

INEEL REMOTE-HANDLED TRANSURANIC WASTE INVENTORY, WASTE DISPOSITION PLANS, AND TECHNOLOGY NEEDS

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ABSTRACT

Idaho National Engineering and Environmental Laboratory (INEEL) currently stores Remote-Handled Transuranic (RH-TRU) waste derived primarily from fuel characterization activities at Argonne National Laboratory. Although the INEEL inventory represents a small portion of the Department of Energy's RH-TRU inventory, this waste stream represents moderate risk to release of radionuclides due to degradation of the storage containers.

To date, the INEEL has primarily been concerned with maintaining the stored inventory while attempting to disposition its substantial contact-handled transuranic (CH-TRU) waste inventory. Sometime on or after December 2002, CH-TRU responsibility will be transferred to a private concern for treatment and disposition. At that time, RH-TRU will be the primary transuranic waste stream. In order to maintain important facilities and to minimize loss of key staff, the RH-TRU waste stream needs to be prepared and dispositioned at the Waste Isolation Pilot Plant (WIPP) immediately following transfer of CH-TRU activities.

Since WIPP is currently working on criteria for waste acceptance and certification, INEEL has begun activities needed to prepare processes, technologies, and the waste for disposition.¹ Based on the National TRU Waste Management Plan, the first RH-TRU shipments from Idaho are planned to occur some time after 2007. Based on milestones in the Idaho Settlement Agreement, all stored RH-TRU will be dispositioned by 2018. INEEL is currently proposing to initiate disposition of its RH-TRU waste beginning in 2004 and ending in 2006. The milestones and disposition period permit several options for waste reconfiguration, repackaging, characterization, loading and shipment to be evaluated, selected, and implemented.

Current activities at the INEEL are focused on creating an RH-TRU project management plan and layout of a technology development roadmap. These two management tools will provide a significant step toward ultimate disposition of the waste. Relative to near-term activities, the technology roadmap represents an important activity since successful implement of various aspects of this roadmap determine the amount of waste actually disposition, the relative cost of disposition, and the radiation exposure threat to workers. The management plan development process and roadmap creation are ongoing, but the progress on these two plans has been hampered by a lack of disposal requirements for RH-TRU. Based on WIPP activities planned for the next six months, a management plan should be available in "DRAFT" by fall of 2000 and be provided to regulators and interested parties for comment by spring of 2001.

INEEL RH-TRU WASTE CHARACTERISTIC AND STATUS

INEEL currently stores approximately 85 m³ of declared RH-TRU waste and may have an additional 120 m³ of waste that may be classified as RH-TRU.² Approximately 95% of the declared RH-TRU waste is derived from Argonne-East alpha-gamma hot cell activities associated with reactor fuel and target characterization activities. Although this inventory can be described by as many as 6 waste content codes, the waste is primarily heterogeneous debris. This heterogeneous debris is composed of two subclasses: combustible and non-combustible. This waste is packaged primarily in 30-gallon waste containers, shown schematically in Figure 1. However, about six different waste packaging containers have been used and include 55-gallon drums, boxes, and specialized containers. This waste is currently stored in subterranean vaults.

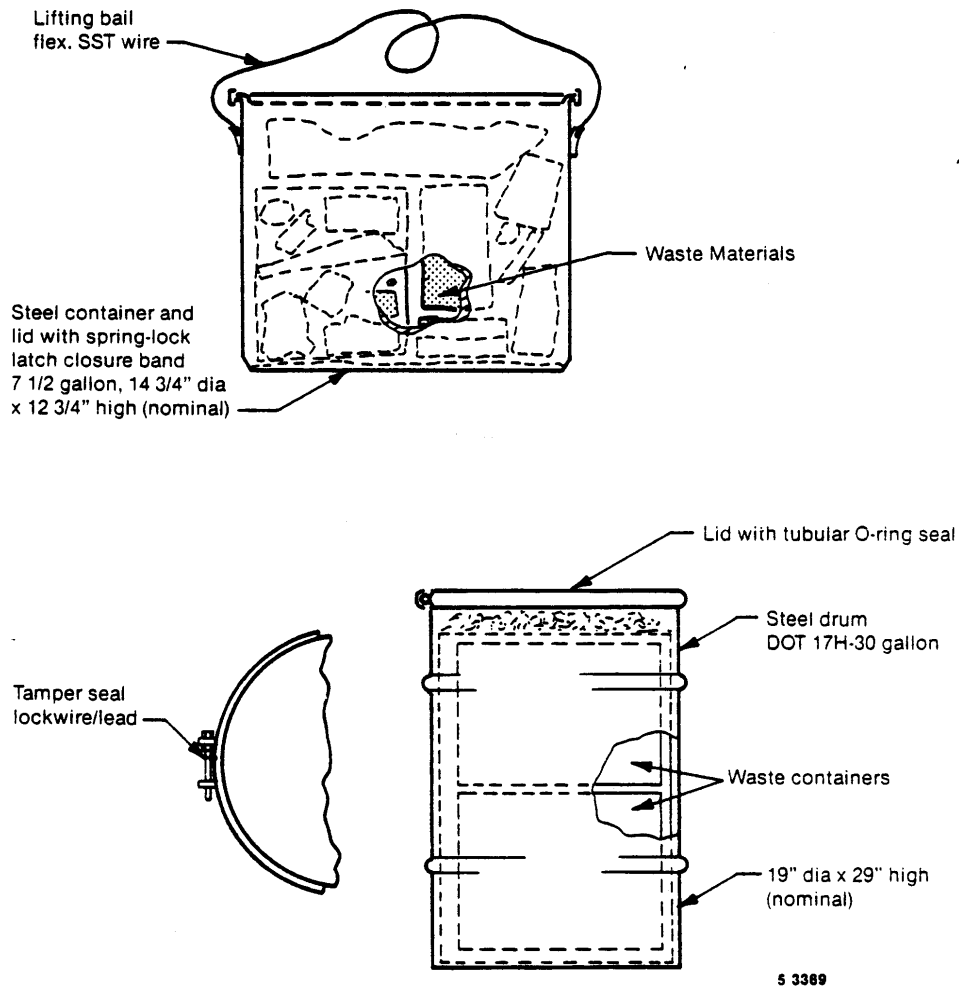


Figure 1. Schematic of RH-TRU Argonne-East Waste Drum

These vaults are concrete encased corrugated steel pipes (As shown in Figure 2.). The pipes are terminated by caps and extend from the soil surface to basalt. The depth of penetration varies from approximately 9 feet to more than 30 feet. Vault diameters vary from 16 to 40 inches, but most are 24 inches in diameter. The vaults are filled with varying numbers of waste drums, and the number and type of waste containers depends on the depth and diameter of the vault. Waste containers have been stacked in the vaults one on top of the other since 1976. Due to temperature cycling that has caused moisture to condense on the drum surfaces, a significant number of drums have corroded. The extent of container degradation is currently uncertain.



Figure 2. Remote-Handled Transuranic Waste Storage Vaults

The remaining declared waste represents various, small amounts of solidified waste, HEPA filters, and plutonium sources. Most of this waste is either stored in the vaults or maintained in one or more inactive hot cells.

The waste that is potentially RH-TRU is currently been stored as Mixed Contact-Handled waste. This waste is characterized as being lead-lined 55-gallon drums and 4 ft. by 4 ft. by 8ft. boxes containing Rocky Flats waste having high concentrations of Americium. This waste is currently stored in the earthen covered pad and physical condition of the waste and validity of content code records are unknown. Ultimate disposition of this waste will occur following retrieval, and a special activity will be implemented to handle

this situation. Should this waste be identified as RH-TRU, a range of waste content codes will describe this waste. The physical condition of these waste containers is currently unknown, but assumed to be intact. Waste repackaging will be performed to reduce dose levels and lead so that the waste can be sent to the Advanced Mixed Waste Treatment Facility.

ONGOING ACTIVITIES

The INEEL Waste Management RH-TRU work package³ has three identified tasks. Since INEEL currently does not plan to prepare to ship RH-TRU before 2004, the work package primarily focuses on development of a management plan that details process options for ultimate disposition of the waste, initiation of waste retrieval from vault storage, and preliminary technology evaluation for waste characterization.

Management plan development is currently focused on waste handling and processing options as defined in the INEEL TRU Baseline Disposition Map shown in Figure 3. The high level strategies being pursued by this plan are: 1) Satisfy site specific waste management requirements, 2) Determine waste pedigree: defense generated and TRU, 3) Compile acceptable knowledge information, 4) Devise process for WIPP concurrence for waste pedigree, and 5) Conceptualize and cost waste processing and shipment options. The elements of this planning activity included near term waste retrieval, near and mid-term waste storage, waste repackaging for volume reduction, characterization, 72B canister loading and interim storage, and shipment cask loading.

Process Review

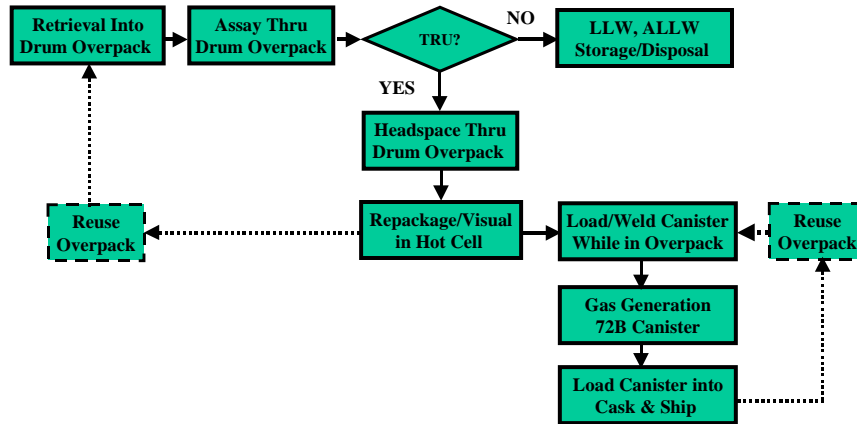
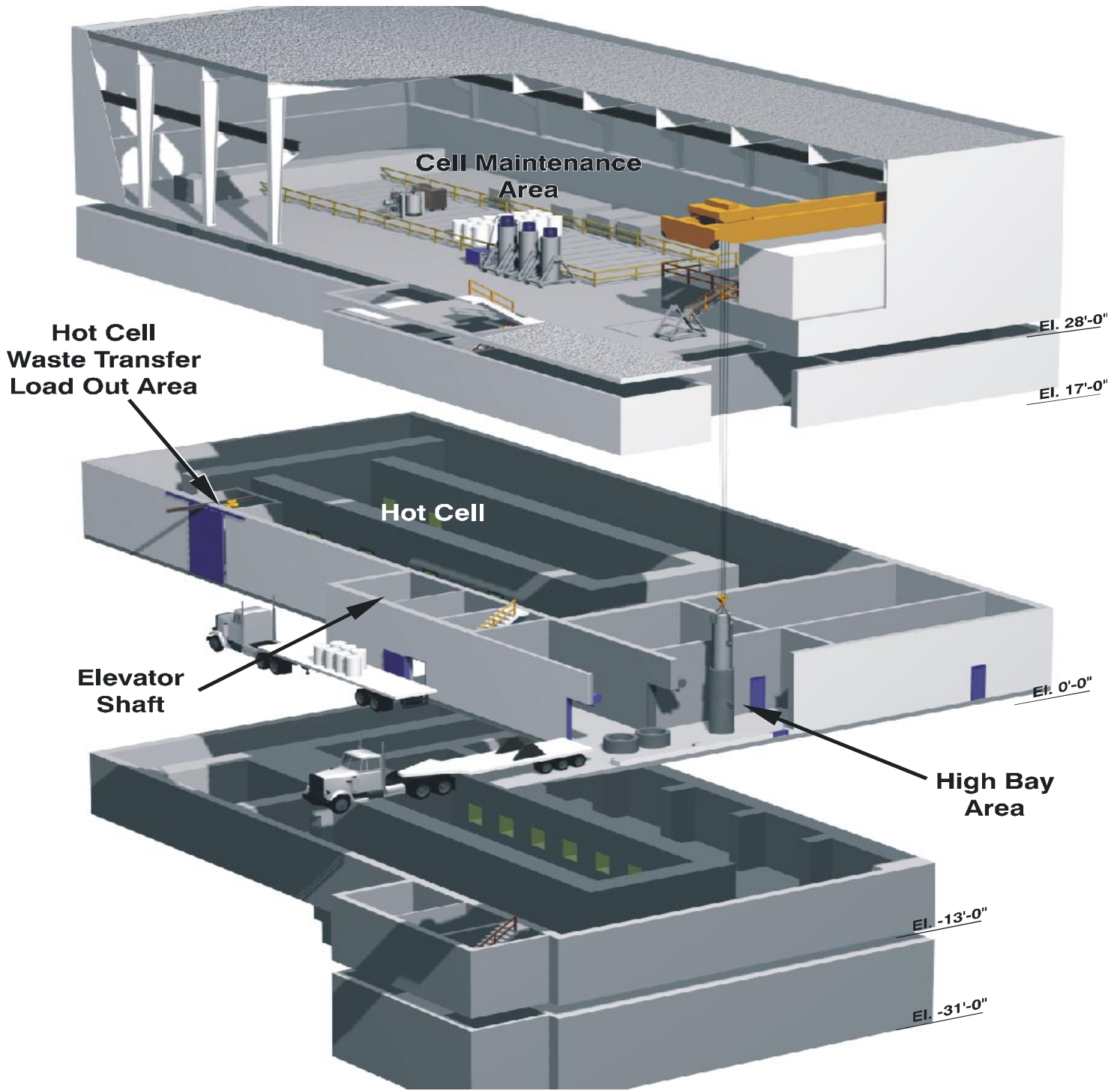


Figure 4. RH-TRU Waste Disposition Process Flow Diagram.



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Figure 5. Proposed Repackaging and 72B Canister Loading Facility

Waste retrieval from the vaults is considered advisable based on visual examination of the condition of the waste containers performed some years ago indicated that continued container degradation might severely complicate waste retrieval by 2017. Current

activities are working to fabricate some twelve shielded overpacks (See Figure 6) for interim storage of the retrieved containers. A procedure for removal of the drums from the vaults is being developed and is undergoing considerable evaluation and review. The current plan is to retrieve approximately 12 to 15 drums per year for the next few years. Based on the shielded and overpacked condition of this waste, the waste will be placed in contact-handled waste storage until it is transferred to processing. In the interim, this stored waste will be used as test samples for technology evaluation activities conducted by the RH-TRU work package and the Mixed Waste Focus Area.



Figure 6. RH-TRU 30 and 55-Gallon Drum Shielded Overpack

Currently based on the heterogeneous debris characteristics of most of INEEL's RH-TRU waste and the relatively high activity of the waste, no characterization technology currently exists for this waste stream. The work package is currently testing and evaluating a number of technologies and methods for nondestructive assay and headspace analysis of gas, and determination of gas generation.

In prior years, considerable attention was given to development of a shielded overpack described above. The a unique feature (See Figure 7) was provided in the design of this overpack to permit drum venting, filter insertion, and head-space gas determination.⁴

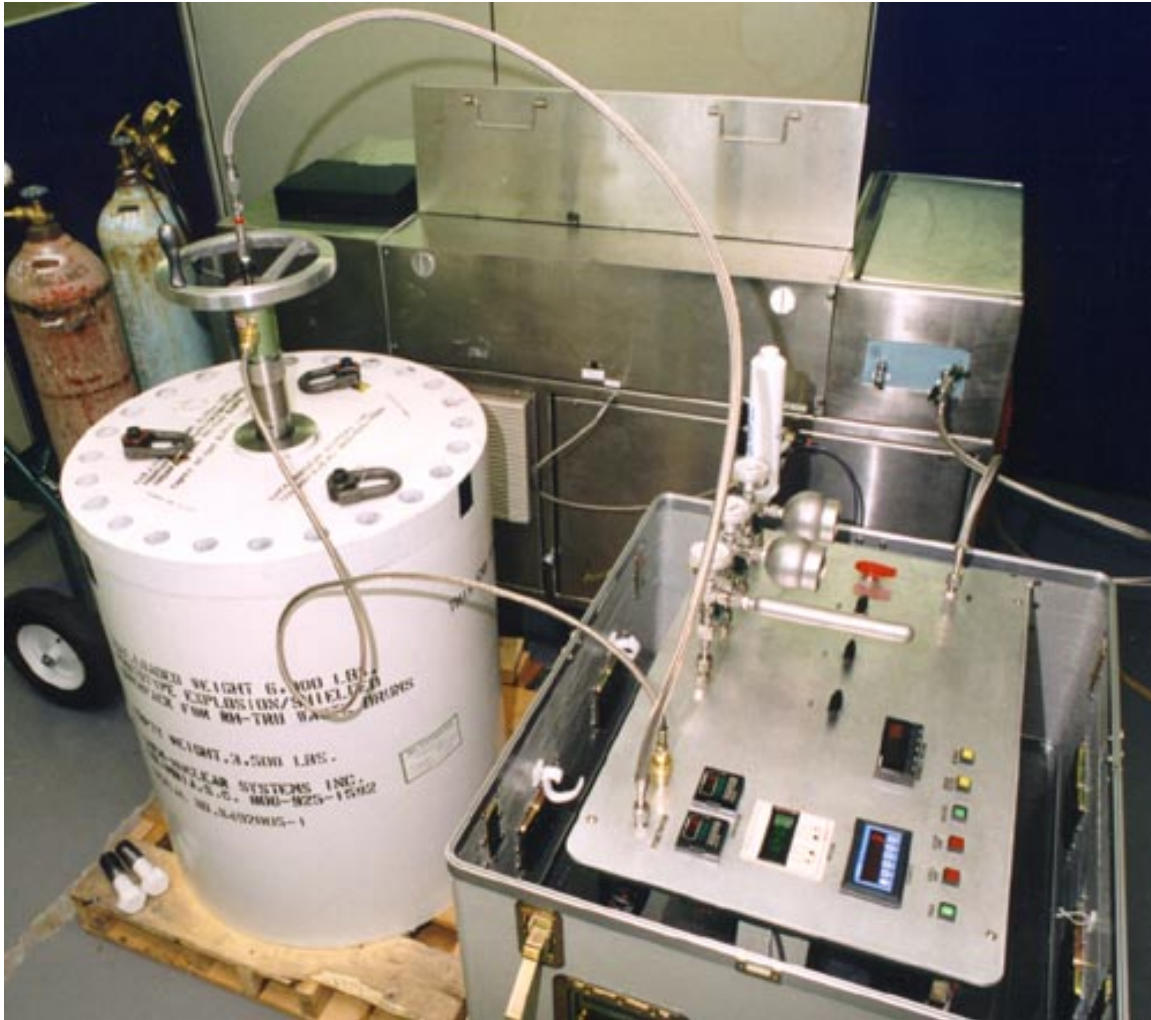


Figure 7. Drum Venting and Headspace Analysis Station

After successful retrieval and overpack of some RH-TRU waste, gamma spectroscopy combined with acceptable knowledge and fission product calculations will be evaluated as a viable method for characterization of the fissile material content of INEEL debris waste forms and used in support of acceptable knowledge data. (See Figure 8)



Figure 8 RH-TRU Waste Nondestructive Assay Characterization

FUTURE ACTIVITIES

Based on the planning currently underway at the INEEL, RH-TRU to be performed over the next two years will be focused on identifying viable characterization technology and development of various types of hardware including 72B overpacks. Canister and cask loading technology will be the focus of activities in following years. By 2004, hot cell modification and operational modifications to existing facilities will be completed or near completion so that initial shake down for waste processing will be initiated. It is currently anticipated that a successful repackaging campaign will result in all RH-TRU shipments being completed by the end of 2007 or 2008.

MANAGEMENT STRUCTURE

Figure 9 illustrates the current programmatic management structure for the INEEL RH-TRU program.

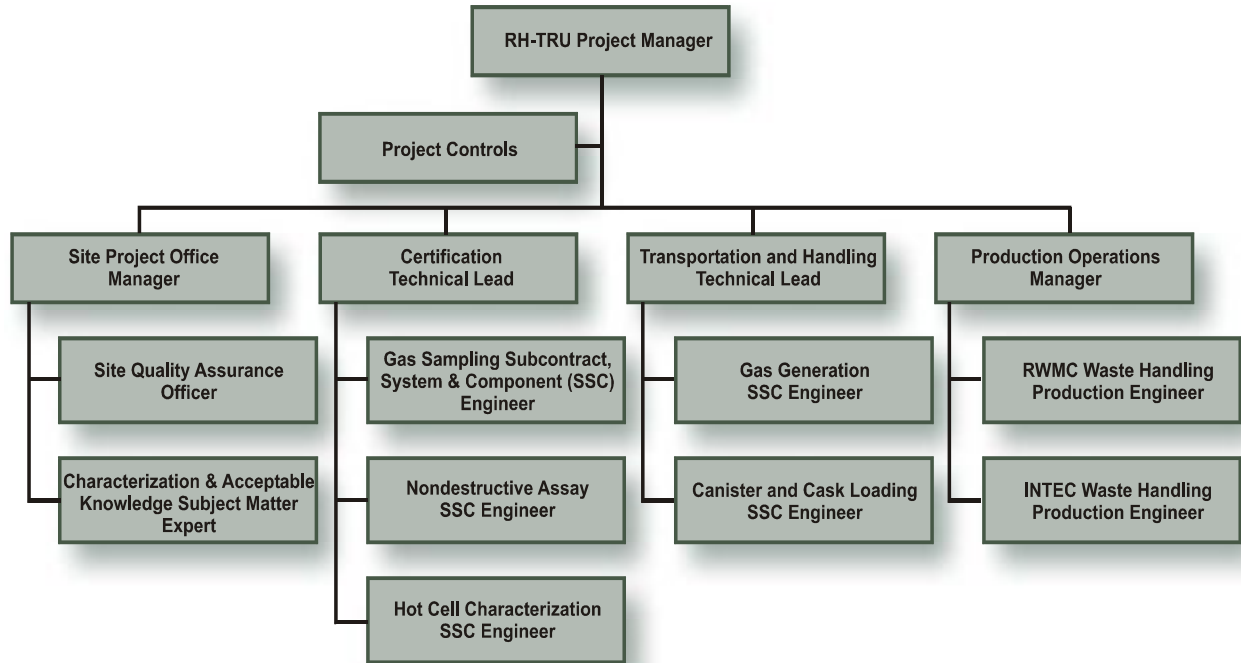


Figure 9. INEEL RH-TRU Management Structure

TECHNICAL CHALLENGES

Based on current development activities, there are two areas that currently have major technology needs. The most significant area is waste characterization. The heterogeneous debris nature of the waste requires some type of volumetric measurement that can not be provided by sampling and destructive analysis. Further, some of the mixed waste will require direct determination of not only fission products but also fissile materials. Based on the need to core certain waste forms for removal of samples, various types of remotely operated and controlled mechanical systems will be required.

CONCLUSIONS

Based on current planning and the unique waste characteristics of INEEL's RH-TRU inventory, INEEL will be able to put in place processes to disposition this waste. Given that current plans are focused on reduction of the number of waste shipments and viable technologies for waste characterization and mechanical systems can be obtained, INEEL should be able to disposition all of its RH-TRU inventory by 2008 or 2009.

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