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NATIONAL LABORATORY
EST. 1943

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ESHID-603412

Symbol: EPC-DO: 19-137
LA-UR: 18-26283
Locates Action No.: N/A
Date: MAY 17 2019

Mr. George P. Brozowski
Regional Health Physicist / Radon Coordinator
Multimedia Division
U. S. Environmental Protection Agency, Region 6
1445 Ross Ave, 6-MM-XU, Suite 1200
Dallas, TX 75202

Subject: Transmittal of Application for Pre-Construction Approval and Notice of Intent to Start Operations under 40 CFR 61 Subparts A and H for Venting of Flanged Tritium Waste Containers (FTWCs) at TA-54

Dear Mr. Brozowski:

Please find attached to this memo an Application for Pre-Construction Approval under 40 CFR 61 Subparts A and H for venting operation of the Flanged Tritium Waste Containers (FTWCs). This application meets the criteria in the Radionuclide NESHAP, that portion of the Clean Air Act which regulates airborne emissions of radionuclides from DOE facilities, and is required under 40 CFR 61.07 and 40 CFR 61.96. This application is virtually identical to that which you approved in a memo dated September 25, 2018. Due to delays in Laboratory operations, construction did not commence within the 180 day window provided in that memo; consequently, we are again requesting approval for this operation. Note that due to the rapid turnaround expected on this operation, this letter also serves as a Notice of Intent to Start Operations under 40 CFR 61.09(a)(1). The anticipated start date for these venting operations is June 17, 2019, or as soon as possible after the date when EPA Pre-Construction approval is received.

The subject of this application is proposed plans to vent the headspace gas of four containers, called Flanged Tritium Waste Containers (FTWCs), which are located at TA-54 Area G, Building

1028. The FTWCs are used for storage of tritium-contaminated waste. The headspace gas contents of these FTWCs may contain hydrogen and oxygen in hazardous concentrations, requiring venting in-place before the FTWCs can be further handled for waste processing. The venting operation is expected to release a fraction of the FTWC tritium contents as well.

Using worst-case operational data and assuming that 100% of the FTWC tritium contents are released, the maximum uncontrolled dose from this venting operation is 20.2 millirem per year. When credit for emissions control systems and more realistic release scenarios are considered, the actual off-site dose from these venting operations is expected to be less than 6 millirem per year. While this is higher than the annual dose reported in recent years, the benefit of removing this risk offsets the short-term increase in off-site dose.

The Application attached is an updated version of the document approved in September 2018, with only minor changes. These updates include:

- Updating schedule information on page 3, as indicated in this memo.
- Removing specific references to a "getter bed" as an emissions control system and an associated removal efficiency. While the project will use an emissions control system, the exact equipment to be used is still being determined. The project will use either a getter bed or molecular sieve system.
- Decay-correcting tritium inventory to June 1, 2019; this reduces total activity and subsequent off-site doses by about 7% below levels in the 2018 application. These changes are on pages 9-11, and Tables 1, 2, and 3 of the Application.
- The emissions exhaust and monitoring system described in Attachment B has slightly changed. The exhaust system will simply be inserted through the open door of Building 1028 during venting operations, rather than penetrating through the building wall. The new "Overhead View" illustration in Attachment B represents current plans.

This venting operation will be equipped with an emissions monitoring system that meets 40 CFR 61 Appendix B, Method 114 criteria, and the sampling system will be tested to meet location siting criteria in ANSI N13.1. Due to the potentially hazardous conditions at Building 1028 prior to venting, the required flow characterization testing will likely be done at an alternate location using the "similar design" criteria process in ANSI N13.1 Section 5.2.

In addition to source emissions monitoring, there are a variety of ambient air samplers located around Technical Area 54 and at public receptor locations in the White Rock community near TA-54. These stations are part of the LANL Airnet program, and continuously measure the ambient air for airborne particulates and tritiated water vapor.

Due to the very short-term nature of this project, a formal Emissions Management Plan will not be developed per usual LANL procedure. Rather, upon completion of the venting activities, Rad-NESHAP personnel will evaluate effects of the venting and off-site dose consequence on other LANL operations. We will communicate the results of the venting operations to you either as part of the Notice of Actual Startup or via telephone and email.

If you have questions or comments, please contact David Fuehne of LANL's Environmental Compliance Programs Group, or Adrienne Nash of NA-LA. Mr. Fuehne can be reached by email at davef@lanl.gov or by phone at (505) 699-5619; Ms. Nash can be reached by email at adrienne.nash@nnsa.doe.gov or by phone at 505-665-5026.

Sincerely,

Enrique "Kiki" Torres
Division Leader
Environmental Protection & Compliance
Triad National Security, LLC

Sincerely,

Peter Maggiore
Deputy Assistant Manager
National Nuclear Security Administration
U.S. Department of Energy

ET/PM/DF:jdm

Attachment(s): Attachment 1 Application for Pre-Construction Approval under 40 CFR 61 Subparts A and H for Venting of Flanged Tritium Waste Containers (FTWCs) at TA-54

Copy: Adrienne Nash, NA-LA, adrienne.nash@nnsa.doe.gov, (E-File)
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Attachment 1

Application for Pre-Construction Approval under 40 CFR 61 Subparts A and H for Venting of Flanged Tritium Waste Containers (FTWCs) at TA-54

EPC-DO: 19-137

LA-UR-18-26283

Date: MAY 1 7 2019

Application for Pre-Construction Approval
under 40 CFR 61 Subparts A and H
for
Venting of Flanged Tritium Waste Containers (FTWCs) at TA-54

Los Alamos National Laboratory (LANL)
Radionuclide NESHAP[1] Compliance Program

1. Name & Address

Department of Energy Offices

Site Owner

U. S. Department of Energy
Environmental Management
Los Alamos Field Office
1900 Diamond Drive, MS M984
Los Alamos, NM 87544

Program Owner

U. S. Department of Energy
National Nuclear Security Administration
Los Alamos Field Office
3747 West Jemez Road, MS A316
Los Alamos, NM 87544

Operator Point-of-Contact:

Radionuclide NESHAP Program
Environmental Protection and Compliance Division
Compliance Programs Group, EPC-CP
Los Alamos National Laboratory
P. O. Box 1663, MS J978
Los Alamos, NM 87545

Collectively, the Owners and Operator are referred to herein as "the Applicants."

[1] National Emissions Standards for Hazardous Air Pollutants – Radionuclides. Title 40 of the Code of Federal Regulations, Part 61, Subpart H. "National Emissions Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities." Referred to as Rad-NESHAP. Compliance with this regulation at LANL is managed by the Environmental Protection and Compliance Division - Compliance Programs Group, EPC-CP.

2. Location of Source

Los Alamos National Laboratory (LANL)
Technical Area 54, Building 1028
Materials Disposal Area G
Los Alamos, NM 87545

A larger scale map of the LANL site in relationship with nearby communities appears in Attachment 1. A near-field map showing TA-54 and Building 1028 and the White Rock town site appears below. Building 1028 is in the southwest corner of LANL's Materials Disposal Area G.

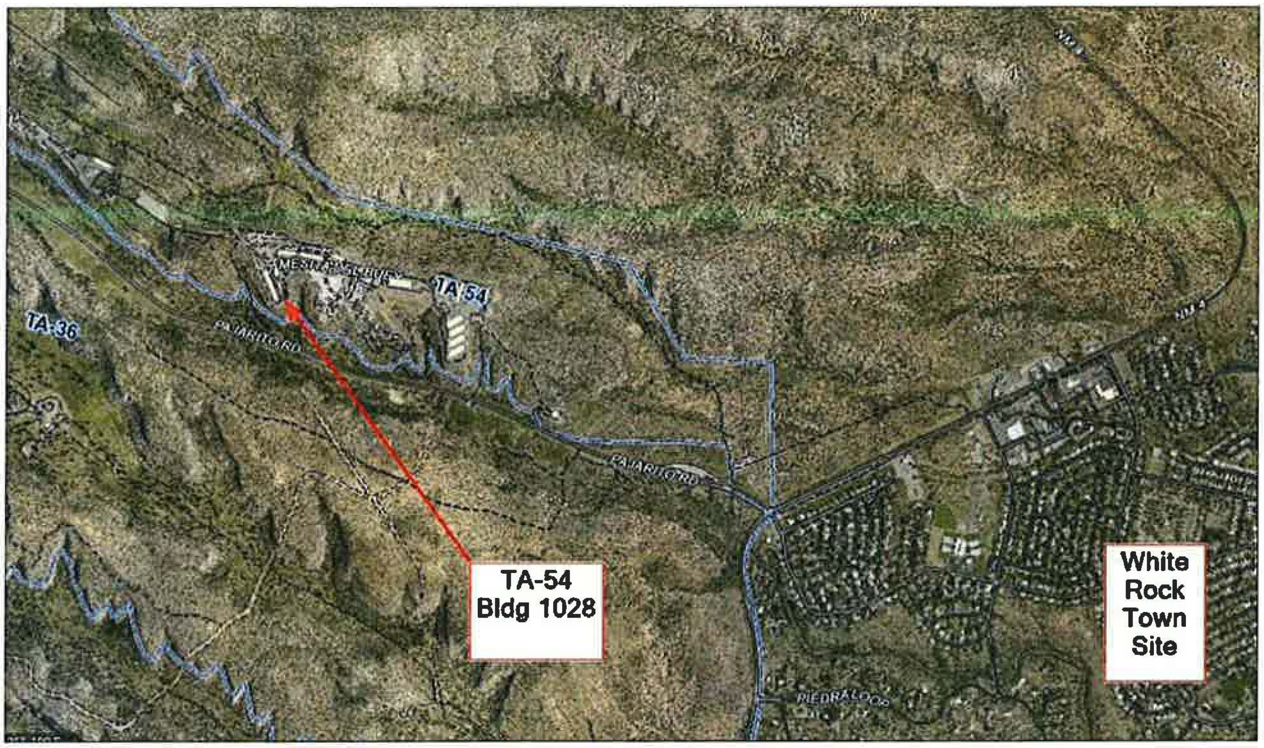


Figure 1
Map of TA-54 Building 1028 and Nearby Communities

3. Technical Information

a. Nature of the project

[Note: Refer to Appendix C for explanations of acronyms and other references.]

This project will vent headspace gases from specialized high-pressure storage vessels, called Flanged Tritium Waste Containers, or FTWCs. These containers are located in LANL's TA-54, Building 1028. The FTWC headspace gas contains hydrogen and oxygen, accompanied by radioactive tritium which will be vented along with the headspace gases. The tritium may be in the form of water vapor or as elemental hydrogen gas. There are four FTWCs with significant tritium inventory, called out later in this document; other containers within Building 1028 are not part of this Application.

The FTWCs at TA-54 contain tritium-contaminated metal parts and molecular sieve media, which is a pebble-like material used to absorb water vapor from exhaust air streams. This molecular sieve media inside the FTWCs is contained in metal canisters, along with some loose media material in bags. Over time, tritiated water vapor that had been adsorbed onto the media can become liberated into the FTWC headspace. Radiolysis can cause separation of the water vapor, possibly resulting in a hazardous hydrogen-oxygen mixture within the FTWC.

The Applicants have determined that continued tritium storage in these containers could pose an unsafe condition. To mitigate this hazard, the FTWCs will be vented in-place to remove hazardous gases.

A vent manifold has been developed for use on FTWCs at other LANL sites. This vent manifold will connect to the top of the FTWC and open a release path through an existing port in the FTWC lid. Headspace gas inside the FTWC will be sent through a tritium capture system called a "getter bed." The getter bed will capture available tritium in the gas stream, which will then be directed into an exhaust duct system equipped with an emissions monitoring system. This monitored exhaust line will be set up at Building 1028 for this venting operation and is not a permanent feature of the building.

For this project, the Applicants are defining the start of construction as the beginning of modifications of Building 1028 to support this venting process. These modifications are expected to take less than 14 days to complete.

The venting operation is expected to take place in the summer of 2019, starting June 17, 2019 at the earliest. There will be a series of operational readiness reviews prior to activities commencing.

The Applicants must provide EPA with a 60-day approval window[2] prior to the start of construction, and must also provide EPA a Notification of Anticipated Startup[3] of operations between 30- and 60-days before the start of operations. Due to the compressed timeline of this activity, this application also constitutes formal Notification of Intent to start operations. The Applicants have been and will continue to be in frequent communication with EPA Region 6 on this operation.

This Application for Pre-Construction Approval only addresses the venting process at TA-54. Further processing activities will be addressed by subsequent Applications if needed. The FTWCs also contain some RCRA-regulated lead waste; handling of this material is also outside the scope of this Application.

[2] Title 40 of the Code of Federal Regulations, Part 61, Section 61.08(a). Approval of construction or modification.
[3] Title 40 of the Code of Federal Regulations, Part 61, Section 61.09(a)(1). Notification of startup.

b. Description of proposed facility

Materials Disposal Area G is a 63-acre site within LANL's TA-54, designated for subsurface disposition and retrievable storage of low-level radioactive waste and certain other waste types. The site consists of active and inactive subsurface units that include pits, shafts, and trenches with depths ranging from 10 to 65 feet below the original ground surface. Minimal waste disposition is still ongoing at Area G. Other waste processing activities currently underway are dedicated to the characterization, removal, sorting, segregating, size-reduction, and repackaging of waste. An image of Area G showing Building 1028 appears below.

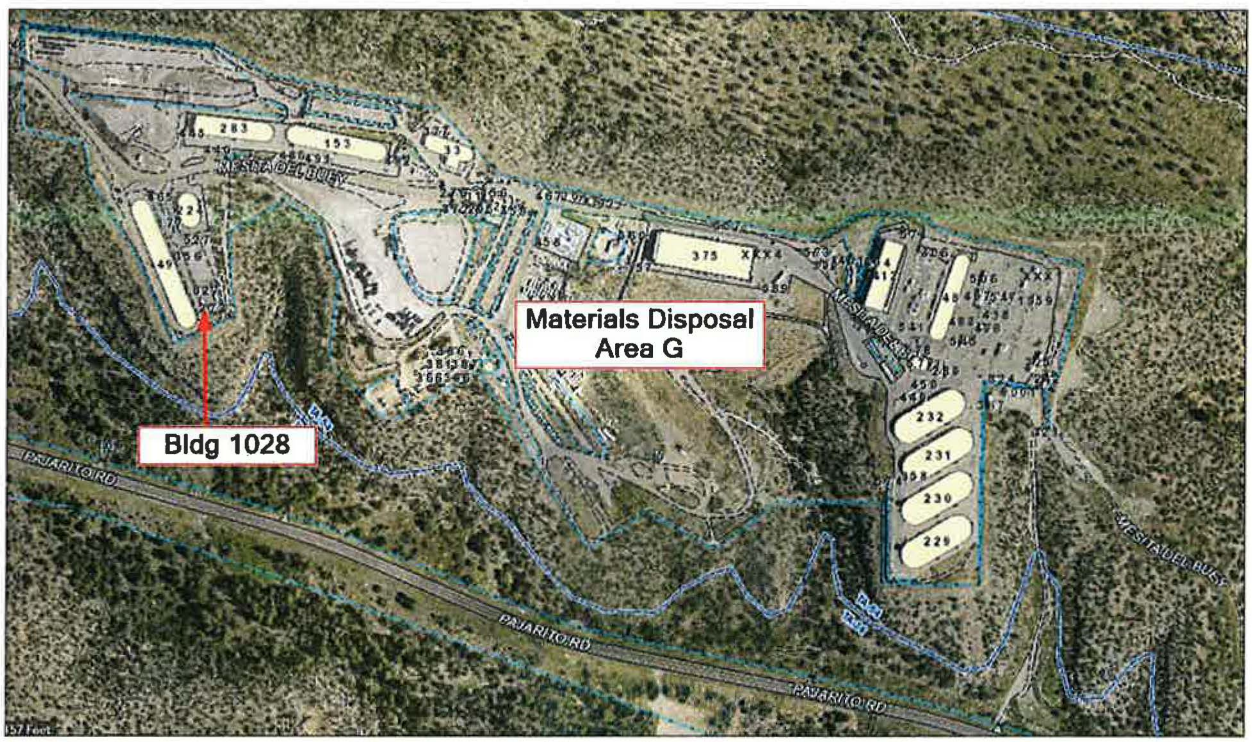


Figure 2
Map of TA-54 Materials Disposal Area G

Building 1028 is essentially a 10 foot by 24 foot shipping container that has been modified for long-term drum storage. It is equipped with an electrical panel, air conditioning, etc. There are four similar structures, clustered in a U-shape. Images of these buildings appear in Figure 3, shown on a LANL map and then a photograph of the cluster of buildings.

Figure 3
Images of TA-54 Building 1028

As shown in Figure 3, Building 1028 is currently equipped with ventilation louvers and electrical power. For the FTWC venting operation, an exhaust fan and ventilation duct will be temporarily installed at the building to provide controlled exhaust flow and emissions monitoring from the operation. See Attachment B for a proposed schematic of ventilation and monitoring.

c. Size of operation/facility

The FTWCs are each approximately 50 gallons in size. Each FTWC has been stored in an 85 gallon steel drum for ease of handling and disposal. The FWTC vessels are equipped with lifting rings and the lids have a central port that is sealed with a ¼" VCR[4] plug and gasket. Figure 4 shows examples of FTWCs.

Figure 4
Examples of Flanged Tritium Waste Containers (FTWCs)

The existing vent manifold used at WETF is shown in Figure 5. A leak-tight chamber is fitted over the port in the FTWC lid, providing containment for the headspace gases while the plug is loosened. The gases can then be released in a controlled manner through a metering valve attached to the vent chamber. A similar design will be used on the Area G FTWCs, with the central vent chamber connected to a collection system for tritium removal and an exhaust duct for emissions measurement.

[4] VCR stands for Vacuum Coupling Radiation, a type of fitting used for precision gas transfer systems.

Example of venting fixture to be used at Area G

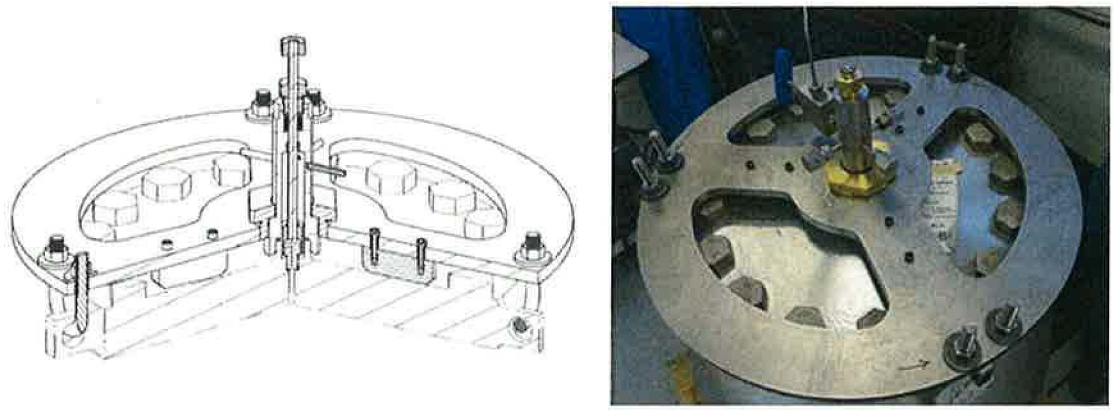


Figure 5
Example of FTWC Venting Fixture

d. Methods of operation

The general process for this operation is listed below. Changes may take place as process plans mature.

1. Activate the ventilation system to provide controlled exhaust and monitored emissions.
2. Operators enter Bldg 1028
3. Move localized ventilation duct over the FTWC being processed
4. Remove the outer 85-gallon drum lid
5. Attach the vent manifold to the FTWC
6. Leak test to ensure seal between vent manifold and FTWC
7. Connect the vent manifold to the exhaust duct
8. Loosen the VCR plug in the FTWC lid, allowing headspace gas into vent manifold chamber
9. Open the vent chamber bleed valve, allowing gas to flow through the control system into the exhaust duct
10. Continue venting until instruments indicate pressure equilibrium has been reached
11. Purge the FTWC headspace with an inert gas (e.g., nitrogen), if conditions allow
12. Re-seal FTWC and remove vent manifold
13. Re-attach 85-gallon lid
14. Move vented FTWC out of 1028 to allow access to next drum
15. Repeat for all remaining FTWCs

e. Emissions control equipment

The vent manifold will direct all headspace gases through a control system to remove tritium from the air stream. The control system, a getter bed or molecular sieve system, uses a high-surface area metal matrix to chemically bind with hydrogen/water and remove it from the gas stream. While removal efficiency of the getter bed can vary with flow rates and with operating temperature and pressure, experience at LANL indicates that such a system will remove a significant amount of tritium from the air stream.

f. Emissions monitoring equipment

The stack monitoring equipment will meet all requirements of 40 CFR 61 Subpart H. Installed monitoring equipment will be certified to meet design and sampling location criteria in ANSI/HPS N13.1-1999. A sample of the exhaust air stream will be extracted continuously during FTWC vent operations. The sample location will be certified under ANSI/HPS N13.1-1999. Note that due to the potential hazardous conditions of the work site, the venting and emissions monitoring systems will be designed using best practices, but commissioning tests on the system may be performed at a different LANL location or at Building 1028 after the FTWC mitigation is complete. Since the only pollutant of concern is tritium, aerosol mix testing is not required for this source.

The current emissions monitoring plans involve the use of a tritium bubbler system, a retrospective sampler which can discriminate between chemical species of tritium; e.g., tritiated water vapor (HTO) or elemental tritium gas (HT). Equipment availability may require alternative instruments; but whatever system used will meet criteria in 40 CFR 61, Appendix B, Method 114.

Additional monitoring systems may be used for operational indicators – for example, real-time indicating systems such as an ion chamber.

4. Emissions Calculations and Off-Site Dose Summary

a. Uncontrolled emission estimates and monitoring requirements

Calculations to determine the potential uncontrolled emissions from the venting operations are based on the following factors:

- 100% of the tritium is assumed to be liberated from the molecular sieve media and available for venting (an extremely conservative assumption);
- The tritium is in the form of water vapor (HTO);
- Tritium activity is based on waste inventory values, decay corrected to June 1st 2019. Container inventories are:

Table 1: FTWC Tritium Inventory TA-54, Building 1028	
Container	**Ci**
225	41,845
226	43,017
227	12,325
229	17,498
Bldg 1028 Total Inventory:	114,683 curies

- The air emissions from this radioactive material throughput are calculated using 40 CFR 61 Appendix D methodology, using a 100% release fraction for gaseous material;
- Total air emissions = 114,683 Ci/year throughput * 1.0 = 114,683 curies

Off-site dose impacts are calculated using CAP88-PC Version 4, the latest EPA-approved analysis code. CAP88 was used to generate a "millirem per curie" factor for a unit release (1.0 Ci) of tritium; this allows scaling of emissions and straightforward analysis of a variety of emissions scenarios. Table 2 contains the analysis and results of emissions and dose calculations. Input parameters for CAP88 and other calculation descriptions are contained in Attachment D.

The resulting uncontrolled off-site dose of 20.2 mrem/year meets the Subpart H threshold for continuous monitoring (0.10 mrem/year). Therefore, **continuous monitoring of airborne radionuclide emissions from the process is required.**

Table 2
Radioactive Materials Usage And Dose Summary
Uncontrolled Emissions and Off-Site Dose

Radionuclide	Inventory (Ci)	Release Fraction	Emissions Source Term (Ci/year)*	Dose Factor from CAP88 Model Run* (mrem/Ci)	Off-Site PEDE** (mrem/year)
Tritium H-3	114,683	1.0	114,683	1.76E-04	20.2
Total annual off-site potential dose from uncontrolled emissions					20.2 mrem

*CAP-88 Model run with emission source term of 1.0 Ci/year; see Appendix D for details.
** Off-site PEDE is calculated by multiplying emission source term by CAP88 dose factor.

The stack effluent will be sampled for radioactive constituents according to ANSI/HPS N13.1-1999. All radionuclides that may contribute greater than 10% of the PEDE[5] will be measured in accordance with §61.93(b)(4)(i). The process exhaust will be monitored for tritium, the only radionuclide present in the FTWC.

b. Controlled emissions estimates

Section (a) above and Table 2 is the analysis of *potential* emissions, without taking credit for any HEPA filters or other emissions controls. As mentioned in Section 3.e above, the exhaust gas stream will be equipped with a getter bed or molecular sieve emissions control system, which is expected to capture a significant portion of the tritium from the air exhaust. Since a getter bed is not a recognized emissions control system in 40 CFR 61 Appendix D, no official "controlled" emissions estimate and dose calculation is presented here. The controlled emissions estimate will be the same as uncontrolled emissions estimate in Table 2, above.

The controlled dose calculation is the driver for determining whether or not a source requires pre-construction notification and approval (this memo). Since potential emissions dose from the FTWC venting exceeds 0.1 millirem per year, pre-construction approval is required for this activity.

c. Estimate of actual anticipated emissions

The calculation in section 4(a) above, as summarized in Table 2, analyzes the worst-case scenario for operational throughput. These calculations use the maximum tritium activity and assumed 100% of the activity is liberated from the molecular sieve waste and will be vented from the FTWC.

This represents the upper bound on emissions that could come from the facility and establishes the operational envelope for the activity. However, it is informative to describe the level of emissions that is realistically anticipated from the FTWC venting.

[5] PEDE is the potential effective dose equivalent, the dose consequence from air emissions without taking credit for any emissions controls.

Table 3 below shows more realistic estimates of emissions based on varying the fraction of tritium inventory liberated from the molecular sieve bed and the getter bed estimated collection efficiency. It is anticipated by program subject matter experts that at least 50% of the tritium will remain on the molecular sieve material and NOT be airborne and subject to venting in this activity. A variety of scenarios are shown in Table 3.

Table 3
Annual Radioactive Materials Usage And Dose Summary

Anticipated emissions and off-site dose under different operating scenarios

Tritium Inventory (Ci)	Mol Sieve Fraction Liberated	Getter Bed Performance		Air Emissions (Ci)	CAP88 Dose Factor	Off-Site Dose (mrem/year)
		Removal	Transmittal			
114,683	50%	20%	80%	45,873	1.76E-04	8.07
114,683	10%	20%	80%	9,175	1.76E-04	1.61
114,683	75%	50%	50%	43,006	1.76E-04	7.57
114,683	50%	50%	50%	28,671	1.76E-04	5.05
114,683	100%	90%	10%	11,468	1.76E-04	2.02
114,683	50%	90%	10%	5,734	1.76E-04	1.01
114,683	10%	90%	10%	1,147	1.76E-04	0.20

The anticipated off-site dose from this operation ranges from 0.20 mrem up to just over 8 mrem. While this is higher than recent LANL-wide Rad-NESHAP compliance doses (0.47 mrem in 2017), it is still within the 10 mrem standard[6] established under the Radionuclide NESHAP. Also, the benefit of removing this potentially hazardous source term from LANL offsets the one year of elevated emissions.

5. Follow-up questions or comments

If more information is needed or if there are questions or comments, please notify one of the points-of-contact below.

Radionuclide NESHAP Team Leader: David Fuehne
505-699-5619
davef@lanl.gov

Federal Point of Contact (NA-LA): Adrienne Nash
505-665-5026
adrienne.nash@nnsa.doe.gov

[6] Under the Radionuclide NESHAP, emissions of airborne radionuclides from DOE facilities are limited to that which would cause less than 10 millirem per year to the maximally exposed individual member of the public.

ATTACHMENT A
Site Maps

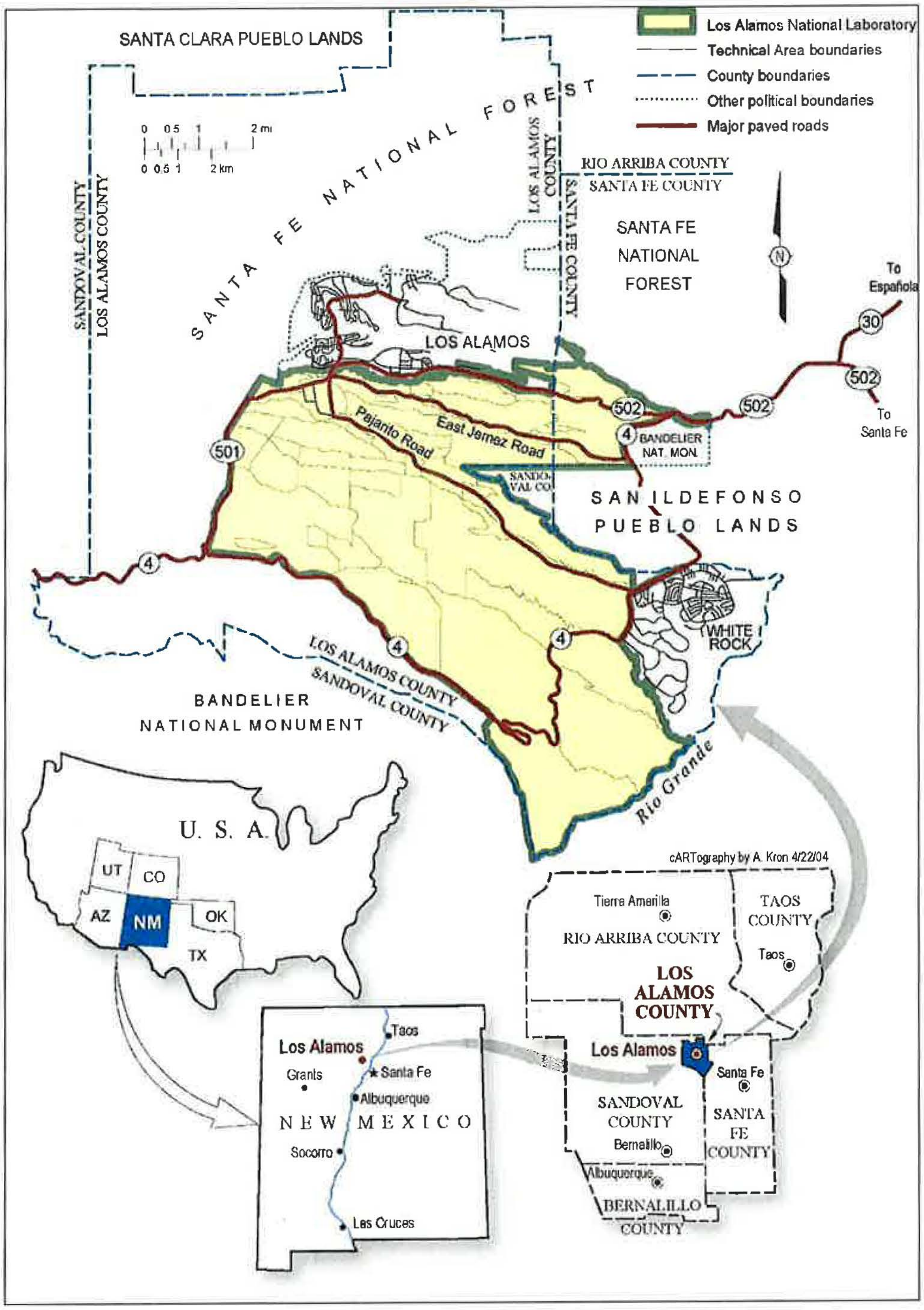


Figure A-1
Map of Los Alamos National Laboratory (LANL) on a national, state, regional, and county scale

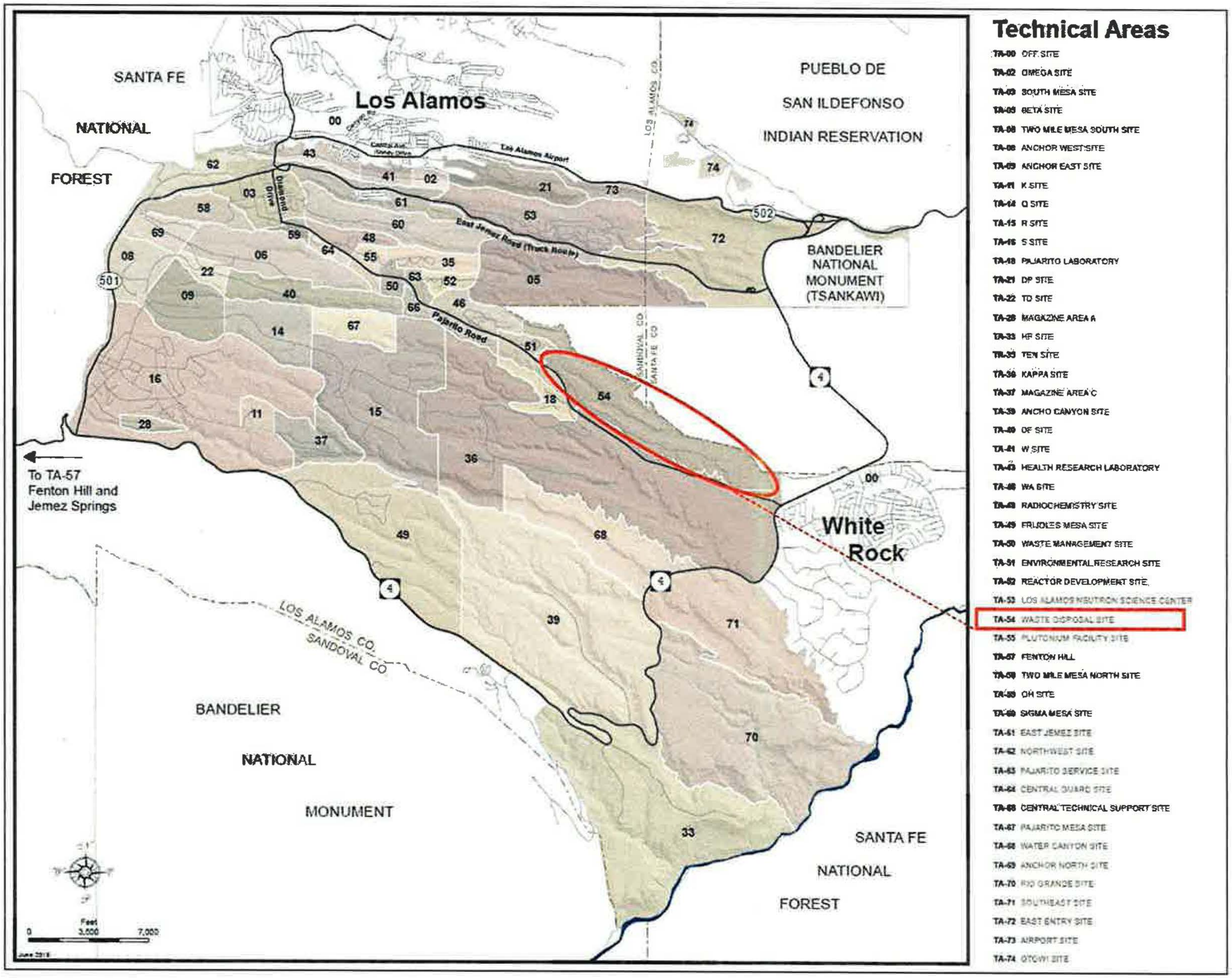
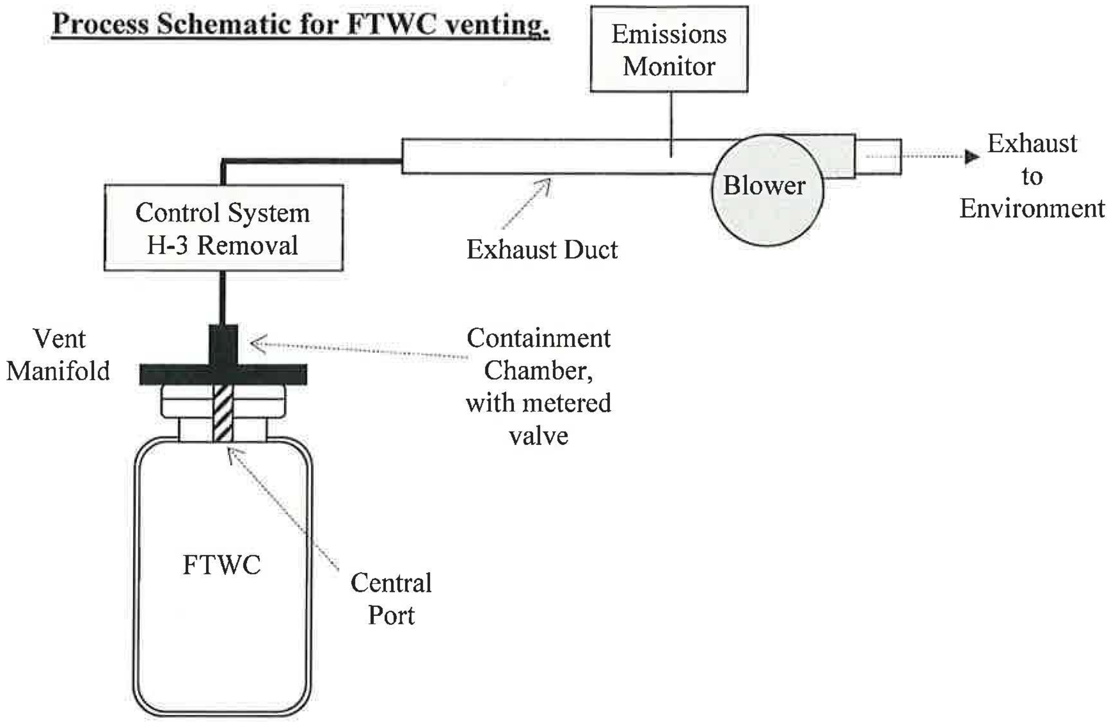


Figure A-2
Map of Los Alamos National Laboratory and TA-54

ATTACHMENT B

Process Schematic for FTWC venting.



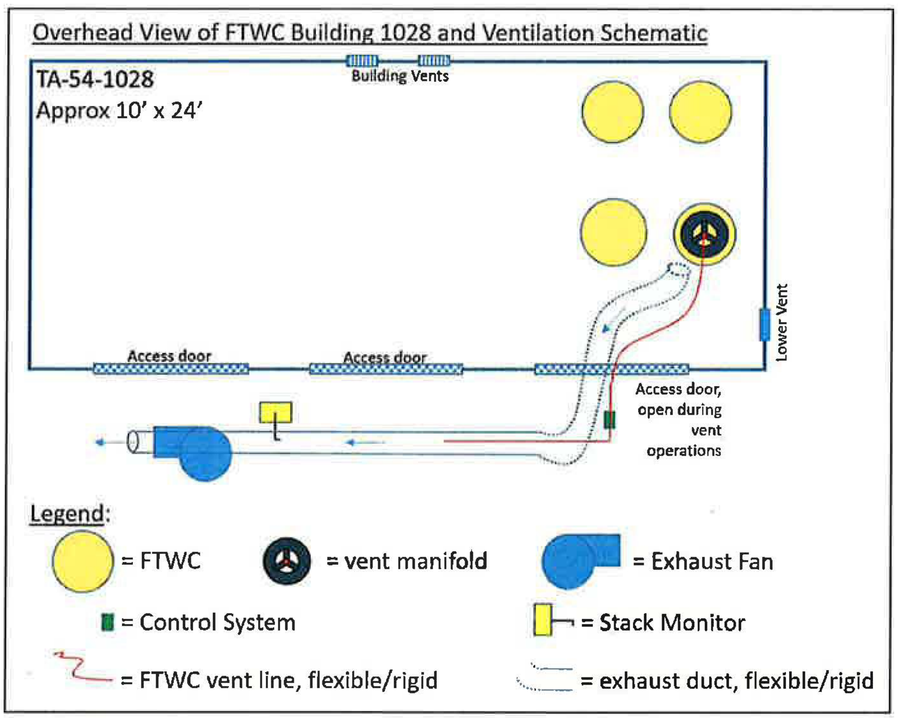


Figure B-1
Views of Planned FTWC Venting operations

ATTACHMENT C
Acronym List & Regulatory References

Rad-NESHAP	Radionuclide NESHAP. National Emissions Standards for Hazardous Air Pollutants, pertaining to emissions of Radionuclides from DOE facilities. Promulgated in 40 CFR 61, Subpart H.
ANSI/HPS N13.1-1999	American National Standards Institute/Health Physics Society, N13.1-1999. Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities. Incorporated by reference into 40 CFR 61, Subpart H.
CAA	Clean Air Act. Specifically, the Rad-NESHAP regulation
CEDE	Controlled Effective Dose Equivalent, radiological dose consequence from an activity, after taking credit for applicable emissions controls systems
CFR	Code of Federal Regulations
EM-LA	Environmental Management, Los Alamos Field Office; the Department of Energy office responsible for operating certain legacy waste cleanup operations at LANL
EPA	United States Environmental Protection Agency; LANL is regulated by Region 6 of the EPA
EPC-CP	Environmental Protection and Compliance Division-Compliance Programs Group. EPC-CP manages the Rad-NESHAP program for LANL.
FTWC	Flanged Tritium Waste Container. Vessel used to store tritium waste for disposal. Certified to high pressures, up to 300 pounds per square inch.
HEPA	High-Efficiency Particulate Air Filters, standard emissions control systems, used to remove particulate radioactive material from exhaust air streams.
LANL	Los Alamos National Laboratory
NA-LA	National Nuclear Security Administration, Los Alamos Field Office; the Department of Energy office responsible for management and operation of the majority of LANL facilities and programs
PEDE	Potential Effective Dose Equivalent; radiological dose consequence from an activity, without taking credit for any emissions controls systems
RCRA	Resource Conservation and Recovery Act. Federal regulations addressing the storage, handling, and treatment of hazardous waste.
RMUS	Radioactive Material Usage Survey
TA	Technical Area
VCR	Vacuum Coupled Radiation fitting, a type of fitting used for precision gas transfer systems

ATTACHMENT D
Supporting Documentation for Dose Calculations

CAP88 Input Parameters
TA-54-1028 FTWC Venting Operations

Distance to critical receptor	2195 meters to the East Southeast (ESE)
Wind file used	TA-54 Meteorological Tower Years 2007 through 2011
Annual precipitation	45 cm per year
Average ambient temperature	9 degrees Celsius
Mixing height	1600 meters
Average humidity	5.5 grams per cubic meter
Area of Source*	22 square meters
Source height*	0 meters
Plume rise*	0 m/sec, momentum
Agricultural data	Local
Other terms	CAP88 default values
Source term input	1.0 curie of H-3 (vapor phase, HTO) 1.0 curie of H-3 (gas/elemental phase, HT)
CAP88-derived dose factor**	1.76E-04 mrem/Ci of H-3 (vapor, HTO) 1.64E-04 mrem/Ci of H-3 (elemental/gas, HT)

For conservatism, we are assuming all H-3 is HTO vapor phase

* Note: Area of source estimated from Google Earth dimensions. Source height and plume rise assumed zero as conservative values. Horizontal releases will result in zero vertical plume rise.

** Note: The unit source term of one curie is used as a CAP88 input file to generate a "millirem per curie" factor. This factor is then multiplied by the actual source term of the operation to determine off-site dose from releases of radioactive material.

Dose Assessment Explanatory Notes

CAP88 Output

The CAP88 synopsis file will return a "millirem per year" value from the above calculation. Since this value assumes a unit source term (1.0 Ci), one can scale this number up or down to reflect the emissions level desired for calculation. The doses determined in Tables 1 and 2 illustrate these calculations. Since the values for HTO vapor and HT gas were very similar, we used the more conservative HTO millirem per curie value for all calculations in the document.

Assumed Release Fraction

Appendix D of 40 CFR 61 provides values of release fractions for different types of operations. These fractions are based on physical state of the processed material: gaseous, liquid, particulate, or solid. The typical assumption is to use the particulate release fraction (RF=0.001) for handling particulate radionuclides, and a gaseous release fraction (RF=1.0) for gaseous radionuclides and also used for tritium per LANL Rad-NESHAP policy.

Dose Calculation Procedures

LANL procedures ENV-ES-TP-501 and –511 were used to run CAP88. Input parameters selected were the most conservative values – e.g., those which result in the highest calculated off-site dose values. Input criteria for CAP88 are listed in Attachment D. CAP88-PC version 4 was used to calculate these values.

Dose assessment procedures are available on the EPC Division internal web site, at the following URL.

http://int.lanl.gov/org/padops/adesh/environmental-protection/quality-assurance/plans-procedures/all.shtml

General QA documents are also available on that site. For access outside the LANL firewall, please use the contact information in Section 5 above.