

LLNL NESHAPs 2002 Annual Report

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LLNL NESHAPs 2002 Annual Report

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SECTION I. Site Description

LLNL was established in 1952 to conduct nuclear weapons research and development. The Laboratory's mission is dynamic and has been broadened over the years to meet new national needs. LLNL serves as a national resource in science and engineering; its activities focus on global security, energy, global ecology, biomedicine, economic competitiveness, and science and mathematics education. LLNL comprises two sites—the main laboratory site located in Livermore, California (Livermore site), and the Experimental Test Facility (Site 300) located near Tracy, California. Figure 1 shows the locations of the sites. The University of California operates LLNL for DOE.

Livermore Site

LLNL's Livermore site occupies an area of 3.3 km² located about 60 km east of San Francisco, California, adjacent to the City of Livermore in the eastern part of Alameda County. In round numbers, 7 million people live within 80 km of the Livermore site; 76,700 of them live in the City of Livermore.

The Livermore site is located in the southeastern portion of the Livermore Valley, a topographical and structural depression oriented east-west within the Diablo Range of the California Coast Range Province. The Livermore Valley forms an irregularly shaped lowland area approximately 26 km long and an average of 11 km wide. The floor of the valley slopes from an elevation of approximately 200 m above sea level at the eastern end to approximately 90 m above sea level at the southwest corner.

The climate of the Livermore Valley is characterized by mild, rainy winters and warm, dry summers. The mean annual temperature is about 15°C. Temperatures typically range from -5°C during some pre-dawn hours in the winter, to 40°C on a few summer afternoons. The 2002 annual wind data for the Livermore site are displayed as a wind rose in Figure 2. Although winds are variable, the prevailing wind direction is from the southwest, especially during the summer. However, during the winter, the wind often blows from the northeast. Most precipitation occurs as rain between October and April with very little rainfall during the summer months. In 2002, the Livermore site received 271 mm of precipitation.

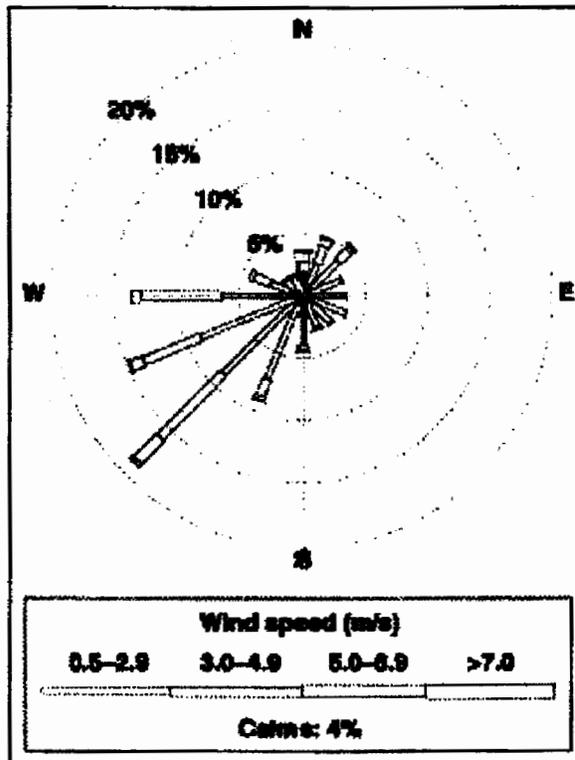


Figure 2. Wind rose showing the average annual wind speed, frequency of occurrence, and direction at the Livermore site, 2002.

area is the city of Tracy (population approximately 65,600), located 10 km to the northeast.

The topography of Site 300 is much more irregular than that of the Livermore site; it consists of a series of steep hills and ridges, which are oriented along a generally northwest/southeast trend, separated by intervening ravines. The elevation ranges from approximately 540 m in the northwestern portion of the site to 150 m at the southeast corner. The climate at Site 300 is similar to that of the Livermore site, with mild winters and dry summers. The complex topography of the site significantly influences local wind and temperature patterns, making the temperature range

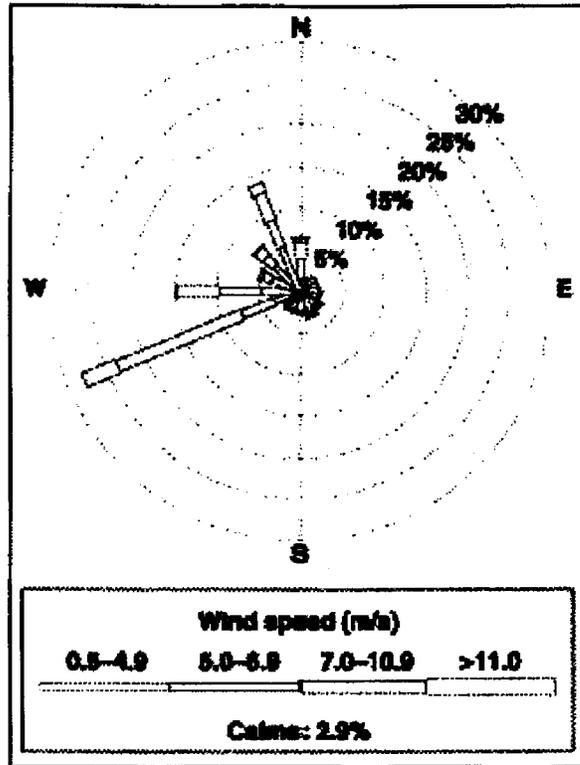


Figure 3. Wind rose showing the average annual wind speed, frequency of occurrence, and direction at Site 300, 2002.

somewhat more extreme than at the Livermore site. The 2002 annual wind data for Site 300 are displayed as a wind rose in Figure 3. Prevailing winds are from the west-southwest. As is the case at the Livermore site, precipitation is highly seasonal, with most precipitation occurring between October and April. Site 300 received 220 mm of precipitation during 2002. The mean annual temperature is about 17°C.

SECTION II. Air Emission Sources and Data

Sources

Nearly a hundred different radioisotopes are used at LLNL for research purposes, including biomedical tracers, tritium, mixed fission products, transuranic isotopes, and others—see Table 1 for a list of the radionuclides and the “radionuclides” column in the Attachment 1 spreadsheet for a breakdown by facility. Radioisotope handling procedures and work enclosures are determined for each project, depending on the isotopes, the quantities being used, and the types of operations being performed. Work places include glove boxes, exhaust hoods, and laboratory bench tops. Exhaust paths to the atmosphere range from triple HEPA (High Efficiency Particulate Air) filtered ventilation systems, to roof vents and stacks lacking abatement devices, to direct dispersal of depleted uranium during explosives testing at Site 300, to a variety of diffuse area sources.

Table 1. Radionuclides used at LLNL during 2002.

³ H	⁵⁴ Mn	⁹⁹ Tc	¹⁴⁸ Gd	²²⁹ Th	²⁴⁰ Pu
⁷ Be	⁵⁵ Fe	¹⁰³ Rh	¹⁵¹ Pm	²³⁰ Th	²⁴¹ Am
¹⁰ Be	⁵⁷ Co	¹⁰⁶ Ru	¹⁵¹ Sm	²³¹ Pa	²⁴¹ Pu
¹³ N	⁵⁸ Co	¹⁰⁹ Cd	¹⁵² Eu	²³² Th	²⁴² Cm
¹⁴ C	⁵⁹ Ni	¹¹³ Sn	¹⁵⁴ Eu	²³² U	²⁴² Pu
¹⁵ O	⁶⁰ Co	¹²⁵ I	¹⁵⁵ Eu	²³³ U	²⁴³ Am
²² Na	⁶³ Ni	¹²⁵ Sb	¹⁷² Hf	²³⁴ U	²⁴⁴ Cm
³² P	⁷⁵ Se	¹³¹ I	¹⁷⁴ Lu	²³⁵ U	²⁴⁴ Pu
³³ P	⁸⁵ Sr	¹³³ Ba	¹⁹⁵ Au	²³⁶ Pu	²⁴⁶ Cm
³⁵ S	⁸⁸ Y	¹³⁴ Cs	^{195m} Pt	²³⁶ U	²⁴⁸ Cm
³⁶ Cl	⁹⁰ Sr	¹³⁷ Cs	²⁰⁷ Bi	²³⁷ Np	²⁴⁹ Cf
⁴⁰ K	⁹⁰ Y	¹⁴⁰ Ba	²⁰⁹ Po	²³⁷ U	²⁵⁰ Cf
⁴¹ Ar	⁹⁴ Nb	¹⁴¹ Ce	²¹⁰ Pb	²³⁸ Pu	²⁵² Cf
⁴¹ Ca	⁹⁵ Nb	¹⁴⁴ Ce	²²³ Ra	²³⁸ U	
⁴⁶ Sc	⁹⁵ Zr	¹⁴⁷ Nd	²²⁶ Ra	²³⁹ Np	
⁵¹ Cr	⁹⁹ Mo	¹⁴⁷ Pm	²²⁸ Th	²³⁹ Pu	

Sources of radioactive material emissions to air at LLNL are divided into two categories for purposes of evaluating NESHAPs compliance: point sources (including stacks, roof vents, and explosive experiments conducted on Site 300's firing tables) and diffuse area sources (including dedicated waste accumulation areas and other areas of known contamination). Several emission sources are treated as diffuse extended area sources, including Radioactive and Hazardous Waste Management's "Tank Farm" operations at Building 514 and waste storage at the Building 612 Yard, and other Livermore-site sources external to buildings. Detailed

information is given in Attachment 1 for emissions from LLNL's radiological operations that took place during 2002.

2002 Air Monitoring

In this section we describe continuous stack-effluent sampling systems at selected LLNL facilities and ambient air monitors in place at numerous locations on and off LLNL sites.

Continuous Stack Air Effluent Monitoring

Actual measurements of radioactivity in air and effluent flow are the basis for reported emissions from continuously monitored sources. In 2002, there were seven buildings (Buildings 175, 177, 235, 251, 331, 332, and 491) at the Livermore site and one building (Building 801A) at Site 300 that had radionuclide air effluent monitoring systems. These buildings are listed in Table 2, along with the number of samplers, the types of samplers, and the analytes of interest. Many samplers would operate from emergency power systems if normal power were lost.

Air samples for particulate emissions are extracted downstream of HEPA filters and prior to the discharge point to the atmosphere. Particles are collected on membrane filters. The sample filters are removed and analyzed for gross alpha and beta activity on a weekly or bi-weekly frequency depending on the facility. In most cases, simple filter aerosol collection systems are used. However, in some facilities, alpha continuous air monitors (CAMs) are used for sampling. In addition to collecting a sample of particles, the CAM units provide an alarm capability for the facility in the event of an unplanned release of alpha activity.

Detection of gross alpha and beta activity resulting from particles collected on the air filters is accomplished using gas flow proportional counters. Analysis is delayed for at least four days from the end of sample collection to allow for the decay of naturally occurring radon daughters. For verification of the operation of the counting system, calibration sources, as well as background samples, are intermixed with the sample filters for analysis. Analysis is performed by the Radiological Measurements Laboratory (RML) in LLNL's Hazards Control Department (HCD).

Each stack of the Tritium Facility (Building 331) is monitored for tritium release by both an alarmed continuous monitoring system and by molecular sieve continuous samplers. The alarmed monitors, which are Overhoff ion chambers, provide real time tritium concentration release levels (HT, HTO, or other gaseous forms). The sieve samplers discriminate between tritiated water (HTO) vapor and molecular tritium (HT); they provide the values used for environmental reporting and are exchanged weekly. Each sieve sampler (not alarmed) is in parallel with an alarmed monitor and consists of two molecular sieves. The first sieve collects tritiated water vapor; the second sieve contains a palladium-coated catalyst that converts molecular tritium to tritiated water, which is then collected. The molecular sieve samples are submitted to the Hazards Control Analytical Laboratory where they are put into a

recovery system for the bake out of tritiated water vapor and subsequent condensation and collection of the water. The retrieved tritiated water is analyzed by RML using liquid scintillation counting techniques.

Environmental Protection Department (EPD) environmental analysts review data from air particulate sampling filters and molecular sieves.

Table 2. Air effluent sampling systems and locations.

Building	Facility	Analytes	Sample type	Number of samplers
175	MARS ^a	Gross α , β on particles	Filter	6
177	Extractor Test ^a	Gross α , β on particles	Filter	1
235	Chemistry and Materials Science	Gross α , β on particles	Filter	1
251	Heavy Elements Unhardened area Hardened area	Gross α , β on particles	Filters	24
		Gross α , β on particles	Filters	4
331	Tritium	Tritium	Ionization Chamber ^b	4
		Gaseous tritium/ tritiated water vapor	Molecular sieves	4
332	Plutonium	Gross α , β on particles	CAM ^b	12
		Gross α , β on particles	Filters	16
491	Isotope Separation ^a	Gross α , β on particles	Filters	1
801A	Contained Firing Facility	Gross α , β on particles	Filters	1

Note: "CAM" denotes Eberline continuous air monitors.

^a Operations discontinued, however, air effluent sampling systems at this building continue to operate as part of the maintenance and surveillance shutdown plan for the facilities. The Building 177 effluent sampling system was removed in Feb. 2002, after decontamination and decommissioning of the facility was completed.

^b Alarmed systems.

Results of Stack Monitoring for Tritium: Operations in the Tritium Facility (Building 331) in 2002 released a total of 36 Ci (1.3×10^{12} Bq) of tritium. Of this, approximately 33 Ci (1.2×10^{12} Bq) were released as tritiated water (HTO). The remaining 9.7% of the tritium released, 3.5 Ci (1.3×10^{11} Bq), was elemental tritium

gas (HT). The highest single weekly stack emission from the facility was 3.8 Ci (1.4×10^{11} Bq), of which more than 99% was HTO.

Building 331 tritium emissions, as measured by stack monitoring, remained considerably lower than levels that occurred during the 1980s. We anticipate that emissions over the next five years will exceed the 2000–2002 levels, as research and development work is performed for new programmatic efforts. However, engineered controls designed to contain and recapture tritium leakage should maintain relatively low emissions. Figure 4 illustrates the combined HTO and HT emissions from the facility since 1981.

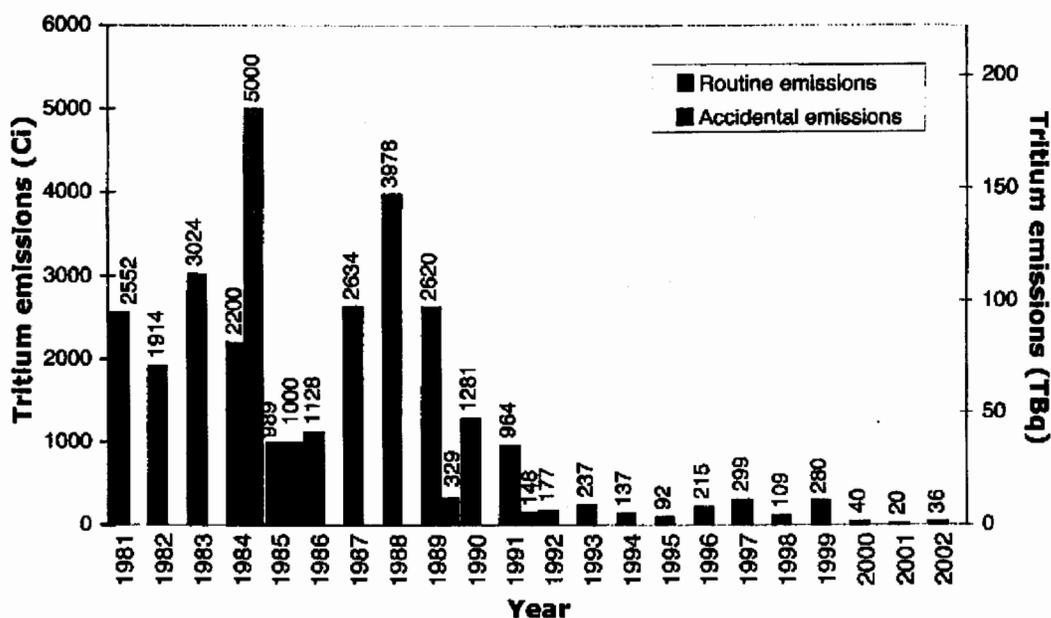


Figure 4. Combined HT and HTO emissions from the Tritium Facility, 1981–2002, distinguishing between chronic releases during normal operations (black bars) and acute accidental releases (gray bars). Accidental releases are predominantly HT gas.

Stack Monitoring for Gross Alpha and Gross Beta Radiation: For most discharge points at the other facilities where continuous stack sampling is performed, the results are below the minimum detectable concentration (MDC) of the analysis; sometimes as few as 1 to 4 samples (out of 25 to 50 per year) have concentrations greater than the MDC. Generally, these few samples having results above the MDC are only marginally above it. Use of zero values for this type of data can be justified based on knowledge of the facility, the use of tested, multiple stage, HEPA filters in all significant release pathways, and alpha spectroscopy based

an air particulate monitor positioned at the location of the hypothetical maximally-exposed member of the public (defined in Section III) for the Livermore site. Data from air surveillance monitors provide a valuable test of predictions based on air dispersion modeling, and can help characterize unplanned releases of radioactive material.

The data from the surveillance air monitoring network provide continuous measurements of the concentrations of radionuclides present in the air at the Livermore site, Site 300, and in the surrounding areas. Data from the network are presented in the LLNL Site Annual Environmental Report (SAER), which is available to the public in hardcopy form, on CD, and on the Internet. (See, e.g., Gallegos et al., *Environmental Report 2001*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-50027-01, September 2002; <http://www.llnl.gov/saer>).

Radionuclide Usage Inventory Update

A "partial" accounting of LLNL's radiological emission sources was made in 2002 (as was done in 2001), in accordance with the allowance by EPA that a 100% accounting need be made only every third year. A 100% accounting was made when reviewing and reporting on operations conducted in 2000.

The partial accounting focused on sources in four categories: (1) the group of sources that collectively (in a ranked list) accounted for at least 90% of the dose to the maximally-exposed public individual from both the Livermore site and Site 300 in the previous year's (2001) assessment; (2) all "new" sources, i.e., those that commenced emissions in 2002, or sources that showed significantly elevated releases over 2001 levels; (3) all monitored sources; and (4) all sources in the major LLNL waste stream dealt with by Radioactive and Hazardous Waste Management (RHWM) Division in the Environmental Protection Department (EPD) of LLNL.

Radionuclide usage inventory forms, with guidance for completing them, were sent to all assurance managers, facility managers, and project-responsible persons connected with activities meeting these criteria for our partial accounting. The forms were completed by experimenters, and certified by facility managers. In particular, radionuclide usage data for all Site 300 explosives experiments and all significant stack and diffuse sources at both sites were included in this update.

behavior and similar modes of decay and decay energies of the radiation type of the isotope of interest. Once a surrogate is selected, the equivalent source term is adjusted by the product of the initial inventory of the isotope of interest and the ratio of the effective dose equivalent of the surrogate to that of the isotope of interest. In some cases, experimenters did not provide isotopic analyses of mixtures of radionuclides, and they identified the radionuclides used as "gross alpha," "gross beta," "gross gamma," or "mixed fission products" (MFP). In these cases, ^{239}Pu was used as the surrogate for gross alpha, ^{137}Cs was used as the surrogate for gross gamma, and ^{90}Sr was used as the surrogate for gross beta and mixed fission products to provide conservative dose estimates.

Population Inputs: Population distributions centered on the two LLNL sites were compiled from the LandScan Global Population 1998 Database developed by Dr. Jerome Dobson at Oak Ridge National Laboratory. The population data files (distribution of population with distance and direction) used in the 2002 modeling effort are the same as those described in the 2000 NESHAPs annual report (*LLNL NESHAPs 2000 Annual Report*, Gallegos et al., June 2001).

Land Use and Agricultural Inputs: Options for model inputs regarding agricultural characteristics and land use are established by the EPA, and the particular designation selected can strongly influence the ingestion dose received by the population being evaluated. The "user entered" option was again selected for the CAP88-PC modeling effort for 2002. The values entered corresponded to the "local agriculture" option (everything is home produced), with one exception—all milk consumed was assumed to be imported when assessing dose to individuals (as opposed to populations). An assumption that all milk comes from local cows would not be supported by the agricultural activities conducted in the area. For population dose assessments, all food is considered to be locally grown, i.e., grown within an 80 km radius about the site; default densities of agricultural products in California are used.

Emission Source Terms: The source term for each emission point in the calculations was determined by one of two methods: For continuously monitored sources, the sampling data (curies released per unit time) for each radionuclide were used directly. For unmonitored facilities, the radionuclide usage inventories, together with time factors and EPA-specified physical state factors, are used to estimate potential emissions to air from a source. Time factors are used to adjust for the fact that a radionuclide may not always be in the same facility all year or may be encapsulated or enclosed for a substantial part of the year. Time factors are chosen to allow a more reasonable estimate of the amount of radioactive material released into the atmosphere. The EPA-specified factors for potential release to air of materials in different physical states (solid, liquid, powder, or gas) are those stated in 40 CFR Part 61, Appendix D. If the material was an unconfined gas, or any material heated above 100°C (with exceptions noted in Table 3), then the factor 1.0 was used;

for liquids and powders, 1.0×10^{-3} was used; and for solids, 1.0×10^{-6} was used. The U.S. EPA has granted approval for LLNL to use alternative physical state factors for elemental uranium, uranium/niobium alloy, and elemental plutonium. Table 3 provides the approved temperatures for application of the physical state factor for each material.

These factors are allowed provided that the material is not intentionally dispersed to the environment and that the processes do not alter its chemical form. The physical-state-dependent release fraction and the time factor are used to adjust (by multiplication) the total annual usage inventory to yield the potential annual release to air. In addition, emission control abatement factors (40 CFR 61, Appendix D), when applicable, were applied. Each HEPA filter stage was given a 0.01 abatement factor. (However, abatement factors were not used to evaluate compliance with the 0.1 mrem [$1 \mu\text{Sv}$] standard that determines the need for continuous monitoring at a facility.) The use of actual stack effluent sampling data is much more direct, and presumably more accurate, than using assumptions based on usage inventory, time factors, release fractions, and emission control factors.

Table 3. List of materials exempted from the "treat as a gas above 100°C rule," and temperatures at which the various physical state factors apply.

Material	Solid physical state factor	Liquid physical state factor	Gas Physical state factor	Year Approved
Elemental uranium	<1100°C	Between 1100°C and 3000°C	>3000°C	1996
Uranium/niobium alloy	<1000°C	Between 1100°C and 3000°C	>3000°C	2001
Elemental plutonium	<600°	Between 600°C and 3000°C	>3000°C	2001

Site-Wide Maximally Exposed Individual: For LLNL to comply with the NESHAPs regulations, the LLNL site-wide maximally exposed individual cannot receive an EDE greater than 10 mrem/y ($100 \mu\text{Sv}/\text{y}$). The site-wide maximally exposed individual (SW-MEI) is defined as the *hypothetical* member of the public at a single residence, school, business, church, or other such facility, who receives the greatest LLNL induced EDE from the combination of all radionuclide source emissions, as determined by modeling.

At the Livermore site, the SW-MEI for 2002 was found, as usual, to be located at the UNCLE Credit Union, about 10 m outside the controlled eastern fence line of the site, but about 10 m within the perimeter of the site property, as shown in Figure 5. At Site 300, the 2002 SW-MEI was again, as in the previous two years, located at the boundary with the Carnegie State Vehicle Recreation Area, managed by the California Department of Parks and Recreation, approximately 3.2 km south southeast of the firing table at Building 851, as shown in Figure 6.

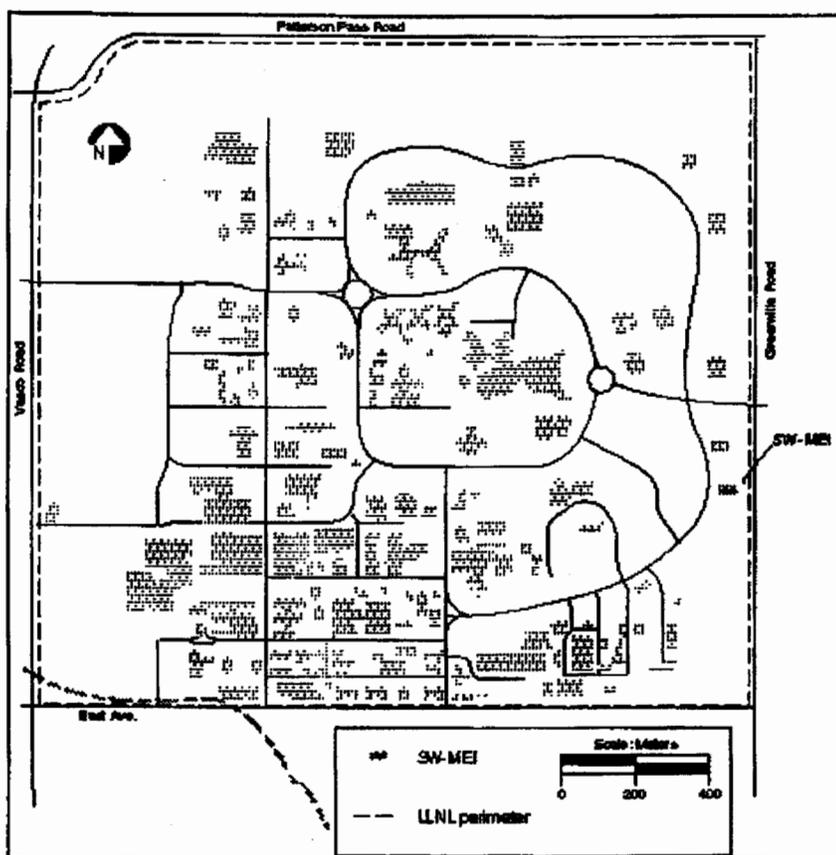


Figure 5. Location of Site-Wide Maximally Exposed Individual (SW-MEI) at the Livermore site, 2002.

In the Attachment 1 spreadsheet, the distance and direction to the respective SW-MEI are shown for each facility at each site. Doses to the SW-MEIs were evaluated for each source and then totaled for site-specific evaluations against the 10 mrem/y (100 μ Sv) dose standard (see "Total Dose to Site-Wide Maximally Exposed Individuals" in Section IV).

Maximally Exposed Public Individual: To assess compliance with the EPA requirement for continuous monitoring of a release point (potential dose greater than 0.1 mrem/y [1.0 μ Sv/y]), emissions must be individually evaluated from each point source; the location of the maximally exposed public individual (MEI) is generally different for each emission point. The maximum dose at a location of unrestricted public access typically occurs at a point on the site perimeter. Therefore, it is often referred to as the maximum "fence line" dose, although the off-site maximum dose could occur some distance beyond the perimeter. (This could

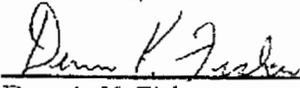
In 2002, there were seven buildings (Buildings 175, 177, 235, 251, 331, 332, and 491) at the Livermore site and one (Building 801, the Contained Firing Facility) at Site 300 that had radionuclide air effluent monitoring systems. These buildings are listed in Table 2, along with the number of samplers, the types of samplers, and the analytes of interest.

LLNL remains committed to monitoring stack effluent air from its Tritium Facility (Building 331), Plutonium Facility (Building 332), Contained Firing Facility (Building 801), and the seismically hardened area of its Heavy Element Facility (Building 251). In addition, other facilities are continuously monitored, as necessary, based on evaluations of potential emissions without control devices, as in the case of Building 235, or where classification or other issues prevent a usage-inventory-based evaluation.

SECTION V. Certification

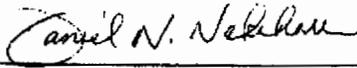
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: Dennis K. Fisher
Associate Director
Safety and Environmental Protection
Lawrence Livermore National Laboratory
7000 East Avenue, L-668
Livermore, CA 94550

Signature:  Date: 6/20/03
Dennis K. Fisher

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. See 18 U.S.C. 1001.

Name: Phillip Hill
Acting Deputy Manager
Safety and Environmental Programs
U.S. Department of Energy
7000 East Avenue, L-293
Livermore, CA 94550

Signature:  Date: 6/24/03
for Phillip Hill

SECTION VI. Supplemental Information on NESHAPs Compliance and QA/QC Activities

Requirements Under New EPA Standard for Stack Sampling

In September 2002 EPA amended 40 CFR 61 Subpart H (NESHAPs) to require use of a new standard, ANSI N13.1-1999, for stack sampling of radiological effluent from certain newly constructed or modified facilities. This action replaced the existing standard ANSI N13.1-1969, and imposed some conditions on stack monitoring systems of existing facilities that are "grandfathered in" under the old standard. An assessment performed by TAMM Group in EPD identified 10 stack sampling systems (nine at the Livermore site and one at Site 300) that must satisfy the new standard, as listed in the following table.

Table 6. Livermore site and Site 300 stack sampling systems that must satisfy the maintenance and inspection requirements in the ANSI N13.1-1999 standard.

Building	Exhaust	Sampler ID	Operation
251	FGBE-1000	PAM_46	Hardened Area Glove Boxes
251	FGBE-2000	PAM_47	Hardened Area Glove Boxes
695 ^(a)	FHE-1000, 2000, 3000	PAM_1	FHE, Waste Treatment Exhaust
332	FGBE-1000	SP_3	Glove Box, Increment 1
332	FGBE-2000	SP_4	Glove Box, Increment 1
332	FGBE-3000	SP_8	Glove Box, Increment 1
332	FGBE-4000	SP_9	Glove Box, Increment 1
332	FGBE-7000, 8000	SP_10	Glove Box, Increment 3
801	FEFH-1, FE-2	PAM_1	Test Chamber, Facility Exhaust
235	FHE-2001, 2002	PAM_1	Hood and Glove Box Exhaust, Room 1130

^a The stack for Building 695, LLNL's new Decontamination and Waste Treatment Facility, was not operational in 2002.

An implementation plan was prepared that addresses the inspection and calibration requirements of the new standard. The LLNL stack monitoring systems not cited in Table 6 are not required by NESHAPs regulations, but continue in operation as a best management practice. The new standard is described in a 1999 supplement to Health Physics Society Journal, entitled "Sampling and monitoring releases of airborne radioactive substances from the stacks and ducts of nuclear facilities" (report ANSI/HPS N13.1-1999).

two 30-m stacks; one explosives experiment conducted at Site 300's Firing Table 851; five sources reported by RHWM; and the Building 612 Yard waste tritium storage area.

More broadly, the quality and accuracy of our accounting and inventory processes were checked in several ways. In the accounting of new sources, more than 200 NEPA or related (primarily Integration Work Sheets and Occupational Safety Plans) documents were examined as they arose over the course of the year and reexamined collectively at year's end to identify all new 2002 projects having potential to release radioactive material to air. Additionally, all Radioactive Materials Management Areas new to 2002 were inventoried. The data characterizing the principal source at each site (principal in terms of producing the greatest potential dose to the public) were double-checked for accuracy. Finally, each radiological inventory form returned by the programs was scrutinized for consistency and evident errors as it was compiled and entered into the spreadsheet, Attachment 1. Based on these QC efforts, we believe that the data presented in Attachment 1 meets EPD's quality assurance objectives.

measurements of tritium in air near this source. The median annual concentration of tritium in air for 2002 in this area was 49 pCi/m³ (1.9 Bq/m³). These data were used to calculate the total tritium emissions from the area, using a conservative approach that assumed the source to be 60 m south-southwest of the air sampler. With this assumption, a diffuse source emission of 2.3 Ci/y (7.4×10^{10} Bq/y) was required to produce the concentrations measured at the air sampler. This source term produced a CAP88-PC-calculated 2002 dose to the SW-MEI from the Building 612 Yard of 1.1×10^{-2} mrem (1.1×10^{-1} μ Sv); a dose 0.75 times this amount was calculated when the NEWTRIT model was implemented.

Southeast Quadrant

The Southeast Quadrant of the Livermore site has elevated levels of plutonium in the surface soil (from historic waste management operations) and air (from resuspension). A high volume air particulate sampler is located adjacent to the UNCLE Credit Union (the location of the SW-MEI) to monitor the plutonium levels in this area. Monitoring data from this air sampler were used as a direct measurement of potential dose via the air pathway. The median annual concentration of ²³⁹⁺²⁴⁰Pu (the analytical technique used, namely alpha spectroscopy, does not distinguish between ²³⁹Pu and ²⁴⁰Pu) in air was 1.83×10^{-19} Ci/m³ (6.76×10^{-9} Bq/m³). Using the dose conversion factor of 3.08×10^5 mrem/ μ Ci (8.32×10^{-5} Sv/Bq) from Federal Guidance Report No. 11, EPA-520/1-88-020, U.S. Environmental Protection Agency (1988) for ²³⁹Pu and ²⁴⁰Pu, and the standard man breathing rates of 8400 m³/y, the dose was determined to be 4.7×10^{-4} mrem (4.7×10^{-3} μ Sv) for 2002.

Site 300 Principal Diffuse Sources

Diffuse sources at Site 300 involve primarily depleted uranium, and to a considerably lesser extent, tritium. During remediation efforts at Site 300, LLNL completed a contaminant screening to identify potential routes of migration from soil to air and other environmental media of these radionuclides and other contaminants (Final Site Wide Remedial Investigation Report; Webster-Scholten, Ed., 1994, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-AR-108131). Uranium-238 and tritium were identified as contaminants of potential concern.

Tritium Evaporation and Migration at Site 300

Tritium gas and solids containing tritium (Li³H) were components of explosives assemblies tested on the firing tables during experiments in years past. Most of the gaseous tritium escaped to the atmosphere during the tests, but some of the solid Li³H remained as residue in the firing table gravel. Rainwater and dust-control rinse water percolated through the gravel, causing the tritium to migrate into the subsurface soil and, in some cases, eventually to the ground water. Tritium contaminated gravel was removed from the firing tables in 1988 and disposed in the Pit 7 landfill. Tritium in landfills, firing table soils, and ground water are potential sources of diffuse emissions of tritium to the atmosphere at Site 300. LLNL

personnel maintain an air tritium sampler at a perimeter location at Site 300, and doses from diffuse tritium sources may be estimated based on the monitoring data for that sampling location. For the calendar year 2002, all measurements in ambient air at the Site 300 perimeter location were consistent with natural background measurements.

Resuspension of Depleted Uranium in Soil at Site 300

Like tritium, depleted uranium has been used as a component of explosives test assemblies. It remains as a residue in surface soils, especially near the firing tables. Because surface soil is subject to resuspension by the action of wind, rain, and other environmental disturbances, the collective effects of surface soil uranium residuals on off-site doses were evaluated.

A model was developed to distinguish between the contribution to measured uranium activities arising from naturally occurring uranium (NU) and that from depleted uranium (DU) contributed by LLNL operations. (A derivation of the model was presented in *LLNL NESHAPs 1995 Annual Report*, Gallegos et al., 1996.) We base our dose estimate for resuspended depleted uranium (DU) on the measured environmental surveillance monitoring total concentration in air of uranium-238, subtracting out the part contributed by NU, from the following equation:

$$\mu = \frac{0.00726 - 0.99274 \frac{M(\text{CU} - 235)}{M(\text{CU} - 238)}}{0.00526 \frac{M(\text{CU} - 235)}{M(\text{CU} - 238)} + 0.00526}$$

where μ is the fraction (by weight) of uranium contributed by operations, CU is composite uranium (both DU and NU), $M(\text{CU}-235)$ the mass of U-235 in the composite (measured) uranium, and $M(\text{CU}-238)$ the mass of U-238 in the composite (measured) uranium.

For 2002, all eight air-particulate monitors at Site 300 were used to determine the annual-average concentrations of isotopes U-238 and U-235. These site-average values gave an estimate of 3.3×10^{-3} mrem (3.3×10^{-2} μSv) for the SW-MEI dose resulting from resuspension of DU in soil for 2002.

Modeling Dose from Tritium

To evaluate dose from tritium releases to air, we use the EPA-sanctioned CAP88-PC code. Its tritium model calculates dose from inhalation, skin absorption, and ingestion of tritium only in its tritiated water vapor form (HTO). Doses from HT or organically bound tritium (OBT) are not calculated. CAP88-PC's tritium model is based on the specific activity model, which assumes that the tritium-to-hydrogen ratio in body water is the same as in air moisture. Because the specific activity model

Comparison of 2002 Modeling Results with Tritium Air Surveillance Monitoring Data

A comparison was made between CAP88-PC-predicted concentrations of tritium in air and ambient air monitoring data for eleven tritiated water vapor samplers on the Livermore site (designated VIS, SALV, POOL, CAFE, MESQ, MET, COW, B331, B514, B624, and B292) and one off-site sampler (ZON7) that have been used for comparison since 1997. In addition, a new air tritium monitor (DWTF) has been added to the comparison. Monitor locations are shown in Figure 7.

Only concentrations from the three most significant sources of tritium releases to air at the Livermore site were included in the model-data comparison. The largest point source is the Tritium Facility (Building 331), where tritium is emitted from two 30-m-high, continuously monitored stacks. Based on stack monitoring, a total of 32.9 Ci (1.22×10^{12} Bq) of HTO was emitted from Building 331 stacks in 2002. (The 3.47 Ci [1.28×10^{11} Bq] of HT emitted from the Tritium Facility stacks is not included in the comparison because the tritium air surveillance monitors register only HTO.)

Generally one would expect the Tritium Facility stacks to make the largest contribution to concentrations of tritium at distant monitors (e.g., ZON7), because the emissions are cast high into the air and carried with the wind. Diffuse-source emissions are lower to the ground, primarily affecting those monitors in close proximity. The other two principal sources in our modeling/measurement comparison are of this type: open-air diffuse emission areas associated with the Building 612 Yard and the Tritium Facility (Building 331) outside yard waste accumulation and storage areas. Emissions from the Building 612 Yard source were estimated to be 2.3 Ci (8.5×10^{10} Bq), based on calibrating CAP88PC-predictions of tritium concentrations at the tritium monitor B624 closest to it. (Thus the B624 data do not provide a test of the modeling.) Emissions from the B331 outside yard source were estimated to be 1.0 Ci (3.7×10^{10} Bq) in 2002, based on facility knowledge and environmental monitoring data (primarily the B331 monitor near this yard). While these two diffuse sources contribute significantly to tritium concentrations in all of the monitors, all other potential sources of tritiated water vapor release, such as the radioactive and hazardous waste management operations in Building 514 and the Building 292 diffuse source, were too minor to influence the overall model-data comparison.

Annual average concentrations of HTO in air (pCi/m^3) at the locations of the thirteen monitors were modeled for the three sources individually and collectively, and compared to the measured annual mean concentrations. The results, displayed in Table 7, show that by taking into account the leading sources releasing tritiated water vapor to air, fairly good agreement is obtained between model runs and data for all of the air tritium monitors.

Faucett Associates, Bethesda, MD. 20814; JACKFAU-341/12-87; 1987). Similarly, the study (Peterson op. cit.) that compared CAP88-PC predictions with air tritium concentrations at 13 perimeter and off-site locations showed that ninety-six percent of all predictions fell within a factor of three of the observations, and slightly more than half of the predicted air concentrations were greater than the observed air concentrations.

Table 7. Comparison of measured and modeled annual mean concentrations of tritiated water vapor (HTO) in air at selected Livermore site locations, 2002.

Air monitor (name)	Mean measured concentration (pCi/m ³)	Modeled* average concentration (pCi/m ³)	Ratio of modeled- to-measured concentrations	Modeled concentration of tritium in air contributed by the indicated source (pCi/m ³)		
				B331 Stacks	B612 Yard	B331 Outside
B624	56.4	58	1.0	1.4	56	0.12
B331	10.0	14	1.4	0.051	1.4	13
POOL	3.22	3.5	1.1	1.2	1.2	1.1
B514	3.15	8.4	2.7	0.56	7.7	0.11
B292	1.75	0.77	0.46	0.23	0.32	0.22
VIS	1.72	2.6	1.5	1.2	1.3	0.14
CAFE	1.67	2.2	1.3	0.68	1.2	0.35
DWTF	1.45	1.5	1.0	1.2	0.24	0.10
COW**	1.22	1.4	1.1	1.0	0.24	0.12
SALV**	0.929	1.6	1.7	0.40	1.1	0.061
MESQ**	0.755	0.97	1.3	0.20	0.35	0.42
ZON7**	0.663	0.67	1.0	0.50	0.14	0.032
MET**	0.458	0.49	1.1	0.15	0.19	0.15
(CRED)***		3.5		1.3	2.0	0.16

*This result takes into account the three most significant tritium sources; it is the annual-average concentration comprising the sum of the three contributions shown in the far right columns.

**At these locations, more than 25% of the samples were below detection limits. The annual mean includes negative concentrations for all except COW. MET has the lowest percentage of detections (17%).

***The CRED location does not have a tritium surveillance air monitor, but it marks the location of the SW-MEI.

SECTION VIII. Supplemental Information on Other Compliance

Status of Compliance with Other Regulations

Status of compliance with 40 CFR 61 Subpart Q - National Emission Standards for Radon Emissions from Department of Energy Facilities

LLNL does not have storage and disposal facilities for radium containing materials that would be a significant source of radon.

Status of compliance with 40 CFR 61 Subpart T - National Emission Standards for Radon Emissions from the Disposal of Uranium Mill Tailings

LLNL does not have or store any uranium mill tailings.

Information on Radon-220 and Radon-222 Emissions

Radon emissions occur naturally by emanation from the earth. Radon-222 emissions that were reported in past NESHAPs annual reports from research experiments at the Livermore site did not occur in 2002.

ATTACHMENT 1. LLNL NESHAPs 2002 Annual Report Spreadsheet

Guidance for Interpreting the Data Spreadsheet

A generalized description of each facility and its operations is provided on the spreadsheet. In addition, the following information is shown for each listed emission point or stack:

- Building and room number(s)
- Specific stack identification code(s)
- Generalized description of operations in the room(s) or area(s)
- Radionuclides utilized in the operation
- Annual radionuclide usage inventory with potential for release (by isotope, in curies)
- Physical state factors (by isotope)
- Stack parameters
- Emission control devices and emission control device abatement factors
- Estimated or measured annual emissions (by isotope)
- Distance and direction to the site-wide maximally exposed individual (SW-MEI)
- Calculated EDE to the SW-MEI
- Distance and direction to the maximally exposed individual for that specific source (MEI)
- Calculated EDE to the MEI (source term not adjusted for emission controls)
- Source category

Radionuclides

The radionuclides shown in the spreadsheet are those from specific emission points where air emissions were possible. If radionuclides were present, but encapsulated or sealed for the entire year, radionuclides, annual usage inventories, and emissions are not listed.

Radionuclide Usage Inventories with Potential for Release

The annual radionuclide usage inventories for point source locations are based on data from facility experimenters and managers. For Buildings 251 (hardened area) and 332, classification issues regarding transuranic radionuclide usage inventories make use of the usage inventory / modeling approach impractical. However, all such affected emission points in these buildings are continuously monitored, and emissions are therefore directly determined.

Physical State Factors

The physical state factors listed are EPA potential release fractions from 40 CFR 61, Appendix D, whereby emissions are estimated from radionuclide usage inventories depending on their physical states for use in dispersion/dose assessment modeling. A physical state factor of 1.0×10^{-6} is used for solids, 1.0×10^{-3} is used for liquids and powders, and 1.0 is used for unconfined gases and substances heated above 100°C. Regarding the latter, U.S. EPA has granted LLNL approved alternative emissions factors for elemental uranium, uranium/niobium alloy, and elemental plutonium. (See Table 3 in Section III.) These factors are allowed provided that the material is not intentionally dispersed to the environment and that the processes do not alter the chemical form of the material.

Stack Parameters

Engineering surveys conducted from 1990 through 1992 form the basis for the stack physical parameters shown, which were checked and validated by facility experimenters and managers for 1994 and 1995. Stack physical parameters for sources evaluated in 2002 were updated, as necessary, by experimenters and managers for those facilities.

Emission Control Devices

High Efficiency Particulate Air (HEPA) filters are used in many LLNL facilities to control particulate emissions. For some discharge points, scrubbers and electrostatic precipitators aid the control of emissions. The operational performance of all HEPA filtration systems is routinely tested. The required efficiency of a single stage HEPA filter is 99.97%. Double staged filter systems are in place on some discharge points. Triple stage HEPA filters are used on glove box ventilation systems in the Building 332 Plutonium Facility and in the hardened portion of Building 251.

Control Device Abatement Factors

Similar to physical state factors, control device abatement factors, from Table 1 in 40 CFR 61, Appendix D, are those associated with the listed emission control devices, and are used to better estimate actual emissions for use in dispersion and dose models. By regulation, each HEPA filter stage is given a 0.01 factor (even though the required test efficiency that all LLNL HEPA filters must maintain would yield a factor of 0.0003).

Estimated Annual Emissions

For unmonitored and non-continuously monitored sources, estimated annual emissions for each radionuclide are based on the product of (1) usage inventory data, (2) time factors (discussed in "Emission Source Terms" in Section III), (3) EPA potential release fractions (physical state factors), and (4) applicable emission control device abatement factors.

Actual emission measurements are the basis for reported emissions from continuously monitored facilities. LLNL facilities that had continuous monitoring systems in 2002 were Buildings 175, 177, 235, 251, 331, 332, and 491 at the Livermore site, and Building 801 at Site 300, as noted earlier. See the discussion below under "0.1 mrem/y Monitoring Requirement" regarding the use of emissions measurements for monitored sources.

10 mrem/y Site-Wide Dose Requirement

For LLNL to comply with the NESHAPs regulations, the LLNL site-wide maximally exposed individual (SW-MEI; defined as the hypothetical member of the public at a single residence, school, business, or office who receives the greatest LLNL-induced EDE from the combination of all radionuclide source emissions) cannot receive an EDE greater than 10 mrem/y (100 μ Sv/y). (See Section III for a discussion of the SW-MEI.)

In the spreadsheet, the distance and direction to the respective SW-MEI are shown for each facility at each site. Doses to the site specific SW-MEIs were evaluated for each source and then totaled for site specific evaluations against the 10 mrem/y dose standard (see Section IV).

0.1 mrem/y Monitoring Requirement

To assess compliance with the requirement for continuous monitoring (potential dose greater than 0.1 mrem/y [1.0 μ Sv/y] to the maximally-exposed public individual or MEI, discussed earlier in Section III), emissions must be individually evaluated from each point source. The location of the MEI is generally different for each emission point. The maximum dose at a location of unrestricted public access typically occurs at a point on the site perimeter. Therefore, it is often referred to as the maximum "fence line" dose, although the off-site maximum dose could occur some distance beyond the perimeter. (This could happen, e.g., when the perimeter is close to a stack; however, for nearly all emission points at the Livermore site and Site 300, calculations show that ground level concentrations of radionuclides generally decline continuously beyond LLNL boundaries.) As stipulated by the regulations, modeling for assessment of continuous monitoring requirements assumed unabated emissions (i.e., no credit was taken for emission abatement devices, such as filters), but physical state factors and time factors were applied.

The unabated EDE cannot be calculated for HEPA-filtered facilities monitored for radioactive particles. Because the monitoring equipment is placed after HEPA filtration, there is no way to obtain an estimate for what the emissions might have been had there been no filtration. It is not reasonable to apply factors for the effects of the HEPA filters on the emission rate because most of what is measured on the HEPA filters is the result of the radioactive decay of radon, which is capable of penetrating the filter. The spreadsheet gives, for each inventoried point source, the

dose to the MEI and the distance and direction to the LLNL fence line where the MEI is located. However, for HEPA-filtered monitored sources, no value is shown.

Source Categories

LLNL radionuclide air emission sources have been classified into seven source categories, indicated by the number in the next to last column of the spreadsheet: (1) Unmonitored or non-continuously monitored Livermore-site facilities that have had a radionuclide usage inventory update for 2002; (2) Unmonitored or non-continuously monitored Livermore site facilities with a previous radionuclide usage inventory update (this category is not used in years with complete usage inventory updates, such as 2000); (3) Continuously monitored Livermore site facilities; (4) Site 300 explosives experiments; (5) Diffuse sources where emissions and subsequent doses were estimated using inventory processes; (6) Diffuse sources where emission and dose estimates were supported by environmental surveillance measurements; and (7) Sources whose emissions estimates and subsequent doses were estimated by confirmatory air sampling rather than continuous sampling.

Attachment 1 - 2002 LUNL NESHAPS Annual Report Spreadsheet

Building	Room/Area	Stack ID	Operation	Radionuclides	Annual Inventory with Potential for Release (Ci)	Physical State Factor	Stack Height (ft)	Stack Diameter (ft)	Stack Velocity (m/s)	Control Device(s)	Control Device(s) Efficiency	Estimated Annual Emissions (Ci)	Distance to Street (ft)	Distance to Downwind Receiver (ft)	Downwind Receiver Category				
131	12E1	FHE-6000/7000	Storage and cleaning of assemblies	U-238	6.1E-06	1.0E-06	11.2	0.13	7.8	None	0.01	6.1E-14	1328	3.1E+12	None	2			
				U-235	7.8E-08	1.0E-06								7.8E-16					
				U-234	5.7E-07	1.0E-06								5.7E-15					
				U-232	1.5E-06	1.0E-06								1.5E-14					
131	12A8	Room 4A	Storage and cleaning of post-1994 materials	U-238	7.7E-07	1.0E-06	NA	NA	NA	None	1	7.7E-13	1316	8.8E+11	W	1.6E-09	2		
				U-235	7.7E-08	1.0E-06								7.7E-16					
				U-234	7.7E-07	1.0E-06								7.7E-15					
				U-232	1.5E-06	1.0E-06								1.5E-14					
132N	2675	FHE-6000/7000	Preparation of aqueous solutions for analysis	U-238	2.8E-18	1.0E-03	38.1	2.13	6.6	None	1	2.8E-21	1504	4.7E+16	SW	1.0E-15	2		
				U-235	3.3E-16	1.0E-03								3.3E-19					
				U-234	4.8E-14	1.0E-03								4.8E-17					
				U-232	1.3E-14	1.0E-03								1.3E-18					
132N	2679	FHE-6000/7000	Preparation of aqueous solutions for analysis	U-238	3.7E-17	1.0E-03	38.1	2.13	6.6	None	0.01	3.7E-19	1504	3.3E+11	SW	5.2E-09	2		
				U-235	7.8E-12	1.0E-03								7.8E-16					
				U-234	7.8E-12	1.0E-03								7.8E-16					
				U-232	3.8E-13	1.0E-03								3.8E-17					
132N	2685	FHE-6000/7000	Transfer and solvent extraction of waste samples for PCB analysis	Co-57	6.5E-09	1.0E-03	38.1	2.13	6.6	None	1	6.5E-12	1504	3.8E+11	SW	6.5E-11	2		
				Co-60	4.5E-10	1.0E-03								4.5E-13					
				Th-232	3.4E-11	1.0E-03								3.4E-14					
				Th-230	7.2E-14	1.0E-03								7.2E-17					
132N	2689	FHE-6000/7000	Transfer and solvent extraction of waste samples for PCB analysis	Co-57	1.7E-07	1.0E-03	38.1	2.13	6.6	None	1	1.7E-10	1504	2.1E+12	SW	1.8E-11	1		
				Co-60	2.7E-10	1.0E-03								2.7E-13					
				Th-232	4.2E-11	1.0E-03								4.2E-14					
				Th-230	4.4E-14	1.0E-03								4.4E-17					
132N	2694	FHE-6000/7000	Transfer and solvent extraction of waste samples for PCB analysis	Co-57	1.7E-07	1.0E-03	38.1	2.13	6.6	None	1	1.7E-10	1504	2.1E+12	SW	1.8E-11	1		
				Co-60	2.7E-10	1.0E-03								2.7E-13					
				Th-232	4.2E-11	1.0E-03								4.2E-14					
				Th-230	4.4E-14	1.0E-03								4.4E-17					

NOTE: To convert curies to becquerels use 1 Ci=3.7E+10 Bq and to convert ebfm to dwt use 1 lb=4.5E+05 grams.

Attachment 1 - 2002 LLNL NESHAPs Annual Report Spreadsheet

Building	Room/Area	Stack ID	Operation	Substances	Annual Inventory with Potential for Release (lb)	Physical State Factor	Stack Height (ft)	Stack Diameter (in)	Stack Velocity (m/s)	Control Device(s)	Control Device Measurement Factor	Estimated Annual Emissions (lb)	Distance to Stack (ft)	Distance to Stack (ft) from Nearest Sensitive Area	Direction to NE	U-ANUS (ft) to NE	U-ANUS (ft) to NE	Source Category			
151	2326	PAC-39	Chemical synthesis of metals	Co-17	1.0E+00	1.0E+00	12.8	0.41	7.6	None	1	3.0E-07	1300	E	8.0E-05	768	SW	2.2E-08			
				Co-18	1.0E+00	1.0E+00								2.0E-05							
				Co-19	1.0E+00	1.0E+00									2.0E-05						
				Co-20	1.0E+00	1.0E+00									2.0E-05						
				Th-230	1.0E+00	1.0E+00									4.3E-11						
				Th-232	1.0E+00	1.0E+00									4.3E-11						
				Th-232	1.0E+00	1.0E+00									3.0E-12						
				Pa-233	1.0E+00	1.0E+00									4.6E-10						
				Pa-233	1.0E+00	1.0E+00									2.0E-08						
				Pa-233	1.0E+00	1.0E+00									2.0E-08						
151	2344	PAC-63 PAC-65	Preparation of environmental and waste samples	Co-17	1.0E+00	1.0E+00	12.8	0.30	3.9	None	1	1.0E-12	1300	E	1.0E-10	584	WNW	5.4E-10			
				Co-18	1.0E+00	1.0E+00								1.0E-12							
				Co-19	1.0E+00	1.0E+00									1.0E-12						
				Co-20	1.0E+00	1.0E+00									1.0E-12						
				Co-117	1.0E+00	1.0E+00									1.0E-12						
				Co-117	1.0E+00	1.0E+00									1.0E-12						
				Co-117	1.0E+00	1.0E+00									1.0E-12						
				Co-117	1.0E+00	1.0E+00									1.0E-12						
				Co-117	1.0E+00	1.0E+00									1.0E-12						
				Co-117	1.0E+00	1.0E+00									1.0E-12						
151	2348	PAC-75	Waste transport/analysis of liquids	Co-17	1.0E+00	1.0E+00	12.8	0.41	8.7	None	1	1.0E-13	1300	E	3.7E-17	768	SW	8.7E-17			
				Co-18	1.0E+00	1.0E+00								1.0E-13							
				Co-19	1.0E+00	1.0E+00									1.0E-13						
				Co-20	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
151	2350	PAC-76	Transfer of liquid residues	Co-17	1.0E+00	1.0E+00	12.8	0.41	8.4	None	1	1.0E-13	1300	E	4.6E-13	768	SW	1.1E-12			
				Co-18	1.0E+00	1.0E+00								1.0E-13							
				Co-19	1.0E+00	1.0E+00									1.0E-13						
				Co-20	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
				Co-117	1.0E+00	1.0E+00									1.0E-13						
175	105	PAC-02	Operations discontinued	Co-17	1.0E+00	1.0E+00	12.8	0.41	4.1	None	1	1.0E-02	1300	E	0.0E+00	768	SW	0.0E+00			
				Co-18	1.0E+00	1.0E+00								1.0E-02							
				Co-19	1.0E+00	1.0E+00									1.0E-02						
				Co-20	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
177	1020	PAC-32	Operations discontinued	Co-17	1.0E+00	1.0E+00	12.8	0.41	4.1	None	1	1.0E-02	1300	E	0.0E+00	768	SW	0.0E+00			
				Co-18	1.0E+00	1.0E+00								1.0E-02							
				Co-19	1.0E+00	1.0E+00									1.0E-02						
				Co-20	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
				Co-117	1.0E+00	1.0E+00									1.0E-02						
184	6122	3C-2V4 (Target Exhaust)	The accelerator beam can produce areas quantities of short-lived activation products.	Co-17	1.0E+00	1.0E+00	10.5	1.37	4.5	None	1	6.0E-02	1325	SE	5.2E-07	1325	SE	5.2E-07			
				Co-18	1.0E+00	1.0E+00								6.0E-02							
				Co-19	1.0E+00	1.0E+00									6.0E-02						
				Co-20	1.0E+00	1.0E+00									6.0E-02						
				Co-117	1.0E+00	1.0E+00									6.0E-02						
				Co-117	1.0E+00	1.0E+00									6.0E-02						
				Co-117	1.0E+00	1.0E+00									6.0E-02						
				Co-117	1.0E+00	1.0E+00									6.0E-02						
				Co-117	1.0E+00	1.0E+00									6.0E-02						
				Co-117	1.0E+00	1.0E+00									6.0E-02						

NOTE: To convert cubic to kilograms use 1.275 x 10⁻³ kg and to convert milliliters to liters use 1.0 x 10⁻³ liters.

Attachment 1 - 2002 LLNL NESHAPs Annual Report Spreadsheet

Building	Room/Area	Stack ID	Operation	Radionuclides	Physical Size	Stack Height (ft)	Stack Diameter (in)	Stack Velocity (ft/min)	Control Efficiency (%)	Control Method	Control Device Assessment	Estimated Annual Discharge (Ci)	10,000-hr Discharge (Ci)	10,000-hr Discharge (Ci)	10,000-hr Discharge (Ci)	10,000-hr Discharge (Ci)	Source Category		
233	1708B	Room Air	Gross alpha/beta samples of particulates, dry aerosols, of filters and venters	Pr-233	2.1E-10	1.0E-06	NA	NA	NA	NA	NA	2.1E-10	2.1E-10	2.1E-10	2.1E-10	2.1E-10	2		
				Pr-235	5.1E-08	1.0E-06	NA	NA	NA	NA	NA	NA	NA	5.1E-08	5.1E-08	5.1E-08	5.1E-08	2	
				Pr-240	1.3E-08	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.3E-08	1.3E-08	1.3E-08	1.3E-08	2
				Pr-241	5.2E-08	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	5.2E-08	5.2E-08	5.2E-08	5.2E-08	2
				Pr-242	7.8E-14	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	7.8E-14	7.8E-14	7.8E-14	7.8E-14	2
				Am-241	2.8E-08	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	2.8E-08	2.8E-08	2.8E-08	2.8E-08	2
				U-235	1.3E-08	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.3E-08	1.3E-08	1.3E-08	1.3E-08	2
				U-238	1.3E-08	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.3E-08	1.3E-08	1.3E-08	1.3E-08	2
				U-234	3.0E-09	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	3.0E-09	3.0E-09	3.0E-09	3.0E-09	2
				Pr-235	1.3E-13	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.3E-13	1.3E-13	1.3E-13	1.3E-13	2
				Gross alpha/beta	3.2E-13	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	3.2E-13	3.2E-13	3.2E-13	3.2E-13	2
				U-235	1.1E-12	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.1E-12	1.1E-12	1.1E-12	1.1E-12	2
233	1714	Room Air	Detection of environmental airbears	H-3	6.7E-10	1.0E-06	NA	NA	NA	NA	NA	NA	6.7E-10	6.7E-10	6.7E-10	6.7E-10	6.7E-10	2	
				Gross alpha/beta	4.1E-11	1.0E-06	NA	NA	NA	NA	NA	NA	NA	4.1E-11	4.1E-11	4.1E-11	4.1E-11	2	
				Gross beta	1.0E-11	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.0E-11	1.0E-11	1.0E-11	1.0E-11	2
				Gross total	4.8E-10	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	4.8E-10	4.8E-10	4.8E-10	4.8E-10	2
				Gross alpha/beta	1.7E-11	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.7E-11	1.7E-11	1.7E-11	1.7E-11	2
				Gross beta	2.3E-12	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	2.3E-12	2.3E-12	2.3E-12	2.3E-12	2
				Gross total	1.7E-11	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.7E-11	1.7E-11	1.7E-11	1.7E-11	2
				Pr-233	7.8E-13	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	7.8E-13	7.8E-13	7.8E-13	7.8E-13	2
				Pr-235	2.5E-12	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	2.5E-12	2.5E-12	2.5E-12	2.5E-12	2
				Pr-240	2.5E-12	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	2.5E-12	2.5E-12	2.5E-12	2.5E-12	2
				H-3	1.1E-10	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.1E-10	1.1E-10	1.1E-10	1.1E-10	2
				233	1734	Room Air	Acid digestion for sample analysis	H-3	6.8E-09	1.0E-06	NA	NA	NA	NA	NA	NA	6.8E-09	6.8E-09	6.8E-09
Gross alpha/beta	3.4E-11	1.0E-06	NA					NA	NA	NA	NA	NA	NA	3.4E-11	3.4E-11	3.4E-11	3.4E-11	2	
Gross beta	2.8E-12	1.0E-06	NA					NA	NA	NA	NA	NA	NA	NA	2.8E-12	2.8E-12	2.8E-12	2.8E-12	2
Gross total	3.1E-12	1.0E-06	NA					NA	NA	NA	NA	NA	NA	NA	3.1E-12	3.1E-12	3.1E-12	3.1E-12	2
Pr-233	3.0E-11	1.0E-06	NA					NA	NA	NA	NA	NA	NA	NA	3.0E-11	3.0E-11	3.0E-11	3.0E-11	2
C-14	1.5E-11	1.0E-06	NA					NA	NA	NA	NA	NA	NA	NA	1.5E-11	1.5E-11	1.5E-11	1.5E-11	2
P-32	1.5E-10	1.0E-06	NA					NA	NA	NA	NA	NA	NA	NA	1.5E-10	1.5E-10	1.5E-10	1.5E-10	2
Pr-233	1.3E-17	1.0E-06	NA					NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2
Pr-242	1.2E-16	1.0E-06	NA					NA	NA	NA	NA	NA	NA	NA	1.2E-16	1.2E-16	1.2E-16	1.2E-16	2
Pr-239	2.6E-17	1.0E-06	NA					NA	NA	NA	NA	NA	NA	NA	2.6E-17	2.6E-17	2.6E-17	2.6E-17	2
H-3	1.4E-14	1.0E-06	NA					NA	NA	NA	NA	NA	NA	NA	1.4E-14	1.4E-14	1.4E-14	1.4E-14	2
Pr-90	3.1E-14	1.0E-06	NA					NA	NA	NA	NA	NA	NA	NA	3.1E-14	3.1E-14	3.1E-14	3.1E-14	2
234	108	Room Air	Analysis of urine for radionuclides	Am-241	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2		
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2	
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2	
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2	
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2	
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2	
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2
				Am-243	1.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.3E-17	1.3E-17	1.3E-17	1.3E-17	2
234	110	Room Air	Analysis of urine for radionuclides	Am-241	6.2E-19	1.0E-06	NA	NA	NA	NA	NA	NA	6.2E-19	6.2E-19	6.2E-19	6.2E-19	2		
				Am-243	2.3E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	2.3E-17	2.3E-17	2.3E-17	2.3E-17	2	
				Am-243	1.1E-15	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.1E-15	1.1E-15	1.1E-15	1.1E-15	2
				Am-243	9.9E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	9.9E-17	9.9E-17	9.9E-17	9.9E-17	2
				Am-243	8.0E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	8.0E-17	8.0E-17	8.0E-17	8.0E-17	2
				Am-243	2.7E-19	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	2.7E-19	2.7E-19	2.7E-19	2.7E-19	2
				Am-243	2.8E-18	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	2.8E-18	2.8E-18	2.8E-18	2.8E-18	2
				Am-243	2.8E-18	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	2.8E-18	2.8E-18	2.8E-18	2.8E-18	2
				Am-243	6.2E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	6.2E-17	6.2E-17	6.2E-17	6.2E-17	2
				Am-243	6.2E-17	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	6.2E-17	6.2E-17	6.2E-17	6.2E-17	2
				Am-243	4.5E-12	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	4.5E-12	4.5E-12	4.5E-12	4.5E-12	2
				Am-243	6.7E-13	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	6.7E-13	6.7E-13	6.7E-13	6.7E-13	2
Am-243	6.7E-13	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	6.7E-13	6.7E-13	6.7E-13	6.7E-13	2				
Am-243	7.0E-14	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	7.0E-14	7.0E-14	7.0E-14	7.0E-14	2				
Am-243	2.3E-14	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	2.3E-14	2.3E-14	2.3E-14	2.3E-14	2				
Am-243	7.0E-12	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	7.0E-12	7.0E-12	7.0E-12	7.0E-12	2				
Am-243	3.0E-12	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	3.0E-12	3.0E-12	3.0E-12	3.0E-12	2				
Am-243	1.1E-12	1.0E-06	NA	NA	NA	NA	NA	NA	NA	NA	1.1E-12	1.1E-12	1.1E-12	1.1E-12	2				

NOTE: To convert curies to becquerels use 1 Ci=3.7E+10 Bq and to convert millieiv to sieverts use 1 Sv=1.0E+05 mrem.

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Building	Room/Area	Stack ID	Operation	Releasables	Physical Inventory for Release (PI)	Physical Release	Stack Height (m)	Stack Diameter (m)	Stack Velocity (m/s)	Control Device	Control Device Approval	Control Device Region	Estimated Annual Emissions (kg)	Distance to Downwind Property (m)	Distance to MD (m)	Direction to MD	Equipment	Unsettled Emission	Downwind Category																
254	110	(continued)	Analysis of urea for releasables	U-115	3,05-13	1,00-03	6.1	1.07	5.3	None	None	None	1,00-03	1,070	1,035	SW	None	1,00-16	2																
				U-90	5,05-14	1,00-03							1,00-03																						
				U-91	5,05-14	1,00-03							1,00-03																						
				U-217	1,10-10	1,00-03							1,00-03																						
				U-218	1,10-10	1,00-03							1,00-03																						
				U-219	1,10-10	1,00-03							1,00-03																						
				U-220	1,10-10	1,00-03							1,00-03																						
				U-221	1,10-10	1,00-03							1,00-03																						
				U-222	1,10-10	1,00-03							1,00-03																						
				U-223	1,10-10	1,00-03							1,00-03																						
				U-224	1,10-10	1,00-03							1,00-03																						
				U-225	1,10-10	1,00-03							1,00-03																						
				U-226	1,10-10	1,00-03							1,00-03																						
				U-227	1,10-10	1,00-03							1,00-03																						
				U-228	1,10-10	1,00-03							1,00-03																						
254	115	PH-1000	Analysis of urea for releasables	PH-242	1,00-18	1,00-03	6.1	1.07	5.3	None	None	None	1,00-18	1,070	1,035	SW	None	1,00-16	2																
				PH-243	1,00-18	1,00-03																													
				PH-244	1,00-18	1,00-03																													
				PH-245	1,00-18	1,00-03																													
				PH-246	1,00-18	1,00-03																													
				PH-247	1,00-18	1,00-03																													
				PH-248	1,00-18	1,00-03																													
				PH-249	1,00-18	1,00-03																													
				PH-250	1,00-18	1,00-03																													
				PH-251	1,00-18	1,00-03																													
				PH-252	1,00-18	1,00-03																													
				PH-253	1,00-18	1,00-03																													
				PH-254	1,00-18	1,00-03																													
				PH-255	1,00-18	1,00-03																													
				255	105	PH-4							Analysis of urea for releasables							PH-125	2,34-08	1,00-03	6.8	0.30	5.1	None	None	None	2,34-08	790	790	W	None	1,00-11	2
PH-126	2,34-08	1,00-03																																	
PH-127	2,34-08	1,00-03																																	
PH-128	2,34-08	1,00-03																																	
PH-129	2,34-08	1,00-03																																	
PH-130	2,34-08	1,00-03																																	
PH-131	2,34-08	1,00-03																																	
PH-132	2,34-08	1,00-03																																	
PH-133	2,34-08	1,00-03																																	
PH-134	2,34-08	1,00-03																																	
PH-135	2,34-08	1,00-03																																	
PH-136	2,34-08	1,00-03																																	
PH-137	2,34-08	1,00-03																																	
PH-138	2,34-08	1,00-03																																	
281	100	PH-2	Thermal gas monitor calibration				PH-2	2,32-05	1,00-03	6.1	0.31	5.4		None	None	None	2,32-05	700	700	W	None	1,00-05							2						
				PH-3	2,32-05	1,00-03																													
				PH-4	2,32-05	1,00-03																													
				PH-5	2,32-05	1,00-03																													
				PH-6	2,32-05	1,00-03																													
				PH-7	2,32-05	1,00-03																													
				PH-8	2,32-05	1,00-03																													
				PH-9	2,32-05	1,00-03																													
				PH-10	2,32-05	1,00-03																													
				PH-11	2,32-05	1,00-03																													
				PH-12	2,32-05	1,00-03																													
				PH-13	2,32-05	1,00-03																													
				PH-14	2,32-05	1,00-03																													
				PH-15	2,32-05	1,00-03																													
				281	117A	PH-3	Thermal gas monitor calibration	PH-3	1,00-04				1,00-03				6.7						0.30	6.1	None	None	None	1,00-04		579	579	NE	None	1,00-10	2
PH-4	1,00-04	1,00-03																																	
PH-5	1,00-04	1,00-03																																	
PH-6	1,00-04	1,00-03																																	
PH-7	1,00-04	1,00-03																																	
PH-8	1,00-04	1,00-03																																	
PH-9	1,00-04	1,00-03																																	
PH-10	1,00-04	1,00-03																																	
PH-11	1,00-04	1,00-03																																	
PH-12	1,00-04	1,00-03																																	
PH-13	1,00-04	1,00-03																																	
PH-14	1,00-04	1,00-03																																	
PH-15	1,00-04	1,00-03																																	
281	1305	Room 4F	Thermal gas monitor calibration					PH-3	1,00-04	1,00-03	6.4	0.31	7.2	None	None	None		1,00-04	753	753	W	None						1,00-07	2						
								PH-4	1,00-04	1,00-03																									
				PH-5	1,00-04	1,00-03																													
				PH-6	1,00-04	1,00-03																													
				PH-7	1,00-04	1,00-03																													
				PH-8	1,00-04	1,00-03																													
				PH-9	1,00-04	1,00-03																													
				PH-10	1,00-04	1,00-03																													
				PH-11	1,00-04	1,00-03																													
				PH-12	1,00-04	1,00-03																													
				PH-13	1,00-04	1,00-03																													
				PH-14	1,00-04	1,00-03																													
				PH-15	1,00-04	1,00-03																													
				281	1307	PH-4	Thermal gas monitor calibration	PH-4	1,00-04	1,00-03							6.4	0.31					7.2	None	None	None	1,00-04			753	753	W	None	1,00-07	2
								PH-5	1,00-04	1,00-03																									
PH-6	1,00-04	1,00-03																																	
PH-7	1,00-04	1,00-03																																	
PH-8	1,00-04	1,00-03																																	
PH-9	1,00-04	1,00-03																																	
PH-10	1,00-04	1,00-03																																	
PH-11	1,00-04	1,00-03																																	
PH-12	1,00-04	1,00-03																																	
PH-13	1,00-04	1,00-03																																	
PH-14	1,00-04	1,00-03																																	
PH-15	1,00-04	1,00-03																																	
281	1311	PH-12	Solution preparation					PH-12	1,00-04	1,00-03	6.1	0.41	4.0	None	None	None			1,00-04	753	753	W					None	1,00-08	2						
								PH-13	1,00-04	1,00-03																									
								PH-14	1,00-04	1,00-03																									
				PH-15	1,00-04	1,00-03																													
				PH-16	1,00-04	1,00-03																													
				PH-17	1,00-04	1,00-03																													
				PH-18	1,00-04	1,00-03																													
				PH-19	1,00-04	1,00-03																													
				PH-20	1,00-04	1,00-03																													
				PH-21	1,00-04	1,00-03																													
				PH-22	1,00-04	1,00-03																													
				PH-23	1,00-04	1,00-03																													
				PH-24	1,00-04	1,00-03																													
				PH-25	1,00-04	1,00-03																													
				281	1329	PH-5	Radioactivity migration studies	PH-5	1,00-04	1,00-03							6.7	0.30	6.1				None	None	None	1,00-04				579	579	NE	None	1,00-08	2
PH-6	1,00-04	1,00-03																																	
PH-7	1,00-04	1,00-03																																	
PH-8	1,00-04	1,00-03																																	
PH-9	1,00-04	1,00-03																																	
PH-10	1,00-04	1,00-03																																	
PH-11	1,00-04	1,00-03																																	
PH-12	1,00-04	1,00-03																																	
PH-13	1,00-04	1,00-03																																	
PH-14	1,00-04	1,00-03																																	
PH-15	1,00-04	1,00-03																																	
PH-16	1,00-04	1,00-03																																	
PH-17	1,00-04	1,00-03																																	
PH-18	1,00-04	1,00-03																																	
PH-19	1,00-04	1,00-03																																	
281	1000	Room 4F	Consumption	PH-5	1,00-06	1,00-03	6.8	0.30	6.1	None	None	None	1,00-06	753	753	W	None	1,00-11	2																
				PH-6	1,00-06	1,00-03																													
				PH-7	1,00-06	1,00-03																													
				PH-8	1,00-06	1,00-03																													
				PH-9	1,00-06	1,00-03																													
				PH-10	1,00-06	1,00-03																													
				PH-11	1,00-06	1,00-03																													
				PH-12	1,00-06	1,00-03																													
				PH-13	1,00-06	1,00-03																													
				PH-14	1,00-06	1,00-03																													
				PH-15	1,00-06	1,00-03																													
				PH-16	1,00-06	1,00-03																													
				PH-17	1,00-06	1,00-03																													
				PH-18	1,00-06	1,00-03																													
				PH-19	1,00-06	1,00-03																													

NOTE: To connect cases to background use 1 (C-3), 7 (D) Bq and to connect releases to releases use 1 (S-1), 1 (S-2) mm.

Attachment 1 - 2002 LLNL NESHAPS Annual Report Spreadsheet

Building	Room/Area	Stack ID	Operation	Substance	Annual Inventory with Potential for Release (lb)	Physical State	Stack Height (ft)	Stack Diameter (in)	Stack Velocity (m/s)	Control Device(s)	Control Device Abatement Factor	Estimated Annual Emissions (lb)	Distance to Downwind Point (m)	Distance to Downwind Point (mi)	0.1 mm x 0.1 mm x 0.1 mm Downwind Concentration (mg/m ³)	Distance to Downwind Point (mi)	0.1 mm x 0.1 mm x 0.1 mm Downwind Concentration (mg/m ³)	Stack Category	
514	Exhaustor	(continued)		Am-123	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor	(continued)		Am-241	3.3E-06	1.0E-03						3.3E-06							
				Am-241	3.3E-06	1.0E-03								3.3E-06					
514	Exhaustor																		

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Building	Room/Area	Stack ID	Operation	Radionuclides	Radionuclides with Release (Ci)	Stack Height (m)	Stack Diameter (in)	Stack Velocity (m/s)	Control Device(s)	Control Device Efficiency Factor	Estimated Annual Emissions (Ci)	(Dose) (mSv) or (Mrem) or to SWMS	Direction to SWMS	Distance to MQ (m)	Stack Diameter to MQ (m)	Stack Velocity to MQ (m/s)	Estimated Annual Emissions (Ci)	Source Category
612	All WAA*	Area source	Dismantling in 512 yard and all LLNL Waste Accumulation Area (WAAA)	Ar-241	4.1E-10	1.0E-03	MA	MA	None	1	0.5E-09	NE	1.1E-03	276	89	3.6E-02	6	
				Ar-241	1.5E-11	1.0E-03	MA	MA	None	1	1.5E-11	1	1.5E-11	ESE	6.5E-09	969	W	3.1E-08
614	Open Area	Area source	Reprocessing operation	U-235	4.7E-03	1.0E-01	MA	MA	None	1	4.7E-03	W	2.8E-07	444	MA	MA	2.8E-07	3
				U-235	2.3E-07	1.0E-01	MA	MA	None	1	2.3E-07	1	2.3E-07	W	2.8E-07	444	MA	MA

NOTE: To convert values to Becquerels use 1 Ci=3.7E+10 Bq and to convert millirem to sieverts use 1 Sie=1.0E+03 mrem.

Attachment 1 - 2002 LLNL NESHAP's Annual Report Spreadsheet

Building	Room/Area	Unit ID	Operation	Substances	Annual Inventory with Potential for Release (CI)	Physical Stress Factor	Stack Height (m)	Stack Diameter (m)	Stack Velocity (m/s)	Control Device (Model #)	Control Device Abatement Factor	Estimated Annual Emissions (CI)	Distance to Downwind Street (m)	Distance to Maximum Downwind Street (m)	Direction of Max Wind	Maximum Downwind Street Emission Category																
The Southeast Quadrant of the Livermore Site has slightly elevated levels of Pu-239 in the surface soil and in (proximity from contamination). SITE 300 DIFFUSE SOURCES	Southeast Quadrant	Area Source	Manufacturing	Pu-239	NA	NA	NA	NA	NA	None	1	NA	0	NA	NA	6																
																	U-235	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
																	U-238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
																	U-234	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diffuse sources consist of transportation of depleted uranium and waste handling. Site 300	Open Area	Area Source	Soil recontamination	H-3	NA	NA	NA	NA	NA	None	1	3.1E-04	4668	5	N	5.1E-06	6															
																		U-235	NA													
																		U-238	NA													
																		U-234	NA													
EMISSOR SOURCES THAT ACCOUNT FOR MORE THAN 50% OF THE POTENTIAL EFFECTIVE DOSE EQUIVALENT AT EACH SITE.																																
LIVERMORE SITE SOURCES																																
612	Tand	Area Source	Storage of low level waste	H-3	NA	NA	NA	NA	NA	None	1	2.3E+00	444	NE	SW	2.4E-02	6															
331	AP	Stack 1 Stack 2	Tritium research and development Disassembly of parts	H-3	7	1	30	1.22	7.09	None	1	2.4E-02	337	DE	DE	5.1E-05	3															
514	Evaporator	Room AP	Waste consolidation	Various radionuclides	4.5E-03	1.0E-03	NA	NA	NA	None	1	4.2E-08	328	NE	SW	3.1E-03	1															
612	10C	Room AP	Laboratory analysis	Various radionuclides	4.2E-05	1.0E-05	NA	NA	NA	None	1	4.2E-08	444	NE	SW	1.9E-03	1															
331	Outside	None	Storage of contaminated parts	H-3	NA	1	NA	NA	NA	None	1	4.2E-08	337	DE	SW	5.0E-05	6															
SITE 300 SOURCES																																
651	Feing Table	None	Explosive tests	U-235 U-238 U-239	1.3E-02 2.8E-04 1.4E-03	1	NA	NA	NA	None	1	1.5E-01	3170	SE	WSW	2.0E-05	4															
504 300	All	Area Source	Soil recontamination	U-235 U-238 U-239	NA NA NA	NA NA NA	NA	NA	NA	None	1	3.3E-03	NA	NA	NA	NA	6															

NOTE: To convert cubic to kilograms use 1 Cu=3.216x10 kg and to convert millipascal to pascals use 1 Pa=1.0E+03 mpa.

ATTACHMENT 2. Surrogate Radionuclides List

The need for selection of a surrogate isotope occurs when an isotope used in operations (isotope of interest) is not contained in the limited nuclide library in the NESHAPs dose compliance model CAP88-PC. The selection of a suitable surrogate is based upon several criteria. If possible, a surrogate isotope is chosen from the CAP88-PC radionuclide library that has a metabolically similar behavior to the isotope of interest. Following an acute inhalation exposure, the metabolically similar surrogate would concentrate in the same specific organs and tissues as the isotope of interest. In most cases the surrogate selected possesses similar modes of decay and decay energies of the radiation type of the isotope of interest. Thus, the surrogate models the behavior of the isotope with similar relative biological effect due to deposition energy.

According to present knowledge, the daughter nuclides produced following physical decay are assumed to remain organ site specific and follow the translocation pathway of the parent. Therefore, when a surrogate of similar metabolic behavior is not available or has a greatly dissimilar half-life, the surrogate chosen is a daughter nuclide of the isotope of interest that will remain organ site specific and follow the translocation pathway of the parent.

Once a surrogate has been selected, the equivalent source term is adjusted by the product of the initial inventory of the isotope of interest and the ratio of the effective dose equivalent of the surrogate to that of the isotope of interest. For determining the dose ratio, the primary exposure pathway is assumed to be that of inhalation and inhalation dose conversion factors (International Commission on Radiological Protection Publication No. 71, "Age-dependent Doses to Members of the Public from Intake of Radionuclides: Part 4 Inhalation Dose Coefficients," Elsevier Science Ltd., 1996) are used for determination of the effective dose equivalents.

In addition, isotopic analysis of mixtures of radionuclides are not always available, and radionuclide usage inventories are stated as "gross alpha," "gross beta," "gross gamma," or "mixed fission products" (MFP). In these cases, ^{239}Pu is used as the surrogate for gross alpha, ^{137}Cs is used as the surrogate for gross gamma, and ^{90}Sr is used as the surrogate for gross beta and mixed fission products to provide conservative dose estimates.

Table 2-1 provides a list of radionuclides not in the CAP88-PC library and their respective surrogates.

Table 2-1. List of surrogate radionuclides.

Isotope	Half-Life	Lung Class ^a	ALI (inh) μCi	DAC (inh) $\mu\text{Ci}/\text{m}^3$	Surrogate	Half-Life	Lung Class ^a	ALI (inh) μCi	DAC (inh) $\mu\text{Ci}/\text{m}^3$
Ca-108m	127 y	Y	2.0×10^1	1.0×10^{-8}	Co-60	5.271 y	Y	3.0×10^1	1.0×10^{-8}
Bi-207	38 y	W	4.0×10^2	1.0×10^{-7}	Bi-214	19.9 min	W	9.0×10^2	4.0×10^{-7}
Ca-45	163 d	W	8.0×10^2	4.0×10^{-7}	Sr-90	29.12 y	D	2.0×10^1	8.0×10^{-9}
Cd-109	464 d	Y	1.0×10^2	5.0×10^{-8}	Co-60	5.271 y	Y	3.0×10^1	1.0×10^{-8}
Cf-249	350.6 y	Y	1.0×10^{-2}	4.0×10^{-12}	Cm-245	8500 y	W	6.0×10^{-3}	3.0×10^{-12}
Cf-250	13.1 y	W	9.0×10^{-3}	4.0×10^{-12}	Am-241	432.2 y	W	6.0×10^{-3}	3.0×10^{-12}
Cl-36	3.01×10^5 y	W	2.0×10^2	1.0×10^{-7}	Cs-137	30 y	D	2.0×10^2	6.0×10^{-8}
Es-254	275.7 d	W	7.0×10^{-2}	3.0×10^{-11}	Pu-239	24065 y	Y	2.0×10^{-2}	7.0×10^{-12}
Eu-149	93.1 d	W	3.0×10^3	1.0×10^{-6}	Pm-151	28.4 hr	Y	3.0×10^3	1.0×10^{-6}
Gd-148	93 y	D	8.0×10^{-3}	3.0×10^{-12}	La-140	40.272 h	W	1.0×10^3	5.0×10^{-7}
Os-185	94 d	D	5.0×10^2	2.0×10^{-7}	Mo-99	66 h	Y	1.0×10^3	6.0×10^{-7}
P-33	25.4 d	W	3.0×10^3	1.0×10^{-6}	P-32	14.29 d	D	9.0×10^2	4.0×10^{-7}
Re-184	38 d	W	1.0×10^3	6.0×10^{-7}	Mo-99	66 h	Y	1.0×10^3	6.0×10^{-7}
Se-75	119.8 d	W	6.0×10^2	3.0×10^{-7}	As-76	26.32 h	W	1.0×10^3	6.0×10^{-7}
Sr-85	64.8 d	D	3.0×10^3	1.0×10^{-6}	Sr-90	29.12 y	D	2.0×10^1	8.0×10^{-9}
Ta-182	115 d	Y	1.0×10^2	6.0×10^{-8}	Hf-181	42.4 d	W	4.0×10^2	2.0×10^{-7}
Tb-157	110 y	W	3.0×10^2	1.0×10^{-7}	La-140	40.272 h	W	1.0×10^3	5.0×10^{-7}
Tb-158	180 y	W	2.0×10^1	8.0×10^{-9}	La-140	40.272 h	W	1.0×10^3	5.0×10^{-7}
Tl-204	3.78 y	D	2.0×10^3	9.0×10^{-7}	Pb-214	26.8 min	D	8.0×10^2	3.0×10^{-7}
Tm-168	93.1 d	W	2.0×10^3	8.0×10^{-7}	La-140	40.272 h	W	1.0×10^3	5.0×10^{-7}
Tm-171	1.92 y	Y	3.0×10^2	1.0×10^{-7}	La-140	40.272 h	W	1.0×10^3	5.0×10^{-7}
Y-88	106.64 d	Y	2.0×10^2	1.0×10^{-7}	Y-90	64 h	Y	6.0×10^2	3.0×10^{-7}
Am-244	10.1 h	W	2.0×10^2	8.0×10^{-8}	Cm-244	18.11 y	W	1.0×10^{-2}	5.0×10^{-12}
Au-195	183 d	Y	4.0×10^2	2.0×10^{-7}	Ba-133	10.74 y	D	7.0×10^2	3.0×10^{-7}
Co-56	78.76 d	Y	2.0×10^2	8.0×10^{-8}	Co-60	5.271 y	Y	3.0×10^1	1.0×10^{-8}
Gd-146	48.3 d	W	3.0×10^2	1.0×10^{-7}	Sm-147	1.06×10^{11} y	W	4.0×10^{-2}	2.0×10^{-11}
Kr-85	10.72 y	Gas	See Note	1.0×10^{-4}					
Rh-102	2.9 y	Y	6.0×10^1	2.0×10^{-8}	Rh-106m	29.9 s	Y	4.0×10^4	1.0×10^{-5}
U-239	23.54 min	Y	2.0×10^5	6.0×10^{-5}	U-240	14.1 h	Y	2.0×10^3	1.0×10^{-6}
Zr-90	809 ms	W	N/A	N/A	Y-90	64 h	Y	6.0×10^2	3.0×10^{-7}
Po-209 ^b	102 y	N/A	N/A	N/A	Pu-239	24065 y	Y	2.0×10^{-2}	7.0×10^{-12}

Note: The DAC for Kr-85 also has been relaxed considerably since its beta emission only irradiates the skin. The DAC is based on limitation of non-stochastic effects in the skin; the MPC was derived assuming that the beta particles of energy greater than 0.1 MeV contributed to the whole body dose.

^a D = days, W = weeks, Y = years.

^b No ALI or DAC information available. Pu-239 used to provide a conservative alpha-emitter dose.

Source: Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion, Federal Guidance Report No. 11, EPA-520/1-88-020, U.S. Environmental Protection Agency, 1988.

Mr. Jack Broadbent, Director
Air Division, U.S. EPA Region IX

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Understanding between the U.S. EPA and the U.S. DOE¹ concerning NESHAPs expressly states that the use of environmental measurements of radionuclides at critical receptor locations is "particularly appropriate . . . for facilities with minor emission points (of the periodic confirmatory type) and/or diffuse sources as primary contributors to dose."

EPA has, in fact, granted facilities permission to demonstrate compliance with NESHAPs when the conditions in 40 CFR 61.93(h)(5) are met. The opinion allowing certain operations at the Oak Ridge National Laboratory has been documented on the EPA's web page on the Internet.² The Fernald Environmental Management Program and the Mound Plant, with EPA concurrence, have also implemented a NESHAPs compliance demonstration program based on ambient air monitoring.

Secondly, monitoring data provide a better starting point for dose estimates. Air samplers can be placed at or near the location where an individual can be exposed, and air samplers provide measurements of the real concentrations at that location. In contrast, modeling results are estimates of the concentration averaged over an area specified by the model. Moreover, it is important to keep in mind that models are validated, i.e., their accuracy determined, by comparison of modeled results with monitoring data. CAPSS-PC, the EPA-approved model currently used to demonstrate NESHAPs compliance, was verified by comparing the environmental monitoring data at five sites with the model predictions. In net effect, the doses calculated for NESHAPs compliance provide a retrospective look at the actual effects of a facility. Monitoring data from continuous ambient air monitors are an excellent source of information about the actual concentrations of radionuclides in air. In fact, LLNL regularly includes in its annual NESHAPs reports a comparison of modeling and monitoring results for the principal emitted radionuclide, tritium, and the comparison shows that model results generally over predict air concentrations at the site perimeter.

Finally, LLNL has collected and measured very low levels of specific nuclides in the ambient air since 1971. Air samplers are currently in use to evaluate diffuse radionuclide emission sources at LLNL for which inventory data is unavailable. It is worthy of note that, for the years 2000 and 2001, diffuse sources (rather than continuously monitored major point sources) have been major contributors to dose at the LLNL Livermore site, accounting for more than one-half of the total dose calculated for the site, and that 40% or more of the total dose calculated for the Livermore site for those two years was based on ambient air measurements.

¹ Memorandum of Understanding Between the U.S. Environmental Protection Agency and the U.S. Department of Energy concerning the Clean Air Act Emission Standards for Radionuclides 40 CFR Part 61 including subparts H, I, Q & T. Signed by the Environmental Protection Agency, September 29, 1994, and by the Department of Energy, April 5, 1995.

² Memorandum, Frank Marciniwski, Division Director, Radiation Protection Division, Office of Radiation and Indoor Air, Environmental Protection Agency to Regional Radionuclide NESHAPs Coordinators, Regions IX, "Criteria to Determine Whether a Licensed Facility At IXIE is Subject to Subpart H," January 26, 2001 (Found at Applicability Determination Index, Determination Detail Control Number 201004, <http://index.sdc.moses.com/occa/ix/adi/html/201004.htm>). IAMA03-021

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Air Division, U.S. EPA Region IX

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40 CFR 61.93(b)(5) allows the use of air samplers to obtain "environmental measurements of radionuclide air concentrations at critical receptor locations as an alternative to air dispersion calculations in demonstrating compliance" when criteria are established. These criteria, a summary of how they will be met by LLNL, supporting LLNL procedures, as paper copy of the air surveillance monitoring chapter of the LLNL Environmental Report 2001, and a compact disk of the entire LLNL Environmental Report 2001 are submitted with this letter.

LLNL has demonstrated compliance with radionuclide NESHAPs since 1990. At all times, the doses from LLNL operations have been well below the 10 mrem standard. For the Livermore site, the doses have ranged from a high of 0.240 mrem in 1990 to a low of 0.017 mrem reported for calendar year 2001. For Site 300, the doses have ranged from a high of 0.081 mrem in 1994 to a low of 0.019 mrem in 2000. Approval of this application will allow LLNL to make stack monitoring of sources with a potential to emit greater than 10% of the standard the primary focus of its NESHAPs compliance efforts, rather than the current focus on collecting inventory data and modeling nearly 200 sources that account for less than 1% of the total dose consequences from LLNL operations.

We look forward to discussing with you in more detail how our existing monitoring program meets the requirements of 40 CFR 61.93(b)(5) for demonstrating compliance with NESHAPs for minor point sources. Please contact Art Biermann, 925-422-6017 for further information.

Sincerely,



C. Susi Jackson, Director
Operations and Regulatory Affairs Division

Attachments:

Six Criteria for Use of Environmental Measurements
Air Tritium Sampling Procedure
Air Particulate Sampling Procedure
Air Particulate Sampler Calibration Procedure
Air Surveillance Monitoring Chapter (SAER 2001)
Ambient Air Monitoring Chapter (SAFR 2001)
SAER 2001 CD

cc:

Biermann, A. L-629
Gallegos, G. L-629
Harrach, B. L-629
Lessler, R. EPA IX
Mishra, V. DOE
Raber, E. L-626
Rauhut, K. L-701
Tripodes, J. L-626
DCC

LAMAB002



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-2901

April 22, 2003

Ms. C. Sue Jackson, Leader
Operations and Regulatory Affairs Division
Lawrence Livermore National Laboratory
Environmental Protection Department, University of California
P.O. Box 808, Livermore, CA 94551-9900

**Subject: Request for Authorization to Use Surveillance Monitoring to Demonstrate
Radionuclide NESHAPs Compliance for Minor Emissions Points**

Dear Ms. Jackson:

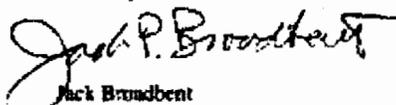
We have reviewed your letter and attachments of March 5, 2003 requesting approval to use surveillance monitoring for minor emission points. In accordance with the provisions of the Clean Air Act and 40 CFR Part 61, Subpart H, your request has been approved.

We request that emissions be closely monitored, identified, and quantified during the use of the approved alternative method, and that the monitoring procedure and related data be kept on file for review by EPA.

This alternative method may be used immediately after this approval is received by the Lawrence Livermore National Laboratory.

If you have any questions, please contact Dick Lessler, at (415) 947-4197.

Sincerely,


Jack Broadbent
Director, Air Division

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