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Solid Low-Level Radioactive Waste Volume Projections at Los Alamos National Laboratory

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ABSTRACT

In response to regulatory requirements, the current economic environment, and diminishing on-site low-level radioactive waste (LLW) disposal capacity, Los Alamos National Laboratory (LANL) needed to develop a system to collect data on future LLW generation that would comply with DOE Order 5820.2A and be an effective facility planning tool. The LANL Volume Projections Project (VPP) was created to meet these needs. This paper describes the objectives, scope, and components of the VPP that will provide information essential to future facility planning and development.

The VPP potentially involved the accumulation and evaluation of a large volume of data. The minimum data requirements were determined by considering the waste management facility's preliminary performance assessment results, on-site disposal space limitations, treatment options, and off-site disposal options. Using these data requirements, a questionnaire was developed to obtain the necessary waste stream information from the waste generating facilities. A pilot program was implemented to evaluate the sufficiency of the data gathered and the ease-of-use of the questionnaire.

An Oracle database will be developed to manage the information. When the database is completed, the questionnaire will be distributed to the five largest waste generating facilities (accounting for 75 percent of the solid LLW disposed of at LANL). The LANL-wide implementation of this program is scheduled for the following fiscal year.

DEFINITIONS

Container. A receptacle used to hold materials or waste for shipment, storage, or disposal.

Low-level radioactive Waste. Solid waste that is radioactive and is not classified as high-level waste, TRU waste, spent nuclear fuel, or tailings from the milling of uranium or thorium ore.[1]

Normal Waste. Waste that is not generated through an environmental restoration project, a decontamination/decommissioning project, a spill clean-up, or an abatement project.

Performance Assessment. A systematic analysis of the potential risks posed by waste management systems to the public and environment, and a comparison of those risks to established performance objectives.[2]

Waste generator. Any person by site whose act or process produces waste or whose act first causes a waste to become subject to regulation.[3]

Waste Stream. A waste or group of wastes generated by a process at regular intervals or continuously over time that varies only within a narrow range of parameters.[4]

ACRONYMS

BEMR	Baseline Environmental Management Report
DOE	Department of Energy
IDB	Integrated Database
LANL	Los Alamos National Laboratory
LLW	Low-level radioactive Waste
ORNL	Oak Ridge National Laboratory
PA	Performance Assessment
TSD	Treatment, Storage, or Disposal Facility
VPP	Volume Projections Project
WPF	Waste Profile Form

INTRODUCTION

The LANL Waste Management Program Office and its facilities must provide waste generation projection data to the Department of Energy, the University of California and other stakeholders. Because of the following concerns, the need for accurate waste generation volume projections has increase substantially: projected deep budget cuts for environmental management programs, and the need to assure the availability of waste treatment, storage, and disposal (TSD) capabilities. An annual survey will be used to gather facility specific estimates of future waste stream generation volumes to compile waste volume projection data with TSD capacity data. The questionnaire will be useful in performing compliance, reporting, and planning activities.

REGULATORY DRIVER

DOE Order 5820.2a, *Radioactive Waste Management* states that "Generators shall provide an annual forecast in the third quarter of the fiscal year to field organizations managing the off-site disposal facility to which the waste is to be shipped."[2] Additionally, the draft DOE 5820.2b, states that "Because of the long time period involved and the nature of the events and processes affecting disposal facility performance, there will be substantial uncertainties associated with the performance projections. A Performance Assessment Maintenance Program should include a process for reducing uncertainties in predictions about the long-term performance of the facility based on experimental and model improvement efforts... Projections should, at a minimum, provide the following: a listing of the types of waste to be shipped and an estimate of the as-transported volume and weight of each waste type and the activity of major radionuclides by isotope in each waste type."[5]

DISCUSSION

Between 1992 and 1995, LANL generated approximately 2600 cubic meters of LLW per fiscal year. Therefore, the VPP involved the accumulation and evaluation of a large volume of data. Because of the large number of LLW generators and the need to ensure that the amount of data gathered was

manageable, it was necessary to limit the data requested to those items that directly impact the facility's disposal capabilities and those needed for DOE reporting activities. These items are identified in the PA, the Baseline Environmental Management Report (BEMR), and in the DOE Integrated Database (IDB).

The PA requires information on the volume of waste disposed of, the radionuclide content, the waste matrix, and the type of container used for disposal. Because of space limitations, treatment options, and off-site disposal options, similar information must also be evaluated to ensure that facility operations are not impacted.

Additionally, the data obtain from this project will reported to the BEMR and the IDB. The BEMR includes "life-cycle cost estimates, tentative schedules, and project activities necessary to complete the Environmental Management Program."[6] The IDB provides "radioactive waste inventories and projections, ...for use in the planning and analysis of waste management functions."[7]

Questionnaire Development

Before the questionnaire was developed, representatives from LANL's waste management facilities, pollution prevention program, and waste management program office met to discuss the data required to meet reporting requirements. The following items were identified as minimum data requirements to be provided on the VPP questionnaire:

I. The fiscal year was chosen as the reporting period, since the amount of waste generated correlates with the funding received for the fiscal year. Data will be collected in the first quarter of each fiscal year for the current year as well as the next four years.

II. The volume is reported in cubic meters. Cubic meters was chosen as the reporting unit because it is the unit requested by the BEMR and the IDB.

III. The matrix categories are summarized in Table I and are similar to those used to report to the IDB and the BEMR The matrices are important to the evolution of the performance assessment, as the waste matrix directly effects the migration of radionuclides into the surrounding environment.

TABLE I - MATRIX CATEGORIES

1	Combustible
2	Noncombustible and compactible
3	Noncombustible and combustible mixed
4	Activated metal, equipment, and hardware
5	Contaminated metal, equipment, and hardware
6	Filter media
7	Biological waste
8	Asbestos-contaminated waste
9	Soil and sediment

10	Solidified liquids
11	Solidifed sludge or resin
12	Sources
13	Paint waste
14	Salt waste
15	Incinerator ash
16	Activated carbon
17	Other inorganic wastes
18	Other

IV. The container type is the container used to dispose of the majority of the waste. The container types of interest are listed in Table II. The container type affects the migration rates of radionuclides and the efficiency of the disposal unit.

TABLE II - PROPOSED PACKAGING

B	Bulk (unpackaged)
C	Cardboard box
D	Drum
M	Metal box

V. A confidence level (i.e., low, medium, or high) was requested to determine variance in the data.

> " High confidence indicates that the volume estimates are expected to be accurate to +/- 25%; Medium +/- 50%; Low +/- 100%."[6]

Using the minimum data requirements, a questionnaire was developed (see Appendix A). The data was requested for each waste stream as identified on LANL Form No. 1346, *Waste Profile Form* (WPF), which describes the physical, chemical, and radiological characteristics of a waste and the generating process. The questionnaire was reviewed by the disposal facility managers and the LANL waste management program office before the pilot program was implemented.

Target Audience

LANL operates using a facility management model. Therefore, the facility managers were identified as the target audience for the questionnaire because they are responsible for the activities that take place within the facilities. Each LLW- generating facility will be requested to provide volume,

matrix, and container type for each normal waste stream referenced by the WPF. LLW generators will be provided with previous generation rates to assist them in determining future generation rates. Previous generation rates will be obtained from the LANL Chem-LLW Database.

Pilot Program

A pilot program was developed and implemented to evaluate the data gathered and the ease-of-use of the questionnaire. The pilot program was initiated at a major LLW generating facility, the Plutonium Facility. This facility generates approximately 400 cubic meters of LLW per fiscal year, making it the second largest LLW generator at LANL. The two primary waste streams coming from this facility are a compactible waste stream consisting of paper, plastic, and glass and a noncompactible waste stream consisting of building debris, metal, and wood. During the pilot program, representatives of the generating facility were given the opportunity to comment on the questionnaire.

RESULTS

As a result of the pilot program, no changes were made to the questionnaire. The questionnaire will be reevaluated annually to incorporate changes in reporting requirements and facility needs. User comments will also be considered during the review of the questionnaire.

CONCLUSION

The VPP was developed to collect LLW volume projection data essential to future planning at the LANL LLW disposal facility. Not only does the current economic environment and diminishing disposal space warrant this type of activity, it is also required by DOE Order 5820.2a.[2] The questionnaire has been developed and evaluated; however, because of budget constraints the remainder of this project has not yet been completed. Once funds are available, an Oracle database will be developed to manage the data. This database will allow LANL's waste management organizations to access the information regarding future LLW generation. Upon completion of the database, the questionnaire will be distributed to the five largest waste generating facilities (accounting for 75 percent of the solid LLW disposed of at LANL). The LANL-wide implementation of this program is scheduled for the following fiscal year.

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Appendix A - Questionnaire