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Technical Solutions Report MCP 2

Technical Solutions Study
Miamisburg Closure Project
Concerning
INDEPENDENT REVIEW OF THE MAIN HILL PROJECT ESTIMATES OF TRITIUM INVENTORIES, RELEASE FRACTIONS, AND OVERALL D&D APPROACH

Prepared by

The Office of Science and Technology (EM-50)
Technical Solutions Team

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List of Acronyms

ALARA	As low as reasonably achievable
ARWT	Advance Radiation Worker Training
BIO	Basis for Interim Operation
BWXTO	BWXT of Ohio, Inc.
CAP88-PC	Clean Air Act Assessment Package – 1988 (personal computer)
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
D&D	Decontamination and decommissioning
DCGL	Derived concentration guideline level
DOE	U.S. Department of Energy
DOE-OH	U.S. Department of Energy Ohio Field Office
DQO	Data Quality Objective
DS	Development and Standards
ERS	Effluent Removal System
EM	DOE Office of Environmental Management
EM-50	DOE Office of Science and Technology
EPA	U.S. Environmental Protection Agency
FAST	Functional analysis system technique
HEPA	High efficiency particulate air
H-3	Hydrogen-3 (tritium)
HT	Tritium in the form of hydrogen gas
HTO	Tritiated water vapor
LANL	Los Alamos National Laboratory
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCP	Miamisburg Closure Project
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NETL	National Energy Technology Laboratory

OEPA	Ohio Environmental Protection Agency
R	Research
SARA	Superfund Amendments and Reauthorization Act
SRS	Savannah River Site
SW	Semi Works
TERF	Tritium Emissions Reduction Facility
VM	Value management

Units

Ci	Curie
cm	Centimeter
cm^2	Centimeter squared
cm^3	Centimeter cubed
L	Liter
mCi	Millicurie
millirem	0.001 Roentgen equivalent man
mL	Milliliter
µCi	0.000001 curie

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TABLES

FIGURES

APPENDIX

EXECUTIVE SUMMARY

From September 30 through October 4, 2002, a Technical Solutions Team provided by the Department of Energy (DOE) Office of Science and Technology (EM-50) conducted independent reviews of tritium inventory calculations, emissions modeling, and the use of tritium recovery systems. In addition, a Value Management (VM) Study was conducted to provide possible alternatives to accelerate the Miamisburg Closure Project (MCP) schedule. This work was done at the request of the Director of the MCP, and was coordinated by the National Energy Technology Laboratory (NETL).

The team presented their results and a draft copy of this report to the MCP Director and his staff during a closeout meeting at the end of the weeklong effort. The VM Proposed Alternatives were not fully developed and no estimate of their impact on cost and schedule was presented due to the time required to conduct the independent reviews. If any of the alternative proposals are adopted by the contractor, EM-50 is prepared to continue providing assistance in developing and implementing them as part of their Closure Site Support Program.

INDEPENDENT REVIEW RESULTS

The team reached the following conclusions while conducting the independent reviews:

Tritium Inventory

The team concluded that the inventory estimates reviewed, which included six of 19 estimates for residual tritium in the Building SW-R complex, were reasonably accurate with one exception. This exception was the estimate for concrete associated with the building structure, where assumed tritium concentrations were based on Savannah River Site experience rather than actual characterization data. The team considers that characterization data from concrete samples are necessary for an accurate inventory estimate prior to open-air demolition, and notes that some concrete samples have been recently taken but not yet analyzed. The team noted that the contractor scientist did an excellent job in developing estimates that are reasonable and appropriate for the current work scope and requirements.

Computer Modeling

In its evaluation of modeling associated with estimating offsite doses, the team noted that the site uses one model for dose assessment in compliance with the National Emissions Standards for Hazardous Air Pollutants (NESHAPS) and another for planning work. The team considered the NESHAPS compliance model to be acceptable. The model used for planning work may be improved by adopting a proposed alternative to use best estimate inputs with credit for mitigation features. The team also offers for consideration another proposal regarding use of radiation dose rather than curies to better convey to stakeholders the miniscule risk associated with tritium emissions from the site.

Observations on Schedule Performance

The team discussed with contractor management possible reasons why the closure project is significantly ahead the November 2001 baseline schedule even though tritium stack emissions are tracking at a rate of only approximately 1000 curies per year. From these discussions, the team concluded that D&D strategy changes were effective in reducing time necessary for the work, but that extending the annual tritium stack emissions limit to 10,000 curies would not substantially reduce the SW-R project schedule because the emissions are not limiting project activities.

Tritium Emissions Reduction Facility (TERF) Operation

In the time available, the team could not make a definitive recommendation regarding whether or not the baseline TERF system or an alternative approach should be used for effluent detritiation. However, with the information presently available it appears that the baseline should be followed. Nonetheless, the alternates should be held at the ready (especially the Cart which is already on site) should an eventuality such as a major TERF failure be encountered. Also, the team concluded that an adsorbent-only based system should be considered for future needs such as an unplanned shutdown of the TERF itself, or to expedite schedule while TERF is running.

VM STUDY – PROPOSED ALTERNATIVES

The following six Proposed Alternatives for accelerating the MCP schedule are listed and a brief summary of each presented as follows:

<u>VM Proposal No. 1</u> **Abandon the current "open-air" D&D and continue to use the available stacks.** Instead of the current "open air" demolition, consider completely enclosing SW-R Building or use partial tenting, or local air flow control to direct all emissions from demolition up through the existing filtered stack. Near real-time computer monitored characterization should be used to schedule and control work while minimizing the amount of additional conventional characterization done. Controlling emissions in this manner will allow easier NESHAPS compliance and will save time and money by reducing the need for additional characterization. Key to the success of this approach is the use of large equipment.

<u>VM Proposal No. 2</u> **Reduce Schedule Risk.** It is proposed that a viable way to reduce schedule risk by removing uncertainties is to completely enclose the entire SW-R complex under a stand-alone type containment structure . This will permit the "Old Cave" removal to be deferred until after the building is taken down, and will allow the concrete slabs and soils to be removed under cover with the emissions going up the filtered stack. In addition, the VM Team pointed out that minimizing the amount of "tritium bake-off" performed in the R-108 Tritium Recovery Laboratory will allow TERF to be shutdown early. The combined effect of deferring the Old Cave work, reducing the known bottleneck in R-108, and shutting TERF down early, will allow the redeployment of several crews of labor. Since labor is known to be the limiting factor in completing the Main Hill Project, these proposed steps taken together may make a significant impact on schedule. (NOTE: After discussion with the team, this proposal was written and submitted by the facilitator and included as a proposal in the report. The team recognized that the proposal did contain some merit; however, the team didn't have sufficient time to conduct an in-depth analysis.)

VM Proposal No. 3 **Improve the input into the emissions modeling and use the resulting information more effectively.** Improve the approach to NESHAPS compliance by making better use of previous experience to establish meaningful release fractions for estimating emissions using CAP88. Also, discontinue the reporting to the public of the gross amount of emissions (curies) and instead begin reporting the amount of equivalent dose (millirem) as is done in the commercial nuclear industry.

VM Proposal No. 4 **Characterization Guidance.** The team suggests following the process of the *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, DOE/EH-0624, in facility characterization work related to T Building. The MARSSIM provides the primary DOE guidance for characterization surveys and use of the MARSSIM process could improve these surveys and lend more credibility to the results. (NOTE: After extended discussion with the team, this proposal was written and submitted by the team recorder in order to have it included in the report.)

VM Proposal No. 5 **Improved Concrete Characterization Method**. The team suggests using, for all applicable concrete samples associated with the SW, R, and T buildings, an improved process which uses a hammer drill instead of a core. This process has been used at the Savannah River Site and proved to be much superior to previous methods for determining tritium concentrations in concrete.

VM Proposal No. 6 **Work Practice Improvements.** The team recommends adopting the Advanced Radiological Worker Training program which has improved efficiency at the Savannah River Site

The Path Forward

The team requests that DOE and contractor management consider the proposals and determine what areas warrant further study in the interest of improving the building decontamination and demolition plan. The team stands ready to assist in this effort and will provide other help with the project as requested by the site through EM-50.

Note that BWXT of Ohio, Inc. management reviewed a draft copy of this report for factual accuracy, and their input was incorporated into this final version.

Table 1. Technical Solutions Team Members

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to describe the results of a technical solutions study conducted at the Department of Energy's (DOE) Miamisburg Closure Project (MCP), formerly known as the Miamisburg Environmental Management Project, Mound Plant, and Mound Laboratory.

As described in the scope of work (Appendix A), the study focused on examining existing data related to tritium contamination in the SW-R Building complex, and recommending appropriate additional characterization of the facility. The baseline approach reviewed was the redacted version of Revision A of the *Mound Exit Project, Performance Baseline 2002 (PB2)*, dated November 20, 2001 (reference 1)

The study took place onsite from September 30 to October 4, 2002. The primary participants were members of a technical solutions team assembled by the Department's Office of Science and Technology (EM-50) National Energy Technology Laboratory. This team included seven senior, experienced professionals in the fields of tritium behavior, air dispersion modeling and nuclear facility decontamination and decommissioning (D&D), as shown in Table 1. Assisting with the study were personnel of the MCP contactor, BWXT of Ohio, Inc. (BWXTO).

Personnel from the Battelle-Columbus Laboratories Decommissioning Project also participated in the study on a limited basis, and the results produced may prove useful at that site in the decommissioning of the JN1 Hot Cell Facility. The general approaches and processes described herein may help other sites as well.

This technical solutions study was the third technical solutions visit in a series of technical solution activities being undertaken by EM-50 as part of an initiative to help the Department's sites with closure activities, and the second such visit to the MCP. The first MCP visit took place from July 29 to August 1, 2002. The reference (2) report describes the results of the workshop conducted during the first visit; recommendations contained in the report are summarized in Appendix B.

Such technical solutions visits are intended to provide rapid and on-going access to critical experience and expertise in areas such as characterization, decontamination and demolition, and waste management.

1.2 Scope

As indicated in the scope of work, the primary objective of the team was to independently review the tritium emission assumptions in the November 2001 baseline and to suggest improvements or alternatives that would accelerate the schedule to speed site closure. The scope also included:

(1) Providing independent review of the baseline tritium holdup inventory estimates and projected release fractions in SW, R and T Buildings, and, if possible, identifying methods for determining the actual amount of tritium holdup associated with equipment and systems on the critical path.

(2) Providing independent review of the baseline modeling and associated safety margins, proposing technically sound improvements that will result in schedule acceleration while maintaining adequate control of effluents.

(3) Providing independent review of the baseline plans for using the various tritium recovery systems available, such as the Tritium Emissions Reduction Facility (TERF) and the site's tritium recovery carts,

- Recommending the optimum use of these systems factoring in any potential conservatism that may exist in the baseline.
- Recommending the earliest date for the shutdown of TERF while maintaining adequate control of effluents.
- Proposing alternate plans with earlier TERF shutdown dates that will result in significant schedule improvements. Quantify potential effluents and associated schedule improvements.

(4) Providing independent review of the contribution of tritium emissions to the site National Emissions Standards for Hazardous Air Pollutants (NESHAPS, reference 3) effluents in the PB2 Baseline.

The scope of work also summarized the current approach to D&D of the buildings. This approach entails demolishing the SW-R Building complex and shipping the rubble off site as low-level radioactive waste. The Main Hill Project D&D plan calls for leaving selected equipment and building components in place until they can be removed and disposed of during the building demolition phase. T Building, which forms the remainder of the tritium complex, will be decontaminated and left in place. The approach just described is considered to be the baseline approach for the purposes of this study.

The scope of work also notes that much of the available information on tritium contamination in the SW-R facility is based on process knowledge and limited sample data.

In briefings given to the team given on September 30, 2002, MCP management discussed the scope of the study and expectations for the project. These expectations mainly reiterated the objectives outlined in the scope of work. The key expectation was for the team to complete an independent review of the Main Hill Project tritium inventories, considering the assumptions in the November 2001 baseline, to determine whether the tritium estimates are conservative, over conservative, or right on target, taking into account recent site emissions data. Management also expected the team to recommend a date to shutdown the TERF, given that this shutdown date is important to the project.

1.3 Approach

The study followed a value management process comprised of six basic steps. Step (1) involved team review of project information and presentations by project personnel. Step (2) involved brainstorming to identify ideas for alternate solutions. In step (3), the team analyzed these ideas and identified the most promising ones for further development into concepts. Step (4) entailed developing these ideas into concepts and reasons why they would offer advantages over the current approach. The concepts were further condensed into major proposals. Each proposal was assigned to a team champion, who detailed the scope of the proposal. Step (5) involved a presentation by the team to site management on the results of the workshop and providing draft copies of this report. In step (6), if requested by the site, the team will be available for additional support.

Prior to the onsite part of the study, the technical solutions team reviewed background information on the SW-R Building complex and the issues associated with building D&D. This information included:

- *Tritium Cleanup and Site Restoration Value Engineering Study*, dated March 11 – 15 ,1996, performed on behalf of the DOE – Ohio Field Office (DOE-OH). (reference 4)
- *SW/R Tritium Complex D&D Pre-Conceptual Engineering Study*, October 31, 1996 (reference 5)
- *Assessment of Future Tritium Releases From the T/SW/R Tritium Complex*, November 22, 1996 (reference 6)
- *Ohio Summit VIII Action Item 9, Gather data with which to evaluate establishing a rational release limit for tritium at Mound*, a Mound presentation dated February 13, 1997 (reference 7)
- *A Total Tritium Recycle and Enrichment System*, undated (reference 8)
- *Operating Experience With the Sandia Tritium Facility Cleanup Systems*, 1985 (reference 9)

- *Livermore H_3 experts recovering tritium from defense, for defense*, 1999 article (reference 10)
- *Proposal for Large Scale Decontamination and Decommissioning (D&D) Demonstration Project for the T/SW Tritium Complex Decommissioning*, July1996 (reference 11)

The team discussed various ideas to help deal with the issues identified in the scope of work, and identified the ideas which merited further consideration. The team also discussed the recommendations made during the EM-50 study conducted two months previously. As noted previously, these recommendations are outlined in Appendix B.

1.4 Background

As the MCP moves forward toward site closure, various site nuclear buildings, including the SW-R complex, are being decontaminated and demolished. This activity and environmental restoration of the site property are being performed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (reference 12), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) (reference 13).

In 1990, DOE and the U.S. Environmental Protection Agency (EPA) signed a Federal Facility Agreement for the Mound site. In 1993, the Ohio Environmental Protection Agency (OEPA) also became a signatory to the Federal Facility Agreement. Under the CERCLA and the agreement, both EPA and OEPA independently review and oversee the MCP.

The CERCLA program at the MCP operates in conjunction with DOE's environmental restoration program. Under these programs, the site must comply with all applicable federal environmental laws, including the Clean Air Act (reference 14).

Site History

The 306-acre MCP site is located in Miamisburg, Ohio, approximately 10 miles south-southeast of Dayton. Construction of the site began in 1947. As a DOE research, development, and production facility, Mound's main function was to manufacture nuclear and non-nuclear components for nuclear weapons.

Mound also manufactured compact radioisotope power sources used in the nation's space program. Plutonium-238 was used extensively for this purpose. Other radioactive materials were also used, including plutonium dioxide and polonium-210. In the mid-1950s, several programs involving tritium were instituted at the site and the site developed extensive capabilities for handling and studying tritium and tritium compounds.

Figure 1.1. Site View Showing SW-R Complex and Stack

R (Research) Building

Constructed in 1948 and located on the Main Hill part of the site, Building R consists of a single-story structure with a penthouse, constructed of concrete block with a brick facing. The total floor area is 55,006 square feet. The roof consists of metal with a built-up coal tar membrane. The building penthouse contains a high efficiency particulate activity (HEPA) filter bank and associated ductwork connecting it to the T-West stack.

The building was divided into two areas. The hot side included areas used for tritium recovery, rooms in which plutonium work was done, and rooms used for analytical support activities. On the cold side of the building were research and development laboratories, analytical laboratories, a respirator fitting facility, offices, and a library. Building R is physically connected to Building SW, so the two structures are being treated as a single complex for D&D purposes.

SW (Semi-Works) Building

Building SW is a two-story structure, also with a penthouse, and also constructed of concrete block with brick facing. The roof consists of a built-up membrane formed of carboline, asphalt, and coal tar. Located in the Main Hill area, the building has a total area of 43,066 square feet.

As originally constructed in 1950, the SW Building consisted of a 140-foot by 60-foot steel framed, high bay building with 12-inch-thick outer walls formed of concrete block and brick veneer. Between 1957 and 1979, the building received 13 additions, some single story and others two story. Most outer walls of these added-on structures were 12-inch-thick concrete block and brick, like those of the original structure. The building footprint with the additions is now approximately 140 by 211 feet.

Building SW was used for tritium recovery and purification, tritium component development, component evaluation, and analysis of materials. It was also used for research projects involving plutonium, actinium, radium, uranium, thorium, and protactinium. The building contains a ventilation system with HEPA filters and contains alpha and beta hot drains.

Underneath Room SW-19 of the SW Building lies the "Old Cave." In this area, equipment used in the early 1950s for a radium-actinium separation process was entombed. This equipment contains high levels of radioactivity. The Action Memorandum for the SW Building (reference 15) describes eight safe shutdown activities for Building SW. These entail shutdown of systems and areas, decontamination and radioactive equipment removal.

The Effluent Removal System (ERS) is located near the center of the SW Building. It is no longer operable and has been taken out of commission.

T (Technical) Building

T Building is located beneath the Development and Standards (DS) Building, near the SW-R complex. It is a heavily-reinforced underground structure built in 1948 that was designed to be bomb proof. It is approximately 345 feet long, 150 feet wide and 34 feet high. The facility was used for tritium processing and other activities.

T Building contains the TERF. The TERF accepts radioactively contaminated gaseous streams from sources such as glovebox purges and vacuum pump exhausts. In the TERF, the effluent streams are chilled to remove excess moisture and condensable organic components. The gas then passes through catalytic reactors where the hydrogen components are oxidized. The oxidation products (water) are collected and treated. The ERS operated in this same manner.

The T building remains in use to support D&D of the SW-R complex. Current site plans are to decontaminate the structure and release it for industrial use under criteria agreed upon by DOE and the City of Miamisburg.

Conservatism in Tritium Inventory Estimates

Actual radioactive air emissions experienced during removal of radioactive equipment from SW, R, and T buildings have been well below predictions contained in previous baselines. This situation has led to concern by DOE over whether the contractor's tritium inventory estimates and associated computer modeling have been overly conservative, the primary reasons behind the current study. More detail on this matter appears in the scope of work in Appendix A.

1.5 Organization of this Report

Section 2 summarizes requirements related to radioactive emissions during the D&D work. It is similar to Section 2 of the previous EM-50 study report (reference 2).

To provide background information, Section 3 summarizes available information on radioactivity in the Main Hill Project buildings.

The results of the study appear in Sections 4 through 8. Section 9 discusses the path forward with respect to the study results. References are listed in Section 10.

Appendices provide the scope of work, summaries of the results of previous studies related to decommissioning and controlling radioactive emissions, information generated following the VM process, a list of attendees at the team's briefing, and a summary of lessons learned in the study.

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2.0 EMISSION REQUIREMENTS

Federal regulations related to release of radionuclides to the environment during processes such as contaminated building D&D are promulgated by the EPA. These regulations, which appear in the Code of Federal Regulations 40 CFR 61.90 through 40 CFR 61.103, require monitoring radionuclide releases at all release points and limiting resulting doses to any member of the public to a maximum of 10 millirem per year total effective dose equivalent

The EPA has approved the use of three radiation dose assessment computer codes to demonstrate compliance with these NESHAPS requirements. One of these is CAP88, which MCP will use as an air dispersion model.

The original CAP88 code was developed jointly by EPA and DOE's Oak Ridge National Laboratory for use on a mainframe computer. Later versions were developed for personal computers (CAP88-PC) and use of these was also approved by EPA.

The CAP88 code models the behavior in the atmosphere of many radionuclides, including tritium. The code assumes that all releases of tritium occur in the form of water vapor (HTO). Even though a release may occur in hydrogen gas form (HT), the regulation does not allow converting HT to an equivalent quantity of HTO. This situation results in conservatism for HT releases because environmental pathway differences between HT and HTO make the public radiation dose associated with a release of HT much smaller than the dose from release of an equivalent amount of HTO.

The Action Memorandum for cleanup of Building, R, SW, and 58 and 68 slab removal (reference 15) provides cleanup objectives for these facilities. Among the values specified are the following radioactivity concentrations in soil: Pu-238 55 pCi/g, Pu-239/240 55 pCi/g, and H-3 235,000 pCi/g. Because the site plans to remove the SW-R Building structure and dispose of building rubble and other debris as radioactive waste, there are presently no cleanup criteria that apply to the structure itself, although there are waste acceptance and shipping container criteria for the rubble/debris. Cleanup criteria for T Building have not yet been developed.

The November 2001 baseline (reference 1) used as the baseline for this study refers to achieving NESHAPS emissions requirements. The site has previously been using a limit of 1000 curies per year total tritium emissions, with actual tritium emissions falling well below this value in recent years. However, during 2002 the operational limit has been increased to 2200 curies, which is well below NESHAPS requirements.

3.0 RADIOACTIVITY IN THE MAIN HILL PROJECT BUILDINGS

3.1 Radionuclides Associated With the Facilities

According to Mound Technical Manual MD-22153 (reference 16), radioactive materials used in the SW-R complex included H-3 and a wide variety of other radionuclides, such as Po-208, Po-209, Po-210, Ac-227, Ra-226, Th-228, Th-229, Th-230, U-233, U-238, Pu-238, Pu-239, Pu-240, Pu-241, Np-237, and Am-241. Reference (16) indicates that the radionuclide mix varied considerably from room to room.

In the T Building, radionuclides used included tritium along with Po-210, Pu-238, Pu-239, and others associated with polonium processing.

3.2 Source Term Reduction Efforts

Based on estimates and waste management transportation conditions, various equipment is being removed prior to the proposed conventional demolition. Contractor personnel briefed the team on the source term reduction program that involves removal of relatively large tritium sources from the SW-R complex and from the T Building. This program, which is currently underway, involves removing before building demolition various radioactive systems and equipment that are known to individually contain more than approximately 100 curies of tritium and components containing significant alpha contamination. Much of this equipment has been moved to the Room R-108 Tritium Recovery Laboratory for processing. Removal of this equipment reduces the tritium present when building demolition begins.

A chart provided by the contractor showed a cumulative source term reduction from August 2001 through September 2002 of approximately 32 grams based on best estimates or process knowledge. In addition, contaminated piping has been and is being removed; this piping also has substantial inventory from the perspective of environmental release.

3.3 The Tritium Inventory Estimating Process

The November 2001 baseline (reference 1) outlines the basic process used to characterize radioactivity associated with the facilities. This process consists of three basic steps:

(1) Evaluating existing building characterization data including historical radiological control surveys to identify the extent of characterization,

(2) Characterizing equipment in the facilities during ongoing work, and

(3) Final characterization of each room, with an estimated number of samples based on the area of the room.

The November 2001 baseline documents provide for supplemental area characterization where indicated by limited available data.

The November 2001 baseline documents also include expected radioactive contamination levels for some equipment. However, they do not specify acceptable radioactive emissions from tritium, other than by reference to compliance with NESHAPS emission requirements.

Site contractor technical personnel briefed the team on details of the process and provided information on tritium emission estimates. The inventory estimates are based primarily on process knowledge and experience, using existing order-of-magnitude tritium contamination levels inside equipment and piping lines. Estimates for tritium contamination in concrete are based primarily on data from tritium facilities at DOE's Savannah River Site. The projected potential doses assume open air demolition at some point in the building demolition process, with no controls to reduce emissions, and emission releases taking place at 10 feet above ground level, given that the CAP88-PC model does not allow taking credit for engineered controls.

Contractor technical personnel noted that in surface radioactivity measurements for tritium, smear measurements were assumed to reflect 10 percent of existing surface radioactivity, based on Chalk River experience.

3.4 Examples of Tritium Estimates

The contractor provided to the team a document entitled *Technical Basis Details for Public Dose From Conventional Demolition of SW/R Residual Radioactive Materials (In/Near the Range of 0.1 to 10 mrem per Removal) in Order of Decreasing Significance*, dated May 29, 2002 (reference 17).

This technical basis document outlines the basis for estimating potential radiation doses to the public for D&D of 19 areas of interest in the SW-R Building complex using conventional demolition means without emission controls such as containment tents, tritium removal by TERF, or by venting through a stack.

These 19 areas of interest constitute the expected residuals after removal of high-level tritium sources as described in Section 3.2 above. For each area, an estimate of the total radionuclides was given, along with a projected potential dose from ground-level emissions.

The team reviewed six of the tritium estimates in these 19 areas of interest to determine the accuracy and degree of conservatism in the estimates. The results of this review appear in Section 4.

3.5 In-Process Characterization Data

The team asked about characterization data generated during removal of equipment such as gloveboxes already taken out of the SW, R, and T

Building and how these data compare with initial estimates. The team understands that only limited in-process survey data are available. Some of these data formed the basis for estimates discussed in Section 4.

3.6 Additional Characterization

The contractor provided the *R and SW Buildings Sample and Analysis Plan* dated April 2002 (reference 18) and the *SW-1B Addendum* to this plan, dated July 2002 (reference 19). The basic reference (18) plan provides for soil and groundwater samples. The SW-1B Addendum applies to part of the original SW Building now occupied by rooms 11 through 16 and corridor 3A. This area was originally used for treatment of waste from the Old Cave, then in the 1950s for a PUREX pilot plant, and later as a tritium laboratory. It contains sumps and trenches which were filled with concrete, gravel, or soil and capped with concrete in the late 1950s.

The SW-1B Addendum calls for taking eight concrete profile samples from floor locations at and around known tritium hot spots. Twenty sets of core bore samples were to be taken, eight at general floor locations and the others through entombed sumps or entombed trenches. The core samples were to include underlying material and soil, and in some locations, bedrock. Sample analyses were to include tritium and other radioactive materials such as radium, uranium, thorium, and plutonium. (The team understands that these samples have been taken but not yet analyzed.)

3.7 Actual Emissions Data From SW-R Building Equipment Removal

The contractor provided data related to actual tritium stack emissions. One chart showed tritium stack activity released month-by-month during 2002. Monthly totals from all stacks ranged from 46.49 curies in March to 197.66 curies in August. Cumulative 2002 tritium stack emissions through August were approximately 704 curies. The contractor also provided a chart showing projected tritium stack emissions in 2002 higher than the actual measured emissions; the total projected for the year in this chart was 2723 curies. Another chart provided by the contractor showed the tritium release rate for the Nuclear Component Development and Pre-Production Facility stack, which resulted from approximately 39 curies being released from the SW-150 main glovebox opening.

4.0 RESULTS OF TRITIUM INVENTORY REVIEW

The team reviewed the provided information on contractor tritium inventory estimates contained in reference (17), and interviewed project staff to more fully understand their technical basis. The team drew the following conclusions for the reasons indicated:

- The use of process knowledge to determine equipment or component source terms such as vane pumps, uranium beds, molecular sieve beds, and carbon traps, is the only viable method of doing so until the component can be “processed” to validate the inventory. The confirmed tritium recovered in TERF from processing components to date is approximately 70 percent of the estimated baseline inventory. This correlation is considered to be in good agreement in consideration of the process parameters that can affect inventory in such components.

- The projected releases associated with these equipment/component source terms from TERF effluent are expected to be very small. Emission data confirm this. Because of the large predicted inventories (gram quantities of tritium), TERF operation is necessary to control emissions and processing is required to ship the equipment/component as a waste.

- Analysis has confirmed that the Primary Tritium System has sufficient tritium inventory that it must be removed while the glove boxes are vented to TERF and prior to any building demolition activity. An oil mist is very pervasive throughout the system; this results in a significant uncertainty in the inventory estimate and thus in the potential for emissions as the system is removed if TERF is not used. Removing the piping with the glove boxes intact does not appear to be hindering the D&D activities.

- The estimates for tritium inventories in the building concrete walls, concrete slab, and sub-slab soils should be confirmed through more in-depth characterization. The methodology to be followed for characterization should be based on guidance in the *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, DOE/EH-0624, Revision 1 (reference 20), as recommended in Section 8, to help ensure timely approvals for open air demolition. (The team understands that the current sample and analysis plans were developed in a format familiar to the regulators and stakeholders.)

- Surface smears have been used to determine the residual contamination, and hence inventory, in glove boxes and in tritium effluent piping systems. The methodology followed is considered to be conservative, although the number of swipe samples has been limited and the accuracy of swipe data for the oil-coated surfaces is not known. However, for the current practice of venting the glove boxes through TERF, the limited knowledge is adequate as significant emissions are unlikely. For those glove boxes that remain in place for open air demolition, more adequate characterization of inventory and release fraction is necessary, and such characterization is being done, as indicated below.

- Some piping systems and gloveboxes have special waste shipment issues due to the tritium inventory or other contamination, and the activities associated with them are dictating their removal. The SW Building tritium effluent piping lines have low points where liquid oil has accumulated. While the tritium inventory is low, the waste package cannot include free liquids; hence they are presently being removed. The inventory calculations for this system have limited accuracy, but the removal activities are not expected to result in a high release fraction due to the nature of the tritium contamination (oil and oil film) and removal is normally while vented through TERF. Therefore, the inventory information and removal plan are appropriate. Similarly, the Room 108 glovebox is contaminated primarily by alpha. Its characteristics for waste shipment will be defined by transuranic waste requirements, and it will be decontaminated; tritium inventory is not dictating the activities associated with this box.
- Good characterization has been done on gloveboxes that are currently planned to remain in the building through during open air demolition. The results are likely conservative due to the assumed efficiencies for swipes taken on oil surfaces. The practice of removing these gloveboxes if they are in the way of obtaining characterization data on building systems does not appear to be impacting the schedule unnecessarily, and may in fact be having a positive benefit.
- The methodology applied to the capillary tubing is acceptable. The inventory of the capillary tubing has been determined via diffusion-type calculations and is relatively small (~100 curies). The tubing has been crimped but will be left in place for open air demolition because of the effort required to remove it.
- The decontamination of the components of the ERS currently underway should continue because of the estimated (by process knowledge) large inventories of tritium on the molecular sieve beds in this system. Even when decontaminated, consideration should be given to removing these components prior to open-air demolition, because of the inability to validate the residual inventory, as there is a high potential for a higher-than-anticipated release.

The team noted that the contractor scientist did an excellent job in developing estimates that are reasonable and appropriate for the current work scope and requirements.

Table 4.1 shows the specific estimates described in reference (17) which the team reviewed and the team's conclusions on each estimate.

Table 4.1 Tritium Inventory Estimates Reviewed [Note that numbers in the table match those in reference (17).]

<table>
<tr><td rowspan="7">1</td><td colspan="3">Material Description: SW Building primary piping systems, after air purge (including tanks)</td></tr>
<tr><td colspan="3">Primary form(s) of contamination: varying thickness, shellac-like residue from oil mist</td></tr>
<tr><td colspan="3">Inventory Measurement Techniques: (1) process knowledge, (2) calorimetry, (3) He-3 in-growth in tanks by mass spectroscopy</td></tr>
<tr><td>Accuracy of technique(s): factor of 10 for piping, ± 25% for tanks</td><td colspan="2">Number of samples: 2 determinations of residue from tanks (1-5 Ci/cm^2) , calorimetry of plugged pipe sample (35 Ci/cm^3), z-trap sample (450 Ci/cm^3), 20 gas samples from tanks</td></tr>
<tr><td colspan="3">Calculation: piping Ci/m^2 x area (m^2) + tank activity, 10 micron film, assuming 0.001 cm shellac thickness and Ci/cm^2 are uncertain

Piping (20,000 Ci) + tanks (80,000 Ci) = 100,000 Ci</td></tr>
<tr><td colspan="2">Estimated curies: 100,000</td><td>Estimated dose: 100 millirem (ground level release)</td></tr>
<tr><td colspan="2">Estimated overall accuracy of inventory: low for piping, high for tanks</td><td>Estimated overall impact: high</td></tr>
<tr><td></td><td colspan="3">Conclusions: (1) estimate is reasonably accurate and not overly conservative, possibly low (2) tanks and piping obviously need to be removed before building demolition.</td></tr>
</table>

Table 4.1 Tritium Inventory Estimates Reviewed (continued)

<table>
<tr><td rowspan="8">3</td><td colspan="2">Material Description: SW-R Building, H-3 contaminated concrete and sub-slab soils</td></tr>
<tr><td colspan="2">Primary form(s) of contamination: Bulk contaminated concrete from tritiated oil and water spills onto some floor surfaces. Permeation through the concrete over time has reached the underlying soil.</td></tr>
<tr><td colspan="2">Inventory Measurement Techniques: Savannah River Site data were used for concrete, scaled up to account for higher activity in Mound HTO (1000 Ci/L at Mound, 5 Ci/L at SRS). Data showed ~1 µCi/g for oil spills, 0.5 µCi/g for HTO spills, and other areas <1 nCi/g. Soil samples taken in 1977 provide available soil data.</td></tr>
<tr><td>Accuracy of technique(s):</td><td>Number of samples: No concrete sample results used in estimate (8 concrete profile samples and 20 bore hole samples have been taken recently in room SW-13, but results are not yet available). Soil sample results from 7 bore holes in 1977 showed averages up to 100 µCi/g to a depth of 4 feet.</td></tr>
<tr><td colspan="2">Assumptions: (1) Leaks of contaminated oil occurred on 1% of floor area, (2) Leaks of contaminated HTO occurred on 0.1% of floor area, (3) permeation of H-3 in concrete is roughly even through depth of concrete slab, (4) Contaminated walls are <1 nCi/g for a total of ~1 Ci, soil beneath rooms SW-8, SW-12, and SW-13 is contaminated at 100 µCi/g to 4 foot depth, (5) radioactive decay not taken into account for conservatism.</td></tr>
<tr><td colspan="2">Calculation: Assumed average concrete activities (1 µCi/g , 0.5 µCi/g , <1 nCi/g) x respective contaminated volumes, average soil activity (100 µCi/g) x contaminated volume.</td></tr>
<tr><td>Estimated curies: 600 Ci (493 in concrete, 100 in soil, rounded up to 600 total)</td><td>Estimated dose: 0.6 millirem (ground level release)</td></tr>
<tr><td>Estimated overall accuracy of dose: low, concrete within (1/8 to 2)x, soil (1/5 to 2)x</td><td>Estimated overall impact: medium</td></tr>
<tr><td></td><td colspan="2">Conclusions: (1) The team considered the overall accuracy of the estimate to be low, given the number of assumptions and the lack of sample analysis data from the SW-R building. (2) The 400 µCi/g SRS figure should be 100 µCi/g. (3) Taking radioactive decay into account would further reduce the inventories to approximately 25% of those calculated, with no other assumption changes. (4) The estimate must be refined based on results of hammer drill concrete samples in representative areas, including potentially contaminated walls.</td></tr>
</table>

Table 4.1 Tritium Inventory Estimates Reviewed (continued)

4	**Material Description:** R Building Room 108, alpha-beta inert glovebox, not decontaminated	
	Primary form(s) of contamination: The glovebox was used for disassembly and baking many contaminated items. Pu-238, Pu-239, and Am-241 are known to be present, as well as H-3.	
	Inventory Measurement Techniques: Smear measurements for removable radioactivity, with scintillation counting.	
	Accuracy of technique(s): factor of 3	**Number of samples:** 5
	Calculation: Average removable H-3 (1 μCi/cm^2) x 10 x interior surface area (30 m^2).	
	Estimated curies: 3 Ci H-3	**Estimated dose:** 0.3 millirem total, including transuranics (H-3 0.003 millirem) (ground level release)
	Estimated overall accuracy of inventory: medium	**Estimated overall impact:** low (H-3)
	Conclusions: Alpha contamination dominants in this area. The tritium inventory estimate is reasonable.	

6	**Material Description:** SW-R Building, H-3 contaminated capillary tubing	
	Primary form(s) of contamination: Internally contaminated from sampling HT	
	Inventory Measurement Techniques: Process knowledge, literature on permeation of H-3 into stainless steel	
	Accuracy of technique(s): (1/3 – 1)x	**Number of samples:** None
	Calculation: Considered tubing volume, diffusion into material at H-3 pressures averaging ½ atmosphere. Offsetting factors: (1) surface contamination was not considered, (2) surface barrier effect and out-gassing not considered.	
	Estimated curies: 150 Ci.	**Estimated dose:** 0.15 millirem (ground level release)
	Estimated overall accuracy of inventory: medium	**Estimated overall impact:** medium
	Conclusions: (1) The estimate is reasonably accurate, and on the conservative side.	

Table 4.1 Tritium Inventory Estimates Reviewed (continued)

<table>
<tr><td rowspan="7">8</td><td colspan="2">Material Description: SW Building tritium effluent (ERS, TERS) piping lines, after air purge</td></tr>
<tr><td colspan="2">Primary form(s) of contamination: Surface oxides and organic films</td></tr>
<tr><td colspan="2">Inventory Measurement Techniques: Smears, with scintillation counting</td></tr>
<tr><td>Accuracy of technique(s): within factors of 5 (single smears), 2 (multiple smears)</td><td>Number of samples: 5-10</td></tr>
<tr><td colspan="2">Calculation: Typical internal contamination (10 µCi/cm^2) x piping internal surface area (500,000 cm^2) + oil (10 L at 10 Ci/L) = 105 Ci</td></tr>
<tr><td>Estimated curies: 100 Ci</td><td>Estimated dose: 0.1 millrem (ground level release)</td></tr>
<tr><td>Estimated overall accuracy of inventory: low to medium</td><td>Estimated overall impact: medium</td></tr>
<tr><td></td><td colspan="2">Conclusions: (1) The team understands that the contractor is removing most of this piping because of liquid oils present. (2) The inventory estimate is satisfactory since TERF is being used for this equipment.</td></tr>
</table>

<table>
<tr><td rowspan="7">9</td><td colspan="2">Material Description: SW Building tritium gloveboxes (except SW-240, R-108 inert), partly decontaminated.</td></tr>
<tr><td colspan="2">Primary form(s) of contamination: Surface oxides and organic films</td></tr>
<tr><td colspan="2">Inventory Measurement Techniques: Smears, with scintillation counting</td></tr>
<tr><td>Accuracy of technique(s): within a factor of 2</td><td>Number of samples: 1 per m^2 (10 to 20 per typical 6-foot-long glovebox)</td></tr>
<tr><td colspan="2">Calculation: Average internal contamination (10 µCi/cm^2) x interior surface area (12,000 m^2) assuming partial decontamination removes ½ activity.</td></tr>
<tr><td>Estimated curies: 60 Ci</td><td>Estimated dose: 0.06 millrem (ground level release)</td></tr>
<tr><td>Estimated overall accuracy of inventory: medium</td><td>Estimated overall impact: low</td></tr>
<tr><td></td><td colspan="2">Conclusions: (1) The calculation is reasonably accurate.</td></tr>
</table>

During discussions about tritium characterization, the contractor provided two technical journal articles (references 21 and 22) and Westinghouse

Savannah River Company report WSRC-TR-2001-00262 (reference 23) that describe respectively extensive experience at the Savannah River Site with characterization of tritium in concrete and with air and surface tritium detection. The team member who wrote the articles and the report discussed this experience with the contractor.

5.0 RESULTS OF COMPUTER MODELING REVIEW

The objective of this review was to review the dose assessment method and determine the margin between actual and projected doses. Date reviewed included that contained in the site *Annual Site Environmental Report for Calendar Year 2000* (reference 24) and the site *Annual Site Environmental Report for Calendar Year 2001* (reference 25).

The primary variables associated with estimating offsite doses are the activity released and the dose pathway. The CAP88-PC code is used to estimate doses. This is a standard code used by the majority of the industry for this purpose. Critical inputs to the code are based on sector data associated with environmental data, such as distances to the nearest residence, gardens, water supply, etc. Metrological data are input based on wind rose data for each sector. The method of estimating doses seems normal and accurate.

Release data were evaluated from the references above. The results are shown in Table 5.1.

Table 5.1. Tritium Release Data from 2000 and 2001

Tritium Releases	2000	2001	2002 to date
Air (Ci)	380	830	703
Water (Ci)	1.7	2.2	1.24
Total HTO (Ci)	310	707	
Total elemental (Ci)	73	125	
Tritium Dose actual (milliem)	0.011	0.013	
CAP-88 PC prediction (millirem)	0.03	.07	
Total site dose, all radionuclides (millirem)	0.18	0.23	
Tritium % of total all-radionuclide site dose	6.1	5.7	
DCF (millirem/Ci released)	$2.9E^{-5}$	1.6E-5	
Reference population dose (person-rem)	1.3	2.84	

The ability of CAP-88 PC to accurately predict offsite doses is illustrated in that table above. Over-estimates on the order of a factor of three to 10 are not unusual given the inherent conservatism in the methodology.

Inventories and Predicting Releases

Another basic factor in predicting offsite doses is the estimate of the release fraction. That is, the fraction of radioactive material released from the base inventory when opened to the environment. Dr. John Gill reported that there are several conservative factors assumed in the CAP88-PC input to predict release fractions. One is the release fraction associated with solidified oils. The assumed release fraction is 1.0. The estimated release fraction is 0.1, which could be verified in the field and used to predict release values. There is a standard 10 percent swipe assumption that is applied to the inventory. That is, a factor of 10 is applied to the swipe results to estimate the removable inventory. This factor is applicable to dry type surfaces but not to oil-based surfaces. Double swiping could be used to better estimate the total inventory. John estimated that 80 to 90 percent of the inventory could be removed in the first swipe. This factor could reduce the inventory by nearly 90 percent.

Interview with Jeff Stapleton, Radiation Protection Manager

Mr. Stapleton confirmed that the estimated doses associated with tritium releases are a factor of two to three higher than actual doses verified by environmental samples. The margin of conservatism is somewhat higher for predicting releases due to the inherent conservatism in the assumptions, as discussed above.

The NESHAPS compliance criteria is set in an annual report to the EPA that provides plans for projects and their release assessment. Once a commitment is made to control releases to specified values in the planning report, these cannot be exceeded without prior notification and approval from the regional EPA officials. This matter was discussed to confirm that there is sufficient flexibility in the process to increase releases within the 10 millirem per year site limit without impacting the project schedule.

Mr. Stapleton cautions that recommendations to accelerate the schedule to begin SW-R complex demolition must consider the impact of increases in alpha particulate releases. Developing methods to predict particulate doses have proved to be difficult. Actual doses have been a factor of 200 greater than predicted. This potential problem can be mitigated by using the filtered ventilation system as much as possible during demolition.

Another problem is with the public perception of tritium risk based on reporting activity released instead of radiation dose. Mr. Stapleton indicated that the annual report to DOE and its distribution to the public and the media causes some of that confusion. He recommended publishing a summary of the annual report for the public that emphasizes dose as the true risk of site operations.

Team perspective

The original basis for the inventories and resultant release estimates contains significant uncertainty and lack of verification. It was prudent at that time to conservatively estimate inventory to assure compliance with release criteria.

Operations have shown that the releases are well below these estimates; however, no attempt has been made to adjust values based on operating history. A near-real-time release estimating system based on operating feedback could ameliorate this problem.

Release Objectives

Radioactive releases are an important constraint that must be considered in the operations at the site. A clear performance goal must be administered throughout the project to all stakeholders. Every person working on the project should understand the importance of his or her work in relation to the overall goal. In discussions with various project personnel, team members received the impression that there was a degree of confusion over the appropriate site control level for annual tritium releases.

ALARA Objectives

ALARA (As Low as Reasonably Achievable) is a concept defined as reducing radiation exposures in a cost-effective manner. It means that no exposure should occur without a net benefit. It should be shown that the increase in releases and doses to the public reduces the time that radioactive material inventories are present and susceptible to uncontrollable release from a design basis event. The Basis for Interim Operation (BIO) has risk values from these events and could be used to quantify overall system risks in the same way probability risk assessment methods are used an commercial nuclear power plants. As a simple example, if the risk of a fire taking place is 1×10^{-3} per year and the consequences are one rem to the maximum individual, then saving six months on the schedule would be the equivalent to reducing the risk by 0.5 millirem. If the proposed recommendation results in less than 0.5 millirem, then the recommendation would be reducing the overall risk.

Recommendations

The team recommends:

(1) Providing clear goals and operating limits on releases, expressing these in total doses for the site, with appropriations for each project, and creating incentives to reduce releases and to reduce cost and schedules.

(2) Utilizing near-real-time monitoring for planning. (A recommendation related to near-real-time monitoring also appears in Section 8.)

(3) Deconstructing the buildings with the ventilation system in operation thru filters and the stack as much as possible. (A recommendation related to this strategy also appears in Section 8.)

(4) Using environmental data to form dose estimates in plans.

(5) Measuring release fractions during early operations and using these for planning releases.

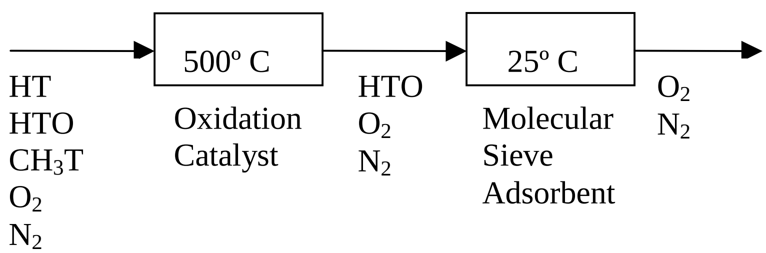
(6) Reporting doses as the risk from facility operations, avoiding the use of activity as a measure of risk.

6.0 EVALUATION OF DETRITIATION PROCESSES

6.1 Technology Description

The Mound Laboratory pioneered the use of oxidation/adsorption for reducing the amount of tritium vented to the atmosphere from tritium facilities. The present system of this type operating at the site is TERF. This system replaced the original ERS.

An oxidation/adsorption gas detritiation system is shown in the following figure:



Tritium can be fed to such a system as elemental (HT), water (HTO), methane (CH_3T) and other forms (not shown). Along with oxygen these gases are sent to a bed filled with oxidation catalyst. Operated at around 500° C this processing step will oxidize tritium in all forms to water (HTO). This stream is sent directly to a room temperature adsorbent bed usually filled with molecular sieve. Such beds have a strong affinity for water so HTO is captured on the sieve. The product from this system is tritium-free gas which can be released directly to the environment. When the molecular sieve is saturated with water, the bed must be regenerated by heating. Water is driven off, collected, assayed, packaged and disposed.

The TERF processing capacity is 35 to 100 cubic feet per minute depending on how it is operated.

6.2 Present Need for TERF

While almost all of the tritium processing capability at Mound has already been shutdown, the need for TERF continues. As Mound systems continue to be shutdown, the TERF is needed to prevent excessive amounts of tritium from being released. Specifically TERF is needed to process effluent resulting from:

- Preparation of high-inventory components for disposal (e.g. hydride beds)
- Glovebox atmosphere processing
- Purging of lower inventory items (e.g. process piping)

- Unplanned operations requiring effluent detritiation

Of 35 high-inventory components requiring preparation for disposal, only about four remain to be processed. Out of approximately 100 gloveboxes which were in operation, only about four continue to have their atmosphere sent to TERF. TERF can also be useful during the purging of many inventory items such as process piping and various components. Sometime during the progression from high to low inventory items, there will no longer be a need for effluent detritiation at the site.

6.3 Cost/Benefit of Continued TERF Operation

Cost

Presently about four full-time persons are required to operate TERF. This results in a yearly operational cost of about $1 million. This is about one percent of the yearly cost of operations at Mound.

Status

Presently TERF is fully operational. No major maintenance or system upgrades are required to continue operations. TERF provides high-throughput effluent detrititation. This system is operational, workers are trained for TERF operation, and its use is already approved as part of the BIO. It is already installed in an appropriate space, and it is already connected to appropriate processing points. Its effluent is already appropriately monitored and connected to the stack. A system is already in place for disposing of the tritiated water regenerated from TERF. The system is operating reliably.

Benefit

TERF provides all of the foreseeable MCP needs for effluent detritiation.

Changing TERF Feed Streams

<u>(1) Feed Flowrates:</u> The traditional inputs to TERF have fallen into two categories. These are: (1) glovebox atmosphere processing with high flowrate and low tritium content and (2) process pump-outs with low flowrates and high tritium content. With most of the MCP gloveboxes no longer exhausting to TERF, TERF now has considerably more capacity than is needed.

<u>(2) Feed Concentrations:</u> Traditionally both HTO and other forms of tritium have been sent to TERF. The system's oxidation step was required to ensure that all of the various forms of tritium were converted to HTO. However, in the near future when all of the high-inventory components have been prepared for disposal (i.e. baked off), only glovebox atmospheres and the like will be sent to TERF.

Presently these streams are composed of about 80 percent HTO and about 20 percent HT.

Baseline Approach

The baseline approach is to use TERF for all of the MCP's upcoming needs for effluent detritiation. When these needs have been exhausted, TERF will be shutdown.

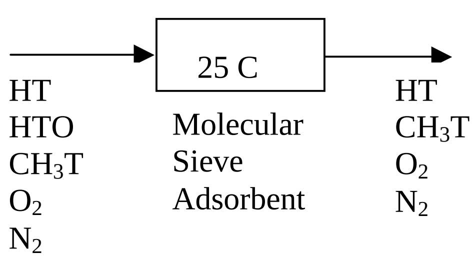
Detritiation Alternatives

TERF was ideally suited to processing streams which combined had a large flowrate and had large non-HTO forms of tritium. However, as the flowrate to TERF decreases, as the total amount of tritium to TERF decreases, and as the feed becomes increasingly HTO; alternate effluent detritiation systems can be considered. These include the following:

<u>(1) LLNL tritium cleanup "Cart":</u> The Los Alamos National Laboratory system is a small TERF. It includes the same oxidation and adsorption steps, it includes pumps to maintain flow and ion chambers to monitor system performance. The Cart can accept non-HTO forms of tritium. The main difference is that the Cart has a flowrate which is about 1/100th of TERF, or a flowrate which is appropriate for either processing one glovebox atmosphere or evacuation of a few components. This system is already on-site at Mound and has been used to process the atmosphere of one glovebox.

The Cart is well-suited for processing gas generated during high-inventory component preparation for disposal, i.e. an operation with low flowrate, high tritium concentration and potentially large non-HTO tritium components.

<u>(2) An Adsorbent-Only System:</u> Because Mound system outgassing is now about 80 percent HTO and because it has a relatively low tritium concentration, an adsorbent-only detritiation system can be considered. Such a system is shown in the following figure:



This system is considerably simpler than the systems which include oxidation since oxidation of, for instance, methanes require heating to around 500° C. The adsorbent-only system consists of only one processing step, i.e. molecular sieve adsorbent. This has the distinct advantage of being quite simple to construct. Its obvious disadvantage, of course, is that species such as HT pass through to the stack. Nonetheless, for the present Mound outgassing composes of 80 percent HTO, an adsorbent-only system can reduce stack emissions and the associated dose by a factor of five. This may be useful for selected operations.

Expected upcoming operations and the alternatives which can appropriately be considered are given in the following table:

Table 6.1. Operations and Alternatives

Operation	Appropriate Alternative
Preparation of high-inventory components for disposal (e.g. hydride beds)	Cart
Glovebox atmosphere processing	Cart or Adsorbent-Only
Processing of lower inventory items (e.g. process piping)	Cart or Adsorbent-Only
Unplanned operations requiring effluent detritiation	Cart or Adsorbent-Only

Comparison

A summary comparison of TERF and the two alternatives is given in the following table:

Table 6.2. System Comparison

System	Technology Category	Capacity CFM	Removes HTO	Removes Non-HTO Tritium	Status
TRF	Baseline	35-100	Yes	Yes	Operating
“Cart”	Alternate	1	Yes	Yes	On hand, tested once at site
Adsorbent Only	Alternate	10	Yes	No	Used elsewhere and can be readily constructed

Recommendation

If TERF were on the critical path leading to ultimate closure of the site, then there would be considerable incentive to shutdown TERF quickly and implement an alternative. However, project personnel have informed the review team that TERF is not on a critical path (and that the schedule float is nearly one year).

Factors to consider when evaluating whether to proceed with the baseline or to shutdown TERF early while employing an alternate are shown in Table 12.3..

Table 6.3 Alternative Comparison

Reasons to follow baseline	Reasons to follow an alternate
TERF already fully operational, approved, and reliable.	The Cart is already on site and has been successfully operated at Mound (by LANL personel)
An alternate, while somewhat cheaper to operate, will incur startup costs	TERF fails and requires significant restart costs
TERF shutdown is not on critical path	TERF appears on critical path in future scheduling
Operational cost of TERF is not high	Additional, localized glovebox purging is needed
There is risk in bringing an alternate online	Unexpected cleanup becomes necessary after TERF is shutdown
A MCP operator(s) would need to be trained to operate the Cart. Also Cart and use of an adsorbent-only based system would require processing an unresolved safety question to the BIO.	Operation of TERF becomes too expensive

In the time allotted for this review, the team cannot make a definitive recommendation regarding whether or not the baseline or an alternative approach should be used for effluent detritiation. However, with the information presently available it appears that the baseline should be followed. Nonetheless, the alternates should be held at the ready (especially the Cart which is already on site) should an eventuality such as a major TERF failure be encountered. And an adsorbent-only based system should be considered for future needs such as unplanned shutdown of the TERF itself.

7.0 OBSERVATIONS ON SITE SCHEDULE PERFORMANCE

The team noted the situation with the project being well ahead of the schedule included in the November 2001 baseline even though tritium stack emissions through August 2002 are far below the NESHAPS annual limit, and below a rate which would produce 2200 curies per year. The team discussed this matter with contractor management.

In planning the work shown on the November 2001 baseline schedule, the contractor considered an annual total of 10,000 curies of tritium through the stacks to be equivalent to NESHAPS requirements. However, the schedule was not developed in direct correlation with the releases. The current baseline schedule was reviewed/revised at the work package level over a six week period.

The contractor reduced personal protective equipment requirements and reduced containments to improve efficiency, and made other changes to reflect changes in D&D philosophy for the work in the SW-R complex. The strategy was changed, because of low emissions during D&D, to leave certain equipment such as low-level gloveboxes in place during demolition. Equipment inside other gloveboxes was dismantled with emissions going direct to a stack. Such changes helped cut time out of the schedule. According to the contractor, there is some schedule savings in D&D of the building crawl spaces because of lower-than-expected contamination levels found thus far. And radiological surveys associated with other work have shown that actual contamination levels are lower in some cases than those considered in the baseline estimate; some additional time savings may emerge from this situation.

Regarding time savings associated with increasing stack emissions to 10,000 curies of tritium a year, the contractor considers that such a change could result in only limited schedule reduction. The contractor indicated that the SW-R project is moving as fast as practicable at this time, with the work limited by available personnel resources, which are based on approved budgets.

Based on these discussions, the team concluded that D&D strategy changes were effective in reducing time necessary for the work, and that extending the annual tritium stack emissions limit to 10,000 curies would not substantially reduce the SW-R project schedule

8.0 VALUE METHODS STUDY PROPOSED ALTERNATIVES

Based on the results of the value study, the team offers the following recommendations for consideration by the site. Note that additional recommendations appear in Section 5.

8.1 Proposal Number 1: Changes to Accelerate Schedule

Background

The team learned that off-site dose from the SW-R complex demolition should be planned to be no more than about one millirem since the total from all Mound projects cannot exceed 10 millirem. One millirem of offsite dose equates to about 500 curies of near ground releases of tritium and about 10,000 curies of stack releases of tritium per year. The team understands and agrees that some additional work will be necessary to remove remaining asbestos in the facility and to remove the significant tritium hold-up in the primary tritium systems. The team also learned that alpha-emitting radionuclides will control SW-R demolition both from an emissions standpoint and worker protection.

Proposal

The SW-R complex dismantlement and demolition is expected to be conducted primarily by systematic segmentation and removal of the structure using heavy equipment such as skid-steer tractors and a track-hoe mounted universal processor. At the point where the primary tritium systems and the asbestos-containing materials are removed, the SW-R tritium source inventory, based on the documents reviewed by the team, is low enough to begin dismantlement and demolition using heavy equipment. The team believes that schedule acceleration can be realized through the use of heavy equipment for future dismantlement and demolition activities. This dismantlement and demolition work can proceed without further source reduction or characterization since the offsite dose would be <1 millirem even if stacking is not employed.

The team acknowledges that there is a level of uncertainty concerning the level of residual tritium in the SW-R facility. In addition, uncharacterized or under-characterized sources of alpha-emitting contamination contribute to emissions uncertainty. To begin systematic demolition soon while reducing the risk from uncharacterized sources, the team believes that some specific methods can be employed.

First, the team believes that near real-time release monitoring should be used to assess actual releases, which mitigates the uncertainty associated with uncharacterized sources and the release fractions that are also difficult to quantify. Specifically, daily monitoring of stack discharges and weekly offsite dose calculations (final) measurements are recommended. This approach largely reduces the dependency on emissions estimating, which promotes an inherent and substantial level of uncertainty.

Second, installed ventilation systems could continue to be used during demolition to significantly reduce the dose impact from tritium and alpha releases. Although the efficiency of the installed ventilation system and stack systems at the point of demolition would be reduced as the buildings are demolished, it will still provide the positive movement of air towards the filtered and stacked system. Additionally, localized ventilation units that exhaust back into the installed system could be incorporated to capture additional potential releases. If considered necessary, localized tenting systems can be incorporated to maintain full system effectiveness at areas with known high concentrations. Alternatively, portions of the structure may be dismantled by removing all of the internal equipment and floors with heavy equipment inside of the structure shell and then removing the remaining shell structure. This is possible since much of the SW-R complex is free of structural components. Demolition of the highly-contaminated concrete slab sections could also be conducted inside of the gutted structural shell.

By using the installed ventilation systems that allow for elevated-height emissions, public tritium dose is reduced by a factor of about 1,000. Public alpha dose is effectively eliminated through stack use since the alpha particulates are removed through mechanical filtration. Worker dose, which is largely controlled by alpha emitters, can be controlled by the use of heavy equipment instead of hands-on dismantlement. Bottled breathing air would be supplied to the equipment operator.

The baseline schedule calls for the Old Cave work to be complete prior to SW-R complex demolition. The team believes that the Old Cave work can be done in parallel with SW-R demolition since it only affects a small portion of the overall structure. The Old Cave area has a barrier wall around it, which would be a viable location to temporarily halt demolition. In addition, ventilation can be redirected to the 61-meter stack to maintain positive ventilation for that activity. After the Old Cave excavation work in complete, that remaining structure can be removed.

This approach would accelerate the schedule by:

- Eliminating the need for further characterization

- Eliminating the need for further source inventory removal (primarily alpha-emitting radionuclides)
- Allowing SW-R equipment dismantlement with heavy equipment
- Allowing SW-R demolition activities to be initiated earlier than currently scheduled
- Allowing SW-R demolition activities and the Old Cave work to be conduct in parallel
- Shortening the time by which the SW-R structure is removed

8.2 Proposal Number 3: Schedule Risk Reduction

Background

The MCP Main Hill Project is considered to be on the critical path to site closure by 2006. This Value Management Study scope was aimed at determining the impact of tritium during the D & D of SW and R Buildings and the decontamination of T Building. The present baseline approach calls for removal of source terms in the buildings that could potentially individually produce 100 millirem or more of dose. Following source removal the open-air D & D of SW and R Buildings would begin. The concrete slabs plus the soils underneath, and the impacts of the alpha contamination were outside the scope of this study.

The November 2001 baseline was examined, and the important steps necessary to get to the start of the "open-air" D & D were analyzed in detail. For the purposes of this proposal, it was established the project is worker limited. It was also concluded the project baseline has a high, though acceptable, degree of uncertainty based on prior DOE project performance. Several different ways to reduce the current schedule of some individual components of the baseline have been analyzed with the objective of reducing the time needed to be able to begin the open-air D & D. The team believes that the collective reduction of schedule for the individual components will result in a total Main Hill Project schedule reduction of some significance.

It should be noted that the contractor has considered each of the individual components and they have not been adopted. However, there is no evidence they have been considered together as a package to achieve schedule reduction.

Proposals

The following series of proposals is presented for consideration by management. They are based on trying to improve the schedule by shutting down or abandoning certain operations and using the labor resources elsewhere. Since the project is currently labor limited, these combined steps should address this bottleneck and produce significant schedule reduction.

(1) Enclose SW-R Buildings and Use Existing Stack for Emission Control

The following proposals are made on the basis that the open air demolition concept will be abandoned and the existing filtered stack will be used. If so, it is proposed the concept of enclosing the entire SW-R structure be re-examined. If the entire building is under a large enough structure to allow large equipment operation, the building can be taken down and the waste loaded in a contained environment. Next, the concrete slab and the soil underneath can be removed under the same cover.

Enclosing the entire structure is entirely feasible (airplane hangar, geodesic dome) and cost effective when the potential schedule improvement is considered. This approach is also believed superior to the tenting of specific areas during demolition because the slabs and soils would still have to be dealt with by re-tenting or other expensive control measures.

(2) Abandon the Old Cave in Place and Remove It After the Building is Taken Down

Currently, the baseline calls for chipping up the Old Cave under air-tight containment inside the existing building before it is taken down. The plan is to use a rather small, remotely operated jackhammer to bust up and load the old cave shell and contents. The operation will take several months and must be considered a technical risk since nothing of this magnitude has been done before at this site. If this undertaking fails to move on schedule, it will delay the start of D & D.

If required to meet safety concerns, the Old Cave could be easily strengthened or contained inside another structure while the building is being demolished. Once the demolition is complete, the Old Cave could then be removed using large equipment and loaded into large containers. This could easily be done in a few weeks rather than the months now in the baseline. Also, there is little or no technical uncertainty in using the large equipment, and there is believed to be less risk to the operators because they will be inside protected cabs under an enclosure being vented to the stack.

All of the operators and supervision could be redirected toward other projects preventing the start of D & D.

(3) Bake-Off the Items in Room R-108 Only If There Is No Other Alternative for Getting Them Off-Site

Currently, there are an estimated 100 different pieces of equipment in R-108. Some contain sufficient tritium to require heating and oxidation before they are deemed suitable for either transportation or disposal. The baking is done in a small furnace inside a glove box with the heated effluent going to TERF for tritium removal and disposal.

The baking of the items is time consuming and is now done seven days a week, 24 hours per day in order to maintain schedule. Although not considered on the critical path to completion of the Main Hill Project, the start of D & D cannot begin until the bake-off operation is complete.

Previously, there was some consideration given to sending some or all of this highly contaminated equipment off-site for processing, storage, or disposal. This indicates some or all can be transported. However because the baking operation was not considered to be in the critical path, the decision was made to continue the home cooking.

It is proposed that only those pieces of equipment that cannot be otherwise dispositioned be baked-off in R-108. Each item should be closely examined to determine if an alternative means of getting rid of it can be found. Specifically, the following options should be examined:

- Stack all items possible while maintaining NESHAPS requirements
- Remove tritium from applicable equipment by absorbing it on mole sieves. While it is realized it is expensive to dispose of the mole sieves without regeneration, if this produces schedule acceleration it may be cost-effective.
- The most cost-effective disposal would be to transfer as much of the tritium-contaminated equipment as possible to NNSI under its Nuclear Regulatory Commission license. NNSI has previously taken new and slightly contaminated processing equipment from the MCP to set up a commercial tritium recovery plant. The company could be offered the equipment for the contained tritium or paid to take it if that produced a schedule reduction.
- In addition, if necessary to move the schedule, DOE headquarters could be requested to direct another DOE site to handle the problem if it could be shown effective in assuring closure

The operators currently working round-the-clock on baking the tritium off could be re-deployed to other more critical projects.

(4) As Soon As R-108 Is No Longer Baking Off Tritium, Shut TERF Down

The only requirement for the continued operation of TERF ends when the baking operation in R-108 is finished. At that point, it could be shutdown and the four operators re-deployed.

Accepting this proposal package could result in the available resources being used more effectively and could ultimately result in schedule acceleration.

After discussion with the team, this proposal was written and submitted by the facilitator and included as a proposal in the report. The team recognized that the proposal did contain some merit; however, the team didn't have sufficient time to conduct an in-depth analysis.

8.3 Proposal Number 2: Dose modeling

Background

Tritium effluent releases are predicted using methods based on baseline inventories, assumed release fractions, mitigation strategies, such as, venting thru the stack, filtering, etc. The dose model has been used for two primary purposes: to plan and report releases and resultant doses to DOE and EPA (NESHAPS compliance), and for work planning purposes.

The release assessment has two parts, the planning phase and the reporting phase. There are primary variables associated with estimating offsite doses: the activity released and the dose pathway. The CAP88-PC code is used to estimate doses. This is a standard code used by the majority of the industry for this purpose. Critical inputs to the code is based on sector data associated with environmental data, such as, distances to the nearest residence, gardens, water supply, etc. Meteorological data are input based on wind rose data for each sector.

The method of estimating doses from tritium is accurate within a factor of two to seven based on 2000 and 2001 environmental data. This is acceptable given the conservatism of the input data and measuring techniques.

Proposal

(1) Clear Release Criteria

There must be a clear understanding of the radiation dose criteria. Some time should be spent with all stakeholders to get an understanding of roles and responsibilities. There does not seem to be a clear goal documented from the top down. The contractor mentioned that the operating staff had been reluctant to exceed previously defined "limits" and that their performance increased as their confidence grew toward a higher standard. This further signifies a lack of clarity in the overall project direction with regards to acceptable emissions levels.

(2) Work Planning Model

For work planning purposes, the model should be based on best estimate with an appropriate safety margin dependent on the uncertainties in the input. Emphasis should be placed on use of empirical data for release fractions and credit for mitigation features. In this way realistic releases can be used to compare alternative work strategies based on likely emissions forecasting, e.g., to purge the system to TERF or to release thru the stack, etc.

(3) Release Model

Figure 8.1 shows the varying dose risk associated with a 500 curie inventory based on the various release paths and mitigation features. This clearly shows that the dose can vary significantly with mitigative features; therefore, emphasis on dose is key.

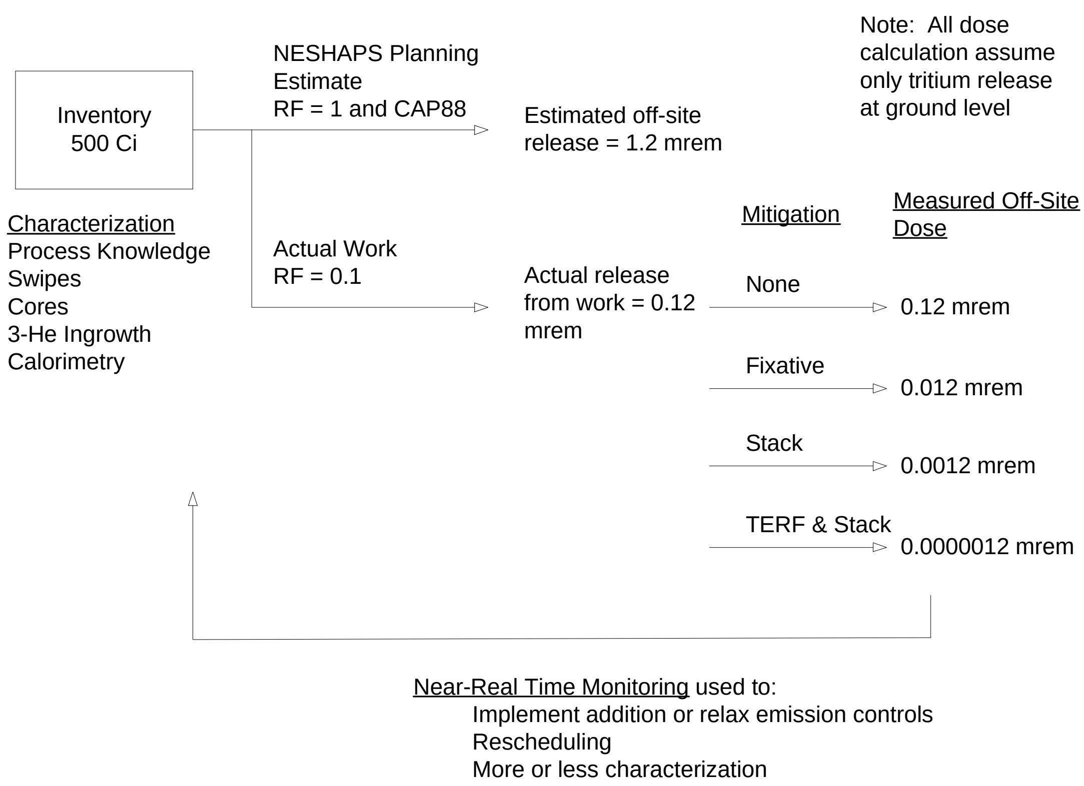


Figure 8.1 Tritium Inventory and Release Process

(4) Public Perception

The public perception of tritium risk may be skewed based on reporting activity released instead of dose. This seems to be due to the work practice of reporting curies releases as a measure of performance. This is fine in house because the activity is a subset of the overall dose goal. The annual report to DOE and its distribution to the public and the media may also be responsible for some of that confusion. It is recommended that the site publish a summary of the annual report for the public that emphasizes dose as the true risk of site operations.

As an example 10,000 Curies of HTO released thru the 61 meter stack results in about one millirem to the maximum individual. This is less than the dose from a single dental x-ray, smoking one cigarette (considering only the radiation associated with the cigarette, not including the other known carcingens). A plane flight from Dayton to Cleveland results in about one millirem of added radiation exposure due to higher cosmic radiation. One millirem is the difference between living in Denver and living at sea level for four days from cosmic background radiation. One millirem risk is equal to the risk of driving about three miles and crossing a two lane road three times.

(5) ALARA Objectives

ALARA is defined as reducing radiation exposures in a cost effective manner. It means that no exposure should occur without a net benefit. It should be shown that the increase in releases and doses to the public reduces the time that radioactive material inventories are present and susceptible to uncontrollable release from a design basis event. The BIO has risk values from these events and could be used to quantify overall system risks in the same way probabilistic risk assessment methods are used at commercial nuclear power plants. As a simple example, if the risk of fire is 1×10^{-3} per year and the consequences are one rem to the maximum individual, then saving six months on the schedule is the equivalent to reducing the risk by 0.5 millirem. If the proposed recommendation results in less than 0.5 millirem, then the recommendation is reducing the overall risk.

8.4 Proposal Number 4: Characterization Guidance

Background

In reviewing contractor sample and analysis plans for soil and concrete associated with the SW-R complex (reference 18 and 19), the team noted that these plans do not refer to the MARSSIM. The MARSSIM provides the primary DOE (and federal) guidance on characterization of nuclear facilities.

Among the MARRSIM guidance applicable to characterization surveys associated with the project are:

- Instrument selection and survey techniques (4.7)
- Data quality objectives (various sections)
- Reference coordinate system (4.8.5)
- Quality control (4.9)
- Characterization surveys (5.3)
- Example characterization survey checklist (pp. 5-16 and 5-17)

Incorporating of appropriate parts of this guidance could improve T Building characterization efforts.

The West Valley Demonstration Project has underway a comprehensive facility characterization program that follows MARSSIM guidance. The purpose of this program is to establish bounding source terms in each part of key facilities with significant radioactive contamination, such as the Process Building and high level waste tank farm.

The West Valley program involves formal evaluation of all existing data and development of a written technical approach to collect any additional data needed, and, in some cases, use of computer codes to model the source terms. In addition, some source terms are being directly calculated based on sample data, without the use of computer codes. The approach depends heavily on historical data supplemented by selected measurements and sampling. The collected data is being evaluated and incorporated into a final report for each plant area. A technical review and approval panel is reviewing and approving major steps in the process. The West Valley program has been peer reviewed to ensure that applicable MARSSIM guidance is incorporated.

While the West Valley facilities have different issues than the facilities of the Main Hill Project, and do not contain tritium in significant amounts, the basic objective – to obtain accurate bounding source terms in different parts of the facilities – is not unlike the needs of the Main Hill Project. Consideration of the West Valley characterization effort could be beneficial to the site.

Following the MARSSIM characterization guidelines could be especially helpful in T Building. Because this building is to be decontaminated and released for industrial, characterization data obtained following MARSSIM guidelines could be used in certain cases for final status survey purposes. This practice would save time and cost in the final status surveys.

The MARSSIM process also entails using derived concentration guideline levels (DCGLs) for radionuclides of interest before starting characterization. This task would be applicable to T Building. Such cleanup guidelines could be developed using the RESRAD-BUILD residual radioactivity computer code. There would be merit in moving forward with this task in the near future, because there is limited DOE precedent with establishing radioactivity guidelines on a mass basis (pCi/g) for structures contaminated in depth, as T Building is from tritium in some areas.

Proposal

The team recommends that the site consider MARSSIM guidance in any additional facility characterization performed in T building. The team also recommends that applicable parts of the West Valley process be considered. The team has provided to the contractor information on key points of contact for the West Valley program, notably Mr. Jack Gerber, Manager of Regulatory and Compliance Programs, at 716-942-4885. The team also suggests that the site move forward with developing DCGLs for T Building.

The team recommends that the site consider the need for additional technical support in developing characterization and sample and analysis plans following the MARSSIM protocols.

Implementation of these recommendations would entail review of applicable MARRSIM guidance and the West Valley process, and incorporation of selected elements into future site facility characterization and sample analysis plans. Implementation would also entail beginning the process of establishing DCGLs for T Building in the near future.

8.5 Proposal Number 5: Improved Concrete Characterization Method

Background

As explained in Table C.2 of Appendix C, the suggested method uses a simple hammer drill, instead of a core, to obtain a depth profile of the concrete. It has proven to be much superior to conventional methods, saving time and costs and resulting in improved accuracy in determining concentrations of tritium in concrete.

Proposal

The recommends that the project use this method for all applicable concrete samples associated with the SW, R, and T buildings.

8.6 Proposal Number 6: Work Practice Improvements

Background

As explained in Table C.3 of Appendix C, the Main Hill Project could benefit from adopting the Savannah River Advanced Radiation Worker Training (ARWT) program, which has resulted in significant improvements at that site.

Proposal

The team recommends that the project consider adopting this program.

9.0 THE PATH FORWARD

On October 4, 2002, the team presented its proposals to representatives of the MCP, including DOE personnel and others. Appendix D lists those in attendance. The team also provided draft copies of this report, which documents the results of the workshop. This draft was provided to BWXTO to check for factual accuracy and corrections from this review were incorporated.

The team stands ready to provide follow-up support to the MCP. Site requests for follow-up technical solutions on this project should be coordinated through the DOE Headquarters technical solutions lead for Ohio, Skip Chamberlain, at telephone 301-903-7248 or at the e-mail address Grover.Chamberlain@em.doe.gov.

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19. *SW-1B Addendum to R and SW Buildings Sample and Analysis Plan*, BWXTO plan dated July 2002.

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APPENDIX A

OHIO TECHNICAL SOLUTIONS STUDY SCOPE OF WORK

INDEPENDENT REVIEW OF THE MAIN HILL PROJECT ESTIMATES OF TRITIUM HOLDUP INVENTORIES, RELEASE FRACTIONS, AND THE OVERALL D & D APPROACH

FOR THE

Miamisburg Closure Project (MCP)

BACKGROUND AND PROBLEM DESCRIPTION:

This Technical Solutions Team will be requested to focus on independently reviewing the amount of Tritium release expected during the deactivation, demolition, and removal of SW and R Buildings and during the remediation of T Building, which will remain standing. The buildings are part of the Miamisburg Closure Project (MCP) [formerly the Miamisburg Environmental Management Project (MEMP)] Main Hill Project. The MCP is located in the middle of a residential area and is currently being developed as an industrial park concurrently with the cleanup activities.

The current MCP technical approach as documented in the PB2 Baseline[1] calls for demolishing SW and R buildings and shipping the debris off-site for burial as low-level radwaste while T Building will be decontaminated and left in place. The approach has changed over time and has resulted in the communication of conflicting information to DOE (e.g., it has been stated that the only way to accelerate schedule is to increase Tritium emissions to greater than 10,000 curies per year). Also, the actual air emissions experienced to date are typically orders of magnitude below the estimates given in previous baselines. This has led DOE to believe the overly conservative estimates are limiting schedule acceleration opportunities while possibly requiring the operation of the Tritium Emissions Recovery System (TERF) for longer than is needed.

A good deal of the information regarding the type and extent of remaining Tritium holdup inventory is based on process knowledge with estimates based on calculations versus actual sample data in many cases. This information has served as source term input to models predicting release of Tritium to various pathways, primarily airborne releases, during demolition activities. This same limited data has been used as the basis for a D & D plan to leave selected contaminated equipment and building components in place until they can be removed and disposed of during the building

[1] **PB2 Baseline refers to the redacted version of the, "Mound Exit Project, Performance Baseline 2002 (PB2)," Revision A, submitted November 20, 2001.**

demolition stage. This “Open Air D & D Approach” is expected to yield millions of dollars in savings in decommissioning and decontamination costs.

Experience has shown that the Tritium holdup inventory estimates and the resulting release modeling may have been too conservative, leading to less than optimal baselines. It is critical that MCP develop a more accurate determination of the amount of Tritium holdup inventory remaining and its release potential using a reasonable safety margin. This is especially important because the correct inventory is needed in order to assure the safety of the public and the private industrial operations located onsite while remaining in compliance with the appropriate regulatory limits.

The TS Team will be asked to independently review the PB2 Baseline Main Hill Project's estimates of tritium holdup inventories, source term determinations, release fractions, and safety margins associated with the Tritium operations and D & D activities. They will review options for Tritium recovery systems on site and recommend optimum usage to control releases. Next, the team will review the PB2 Baseline technical approach and propose technically sound alternatives with a reasonable safety margin while producing schedule acceleration. If required, they will recommend the optimum methods for gathering any additional data needed and then determine how the data can best be used to accelerate closure.

After the estimate of the Tritium holdup inventory is achieved, the most pressing issue the site will have to address concerns the proper cleanup criteria needed to meet the NESHAPS requirements during demolition. MCP will use CAP-88 as an air dispersion model to demonstrate compliance with the NESHAPS requirements. The TA Team is requested to assist in independently reviewing the reasonableness and accuracy of the assumptions and methodology used in the modeling. Included in the analysis of the CAP-88 model and the relevant NESHAPS requirements will be a determination of the contribution of the Tritium to the total airborne release from the site.

SCOPE:

This TS Team is to independently review the PB2 Baseline data and recommend improvements to determine the true extent of tritium holdup inventory in and under the specified buildings. The need for more detailed contaminant data will be driven by the Team’s analysis of the impact of Tritium emissions in achieving the NESHAPS goals for the site coupled with the potential for mitigation of these releases through the use of existing and/or innovative technologies and processes.

The Team will be provided with extensive background information concerning the problems being addressed, and will be made aware of the proposed PB2 Baseline technical solutions for those problems. Upon arrival, the Team will be briefed on the scope of the study and the expectations of management. Next, the contractor will provide a detailed briefing on the PB2 Baseline estimates of tritium holdup inventory, how they were obtained and used, the safety margin, and the resultant D & D approaches. The Team is requested to focus on the PB2 Baseline approach and not on any anticipated approach related to the ongoing procurement activity at MCP. The Team will then tour the buildings with the contractor and have any questions fully answered before addressing the study objectives.

The current MCP contractor has developed a plan for demolishing SW and R Buildings based on the projected levels of radiological holdup inventory. The Team will concentrate on independently reviewing the PB2 Baseline data and assumptions regarding tritium holdup, release fractions, modeling, and safety margins. The Team will also evaluate use of TERF or Tritium Recovery Carts and the relationship of tritium emissions to the total site radiological emissions. The Team will suggest alternate approaches to improve the PB2 baseline and will quantify the schedule improvement and the effect on effluent levels.

OBJECTIVES:

The primary objective of the TA Team is to independently review the tritium emission assumptions in the MCP Exit Plan (PB2 Baseline) and to suggest improvements or alternatives that accelerate the schedule to speed site closure.

Specific objectives of the TA Team are:

1. Provide independent review of the PB2 Baseline Tritium holdup inventory estimates and projected release fractions in SW, R and T Buildings. If possible, identify methods for determining the actual amount of tritium holdup associated with equipment and systems on the critical path

2. Provide independent review of the PB2 Baseline modeling and associated safety margins. Propose technically sound improvements that will result in schedule acceleration while maintaining adequate control of effluents.

3. Provide independent review of PB2 Baseline plans for using the various Tritium recovery systems available, such as TERF and the Tritium Recovery Carts.
    - Recommend the optimum use of these systems factoring in any potential conservatism that may exist in the PB2 Baseline.
    - Recommend the earliest date for the shutdown of TERF while maintaining adequate control of effluents.
    - Propose alternate plans with earlier TERF shutdown dates that will result in significant schedule improvements. Quantify potential effluents and associated schedule improvements.

4. Provide independent review of the contribution of Tritium emissions to the site NESHAPS effluents in the PB2 Baseline.

DELIVERABLES:

The Team will address the Objectives 1-5 above, develop alternatives (if any) to the extent possible and present the results to DOE as a draft final report prior to leaving the site. MCP will review the draft report for factual accuracy and provide comments to the Team. The Team will issue a final report by October 25. It is anticipated that after completion of the final report, some portion of the team will be available for continued consultation. The consultation may range from phone calls to site visits, either individually or as part of a team.

SCHEDULE:

The schedule is as follows:

- Received Technical Solutions Request – 8/19/02
- Site Call to Clarify Request – 8/21/02
- Site Visit – 9/30/02 through 10/4/02
- Closeout and Distribute Draft Report – 10/4/02
- MCP Provide Comments of Draft Report - October 15, 2002
- Complete Final Report – 10/25/02

APPENDIX B

Previous Documentation and Studies

This appendix summaries the results of previous decommissioning and emission control studies at the site to help put into perspective the results of this study. These previous studies include:

1. 1996 Value Engineering Study
2. 1996 Pre-Conceptual Engineering Study
3. 1996 Assessment of Future Tritium Releases
4. 1997 Workshop on Tritium Decontamination and Decommissioning
5. 2002 EM-50 Workshop on Reducing Fugitive Emissions

1. 1996 VALUE ENGINEERING STUDY

Objectives

The goal of the value engineering study described in reference (4) was to evaluate planned activities and recommend the best alternative for tritium emission control during decommissioning of SW, R, and T Buildings.

Scope

The team for this formal value engineering study consisted of five experts on radioactive effluents, including one member of the current study team and the same DOE-OH representative who is supporting the current team.

Two alternatives for limiting tritium emissions were considered by the team, the ERS and the TERF.

Recommendations

To best control tritium emissions, the team recommended that the TERF be activated and that the ERS be shutdown. As an alternative to this approach, the team recommended installation of a wall reaching down to bedrock (six feet below grade) to surround the building and erection of a concrete dome over the structure. Under this strategy, the radioactivity would remain in place and be effectively entombed.

A third strategy offered by the team was to store onsite the low-level tritiated waste from SW Building and T Building. A fourth strategy the team offered concerned a possible shift in emission quantities, i.e., allowing emissions to exceed federal standards.

The value engineering team also made a number of general recommendations, including:

(1) Developing an integrated operations, safe shutdown, and D&D strategy.

(2) Reestablishing a sequence of performing assessment before selecting D&D options.

(3) Applying federal standards to release limits in the decision-making process.

(4) Considering use of new technologies such as the Los Alamos National Laboratory gettering system, the Lawrence Livermore portable tritium cleanup system, and balloon-formed concrete domes.

(5) Pursuing an EM-50 large-scale demonstrative project for the site to help make the latest technologies available.

Other information

The report noted that the estimated cost for D&D of the SW Building was $75 million of which $3.363 million was for the Old Cave. The cost for D&D of R building was noted to be $80.435 million.

Included in the report was an estimate of the total amount of tritium remaining in the SW Building after safe shut down of one gram (10,000 curies) from "lots of machining done there." The report also noted that oil had soaked into floors in many places.

2. 1996 PRE-CONCEPTUAL ENGINEERING STUDY

Objectives

According to reference (5), the primary objective of the study was to evaluate the methods and estimated costs of D&D of the SW-R facility following plans designed to limit total plant release of tritium to less than 1000 curies per year.

Scope

The scope of the study involved engineering design and cost estimates at a conceptual level of detail for several disposition options for the SW-R Building, along with examination of the short-term and long-term benefits of each alternative.

Recommendations

The study concluded that the only viable decommissioning alternative for the SW-R complex was immediate D&D for unrestricted use [of the property after demolition of the building]. This approach involved complete demolition of the SW-R building, excavation of contaminated soil, and removal of the tritium-contaminated equipment in the R Building portion of the complex.

Additional recommendations included (1) initiating D&D activities as early as possible, (2) determining the impact of various tritium release quantities per year using risk analysis, and (3) performing structural demolition of both SW Building and R Building concurrently, combining the latter phase of the two projects. [In 1996, the D&D effort was being treated as two separate projects.]

Other Information

The study noted that the complex contains approximately 40 rooms with 310 gloveboxes and/or fume hoods used to process tritium.

The study included the following estimated volumes for low-level radioactive waste:

Table B.1. Estimated Volume of Low-Level Radioactive Waste

Waste Container Type	Quantity	Disposal Volume (ft^3)
B-25 (4’ x 4’ x 6’)	2817	287,334
Seal welded (3’ x 3’ x 6’)	3878	232,673
Seal welded (3’ x 3’ x 3’)	808	24,240
Sea-land (8’ x 8’ x 20’)	11	14,300
Total waste volume in ft^3		558,547

The welded waste containers were to be used for waste in which tritium was expected to be off gassing. The study estimated the total volume of non-radioactive rubble and construction debris at 271,684 cubic feet.

3. 1996 ASSESSMENT OF FUTURE TRITIUM RELEASES

Objectives

As described in reference (6), this study was performed to evaluate the potential radiological consequences associated with tritium releases that may occur during the D&D of the tritium complex buildings and compare the potential releases to regulatory limits.

Scope

The study included several scenarios for ground-level and stack tritium releases. The associated radiation doses to the maximally exposed individual were estimated for long-term dispersion using the CAP88-PC computer code. A continuous stack release was modeled to account for releases from purging and disassembly of gloveboxes, fume hoods, process equipment, and process lines. Each of the five site stacks then in use was modeled as if it were the single release point for tritium emissions. The calculations were based on the 1994 site wind rose, which showed the predominate winds to be coming from the southwest.

Results

Potential doses to the maximally exposed individual within the current population [1996] were estimated as follows:

Release in curies per year	Dose in millirem per year
10,000	0.02 – 0.03
126,781	0.30 – 0.38
3 x 10^6	7.07 – 8.90

This calculation assumed that the maximally exposed individual was located 8000 meters northeast of the release point

Potential doses to the maximally exposed individual nearer the site, assumed to be located at distances from the stacks varying from 300 meters south from the T West and T East sacks to 700 meters northeast for the other three stacks, were as follows:

Release in curies per year	Dose in millirem per year
10,000	0.32 – 0.70
126,781	4.1 – 8.9

(Note that current site calculations are based on the maximally exposed individual being 880 meters from the T-West Stack.)

The study also indicated that no more than 10 grams of elemental tritium would be released in an accidental short-term puff, and that this release would result in a potential dose to an offsite receptor of no more than three millirem.

Recommendations

The study concluded that approximately 127,000 curies of tritium could be released through the site stacks without exceeding 8.9 millirem per year, and recommended that the actual release limit be established at a value less than 127,000 curies so that releases from other radionuclides could be considering in staying within the 10 millirem per year NESHAPS limit.

The study also recommended that Department of Transportation Type A containers be used, and that containers suspected of having extremely high residual tritium be welded shut prior to moving them outside the building. These recommendations were aimed at decreasing the risk of an unplanned release, which the study concluded was already small.

Other Information

The study provided data on annual site tritium stack emissions, noting that in the 1990s [through 1995] total tritium releases have been approximately 600 to 800 curies per year. Tritium stack emissions in earlier years were much higher, with more than 300,000 curies in 1969. Since 1974, tritium emissions though the stacks have generally been less than 5000 curies per year, except in 1989 when an incident resulted in approximately 38,000 curies of tritium being released.

4. 1997 WORKSHOP ON TRITIUM DECONTAMINATION AND DECOMMISSIONING

In July 1997, a workshop on tritium D&D work was held in Miamisburg as described in reference (26). This workshop, which was sponsored by DOE-NETL and DOE-OH, included discussions on tritium facility D&D at other DOE sites, such as the Building 232-F project at the Savannah River Site.

5. 2002 STUDY ON REDUCING FUGITIVE EMISSIONS

Objectives

As explained in reference (2), the primary objective of the study was to identify the best available strategies and technologies for minimizing radioactive emissions during decontamination and demolition of five buildings at the site, including the SW-R complex.

Scope

The technical solutions team included seven senior, experienced professionals in the fields of nuclear facility decontamination and demolition, air dispersion modeling, and value engineering. The study followed the value engineering process.

The team reviewed information about the site and the issues of concern before the visit. The onsite portion lasted from July 29 through August 1, 2002. The team identified a total of 76 ideas that might have merit in improving the site processes. An August 1, the team briefed site managers on the results of the workshop, and provided draft copies of the reference (2) report.

Recommendations

The team recommended that the site consider the following ideas

- Refining calculations of projected radiation doses from offsite emissions, and use of near-real-time emissions data to promptly determine actual doses.
- Comprehensive characterization of the buildings, making use of proven, innovative characterization techniques.
- Use of partial or full containment tents during building demolition, with ventilation exhaust directed through the 61-meter stack.
- Use of proven, innovative technologies for size reduction and radioactive waste packaging.
- Considering other strategies and lessons learned in other D&D projects for possible application at the site.

The team noted that the site already had a good, well-developed strategy for the D&D work, and acknowledged that the site had considered or was planning to implement most of these ideas. A more-detailed summary of the recommendations appears on the next page.

Other Information

The reference (2) report includes information on the strategy for decontamination and demolition of the SW-R complex provided by BWXT personnel in briefings of the team.

Summary of Proposals From the 2002 Study on Reducing Fugitive Emissions

1. Refined Emissions Dose Calculations and Near-Real Time Monitoring

This would involve characterizing soils to produce a more realistic source term for the particulates released from soils, and refining the tritium ingestion scenario. In regard to near real time monitoring of emissions, the team considers that D&D work could proceed as scheduled initially, without implementing more than minimal fugitive emission controls. Offsite dose monitoring information would be collected and tracked on a weekly to monthly basis. If actual dose monitoring shows that levels are acceptable, the site could continue work as scheduled and perhaps move future year work forward.

2. Comprehensive Characterization

Further characterization efforts would be weighed against the needs of emissions assessments. If the emissions estimate is found to be too conservative and adjustments to the estimate are made, additional characterization effort related to demolishing the R-SW facility may be substantially reduced. The team recommends that several sources of demonstrated or evaluated technologies be reviewed to assure that the most effective and efficient technologies are being used.

3. Using Containment Tents With Ventilation Though the R-SW Stack

As an alternative or back-up to the completely "open air" approach, it is recommended that large tents and directed venting be used where appropriate to contain emissions as dismantling of the contaminated building progressed; only selected areas would be tented. However, it is recommended that open air demolition be done without tents, unless it can be shown that significant schedule reduction can be achieved through the use of tenting. But if emissions from D&D operations are expected to exceed the annual dose limit at the site, then strong consideration should be given to full or partial tenting options.

It is also recommended that specialized use of tents be considered when dismantling the Old Cave and during waste handling and disposal operations at the waste staging area.

4. Using Proven, Innovative Technologies For Size Reduction and Waste Packaging

The team recommends that that the site consider using appropriate innovative size reduction technologies listed in Appendix E. Regarding waste packaging, the team recommends packaging radioactive waste inside buildings to the extent practicable and using intermodal containers and soil sacks to promote efficiency. Wastes that are large and have an irregular shape could be packaged using the Instacote process. The team recommends methods for reducing dose resulting from the staging area, such as delay of the property transfer of Phase 3.

5. Considering Other Strategies and Lessons Learned in Other D&D Projects

The team recommends following a carefully-thought-out sequence for building demolition, and a process for sequential completion of the final status surveys and the related report which could save time during the final stages of the project. The team provided information on other D&D projects using different approaches, and encourages the site to consider

APPENDIX C

Value Management Process Information

This appendix provides information related to the VM process that was developed during the study, as follows:

1. Anticipated Outcome and Criteria for Success
2. Key Issues
3. Ideas Identified
4. Analysis of Ideas
5. Development of Ideas

1.0 ANTICIPATED OUTCOME AND CRITERIA FOR SUCCESS

The presentations made by project management and technical personnel, and subsequent discussions with site personnel, included the following information:

1.1 Anticipated Outcome

The anticipated outcome of the study is as outlined in Section 1.2 of this report, which describes the scope of work.

1.2 Criteria For Success

The principal criteria for success are achieving the objectives outlined in Section 1.2 of this report.

2.0 KEY ISSUES

The team discussed information provided by the site and agreed that the key issue to be addressed by the study is the degree of conservatism in estimating tritium inventories in the SW-R complex and the T Building.

2.1 What is Being Done?

The site is planning to remove the SW-R structure and to decontaminate and release the T Building for industrial use. The site is calculating tritium inventories in these Main Hill Project buildings.

2.2 Why is this Being Done?

The site is removing the buildings to make room for development of the property into an industrial park because the SW-R complex is not considered usable in the industrial park environment, and because they take up space needed for the park development, and to eliminate future risk to people and the environment. The T Building is being left in place so it can be used in the industrial park because of the considerable expense for demolition of it.

Tritium inventories are being calculated to support planning related to radioactive emissions and the methods and timing of D&D work as they are affected by projected emissions.

2.3 How is this Being Done?

The site is removing radioactive materials and equipment from SW-R complex, performing limited decontamination of the building structures, demolishing the structures, and disposing of the building rubble as low-level radioactive waste. Radioactive equipment is being removed from T Building, which will be decontaminated, surveyed for final radiological status, and released for industrial use.

Major equipment/component source terms have been determined by process knowledge. Tritium inventories in systems, piping, equipment, etc. are being calculated primarily by using average tritium contamination levels on internal surfaces – which are based mainly on experience and smear data – multiplied by the total internal surface area.

3.0 IDEAS IDENTIFIED

The team identified 86 ideas for alternative solutions as listed in Table C.1. These ideas were initially grouped by the team as indicated.

Table C.1 Initial Ideas for Solutions

No.	Idea
	Characterization
	Measurements Improvements:
1	Should online mass spectrometry be reinstituted?
2	Evaluate use of laser or other high-tech sensor
3	Use open face proportional counter
4	Install a centralized emissions control system (like Boston)
5	Use Passive Electret Ion Chamber
6	Increase use of hand-held monitors (e.g., gamma compensated, Scintrex 904)
7	Plan to take data in selected D&D operations
8	Use portable liquid scintillation (which may become contaminated)
9	Dedicated field lab for Main Hill Project

	Monitoring Improvements:
10	Have project people acquire rough data (as Savannah River Site)
11	Use Rocky Flats characterization approach
12	Define data quality objectives (DQO) – Savannah River Site model
13	Use hammer drill on concrete
14	MARRSIM approach
15	D&D people take their own samples (similar to 10)
16	Prompt gross data sufficient in many cases
17	Use SRS advanced rad-worker training – 1 day – do own testing
18	Measure activity – do not assume during D&D
19	Use ion electrets, not swipes
	Characterization Improvements:
20	Smart Characterization (define DQO's for components)
21	DQO's –how much is enough?
22	Do not characterize – demolish until limit is reached
23	Define how much is needed
24	Determine worst-case scenario/use final unaccountable inventory (Material unaccounted for/MUF)
25	Review 10 percent swipe efficiency
26	Set threshold concern level
27	Seal a room and measure over time
28	Validate selected items
29	Seal test area (known site) still measure over time
Release Assessment	
	Modeling Improvements:
30	Develop a model at ground level and through stack
31	Literature search for D&D
32	Challenge conservative consumption assumptions
33	Develop best-case/worse-case model
34	Develop realistic and specific model for MCP
35	Take difference between HT and HTO into account in model
	"Concrete is to tritium as a sponge is to water"

36	Credit for expert opinion
37	
	Reporting Modifications:
38	Report same unit measure (dose/millirem) as used by DOE workers and commercial nuclear industry
39	Change reporting units from curies to millirem – use new contract to make change
40	Use worker numbers (3 millirem/year)
	Establish Realistic Release Parameters:
41	Seal area, knock down wall, and measure
42	Bench test in-situ
43	Bench test bell jar lines with oil
44	Establish release rate by testing/obtain data
45	Use tank as test and leave pipe in-place
Control Emissions	
	Control Emissions:
46	Use molecular sieve instead of TERF for HTO
47	Use Cart for bake-out in R-108
48	Tent and vent
49	Real-time monitoring
50	Use localized emission ventilation (w/o tent) and keep stack ventilation running during D&D operations
51	Load rubble into shipping containers at job site, so effluents go up stack
52	Remove more source terms
	Shutdown TERF:
53	Determine if TERF is critical to T-building D&D
54	Use CART rather than TERF to clean TERF
Schedule Improvements	
	Optimize Project Constraints:
55	Set thresholds higher
56	Remove one millirem/project limit
57	Eliminate all constraints

58	Increase release limits
59	Expedite exemptions
60	Carry over bank
	Waste Packaging and Transport:
61	Send to Nevada Test Site
62	Send sources off-site
63	Segregate waste
64	Better waste packaging
65	Minimize disposal costs
	D&D of Building:
66	Detonate building
67	Use wrecking ball
68	Demolish building from inside
69	Leave buildings in place
70	Use robotic systems
71	Enclose building during D&D
	Work Operations:
72	Use stacks
73	Utilize near real time monitoring
74	Stop characterization
75	Revise DOE Order 5400.5 or use international standards
76	Change work rules
77	Reduce personal protective equipment requirements
78	Use three-phase decon
	Improved Project Management Techniques:
79	Leave old cave – do later
80	Subcontract more work
81	Utilize advanced/innovative technologies
82	Reschedule work/minimize risk
83	Use more shifts if bank allows
84	Use computer model to improve schedule

Application of Experience (Lessons Learned)	
85	Ensure TERF is decontaminated before breaking lines
86	Revise inventory estimates and release fraction based on experience
Historical Review (Evaluation of Risk)	
	No recommendations

4.0 ANALYSIS OF IDEAS

The team considered each of the ideas listed in Table C.1. The team determined which ideas would meet the criteria for success described in above, i.e., the objectives of the study. Note that this conclusion was not based on the implementation cost necessarily being lower, because time did not allow for development of detailed cost estimates for ideas which showed promise at this point in the process. Ideas showing the most promise were selected for further development.

The team later informally discussed most of these these ideas with MCP project team members to determine whether there were any reasons why they were not viable. The project team's input was taken into account in selecting the ideas which led to the proposals presented in this report.

5.0 DEVELOPMENT OF IDEAS

The team developed the most promising ideas, considering potential benefits, potential advantages, and possible risks to the project. Tables C.2 through C.4 provide examples of this process.

Table C.2. Near-Real-Time Monitoring

PROJECT: D&D of Main Hill Project Buildings	
ALTERNATIVE: 1. Near-real-time monitoring	
ALTERNATIVE DESCRIPTION	
Implement near real-time monitoring processes to evaluate actual releases. (Note that this recommendation was also made in the report of the 2002 workshop, reference 2.)	
BENEFITS	**DISADVANTAGES**
• Minimizes the effect of the uncertainty associated with release fractions since actual releases and dose consequences are calculated. Theoretical release values are used only to the extent necessary to attain regulatory approval	• More funding and personnel resources may be necessary to support additional sampling and analytical work.

to proceed with decommissioning operations. • Near real-time monitoring also provides the confidence in knowing that any uncharacterized source of radioactive material will be identified quickly so that mitigating measures can be taken and the "dose bank" can be updated.	
IDENTIFIED RISKS	
None.	

Table C.3. Improved Concrete Characterization

PROJECT: D&D of Main Hill Project Buildings	
ALTERNATIVE: 2. Improved Concrete Characterization	
ALTERNATIVE DESCRIPTION	
The scope of the project presently does not include any bulk characterization of concrete floors and walls, apart from floor profile and core sample recently taken and not yet analyzed. The ability of concrete to harbor very sizable quantities of tritium is well known and documented in D&D and scientific literature (see references 21 and 22). This is the case for facilities processing either the elemental or the oxide forms of tritium. There is an industry perception that concrete characterization is expensive and time consuming. However in the last few years, many new tools and measurement methods have been demonstrated and reported in the literature, some of which were used successfully at DOE facilities. It is now possible to obtain depth profiles of bulk concrete for a few hundred dollars per location. Additionally, the analysis can be completed overnight in a modest mobile field laboratory. Tritium concentration data in curies of tritium per kilogram of concrete are readily determined to an accuracy of 10 percent or less. Conducting such characterization removes the risk of missing or falsely assigning the inventory of this difficult radionuclide in D&D projects. The method uses a simple hammer drill, instead of a core, to obtain a depth profile of the concrete. Drill powder from each increment of depth desired is quickly placed in a glass vial for transport and analysis. One gram of the powder is leached overnight in 10 mL of 1 M HNO_3. Two to three mL of the leachate is distilled for LSC and analytical quality results. The team understands that this method has been used in a few locations on the SW-R project, but considers that its use needs to be expanded.	
BENEFITS	**DISADVANTAGES**
• No damage to the facility and minimal exposure risk to the sampling personnel.	• None identified other than the moderate costs and time beyond the risky no bulk characterization approach.

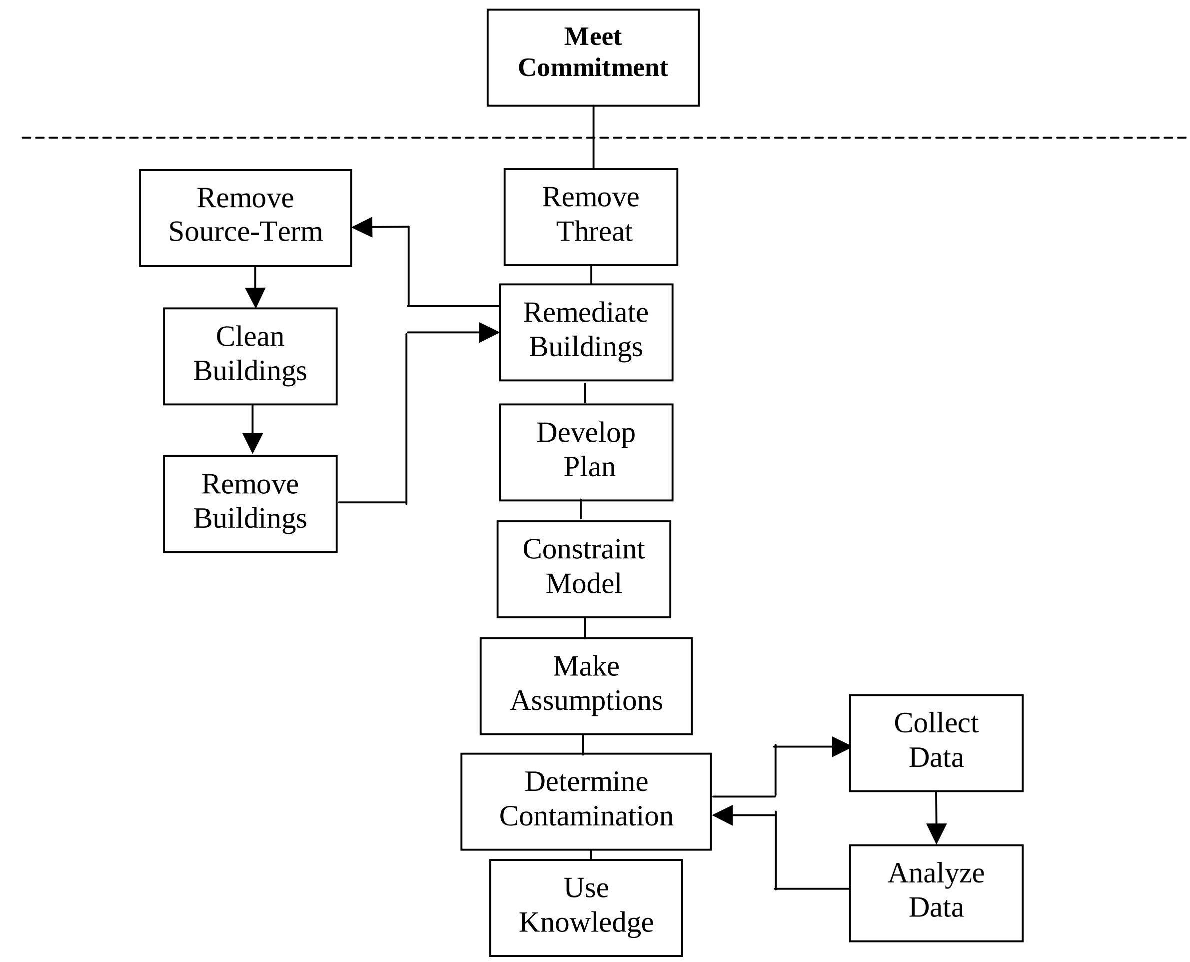
• No liquid waste generated. • No specialized equipment or personnel required for work. • Greatly reduces the risk of missing bulk contaminated concrete resulting from the baseline surface survey method (smears). • Builds case for accurate inventory for regulatory approval of proposed D&D activities.	
IDENTIFIED RISKS	
Risks are very minimal to either the facility or personnel. The only issue is the small additional cash and time expense versus the time and cash constraints of the project.	

Table C.4. Work Practice Improvements

PROJECT: D&D of Main Hill Project Buildings	
ALTERNATIVE: Work Practice Improvements	
ALTERNATIVE DESCRIPTION	
The current D&D effort of the project is amenable to significant improvements in work practices. The contractor realizes that this would speed and simplify on-going work and expedite future planning and preparations. Specific changes would be patterned on the Savannah River ARWT program. Savannah River Site ARWT personnel are approved to operate standard survey and dose-rate instruments to monitor and maintain radiological work safety. This includes taking and measuring contamination smears and contaminated surfaces. (They can make such measurements, but official documentation records may be authorized only by a certified health physics inspector.) This practice is a big help in itself; however, ARWT personnel are also excellent candidates for using more sophisticated instrumentation such as liquid scintillation and proportional counters. There are also active and passive ion-chambers and energy spectrometers for better and more sensitive measurements than available in most health physics arsenals. Training and qualification for ARWT requires about one and one-half days under the Savannah River Site program.	
BENEFITS	**DISADVANTAGES**
• Rapid in-situ analytical counting information available to aid contractor/worker decisions on extent and kind of contamination, progress of decontamination efforts, and identifying candidate materials for free release	• Does not relieve need for some support from health physics inspectors. • Requires training beyond Radiation Worker-II; time and money needed to setup and maintain annual training.

considerations. • Frees health physics inspectors for work requiring procedural protocol and legal authorization such as contamination and free release surveys.	
IDENTIFIED RISKS	
None	

The team developed a Functional Analysis System Technique (FAST) chart to help organize the concepts and how they relate to the project objectives. A copy of this chart appears in Figure C.1.



Study Objectives:
1. Minimize Emissions
2. Accelerate Closure Schedule
3. Assess Conservativeness of tritium estimates and inventory

All-the-Time Functions:
1. Minimize Costs
2. Maintain/improve safety
3. Meet regulatory requirements
4. Reduce risk

Figure C.1 FAST Diagram

APPENDIX D

Team Presentation Attendance List

Name	Organization	Telephone	E-Mail
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APPENDIX E

Lessons Learned

The purpose of this appendix is to identify the lessons learned during the technical solutions visit to the MCP. A team of seven members visited on September 30 – October 4, 2002. The purpose was to provide assistance in characterizing and controlling fugitive tritium emissions during building demolition. In preparation for the visit, a Scope of Work was prepared for the DOE Ohio Field Office. Resumes of participants with expertise in areas of consideration were provided for approval by the site. The MCP staff requested that the team provide independent observations, in conjunction with evaluation of the MCP baseline approach The lessons learned from this technical solutions effort are as follows:

1. The scope of work document is critical to success and must be well understood. During the visit, "scope creep" and additional questions from the customer resulted in a broader range of discussion than was originally understood. The team voiced a need for well-defined roles and objectives. The outcome was successful, but care should be taken to insure scope consistency with site objectives and to remain within those guidelines.

2. The breadth of disciplines and wealth of experience provided by the technical solutions team was sufficient for the task. It was noted that this team worked exceptionally well together.

3. The VM process followed allowed freedom for the team to develop ideas and concepts of importance to the task. Nevertheless, the VM process requires that problems be narrowly defined up-front and that they involve development of baseline alternatives (see number 1, above).

4. A strong facilitator was necessary to ensure participation by all of the team members and a balanced outcome. Responsibilities of the value study facilitator could have been better defined prior to the team meeting. In this case, it was not clear whether the facilitator was also a team participant. The facilitator should function as independent to the task, rather than having a vested interest.

5. Pre-meeting materials that were provided to team members a week before the meeting were quite useful in orienting the team to the task at hand.

6. Project Team commitment to the successful outcome of a technical solutions event is critical to success. The Ohio Field Office and the MCP contractor staff support of the visit was excellent. Busy managers remained available on short notice through the visit to answer questions and provide additional information.

7. A clear agenda for the meeting was not provided. Such an agenda should be provided before the start of the meeting and should include: daily start

times; major divisions of the process to be followed; expected timing of key deliverables (e.g., draft report, draft presentation, closeout meeting, etc.).

8. The team noted that the draft report provided at the closeout meeting was not a "perfect product" and would require additional work. The team expressed concern that their respective schedules would not allow time for extensive report review/rework.

9. The expected format of the report and the respective sequencing of closeout presentation slides were difficult to determine. Expectations changed several times during the last few hours of team preparation. Better communication between the customer and the facilitator prior to the meeting may have lessened this confusion. (see number 1, above)

10. The conference room provided to the team was adequate, although quite cramped. There were adequate white boards mounted on the walls and easels available. Additional office space was made available to team members as needed and additional conference rooms were made available for meetings with Mound managers.

11. The team had a "willing" scribe that used a computer and projector as a useful tool during group discussions and in drafting the out-briefing materials. The preparation of both the out-briefing and the visit report was initiated before the visit began. This practice helps to produce a more effective presentation and enables the final report to be completed faster. It also helps team members to be more focused and better prepared at the start of the visit.