PREPARING THE TRITIUM SYSTEMS TEST ASSEMBLY FACILITY FOR TRANSFER TO D&D

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ABSTRACT

The Tritium Systems Test Assembly (TSTA) facility at Los Alamos has completed its research mission. DOE's Office of Science is preparing the facility for transfer to the DOE Office of Environmental Management**.**

The paper focuses on subjects related to preparing TSTA for transfer and deactivation. The physical conditions for removal of accountable tritium and degree of isolation for the equipment that contains residual tritium are addressed. Criteria for gloveboxes containing process and experimental equipment are presented, as are other Stabilization End Point Specifications that serve as the basis for transfer.

Stabilization end point specifications and records requirements for transition of TSTA have been determined with a graded approach. The results provide a very focused description of the transition project completion and a basis for transfer. The activities to select end points and record requirements have also served to effectively establish working level communications between current and future staff and management.

This paper provides a working example for others of how to apply the guidance of LCAM and its Transition Implementation Guide in an effective manner.

INTRODUCTION

The Tritium Systems Test Assembly (TSTA) facility at Los Alamos has completed its mission. DOE's Office of Science is preparing the facility for transfer to the DOE Office of Environmental Management**.**

Objective

The paper focuses on subjects related to "stabilization" of TSTA to prepare it for transfer to a mostly-passive surveillance and maintenance condition. Decisions are yet to be made regarding whether demolition will be in the near term or after an extended period of deactivation. The objectives here are to:

- Describe the technical approach and end points for TSTA stabilization
- Provide a practical example for applying DOE Life Cycle Asset Management Order, DOE O 430.1A (LCAM) and the related DOE G 430.1-5, Transition Implementation Guide.

The physical conditions of tritium removal and degree of isolation for the equipment that contains residual tritium are addressed. Criteria for gloveboxes containing process and experimental equipment are presented as well other stabilization end point specifications that serve as the basis for transfer.

Facility Description

The TSTA facility consists of an experimental area, supporting systems rooms, offices, and light laboratory space. It was used for the Rover rocket program and for uranium processing prior to 1975. Fusion program tritium research was conducted between 1984 and 2000.

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.

The facility has been designated a moderate hazard nuclear facility. The facility is generally in very good physical condition and consists of 13,500 ft^2 building space and contents as follows:

- The 3,700 ft^2 main experiment area, rooms 5501 and 5508,includes a 95'x35' high bay main floor and a mezzanine. 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 variety of support and cleanup systems, and a large capacity experimental room cleanup system that has never been used.

- North section of 11 rooms that encompasses 5,990 ft^2 of uncontaminated supporting space (Control room, support center, equipment rooms, switchgear, power supplies, etc.).
- South section of 12 rooms that encompasses 3,820 ft^2 adjoining office space and light-duty uncontaminated laboratory space, and a backup-power diesel generator.

Systems within the facility are in the following types:

- Process Systems – 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, experimental air de-tritiation system, and solid waste.

The TSTA stabilization project began in FY 01. Progress is being made towards removal of bulk tritium and establishing conditions for transfer in FY 03 to those responsible for deactivation and demolition. Planning is the combined effort of stabilization managers and deactivation experts. As such, a smooth transition should be realized.

ESTABLISHING THE STABILIZATION END STATE

Stating the overall stabilization end state provides the basis for detailed end point specifications. The stabilization end state is defined by the following overall conditions:

1. The bulk of the tritium will be 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 as waste. The goal for stabilization is that the residual tritium inventory will be less than the 1.6 gram threshold for a hazard category 3 nuclear facility, and thus qualify for designation as a Radiological Facility. However, it will be difficult and may not be cost effective to achieve a Radiological Facility designation for TSTA.
2. Other hazardous materials will be removed or stabilized. Specifically, U-238 adsorption beds will be oxidized (or stabilized otherwise) and the uninterruptible power supply batteries will be removed.
3. Special knowledge of the facility systems will not be required for remaining operations to perform subsequent surveillance and maintenance (S&M), deactivation, or decommissioning. Specifically, all operations requiring use of the TSTA Tritium Waste Treatment system will be completed and the Master Data and Acquisition Control (MDAC) system will not be needed for any operations. The control center will be systematically de-energized.
4. Exhaust ventilation and stack monitoring may remain in operation, depending on the facility classification and associated operational requirements.
5. No systems or tanks, either fixed or portable, will remain pressurized. They will be emptied, left open, or removed.

TECHNICAL APPROACH TO DETERMINE STABILIZATION END POINTS SPECIFICATIONS

End points are individual specifications for the conditions and other requirements to be achieved at the completion of the stabilization project. They define the requirements for the transition of TSTA from an operational facility to becoming an excess facility. End points for stabilization have been developed using experience and methods developed and applied by EM-20 throughout the DOE complex.

The process adapted for stabilization is reflected in **Fig. 1**. The end point process ensures that the work being conducted has a basis that can be traced back to a set of objectives. This serves to both ensure completeness while avoiding unnecessary work.

The objectives are implemented with a generic set of criteria (left side of the figure) that are applied to the specific characteristics of TSTA (right side of the figure), to arrive at project- and facility-specific end points (bottom of the figure).

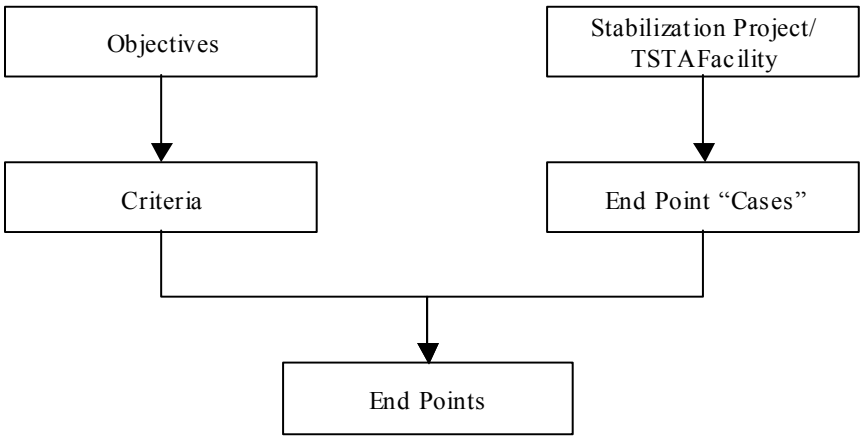

Fig. 1 – End Points Development Steps for TSTA Stabilization

Stabilization Objectives and Criteria

The end point objectives provide the high-level drivers for end points. The stabilization-specific objectives are listed in Table I along with their bases. These objectives are implemented via criteria in Table II as indicated in the last column in that table. The subjects and statements of criteria are general. They have been adapted to TSTA from prior stabilization and deactivation projects. As can be seen, each objective is addressed by at least two of the criteria.

Table I – Stabilization Objectives for End Point Determination

Objectives	Basis
1. Comply with DOE Life Cycle Asset Management Order, DOE O 430.1A	Objectives of the DOE G 430.1-5, *Transition Implementation Guide* as specifically defined by the MOA for Transfer (between DOE-SC and DOE-EM) and the associated Survey Report.
2. Comply with LANL Laboratory Implementation Requirements	Checklist developed by FMU-64 (Surveillance and Maintenance Organization) for transfer of surplus facilities, derived from "Laboratory Excess Space and Surplus Facility Requirements," LIR-230-01-01.0
3. Protect the Public and the Environment	Standard stabilization and deactivation end point objectives (See DOE G 430.1-5)
4. Protect the S&M Worker	Standard stabilization and deactivation end point objectives (See DOE G 430.1-5)
5. Facilitate Future D&D	Standard deactivation end point objectives applied to ensure that facility cranes and hoists are maintained and will be available for facility demolition.

Table II – Stabilization Criteria for End Point Determination

Criteria Subjects	Criteria Statements	Implement Objectives #
1. Structural and Boundary Integrity	Structural and boundary integrity will be such that: 1) S&M or D&D personnel are safe, 2) contamination or hazardous materials remaining in the facility are contained or have been stabilized against release, and 3) intrusion by unauthorized personnel, animals, and plants are prevented.	1, 3, 4
2. Nuclear Materials	Accountable Tritium has been removed (100 curies of tritium is an accountable quantity).	1
3. Hazardous Materials	Hazardous materials and chemicals have been removed in compliance with environmental regulations. Any hazardous materials remaining in the facility are labeled and confined or have been stabilized to prevent release. Documentation of quantities and location of remaining hazardous materials is complete.	1,2
4. Operational Systems and Equipment	Service and utility systems and equipment required to support S&M and maintain stable conditions (such as lighting, exhaust ventilation, sump pumps, etc.) are operational. Equipment that has been judged to be essential for future S&M or D&D (such as cranes or jib hoists) remains operational.	1, 3, 4, 5
5. Abandoned Systems and Equipment	Nonessential systems and equipment have been: 1) abandoned in place and isolated, vented, and/or sealed, or 2) removed.	1, 3, 4
6. Personnel Safety	The safety of S&M and D&D personnel are safeguarded by stable conditions, postings, and written procedures that have been established in accordance with standard procedures for radiological protection and industrial safety practice. Contamination remaining in the facility is clearly identified and has been stabilized.	1, 4
7. Waste	Removable wastes have been disposed. The only liquid wastes remaining are minimal quantities within installed equipment that cannot be readily removed.	1, 2, 3
8. Housekeeping	Classified and valuable materials are removed. Trash, furniture, and other loose equipment and materials have been removed.	2, 3
9. Administrative	Facility-specific records and documents have been transferred. This includes, for example, the Authorization Basis/Safety Regime, other regulatory requirements (such as permits), contracts and purchase orders, and other agreements. Reporting requirements are identified. Government owned capital assets are listed.	1, 2
10. Characterization	Data for as-left materials and conditions important to S&M and future D&D have been recorded and are retrievable.	1, 4, 5
11. Reduce S&M Costs	To the extent practicable, S&M requirements have been minimized.	1, 2

Stabilization Project and TSTA Facility Cases

In EM-20's end points methods, "Cases" refers to logical grouping of end points, based on the physical and functional attributes of the facility. Documenting end points and their completion are organized in case groups.

For the stabilization project the spaces and systems are assigned to these cases based on the specifics of the TSTA facility. Four cases were defined as described in Table III. Details of the application of these case definitions to TSTA-specific spaces, operable systems and equipment, and abandoned and systems and equipment are shown in Table IV, TableV, and TableVI respectively.

Table III – Stabilization End Point Case Descriptions

Case	Description	Criteria Subject # That Apply
Case 1: Overall Project Requirements	This case is for assigning end point requirements that apply to the stabilization and the TSTA facility as a whole. That is, they are not associated with any specific space or system. These end points are mostly in the administrative area, such as the records package for transfer.	9
Case 2: Spaces	Includes internal rooms and spaces, external sheds, and external parts of the facility (roof, walls). The space delineations represent physical boundaries and/or functional differences.	1, 2, 3, 6, 7, 8, 10
Case 3: Operable Systems and Equipment	Systems and equipment that remain operable at the completion of the stabilization. The stabilized end state will require some systems and equipment to remain operable for S&M or D&D.	4, 6
Case 4: Abandoned Systems and Equipment	Systems and equipment NOT operable at the completion of the stabilization. All other systems and equipment will be isolated and abandoned in-place, or removed (e.g., a glovebox shipped to Idaho).	2, 3, 5, 6, 10, 11

Table IV – Case 2: Spaces

Space	Comment
Main Experiment Area	Maintain ventilation and tritium monitoring. Facility heating is required to support the fire protection system.
Tritium Experiment (TEX) Lab Room	Maintain ventilation and tritium monitoring. Facility heating is required to support the fire protection system.
Control Room (5504)	The control room will be left inactive and the tritium monitor alarm and fire alarm will be reconfigured.
Service and Equipment Rooms (5509, 5510, 5511, 5512/A, 5513, and 5514/A)	Standard end points apply to the service and equipment rooms. Responsibility for the diesel generator and reconfigured hot water system will transfer to the adjacent facility (TSFF).
Facility Roof and Walls	Evaluate and ensure facility and roof structural integrity for 5 years.
Office Areas (5500G/J, 5503, 5507A, 5516, 5517, 5518, 5519, 5520, 5521, 5522, 5523, 5523A, and 5524)	Isolate water to restrooms and lock restrooms to prevent access.
Storage Shed (2213)	Remove all materials

TableV– Case 3: Operable Systems and Equipment

System and Equipment	Reason for Remaining Operable
Tritium Monitoring	Initiates alarm in the event of high airborne tritium.
Ventilation System and Stack	Maintains dilution of any tritium out gassing from remaining components.
Fire Protection System (Suppression and Detection)	Fire protection system is required until a fire hazards analysis or combustible loading analysis can be completed to justify shutdown of the system. Regardless, all loose combustible material will be removed to minimize the potential for a fire.
City Water	Provides water for the wet pipe fire suppression system.
Electrical Power Distribution System	Provides power for operable systems above. Also lights and power to support S&M activities.
Steam System	Freeze prevention for fire protection system.
Radioactive Liquid Waste System	Pumps out any leaks from city water, fire protection, or steam system condensate blow down and relief valves in the facility.
2 Ton Bridge Crane	Used for S&M and future D&D.
Jib Hoists	Used for S&M and future D&D.
Diesel Generator and Diesel Fuel Storage Tank	The diesel generator and fuel tank will be maintained under separate funding to support Building 209 operations.
Lightning Protection System	Protect against lightning strikes.

TableVI– Case 4: Abandoned Systems and Equipment

System and Equipment	Comments
Backup Power Supply and Uninterruptible Power Supply (Batteries)	Remove batteries
Breathing Air System	
Communication System (phones, paging)	
Component Cooling Water	
Cooling Towers 220 and 240 (CW Heat Exchanger)	
Experimental Chamber (TEX Room)	
Experimental Tritium Cleanup (ETC)	
Gaseous Helium	
Glovebox and Load-in/Load-out (LIO) System	
Glovebox EXP1	
Glovebox EXP3	
Glovebox FCU and Fuel Cleanup System	Remove molecular sieve and Al-Pd catalyst bed
Glovebox FCU-GAN/TP3	
Glovebox ISS GB1 and Isotope Separation System (includes vacuum jacket)	Remove Al-Pd catalyst bed
Glovebox ISS-GAN (GB2)	
Glovebox ISS-UTB (GB3)	Remove Uranium hydride
Glovebox Old SWD in wood box	Located in yard, to be moved inside facility
Glovebox PMR	
Glovebox RAMAN (EXP2)	
Glovebox SWD GB1 and Solid Waste Disposal System	
Glovebox TP1/TP2	
Glovebox TPE	Removed from facility
Glovebox TPOP	
House Air/Instrument Control Air	

TableVI– Case 4: Abandoned Systems and Equipment

System and Equipment	Comments
House Vacuum System	
Hydrogen/Argon Supply	
Impurity Simulation (IMS)	
Liquid Nitrogen	
Master Data & Acquisition (MDAC)	
Nitrogen Tank and High and Low Pressure Nitrogen System	
Process Evacuation System (PEV)	
Process Loop	
Sanitary Effluent	
Secondary Enclosure/Vacuum Glovebox and System	
Self Assaying Portable Uranium Bed (SAPUB)	Remove Uranium hydride
Tritium Waste Treatment (TWT)	Remove molecular sieve and Al-Pd catalyst bed
TSFF Reserve Catalyst Recombiner in wood box	Located in yard, to be moved inside facility
House Vacuum	Remove charcoal bed

RESULTS - STABILIZATION END POINT SPECIFICATIONS

Approximately 500 End points were derived for the 7 spaces, 11 operable systems and equipment, and 38 abandoned systems and equipment. For purposes of this paper an example from each case follows.

CASE 1 Example: Overall Project Requirements

1. Verify Hazard Category 3 HA/AB Document is approved
2. Verify FMU-64 S&M procedure is prepared and issued
3. Verify FMU-64 access signs are placed on all primary entrance doors
4. Verify facility is decontaminated to levels specified in TFSP per associated work instructions
5. Update and issue emergency response plan/procedure to reflect stabilized facility
6. Transfer authorization basis including USQ D Documentation to FMU-64
7. Replace current door cores/padlocks with FMU-64 door cores/padlocks
8. Remove sensitive/UCNI Documents
9. Remove refrigerants from all equipment, including water coolers and label equipment indicating status
10. Remove and reuse/excess tritium exit signs
11. Remove all unattached combustible materials inside the facility and immediately surrounding the facility
12. Remove all portable items (chairs, tables, furniture, workbench, etc.)
13. Records turnover package is provided: Final radiological surveys, deactivation work plans/packages, description/photos of space, modified configuration management docs, historical information, compliance documents
14. Radioactive waste area for waste generated during S&M will be identified in the documents to be transferred
15. Provide administrative/physical controls to prevent unauthorized access
16. Post/label evacuation route
17. Perform combustible loading review to determine maximum fire loading limits
18. Isolate/seal potential pathways from the environment to protect from animal/vermin intrusion
19. Housekeep and remove, excess/dispose unattached materials and equipment
20. Have JCNNM conduct a thorough rodent control patrol and rid facility of rodent droppings
21. Have ESH-17 check ACIS to verify chemicals have been removed
22. Fix/remove/seal radioactive contamination to mitigate migration from facility, if required
23. Deactivate security alarm doors to process areas

CASE 2 Example: Spaces - Main Experiment Area

1. Remove/dispose of non-hazardous, radioactive, hazardous, and mixed waste in accordance with approved waste handling procedures and regulatory requirements
2. Provide administrative/physical controls to prevent unauthorized access and to prevent unauthorized storage of hazardous/radioactive materials
3. Maintain facility heating to support fire protection system
4. Document remaining industrial hazards and compliance with industrial safety requirements for inclusion in the transition completion package
5. Document compliance with asbestos program for inclusion in the transition completion package
6. Document compliance with confined space program for inclusion in the transition completion package
7. Remove unattached combustible materials

CASE 3 Example: Operable Systems and Equipment – 2 Ton Bridge Crane

1. Review and update spare parts inventory
2. Review and update requirements and procedures for emergencies, operations, surveillance, and maintenance: Define periodic preventive maintenance period
3. Review and update existing configuration control documentation
4. Park crane at North end of facility
5. Label system/equipment as OPERATIONAL

CASE 4 Example: Abandoned Systems and Equipment - Glovebox EXP1

1. Vent and purge systems/piping
2. Stabilize glovebox and components for intact removal to facilitate disposal
3. Remove appurtenances (i.e. Pass-boxes) to facilitate waste packaging for D&D
4. Remove and dispose structurally unstable piping
5. Remove and dispose glovebox windows
6. Remove and dispose accountable tritium and high inventory components
7. Provide completed end point package including work instruction, red line drawings, final radiological surveys, and description/photos of system
8. Leave system/piping open and vented to facility or closed/sealed with sampling and vent access
9. Label system/equipment as SYSTEM DEACTIVATED
10. Label component/system with contamination/characterization information
11. Isolate instrument air/process air/plant air to system/equipment and depressurize associated air header
12. Isolate existing steam supply to equipment/system and drain condensate from associated piping
13. Disconnect electric connections and terminate power feeds at the circuit breaker and install tags
14. Decontaminate glovebox interior

RESULTS - RECORDS PACKAGE FOR TRANSFERRING THE STABILIZED FACILITY TO SURVEILLANCE AND MAINTENANCE

This section identifies the records package that should be provided to the receiving organization. They are divided into two types: 1) project and administrative records, and 2) those related to the as-left physical conditions of TSTA. It is noted that a future decision will be needed regarding records storage when the entire TA-21 Area set of buildings is demolished.

Project and Administrative Records

Stabilization Project Completion Report

Provide a management summary of the stabilization project, general status and conditions of the facility, and conformance with the TFSP Project Plan Summary. The report should address or attach as of the date of transfer:

- A list and description of unresolved issues and other needed non-routine management actions.
- A list of activities and commitments that must be performed to complete stabilization after the receiving organization assumes responsibility.

Outstanding Commitments

Provide the status of the following as they *specifically apply to TSTA*:

- Regulatory commitments; for example, status of compliance with applicable regulations such as DOE Orders, OSHA, NEPA and CERCLA/RCRA.
- Agreements that identify the terms and milestones pending and entered into by DOE with federal, state, and local agencies such as settlement agreements, administrative or consent orders, and compliance plans to resolve outstanding notices of violation.
- Air permits, stack effluent monitoring requirements, liquid drains sample requirements, and reporting.
- Corrective actions completed and outstanding, from previous audits, inspections, and other similar activities.

Authorization Basis

Provide the most current safety documentation and environmental permits for the TSTA facility:

- A description of the safety envelope currently in place.
- Status of planned actions related to the SAR, TSRs, hazards reviews, and implementing procedures covering the current status of the facility.
- Copy of TSR surveillance program description and statement of open non-compliance with TSRs. Provide USQ D records.

Emergency Response

The emergency response plan should be revised for the stabilized state, including as appropriate, response to a high tritium condition or to natural events such as fire, flood, severe storms, or earthquake. Prepare an updated facility run sheet for submittal to Emergency Management and Response (EM&R). The run sheet is a list of hazardous and radioactive substances or conditions in the facility used by first responders.

Records Related to As-Left Physical Conditions

The TSTA facility is generally in very good condition. The TFSP will address or document the overall physical status of the buildings and systems, and major equipment at the completion of stabilization. Any of the methods described below may be used to document the as-left condition of the facility. Alternative means to document this condition may be employed when drawings or manuals are not available. Development of new drawings or manuals is not required. Access control and isolation of fluid and electrical systems shall be documented in the records.

Work Package Completion Records - Provide any records of work packages conducted for stabilization. These are also noted as end points for systems and equipment.

Lock and Tag - Provide Lock and Tag Log and keys – used for facility access, isolation of electrical components, chaining of valves, and other situations where physical access is to be controlled.

Drawings - Provide current status (including drawings) of the stabilization/safe shutdown (if applicable). Especially important are marked up electrical drawings that indicate where power and instrumentation wires have been lifted, cut, or removed.

It is recommended that two sets of redlined drawings be created. One set should be maintained at TSTA and the second at the S&M offices. The second set should be placed in controlled document status.

Photographs - Where photographs have been provided in lieu of marked-up drawings, two sets should be created and maintained as above. Each photograph that is used to record final conditions or end point closure must be indexed with annotations as to its purpose.

Equipment Manuals - Maintain equipment technical manuals for systems and equipment that will remain operational, to the extent they exist and have been identified as needed for S&M. Equipment manuals may not exist for all operational systems. *Do not create new manuals if they do not already exist.*

Characterization Information - Characterization information regarding hazardous and radiological materials and contamination:

- Final radiological/hazardous materials survey records keyed to location of fixed hazardous materials, wastes, and contamination with characterization information.
- Inventory of chemical and hazardous substances remaining, if any, and characterization information.

Procedures - A preliminary review was conducted of the existing procedures, instructions, and other operating documents currently in effect to recommend those procedures that will be needed after stabilization. Results are indicated in Table VII. Of the more than 100 procedures during full operation, of the order of 20 will be needed for the post-stabilization S&M, albeit revised in many cases to suit the simpler stabilized facility conditions. Of these remaining procedures, on-site specialists will conduct some, such as for crane inspection and maintenance.

Table VII – Culled List of Procedures – Revised for Stabilized Configuration

Calibration Procedures TMS Instrument Calibration Procedure	**Standard Operating Procedures** Working with Tritium at TA-21 Emergency Tritium Cleanup System Tritium Monitoring System Building Utilities
Emergency Procedures TA-21 Emergency Procedure	**System Design Descriptions** Emergency Generator Set Tritium Monitoring System Utilities System Building Ventilation
Forms TSTA Global Calibration Checklist TSTA Global Maintenance Checklist	**Training Procedures** Qualification Checklist Tritium Monitoring Qualification Checklist Ventilation System Qualification Checklist Emergency Generator Set
Maintenance Procedure Crane/Hoists Monthly Inspection Ground Fault Circuit Inspection Atmosphere Detection System Calibration Stack Air Flow Measurement - Annual Stack Exhaust Blower – Annual	
Operating Procedures/Instructions Control & Execution of OSR Surveillance Tritiated Waste Disposal	

CONCLUSIONS

It is important to establish a clearly delineated set of conditions for transferring TSTA from the DOE Office of Science to the DOE Office of Environmental Management Stabilization end point specifications and records requirements for transition of TSTA have been determined using a graded approach. The results provide a clear description for the scope of the transition project, and a basis for transfer. The process of establishing end points and record requirements facilitated working level communications between the transferring and receiving organizations within DOE and at Los Alamos.

This paper documents a work-in-progress for effectively applying the guidance of LCAM and its Transition Implementation Guide.