with surface and subsurface soil concentrations exceeding the maximum allowable levels defined in the Area 514 Closure Plan (2004) are considered as chemicals of potential concern for the purposes of this analysis.

2. Methodology

One-dimensional vadose zone column modeling is selected as the screening methodology to assess potential impact to ground water from surface and subsurface contamination in the vadose zone. Several one-dimensional screening level tools have been used over the years to assess potential impact to ground water from contaminated soils. Two of the more commonly used and widely accepted tools are VLEACH (1990) and SESOIL (1984). Both of these tools are very useful when site conditions are similar to the assumptions incorporated in the mathematical models. However, VLEACH is limited to a homogenous soil column and transport parameters (i.e. single retardation coefficient). SESOIL is capable of incorporating several soil layers however, accepts only a single moisture content value. SESOIL also requires many other input parameters that are difficult to measure and/or obtain for each site. The assumptions embedded in these codes become severely limiting if the tools are to be used at the Livermore Site. Using homogenous soil profiles is not suitable for Livermore Site source areas since the geology is very complex and significantly different lithologies, ranging from coarse artificial fill to clays, with distinct unsaturated properties exist. Many other numerical tools have also been developed that focus on solving specific aspects of the unsaturated flow and transport process. LLNL selected the numerical code NUFT (Non-isothermal, Unsaturated-Saturated Flow and Transport)(Nitao, 1998) for this work. NUFT is a multi-phase, multi-component flow and transport code that was primarily developed to simulate flow and transport in the unsaturated zone. NUFT is capable of simulating all relevant unsaturated and saturated zone processes such as: advection, dispersion, diffusion, adsorption, volatilization, and degradation for aqueous, gaseous and non-aqueous

phases under non-isothermal conditions. The extensive capabilities of the NUFT code allow us to incorporate all relevant factors for which representative site data exists. This approach is similar to that described in the Central Valley Regional Water Quality Control Board (1989) document for determining designated levels for soil contamination. All factors controlling the migration of a COC in a one-dimensional column are considered and conservative assumptions are used when adequate site data is not available.

2. 1. Conceptual Model

The most important step in screening-level modeling is the development of a representative conceptual model of the area. The approach used in developing representative conceptual models for Area 514 at the Livermore Site is as follows (Figure 1):

- Gather all available surface and subsurface data for the source area.
- Develop a representative soil profile using borehole lithology and geophysics.
- Assign unsaturated flow properties for each soil type.
- Determine the highest elevation of the ground water table at the bottom of the column.
- Assign a conservative infiltration rate at the top of the column.
- Calibrate the flow model until a representative soil moisture profile is obtained.
- Assign the initial concentration distribution along the soil profile for each chemical.
- Using the transport model determine the maximum concentration/activity reaching the ground water and the distribution of concentration/activity along the soil profile.

2. 2. Model Input Parameters

Multiple data sets are used in determining model input parameters. Boring logs, geophysical logs, and information from shallow borings are used to characterize the geology and develop representative soil profiles for Area 514. Long-term ground water elevation data from nearby wells are used to determine the highest ground water elevation observed beneath the site. Laboratory analysis data and literature data for soil physical parameters and unsaturated flow parameters are used as model input based on lithological descriptions. Meteorological data from Livermore Site and Sandia Laboratory weather stations are used in determining the infiltration rate. A conservative approach is taken in assigning each input parameter.

2. 2. 1. Soil profile

A representative soil profile is developed for Area 514 based on geological and geophysical information from nearby wells W-217, W-261, and W-622. Discontinuous layers of low permeability units with fine soils are disregarded. The maximum encountered thickness of high permeability layers, and minimum encountered thickness of adjacent low permeability units are used in developing a conservative soil profile from an unsaturated flow and transport perspective. The representative soil profile is shown in Figure 2.

2. 2. 2. Soil properties

The geological units in Area 514 can be categorized into several general soil types. These types are based on borehole sample descriptions, and geophysical data. A review of the lithological samples from each borehole reveal that we can group these samples in three soil types: 1) High hydraulic conductivity soils - HEK (gravel, sand), 2) Medium hydraulic conductivity soils - MEK (silty sand, silts), and 3) Low hydraulic conductivity soils- LEK (clayey silts, clays).

For each of the three soil types, NUFT input parameters are based on the laboratory analysis results and data from literature surveys. The moisture retention curve of each soil type is defined using the Van Genuchten (1980) model parameters. Care is taken to conservatively select higher permeability, porosity and moisture retention parameter values. The resulting soil profiles are more saturated and more permeable than what is generally observed in the field, therefore contaminant migration occurs at a faster rate and at higher concentrations. This approach is specifically used to account for processes such as fingering and localized heterogeneity. Soil moisture profiles resulting from these set of input parameters conservatively represent typical conditions for a rainy season. The input parameters for each soil type are listed in Table 1.

Table 1. Soil properties used in NUFT.

Parameter	Unit	HEK	MEK	LEK
Solid density	kg/m^3	2740	2730	2750
Bulk Density (ρ_b)	kg/m^3	1820	1240	1370
Vertical Hydraulic Conductivity (K_z)	m^2	1.33E-09	1.02E-09	1.33E-10
Porosity (n)	%	0.32	0.30	0.38
Total Organic Carbon	%	0.1	0.1	0.1
Van Genuchten Parameters				
N	-	1.3	1.2	1.15
M = 1 - (1/n)	-	0.23	0.17	0.13
α	1/Pa	1.224E-03	4.079E-04	1.020E-04
Residual Saturation	%	0.31	0.27	0.32
Maximum Saturation	%	0.94	0.97	0.97
Tortuosity	%	Millington	Millington	Millington

Millington (1961) tortuosity factor = $Saturation^{(7/3)} \cdot n^{(1/3)}$

2. 2. 3. Ground water elevation and the unsaturated zone thickness

Long-term hydrographs from nearby wells completed in the upper most water bearing zone were examined and the highest historical ground water elevations are used in the model as the location for the potential receptor (ground water). The highest historical depth to water near Area 514 is 98.0 feet below ground surface.

2. 2. 4. Infiltration rate

A water balance analysis was conducted to determine an average infiltration rate for the entire site. The Green and Ampt (1911) model to predict net infiltration was used as the basis of the analysis. In addition, time dependent rainfall data was incorporated into the analysis using the Chu (1978) model. Based on this analysis we used an infiltration rate that is equal to 10% of the total precipitation on site. This rate is identical to the rate used for the calibrated regional scale ground water model which balances the overall flow through the basin.

2. 2. 5. Chemicals used in the evaluation

Only chemical above the maximum allowable concentration levels defined in the Area 514 Closure Plan are evaluated in this analysis. Based on this analysis, 10 metals and 4 volatile organic compounds (VOCs) are used in the evaluation of potential impact to ground water (Table2).

Table 2. Chemicals with concentrations above maximum allowable levels.

Chemical	Maximum allowable concentration (mg/kg) Area 514 Closure Plan	Maximum concentration criteria			
		Sample location	Maximum concentration (mg/kg)	Depth of max. level	Max. sample depth at location
beryllium (be)	0.62	CAS15	0.81	10	20
chromium, total (cr)	72.40	CAS07	96.40	5	15
chromium VI (cr6)	-	CAS22	1.40	0	5
cobalt (co)	14.60	CAS27	544.00	0	15
copper (cu)	62.50	CAS21	122.00	0	5
mercury (hg)	0.14	CAS24	2.20	5	15
nickel (ni)	82.80	CAS07	133.00	5	15
silver (ag)	2.50	CAS27	14.10	0	15
vanadium (v)	65.20	CAS07	89.20	2	15
zinc (zn)	75.30	CAS04	702.00	5	15
diethyl phthalate (dph)	0.03	CAS02	0.29	5	5
aroclor (pcb)	0.22	CAS24	1.40	2	15
tetrachloroethene (pce)	0.09	CAS27	0.16	2	15
trichloroethene (tce)	0.26	CAS27	1.20	2	15

2. 2. 6. Initial concentration profiles

Initial concentration profiles for each chemical are established by determining the maximum measured concentration of the chemical at specific depth intervals regardless of the sample location and assigning this maximum value to its respective depth interval in the one-dimensional

column. This approach results with initial concentration profiles in the numerical model that are considered very conservative since for most of the sampling locations chemicals were not detected at many depth intervals. The composite initial concentrations profiles presented in Table 3 represent the worst-case distribution of each chemical in the subsurface.

Table 3. Initial concentration profiles.

Depth [ft]	METAL [mg/kg]										VOC [mg/kg]			
	be	cr	cr6	co	cu	hg	ni	ag	v	zn	dph	pcb	pce	tce
0-2	0.58	70.50	0.49	544.00	122.00	0.12	62.10	14.10	42.70	202.00	0.00	1.40	0.03	0.00
2-5	0.70	51.30	1.40	54.90	90.60	0.70	63.60	1.40	89.20	86.40	0.00	0.00	0.16	1.20
5-10	0.67	96.40	0.00	112.00	91.10	2.20	133.00	1.10	46.30	702.00	0.29	0.00	0.03	0.02
10-15	0.81	42.10	0.00	14.30	29.80	0.06	67.20	0.00	34.60	36.40	0.00	0.00	0.03	0.01
15-20	0.64	31.50	0.00	11.80	24.30	0.03	43.90	0.00	27.00	36.70	0.00	0.00	0.00	0.00
20-25	0.53	55.00	0.00	11.90	19.20	0.06	55.90	0.00	39.70	43.80	0.00	0.00	0.00	0.00

2. 2. 7. Transport parameters

The transport parameters required in NUFT include, physical properties, partitioning coefficients, decay rates, diffusion, and dispersivity constants for chemicals.

Physical properties of chemicals such as molecular weight or half-life are readily available in the literature. Partitioning coefficients between the solid, air and water phases are well studied and exist in large databases (Thiboult, 1990) for various chemicals with a range of reported values. The lowest published values for soil-water partitioning coefficients are selected for this analysis resulting in less sorptive (more mobile) transport behavior. A summary of the applied soil-water partitioning coefficients (K_d) and calculated normalized-K_d values are listed in Table 4. Volatilization of VOCs is not allowed by using a negligible water-air partitioning coefficient therefore conservatively estimating the mass of VOCs that remain soluble in water. None of the chemicals are assigned a decay or degradation rate. Dispersion is assumed negligible in the model, essentially simulating a plug-flux of each chemical towards the water table at the maximum possible concentration.

Table 4. Applied distribution coefficients

Chemical	Applied K_d [mg/l]	Reference	Normalized K_d (=K_d□$_b$/n)		
			HEK	MEK	LEK
beryllium (be)	250	Thibault, D.H., et al., 1990	1422	1030	901
chromium, total (cr)	10	Thibault, D.H., et al., 1990	57	41	36
chromium, VI (cr6)	1.2	Thibault, D.H., et al., 1990	6.8	5.0	4.3
cobalt (co)	45	EPA, 2004b	256	186	162
copper (cu)	35	Baes, C.F. III et al., 1984	199	145	126
mercury (hg)	10	Baes, C.F. III et al., 1984	57	41	36
nickel (ni)	65	EPA, 2004b	370	269	234
silver (ag)	8.3	EPA, 2004b	47	34	30

vanadium (v)	1,000	Baes, C.F. III et al., 1984	5690	4130	3610
zinc (zn)	62	EPA, 2004b	353	256	224
diethyl phthalate (dph)	3.7	State of California EPA, 1994	21	15	13
aroclor (pcb)	174,000	EPA, 2004b	990,000	720,000	630,000
tetrachloroethene (pce)	0.31	EPA, 2004b	1.8	1.3	1.1
trichloroethene (tce)	0.33	EPA, 2004b	1.9	1.4	1.2

3. Computational runs and results

Input files are created for each chemical according to the methodology described in Section 2.1. Following sections discuss the determination of the soil moisture profile, and the transport simulations results for the metals and the VOCs.

3. 1. Soil moisture profile

Prior to the contaminant transport analysis, an initial (flow only) case is simulated to generate a soil moisture profile representative of an average rainfall year. The initial soil moisture profile is based on a steady state infiltration rate of 1.2 inches/year. This infiltration rate is equivalent to 10% of annual average rainfall. This is a conservatively high number since the saturation values in the Area 514 soil profile used in the model are 45% or above (Figure 3). These values of saturation are not typically observed during drilling activities at the Livermore Site. The initial soil moisture profile presented in Figure 3 is used in all subsequent transport simulations. If the area is paved infiltration rate at the site would become negligible and downward migration of all contaminants would seize.

3. 2. Potential impact from chemicals

Vadose zone transport simulations are conducted to evaluate the potential impact of the residual chemicals in soil near Area 514. A very conservative approach is used for this evaluation where the following assumptions are made:

- chemicals do not decay or degrade
- vertical dispersion is negligible
- lateral dispersion does not exist (one-dimensional flow)
- lowest reported soil-water partitioning coefficients are used for each chemical
- there are no geochemical reactions that reduce or bound metals to soils
- volatilization of VOCs is negligible
- first one-foot of the saturated zone is assumed to be the receptor

Based on the above assumptions, the predicted concentrations reaching the receptor (first one-foot of ground water) represent the worst-case scenario of vertical downward transport of chemicals near Area 514. Table 5 lists the predicted concentration of each chemical reaching the receptor. Even under these conservative set of assumptions beryllium, copper, and zinc do not reach the

receptor above their maximum contaminant level (MCL) defined for drinking water standards. Vanadium and Aroclors (PCBs) do not reach the ground water at any detectible quantities. The remainder of the chemicals (both metals and VOCs) may potentially reach the receptor at or above their MCLs, however the travel times to reach the receptor is very long. Cobalt, vanadium and diethyl phthalate do not have defined MCLs. Figure 4 and Figure 5 show the change in concentration at the receptor over time for metals and VOCs, respectively.

A sensitivity analysis was conducted to determine the transport parameters that control the maximum concentration levels and the travel time to reach the receptor. The soil-water partitioning coefficient, which controls the retardation of each chemical, primarily influences the travel time and to a lesser degree the concentration levels reaching the receptor. Since the lowest reported soil-water portioning coefficients are used for this analysis, travel times are expected to increase with increasing values of retardation. The maximum concentrations of VOCs reaching the ground water are very sensitive to volatilization in the subsurface. When volatilization of VOCs is included in the model, the concentrations observed at the receptor are significantly reduced depending on the volatilization rates.

The dispersion coefficient primarily influences the maximum concentration levels reaching the receptor. The maximum concentrations reaching the receptor are expected to reduce with vertical and lateral dispersion. The assumption of using the first foot of the saturated zone is also a very sensitive parameter. The maximum concentrations reaching a well completed directly beneath Area 514 would be significantly lower than what is predicted by this analysis due to the increased mixing volume and removal due to existing natural ground water flow. Figure 6 shows the sensitivity of dispersion and the receptor thickness using an example tracer chemical.

Another parameter that influences the maximum predicted concentration and the travel time is the infiltration rate. When infiltration rates are reduced to levels that would be equivalent to paved surfaces, the downward migration of contaminants seizes. This analysis does not include degradation of chemicals (de-chlorination of VOCs) nor geochemical reactions (complexation of metals). These processes will reduce or seize the migration of chemical towards the receptor.

Table 5. Maximum concentration and arrival time

Chemical	Maximum concentration reaching ground water [ug/L]	Time [years]	MCL [ug/L]	Time predicted to reach MCL [years]
beryllium (be)	2.5	600,000	4	Below MCL
chromium, total (cr)	4,500	24,000	50	13,000
chromium VI (cr6)	120	3,500	50	3,000
cobalt (co)	1,200	120,000	MCL not defined	-
copper (cu)	1,280	90,000	1300	Below MCL
Mercury (hg)	56	26,000	2	17,000
nickel (ni)	1,000	160,000	100	100,000
silver (ag)	115	22,000	100	21,000
vanadium (v)	Does not reach ground water		MCL not defined	-
zinc (zn)	2,900	155,000	5000	Below MCL
diethyl phthalate (dph)	15	9,300	MCL not defined	-
aroclor (pcb)	Does not reach ground water		0.5	-

tetrachloroethene (pce)	60	1,200	5	800
trichloroethene (tce)	270	1,200	5	750

4. Conclusions

A screening level evaluation of impact to ground water from residual chemicals in soils at the Area 514 indicates that there are no immediate risks for this pathway. A very conservative set of assumptions were used in this screening level analysis to represent the worst-case scenario for vertical migration of chemicals to a receptor at the ground water table. Several of the chemicals do not reach the receptor within the time frames used for this analysis. The remaining chemicals do not reach the receptor for thousands of years even under most conservative conditions.

The assumptions used in this analysis do not reflect the actual site conditions. An evaluation using site specific conditions will predict fewer chemicals and lower concentrations reaching the ground water.

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Figures

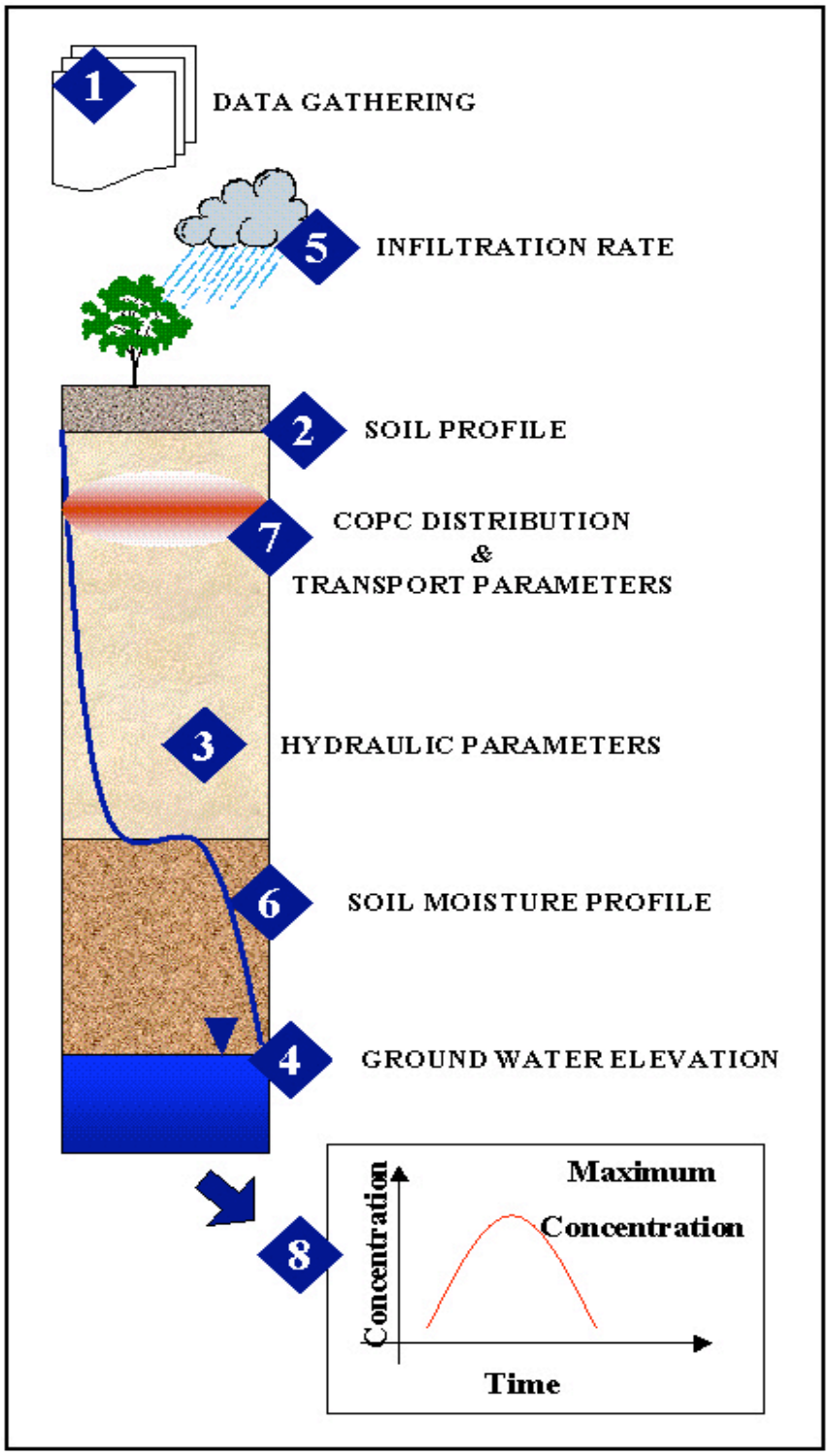

Figure 1. Conceptual model and the steps followed in determining potential impact to ground water.

Depth Interval (ft bgs)		Lithology	USC	Hydraulic conductivity	Water Table	NUFT Soil Profile
0	5	Silty Gravel	GM	HEK		H
5	10	Clayey Silt	ML	LEK		L
10	15	Silty Sand	SM	HEK		H
15	20	Silty Gravel	GM	HEK		
20	25	Clayey Gravel	CL	LEK		L
25	30	Clayey Silt	ML	LEK		
30	35	Silty Gravel	GM	MEK-HEK		H
35	40	Gravelly Sand	SP	HEK		
40	45	Sandy Silt	ML	LEK-MEK		M
45	50	Silty Sand	SM	MEK		
50	55	Clayey Silt	ML	LEK		L
55	60	Sandy Silt	ML	LEK-MEK		M
60	65	Silty Sand	SM	MEK		
65	70	Silty Sand	SM	MEK		
70	75	Sandy Silt	ML	LEK-MEK		
75	80	Sandy Silt	ML	LEK-MEK		
80	85	Clayey Gravel	GC	LEK		L
85	90	Sandy Gravel	GM	HEK		H
90	95	Clayey Gravel	GC	LEK		L
95	100	Clayey Gravel	GC	LEK	Depth to water 98 ft	
100	105	Gravelly Sand	SM	HEK		H

Figure 2. Building 514 Area representative soil profile.

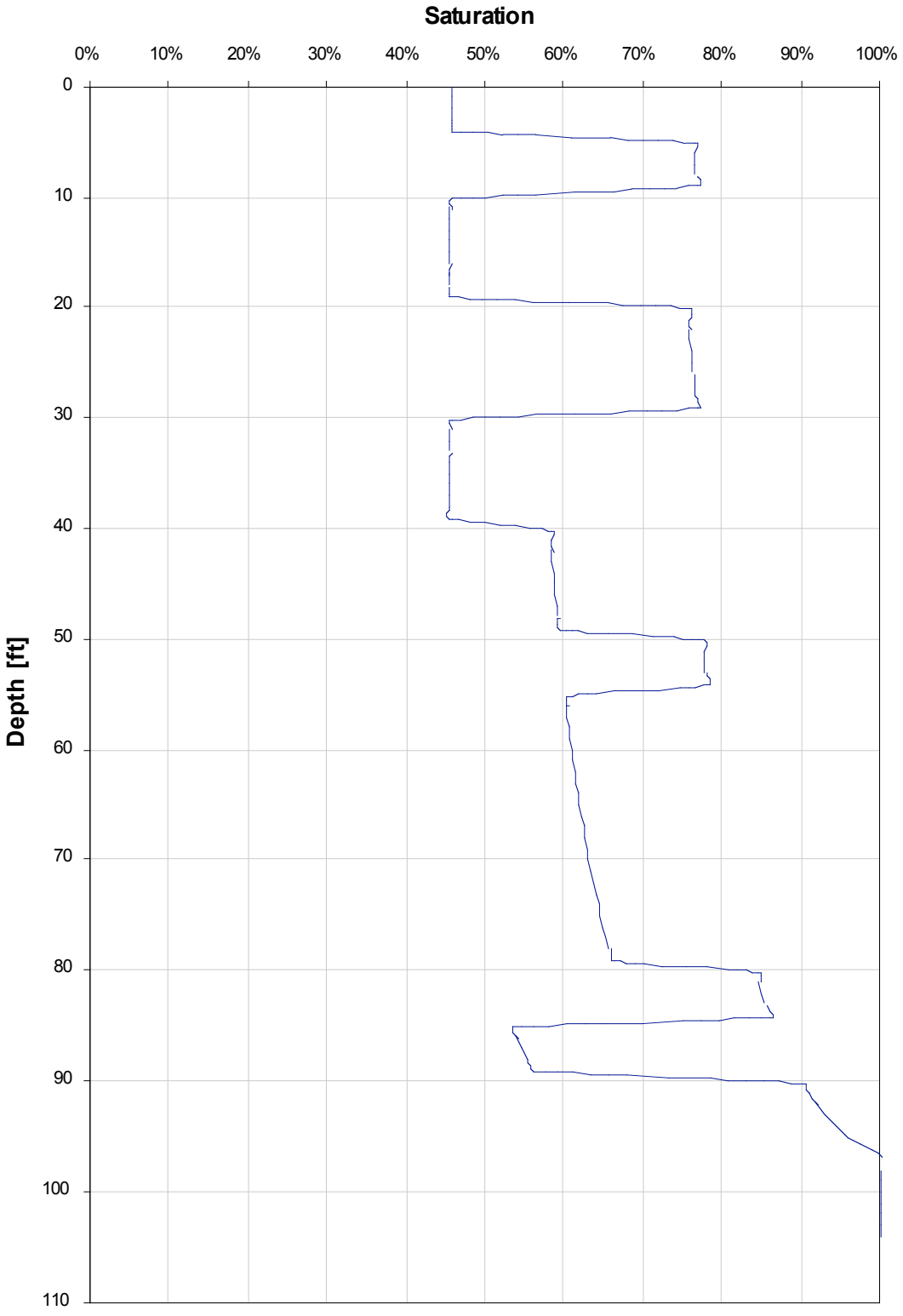

Figure 3. Computed soil moisture profile used in all transport simulations.

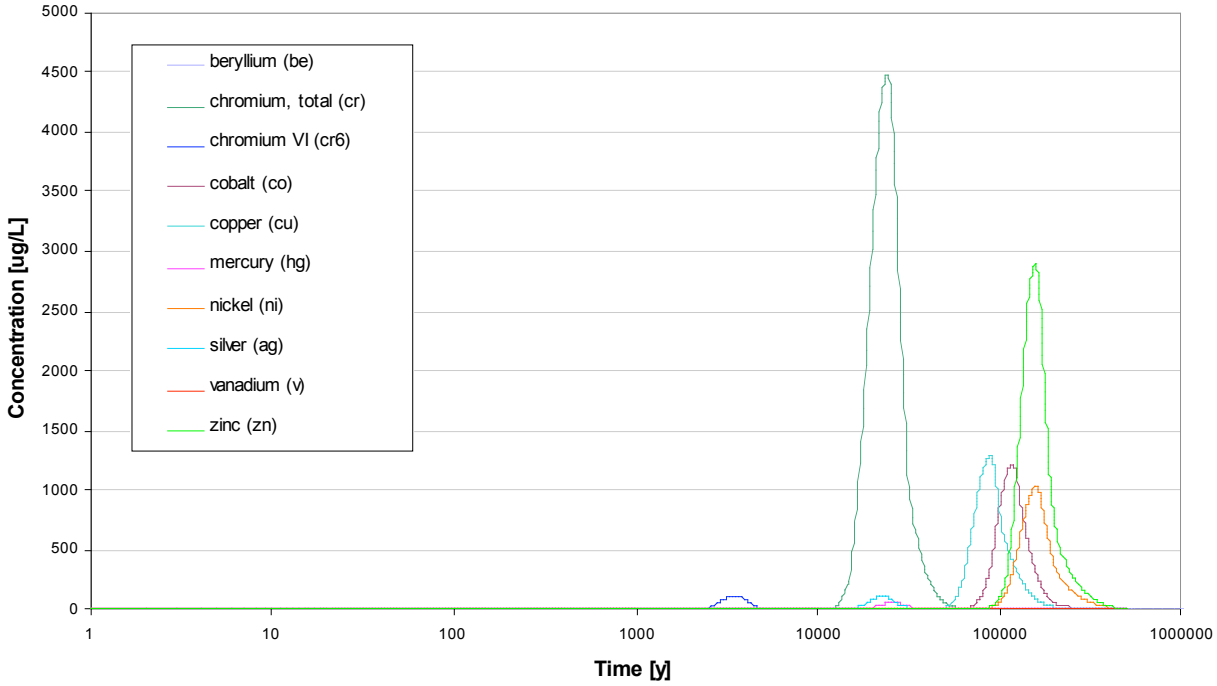

Figure 4. Concentration of metals at water table.

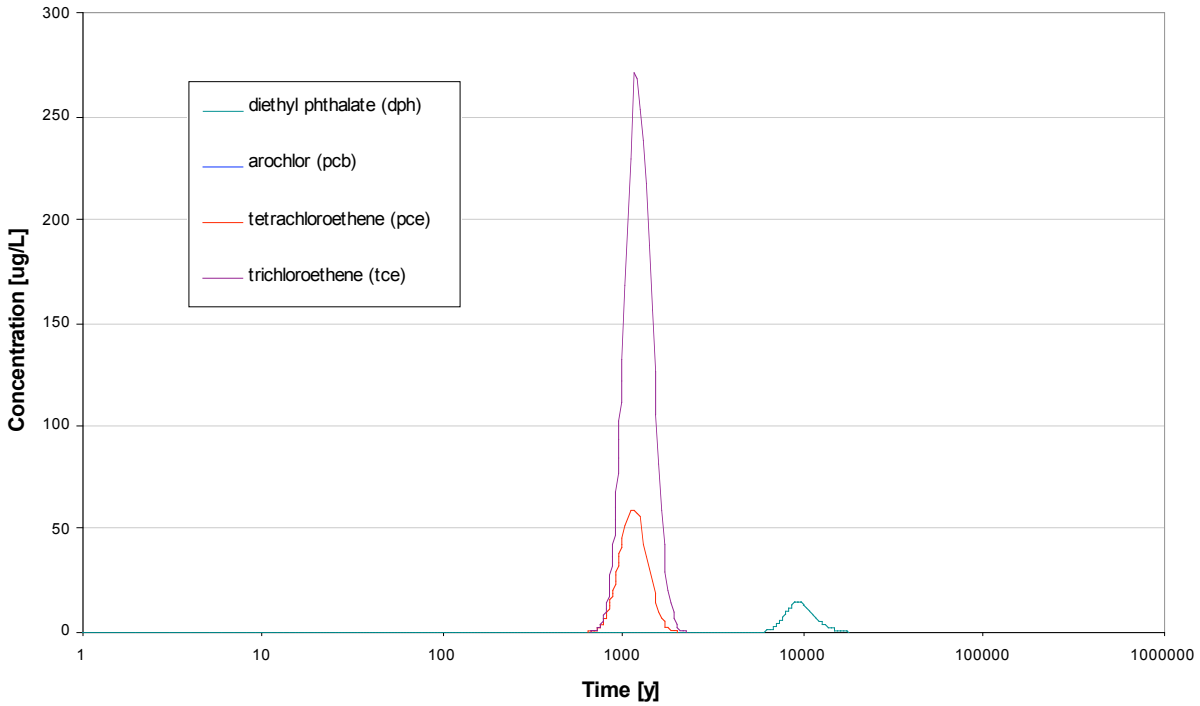

Figure 5. Concentration of VOCs at water table.

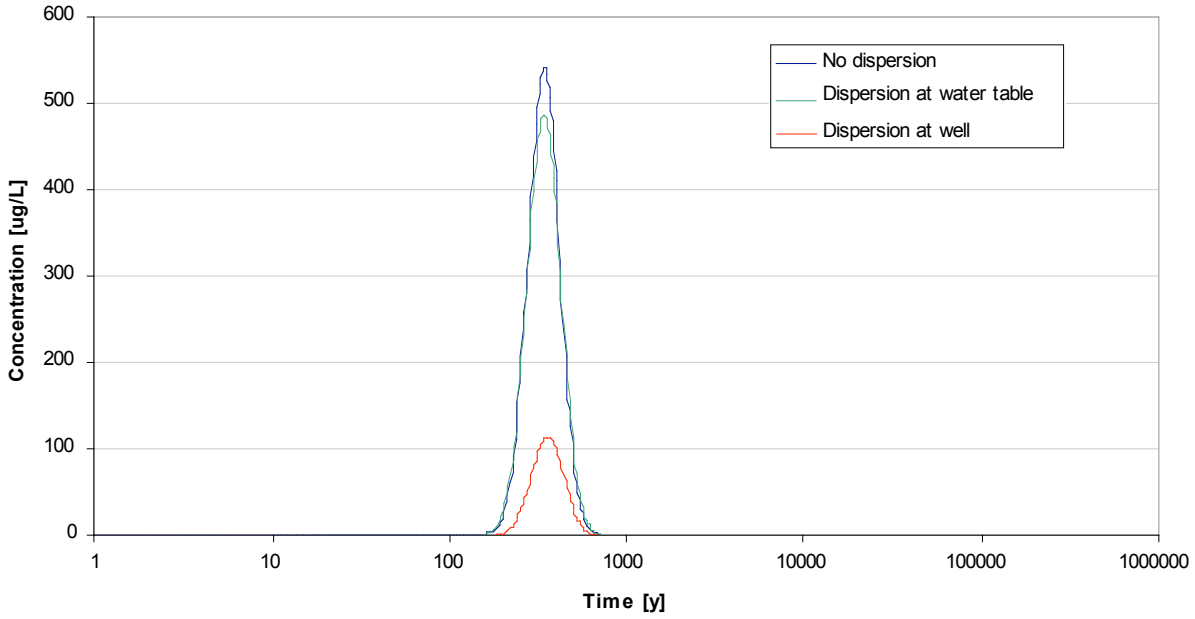

Figure 6. Sensitivity analysis results for assumptions used in the model.

Appendix L
Letter for Interim Measure

Lawrence Livermore National Laboratory

Decontamination and Waste Treatment Facility DWTF

January 21, 2005

Mr. Mohinder Sandhu, P.E. Chief
Standardized Permits and Corrective Action Branch
Department of Toxic Substances Control
8800 Cal Center Driver
Sacramento, California 95826

Subject: Interim Action at Area 514, Lawrence Livermore National Laboratory

Dear Mike:

As you know, LLNL has completed the removal of structures, foundations and asphalt associated with interim status waste treatment units in Area 514 in accordance with the approved Closure Plan. We are currently preparing a partial closure report for submittal, which will include the disposition of waste removed, and the characterization of soils under previous waste management units.

As discussed in our meeting on January 5, 2004, it is very unlikely low-levels of residual contamination in soils at Area 514 would pose a risk to groundwater in the next several years, even under worst-case assumptions. It is our intention to apply a six-inch layer of compacted gravel with a two-inch asphalt cover over the exposed surfaces in Area 514 to stabilize the site during the completion of the closure process. Surface run-on would be prevented by perimeter berming, where necessary. Area 514 slopes to the center of the site and any rainwater would be collected and sent to the onsite storm drain system through an existing connection. The area would be used periodically for vehicle parking. The installation of this asphalt cover would begin as soon as possible.

If you have any questions about this interim action, please call me at 925-423-3261.

Sincerely,

Bruce McDowell
Environmental Assurances Manager

cc: Stanek, M.S. L-601

Appendix M
Waste Determination Memos

513/514 Project Characterization Documentation

TO: Mark Divoky

FROM: Craig B. Fish

SUBJECT: Release of Asphalt Ground Cover from Between Buildings and Concrete Pads, aka "Walkable Surfaces".

The Asphalt Ground Cover was laid on dirt areas between buildings and concrete pads throughout the B-514 Project area and is referred to as the "Walkable Surfaces". Some of the asphalt reaches thicknesses of over 2 feet.

I have reviewed the following data, which is representative of the Asphalt Ground Cover, and made the following characterizations:

	Source	Document	Date	Sample Method	Characterization
1	Earth Tech STL	CAS sample results	4 Aug 2004	Metals and volatiles Bulk	NonHaz
2	Earth Tech STL	CAS sample results	4 Aug 2004	GAB and tritium Bulk	NonRad
3	LLNL	Survey Record, Steve Hall, ORAD-EOG	27 July 2004	Micro-R Direct Surveys	Nothing exceeding background
4	LLNL	Survey Record, Sal Ingaro, RHWM	10 Aug 2004	Micro-R Direct Surveys	Nothing exceeding background
5	LLNL/CES	COC 14358	23 July 2004	Bulk Tritium	Bulk results below 5 pCi/g

This waste is characterized as nonhazardous and nonrad (at or below background) and may be disposed at the Altamont Landfill under Profile #40812100, "Non-Compacted Trash". Please ensure that the proper documentation is completed before this waste leaves LLNL, i.e., photograph the bins and sign verifying that the bin contains only the waste listed above. If you have any questions, please call me at extension 4-4988.

cc: Miguel Castro, L-499
Joy Hirabayashi, L-633
Tige Nelson, L-620
Tracey Simpson, L-369

EO: 04-XXX/lb

University of California
Lawrence Livermore
National Laboratory

Interdepartmental letterhead

Mail Station: L-633

Ext: 4-4988

e-mail: fish2@llnl.gov

ENVIRONMENTAL PROTECTION DEPARTMENT

OPERATIONS AND REGULATORY AFFAIRS DIVISION

August 18, 2004

TO: Mark Divoky, L-499
Project Manager

FROM: Craig Fish, Environmental Analyst
Environmental Operations Group

SUBJECT: **Release of Above-Ground Structure: CSU 1 and CSU 2 (aka 513A, 514-1, and 514-2)**

The above-ground structure, CSU 1 and CSU 2 is a pile of red steel "I" beams and corrugated metal roofing located at the Building 514 (B-514) project area and is referred to as the "Red Beams."

I have reviewed the following data, which is representative of CSU 1 and CSU 2, and made the following determinations:

	Source	Document	Date	Sample Method	Characterization
1	Earth Tech STL	CSU sample results.xls	26 July 2004	Metals Swipes	NonHaz
2	Earth Tech STL	CSU sample results.xls	26 July 2004	GAB Swipes	NonRad
3	Earth Tech STL	Field Direct Surveys	June 10 to 16 2004	Direct Surveys	NonRad
4	LLNL/CES	COC 14340	27 July 2004	Metals Swipes	NonHaz
5	LLNL/CES	COC 14340	27 July 2004	GAB Swipes	NonRad

This waste is characterized as non hazardous and nonrad and may be disposed at the Altamont Landfill. High chrome and lead concentrations in a bulk paint sample (Chemistry and Materials Science Environmental Services [CES] Laboratory Chain of Custody [COC] 14334) prevent this metal from being recycled as scrap. Please ensure that the proper documentation is completed before this waste leaves LLNL, i.e., photograph the bin and sign verifying that the bin contains only the waste listed above. If you have any questions, please call me at extension 4-4988

cc: Miguel Castro, L-499
Joy Hirabayashi-Dethier, L-633
Tige Nelson, L-620
Tracey Simpson, L-369

EO04-256/lgb

University of California
Lawrence Livermore
National Laboratory

EPD Docs

Interdepartmental letterhead

Mail Station: L-633

Ext: 4-4988

e-mail: fish2@llnl.gov

ENVIRONMENTAL PROTECTION DEPARTMENT

OPERATIONS AND REGULATORY AFFAIRS DIVISION

November 16, 2004

TO: Mark Divoky, L-499
SAT Project Manager

FROM: Craig Fish, Environmental Analyst
Environmental Operations Group

SUBJECT: **Release of All Vertical Steel Beams and Corrugated Steel Sheets Associated with the Waste Treatment Tank Farm, a.k.a "WTTF Structure," Not Including the Diamond Plate Second Floor Walkway**

This waste stream consists of the steel structure that was built around the six Tank Farm tanks. The diamond plate second floor walkway that provided access to the open Tank Farm tanks is packaged separately. Based on visual observation, it is obvious that this portion of the steel structure and roof had not been painted annually. Additional items and/or material that are not included in this waste stream are the treatment tanks themselves, all associated waste transmission piping, residues found in the tanks and/or piping, treatment chemical transmission piping and the extra hoses that were stored at the southwest corner of the Wastewater Treatment Tank Farm (WTTF).

The Earth Tech sample numbers that apply to this waste stream consist of: WTTF-RF-(10N, 10W, 30N, 30W), WTTF-SM-SW-CAB and WTTF-SSW(1 to 13 and SSW16 to 24).

I have reviewed the following data, which is representative of the WTTF Structure, and made the following determinations:

	Source	Document	Sampling Date	Sample Method	Results
1	Earth Tech STL	WTTF structure metals swipe results	18 Aug 2004	Metals swipes	NonHaz
2	Earth Tech STL	WTTF structure data: GAB, H3 and survey	30 July 2004	GAB and tritium swipes	Activity at background
3	Earth Tech	Log Book	9, 10, 11 and 16 June 2004	Radiological direct survey	Activity at background
4	LLNL/CES	COC 14318 (76189, 76190)	20 July 2004	GAB and tritium swipes	Activity at background
5	LLNL/CES	COC 14319	20 July 2004	GAB and tritium	Activity at

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				swipes	background

This waste is characterized as nonhazardous and nonradioactive (at background) and may be disposed at the Altamont Landfill under Profile #55063701, "Non-Compacted Trash." Please ensure that the proper documentation is completed before this waste leaves LLNL, i.e., photograph the bins and sign verifying that the bin contains only the waste listed above. If you have any questions, please call me at extension 4-4988.

cc: Joy Hirabayashi, L-633
Tige Nelson, L-620
Tracey Simpson, L-369
Craig Stone, L-499

Interdepartmental letterhead

Mail Station: L-633

Ext: 4-4988

e-mail: fish2@llnl.gov

ENVIRONMENTAL PROTECTION DEPARTMENT

OPERATIONS AND REGULATORY AFFAIRS DIVISION

November 16, 2004

TO: Mark Divoky, L-499
SAT Project Manager

FROM: Craig Fish, Environmental Analyst
Environmental Operations Group

SUBJECT: **Release of B-514 Closure Project Rebar from Concrete Pads from B-514 Area**

Rebar was separated from the walls and the concrete pads of Building 514 (B-514), the Quad Tank berm, CSU-1 and 2, and Building 513. All of the rebar was completely enclosed by concrete during the operation of the facility. Because there was little potential for the waste rebar to be rad, existing Hazards Control (HC) data was used to determine if additional sampling was required. Two radiological direct surveys, swipes and smears were performed on the waste rebar after it was separated from the rubble. Five rolloffs were radiological direct surveyed and swiped on October 1, 2004. The swipes were submitted to and analyzed by the Hazards Control Radiological Measurements Laboratory (RML). Five piles of rebar were radiological direct surveyed and smeared on November 9, 2004. Five smears were taken and surveyed with a Ludlum Model 29-29 thin window scintillation beta/gamma detector. In addition, five swipes were taken and analyzed for tritium from the northwest most pile of rebar at the B-514 Area. This rebar was removed from concrete that contained up to 13.4 pCi/g tritium activity. Based on the radiological swipe and survey results, no additional sampling is required. All survey and analytical results showed activity at background on the rebar.

I have reviewed the following data, which is representative of the rebar wastestream, and made the following determinations:

	Source	Document	Sampling Date	Sample Method	Results
1	LLNL HC	Direct survey results	1 Oct 04	Direct survey	Activity at background
2	LLNL HC	RML results 20071494	5 Oct 04	GAB analysis	Activity at background
3	LLNL HC	Survey and smear results	9 Nov 04	Direct survey	Activity at background
4	LLNL HC	Tritium swipe results – NW Pile	10 Nov 2004	Liquid scintillation	Activity at background

This waste is characterized as nonhazardous and nonrad (at background) and may be disposed at the Altamont Landfill under Profile #40812100, "Non-Compacted Trash." Please ensure that the proper documentation is completed before this waste leaves LLNL, i.e., photograph the bins and sign verifying that the bin contains only the waste listed above. If you have any questions, please call me at extension 4-4988.

cc: Joy Hirabayashi, L-633
Tige Nelson, L-620
Tracey Simpson, L-369
Craig Stone, L-499

Interdepartmental letterhead

Mail Station: L-633

Ext: 4-4988

e-mail: fish2@llnl.gov

ENVIRONMENTAL PROTECTION DEPARTMENT

OPERATIONS AND REGULATORY AFFAIRS DIVISION

November 16, 2004

TO: Mark Divoky, L-499
SAT Project Manager

FROM: Craig Fish, Environmental Analyst
Environmental Operations Group

SUBJECT: Release of B-514 Structure, Not Including the Concrete Pad or the Southern Portion of the Roof Characterized by B-514-RF-70

This waste stream consists of demolition debris including the walls, ceilings, casework, roof, utility ducting, piping and cable.

The Earth Tech sample numbers that apply to this waste stream are: Building 514 (B-514)-CON, BEAM and WALL; B-514-RF-10, 30 and 50; B-514SSW1 to SSW16, B-514SM-SW-DOST and, ROOF-R4A1-IN-1 to 3, ROOF-R4A2-IN-1 to 3, Tank-R4A1-IN-PR1 to 4 and 6 and Tank-R4A2-IN-PR1 to 4 and 6.

Bulk roof sample B-514-RF-70 shows plutonium present. Any waste associated with that sample is characterized as radioactive waste and cannot be disposed with the wastestream addressed in this memo. Bulk wall samples show hazardous metals (TTLC) levels of lead (R110 and R108-S) and antimony (R108-S and R108-S RP). However the composite wastestream is not hazardous when all 13 TTLC metals values are averaged over the entire building (lead average 336 mg/kg and antimony average 403 mg/kg).

I have reviewed the following data, which is representative of the B-514 Structure, not including the concrete pad or the southern portion of the roof and made the following determinations:

	Source	Document	Sampling Date	Sample Method	Results
1	LLNL/CES	COC 14295 N. roof sample	6/23/04	Bulk	Nonhaz and activity at background
2	LLNL/CES	COC 14302	6/24/04	Swipes	Activity at background
3	LLNL/CES	COC 14304	6/25/04	Bulk	Nonhaz and activity at background
4	Earth Tech	Direct rad surveys	6/10/04 to 6/25/04	Alpha and beta/gamma	Activity at background
5	Earth Tech	B-514 structure and non-F-listed pipes	10/29/04	Bulk and swipes	Nonhaz and activity at background

EO04-328/cnh

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This waste is characterized as nonhazardous and nonradioactive (also at background radioactivity) and may be disposed at the Altamont Landfill under Profile #55063701, "Non-Compacted Trash." Please ensure that the proper documentation is completed before this waste leaves LLNL, i.e., photograph the bins and sign verifying that the bin contains only the waste listed above. If you have any questions, please call me at extension 4-4988.

cc: Joy Hirabayashi, L-633
Tige Nelson, L-620
Tracey Simpson, L-369
Craig Stone, L-499

Interdepartmental letterhead

Mail Station: L-633

Ext: 4-4988

e-mail: fish2@llnl.gov

ENVIRONMENTAL PROTECTION DEPARTMENT

OPERATIONS AND REGULATORY AFFAIRS DIVISION

November 23, 2004

TO: Mark Divoky, L-499
SAT Project Manager

FROM: Craig Fish, Environmental Analyst
Environmental Operations Group

SUBJECT: Release of WTTF Berm, CSU 1 and 2, and the Quad Tank Pad

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This waste stream consists of demolished concrete debris including the broken up pads of the Waste Treatment Tank Facility (WTTF) and WTTF bermed area, the container storage units (CSU) 1 and 2 pads, and the quad tank pad.

The Earth Tech sample numbers that apply to this waste stream are CAS1, 2, 4, 5, 6, 7, 10, 12, 13, 14, 28 and 30-SURF-CON and QTU-SM-SW-WEST. CAS2-SURF-CON is characterized as radioactive due to plutonium and CAS28-SURF-CON is radioactive due to tritium. The concrete sample of CAS 2 is associated with the WTTF pad. The concrete debris from the demolished pad has been moved a number of times which has effectively mixed all the debris. It is no longer possible to isolate and separate just the concrete associated with CAS 2 from the rest of the WTTF pad. The entire WTTF pad must be handled as radioactive. The concrete sample of CAS 28 is associated with the sump in the WTTF berm. This sump has already been segregated and is currently being stored in a tracked roll-off.

I have reviewed the following data, which are representative of the aforementioned pads and berm and made the following determinations:

	Source	Document	Sampling Date	Sample Method	Results
1	Earth Tech STL	CAS1,2,4,5,6,7,10,12, 13, 14, 28 and 30-SURF-CON	10/29/04	Bulk	Nonhaz and activity at background with exception of CAS2 and 28
2	Earth Tech STL	Quad pad sump, QTU-SM-SW-WEST	6/10/04	Swipe	Nonhaz and activity at background

This waste, with the exception of the WTTF Pad and the WTTF Berm sump, is characterized as nonhazardous and nonradioactive (also at background radioactivity) and may be disposed at the Altamont Landfill under Profile #55063701, "Non-Compacted Trash." Please ensure that the proper documentation is completed before

this waste leaves LLNL, i.e., photograph the bins and sign verifying that the bin contains only the waste listed above. If you have any questions, please call me at extension 4-4988.

cc: Joy Hirabayashi, L-633
Tige Nelson, L-620
Tracey Simpson, L-369
Craig Stone, L-499

Interdepartmental letterhead

Mail Station: L-633

Ext: 4-4988

e-mail: fish2@llnl.gov

ENVIRONMENTAL PROTECTION DEPARTMENT

OPERATIONS AND REGULATORY AFFAIRS DIVISION

January 13, 2005

TO: Mark Divoky, L-499
SAT Project Manager

FROM: Craig Fish, Environmental Analyst
Environmental Operations Group

SUBJECT: **Release of the Building 514 (B-514) Green and Tan Tanks**

This waste stream consists of two green polyurethane upright tanks, R4A1 and R4A2, and a tan metal horizontal tank, R6A1. These tanks held seal water from the rotating shafts of the Dorr-Oliver filtration unit prior to discharge to the sanitary sewer system.

The Earth Tech sample numbers that apply to this waste stream are: B514-WM-SW-BRNTANK, TANK-R4A1-TB and TANK-R4A2-TB.

I have reviewed the following data, which are representative of the B-514 R4A1, R4A2 and R6A1 tanks, and made the following determinations:

	Source	**Document**	**Sampling Date**	**Sample Method**	**Results**
1	Earth Tech	Summary Table	6/10/04 to 6/25/04	Alpha and beta/gamma	Activity at background
2	Earth Tech	Summary Table	Various	Swipe	Nonhaz and activity at background

This waste is characterized as nonhazardous and nonradioactive (at background radioactivity) and may be disposed at the Altamont Landfill under Profile #55063701, "Non-Compacted Trash." Please ensure that the proper documentation is completed before this waste leaves LLNL, i.e., photograph the bins and sign verifying that the bin contains only the waste listed above. If you have any questions, please call me at extension 4-4988.

cc: Keith Gershon, L-369
Joy Hirabayashi, L-633
Tige Nelson, L-620
Tracey Simpson, L-369
Craig Stone, L-499

EO05-13/cnh

University of California
Lawrence Livermore
National Laboratory

Interdepartmental letterhead

Mail Station: L-633

Ext: 4-4988

e-mail: fish2@llnl.gov

ENVIRONMENTAL PROTECTION DEPARTMENT

OPERATIONS AND REGULATORY AFFAIRS DIVISION

January 12, 2005

TO: Mark Divoky, L-499
SAT Project Manager

FROM: Craig Fish, Environmental Analyst
Environmental Operations Group

SUBJECT: **Release of the B-514 Area WTTF Diamond Plate**

This waste stream consists of pieces of the epoxy painted metal diamond plate walkway from the second level of the Building 514 (B-514) Area Waste Treatment Tank Farm (WTTF).

The LLNL radiological swipes and bulk samples that apply to this waste stream are logged on Chemistry and Materials Science Environmental Services (CES) COC 14318, specifically sample numbers 76186, 76187, 76188, 76191, 76192 and 76193.

The Earth Tech sample numbers that apply to this waste stream are: WTTF-RA1 to RA6.

I have reviewed the following data, which are representative of the B-514 Area WTTF diamond plate walkway and made the following determinations:

	Source	Document	Sampling Date	Sample Method	Results
1	LLNL/CES	COC 14318	6/29/04	Bulk and swipe	Activity at background
2	Earth Tech	Summary Table	6/10/04 to 6/25/04	Alpha and beta/gamma	Activity at background
3	Earth Tech	Summary Table	Various	Swipe	Nonhaz and activity at background

This waste is characterized as nonhazardous and nonradioactive (also at background radioactivity) and may be disposed at the Altamont Landfill under Profile #55063701, "Non-Compacted Trash." Please ensure that the proper documentation is completed before this waste leaves LLNL, e.g., photograph the bins and sign verifying that the bin contains only the waste listed above. If you have any questions, please call me at extension 4-4988.

cc: Keith Gershon, L-369
Joy Hirabayashi, L-633
Tige Nelson, L-620
Tracey Simpson, L-369
Craig Stone, L-499

EO05-12/cnh

University of California
Lawrence Livermore
National Laboratory

Interdepartmental letterhead

Mail Station: L-633

Ext: 4-4988

e-mail: fish2@llnl.gov

ENVIRONMENTAL PROTECTION DEPARTMENT

OPERATIONS AND REGULATORY AFFAIRS DIVISION

January 14, 2005

TO: Mark Divoky, L-499
SAT Project Manager

FROM: Craig Fish, Environmental Analyst
Environmental Operations Group

SUBJECT: **Release of B-514 Dorr-Oliver Filter Room Slab**

This waste stream consists of concrete demolition debris and underlying soil from the slab floor of the Building 514 (B-514) Dorr-Oliver floor.

The LLNL surveys and samples that apply to this waste stream are: Radioactive and Hazardous Waste Management (RHWM) Direct Radiological Grid Survey of 6/22/04 and Chemistry and Materials Science Environmental Services (CES) COC 14304, Sample number 76144.

The Earth Tech sample numbers that apply to this waste stream are: Concrete, asphalt and soil (CAS) 16-SURF-SOIL, CAS16-SURF-CON, CAS17-SURF-SOIL, CAS17-SURF-CON and B514-SM-SW-DOSTAND.

I have reviewed the following data, which is representative of the Dorr-Oliver slab floor and underlying soil and made the following determinations:

	Source	**Document**	**Sampling Date**	**Sample Method**	**Results**
1	LLNL/CES	COC 14304, #76144 Dorr-Oliver stand	6/25/04	Bulk concrete	Nonhaz, activity at background
4	LLNL/RHWM	Survey report	6/22/04	Direct survey	Activity at background
5	Earth Tech	Summary table DO stand	6/9/04	Alpha and beta/gamma	Activity at background
6	Earth Tech	B-514 structure results	7/7/04	Bulk	F-listed haz, activity at background

This waste is characterized as Resource Conservation and Recovery Act (RCRA) F002 hazardous due to the methylene chloride (5 ppb) in the slab and underlying soil, and nonradioactive (at background radioactivity), and may be disposed at a hazardous waste landfill. Please ensure that the proper documentation is completed before this waste leaves LLNL, i.e., photograph the bins and sign verifying that the bin contains

only the waste listed above. If you have any questions, please call me at extension 4-4988.

cc: Keith Gershon, L-369
Joy Hirabayashi-Dethier, L-633
Tige Nelson, L-620
Tracey Simpson, L-369
Craig Stone, L-499

Appendix N
Shipping Documents

Hardcopies of the Shipping Documents are available upon request.