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118-B-1 Excavation Treatability Test Procedures

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Bechtel Hanford, Inc.
Richland, Washington

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CONTENTS

CONTENTS (continued)

1.0 PROJECT DESCRIPTION

1.1 PURPOSE

The 118-B-1 Excavation Treatability Test is required by milestone change request #M-15-93-04. This treatability study has two purposes: to support development of the approach to be used for burial ground remediation and to provide specific engineering information for the design of burial grounds receiving waste generated from the 100 Area removal actions. Data generated from this test will also provide performance and cost information necessary for detailed analysis of alternatives for burial ground remediation.

Further details on the test requirements, milestones, and data quality objectives are described in detail in the *118-B-1 Excavation Treatability Test Plan* (DOE-RL 1994b). The test plan includes information that will be useful in understanding these procedures. It is essential that the reader understand the test plan prior to working with these procedures. These working procedures are intended for use by field personnel to implement the requirements of the milestone. A copy of the detailed test plan will be kept on file at the onsite field support trailer and will be available for review by field personnel. It should be noted that these working procedures were previously issued as WHC-SD-EN-TP-049, Rev. 0.

1.2 TEST OBJECTIVES

The general scope of the treatability test includes excavating five trenches within the 118-B-1 Burial Ground, with the guideline of excavating 5,000 to 10,000 yd^3 of waste material.

Data quality objectives are fully detailed in the *118-B-1 Excavation Treatability Test Plan* (DOE-RL 1994b). The goals of the treatability test are summarized in six objective statements, as presented in Table 1. The objectives are grouped according to the three operations being investigated as a part of this treatability test: excavation, screening, and handling.

Table 1. Treatability Test Objectives.

Operation	Test Objective
Excavation	Compare effectiveness of the top-down and side removal approaches.
	Identify waste forms requiring special excavation equipment and their frequency of occurrence.
Screening	Determine implementability of screening for currently established preliminary waste acceptance criteria (PWAC) for an environmental restoration disposal facility (ERDF) during bulk removal using field instruments and visual observations.
	Determine if contents of containers meet ERDF PWAC using field instruments and visual observation.
Handling	Determine feasibility of segregating waste forms into categories during excavation using a backhoe with thumb.
	Determine feasibility of sorting waste forms into categories using a grizzly screen, disc screen, manual raking, and hand picking.

The following subsections further describe the objective statements.

1.2.1 Excavation

The test will compare both top-down and side excavation approaches.

1.2.2 Screening

The test will determine if items prohibited from the Environmental Restoration Disposal Facility (ERDF) exist in the burial ground and if they can be detected using existing field screening instruments. The prohibited items were defined by the preliminary waste acceptance criteria for the ERDF. These materials are as follows:

- Radioactive waste greater than Category 3, as defined in *Hanford Site Solid Waste Acceptance Criteria* (WHC 1993a)
- Transuranic waste
- Waste with degradable material greater than 10% by volume.
- Free liquids.

1.2.3 Handling Operation: Segregation and Sorting

The handling operation consists of two functions as defined below.

Segregation: The separation of waste forms within the trench using standard excavation equipment, which in this case consists of a trackhoe with bucket and thumb attachment.

Sorting: Manual and/or mechanical separation of waste forms after they have been excavated and bulk removed from the trench.

A goal of the test is to determine the feasibility of segregating and sorting the waste forms into four waste categories: containers, soil, hard waste, and soft waste. These categories were selected because they are readily distinguishable in the field and because they have differing characteristics with respect to their capacities for recycling, treatment, and disposal. A brief discussion of each of the waste categories follows:

- Containers

  Containers may contain materials that require separate segregation into free and organic liquids, soil, hard waste, and soft waste. Sealed containers will be opened and inspected for free liquids. For the purposes of this test, boxes are not considered sealed containers. A minimum number (as determined by the field coordinator) of boxes will be opened.

- Hard Waste

  Hard wastes are assumed to include all metallic and reasonably noncompressible solids. Examples of hard wastes are aluminum tubing, spacers and dummies, lead shielding and bricks, miscellaneous metal parts, and glass. Rock is defined as soil, not as hard waste.

- Soft Waste

  Soft wastes are defined to include all nonmetallic and compressible solid wastes. Examples of soft wastes are paper, cardboard boxes, plastics, personal protective clothing such as gloves and booties, and office wastes.

- Soil

  Soil is defined as all naturally occurring inorganic materials.

2.0 SITE DESCRIPTION

2.1 BACKGROUND

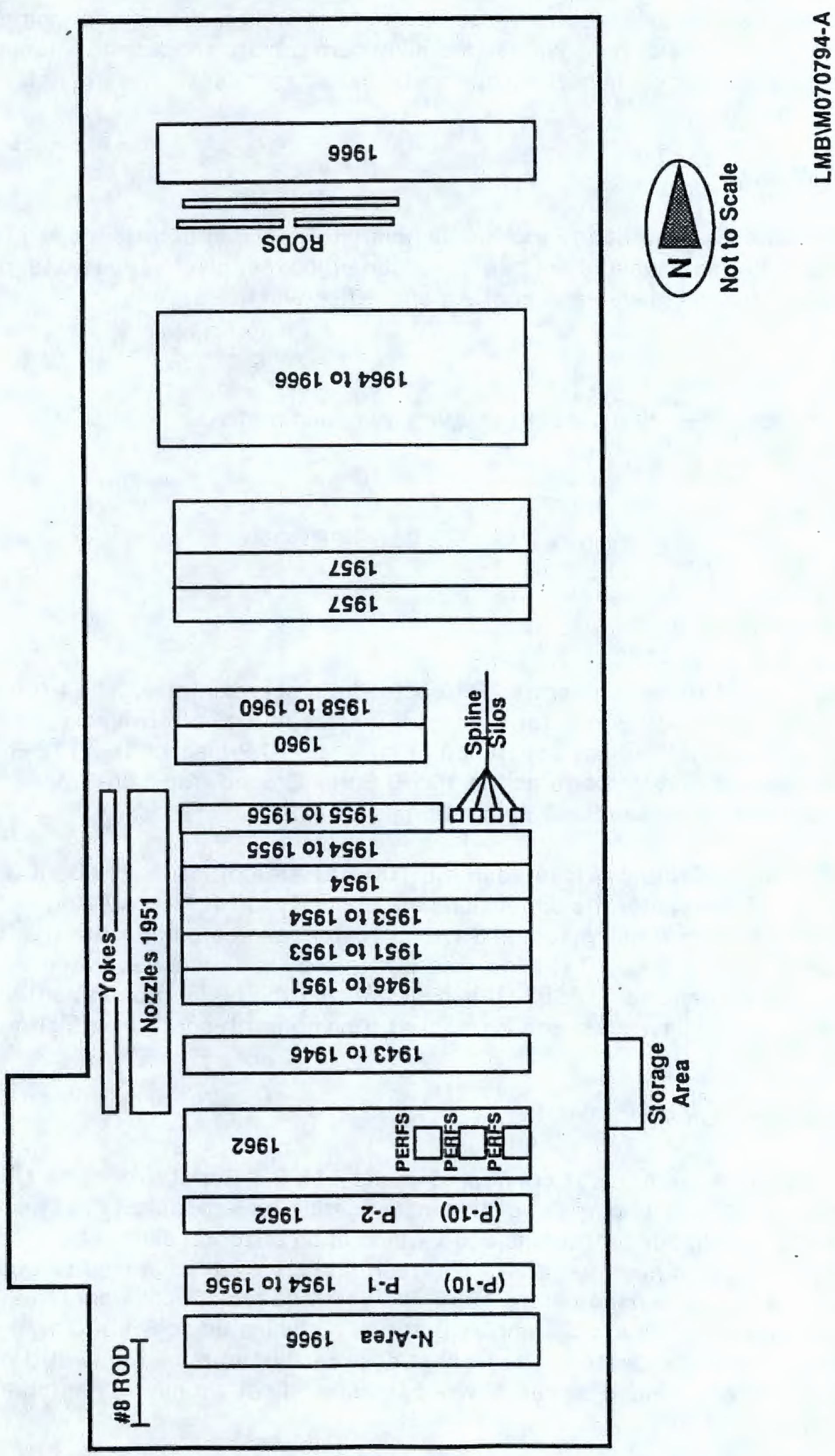
The 118-B-1 Burial Ground supported B Reactor from approximately 1944 through 1973. It was the primary burial ground for B Reactor wastes, but also received waste from the 100-N Reactor and the Tritium Separation Program (P-10 Project). The 118-B-1 Burial Ground has also been referred to as the 105-B Burial Ground, the 105-B Solid Waste Burial Ground, and the Operations Solid Waste Burial Ground.

The 118-B-1 Burial Ground is located in the 100 B/C Area of Hanford, about 3,000 ft due west of the 105-C Reactor. Its dimensions are about 1,000 ft long running north and south, by 320 ft wide running east and west. Historical records indicate that the trenches were typically 300 ft long, 20 ft wide, and 20 ft deep, and were separated by 20-ft spaces (Stenner et al. 1988). It is believed that the burial ground contains 21 trenches running east-west and 3 trenches running north-south (see Figure 1).

2.2 INVESTIGATIONS

A subsurface investigation was conducted at the 118-B-1 Burial Ground in 1976 (Dorian and Richards 1978). The purpose of this investigation was to identify radionuclides, quantify radionuclide concentrations and vertical and horizontal distribution, and measure specific activities in various trenches. Fourteen borings were advanced through various trenches. The trenches used before 1956 showed little radionuclide contamination, while more recent trenches produced samples that had activities up to 80,000 cpm measured with a Geiger-Mueller detector. The highest dose reading obtained was 300 mrem/h. Samples recovered included pieces of wood, plastic, sheet cadmium, cardboard, steel tubing, and reactor poison.

Figure 1. 105-B Solid Waste Burial Ground, 1944 - 1965.



A geophysical survey of the 118-B-1 Burial Ground was conducted in 1993. The purpose of this investigation was to locate primary concentrations of buried waste and possibly determine trench locations. Ground-penetrating radar and electromagnetic induction were the two techniques used in the investigation. Twenty-two zones were identified as containing high concentrations of debris (Bergstrom et al. 1993). Results are shown in Figure 2.

2.3 BURIAL GROUND CONTENTS

The types of waste disposed in the 118-B-1 Burial Ground can be grouped into four general types (types divided for descriptive purposes): soft waste (trash), miscellaneous waste, metallic waste, and special waste. Trash or soft waste consists of contaminated paper, plastic, rags, and clothing packaged in cardboard boxes, and is estimated to make up more than 75% of the waste volume (Dorian and Richards 1978). Metallic waste consists of reactor hardware, equipment, and tools that had been disposed due to excessive radiation levels or because they were worn out or broken. Special waste consists of items disposed from the tritium separation project or N Reactor.

Special waste is anticipated to be confined to trenches P-1 and P-2, located as shown in Figure 1. The special wastes include metals, glass, and other miscellaneous materials disposed from N Reactor and the Tritium Separation Program. The special wastes are also presumed to include liquid tritium waste that was sealed in carbon steel pipes and buried. The quantity of liquid tritium buried is not known. Treatability test trench selection specifically avoided the identified liquid tritium area, based upon available information, geophysical surveys, and location of burial ground markers.

Appendix A contains photographs and a brief description of some of the items expected to be uncovered during the excavation.

2.4 RADIOLOGICAL CHARACTERISTICS

The radiological composition of the 118-B-1 Burial Ground is described in two documents: *Radiological Characterization of the Retired 100 Areas* (Dorian and Richards 1978) and *Estimates of Solid Waste Buried in 100 Area Burial Grounds* (Miller and Wahlen 1987). Dorian and Richards (1978) presents sample analysis taken from boreholes in the 118-B-1 Burial Ground and is the only source of empirical radiological data from samples collected in the 118-B-1 Burial Ground. Miller and Wahlen (1987) uses the sample information and process area reactor operations to derive an estimate of the 100 Area burial ground waste volume and inventory. This estimate is considered the most accurate description available of the burial ground's inventory.

MICROSHIELD, a dose modeling program from Grove Engineering (Rockville, Maryland), was used to estimate the dose rates from the different waste types listed in Miller and Wahlen (1987). The results are presented in Table 2, which lists the expected dose rates from individual waste types without contribution from any other material.

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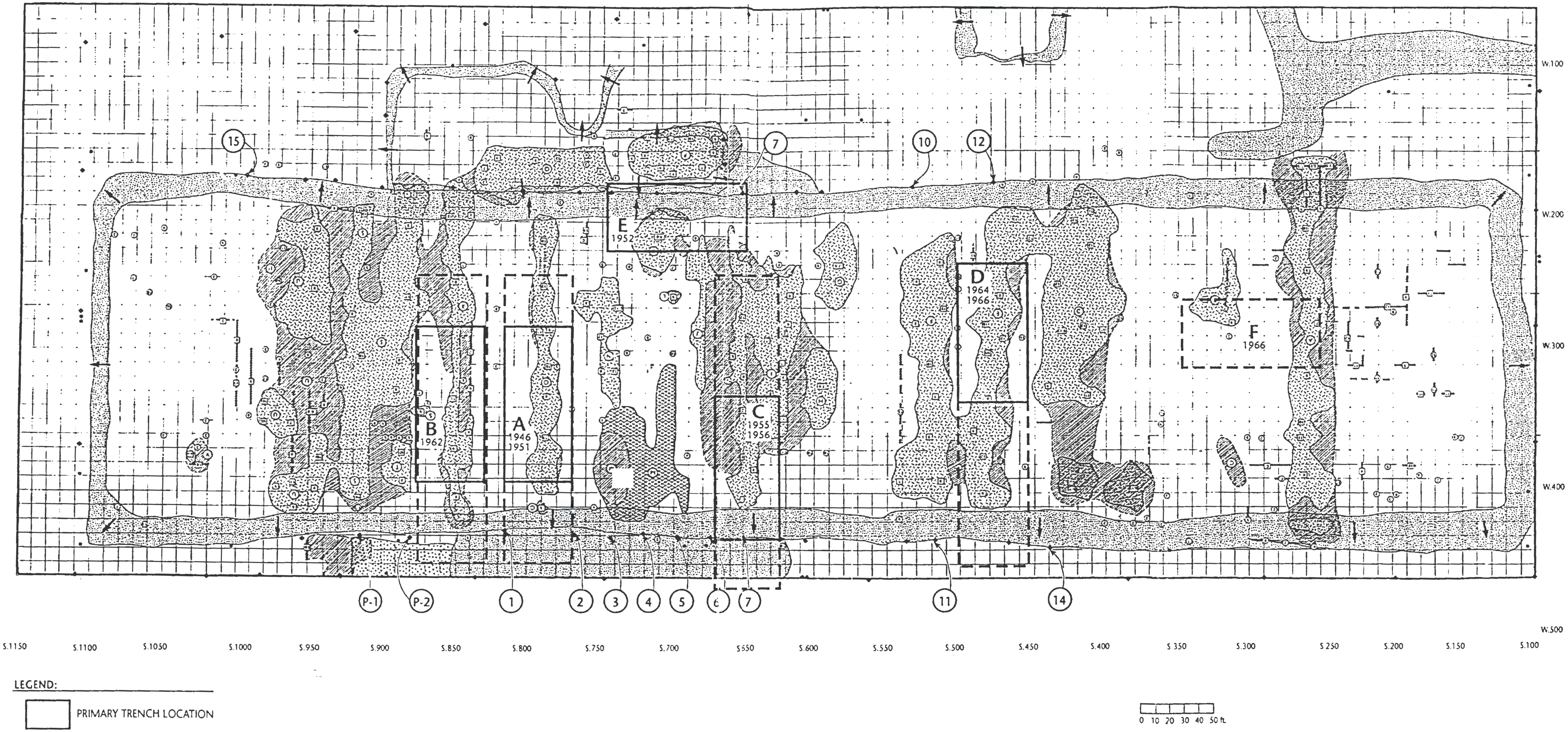

LEGEND:

- PRIMARY TRENCH LOCATION
- ALTERNATE TRENCH LOCATION
- (P-1) EXISTING TRENCH MARKER
- HEAVIEST CONCENTRATION OF ANOMALIES
- MODERATE CONCENTRATIONS OF ANOMALIES
- ZONE WITH STRONG REFLECTOR AT ABOUT 4' BELOW THE SURFACE, POSSIBLY MASKING DEBRIS BELOW

Note: GPR survey map is from Bergstom, et al. 1993

Figure 2. Proposed Trenches for Treatability Test.

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Table 2. Estimated Dose Rates for Burial Ground Waste Types.

Waste item	Size (L x W x D)[a]	Bulk void volume[b]	Contact point	Estimated contact dose rate (mrem/h)[c]
Aluminum spacers	2 x 2 x 1.125 ft	50%	Top center	0.19
Lead/cadmium poison pieces	Sphere 2 ft diameter	50%	Sphere surface	33.5
Aluminum/boron splines	Sphere 5.37 ft diameter	30%	Sphere surface	136
Graphite (broaching)	2 x 2 x 1.125 ft	30%	Top center	37.1
Aluminum process tubes	2-ft-diameter x 3-ft-long cylinder	50%	Side center	6,401
Desiccant	1.5-ft-diameter x 2.27-ft-long cylinder with 0.035-in. steel wall	20%	Side center	d
Lead brick	2 x 4 x 8 in.	0%	Top center	171
Lead sheet	2-ft-diameter x 3-ft-long cylinder	40%	Side center	7.68
Miscellaneous	2 x 2 x 1.125 ft	50%	Side center	1,652
Cadmium sheet	Insufficient data	N/A	N/A	No radionuclide data
Soft waste	2 x 2 x 1.125 ft	60%	Side center	234
Thermocouples	Insufficient data	N/A	N/A	No radionuclide data
Stainless steel steam generator tubes	Insufficient data	N/A	N/A	Negligible - total inventory estimated as <0.01 Ci
Tritium Separations Project - glass line waste	Insufficient data	Unknown	N/A	Unknown[d]

[a]Size assumed based on professional judgement. 2 x 2 x 1.125 ft is the assumed size of cardboard boxes. Cardboard boxes have a wall thickness of 0.125 in.

[b]Void volume assumed based on professional judgement.

[c]Estimated dose rate from MICROSHIELD calculation based on material inventory (Table 2-3), size, void volume, and measurement point.

[d]Beta radiation only; dose rate negligible.

N/A = not applicable

3.0 FIELD ACTIVITIES

3.1 HEALTH AND SAFETY

The guidance for ensuring worker health and safety shall be provided in a site-specific health and safety plan [e.g., hazardous waste operations plan (HWOP)] as described in EII 2.1, "Preparation of Site Specific Health and Safety Plans" (BHI 1994a). Radiological hazards and controls are detailed in the job-specific Radiation Work Permits (RWPs).

As the primary means of protecting the health and safety of field personnel, all individuals who enter the exclusion zone and buffer areas shall have received training to be qualified as a Hazardous Waste Worker as outlined in EII 1.1, "Hazardous Waste Site Entry Requirements." Specific training requirements are listed in the HWOP.

A safety assessment (BHI 1994b) was completed for this project. The operation was considered to be a non-nuclear, low hazard, radiological activity. Trenches P-1 and P-2 are specifically excluded from the safety assessment due to tritium content. These trenches will not be entered during this test. Trench location has been determined by historical records, geophysical surveys, and location of burial ground markers. Trench "B" is located adjacent to the P-1 and P-2 trenches. Trench B will only be entered if needed to complete the test. If trench B is entered, it will be excavated from the north, so that if the southern boundary of the trench (adjacent to P-1/P-2) is encountered, the excavation can be moved or halted.

Safety-related documents and this procedure shall be reviewed by field personnel prior to commencement of work. Compliance with these documents is mandatory. A pre-job safety meeting and regular field-safety "tailgate" meetings shall be held to review safety considerations and identify any potential hazards not previously noted.

Should field conditions arise that warrant a change in either the HWOP or the RWP, the health and safety officer and the health physics supervisor (respectively) may authorize field changes to the documents.

Conditions listed below will require that work be discontinued until the field coordinator, health and safety officer, health physics technician, or engineers have evaluated safety and operational concerns.

- Radiation levels exceeding RWP limits, or levels that cause concern based on operating conditions
- Free liquids (containerized), other than water
- Mercury.

Lapel monitors will be worn during the initial excavation period to evaluate personnel exposures to lead, cadmium, and dust.

3.1.1 Dust Control

Dust-suppression techniques will be necessary for this test. During field activities, contamination must be kept from migrating. Based on the results from the 100 Area Excavation Treatability Test at the 100-FR-1 Operable Unit, crusting agents and water have been shown to be effective for dust control. Application of dust-suppression techniques on exposed excavations, stockpiles, unpaved access roadway, staging areas, and other temporarily disturbed areas will be performed by Construction Forces at the direction of the field coordinator. Application of dust-suppression techniques at the dedicated sorting area will be performed by Plant Forces, at the direction of the field coordinator. Excess water usage in the excavation pit or on the burial ground shall be avoided.

Equipment for general excavation, stockpiling, and access road dust control will consist of a rubber-tired water truck, capable of carrying and applying both water and crusting agents. Equipment for the dedicated sorting area dust control will consist of a stationary water tank and appropriate plumbing.

3.1.2 Sloping

All excavations on the Hanford Site must comply with the Washington Administrative Code (WAC) 296-155. Soil on the Hanford Site is classified as type "C" soil (WAC 296-155-66401). Excavation side slopes shall be no steeper than 1.5 horizontal to 1 vertical, if personnel enter the excavated area. Open excavations will require certification from a Washington State-registered professional engineer at depths equal to or greater than 20 ft. The total depth of the excavation will not exceed 25 ft. Should benching be required to support personnel and/or equipment, a slope of 1.5 horizontal to 1 vertical must be maintained between benches and/or the excavation bottom. Benching in type "C" soil is required to be designed by a registered professional engineer. Trenching will not be performed; therefore, shoring will not be necessary during any phase of operations.

3.1.3 Remote Monitors

Remote monitors will be utilized as the excavation proceeds for field screening purposes. This will be accomplished by passing materials exhumed from the excavation, while in the bucket of the trackhoe, in front of remote sensors, situated within, or at/near the top of the excavation. Additional details are provided in the analytical field screening section.

In addition, mercury vapor and volatile organic compound (VOC) monitoring will be performed near the excavation area as required by the site safety officer. Air quality will be verified prior to personnel entry into the trench.

3.1.4 Air Sampling

Air samplers will be set up around the test site perimeter to sample for potential radioactive airborne contamination. The location of the air samplers will be adjusted in the field and given unique designations. Air samplers shall be operated per WHC-CM-7-4, Section 5.0, "Air Sampling" (WHC 1993c).

3.1.5 Personal Monitoring and Safety

Personal air samplers will be worn by key personnel in the exclusion zone. TMA shall have responsibility of operating and controlling the personal air samplers. Hanford Environmental Health Foundation (HEHF) will analyze samples. Personal dosimetry shall be specified in the RWP. Properly sized respirators shall be available to all test personnel required to work in the exclusion zone.

3.1.6 Emergency

Specific emergency procedures and notifications shall be called out in the HWOP. Wind direction indicators shall be established to aid in upwind evacuation of the trench. Fire lanes and emergency evacuation routes will be identified and established at the site. Dry-chemical fire extinguishers shall be provided in the excavation area.

3.1.7 Data Quality Objective Records

Field engineers will be onsite during all phases of the operation to log information obtained during the treatability test. These engineers will be responsible for assuring that the data collected meet the data need.

3.2 SITE SETUP\LAYOUT

Prior to commencing work, the site will be staged with an exclusion zone, contamination reduction zone, and a support zone, as presented schematically in Figure 3. Site visitors shall be prohibited from all zones at the site unless they meet the requirements listed within the HWOP and this procedure and are escorted by permanent site personnel as authorized by the field coordinator.

- Exclusion Zone

  The exclusion zone(s) shall contain the excavation; the contaminated soil/landfill debris stockpile area; temporary storage area for any encountered liquid containers; and the sorting area. Only essential personnel shall be permitted within the exclusion zone. Portions of the exclusion zone shall be posted in accordance with the applicable RWP for radiological control purposes.

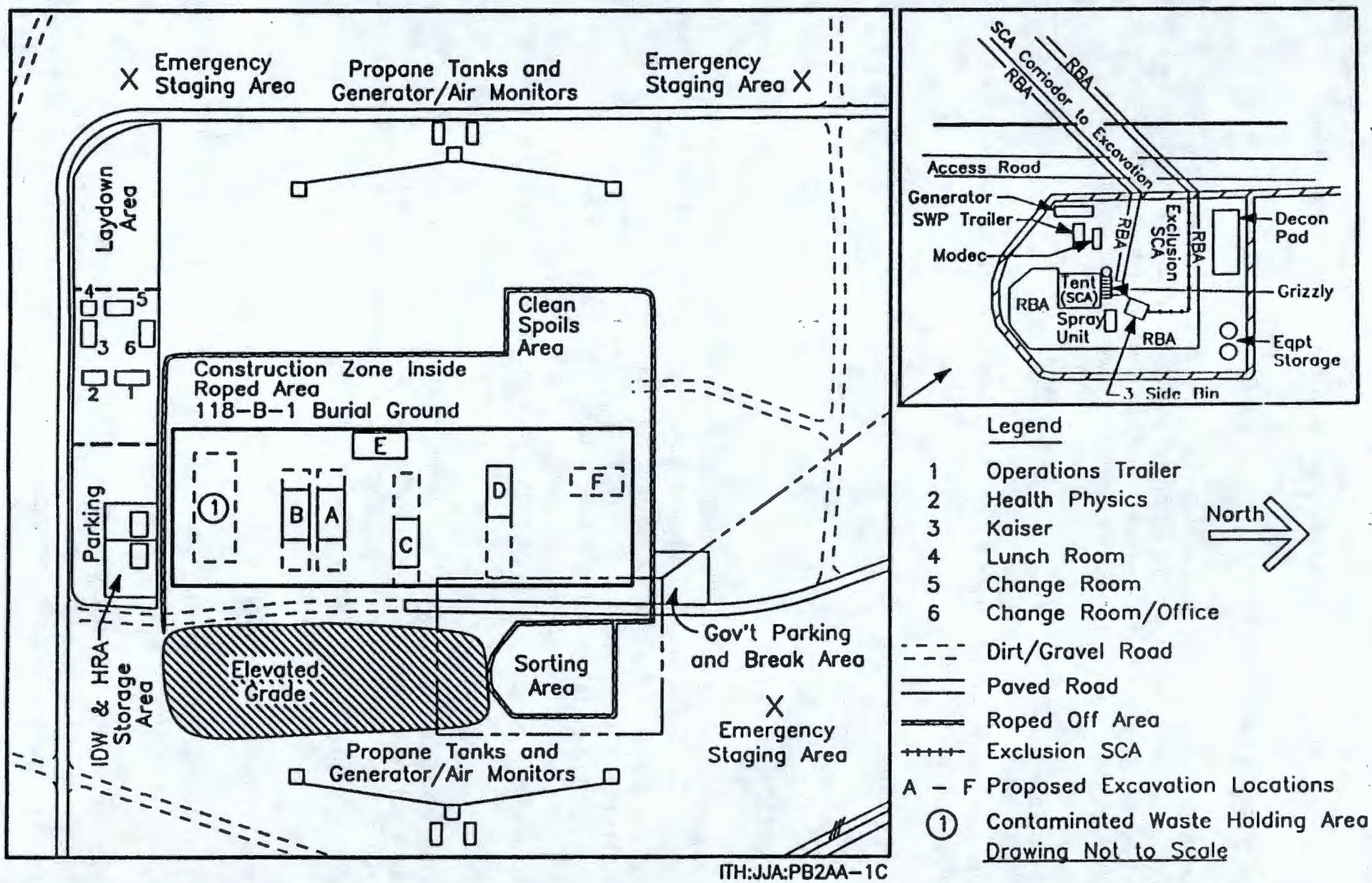

Figure 3. Site Setup.

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Established perimeter barriers shall be established around the excavation site to control ingress and egress of personnel. Any open excavation shall be barricaded except at times when the excavation is ongoing. Temporarily stockpiled, contaminated soil, and landfill debris will be covered or sprayed with a soil fixative during times of inactivity. Smoking shall be prohibited in the exclusion zone.

- Contamination Reduction Zone

  The contamination reduction zone shall contain all provisions necessary to facilitate decontamination. For radiological control purposes, this area will also be posted as a radiological buffer area (RBA) and will include the clean spoil piles. Only essential personnel shall be permitted within the contamination reduction zone.

- Support Zone

  The support zone shall contain all other support facilities, supplies, equipment, and nonessential personnel.

A list of equipment to be used during the excavation treatability test is provided in Appendix B.

3.3 EXCAVATION

Proposed trenches for the treatability test are shown in Figure 2. The field coordinator has the discretion to move these areas for both safety and logistical reasons. The test will not excavate in the trenches designated P-1 and P-2. These trenches were excluded from safety assessment documentation. The location of P-1 and P-2 has been determined based on location of burial ground markers and geophysical surveys.

The safety assessment (BHI 1994) permits a maximum of 2,000 yd^3 to be exposed at any time.

During windy conditions (e.g., >15 mi/h), the health physics technician and field coordinator shall determine which operations can proceed; however, at sustained wind speeds greater than 15 mi/h, mass transfer of contaminated material/soil will be ceased. If personnel are to enter the trench, air quality shall be verified.

3.3.1 Preparation and Methodology

3.3.1.1 Removal of Overburden. The site is presently overlain with overburden materials from the surface to an approximate depth of 5 to 10 ft.

Prior to excavation, the field coordinator will determine the areal extent of the overburden materials to be removed, based upon consultation with the health physics technician for shielding and operational/logistics considerations. Depth of overburden will be determined by digging a few test pits with the excavator prior to large-scale overburden removal.

In general, the bottom footprint of the excavation of the overburden materials should be approximately 25 ft outside of the anticipated footprint of the top of the debris trench to allow equipment traffic. The top of the overburden excavation slope will be controlled by slope stability, per Section 3.1.2 of these test procedures, and other safety considerations, at the direction of the field coordinator. Location and inclination of entry and/or exit ramps out of the overburden excavation will be determined in the field, based upon overall logistics and capabilities of the front-end loader (FEL) and dump trucks.

After excavation, the overburden materials will be transported and placed in the designated overburden area. Nonroutine surveying of the overburben by health physics will be performed on the clean overburden materials. Subsequent removal of overburden materials in adjoining trenches may be placed as the noncontaminated backfill for the prior completed trench to minimize transport distance and cross contamination.

As necessary and available, the removed overburden materials may be used for temporary earth berms, for temporary storage, and containment of exhumed contaminated soil and landfill debris.

3.3.1.2 Field Screening of Overburden Interface. Upon reaching an anticipated depth of within 2 ft of the top of the waste in the trenches, the remaining exposed overburden surface will be field screened using hand-held health physics instruments for presence of contamination. The purpose of this exercise will be to reduce the possibility of cross-contamination of clean overburden materials.

3.3.1.3 Staging Areas.

- Overburden Stockpile

  The overburden area is shown in Figure 3. Surface preparation will be minimal, to include preparing a level working pad using available equipment. The overburden will be placed directly on the ground. The stockpiles will be covered with a crusting agent and, if necessary, plastic sheeting to protect the materials from contamination by fugitive dust.

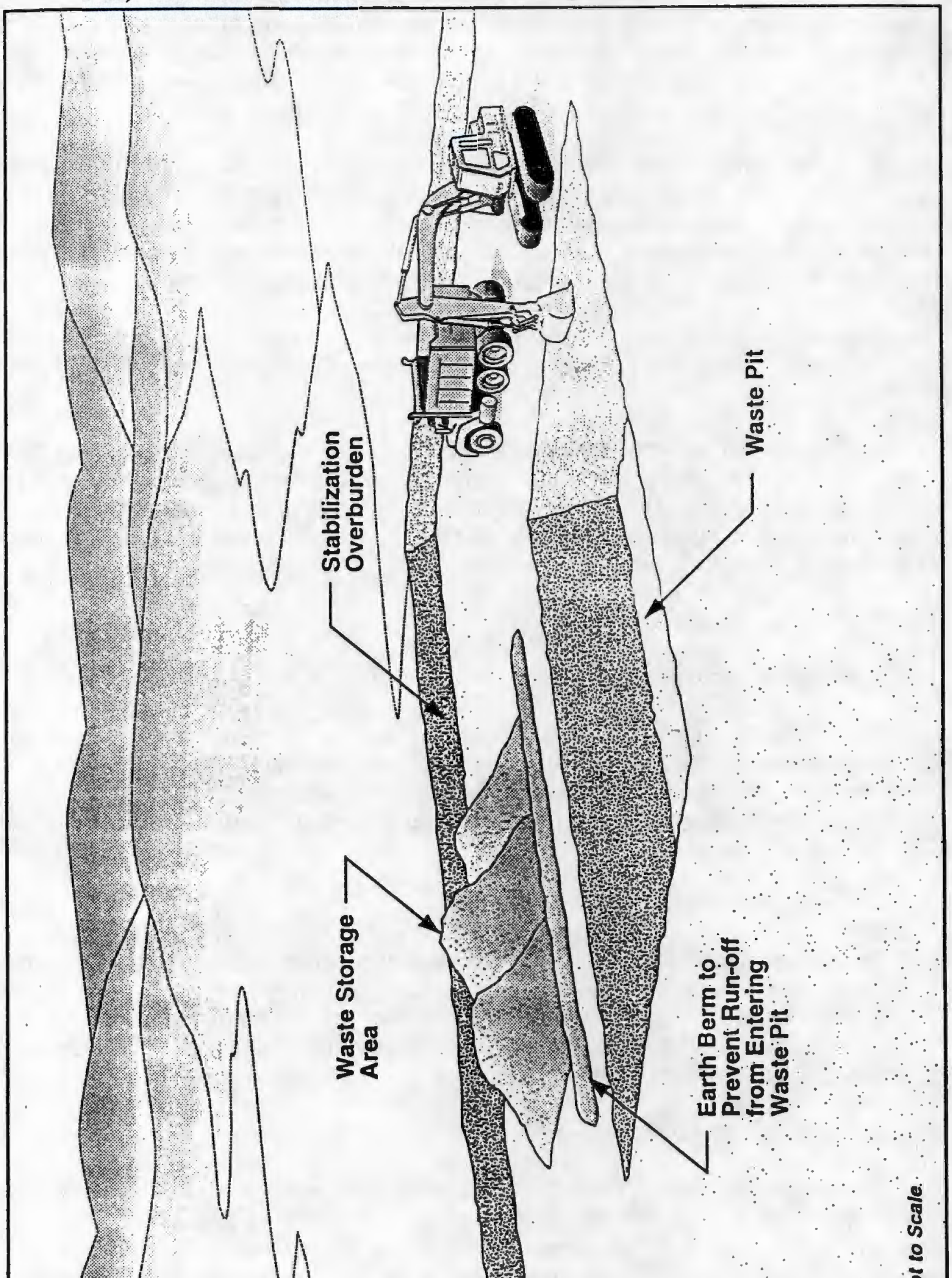
- Contaminated Waste Holding Areas

  The contaminated waste holding areas will be located adjacent to the excavation as shown in Figure 4. If necessary, the area will be bermed with at least 6 in. of soil to prevent runoff from directly entering the waste pit. Contaminated soil and debris will be sprayed with crusting agents and/or covered with plastic during down times to reduce potential contamination spread.

- Temporary IDW Storage Area

  The temporary Investigation Derived Waste (IDW) storage area is shown in Figure 3. Surface preparation will include preparing a level working pad with available equipment. Liquid or containers will be placed in new containers and/or overpacked, and placed on drum pallets for ease in further transport. Hazardous or mixed waste requiring handling as IDW (Section 4.0) will be stored in this area.

Figure 4. Plan View of a Typical Excavation Showing Contaminated Waste Holding Area.



3.3.2 Excavation Methods and Sorting/Segregation

For the waste material to be removed, the excavation will consist of the following operations:

- Bulk removal out of and within the trench (70% to 75% of total excavation volume)
- Segregation within the trench (20% to 25%)
- Bulk removal and sorting out of the trench (1% to 10%).

Slope inclination for all excavation approaches and associated benches and access ramps shall be in accordance with Section 3.1.2 of these test procedures. Field conditions, drawings, and associated trench access conditions will be reviewed by a registered professional engineer if the excavation proceeds below 20 ft and manned entry is required, prior to implementation and entry. The review will be coordinated through the field coordinator.

When excavating radioactively contaminated material, the excavator bucket shall not be completely filled. This will prevent any spillage from the excavator bucket. During screening operations, the bucket shall only contain approximately 1.5 yd^3 of material.

3.3.2.1 Top-Down Excavation Approach. Excavation of each of the five trenches will be started using the top-down approach. Refer to the *118-B-1 Excavation Treatability Test Plan* (DOE-RL 1994b) for detailed descriptions of the top-down approach. The top-down approach will be tested staging the excavator in different locations over the trench. One method will place the excavator to the side of the trench, while the other will have the excavator working from the top of the trench.

From an operational perspective, segregation will be implemented during the excavation only when there is sufficient working area within the trench. Therefore, initial waste excavation for each trench will consist of bulk removal and/or sorting operations. Determination of materials conducive to out-of-trench sorting will be at the discretion of the field coordinator. In general, for this test, materials not conducive to out-of-trench sorting will be large bulky materials, fragile containers, or containers suspected to contain liquids.

As the initial excavation for the debris proceeds with the top-down approach, materials will be excavated with the bucket of the trackhoe, screened with remote sensors, and if allowed to proceed from a radiological and/or health and safety perspective, the materials will be cast into a dump truck, or be placed off line for further radiological screening. The dump truck will then deliver the waste materials to either the contaminated waste holding area or to the sorting area, as determined by the field coordinator. Each trench will have a bulk removal and sorting volume goal of 1% to 10% of the total waste volume exhumed.

In general, once the excavation is below the waste materials, and adequate room exists at the bottom shelf or side of the excavation for in-trench segregation, the trackhoe will test the ability to segregate excavated materials in the trench with the bucket and thumb, using the top- down approach. Materials segregated in the trench will need to be placed at the bottom of the trenches in such a manner as not to cause a safety problem, or impede trackhoe maneuverability within the trench.

It is optimal to leave segregated material in the trench until backfilling to reduce handling. When this is not possible, segregated material may be transported to the contaminated waste holding area.

Data collection will be conducted by the field engineer(s) to fulfill the objectives listed in Table 3.

3.3.3 Backfilling of Trenches

Each trench will be backfilled prior to or simultaneously commencing with the excavation of the next trench. The primary operation consists of documenting materials location, backfilling and compacting the waste in the trench, and replacing the overburden.

A general description and photographic record will be kept of the material excavated, segregated, and placed in the trench. The descriptive documentation should identify the waste category, contamination level, and appropriate trench location and profile.

Backfilling waste into the trench will proceed in a manner that minimizes dust generation and the possibility of destroying the integrity of containers. Some form of compaction, such as packing the waste with the trackhoe bucket in lifts, should be used to increase the relative density of the trench as it is being filled.

3.4 SORTING

3.4.1 Sorting Methodology

The feasibility of sorting waste materials outside of the trench will be evaluated based on the ability to sort materials into the four categories, containers, soil, hard waste, and soft waste. Sorting will be implemented during the treatability test whenever sortable material is encountered and is deemed appropriate by the field coordinator or engineer.

The conceptual volume for sorting is 1% to 10% (50 to 1,000 yd^3) of the total waste volume excavated. The sorting operation has the potential for high dose exposures; hence, the volume of material sorted should be minimized while still meeting the test objectives.

The flowchart, shown in Figure 5, illustrates the approach for the sorting operation. Designated sorting feed material shall be transported from the excavation areas to the sorting area using a FEL or dump truck. Containers (drums, boxes, etc.) shall be removed from the feed material prior to loading the FEL/dump truck.

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Table 3. Collection Requirements Data for Excavation Operations. (sheet 1 of 2)

Excavation operation objective	Data		
	Needs	Measurement, observation	Quality
Compare effectiveness of the top-down and side removal approaches	Maximum stable slope angle for soil and waste	MEASURE: Angle of slope at failure measured from the horizontal using an Abney	Five degrees less than the slope that sloughs. Sloughing is indicated by the formation of tension cracks, a circular slope slippage, and ravelling >6 in. deep.
	Nature of materials in slope	OBSERVE: Soil and waste type	Description of soil or waste type: Soil (Unified Soil Classification System); Waste
	Location of excavator with respect to slope	MEASURE: Minimum workable distance of trackhoe from slope face	Nearest foot
	Maximum stable slope angle for soil and waste	MEASURE: Angle of slope at failure measured from the horizontal using an Abney	Five degrees less than the slope that sloughs. Sloughing is indicated by the formation of tension cracks, a circular slope slippage, and ravelling >6 in. deep.
	Nature of materials in slope	OBSERVE: Soil and waste type	Description of soil waste type: Soil (USCS) waste
	Degree to which native material is mixed into waste material	MEASURE: Depth of uncontaminated soil excavated	Nearest increment of 6 in. averaged over the excavated portion
	Source of uncontaminated interface material	OBSERVE: Location of uncontaminated soil relative to trench materials	Record location in trench (sidewall and bottom). Use relative soil density as indication of native or fill materials.
	Nature of materials being removed	OBSERVE: Waste composition	Description of waste type. Include % degradable material
	Spill volume	MEASURE: Volume of materials dropped during 1 h of excavation or at least 30 cycles. One cycle is defined as time to excavate one bucket-load of materials, dump it, and return to the trench ready to load another bucket	Nearest 1/2 yd^3 spilled, on average, over the observation period
	Reasons for spills	OBSERVE: Reasons for spill	Description of problem (e.g., steep bucket angle, weak thumb grip, operator dependent, etc.)
	Percent swell over a segment of trench. Swell is defined as the incremental increase in volume after trench backfilling divided by the original in-place trench volume.	MEASURE: Cross-section profile before excavation (after removal of overburden)	Using Abney, range finder, and compass, locate boundaries of excavated area for volume calculations
		MEASURE: Cross-section profile after trench excavation	
		MEASURE: Cross-section profile after trench backfilling	
		MEASURE: Volume of liquid containers	

Table 3. Collection Requirements Data for Excavation Operations. (sheet 2 of 2)

Excavation operation objective	Data		
	Needs	Measurement, observation	Quality
Identify waste forms requiring special excavation equipment and their frequency of occurrence	Cycle times	MEASURE: Time it takes to excavate one bucket of material, dump it, and return to the trench ready to fill another bucket	Time in seconds
	Bucket/thumb utilization	MEASURE: Fraction of end effector capacity for bucket-dependent removal and thumb-dependent removal	Fraction of capacity in 25% increments (i.e., 0, 25, 50, 75, or 100%). Capacity is defined as that volume of ideal materials that can be reasonably handled by the end effector (e.g., a 2-yd^3 bucket = 2.25 yd^3 of heaped soil).
	Nature of materials being removed	OBSERVE: Waste composition and arrangement	Description of waste type. Include % degradable material.
	Reasons for inefficient removal	OBSERVE: Reasons for inefficient removal	Description of problem (e.g., too large for bucket or thumb, operator dependent, etc.)
	Waste forms expected to require special equipment	MEASURE: List of waste forms from WHC-EP-0087, *Estimates of Solid Waste Buried in 100 Area Burial Grounds*	List of waste forms, separated by category and physical character
	Waste forms actually requiring special equipment	OBSERVE: Types of waste forms not easily removed with a bucket and thumb	Description of waste forms including category and character
	Frequency of occurrence of waste forms requiring special equipment	MEASURE: Number of waste forms not easily removed with a bucket and thumb	Number of waste forms, separated by category and physical character
	Identification of special equipment potentially capable of removing waste forms not able to be removed by a trackhoe with a bucket and thumb	RESEARCH: Potential capability of equipment to remove troublesome waste forms.	Conversations with equipment vendors, solicitation of vendor references, equipment specifications, and design capacities. Limit search to robust equipment or focus on equipment capable of removal of the most frequently occurring waste forms.
	Equipment substitution or replacement cost	RESEARCH: Net present worth of equipment substitution or replacement costs	Cost of labor for equipment replacement, personnel training, procurement and administration, and to purchase or lease the equipment. Plus 50% minus 30% level of detail.
	Equipment substitution or replacement time	RESEARCH: Additional time invested for equipment substitution or replacement	Procurement, mobilization, change-out, training time, etc. Expressed in terms of duration and equivalent full-time employees.

NOTE: Photographs or video may be used to supplement data collection when descriptions are required.

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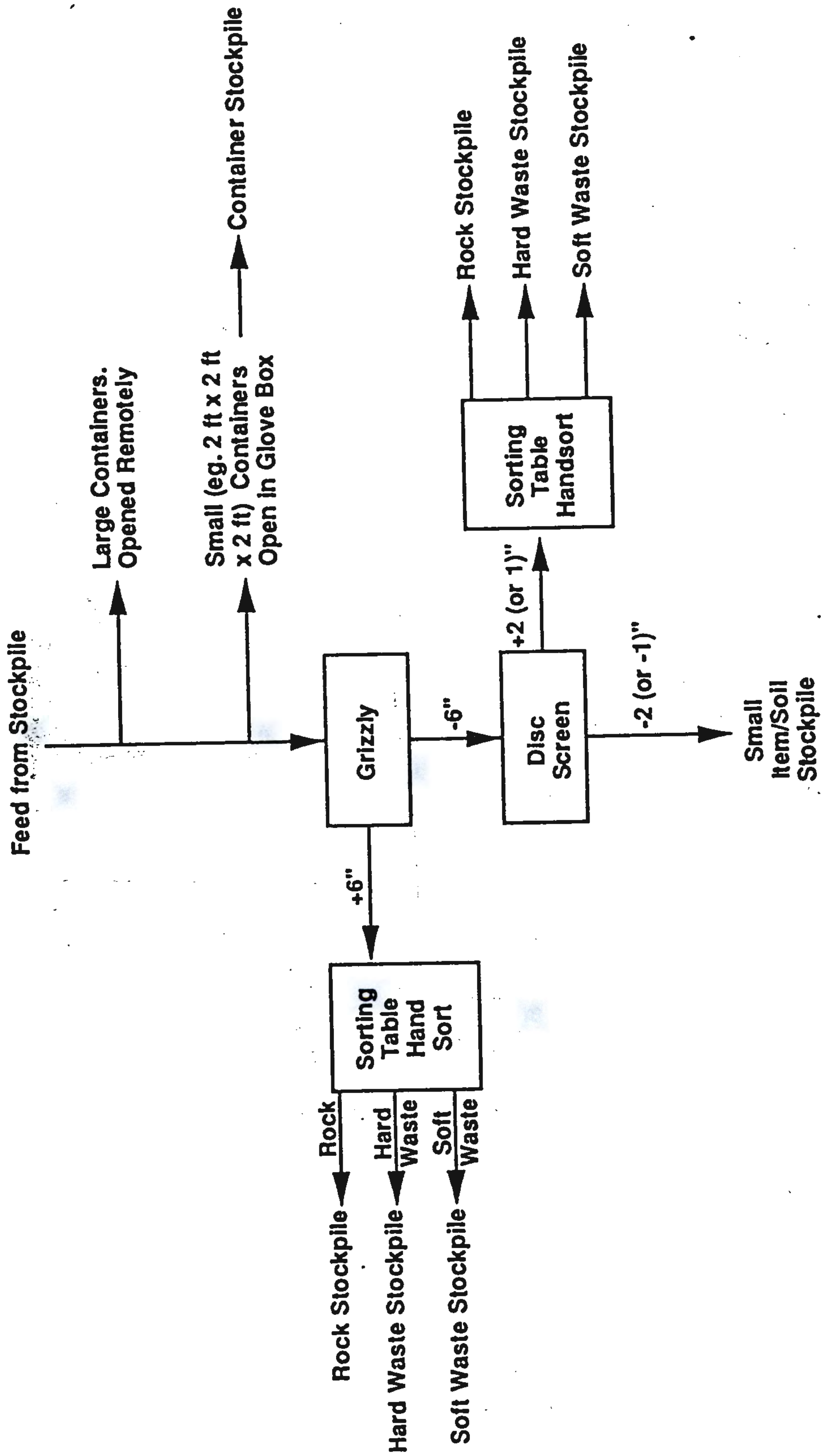
Figure 5. Sorting System Flow Chart.



3.4.2 Sorting Operation

Sorting material will be staged and stockpiled in the contaminated waste holding area. A FEL/dump truck will transport material to the sorting area (Figure 3) for batch processing. The majority of the sorting operations will be outside, except for the container screening area. The container screening area will be enclosed in a tent-type weather enclosure and glove bag. The tent enclosure is large enough that the entire sorting operation may be moved inside it if necessary for weather protection.

Sorting operations will be performed at the discretion of the field coordinator and field engineer. It is expected that sorting operation will require 1 to 2 weeks for each trench excavation. Water sprays will be used for dust control as required during each sorting operation. Each component of the sorting operation will be performed as applicable. The following subsections describe each component of the sorting operation.

3.4.2.1 Waste Staging (Construction Forces). Material will be staged in a three-sided bin located adjacent to the grizzly screen prior to actual sorting operations. The staging shall remove all containers. The containers will be opened and the contents will be inspected per Section 3.4.2.5.

The FEL (Plant Forces) will load and transport the material to the sorting area after staging, where one or more of the following operations will take place.

3.4.2.2 Grizzly Screening (Plant Forces). The grizzly screen is a static bar screen that separates waste forms larger than 6 in. (Figure 6). The screen is slightly angled to allow large materials to roll off the screen; however, some materials may have to be hand or machine picked off of the screen. The width of the grizzly screen exceeds the width of FEL bucket, allowing material to be loaded directly from the FEL. The plus material will fall directly onto the hand-sorting table, where material will be sorted into the four categories.

The minus material will be loaded into the FEL and further processed by one or more of the operations discussed below.

3.4.2.3 Disc Screen (Plant Forces). The disc screen (Figure 7) will be attached to the FEL. It is expected that the FEL can perform all material handling operations with the disc screen attachment. For example, material can be moved from the contaminated waste holding area to the grizzly with the disc screen bucket attachment (the rollers would not be engaged). The disc screen will be fitted rollers that separate the materials into 2-in. minus or 1-in. minus size fractions.

Material will be loaded into the disc screen bucket attachment and transported to the minus fraction stockpile. The rollers will be engaged and the minus fraction material will fall onto the stockpile. The minus fraction material will not be hand sorted or separated any further. The disc screen bucket attachment will then transport material to the sorting table where the plus fraction will be dumped and hand sorted into the four waste categories.

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Figure 6. Grizzly Screen and Sorting Table.

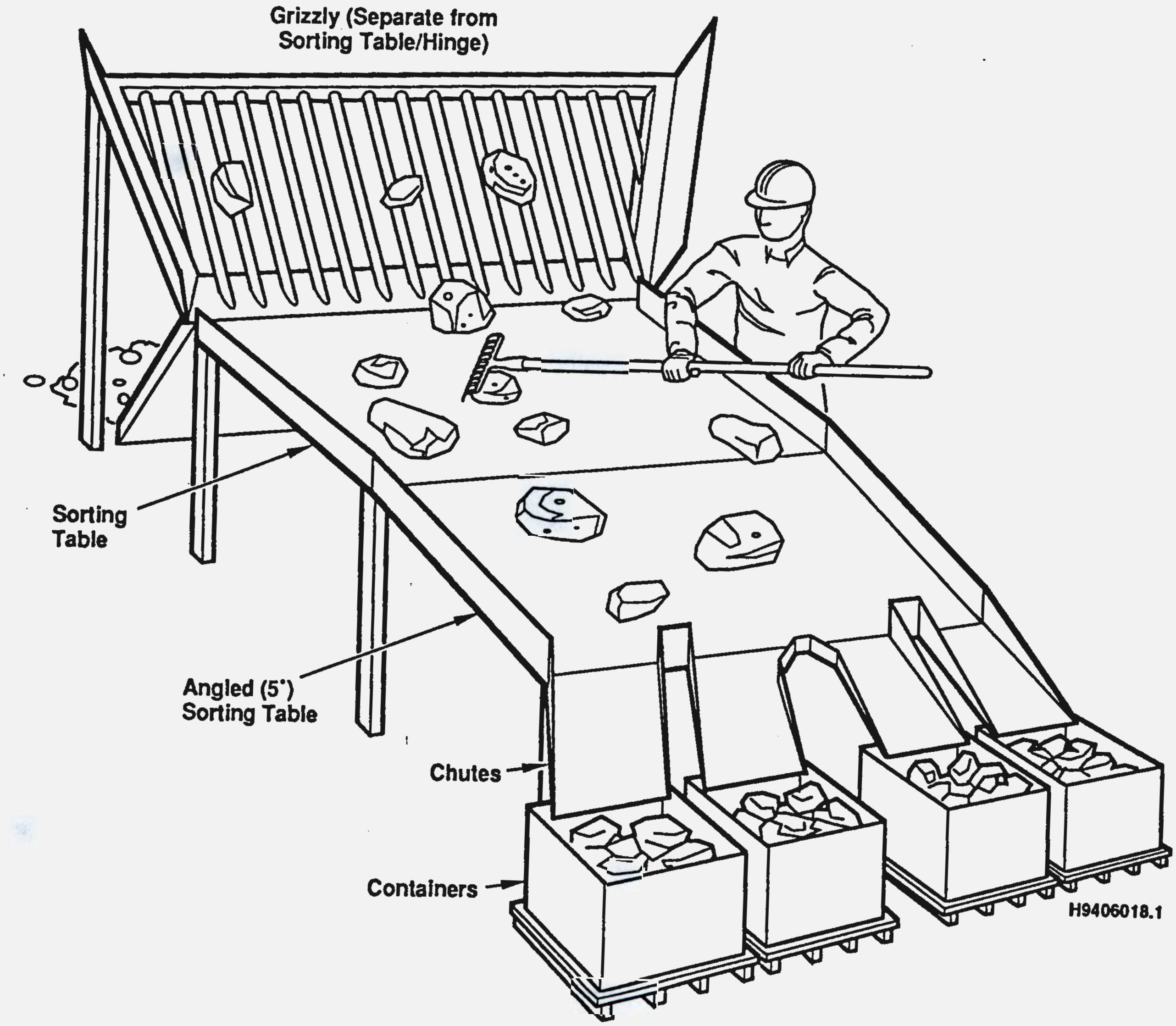
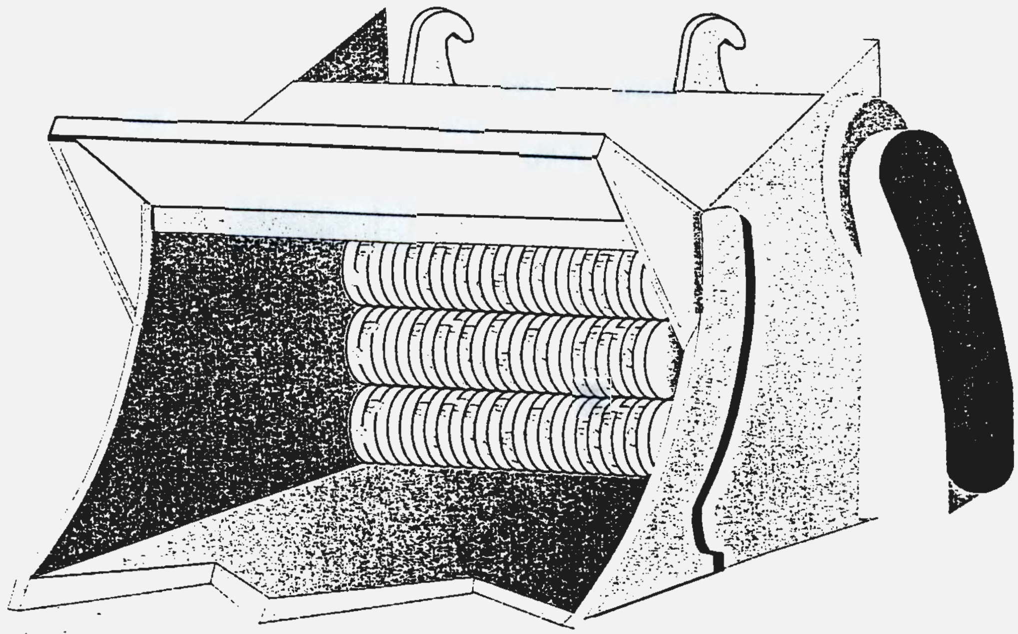


Figure 7. A Bucket Disc Mounted Screen.



3.4.2.4 Hand Sorting (Plant Forces). Hand sorting is required to separate material into the four waste categories. Hand sorting will be done using long-handled tools, such as rakes and picks, as much as possible to reduce exposures. Most of the material will be hand sorted on the sorting tables; however, some hand sorting may be required at the waste piles.

After material has been loaded onto the sorting table (Figure 6), workers on either side of the table will pull and push materials into appropriate waste piles (soil, hard waste, soft waste, and miscellaneous). After recording the appropriate data (Section 3.4.3), the waste will be moved to the stockpile area located within the sorting area.

Some sorting at the waste pile will be required, e.g., to remove containers in the staging area. Workers shall use long-handled tools to rake and push material into the appropriate waste category. Actual handling of the waste items shall be minimized to reduce worker exposure.

3.4.2.5 Container/Box Sorting. Large containers such as drums will be opened and the contents documented. These containers will be opened on a case-by-case basis. Procedures will be developed as necessary once container type and condition is determined. At this time, closed drums are not expected to be encountered. If drums are encountered, work will stop and safety will be consulted prior to taking any action in the vicinity of the drums.

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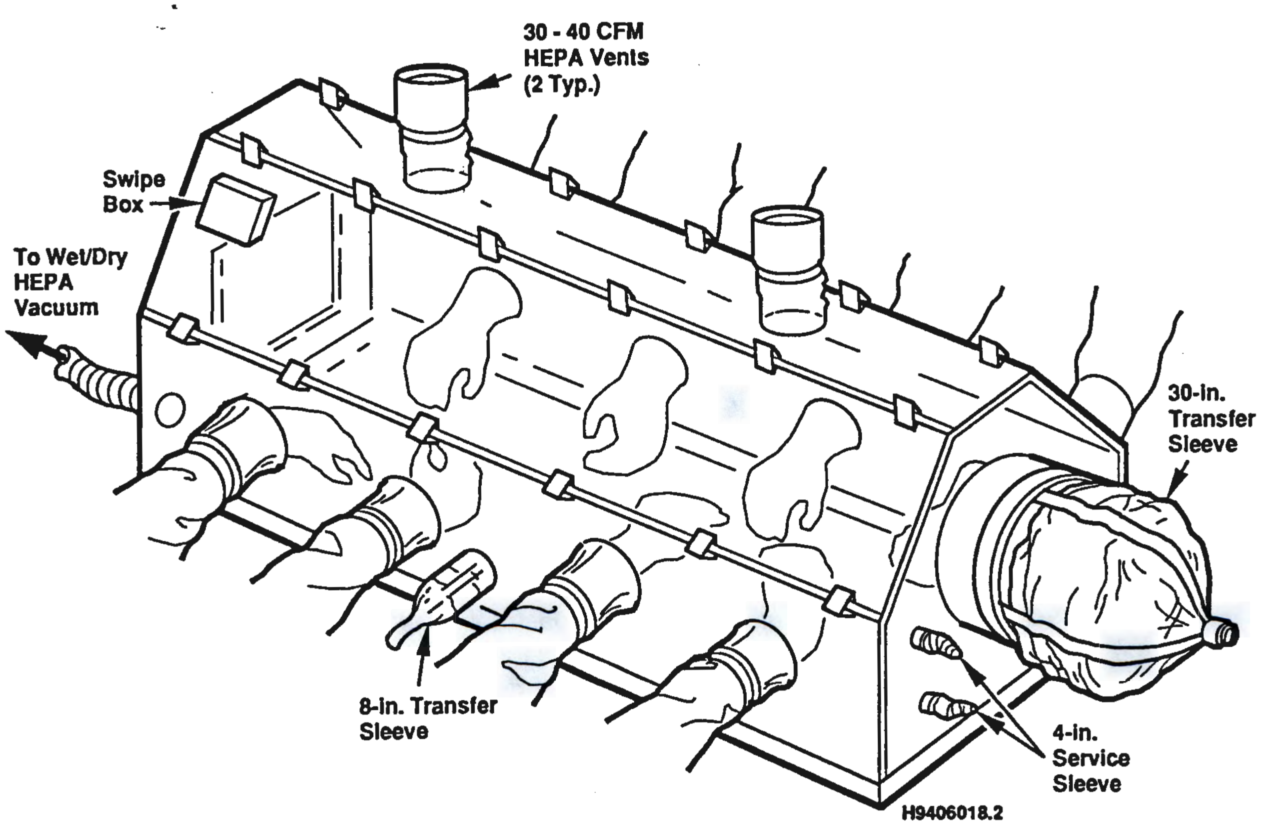
Smaller containers such as small cardboard boxes or plastic bags will be opened in the enclosed glovebag area (Figure 8). Not all boxes will be opened; however, some number of boxes will be opened to characterize their contents. The field coordinator will designate which boxes will be opened.

The glove bag will shall be certified and operated per the *Westinghouse Radiological Containment Guide* (WHC 1994).

Figure 8. Glove Bag.



3.4.2.6 Sorted Waste Stockpiles and Restoration. The waste that has been sorted will be stockpiled within the sorting area. These stockpiles will be covered or sprayed with a dust control agent to prevent blowing debris or dust (Section 3.1.1). Accumulated waste in the stockpiles will be returned to the contaminated waste holding area or will be returned directly to the trench during backfilling (Section 3.3.3).

3.4.2.7 Administrative Control/ALARA. The sorting operations have a high potential for worker exposure. It is important that the ALARA principles be enforced.

- TIME: The minimum volume of waste shall be sorted to meet the test objectives. The time spent sorting shall be minimized as much as possible.
- DISTANCE: Long-handled tools and remote equipment shall be used as much as possible to reduce exposure. Actual handling of the waste should be minimized.
- SHIELDING: Shielding shall be designed and used whenever possible in the sorting operations.

3.4.3 Data Collection

The data collection for the sorting portion of the test will be by visual observation. All information and data will be recorded into a designated log book. Photographs and videos will be used as well to illustrate and document the different waste forms and sorting operation. The information in Table 4 shall be documented throughout the test.

3.5 ANALYTICAL FIELD SCREENING/SAMPLING ACTIVITIES

This section provides a description of the analytical screening process. Field screening is being conducted to demonstrate the ability to determine if burial ground waste exceeds the preliminary ERDF WAC. The procedures described below are the initial methods defined in the test plan. The initial conceptual screening model is depicted in Figure 9. The procedures may be revised by project scientists based on field conditions to ensure that test objectives are being met. Modifications may include changing detection instruments, revising order of screening, and selectively screening waste.

Secondary screening will be conducted on up to 10% of the waste removed from the trench. All unidentified waste will be screened (until a profile of the "unidentified" waste is obtained and the material can be identified by visual observation). All waste will be screened by dose rate for health and safety purposes. This dose rate will be recorded in the field log book if the dose rate exceeds 100 mrem/h.

Secondary screening will be conducted off line from the excavation. Once it has been decided that it is necessary to screen materials, the material will be placed into a designated screening area within the exclusion zone.

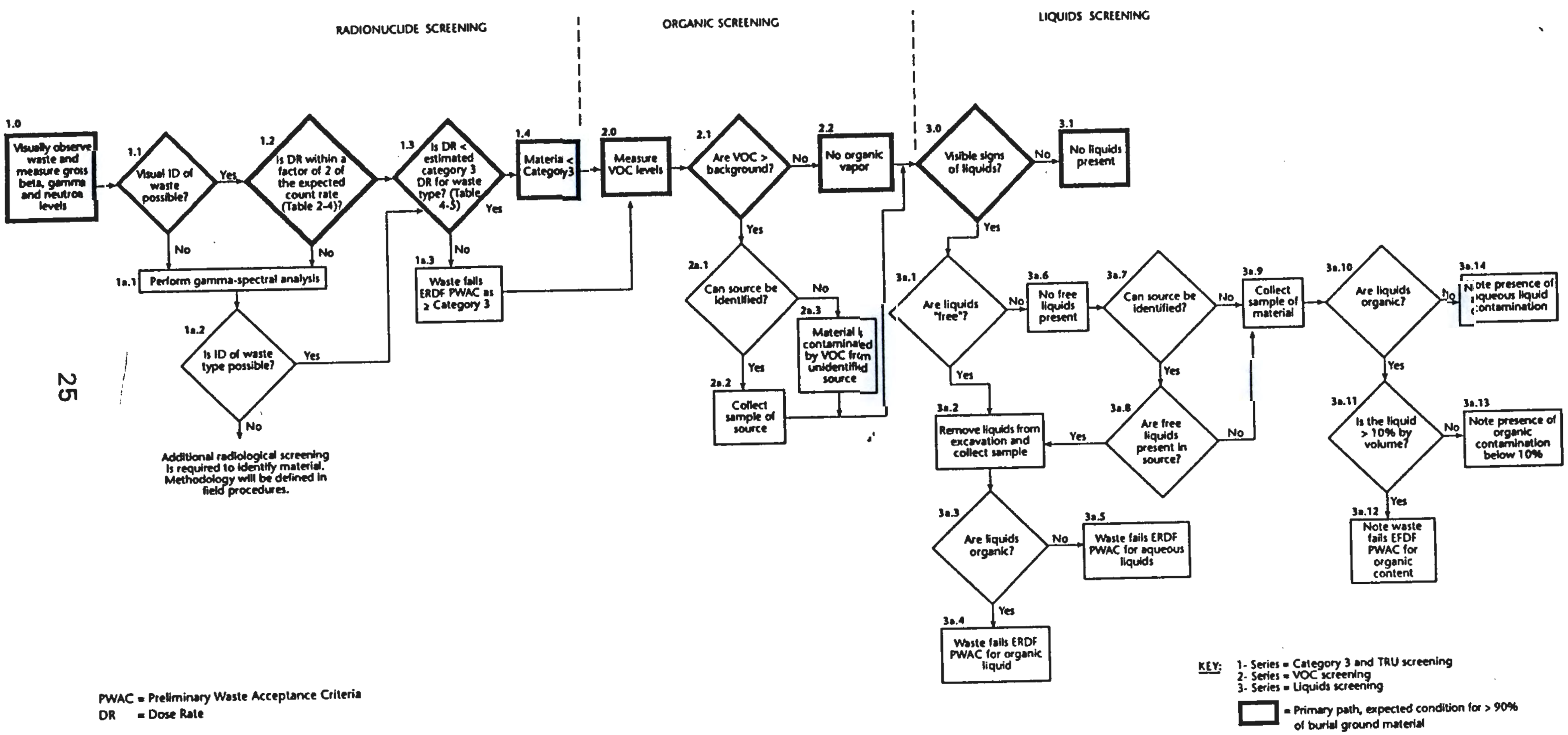


Figure 9. Conceptual Screening Flowchart.

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Table 4. Data Collection Requirements for Sorting.

Operation	Observation/Measurement	Quality
Containers	OBSERVE: Types of container forms encountered.	Description of container; size, shape, physical characteristics, and condition.
	OBSERVE: Types of containers requiring special handling.	Description of container; size, shape, physical characteristics, and condition.
	OBSERVE: Reason for difficulty in maintaining container form integrity during sorting.	Describe problem such as container integrity lost during excavation, mechanical equipment too rough, etc.
	OBSERVE: Content of boxes and if free liquids are present.	Describe content of boxes according to waste category and waste form type.
Mechanical Sorting Operation	OBSERVE: Types of waste forms encountered.	Describe waste form according to waste category (i.e., hard, soft, soil, container) and waste form type (e.g., physical characteristics, size, shape, type of reactor waste, etc.).
	OBSERVE: Relative effectiveness of mechanical sorting into soil and non-soil categories.	Describe ease of mechanical sorting (i.e., relatively easy or difficult to sort).
	MEASURE: Number of non-soil waste forms appearing in small item stockpile per unit volume of soil sorted.	Record mechanical sorting accuracy ratio to the nearest five non-soil waste forms per cubic yard of soil.
	OBSERVE: Reason for improperly mechanically sorted waste forms.	Describe problems encountered in the mechanical sort.
	MEASURE: Number of cubic yards of throughput for the grizzly and disc screen in a given time period.	Record screening rate to the nearest bulk cubic yard per hour.
Hand-Sorting Operation	OBSERVE: Ease of hand sorting.	Describe ease of hand sorting (i.e., relatively easy or difficult to sort).
	MEASURE: Fraction of waste forms in each category that were improperly sorted.	Record hand-sorting accuracy fraction to the nearest 10%. Specify whether volume based or unit based.
	OBSERVE: Reason for improperly hand sorted waste forms.	Describe problems encountered in the hand sort.
	MEASURE: Number or fraction of equivalent cubic yards hand sorted in a given time period by one person.	Record hand-sorting rate to the nearest bulk cubic yard per hour.

3.5.1 Screening to Test if Waste Exceeds Category 3

Visually observe waste and measure gross beta/gamma/neutron does rates: The waste is observed visually, and field instruments are used to measure the gross beta/gamma and neutron levels. Measurements will be made by placing the excavator bucket of waste by a radiation detection monitor. These measurements will be compared to the predicted levels for the identified waste type (Table 2).

Is Visual ID of Waste Possible? Visual observation will be used to identify the type of waste (such as process tubes, soft waste, or graphite). Mixed buckets of waste will be considered "unidentified" until a profile of waste type in the trench being excavated is determined. Any waste exhibiting a dose rate of <.1 mrem/h will not be sent to the secondary screening area. Unidentified waste with higher dose rates will be evaluated for applicability of screening.

Identifiable Waste

Is the contact dose rate less than a factor of 2 of the expected dose rate, as shown in Table 2? If it is, the material is considered identified. If the contact dose rate is less than the estimated Category III dose rate value for that waste type (determined by reviewing dose rates against Table 5), the material is acceptable for ERDF and radionuclide screening is complete. If the material is greater than the Category III dose rate for that waste type, the material is considered greater than Category III. Materials that contain radionuclides greater than their Category 3 concentration limits are given this designation. This material is placed in a known location in the excavation, covered with soil or other shielding (if needed), and marked with a surface marker for later identification.

Unidentifiable Waste

If the type of waste cannot be identified, and/or the contact dose rate is greater than a factor of 2 of the expected rate, the material requires further analysis. Perform gamma-spectral analysis. The objective is to identify all gamma emitters.

Using the radionuclides identified in this step, can the waste type be identified from the list of standard types? If so, compare dose rates to Table 5. If the waste type cannot be identified based on the radionuclides, additional radiological screening (e.g., alpha or beta analysis) is required to identify the material. If the material cannot be identified, it will be stored separately for return to the trench or handled as IDW at the completion of the project. Type of screening analysis will be defined based on type of waste, radiation levels, and initial dose measurements.

Recording Radionuclide Screening Data

All field screening data will be recorded in a controlled field logbook. The following information will be entered:

- Date and time
- Personnel present during screening
- Person making entries in book
- Survey instruments (model, serial number)
- Date and time object excavated
- Description of excavated object
- Measured gamma-ray dose rate and instrument used
- Spectral measurements performed, if any, and ID of any recorded spectrum
- Comments and observations.

Table 5. Estimated Contact Dose Rates for Category III Wastes from the 118-B-1 Burial Ground.

Waste type	r[a]	Original dose rate (R/h)[b]	Category III dose rate (R/h)[c]
Aluminum spacers	d,e	1.9 E-04	N/A
Lead/cadmium poison pieces	d,e	3.4 E-02	N/A
Aluminum/boron splines	d,e	1.4 E-01	N/A
Graphite	2.24	3.71 E-02	8.3 E-02
Aluminum process tubes	8.5 E+03	6.4	5.4 E+04[e]
Desiccant	N/A	None[f]	None
Lead brick	220	1.7 E-01	37
Lead sheet	366	7.7 E-03	2.8
Miscellaneous	2.3 E+04	1.7	4.0 E+04[e]
Cadmium sheet	N/A	None[g]	None
Soft waste	8.1 E+06	2.3 E-01	1.9 E+06[e]
Thermocouples	N/A	None	None
Stainless steel steam generator tubes	N/A	None[h]	None
Tritium separations project - glass line waste	N/A	None[g]	None

[a] $$\frac{\text{Category III Concentration}}{\text{Original Concentration}} = \frac{\text{Category III Dose Rate}}{\text{Original Dose Rate}}$$

The Category 3 dose rate is calculated by holding the isotope ratios from Table 2-3 constant and increasing the concentrations by the factor r. The Category 3 dose rate is then calculated from the increased isotope concentrations.

[b]MICROSHIELD model results based on the actual radionuclide concentrations from Table 2-3.

[c]Category III dose rate (R/h) = r x original dose rate (R/h).

[d]Radionuclides contained in this waste type have no Category III limits.

[e]Practical considerations such as the effects of external radiation and internal heat generation on transport, handling, and disposal will limit the concentration for these wastes (10 CFR 61, Table 2, Section 61.55).

[f]Beta radiation only; dose rate is negligible.

[g]No radionuclide data.

[h]Negligible, total radionuclide inventory <0.01 Ci for 57.5 tons of waste.

N/A = not applicable.

3.5.2 Screening for Organics

Measurement of organics will be conducted during the excavation by an industrial hygiene technician to check for organic vapors in the breathing zone. Detection of organic vapors is performed using a photo-ionization detector (PID). VOCs are not expected in the burial ground, and detection of VOCs above background requires a search for the source (assumed to be a breached container).

If VOCs are identified during the excavation, a search is made of the area to determine if the source of the VOC can be found. This search may include using the monitor to find vapor source and looking for discolored soil, containers, or liquids. If the source is identified, collect a sample of the source from the backhoe bucket. Appropriate personal protective equipment will be designated by the site safety officer/health physics technician. In addition to searching for the source, the PID will be used to collect a grab sample of the vapors to be transported for vapor identification using a field gas chromatograph.

If material is contaminated by VOC from an unidentified source and below safety concern, this information is noted in the field log and the excavation continues.

3.5.3 Screening for Free Liquids

The field coordinator will continually observe the excavation for liquids. If there are visible signs of liquids (these signs may range from discoloration of the waste material to liquid observed dripping off the waste), it must be determined if the liquids are "free."

A liquid is free if it meets the Resource Conservation and Recovery Act (RCRA) definition of a liquid (i.e., fails the paint filter test). Note in the field log that free liquids are present. It is important to describe the conditions that the liquids were found in, including:

- What was the dominant waste type around the liquid?
- What did the material look like?
- Where in the trench were the liquids found?
- Are these any other pertinent facts?
- Volume.

If free liquids are identified, a grab sample must be taken to identify the type of liquid. The objective of the sampling will be to identify if the liquid is a liquid organic present at greater than 10% of the waste matrix.

If containers are identified, these must be handled to contain the liquid and transfer it, if needed, to sound containers for disposal. If the waste matrix is dripping liquid, it must be containerized for treatment or disposal.

Liquids must be removed from the excavation. If a container exists, it may be sound enough to be moved to the staging area. If the container is not sound, the liquid is transferred to a sound container, or the existing container is overpacked. If unsound containers are found, excavation will cease and a safety review will be conducted prior to attempting to move containerized liquids. A sample of the liquid will be collected either during transfer or at the staging area. This sample will be used to characterize the liquid. If the free liquid is known to be rain water or dust control water, this will be noted and no further action will be taken.

3.5.4 Analytical Sampling

The field screening process defined in these procedures may not be sufficient to identify all materials encountered during the test. If unidentifiable materials are encountered, laboratory analysis is required. For this test, up to 20 grab samples may be collected during the excavation test for laboratory analysis. These samples will be collected at the direction of the field coordinator based on the following:

- Material that cannot be identified by field screening
- Up to five samples from the bottom of trenches where the field screening instruments indicate clean soil (NOTE: it is not required to attempt to excavate to the trench bottom in every trench and samples are not required in every trench)
- One grab sample of graphite (^{14}C) for isotopic analysis to confirm the isotope ratios in (if graphite is encountered).

Each grab sample will be analyzed for the following list of analytes from the burial ground waste site group, *100 Area Source Operable Unit Focused Feasibility Study Report, Volume I* (DOE-RL 1994a).

- Radionuclides: ^{14}C, ^{137}Cs, ^{60}Co, ^{152}Eu, ^{154}Eu, ^{3}H, ^{63}Ni, ^{90}Sr Laboratory Specific Procedures (Level V)
- Inorganics: Cadmium (SW-846 Method 6010), Lead (SW-846, Method 7421), Mercury (Solid, SW-846 7471, Liquid, SW-846 7470), Chromium (6010)
- Organics: No specific constituents identified.

Grab samples of free liquids or suspect organic contamination will be sent to the Environmental Analytical Laboratory for volatile and semi-volatile organic screening if the sample meets the radiation requirements of the laboratory. If the sample exceeds these limits, samples will be sent offsite for volatile and semi-volatile organic analysis by SW-846 methods.

Analyte	Procedure	Detection Limit	Precision	Accuracy
^{14}C	Isotope specific	50 PCi/g	35%	75-125
^{137}C	Gamma spectroscopy	3 pCi/g	35%	75-125
^{60}Co	Gamma spectroscopy	.05 pCi/g	35%	75-125
^{152}Eu	Gamma spectroscopy	3 pCi/g	35%	75-125
^{154}Eu	Gamma spectroscopy	3 pCi/g	35%	75-125
^{3}H	Isotope specific	400 pCi/g	35%	75-125
^{63}Ni	Isotope specific	300 pCi/g	35%	75-125
^{90}Sr	Isotope specific	13 pCi/g	35%	75-125
Cadmium	SW-846, Method 6010	2 mg/kg	35%	75-125
Chromium	SW-846, Method 6010	2 mg/kg	35%	75-125
Lead	SW-846, Method 7421	10 mg/kg	35%	75-125
Mercury	SW-846, Method 7471	.1 mg/kg	35%	75-125
Volatile organics	SW-846	SW-846 required detection limit	35%	75-125
Semi-volatile organics	SW-846	SW-846 required detection limit	35%	75-125

Appendix C contains the quality assurance plan for laboratory sampling activities.

3.6 CONTAMINATION PREVENTION AND DECONTAMINATION

Primary contaminants of concern include radionuclides, lead, and mercury. Specific decontamination guidance and special instructions will be decided by the field coordinator, health physics technician, and site safety officer. WHC-CM-1-6 (WHC 1993d) and the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH 1985) also provide guidance on decontamination practices. The following is meant to provide an overview of field decontamination procedures and contamination prevention measures.

3.6.1 Equipment

Successful contamination prevention measures will reduce the likelihood of contamination leaving the exclusion zone and/or the likelihood of creating regulated equipment. The following suggests the minimum contamination prevention measures that should be taken to ensure equipment remains deregulated. The list below does not preclude the health physics technician from the responsibility of informing onsite personnel of the risk involved with taking equipment into the exclusion zone and the Surface Contamination Area (SCA). The health physics technician should advise onsite personnel of the proper measures to minimize equipment contamination potential. Dust control equipment (water sprays and surfactants) will be available at all times to mitigate spread of contaminated soil.

- Wrap instruments in tape/plastic when possible
- Take only what is needed
- Avoid contact with contaminated or suspect media
- Avoid the use of equipment with lots of "nooks and crannies"
- Health physics technician will monitor decontamination activities.

Field decontamination of heavy equipment will be accomplished by the application of high-pressure water and/or steam. (NOTE: Water will be contained and sampled by the health physics technician.) Decontamination of the backhoe bucket will take place over the soil waste storage area or the contaminated area of the excavation. Other field decontamination shall be conducted as required by EII 5.4 and WHC-CM-1-6 (WHC 1993d).

3.6.2 Personnel

Decontamination is the process of removing or neutralizing contaminants that have accumulated on personnel and equipment. To facilitate decontamination, a contamination reduction zone will be maintained at the site. Health physics personnel have the primary responsibility for conducting operation in the contamination reduction zone. Further guidance is available in WHC-IP-0718 (WHC 1993b). The following procedure provides field personnel with direction to exit the exclusion zone.

3.7 SITE RESTORATION

Upon completion of the test, the excavation will be returned to grade level. Soil that has been identified as noncontaminated will be returned to the excavation as backfill. Any additional soil required will be taken from a soil borrow site. Details on backfilling are provided in Section 3.3. After completion of the test, contaminated soil shall be placed back in the burial ground. All equipment and structures will be moved from site, and any altered fencing will be returned to its original location.

4.0 WASTE MANAGEMENT

The 1994 Amendments to the Tri-Party Agreement provide that the "waste generated from the test pits will be managed as 'investigation-derived-waste' or returned to the excavation in a manner that will facilitate final remediation."

The strategy for regulatory compliance for the 118-B-1 treatability test is as follows:

- Materials will be kept within the area of contamination to the maximum extent feasible.
- A selection process to determine which materials will be used for the sorting test will avoid obvious hazardous wastes such as barrels of free liquids, lead bricks, cadmium splines, etc.
- Once material has been removed from the burial ground and entered the sorting process, visual inspection of the wastes will be the main basis for identifying hazardous wastes that have been removed from the area of contamination.
- Materials identified as hazardous wastes that have been taken to the sorting area will be segregated and handled as hazardous waste (either sent to the central waste complex or managed as IDW) unless the quantity of hazardous waste thus generated becomes too large for such management to be feasible.
- If unmanageable quantities of hazardous waste are generated in the sorting process, they will be segregated and returned to a clearly identified isolated location within the burial grounds for ease of later removal.

Specific guidelines with regards to waste management are contained in the Project Specific Waste Control Plan, Appendix D.

5.0 QUALITY ASSURANCE

Quality assurance is handled by following the data quality objectives outlined in the test plan (DOE-RL 1994b). These objectives were derived during six sessions between the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency, and the Washington Department of Ecology using the SAFER approach to develop the quality objectives necessary for the treatability test. A quality assurance project plan is attached in Appendix C.

6.0 REPORTING REQUIREMENTS

All information needed for the test report will be recorded in the controlled field log books as required in EII 1.5. This information will be listed as required in Section 3.0. Prior to commencing field work, a training session will be held for log book entries for consistency among reporters.

Following completion of field testing, a report will be issued that summarizes the data collected, discusses the data in terms of the evaluation criteria and test objectives, provides a narrative of how the test was implemented, and presents conclusions and recommendations applicable to the full-scale remedial action. Specific items to be included in the report are listed in the test plan (DOE-RL 1994b, Section 7.0).

7.0 PROCEDURE MODIFICATIONS

Under field conditions, the optimal aspects of preliminary test design often are not achievable. Factors influencing these efforts can be equipment malfunction or breakdown, weather conditions, improper equipment, soil conditions, physical barriers, and overly optimistic evaluation of capabilities. Because of unforeseen field conditions, modifications to the planned activity may be necessary as decided by the field coordinator.

To ensure efficient and timely completion of tasks, minor field changes can be made by the person in charge of the particular activity in the field. Minor field changes are those that have no adverse effects on the technical adequacy of the job or the work schedule. Such changes shall be documented in the daily log books that are maintained in the field. If it is anticipated that a field change shall affect the agreed-to work schedule or requires the approval of the lead regulatory agency, the applicable DOE unit manager will then be notified.

8.0 PROJECT ORGANIZATION

Project organization for the 118-B-1 Excavation Treatability Test is shown in Figure 10.

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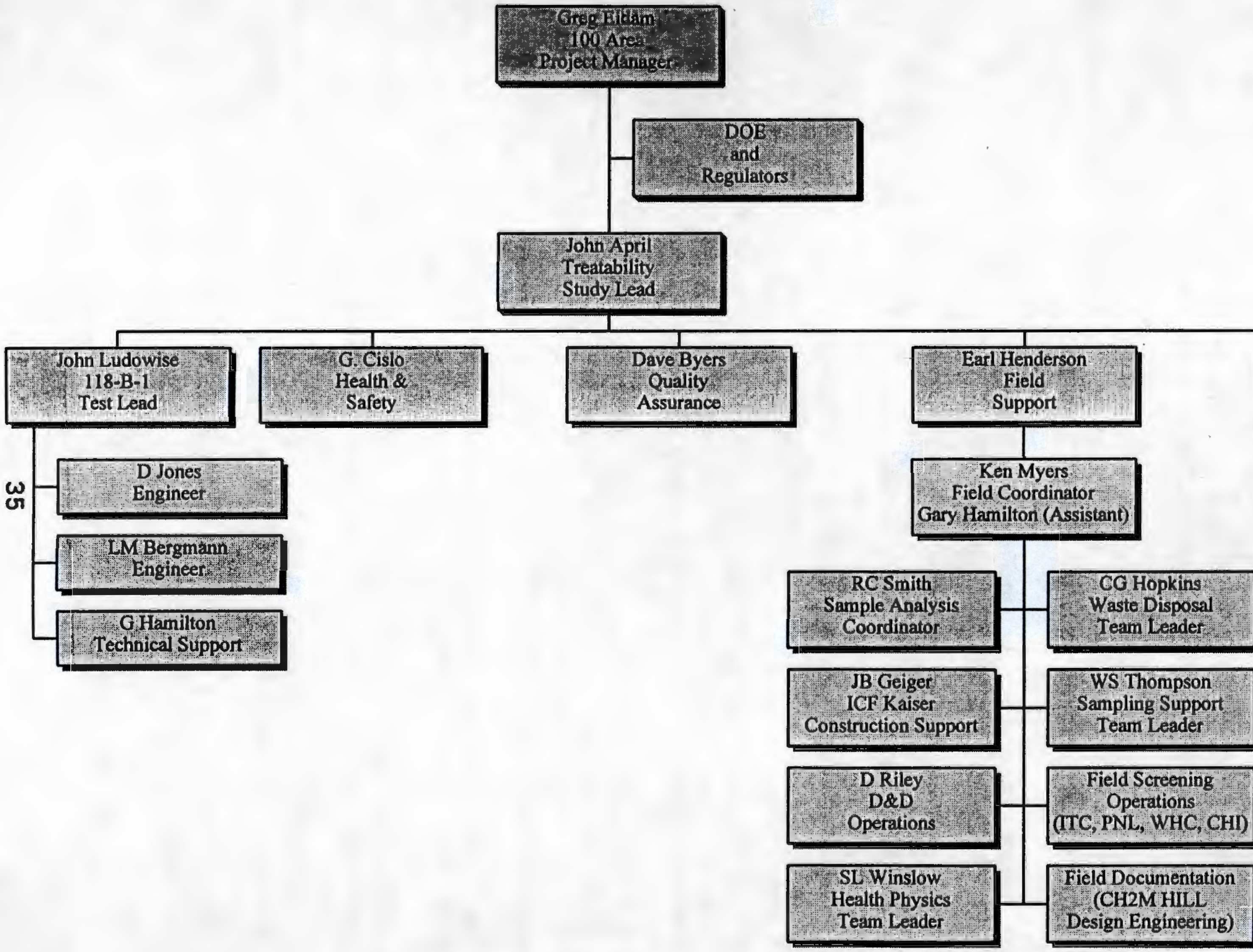

New Organization Effective 12/1/94

Figure 10. Project Organization for the 118-B-1 Excavation Treatability Test.

9.0 REFERENCES

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APPENDIX A

PHOTOGRAPHS OF REACTOR HARDWARE

CONTENTS

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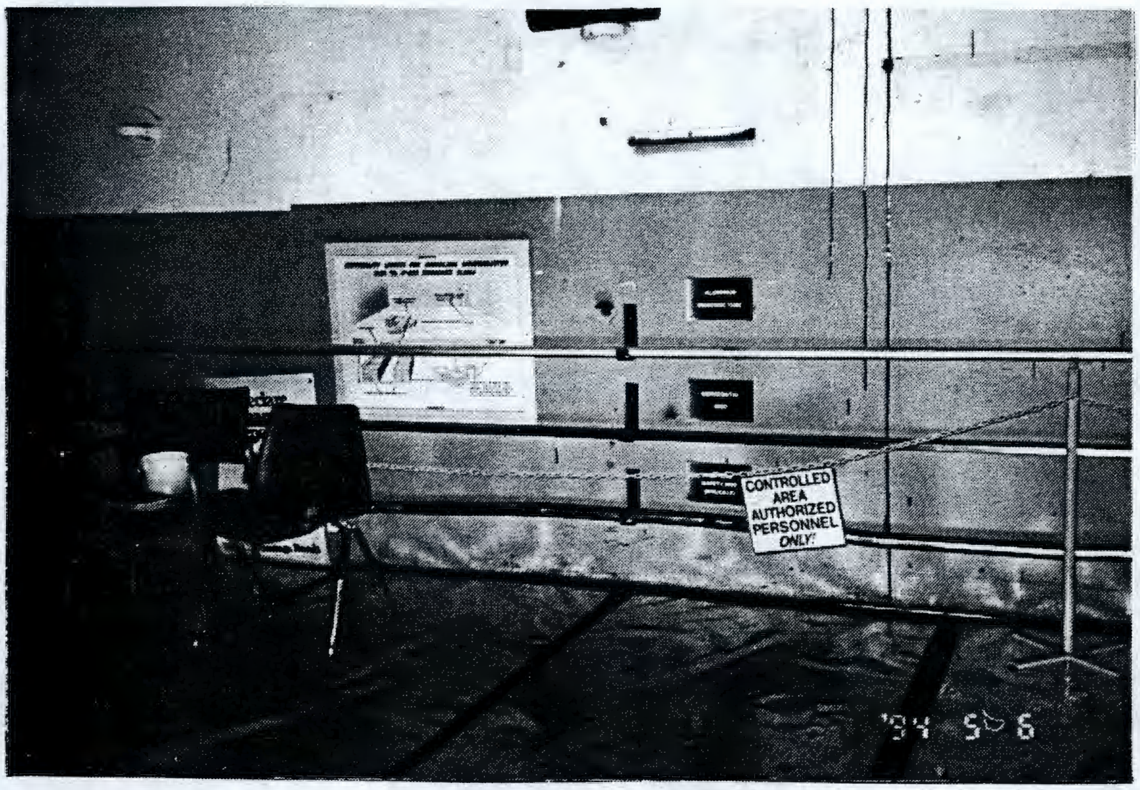
EXAMPLES OF WASTE BURIED IN THE 118-B-1 BURIAL GROUND



PROCESS TUBES

The process tubes were 40 ft long, .125 in. thick, and had an inside diameter of 1.75 in. They were made up of aluminum and later of zircalloy-2 and were used to hold the uranium fuel elements. The major contaminants were ^{60}Co, ^{63}Ni, ^{59}Ni, ^{137}Cs, ^{90}Sr, and ^{152}Eu.

HORIZONTAL CONTROL RODS

Horizontal control rods were long, cylindrical and/or rectangular aluminum tubes that contained boron or cadmium. Their job was to control the power levels of the reactor and maintain the neutron flux distribution. The major contaminants were ^{60}Co, ^{63}Ni, and ^{59}Ni.

VERTICAL SAFETY RODS

Vertical safety rods were used in emergencies and to shut down the reactor. They were capable of controlling large amounts of reactivity and bringing the reactor below critical very quickly. Major contamination came from ^{60}Co, ^{63}Ni, and ^{59}Ni.

GRAPHITE BAR

The inner core of the reactor was made up of many graphite bars that served as the moderator. Process tubes were held in place by these bars.

NICKEL-PLATED BORON BALLS

Nickel-plated boron balls were used as a third control device. The boron balls, 3/8 in. diameter, flowed into vertical safety rod channels to shut down the reactor in emergency situations. Major contamination came from ^{60}Co and ^{63}Ni.

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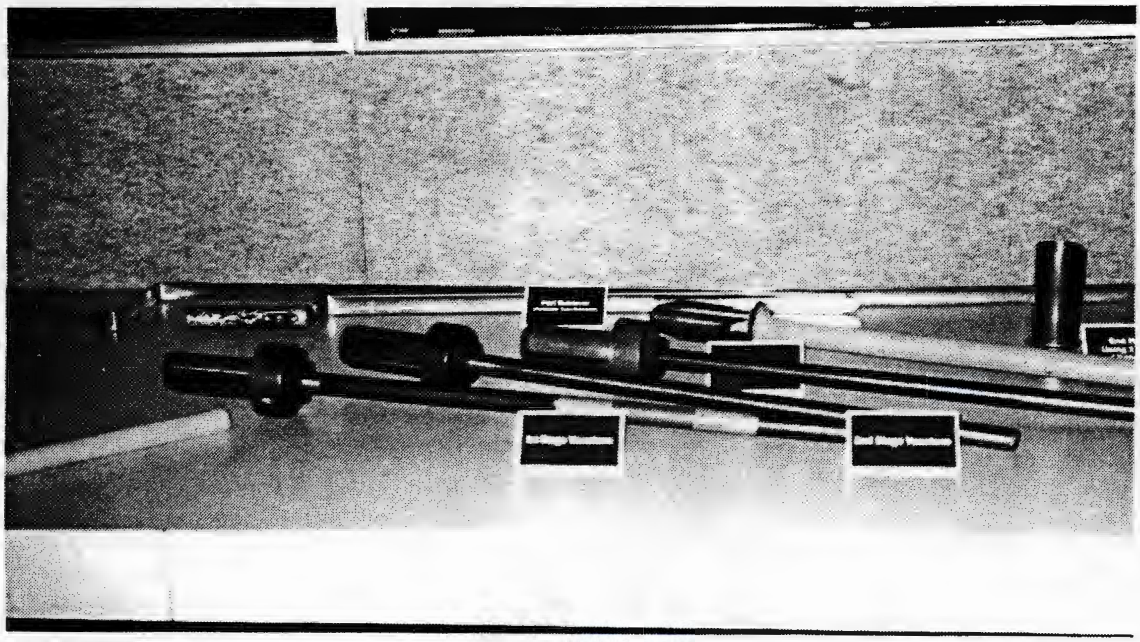
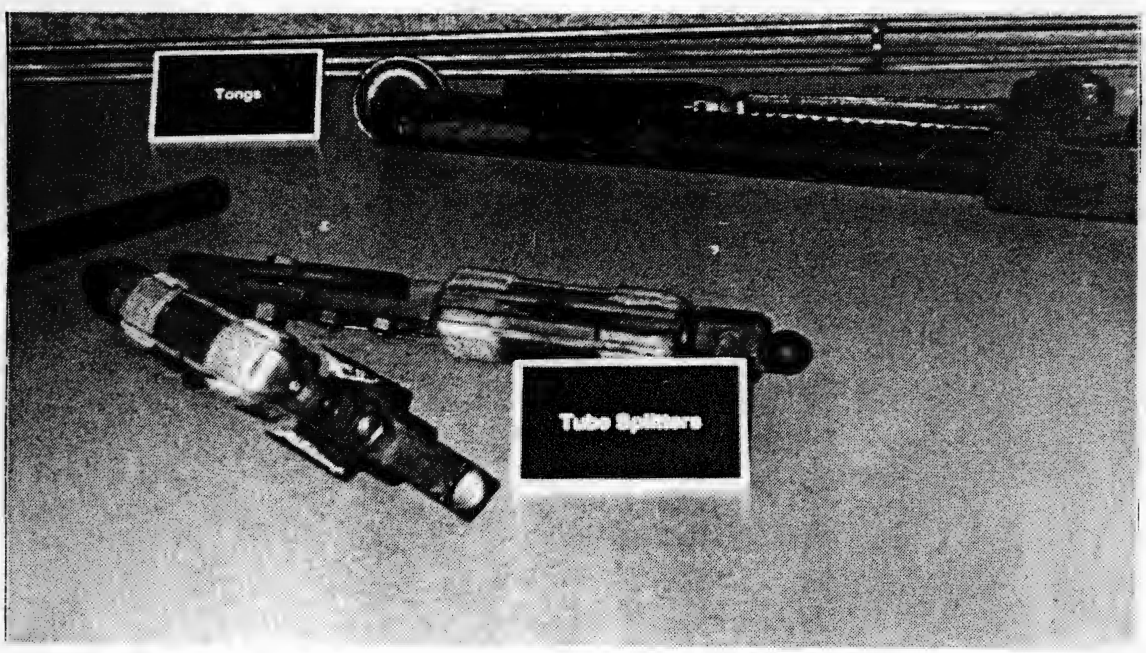


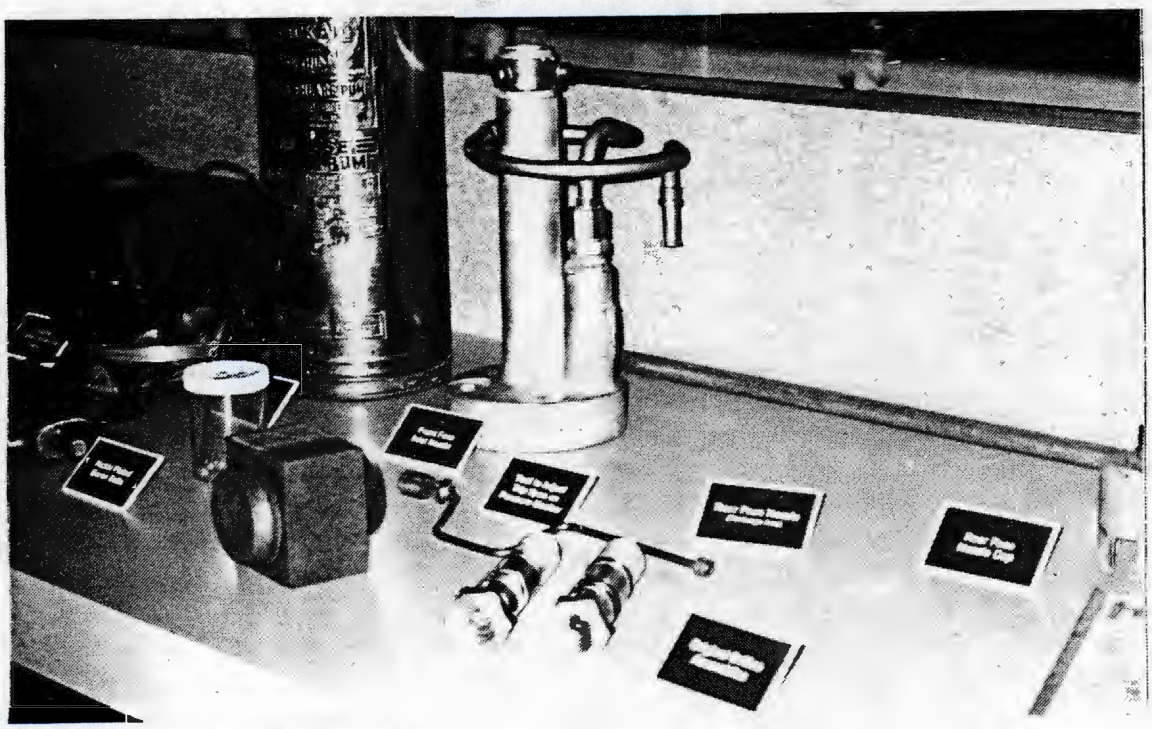
VANSTONE TOOLS

A Vanstone flange was a flared opening at the ends of the process tubes. They were used to get a watertight seal at the gunbarrel, process tubes, and nozzles. The vanstone tools were used to bend the metal interface end of the process tube into a flange.



TUBE SPLITTER

A tube splitter was pulled through a process tube to cut it in half. The process tube could then be easily removed and replaced.



NOZZLES, FRONT AND REAR

Nozzles were made of aluminum, carbon steel, and stainless steel. They allowed cooling water and fuel to enter and exit the process tubes. Major contamination came from ^{60}Co, ^{63}Ni, and ^{59}Ni.

NOZZLE CAPS

Nozzle caps were used as process tube enclosures. The major contaminants were ^{60}Co, ^{63}Ni, and ^{59}Ni.

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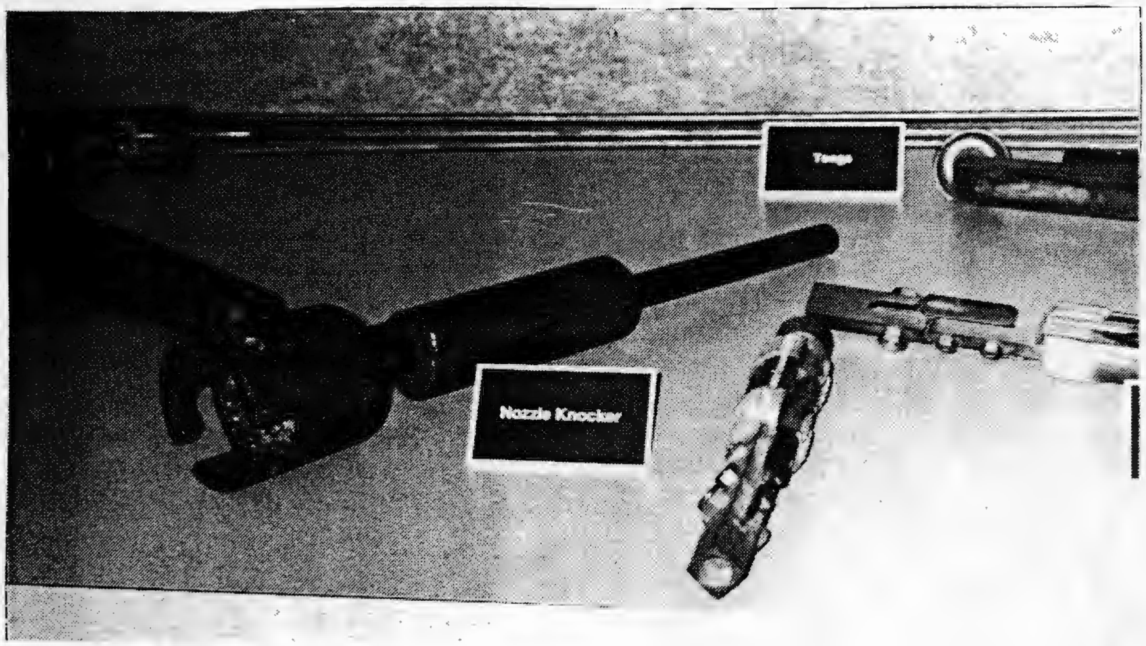
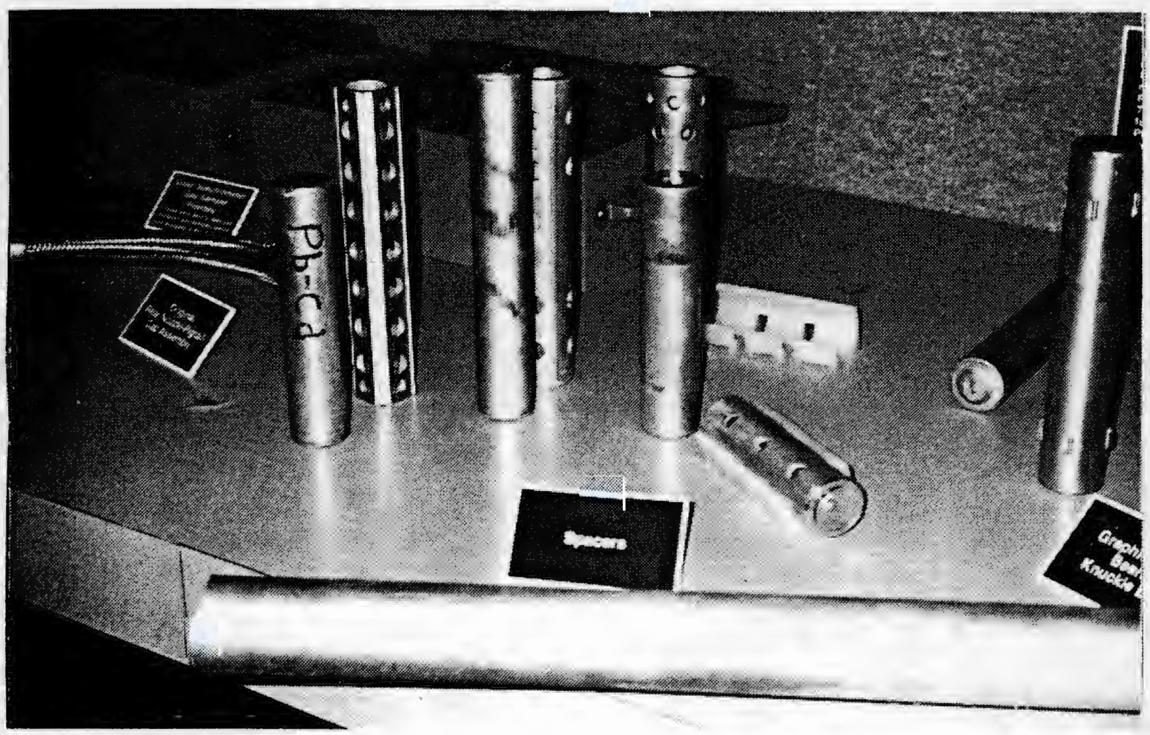


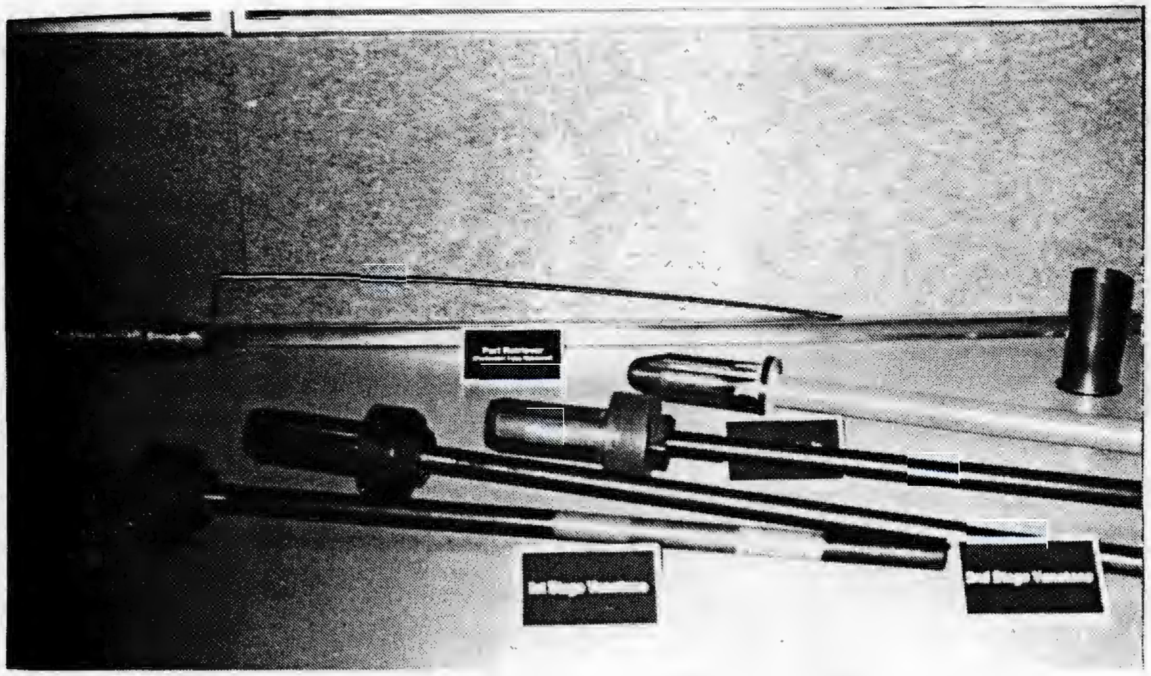
NOZZLE KNOCKER

The nozzle knocker was a maintenance tool used to hammer the nozzles on and off.



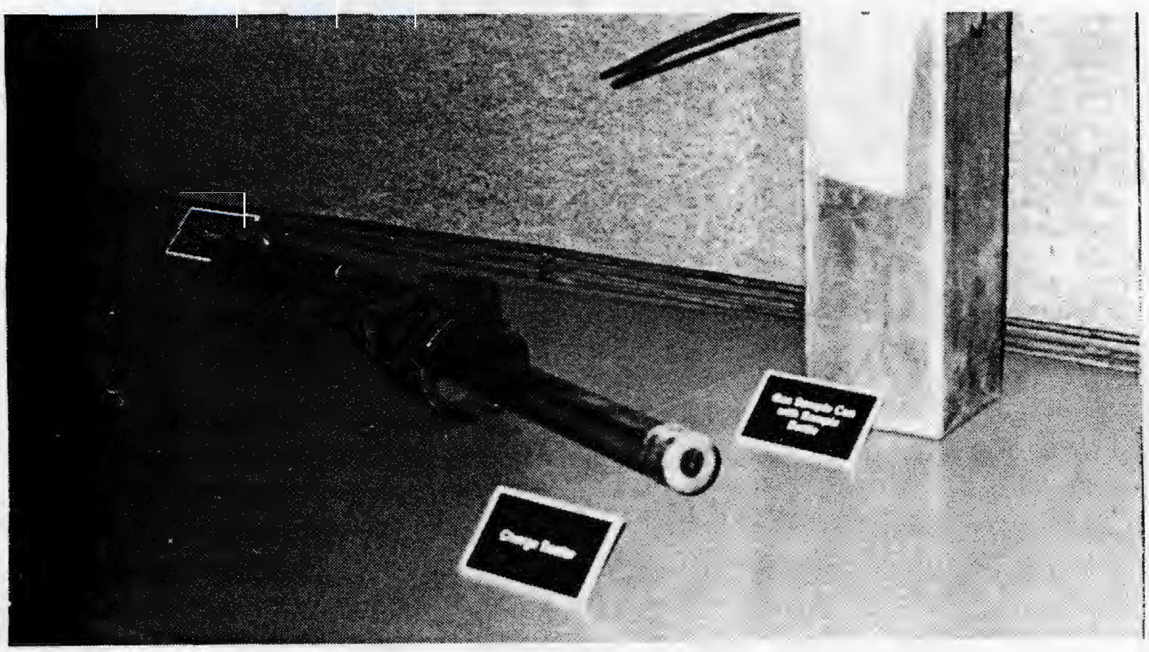
SPACER OR DUMMY

A spacer was an aluminum tube with an outside diameter of 1.4 in. and a .25 in. wall thickness. It was used to fill the length of the process tube, front and rear, that was within the biological shield of the core. The major contaminant was ^{60}Co.



PERF RETRIEVER

A perf retriever was used to remove perforated spacers from the process tubes. They could reach approximately 4 ft inside the process tube.



CHARGE SEATER

The charge seater was used to push the spacers and charges together in the process tubes. This was to eliminate void spaces between fuel charges and spaces and to decrease the chance of them fretting as the water was sent through.

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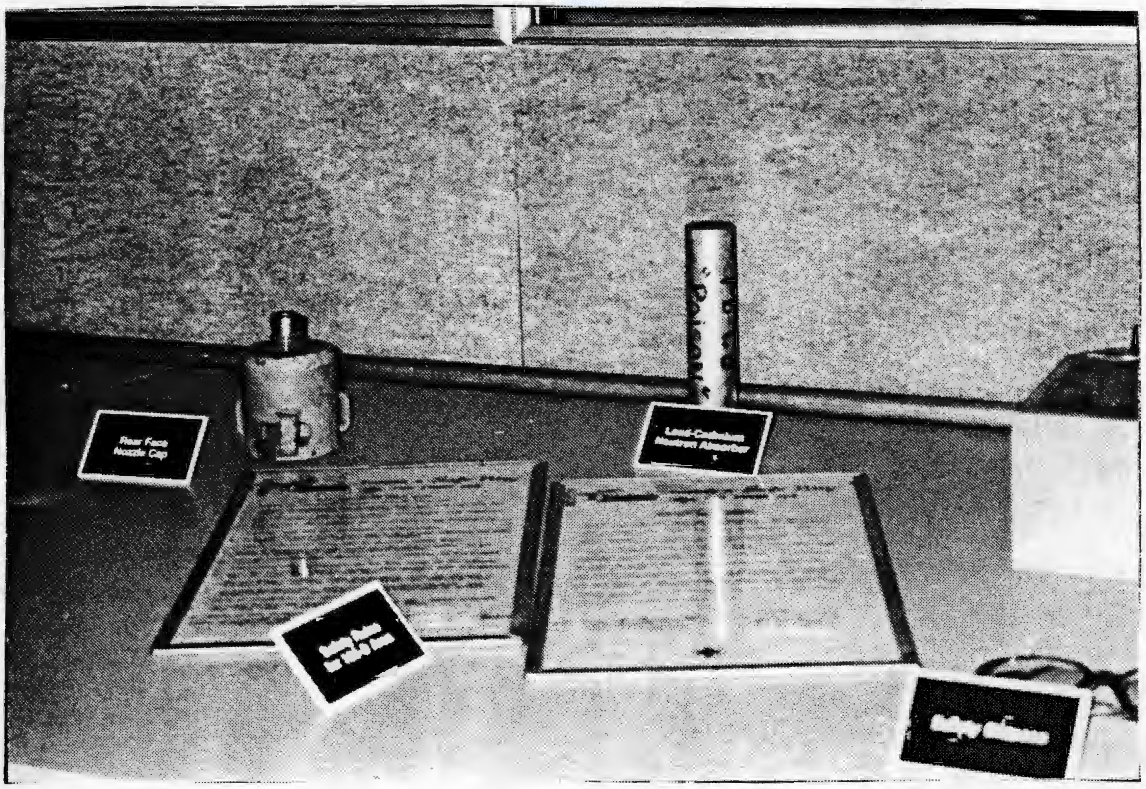
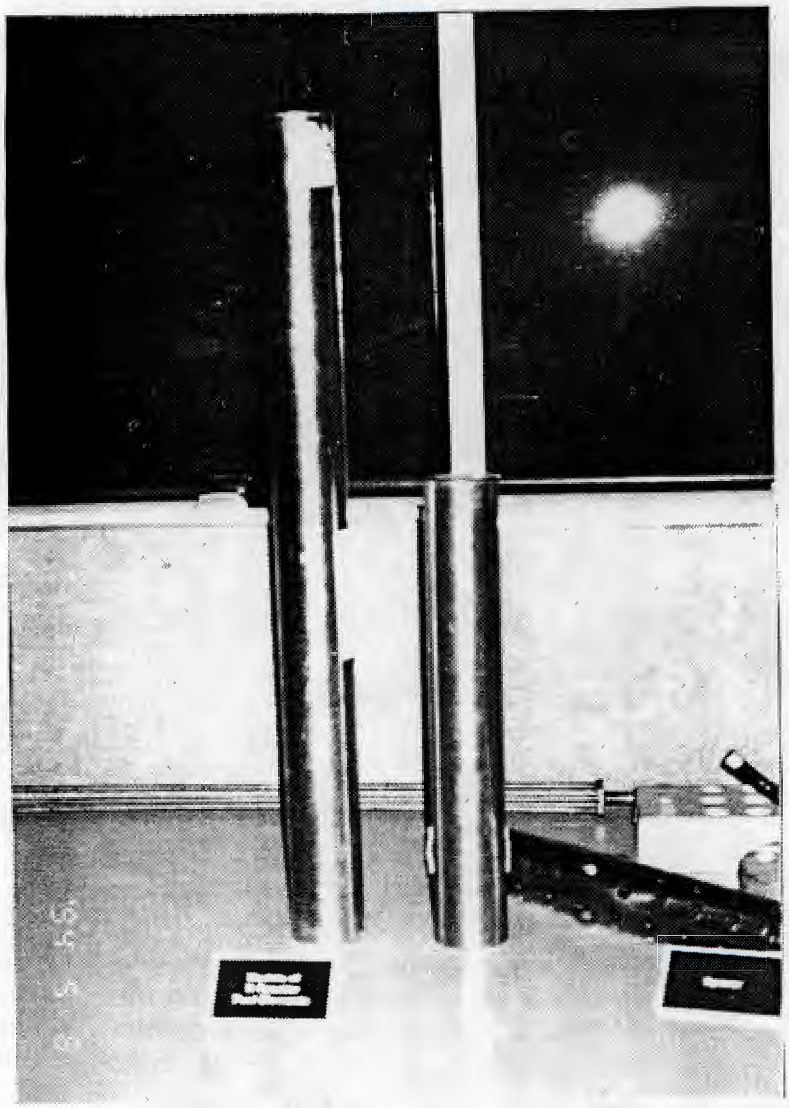


LEAD-CADMIUM NEUTRON ABSORBER

A lead-cadmium neutron absorber was a solid, 6-in. lead-cadmium rod that was 1.4 in. in diameter. It was encased in an aluminum jacket and placed in the ends of a process tube. There, it was used to absorb enough neutrons to protect the reactor's biological shield, but not enough to poison the reaction. The contamination came from ^{60}Co, ^{133}Ba, and ^{108m}Ag.



FUEL ELEMENTS

Fuel elements were uranium encased in sealed aluminum cans or jackets. They were used to incorporate nuclear material into the reactor.

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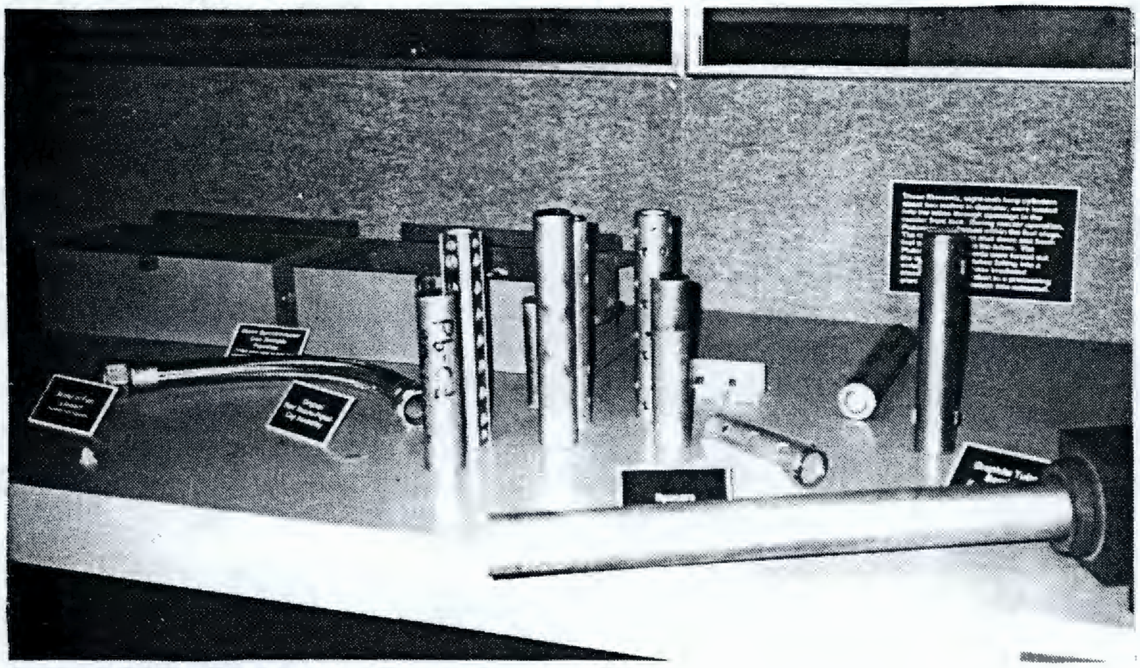
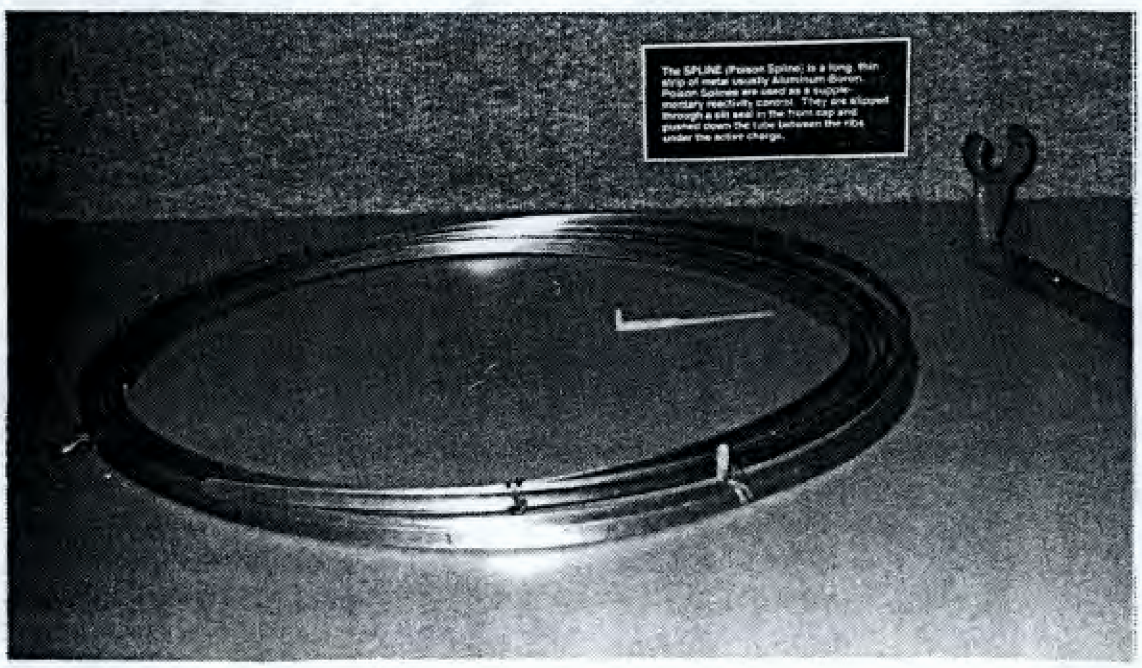


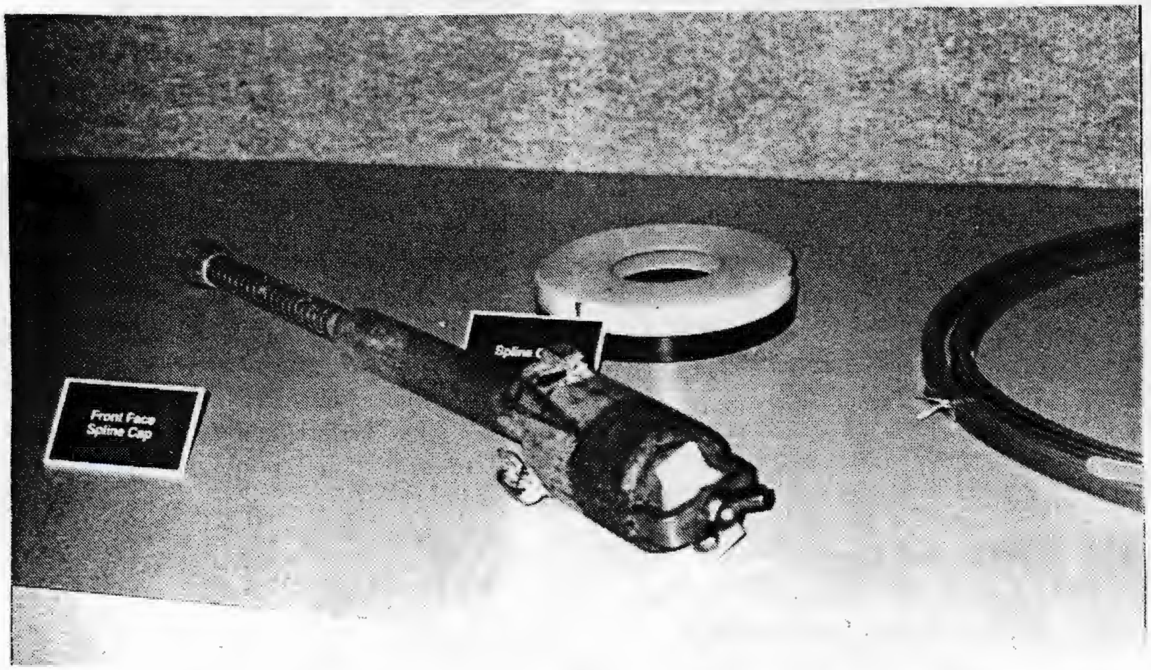
REAR NOZZLE-PIGTAIL CAP ASSEMBLY

The rear nozzle-pigtail cap assembly was made of aluminum. It allowed coolant water to flow from the process tube to the crossheader on the rear face of the reactor. The contaminants were ^{60}Co, ^{63}Ni, and ^{59}Ni.



POISON SPLINES

A poison spline was a 30-ft-long strip of metal, usually aluminum/boron, that was 0.5 in. wide and 1/16 in. thick. It was used for reactivity control that improved reactor efficiency. The major contaminant was ^{60}Co.

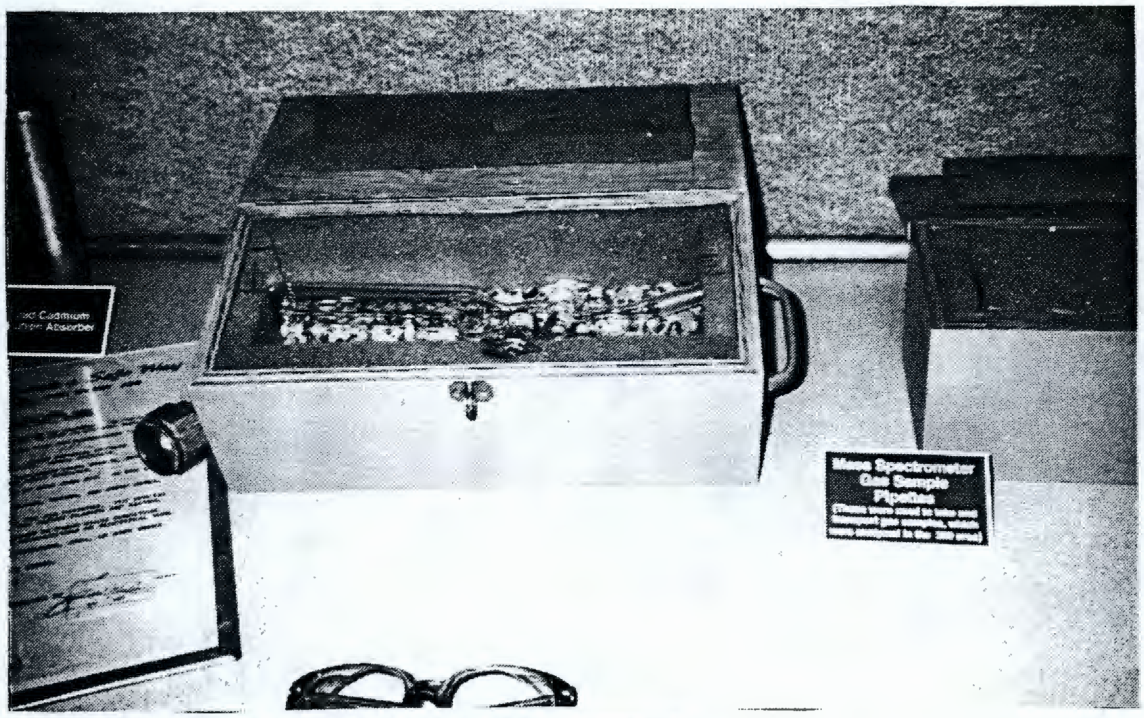


SPLINE CAPS

A spline cap was a nozzle cap with a slit 0.45 in. wide and 0.75 in. high, cut to allow the poison spline to be taken in and out during reactor operation. A plasticized vinyl seal and an aluminum backing were placed onto the back of the cap to provide a watertight seal.

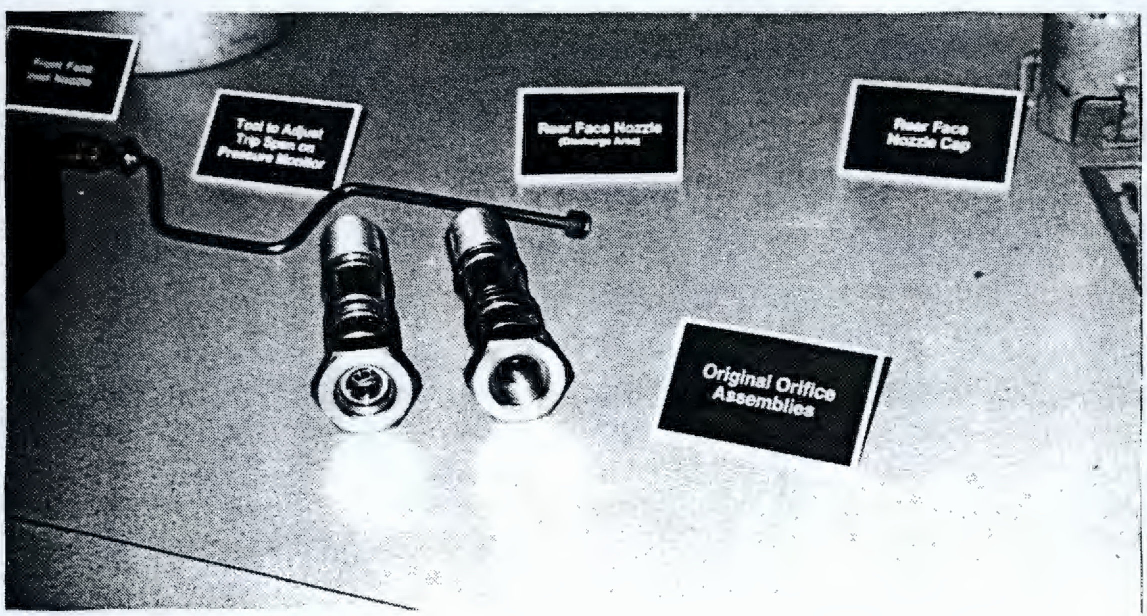
SPLINE CANS

The poison splines were kept coiled, in flat plastic cans, until needed for use. The splines were recoiled into the cans after use and buried.



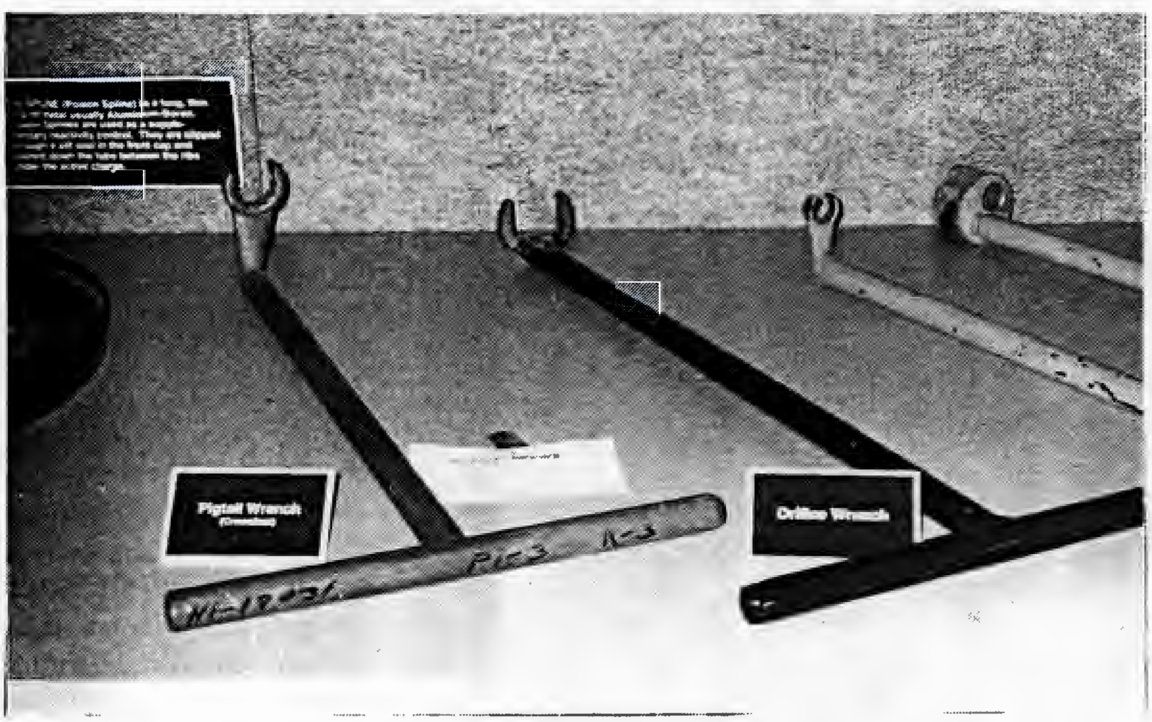
MASS SPECTROMETER GAS SAMPLE PIPETTES

The pipettes were used to take samples of the gases. They were then placed in the spectrometer to make sure the mixture of helium and carbon dioxide was correct.



ORIFICE ASSEMBLIES

The orifice assemblies were used with pigtails in the cooling water process. They controlled the flow rate into individual process tubes for thermal control.



WRENCHES

The nozzle, pigtail, and orifice wrenches were used to remove and replace damaged nozzles, pigtails, and orifices, respectively.

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BYPASS TYPICAL SWITCH

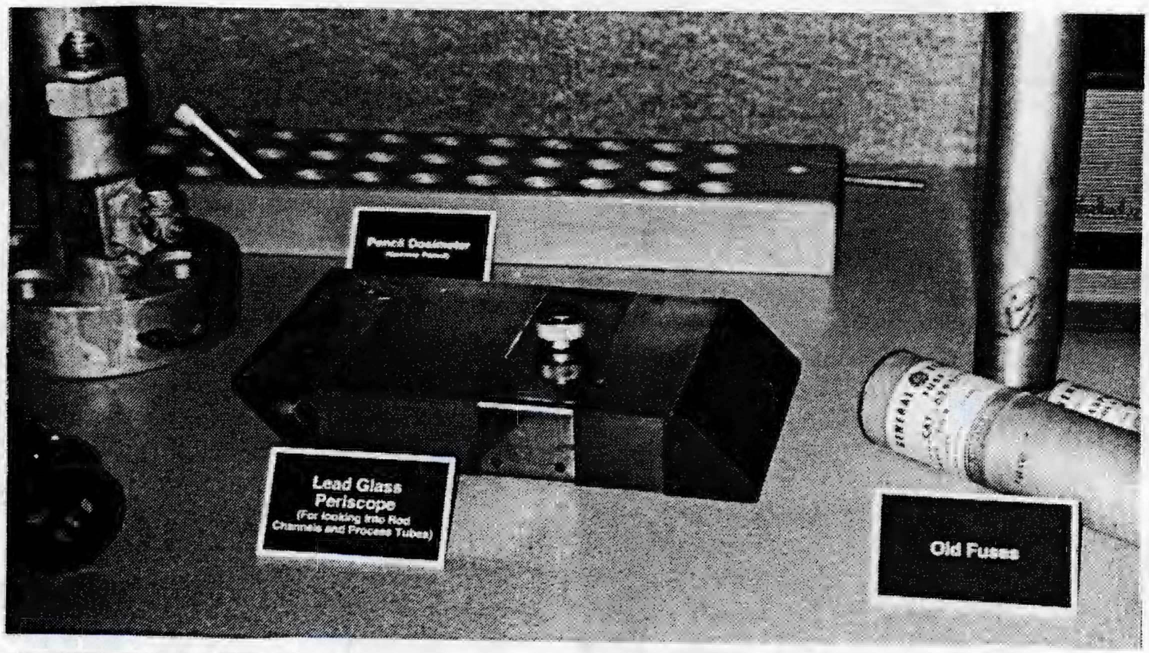
The bypass typical switch was used in the control room. It was a lockable control circuit switch.

CAP WRENCH

The cap wrench was a modified wrench that enabled workers to get into small or hard-to-reach places.

SOFT WASTE

Soft waste consisted of plastic, paper, cardboard boxes, clothing used in radiation zones, and contaminated rags used in cleanup. Soft waste contained small amounts of radionuclides and made up only 5% of the radionuclides buried.



PENCIL DOSIMETER

The pencil dosimeter was used to take gamma radiation measurements.

LEAD GLASS PERISCOPE

The lead glass periscope was used for looking into rod channels and process tubes. The periscope protected the eyes from gamma rays emitting from the opening.

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APPENDIX B

LIST OF EQUIPMENT

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The following list includes equipment to be used during the excavation treatability test. This list has been broken down into four categories, Site Support, Excavation, Field Screening and Sorting. Additional items may be added as the test progresses.

SITE SUPPORT

Office Trailer(s)
Change Trailer(s)
Control Signs
Dust Control Agent for Laydown Areas

EXCAVATION

Trackhoe with 3-yd^3 bucket and thumb attachment
Front-End Loader
Dump Trucks
Personnel protective equipment as specified in the RWP and HWOP
Binoculars
Range Finder
Abney
Leveling Rod
Camera(s)
Video Camera
Construction Fence
Water Truck
Plastic Sheeting
Holding area liners

SCREENING

Eberline RO-7
NOMAD portable spectroscopy system
Germanium detector
Beta Detector
Alpha Monitor
Photo ionization detector
Mercury Monitor

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SORTING

Front-end loader with disc screen attachment
Grizzly with sorting table
Bins for containing sorted material
Rakes and Shovels
Glove bag
Tent

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APPENDIX C

118-B-1 EXCAVATION TREATABILITY TEST QUALITY ASSURANCE PROJECT PLAN

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118-B-1 EXCAVATION TREATABILITY TEST QUALITY ASSURANCE PROJECT PLAN

1.0 INTRODUCTION

The Quality Assurance Project Plan (QAPP) describes the quality assurance (QA) requirements that support the 118-B-1 Excavation Treatability Study characterization activities. This QAPP presents the objectives, organizations, functional activities, procedures, and specific QA and quality control (QC) protocols associated with these activities.

The 118-B-1 Excavation Treatability Test Plan (DOE-RL 1994) references the *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan* (WHC 1990). Due to transition of the environmental restoration contractor, the referenced document is not current; this QAPP fulfills requirements of QAMS-4 (EPA ND).

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

QAPP responsibilities of key personnel are:

- **Field Coordinator**
  Responsible for onsite direction of the sampling team in compliance with the requirements of this QAPP, the sampling plan, and all implementing Environmental Investigations Instructions (EII).

- **Quality Assurance Engineer**
  The QA person is responsible for performing surveillances/assessments to ensure compliance with QMP requirements (BHI 1994a) and this QAPP.

- **Samplers**
  Responsible for collecting samples in accordance with this QAPP, and the Bechtel Hanford, Inc. (BHI) *Environmental Investigations Procedures* (BHI 1994b). Samplers will collect samples at the discretion of the field engineer or field coordinator.

- **Field Engineers**
  Responsible for directing samplers to take samples at specific locations within the excavation area.

- **Other Support Contractors**
  The project manager may assign project responsibilities to other support contractors project responsibilities. Such services shall be in compliance with standard BHI

and/or WHC procurement procedures as discussed in Section 5.0. All work shall comply with BHI approved QA plans and/or procedures.

If samples are taken, the following organizations may become involved:

- **Analytical Services** is responsible for coordinating qualified and approved laboratory support for all project analyses concerns, assisting in sample shipment tracking, resolving chain-of-custody issues, and when requested validating all related data.

- **Qualified Analytical Laboratories.** Soil samples shall be sent to an approved contractor, participant subcontractor, or subcontractor laboratory. They shall be responsible for performing the analyses identified in this plan in compliance with work order, contractual requirements, and approved procedures (see Section 5.0). Each laboratory shall have and comply with a written approved laboratory QA plan. All analytical laboratory work shall be subject to the surveillance controls invoked by QI 7.3, "Source Surveillance and Inspection." This plan shall meet the appropriate requirements of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989). Sample Management shall retain prime responsibility for ensuring acceptability of offsite laboratory activities.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

The QAPP's principal objective is to maintain the quality of field activities, sample handling, laboratory analysis, and to document each processing level.

4.0 SAMPLING PROCEDURES

If samples are taken, sampling activities shall be consistent with the current applicable procedures and the sampling plan. These procedures are identified in the project field sampling plan. They include:

- EII 1.4, "Instruction Change Authorizations"

- EII 1.5, "Field Logbooks"

- EII 1.6, "Record Processing"
- EII 1.7, "Indoctrination, Training, and Qualification"
- EII 3.4, "Field Screening"
- EII 5.1, "Chain of Custody/Sample Analysis Request"
- EII 5.2, "Soil and Sediment Sampling"
- EII 5.5, "Laboratory Cleaning of RCRA/CERCLA Sampling Equipment"
- EII 5.11, "Sample Packaging and Shipping."

As noted in Chapter 3, procured participant contractor and/or subcontractor services shall be subject to the following (WHC 1989):

- QI 4.0, "Procurement Document Control"
- QI 4.1, "Procurement Document Control"
- QI 4.2, "External Services Control"
- QI 7.0, "Control of Purchased Items and Services"
- QI 7.1, "Procurement Planning and Control"
- QI 7.2, "Supplier Evaluation"
- QI 7.3, "Source Surveillance and Inspection"
- QI 17.0, "Quality Assurance Records"
- QI 17.1, "Quality Assurance Records Control"
- EII 1.6, "Record Processing" (BHI 1994b).

The procurement document shall specify that the contractor submit for BHI review and approval prior to use all analytical procedures and its QA/QC program. Participant contractor or subcontractor procedures, plans, and/or manuals shall be retained as project quality records.

5.0 SAMPLE CUSTODY

Project samples shall be controlled per EII 5.1, "Chain of Custody/Sample Analysis Request," from the point of origin to the analytical laboratory. Laboratory chain-of-custody procedures shall be reviewed and approved as required by procurement control procedures as noted in Chapter 4. The contractor shall ensure the maintenance of sample integrity and identification throughout the analytical process. Offsite sample tracking shall be performed by HASM procedure, "Sample Tracking."

Results of analyses shall be traceable to original samples through a unique code or identifier. BHI shall assign the samples Hanford Environmental Information System (HEIS) sample numbers. All results of analyses shall be controlled as permanent project quality records.

6.0 CALIBRATION PROCEDURES

Calibration of critical measuring and test equipment, whether in existing inventory or newly purchased, shall be controlled as required by:

- QR 12.0, "Control of Measuring and Test Equipment"
- QI 12.1, "Acquisition and Calibration of Portable Measuring and Test Equipment"
- QI 12.2, "Measuring and Test Equipment Calibration by User"
- EII 3.1, "User Calibration of Health and Safety M & TE."

Routine field equipment operational checks shall be per applicable EII or procedures. Similar information shall be provided in approved participant contractor or subcontractor procedures.

Participant contractor or subcontractor laboratory analytical equipment calibrations shall be per applicable standard analytical methods. These shall be subject to review and approval.

7.0 ANALYTICAL PROCEDURES

Procedures based on the referenced methods shall be selected or developed, and approved before use in compliance with appropriate procedure and/or procurement control requirements as noted in Chapter 4.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

8.1 DATA REDUCTION AND DATA PACKAGE PREPARATION

All analytical laboratories shall be responsible for preparing a report summarizing the analysis results and a detailed data package. This includes all information necessary to perform data validation to the extent indicated by the minimum requirements of Section 8.2. Data shall be reported on a dry-weight basis. The data summary report format and data package content shall be defined in procurement documentation subject to review and approval as noted in Chapter 4. As a minimum, laboratory data packages shall include the following:

- Sample receipt and tracking documentation, including identification of the organization and individuals performing the analysis, the names and signatures of the responsible analysts, sample holding time requirements, references to applicable

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chain-of-custody procedures, and the dates of sample receipt, extraction, and analysis

- Instrument calibration documentation, including equipment type, model, initial and continuing calibration data, method of detection limits, and calibration procedure used

- Additional QC data, as appropriate for the methods used including matrix spikes, duplicates, recovery percentages, precision data, laboratory blank data, and identification of any nonconformance that may have affected the laboratory's measurement system during the analysis time period

- The analytical results or data deliverables, including reduce data, reduction formulas or algorithms, unique laboratory identifiers, and description of deficiencies

- Other supporting information, such as reconstructed ion chromatographs, spectrograms, traffic reports, and raw data.

Sample data shall be retained by the analytical laboratory and made available for systems or program audit purposes upon request by BHI; the U.S. Department of Energy, Richland Operations Office; or regulatory agency representatives. Such data shall be retained by the analytical laboratory through the duration of their contractual statement of work, at which point, it shall be turned over to BHI for archiving.

8.2 FINAL REVIEW AND RECORDS MANAGEMENT CONSIDERATIONS

All validation reports and supporting analytical data packages shall be subjected to a final technical review by qualified reviewers at the direction of the BHI project engineer. This will be done before data submittal to regulatory agencies or inclusion in reports or technical memoranda. All validation reports, data packages, and review comments shall be retained as permanent project quality records in compliance with EII 1.6, "Record Processing" (BHI 1994b), and QA 17.0, "Quality Assurance Records" (WHC 1989). The project engineer will have the primary responsibility for dispositioning project related records and data.

9.0 INTERNAL QUALITY CONTROL

Sampling plan activities may be evaluated as part of the project's QC effort. All analytical samples shall be subject to in-process QC measures from the field to the laboratory and during laboratory processing. Laboratory analyses performance audits are implemented through the use of QA/QC samples sent to multiple laboratories. In this situation QC does not imply QC from the BHI QA organization. QC sample results enable the accuracy of the data to be assessed. The data quality generated in this project will be operationally defined by the following internal QC sampling.

- Split samples shall be collected and submitted to separate laboratories for a measurement precision assessment. One split sample will be taken for every 20 samples. If fewer than 20 samples are collected during the treatability test, at least one split sample will be taken. Odd sampling matrices such as waste or spilled liquids may not provide enough sample to split or duplicate the samples.

- Duplicate samples shall be collected and submitted to measure intralaboratory precision. One duplicate sample will be taken for every 20 samples. If fewer than 20 samples are taken during the treatability test, at least one duplicate sample will be collected. Odd sampling matrices such as waste or spilled liquids may not provide enough sample to split or duplicate the samples.

- Equipment blanks (matrix-silica sand) shall be prepared and submitted to assess sampling equipment cleanliness. Equipment blanks will be performed for one out of 20 sampling events. If fewer than 20 samples are collected during the treatability test, at least one equipment blank will be taken.

- Laboratory internal QC checks performed per applicable protocol for the analysis. For chemical analysis, this must include data demonstrating achieved accuracy, precision, system calibration, and performance. Reportables will include:

  - Preparation and calibration blanks
  - Calibration verification standards
  - Matrix spikes
  - Duplicates
  - Control samples
  - Other supporting documentation.

The minimum requirements of this section shall be invoked in procurement documents or work orders, compliant with standard procedures as noted in Chapter 4.

10.0 PERFORMANCE AND SYSTEMS AUDITS

Program activities are subject to oversight by QA personnel. Audits may address quality-affecting activities that include, but are not limited to, measurement system accuracy, intramural and extramural analytical laboratory services, field activities, and data collection, processing, validation, reporting, and management. QA audits shall be performed under the standard operating procedure requirements of BHI and/or WHC.

System audit requirements are implemented in accordance with QI 10.4, "Surveillance." All quality-affecting activities are subject to surveillance. The project engineer shall interface with both the Environmental Field Services quality coordinator and the QA officer. The QA officer is responsible for providing surveillances/assessments to ensure compliance with planned activities, and identify conditions adverse to or enhancing overall performance quality.

11.0 PREVENTIVE MAINTENANCE

All measurement and testing equipment used in the field and laboratory that directly affect analytical data quality shall be subject to preventive maintenance measures that ensure minimization of measurement system downtime. Field equipment maintenance instructions shall be as defined by the approved procedures governing their use. Laboratories shall be responsible for performing or managing the maintenance of their analytical equipment; maintenance requirements, spare parts lists, and instructions shall be included in individual methods or in laboratory QA plans, subject to review and approval. When samples are analyzed using EPA reference methods, the preventive maintenance requirements for laboratory analytical equipment are as defined in the procured laboratory's QA plan(s).

12.0 DATA QUALITY INDICATORS

12.1 DATA ASSESSMENTS BY ANALYTICAL FACILITY

Adherence to approved procedures will be sufficient for the majority of data reports. To the extent possible, performance-based standards will be the preferred method of assessment for precision and accuracy measurements. A familiar example is the use of control charts. Values exceeding a 3-sigma limit on well-established and appropriate control chart should be flagged when reported. Samples in the analytical batch should be rerun if possible, and those results also reported.

When appropriate performance-based standards are not available and referenced procedures do not specify, the following two rules may be used.

- Precision--The difference between laboratory duplicates will be subject to a control limit of 150% of the requested limit whenever both sample values exceed the estimated method detection limit (MDL). If the estimated MDL exceeds the requested limit, the higher value may be used to calculate the control limit. When either or both duplicates are below the estimated method detection limit, laboratory precision may be assessed by comparing identically spiked samples. Samples exceeding five times the control limit can be subject to a 20% relative percent difference limit, where:

$$\text{Relative Percent Difference} = \frac{(S - D) \times 100}{((S + D)/2)}$$

S = Sample concentration
D = Duplicate sample concentration.

Failure to meet a precision limit will require evaluation and corrective action as appropriate.

- Accuracy will be defined by percent recovery data where

$$\% \text{ Recovery} = \frac{\text{(Spiked Sample Result - Sample Result)}}{\text{Spike Added}} \times 100$$

When the sample result (SR) is less than the MDL, use SR=0 for the purpose of calculating the percent recovery. Spiked samples having concentrations two to five times greater of the requested detection limit or MDL will have recovery control limits of 50% to 150%. Spiked samples exceeding five times the estimated MDL will have recovery control limits of 75% to 125%. Failure to meet the control limit will require evaluation and corrective action as appropriate. Applicable samples not meeting the limit should be rerun using a postdigestion spike if possible. Postdigestion spikes should be made at two times the indigenous level or lower reporting limit, whichever is greater.

12.2 PROJECT LEVEL ASSESSMENTS

Summary statistics for measurement precision and accuracy shall be prepared in conjunction with the data analysis.

Precision evaluation at the project level will address interlaboratory precision. Precision of environmental measurement systems is often a function of concentration. This relationship should be considered before selecting the most appropriate form of summary statistic. Simplistically, this relationship can usually be classified as falling into one of the following three categories.

- Standard deviation (or range) is constant.
- Coefficient of variation (or relative range) is constant.
- Standard deviation (or range) and coefficient of variation (or relative range) vary with concentration.

The pooled standard deviation or pooled coefficient of variation can be used to summarize data in bullets 1 and 2, respectively. Bullet 3 will require either graphical summary of the data or specialized regression techniques.

Data quality assessments are generally made at concentrations typical of the observed range in routine analyses. In some situations, the typical value measurement will be below an estimated practical method, or instrument detection limit (i.e., an engineering zero). If a standard exists (or is to be set) at some positive finite value, quality assessment summaries may be desired at that level rather than the most representative concentration.

13.0 CORRECTIVE ACTIONS

Corrective action requests required as a result of surveillance reports, nonconformance reports, or audit activity shall be documented. Primary responsibilities for corrective action resolution are assigned to the project engineer and the QA officer. Other measurement systems, procedures, or plan corrections that may be required as a result of routine review processes shall be resolved as required by governing procedures or shall be referred to the project engineer for resolution. Copies of all surveillance, nonconformance, audit, and corrective action documentation shall be routed to the project QA records upon completion or closure.

14.0 QUALITY ASSURANCE PROJECT REPORTS

Special QA reports are not planned for this project. Project records will be maintained in conformance with standard operating procedure requirements of BHI (1994b). Project records will be maintained according to EII 1.6, "Record Processing," and technical data will be dispositioned according to EII 1.11, "Technical Data Management." Surveillance, nonconformance, audit, and corrective action documentation shall be routed to the project QA on completion or closure of the activity. The final project report prepared by the cognizant engineer or designee shall include an assessment of the overall adequacy of the total measurement system with regard to the data quality objectives of the investigation.

15.0 REFERENCES

BHI, 1994a, *Quality Management Plan for Environmental Restoration of the Hanford Site,* Bechtel Hanford Inc., Richland Washington.

BHI, 1994b, *Environmental Investigations Procedures*, BHI-EE-01, Bechtel Hanford Inc., Richland, Washington.

DOE-RL, 1994, *118-B-1 Excavation Treatability Test Plan*, DOE/RL-94-43, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, et seq., Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

EPA, ND, *Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objectives Process*, QAMS-4, Quality Assurance Management Staff, U.S. Environmental Protection Agency, Washington, D.C.

WHC, 1989, *Westinghouse Hanford Company Quality Assurance Manual*, WHC-CM-4-2, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990, *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan,* WHC-EP-0383, Westinghouse Hanford Company, Richland, Washington.

APPENDIX D

WASTE CONTROL PLAN

1.0 INTRODUCTION

This plan presents the methods to be followed in controlling wastes generated during field activities associated with the 118-B-1 Excavation Treatability Test. Field investigation activities are described in *118-B-1 Excavation Treatability Test Plan* (DOE-RL 1994). The activities at 118-B-1 include the following:

- Excavation of solid waste to test retrieval of radioactive waste for future remedial efforts
- Test sorting of solid waste on 1% to 10% of material retrieved from the excavated areas
- Test feasibility of field screening waste to disposal facility waste acceptance criteria.

All material from test pits will be returned to the pit from which it was retrieved following completion of pit excavation. Any liquids removed from the trench, and any visible hazardous waste which is removed from the excavation for sorting will be the exception. These items will be packaged and handled as investigation-derived waste. If quantities of solid hazardous waste exceed an amount capable of being handled in the field, this material will be returned to the excavation in a central area. This area will be marked for ease of future retrieval.

2.0 SCOPE

This treatability test does not involve treatment of contaminated material; therefore, the only residual products from the test are potentially contaminated equipment, recovered liquid, sorted hazardous waste, soil samples from the excavation (if any are taken), and protective clothing and other materials contaminated by the solid waste.

This waste control plan applies to all wastes generated during test activities. Paper, gloves, and related waste, as well as tape, plastic, and disposable personal protective equipment, is expected to make up the majority of the waste. The other potential waste materials are recovered liquids and hazardous materials, such as lead cadmium and mercury, that are removed from the excavation and sorted.

All waste derived from test activities will be subject to handling in compliance with procedures in the *Environmental Investigations Procedures*, BHI-EE-01 (BHI-1994), and *Solid Waste Management*, WHC-CM-5-16 (WHC 1991).

3.0 FIELD DESIGNATION/HANDLING OF WASTES

The area located north of the sorting area is the designated Investigation-Derived Waste Storage Area for the 118-B-1 Excavation Treatability Test. Exclusion zone barricades and proper postings will be sufficient to isolate the storage area from other personnel on the Hanford Site.

3.2 TEMPORARY STORAGE OF RADIOLOGICALLY CONTAMINATED SOIL

Soil recovered during the excavation that has been identified by field screening and other field instrumentation as contaminated (regulated) will be segregated from noncontaminated soil. Contaminated soil will be stockpiled in a lined holding area located within the exclusion zone, in the vicinity of the excavation. During periods of activity, efforts will be taken to ensure the entrainment of contaminated soil in the wind does **not** occur. Once the excavation is complete, the contaminated soil will be replaced within the test pit.

The holding areas will consist of an excavated depressions over the burial ground, lined with 20-mil PVC. Seams within the PVC will be welded together at the factory, prior to use. This will form an impermeable barrier under the soil, over the entire area occupied by the soil storage unit.

At the end of each working day, crusting agents will be applied to the soil and the holding area will be covered. The cover will be of sufficient size to enable the entire storage unit to be covered. Anchors will be piled on the plastic sheeting to form a continuous anchor around the cover.

3.3 NONCONTAMINATED SOIL

Soil recovered during the excavation that has been identified by field screening and other field instrumentation as noncontaminated (nonregulated) will be segregated from contaminated soil. Noncontaminated soil will be staged near the excavation. Upon completion of the treatability test, the soil that is identified as noncontaminated will be returned to the excavation as backfill.

3.4 MISCELLANEOUS WASTE

Miscellaneous waste will be generated during soil sampling activities within the excavation. Miscellaneous waste will include such items as aluminum foil, rubber gloves, and masking tape. This waste will be considered suspect low-level waste due to the possibility of becoming contaminated during sampling activities. Upon exiting the exclusion area, the sample technician and health physics technician will work together to segregate wastes in a plastic bag at the inner edge (outer edge of exclusion zone) of the contamination reduction zone. If practical, the bagged waste will be contained within a 55-gal drum. At the end of each working day, the drum will be secured. The appropriate drum label will be visible on the exterior of the drum. The drum will be stored at the

Investigation-Derived Waste Storage Area. Solid Waste Acceptance Services will assign a hazard identification to the contaminated soil/waste. Final disposition of the waste will be determined by the U.S. Department of Energy, Richland Operations Office, and the lead regulatory agency. Applicable procedures include EII 4.3 (BHI 1994).

3.5 RECOVERED LIQUID/SORTED HAZARDOUS WASTE

Sorting of the solid waste will occur on 1-10% of material retrieved from the excavated areas. Sorting will take place directly adjacent to the excavation. Hazardous waste (i.e. lead, cadmium, and mercury) may be encountered during sorting. These wastes will be packaged appropriately and handled as investigation-derived waste. Lead, cadmium, and mercury will be known by form and will not require sampling in addition to the radionuclides screening. If the quantity of hazardous material found during sorting exceeds a volume capable of being handled within the time and budget constraints of the test, the excess waste will be returned to the excavation into a central area that will be marked. All other sorted material will be returned to the excavation. The 1994 amendments to the Tri-Party Agreement provide that the "waste generated from the test pits will be managed as 'investigation-derived waste' or returned to the trench in a manner that will facilitate final remediation.

All recovered liquid will be handled with extreme caution. When liquids are discovered, the field coordinator, site safety officer, and lead health physics technician will determine an appropriate recovery method for the liquid. Following recovery, the liquids will be overpacked or pumped into a compatible storage container. The liquid will be sampled to determine appropriate waste disposal method.

At the end of each working day, all drums will be secured. The appropriate drum label will be visible on the exterior of the drum. The drum will be stored at the Investigation-Derived Waste Storage Area. Solid Waste Acceptance Services will assign a hazard identification to the contaminated soil/waste. Final disposition of the waste will be determined by the U.S. Department of Energy, Richland Operations Office, and the lead regulatory agency. Applicable procedures include EII 4.3 (BHI 1994).

4.0 REFERENCES

DOE-RL, 1994, *118-B-1 Excavation Treatability Test Plan*, DOE/RL-94-43, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

BHI, 1994, *Environmental Investigations Procedures*, BHI-EE-01, Bechtel Hanford Inc., Richland, Washington.

WHC, 1991, *Solid Waste Management*, WHC-CM-5-16, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993, *Operating Environmental Monitoring*, WHC-CM-7-4, Westinghouse Hanford Company, Richland, Washington.

WASTE CONTROL PLAN

Work Scope Description 118-B-1 Excavation Treatability Test

List Constitutents of Concern Lead, Cadmium, free liquids, Mercury, mixed fission products

Site Description 118-B-1 Burial Ground. West of C-Reactor Building.
See attached map.

Reference DOE/RL-94-43, Rev. 0/WHC-SD-EN-TP-049 **Rev** 0 **Date Approved** August, 1994

Preparer/ Project/RI Coordinator ______ Print/Sign Name **Date** ______

Safety Class 4 **Impact Level** 4

Field Team Leader/ Cognizant Engineer J.M. Frain **IDW Coordinator** G.G. Hopkins

Planned ~~Drilling~~ Excavation Start and Finish Dates: From 8/31/94 **To:** 2/15/95

Waste Storage Facility ID Number(s) N/A

Field Screening Methods

Method	Frequency	Reference	Detection Range	Analyst
PM	per RWP			HPT
GM	per RWP			HPT

Additional field screening will be conducted on waste material to determine waste type and additional characterization needs.

Laboratory Methods (constituents of concern)

Method	Frequency	Reference	Detection Limits	Contract Lab
		WHC-SD-EN-TP-049		

APPROVALS (Print/Sign Name and Date)

G.G. Hopkins [signature] 8/17/94
IDW Coordinator

J.G. Woolard [signature] 8/22/94
Project/RI Coordinator

N/A
Safety Function (if required)

G.B. Gould [signature] J.M. Frain [signature] 8/17/94
Field Team Leader/Cognizant Engineer

N/A
Quality Assurance (if required)

WASTE CONTROL PLAN

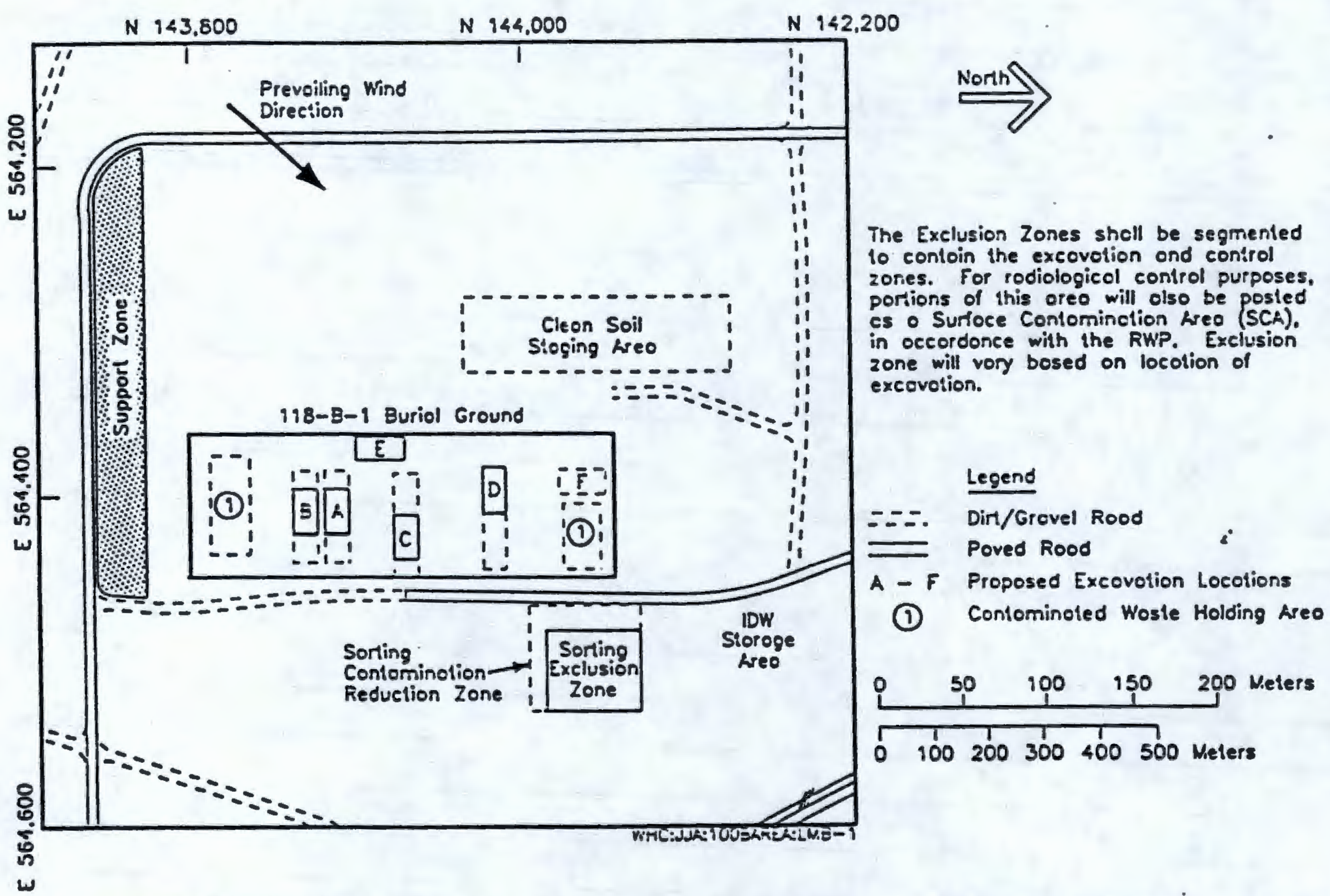
Drill Site Coordinate Location: N/A

Waste Container Storage Area(s) Coordinate Location(s): See Map below.

Requirements for Soil Pile Sampling (if any): Discussed in attached text.

Nonregulated Material Disposal Location(s): Paper, plastic, etc., will be disposed of at the Central Landfill. All soil will be returned to excavation.

SKETCH OF WORK SITE



APPROVALS (Print/Sign Name and Date)

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Lead Regulatory Agency Representative

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J.G. Woolard
Project/RI Coordinator

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