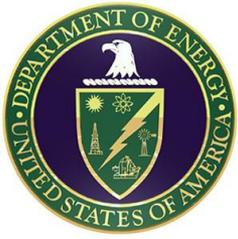# EXHUMATION STUDY PLAN

Presented By
JOSEPH YEASTED, PhD, PE

Exhumation Study Area Manager

West Valley Demonstration Project
Quarterly Public Meeting
August 26, 2015

OUTLINE

Exhumation Working Group

Purpose of Exhumation Studies

➢ *Seven Topical Questions*

Study 1 – Waste Inventory: Analysis and Application

➢ *Purpose and Goals*

➢ *Study 1 Tasks*

Study 2 – Correlation Study: Waste Inventories vs. Field Study Results

➢ *Purpose and Goals*

➢ *Study 2 Tasks*

Study 3 – Review of Precedent Projects: Application to West Valley

➢ *Purpose and Goals*

➢ *Study 3 Tasks*

Summary and Conclusions

Questions and Answers

EXHUMATION WORKING GROUP (EXWG)

Jay Beech, Ph.D., P.E.	Senior Consultant, Geosyntec Consultants

Steve Marschke	Vice President/Nuclear Engineer
S. Cohen & Associates

Frank Parker, PhD, PE	Distinguished Professor of Environmental and Water Resources Engineering, Emeritus, Vanderbilt University

Doug Splitstone, APS	Environmental Statistics Consultant
Splitstone & Associates

Bill Thomas, CHP, CIH	Senior Health Physicist
Plexus Scientific Corporation

Purpose of the Phase 1 Exhumation Studies

1. Enable an improved understanding of the waste inventories and exhumation alternatives applicable to the SDA, NDA and WTF

2. Evaluate and potentially reduce the uncertainty

3. Provide the agencies with information on waste exhumation alternatives to be evaluated in the context of their Phase 2 decision process

DOE and NYSERDA Developed a List of Seven Topical Questions for the EXWG to Address

- **Question 1:** Can the long-lived inventory in the SDA, NDA, and WTF be somehow selectively removed to reduce the time that these facilities will pose a hazard? If so, at what cost?

- **Question 2:** If the long-lived inventory cannot be selectively removed from the disposal areas, can the waste be "mined" out of the SDA and NDA while leaving a majority of the surrounding soil in place? If so, at what cost?

- **Question 3:** If the long-lived inventory cannot be selectively removed from the tanks, could portions of the tanks be removed while leaving surrounding tank material, or just the vaults, in place? If so, at what cost?

- **Question 4:** Are the robust facilities shown in the FEIS for conducting tank and disposal area removals necessary, or can removals be done using less robust, yet still protective methods, at lower cost?

- **Question 5:** Would answers to any of the above questions change if we waited for 30, 60, 90, or 120 years before undertaking the action? For example, could the action go from a remote action to a contact-handled action?

- **Question 6:** With respect to each of these questions, what are the uncertainties associated with estimations of changes in source term and cost given currently available information? Would additional studies likely better quantify and/or reduce these uncertainties? If so, what are these additional studies?

- **Question 7:** Are there exhumation uncertainties or data needs that can be addressed only through a pilot exhumation? Would such a pilot exhumation action be feasible and reasonable considering health and safety, worker exposure, waste generation, and cost? Given these considerations, what would be the costs/benefits of a pilot exhumation?

Purpose:

- Evaluate previous inventory estimates prepared for the NDA, SDA, and WTF, and respond to stakeholder concerns regarding inventory use in the Phase 1 studies.

- Update the radionuclide inventories for the NDA, SDA, and WTF to account for radiological decay, ingrowth, and changed conditions.

- Support future studies and evaluation of selective waste exhumation scenarios.

Goal:

- Provide updated inventory information to support the evaluation of selective waste exhumation scenarios and Phase 2 decision making.

Primary Responsibility: Steve Marschke

Tasks:

1.1 Compare Previous Inventories

- Identify significant differences between available inventories and evaluate root causes of any differences

1.2 Update Waste Inventories to Account for Radiological Decay/Ingrowth

- Update all inventories to a new target year of 2020, as well as four future years (2050, 2080, 2110, and 2140)

1.3 Apply Waste Inventories to Selective Removal Scenarios

- Develop quantitative estimates of waste volumes requiring removal to achieve radionuclide reduction goals.

  o *Example: By exhuming 20% of the waste, 80% of Radionuclide X would be removed.*

Purpose:

- Use radiological modeling studies and statistically-based field studies to establish an empirical statistical relationship between waste inventories and field measurements.

- Provide additional field data to determine if the surrounding soil would require removal or treatment.

Goal:

- Evaluate whether the existing inventory estimates can be independently confirmed by field measurements and, if so, how the existing inventories can be used for evaluating exhumation scenarios and methods.

Primary Responsibility: Bill Thomas & Doug Splitstone

Tasks:

2.1 Evaluation of Previous Surveys and Modeling

- Identify locations for boreholes and use Microshield to predict the level of activity at those locations.

2.2 Geophysical Survey

- Use the most advanced field and data interpretation technologies currently available to verify the location and features of the waste units.

2.3 Statistically Based Field Investigation

- Install borings through SDA and NDA covers to record gamma and neutron radiation levels, as well as to collect soil and water samples.

2.4 Statistical Data Analysis

- Statistically evaluate the correlation of direct downhole measurements with the calculated inventory.

- Identify waste units of interest.

- Based on the inventory estimates, model the gamma and/or neutron activity at the selected location.

- Perform a geophysics survey to refine the waste unit boundaries.

- Install a boring at the selected waste unit and, using downhole detectors, measure the gamma and neutron activity

- Statistically compare the field measurements with model results.

Membrane Liner

Clay Cover

Boring →

Waste Unit: Reported Waste Inventory

Detectors →

Lavery Till
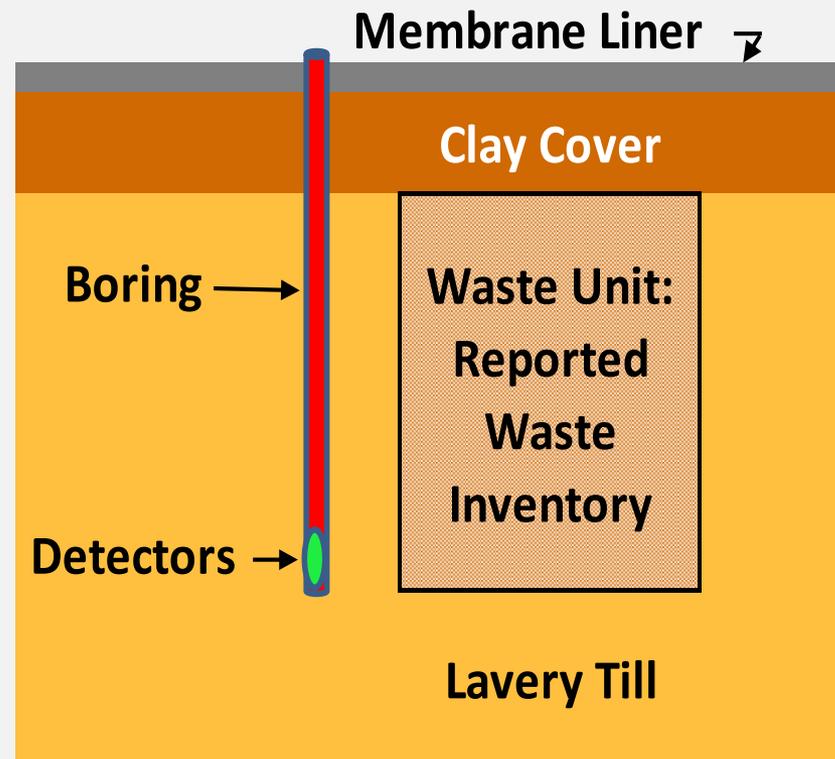
Purpose:

- Evaluate waste exhumation and treatment actions performed at DOE, commercial, and international sites to determine:
  - State-of-practice in exhumation and treatment technologies
  - Lessons learned
  - Methods for worker, public, and environmental protection
  - Related costs, if available
  - Uncertainties encountered and how they were addressed in the decision-making process

Goal:

- Use the Study 3 findings to identify, at a conceptual level, the most appropriate methods for waste exhumation and/or treatment at the SDA, NDA, and WTF.

Primary Responsibility: Dr. Frank Parker and Dr. Jay Beech

Tasks:

3.1 Review of Selected Projects

- Conduct a literature search, interviews, and possible site visits to evaluate approaches, problems encountered, and how uncertainties were addressed at seven targeted sites.

3.2 Confirmatory Evaluation of Other Precedent Projects

- Complete a literature review of technological approaches successfully applied at sites other than the targeted sites.

3.3 Formulation of Conceptual Exhumation Approaches

- Use information from the review of precedent projects to formulate conceptual exhumation scenarios for the SDA, NDA, and WTF

SUMMARY AND CONCLUSIONS

➢ Studies summarized herein prioritized for three reasons:

1. They carry a high likelihood of success toward an increased understanding of published waste inventories;

2. The derived information will support decisions by the agencies regarding full and selective exhumation scenarios;

3. They are not dependent on the strategies and future results of parallel studies being performed by others, but will provide valuable information to these studies.

➢ The intent is to use the results of these studies toward resolution of the seven topical questions, including those questions related to pilot studies and costs, as more becomes known about specific full and partial exhumation scenarios that may be considered as part of the Phase 2 decision process.
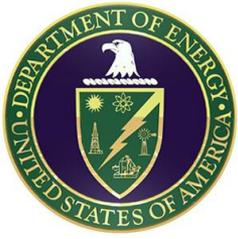
QUESTIONS?

- Magnetometer Survey

- Electromagnetic (EM) Survey

- Seismic Refraction Tomography (SRT)

- Multi-Channel Analysis of Surface Waves (MASW)

- Electrical Resistivity Imaging (ERI).

- DOE: Hanford Site (WA)

- DOE: Savannah River Site (SC)

- DOE: Idaho National Laboratory (ID)

- DOE: Oak Ridge Reservation (TN)

- Maxey Flats Low-Level Radioactive Waste Facility (KY)

- International: Sellafield, United Kingdom

- International: La Hague, France