REPORT OF SURVEY OF THE LOS ALAMOS TRITIUM SYSTEMS TEST ASSEMBLY FACILITY

U.S. Department of Energy
Office of Environmental Management
&
Office of Science

Report of Survey of the Los Alamos Tritium Systems Test Assembly Facility

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1. Introduction

1.1 Purpose

The purpose of this document is to report the results of a survey conducted at the Los Alamos Tritium Systems Test Assembly (TSTA Facility). The survey was conducted during the week of 3/20/00.

The primary purpose of the survey is to identify facility conditions and issues that need to be addressed to transfer responsibility for the facility from the Office of Science (SC) to the Office of Environmental Management (EM). The second purpose is to provide EM with insight regarding the facility's risks and liabilities, which may influence the management of eventual downstream life-cycle activities.

The survey and this report are part of a process for implementing the requirements related to the disposition of excess facilities addressed in **DOE Order 430.1B, REAL PROPERTY & ASSET MANAGEMENT**, using the associated guidance for facility transition, deactivation, surveillance & maintenance, and decommissioning.

1.2 Facility Description

The TSTA facility consists of a TA-21-155 building laboratory area, supporting systems rooms, offices, and light laboratory space. Originally it was used for the Rover rocket program and for uranium processing prior to 1975. Its use since 1984 has been for experimentation with tritium related to the fusion program. The facility has been designated a moderate hazard nuclear facility. The facility is generally in very good physical condition.

The scope of transfer for the TSTA facility includes 13,500 ft^2 building space and contents as follows:

- TA-21-155 North, Room 550[2]. This 3,700 ft room is the main experiment area. It is a 95'x35' high bay and consists of a main floor and a mezzanine. Systems contained include those described below as Process Systems.
- TA-21-155 North, 11 rooms. These include 5,990 ft^2 of uncontaminated supporting lab space (Control room, support center, equipment rooms, power supplies, etc.) Systems contained include those described below as Support and Process Support Systems.
- TA-21-155 South, 12 rooms. These include 3,820 ft^2 adjoining office space and light-duty laboratory space.

The TSTA space is connected to other LANL facilities to the east by a breezeway. Boundaries for building are expected to be the footprint plus six feet in each direction, and any enclosed yards. Boundaries for utilities associated with the facility are expected to be the first source connection, exterior to the facility.

The main experimental area contains tritium and depleted uranium (the latter in hydride storage beds). There are 15 glove boxes in which experiments have been conducted, a control room for process and auxiliaries operation, a variety of support and cleanup systems, and a large capacity emergency room cleanup system that has never been used. A diesel generator is within one of the facility rooms (it is intended to be outside the near term scope of deactivation).

Systems within the facility are in the following types:

- Process Systems (Loop[1] and non-loop) – These are for the facility's recent mission and include a variety of systems used for simulation of tritium fuel processing for a fusion reactor and for other tritium experimentation.
- Support Systems – Utility services such as electrical, steam, ventilation, fire protection, communication, cooling water, breathing air, general vacuum, and nitrogen.
- Process Support Systems – Control room, backup power (diesel generator and uninterruptible power supply), tritium waste processing, gloveboxes, tritium monitoring, emergency air detritiation system, and solid waste.

The building is constructed of 8-inch concrete masonry block. The floors are 4-inch-thick concrete on grade. The roof over the main experimental area is sloped asphalt and gravel and is in good condition. The roof over the auxiliary and office area is 4-inch composite tile and plank P-300 over structural steel members and in fair condition.

1.3 Organization Representatives

Contacts in transferring and receiving organizations are:

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Albuquerque	Richard Nevarez
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1.4 Survey Participants				
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2. Summary, Conclusions & Recommendations

2.1 Comparison With LCAM Requirements

Characterization of the facility to identify and characterize hazardous and/or radioactive materials and wastes remaining is sufficient for transfer (one open item, **See Table 1**, Section 8). Surveillance and maintenance activities have been routinely performed to maintain the facility and its remaining hazards in a stable and known condition pending facility disposition.

For transfer, the primary stabilization activity is tritium removal that should be conducted to take advantage of existing cleanup systems that will be shut down and knowledge of the present staff regarding operation of the equipment and removal/disposal of tritium gas and tritium contaminated components.

There may be contamination residual from prior operations, however, such can only be determined during dismantling because if it is present, it would be embedded in floors, walls behind paint or wallboard.

2.2 Transfer Considerations

Transfer of the TSTA from SC to EM should be conducted with the following criteria for stabilization:

1. The bulk of the tritium will have been removed such that remaining amounts are considered contamination and not accountable material. After the present 129-gram inventory of mobile tritium has been removed, the remaining tritium will consist of contamination in experimental and process equipment. Forty to fifty items with significant gram-quantity contamination (metal getter beds, molecular sieve beds, cryopumps, and traps, oxidation beds, charcoal beds, oil filters, pump and compressor oil) will be disposed of as waste. The goal is to reduce the total tritium inventory to an amount that will allow re-classification to a radiological facility.
2. Other hazardous materials will have been removed or stabilized, specifically U-238 adsorption materials will be oxidized (or stabilized otherwise) and the power supply battery will be removed.
3. Special knowledge of the facility systems will not be required for remaining operations to perform deactivation, post-deactivation S&M, or decommissioning. Specifically, all operations requiring use of the Tritium Waste Treatment system will be completed and the control systems will not be needed for any operations. The control center will be systematically de-energized.
4. No systems or tanks, either fixed or portable, will remain pressurized. They will have been emptied or removed.

Specific details are provided under later discussion of conditions assumed for transfer and post-stabilization S&M.

2.3 Post-Transfer EM Path Forward & Management Risk

After transfer, the S&M cost can be further reduced by performing a fire hazards analysis, removing all loose combustibles, draining water systems, and deactivating the heating steam. Some sort of fire detection may be required. (Whether or not the fire protection analysis is done and the systems deactivated before or after transfer is a matter of management decision. It doesn't matter who does it from a results viewpoint. However, until SC agrees it is in their scope, the S&M estimate for these systems is necessarily included.)

Consideration should be given to performing a low level, but continuous ongoing D&D to remove gloveboxes and systems over the next several years. The rationale for doing so is:

- Availability of staff that know the facility and who are accustomed to dealing with tritium waste.
- Utilization of the 2-ton bridge crane, which is in good condition.
- Use of the exhaust ventilation while it is operable and before fan replacement would be required.

This mode of D&D is envisioned as an assigned crew, with supervision and health physics support, who remove components and gloveboxes for disposal on a week-by-week basis.

2.4 Post-Transfer S&M Reduction via Administrative Contamination Limit Revision

The current facility TSTA administrative limit for tritium contamination requiring cleaning is 1,000 dpm/100 cm^2. After transfer, an assessment should be conducted to see if S&M costs can be further reduced by raising this to the 10,000 dpm/100 cm^2 as allowed by DOE's Radiological Controls Manual (Chapter 2, Article 222), taking into account the requirements of Appendix D to 10 CFR 835. Until such a review is conducted, however, the S&M cost necessarily must be based on current practice.

Table 2 in the Radcon Manual, Summary of Contamination Values, gives the following values for tritium, tritium oxide, and tritium organic compounds:

- Removable: 10,000 dpm/100 cm^2
- Removable + Fixed: 10,000 dpm over area of the probe being used

Notes:

1. The values in Table 2-2 apply to radioactive contamination deposited on exposed surfaces of components and do not include radionuclides incorporated within the component's material. Where contamination by both alpha and beta-gamma emitting nuclides exists, the limits established for the alpha and beta-gamma emitting nuclides apply independently.

2. The amount of *removable* radioactive material per 100 cm^2 of surface area should be determined by swiping the area with dry filter or soft absorbent paper while applying moderate pressure and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. For objects with a surface area less than 100 cm^2, the entire surface should be swiped, and the activity per unit area should be based on the actual surface area. Except for transuranics, Ra-228, Ac-227, Th-228, Th-230, Pa-231 and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual contamination levels are below the values for removable contamination.
3. The levels may be averaged over 1 square meter provided the maximum activity in any area of 100 cm^2 is less than three times the values in Table 2-2.

2.5 Stable Metal Tritides Consideration During D&D

A review was conducted of radiological work practices and monitoring currently being used at Mound to address Stable Metal Tritides (SMT). SMT are tritium atoms bound to metals that can then be released during size reduction operations. They are difficult to detect prior to becoming airborne.

The reason for the review was to determine if the practices implemented at Mound would impact the D&D of other tritium contaminated facilities. The review concluded that current DOE radiological controls and practices for monitoring and worker protection being used at existing tritium facilities are sufficient to protect workers from exposure to SMT.

3. Survey Results

Table 1 - Survey Results

Subject of Survey	Summary
1. Facility Structure	In general, the overall structure is in good condition and well maintained. The building was constructed in 1968 and was stated to have a further life expectancy of 30 years. One location with indication of cracking was observed in the northwest corner above the mezzanine. One location was also noted where steam leak had degraded the wallboard covering in the room containing the non-radioactive support systems. Both of these are inconsequential and there is no concern about the structural integrity for several years. The sloped gravel roof over the main experimental area is in good condition. The flat built-up roof above the other rooms appears much older and will require ongoing maintenance, especially after building heat is turned off. Leakage occurs at the joint where the high bay experimental area adjoins the rest of the building. We were told that the in-leakage does not result in contaminated liquid waste, but runs off to the outside. This part of the roof will likely need replacement within ten years. A general housekeeping should be performed on the roof to remove all loose items (bucket, etc.).
2. Process Systems	There are a variety of experimental and associated storage and cleanup systems. The latter include vacuum, waste Treatment, emergency room cleanup. There are 15 gloveboxes with equipment, tubing, and instruments that contains tritium. In addition there is a class 4 laser in the facility. It is hazardous when operated.
3. Infrastructure and Support Systems	▪ Experimental area exhaust ventilation motor is relatively new. The fan itself is old. ▪ Fire protection is wet pipe. Condition is good. ▪ Heating steam – vintage is 1976 and is judged to have limited life without substantial ongoing maintenance. Steam heat is needed while the wet pipe fire protection is still required. ▪ The 2-ton bridge crane in experimental area is in good condition – consideration should be given to ongoing level of facility dismantlement while this crane is available. ▪ Contaminated floor drain system goes via underground pipe to collection area outside. Pumped from there to waste processing. Conditions are unknown, but stated to be

	satisfactory. ▪ City water, house vacuum, compressed air, chilled water, etc. appear to be well maintained.
4. Nuclear Safety & Materials	Not applicable.
5. Hazardous Material	▪ Backup batteries, Freon, ethylene glycol, industrial solvents and cleaners. ▪ 2000-gallon diesel oil storage and 100-gallon day tank. ▪ No RCRA storage area. ▪ Oxygen, argon, hydrogen, helium, liquid nitrogen. ▪ Oil in vacuum pumps and other equipment.
6. Radioactive Contamination and Waste	▪ Known contamination is only tritium except for approximately 50 kg U-238 getter material. Facility was once used for Rover Rocket program and fuel processing, but no records were provided. ▪ The most significant tritium system contamination is the Tritium Waste Treatment system. It should be purged before transfer. ▪ Primary service water loop was stated to be mildly contaminated (6 μ Ci/l tritium). ▪ The vacuum line is also internally contaminated, as is the exhaust ventilation. ▪ The liquid waste drain system is tritium contaminated and may have contamination from the pre-1975 uranium processing. ▪ Several containers with collected tritium are to be disposed of. ▪ There may be contamination from prior service; however, such can only be determined during dismantling.
7. Environmental	Waste water drain lines that service this building and other building to east lead to a pump shed from where they are pumped to a wastewater processing facility.
8. Characterization Information	Tritium quantities are generally well characterized. There is a sump/drain tank in the northeast corner of the support system area with residual liquid, presumed to be water. It should be characterized, or prior inspection records retrieved.
9. Surveillance and Maintenance	Surveillance and maintenance of the facility has been excellent.

4. Stabilization and Other Actions Required For Transfer

Characterization

The sump tank in northeast corner of the support system area contains liquid, presumed to be water. It should be sampled and analyzed, or prior sample results made available.

Stabilization

1. Tritium will be removed such that:

   - Accountable tritium has been removed.
   - An additional amount of non-accountable tritium, estimated as 15 to 30 grams on 40 to 50 components has been removed.
   - Less than 1.6 grams remains, allowing reduction of the facility accident scenario such that the facility *can be classified as a radiological facility*.
   - Flushing of the Tritium Waste Treatment system has been conducted to achieve the

radiological facility criteria above.

2. Oxidize, or otherwise stabilize, approximately 50 kg U-238 getter beds to eliminate potential for pyrophoricity, eventually to be disposed of as waste.
3. Remove the abandoned cooling tower walls, fill, and exposed piping. The material is severely degraded.
4. Remove batteries for the uninterruptible power supply. They contain acid and generate hydrogen when charging.
5. If the diesel generator is to be deactivated, remove the fuel oil from the storage tank and day tank. (Note that the diesel generator is being considered for adjacent building use, thus remaining in its current location.)
6. Remove experimental equipment (e.g., the Class 4 Laser) and perform "reasonable effort" house cleaning.

Isolation

See the discussion under S&M for as-left conditions. Tritium containing components should be assayed and recorded. (Note, the justification required for change of the facility categorization to "radiological" is that there is 1.6 g or less tritium remaining. The evidence for that justification may provide sufficient characterization of where it is located.) Gloveboxes and large hard-to-remove gas volumes will be purged and left sealed, or where impractical to seal, left open and slowly out-gassing.

To the degree reasonable, process piping should be capped or crimped. (Future removal will most likely remove piping and components by crimping and cutting where possible, without necessarily purging, and disposing as waste).

Other

- Remove anything that would be declared RCRA waste if left. This is to avoid unnecessary declaration of waste or the need to establish a RCRA storage area.
- Provide a list and description, or supporting documents, of facility specific commitments, if any, for which EM will be responsible after transfer.
- Determine if any of the process equipment remaining in the facility is of historical significance, and if so, remove it.
- Agreements (Permits, Licenses, Purchase Orders, Contracts, etc.) - Provide a list and description, or supporting documents, of facility specific permits, licenses, purchase orders, contracts, and other agreements, if any, that apply until the buildings are removed and the SWMU is closed.
- Assets and Property Management - Provide a list of government owned capital assets, if any, (as defined in 41 CFR 109, Department of Energy Property Management Regulations) for which custody will be transferred to EM along with the facility.

5. Surveillance & Maintenance After Transfer

Surveillance and Maintenance after transfer assumes that a stabilized state has been established with the following attributes and as-left conditions:

1. Tritium has been removed as described under Stabilization and Actions for Transfer.
2. Use of the Tritium Waste Treatment system will not be required for any future activities.
3. Use of the control room and control systems will not be required for any future deactivation or D&D activities.
4. Tritium contaminated components and piping are sealed where practical to do so. The level of out-gassing is acceptable from the tritium-contaminated equipment left in the facility.
5. Power, steam, exhaust ventilation, and wet pipe fire suppression systems remain operational.
6. Stack monitoring and periodic instrument calibrations are required.
7. Weekly inspections are conducted to:

   - Survey to trend spread of tritium contamination from out-gassing equipment
   - Look for animal and vermin intrusion
   - Look for water in-leakage, or other changing conditions

8. Other periodic inspections are conducted to look for structural and roof degradation:

It is anticipated that within the next ten years, major roof refurbishment and steam system replacement (or elimination of need) will be required.

An estimate of costs associated with the above is shown in Table 2. *However, in conversations subsequent to these estimates, it was agreed to re-visit these costs after a stabilization project is underway and a better idea is obtained of the anticipated conditions of the facility after stabilization (for example, will the fire system be drained and heating turned off)* .

Table 2 - S&M Cost Estimate Worksheet for Activities After Transfer

Surveillance & Maintenance Costs	Basis for Estimate	Annual Estimated Hours & Capital[2]		Annual Estimated Cost by	
		EM-22	By Site	EM-22	By Site
1. Nuclear Safety	N. A.				
2. Occupational Safety Health	Include with 11 below.				
3. Fire Protection	Include with 11 below.				
4. Radiation Protection	4 hours per week surveys.	200		$20,000	$9,400
5. Emergency Management	Include with 11 below.				
6. Control, Accountability, Security for SNM	N. A.				
7. Training and Qualification	Include in burdened rate.				
8. Quality Assurance	Include with 11 below.				
9. Engineering, Configuration Control	Include with 11 below.				
10. Environmental & Waste Management	Miscellaneous calibrations and Stack monitoring.	850 to 1,000		$85,000	$49,300
11. Administration	(See following Table).	600		$60,000	
12. Facility Structural S&M	Roof refurbishment and steam replacement or elimination. Amortized at $50,000 per year over 10 years.			$50,000	79,300
13. Facility Systems & Components Surveillance	Weekly walkthroughs and repair work orders.	700		$70,000	$84,800
			Subtotal	$285,000	222,800
Other Direct Costs associated with S&M.	Allow 20% of the S&M labor ($325,000) cost for consumables (HEPA filters, equipment replacement and repair parts, paint, absorbent, etc.).			$57,000	
Site Assessment Costs*	Space charges presented on 3/21.				$192,200
- Utilities	Space Charge*, 7,583 sq. ft.			$250,000	
- Security					
- Site Services	Space Charge*, 7,583 sq. ft.			$75,000	

	Subtotal	$382,000	192,200
***Space charges may not apply, depending on LASL policy.**	**Overall Total**	$667,000	415,000

Administrative Labor Estimate	**Hrs/Mo**	
Maintain Administrative Management Systems		
Perform Management Assessments	*0*	
Maintain Policies, Procedures, & Records Management Program	*20*	
Maintain Operating Procedures		0
Maintain Surveillance & Maintenance Procedures		4
Maintain Facility Support Procedures		0
Maintain Administrative Procedures		0
Maintain Records		16
Provide & Maintain Program, Project, Facility Support		
Provide Project Management Support	*12*	
Manage Baseline Budget Control & Administration		4
Provide Short & Long Range Schedule Integration, Database Mgmt., and Maintain the Current Approved Work Plan		4
Provide Future Technical Baseline Planning, MYWP & Basis of Estimate Planning and Scheduling		4
Provide/Maintain Issues Management/Reporting & Tracking	*0*	
Maintain Price Anderson Amendment Act Compliance		0
Maintain Occurrence Reports		0
Conduct Lessons Learned		0
Maintain Facility Administration	*16*	
Provide/Maintain Minsafe S&M Management		16
Maintain ISMS Program		0
Provide DOE Stakeholder Tour Support	*2*	
Total Hours/Mo.	50	
Total Hours/Yr.	600	

[1] "Loop" refers to a system to simulate the primary loop in a fusion reactor
[2] Budget estimate based on $100/hr labor rate - fully burdened