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**Detailed Plan
for the Decontamination
and Restoration
of the 231-Z Facility**

March 1976

MASTER

**Prepared for the U.S. Energy
Research and Development Administration
under Contract E(45-1):1830**

Battelle
Pacific Northwest Laboratories

BNWL-B-479

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DETAILED PLAN
FOR THE DECONTAMINATION AND RESTORATION
OF THE 231-Z FACILITY

by
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March 1976

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DETAILED PLAN FOR THE DECONTAMINATION AND RESTORATION OF THE 231-Z FACILITY

1.0 INTRODUCTION

In January 1975, Battelle, Pacific Northwest Laboratory (PNL) was advised by the Division of Military Application (DMA) of their intention to phase out the General Weapons Development Program. The program has been conducted by PNL Materials Department in the 231-Z Building, 200-W Area of the Hanford Reservation. In addition to the phaseout of the research program, a commitment was made to decontaminate and restore the 231-Z facility for use as a nonplutonium ERDA laboratory.

2.0 OBJECTIVES AND SCOPE OF ACTIVITIES

The objectives of the decontamination and restoration project are:

- Complete removal of all glove boxes and related plutonium processing equipment including ventilation systems, drainage systems, and other obsolete service systems.
- Decontamination of the facility to the extent that future laboratory operations may be conducted without Radiation or Controlled-Zone restrictions.
- Restoration of the facility to such condition as renders it fit for use as a laboratory.
- Program phaseout and decontamination and restoration activities planned to reasonably assure uninterrupted operation of other ongoing research and development programs.

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3.0 RESPONSIBILITIES

Battelle-Northwest shall have responsibility for:

- The management of the total project.
- The preparation of a sufficiently detailed plan to meet project objectives.
- Radiation protection activities.
- Deactivation of glove boxes and related equipment including draining and disposal of contaminated hydraulic and vacuum pump oil.
- Criticality safety evaluations.
- Burial vault procurement.
- Providing design criteria as needed by other contractors.
- Property accounting records.
- Physical security and safeguards.
- Final review and updating of facility drawings.
- Nuclear materials management and accountability.
- Providing guidance to assure safety of operations.
- Historical records and documentation.
- Reports.

The J.A. Jones Construction Company (JAJ) shall:

- Safely remove deactivated and obsolete equipment from the laboratory.
- Package removed equipment in the burial vaults.
- Transport the filled and sealed burial vaults to the burial sites.
- Perform cleanup and restoration activities.

The Atlantic Richfield Hanford Company (ARHCO) shall bury solid wastes.

NOTE: PNL shall prepare the necessary burial records and shall be responsible for scheduling and coordinating the transfer of filled burial vaults to the burial sites.

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4.0 GENERAL CRITERIA

All activities associated with the decontamination and restoration of the 231-Z facilities shall meet the following criteria:

1. The disposal of contaminated materials and equipment shall be in accordance with ERDA Manual Chapter 0511 "Radioactive Waste Management"; ARHCO Document ARH-3032, Specifications and Standards for the Packaging, Storage, and Disposal of Richland Operations Solid Wastes; and standard property disposal procedures.

2. Flammable solvents and loose combustibles shall be removed from glove boxes and prepared for disposal or recovery using standard facility procedures.

3. Hydraulic or vacuum oil in equipment to be buried shall be drained, immobilized, and packaged for burial as solid waste in accordance with current facility procedures.

4. Burial boxes shall be Fiberglass Reinforced Polyester (FRP) covered plywood in accordance with the following Automation Industries, Inc., Vitro Engineering (AII-V) drawings and AII-V procurement specification CE-0948-PI.

H-2-27440, Sheets 1-4

H-2-27441, Sheets 1-3

H-2-27442, Sheets 1-4

H-2-27445, Sheets 1-3

Approved steel or reinforced concrete burial boxes may be used where weight or other unique conditions warrant the use of the more expensive container.

5. Containers used in the transportation of radioactive materials shall be approved in accordance with ERDA Manual Chapter 0529, "Safety Standards for Packaging of Fissile and Other Radioactive Materials."

6. The fissile material content of glove boxes and equipment to be buried shall be at the lowest practical level. Disposal approval shall be requested for every glove box and the request shall specify glove box holdup value and method of measurement.

7. Every glove port and bag port on the glove box shall be covered with a suitable cover taped in place. Glove boxes are expected to be free of external smearable contamination.

8. The 200-Area Fire Department shall be notified prior to deactivation of every glove box fire detector.

9. Lead glass or other exterior glove box attachments may be removed and salvaged provided the criteria of Procedure 6, BNWL-MA-6 are met.

10. The packaging of glove boxes and equipment in burial boxes shall be planned to minimize the void volume in each burial box and to minimize the total volume of transuranic waste buried. Glove boxes shall be sectioned, if necessary, to meet this criterion. Sectioned glove boxes shall be blanked with metal plates.

11. The packaging of glove boxes and equipment into the burial boxes shall be performed outside the building and only during satisfactory weather conditions. Project management shall judge whether wind and/or rain conditions would create a safety hazard.

12. Unprotected glove boxes shall not be stored outside the building.

13. Interior walls that are permanently removed may be released by Radiation Monitoring and transported to the Central Landfill Facility for disposal provided the requirements of Procedure 6, BNWL-MA-6 are met.

14. Painted service lines or ductwork free of external contamination but that cannot be unconditionally released by Radiation Monitoring shall be transported to the Industrial Waste Trench for burial.

15. Equipment or material unconditionally released by Radiation Monitoring may be excessed through standard PNL property disposal procedures.

16. Laboratory rooms shall be decontaminated to levels established by PNL's Occupational and Environmental Safety Department. The following decontamination standards shall apply:

• Maximum smearable	Zero
• Maximum fixed (unpainted)	0.1 $\mu\text{Ci}/100 \text{ cm}^2$ (220 d/m)
• Maximum fixed (under paint)	10 $\mu\text{Ci}/100 \text{ cm}^2$ (22,000 d/m)

Decontamination shall not arbitrarily stop when these levels are attained. The lowest practical level of contamination shall be sought. Contaminated areas shall be thoroughly documented for easy identification by future building occupants.

17. The physical security of the building shall be maintained at all times. Equipment exit routes that require door or wall removal shall be either positively sealed during nonworking hours or monitored under full-time security guard surveillance.

18. The Facility Manager shall approve all cutting and welding operations.

19. The laboratory fire protection system (detectors and sprinklers) shall remain in service or a fire watch shall be established.

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5.0 PLAN

5.1 FACILITY DESCRIPTION

The 231-Z Building is located within the "Z" Exclusion Area inside the Hanford 200-West Area. The Exclusion Area is fenced and access to the area is controlled. Continuous accountability of personnel within the "Z" Exclusion Area is maintained by plant security forces.

The two-story 231-Z Building consists of reinforced concrete and concrete block construction. The building is designed to withstand 100-mile per hour wind loads, and earthquake shocks of intensity VII on the modified Mercalli Scale of 1931. The first floor is used for the research work and is shown on Attachment 1. The second floor, one large open bay with floor area of approximately 23,500 square feet, is used for piping, ventilation and support services for the first floor. The building has a total floor area of 51,000 square feet with 21,700 square feet of process area. In addition to the main laboratory structure there is a 3,000-square foot office extension of concrete block construction. The office building is attached to the laboratory structure and isolated by air locks.

The 231-Z Building is utilized for metallurgical research on plutonium and its alloys and for fabrication development work on plutonium components. Large quantities of plutonium are routinely handled and stored in connection with the research program.

5.2 EXIT ROUTES - DESCRIPTION AND PREPARATION

Eleven exit routes, shown in Attachments 2 and 3, will be used. These exit routes provide for the most efficient removal of facility equipment and for the least disruption to ongoing programs.

Route 1 proceeds north between column lines B and C and exits the building through security door 6. The walls and ceiling of Room 7A will be permanently removed. The door between corridor "A" and Room 7A must be modified and included in security alarm circuit 5.

Route 2 is required to accommodate the larger glove box sections from Rooms 1, 2, and 4. Route 2 proceeds north in corridor "A", enters Room 7 by removing wall panels located between column lines 8 and 10, and exits the building through security door 6. Either the opening between corridor "A" and Room 7 must be sealed offshift or fulltime security guard surveillance provided.

Route 3 permits removal of the smaller items from the vaults and from Rooms 1, 2, 3, and 4. Route 3 proceeds north in corridor "A" and exits the building through security door 7.

Route 4 provides for the removal of glove boxes and equipment from Rooms 6A and 6B. A framed block section must be removed from the north wall of Room 6B adjacent to column line E. The wall between Rooms 6A and 6B will be permanently removed. The equipment removal will proceed through the panel opening into Room 51, through Room 51 double doors into corridor "B" and will exit the building north through corridor "B". Either the opening between Rooms 6B and 51 must be sealed offshift or fulltime security guard surveillance provided.

Route 5 proceeds north in corridor "B" and exits the laboratory through security door 8. Glove boxes and equipment from Rooms 5, 15, 16, 28, and 31 will be removed by this route.

Route 6 provides for the removal of equipment from Rooms 48 and 50 through security door 9 located in Room 50 adjacent to column line M. The door must be removed and the opening enlarged in order to remove glove box 50-4. Either the opening must be sealed offshift or full-time security surveillance provided. When the equipment removal is completed the outside door will not be replaced. The wall opening will be permanently sealed. The walls between Rooms 48 and 50 will be permanently removed.

Route 7 is the major equipment removal path of the project. Glove boxes and equipment from Rooms 46, 47A, 47B, 47C, 18, 19, 33, 34, 36, and 37 will be removed by this route. The route proceeds east in corridor "D"

and exits the building through security door 11. Security door 11 is presently a single door. Prior to removing equipment via Route 7 the opening must be enlarged and the door replaced with double doors and a removable overhead panel. The internal walls separating Rooms 46, 47A, 47B, 47C, and Room 49 will all be permanently removed. The door and adjacent metal panel between Room 49 and corridor "D" will be removed and replaced with double doors. The walls forming Room 19 and Room 25 will be permanently removed, as will the wall separating Rooms 34 and 36. The door and adjacent panel between Room 37 and corridor "D" must also be removed and replaced with double doors. None of the walls to be removed are load-bearing walls.

Route 8 provides for removal of equipment from Rooms 41 and 45 and for removal of glove box 39-1. The framed block panel on the east wall of Room 45 must be temporarily removed and the walls between Rooms 41, 45, and Room 39 will be permanently removed. Either the opening in the east wall of Room 45 must be sealed offshift or fulltime security guard surveillance provided.

Note: Equipment removal via Route 8 is planned approximately one year prior to that described for Route 9. It will be necessary to partition Room 39 to isolate both radioactive materials and classified materials from restoration work proceeding in the north section of Room 39.

Route 9 will be used to remove the last active glove boxes and equipment from the first floor laboratory area. The removal route will be through an opening provided in the east wall of Room 39 by removing the wall above security door 13. At this stage of the project, the nuclear material inventory will have been disposed and all work on classified programs terminated. Off-shift control of the wall opening will then conform to specified security requirements at the time.

Route 10, illustrated in Attachment 3, provides for the removal of all equipment, ductwork and obsolete service lines from the duct level except

the contaminated gas recirculating system located above Room 1. The exit route proceeds east through the service doors located between column lines 3 and 5.

Route 11 will be used to remove the contaminated gas recirculating system located above Room 1, since building ventilation ductwork prevents use of Route 10. A section of the block wall in column line 3 between lines D and E must be temporarily removed. The removal route will proceed through the wall opening, then west along column line 2 to the southwest corner service doors and out the doors onto the first floor roof. A crane will be used to lower the system to ground level.

5.3 GLOVE BOX PREPARATION

Glove boxes shall be removed from service and prepared for burial by completing the following tasks, as appropriate:

- Inspect all packages and containers for fissile material.
- Remove all combustibles from the glove box and package in approved 55-gallon drums. Process the drums for burial or recovery using standard facility procedures.

Note: If special packages or containers are required for the plutonium-contaminated waste, new criticality safety limits may be required.

- Rigidly secure equipment and fixtures that may create a safety hazard during movement of the glove box out of the building and during packaging in the burial vault.
- Examine each glove box using the analytical procedures established by ARHCO during removal of the DMA equipment from the 234-5 Building. Do not complete removal of the glove box until disposal of the plutonium holdup value assigned by this technique has been accepted by appropriate PNL authorities and approved by ERDA.

Note: If a plutonium deposit in excess of the former glove box limit is discovered, a special criticality safety procedure may be necessary. Upon discovery of such a plutonium deposit, work shall be halted at that work station until a criticality safety analysis of the situation is made and proper controls established.

- Drain the oil from hydraulic, vacuum, and refrigeration systems. The oil may be uncontaminated or contaminated, or may contain a recoverable quantity of plutonium. Sample as necessary to determine the proper disposal procedure.
- Salvage lead glass and other exterior attachments as appropriate.
- Five glove boxes (1-3, 2-3, 2-4, 46-1 and 46-2) will be divided into two sections, and two glove boxes (47-1 and 3-1) will be divided into three and four sections, respectively. In addition, twenty-three glove boxes will be separated from the conveyor systems in Rooms 19, 22, 25, 34, 36, 37, and 39. Sectioned glove boxes shall be blanked with a metal plate.
- Install metal plates (reference Drawing H-2-25995) in all glove ports.
- Install protective covers on all bag ports.
- Disconnect all service lines except glove box exhaust.
- Decontaminate glove box exterior surfaces as necessary. Fix non-smearable contamination by best method. Flammable solvents are not expected to be used for decontamination; however, should the use of flammable or toxic agents be necessary, the Facility Manager shall contact Industrial Safety for advice and guidance.
- Attach lifting eyes or other hardware to facilitate handling during removal operations.

5.4 GLOVE BOX REMOVAL

There are seventy-nine (79) glove box sections, representing a volume of 12,000 cubic feet, to be removed for burial. These are described in Attachment 4; a detailed sequence of removal activities is shown in

Attachment 5. Legs, other projections, and attachments shall be removed to reduce the void volume and to improve packaging efficiency. Glove boxes will be removed from the facility after disconnecting and blanking the exhaust ductwork. Removal routes are shown on Attachment 2. Glove box removal shall be planned so that disconnecting the exhaust system, removal from the building and placing in the burial vault shall be a continuous operation.

Glove box removal shall not be scheduled, or shall not proceed, when weather conditions (wind, rain, etc.) would affect the safety of operations. The 231-Z Facility Manager will make this determination. If the removal sequence for glove boxes which have been disconnected from the building exhaust system cannot be completed for weather or other reasons, the disconnected glove boxes shall be protected in a manner that assures contamination control.

In the course of removing the glove boxes, portions or all the walls in seven rooms will be permanently removed. The wall structure varies from room to room and includes block, plasterboard, and sheetmetal. It is anticipated that the waste wall materials will be surveyed and released by Radiation Monitoring and transported to the Central Landfill for disposal. Questionable material will be transported to the Industrial Waste Trench.

Contaminated equipment such as vacuum pumps, hydraulic systems, and refrigeration equipment that are external to, but attached to, glove boxes, shall be buried with the glove box if practical. Any such equipment disconnected from the glove box will be blanked in a manner that assures contamination control. Such separated equipment will be placed in burial vaults for disposal. Major equipment items, such as large hydraulic presses, which are part of the glove box system but primarily external to the glove box will be decontaminated where practical and made available as excess equipment. Where decontamination and release is not possible the contamination shall be fixed by the best method and the equipment transported to the Industrial Waste Trench for disposal.

5.5 EXHAUST SYSTEM AND SERVICE LINES REMOVAL

Included here are the ductwork from the glove boxes to the secondary filters, the 26 secondary filter cages, the ductwork to the final filter, the final filter bank, the exhaust fans, and the stack. These items, shown in Attachment 3, represent approximately 4,500 cubic feet of contaminated waste to be buried and are described in Attachment 4. Also included are obsolete service lines; i.e., electrical conduit, compressed air, inert gas supply, water cooling, air sampling and other miscellaneous lines. For the most part, these lines are painted. As such, they may not be unconditionally released by Radiation Monitoring and therefore must be handled as contaminated waste. However, they do not represent significant additional volume in that either there will be room in the glove box burial vaults for these items or they will be transported to the Industrial Waste Trench. The secondary filter cages may be removed from the system as soon as the glove boxes which they service have been removed. These items will be monitored for significant plutonium holdup in a manner similar to the glove boxes. Where significant plutonium is detected, the filter will be removed for recovery. The secondary filter cages are located in the duct level but extend through the first floor ceiling. The cages are part of the original building services; during facility construction the concrete duct level floor (first floor ceiling) was poured around them. In some zones of the building these floors are 12-inch thick reinforced concrete. The floor will have to be chipped out to remove the cages.

The ductwork between the secondary filters and the final filter also presents some problem, since it consists of relatively long welded sections. While flanged sections and transitions do exist they usually are not located where it would be most convenient for sectioning for efficient packaging. Greenhouse techniques will be used for ductwork cutting operations where contamination control considerations warrant.

Note: If unsuspected plutonium deposits are discovered in exhaust or service lines, criticality safety controls must be established.

5.6 CONTAMINATED DRAINAGE SYSTEM REMOVAL/CONTAINMENT

There are seventy-five (75) floor drains in the laboratory that carried contaminated liquid to the 200-West crib system at some time in the facility's history. The drains are identified as the D-4 system on the reference drawings. These drains now carry very low level or potentially contaminated water to the Z-16 crib. The entire laboratory drainage system was recently dye-tested and the contaminated D-4 system clearly identified. Pertinent drawings (H-2-64100, Sheets 1-4, Plumbing and Drainage 231-Z Building) were made "as-built." Each drain will be cut off below floor level and permanently sealed. All related drain lines leaving the facility and going to the sump tank area, weir box, and Z-16 crib will be excavated and buried as contaminated waste. The D-1 (sanitary), D-2 and D -3 systems (process drains discharging to the Z-16-U-10 swamp) will remain in service. These drains must be surveyed for possible contamination. It may also be necessary to seal and abandon a portion of these systems.

The two 231-W-151 tanks located in a concrete pit to the east of the 231-Z Building contain contaminated liquid. Sludge samples indicate that Tank 2 contains plutonium (~185 grams). A criticality safety procedure will be established for emptying the tanks. The empty tanks and related piping will be left in the pit, the pit filled with earth and topped with gravel. If necessary, a burial site designation request will be prepared.

5.7 OBSOLETE EQUIPMENT DISPOSAL

A variety of uncontaminated laboratory and ventilation equipment and instrumentation will become obsolete as restoration progresses. The equipment will be excessed following standard property disposal procedures.

5.8 ALARM SYSTEMS REMOVAL

The criticality detector and alarm system will be salvaged as will the criticality dosimeter system. The continuous alpha air monitoring system will also be salvaged. All alpha radiation monitoring equipment will be

5.9 FACILITY RESTORATION

- Maximum Smearable Zero
- Maximum Fixed (unpainted) $0.1 \mu\text{Ci}/100 \text{ cm}^2$ (220 d/m)
- Maximum Fixed (under paint) $10 \mu\text{Ci}/100 \text{ cm}^2$ (22,000 d/m)

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Note: The 231-Z facility has been in continuous service for over thirty years. During that time there have been many contamination incidents. Documentation of these incidents is not considered sufficiently reliable or complete to know beyond reasonable doubt what floor and wall areas may have contamination which has been painted over. Stripping all surfaces bare and repainting are not recommended. It is believed to be an acceptable risk to operate the laboratory "cold" with facility procedures that would require Radiation Monitoring coverage for all facility modifications where painted surfaces would be disturbed. Routine surveillance by Radiation Monitoring should also be adopted to search for contamination which might work or wear its way to the surface.

In addition to the internal restoration work described above, the Z-plant exclusion area fence shall be relocated to exclude the 231-Z Building.

6.0 SPECIAL CONSIDERATIONS

The phaseout of the DMA program, the decontamination/restoration of the 231-Z facility, and the initiation of new R&D programs will occur on an overlapping time schedule. Careful planning will be required to assure 1) minimum interference during the transition from the fissile material-classified mode of operation to the anticipated nonradioactive material mode of operation, 2) completion of the decontamination/restoration in a timely and economical manner, and 3) that all pertinent PNL and ERDA requirements are met. Most of the areas of concern have been discussed in other sections of this document but are summarized again here.

6.1 SECURITY

Classified work is expected to continue in the facility through mid-FY77. Above-threshold quantities of plutonium will be handled in the facility during the same period. The present security and physical safeguard controls must be rigidly maintained during this period. Several equipment removal routes require that alarmed doors be temporarily removed from service or that openings be provided in the security perimeter wall. These openings must be sealed off-shift or full time patrol surveillance provided. The sealing method shall satisfy PNL and ERDA security and shall be at least equivalent to that used during the Consolidated Maintenance and Storage Addition Project (BCP-062).

6.2 RADIATION PROTECTION

The 231-Z Building General Radiation Work Procedures will cover most of the operations. Unique or unexpected circumstances may require preparation of a special Radiation Work Procedure (RWP). Radiation Monitoring requirements will be extensive, particularly during FY77, and additional monitoring staff will be assigned to the facility as required. Data collected by Radiation Monitoring will provide the basis for decisions on

equipment removal, burial or salvage, decontamination and restoration, and future facility operating requirements. Dosimetry requirements will be reviewed periodically as staff assignments change.

6.3 VENTILATION AND AIR BALANCE

The proper control of ventilation and air balance is crucial to safe working conditions in the laboratory. Interior wall removal will require adjustment to air supply and exhaust controls. The temporary removal of wall panels may necessitate restrictions on glove box operations and movement of nuclear materials. At the completion of the project a complete rebalance of the facility ventilation system will be required.

6.4 CRITICALITY SAFETY

Removal of the liquid from the two 231-W-151 tanks will present a direct serious criticality safety problem and will require formal evaluation by PNL criticality safety staff. Several other less direct potential problem areas must be given consideration. These include:

- washing down of "dry" glove boxes. If it becomes necessary to use significant quantities of solutions to reduce internal contamination of a "dry" glove box, then limits on volume of solution and size of vessels may be necessary.
- disposal of oil and hydraulic fluid. In the disposal of fluids from glove boxes consideration must be given to the possibility of these fluids containing significant quantities of plutonium.
- special packages for plutonium-bearing scrap. If special packages or containers are required, then new criticality safety limits may be needed.
- discovery of a concealed plutonium deposit. A special criticality safety procedure may be necessary if, during evaluation of a glove box, exhaust or service line, unsuspected deposits of plutonium are discovered.

6.5 ALARM SYSTEMS

Glove box fire alarm detectors will be removed from service as the glove box is deactivated and prepared for removal from the building. All other alarm systems will remain in service until project completion.

6.6 NUCLEAR MATERIALS MANAGEMENT

The current schedule of monthly and physical inventories of nuclear materials will be maintained. Disposal of glove boxes, filter cages, and certain equipment items will require careful attention to measurement of plutonium holdup and preparation of appropriate disposal documentation. By the end of FY77, the entire nuclear material inventory will be transferred to recovery or to other ERDA contractors.

6.7 PROPERTY DISPOSAL

Hundreds of property inventory items will be buried, transferred to excess or salvage, or otherwise relocated. Preparation of appropriate documentation for approval of these transactions is an important responsibility of project management.

6.8 PROJECT MANAGEMENT

The Materials Department will assign sufficient management, engineering and technician staff to the project to assure prompt response to the needs of the various PNL and contractor organizations involved. Checksheets, shown in Attachment 6, shall be maintained to assist in monitoring work progress and for use in report preparation.

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7.0 TIME SCHEDULE AND COST ESTIMATE

The completion schedule and total cost of the decontamination and restoration project will depend on the rate at which funding is provided. A firm funding plan for these activities has not been established. The cost estimate shown in Table 1 assumed a total funding level of \$525 K for FY76 and FY76T, with the balance of funds provided in FY77, and project completion anticipated by September 30, 1977. Funding at a lower rate seems probable; completion of the project will be delayed until FY78, and costs will probably escalate by 1-2% of the total below for every month's delay. The final schedule and cost will be heavily dependent on the timing of authorization of FY77 funds. The total cost estimate of \$4,761 K was used as the basis for the cost/schedule plans of Attachment 7. Revisions will be required when a firm funding plan is developed. A work schedule is shown in Attachment 8.

TABLE 1. Estimated Cost of Decontamination and Restoration
(thousands of dollars)

<u>Organization</u>	<u>FY76-76T</u>	<u>FY77</u>	<u>Total*</u>
PNL	305	1076	1381
JA Jones Construction Co.	<u>220</u>	<u>3160</u>	<u>3380</u>
Totals	525	4236	4761

*Includes 25% contingency and 13% escalation and assumes all necessary funds will be provided early in FY77.

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8.0 WORKING REFERENCE DOCUMENTS

The following documents and specifications are pertinent to the decontamination and restoration of the 231-Z facility:

1. Schedule 189, "Decontamination and Restoration of the 231-Z Facility," Budget Activity No. NM-25-03, April 1975.
2. J. D. Anderson, Specifications and Standards for the Packaging, Storage, and Disposal of Richland Operations Solid Wastes, ARH-3032, Atlantic Richfield Hanford Company, Richland, WA, April 29, 1974.
3. ERDA Manual Chapter 0511, "Radioactive Waste Management."
4. ERDA Manual Chapter 0524 Appendix, "Standards for Radiation Protection."
5. R. A. Kennedy, Design Criteria - Transuranic Dry Waste Burial Containers, ARH-2239, Atlantic Richfield Hanford Company, Richland, WA, March 15, 1972.
6. W. R. Heald, Proposed Use of Fiberglass Reinforced Polyester (FRP) Plywood Containers for Transuranic Burial, ARH-3061, Atlantic Richfield Hanford Company, Richland, WA, April 2, 1974.
7. CE-0948-P1, "Procurement Specification for Fiberglass Reinforced Plastic (FRP) Plywood Retrievable Container Modules," Rev. No. 3, 1-17-75, Vitro Engineering.
8. 231-Z Building General Radiation Work Procedure, 8-20-75.
9. ERDA Manual Chapter 0529, "Safety Standards for Packaging of Fissile and Other Radioactive Materials."

ATTACHMENT 1
FIRST FLOOR ARRANGEMENT
231-Z BUILDING

REFERENCE DWG	EQUIPMENT OR PIPING ARRANGEMENTS	
H-2-63750 ARCH FIRST FLOOR	H-2-3428 ROOM-1	H-2-5377 RM 27 THRU 39
H-2-5213-16 SERVICE PIPING	H-2-31792 ROOM-2	H-2-3633 RM 34 AND 36
H-2-64100 DRAIN & PLUMB	H-2-31774 ROOM-3	H-2-51286 ROOM 37
H-2-34064-72 ELECTRICAL	H-2-3611 ROOM-4	H-2-3450 RM 35 & 37
H-2-33169 SIMPLIFIED BLDG LAYOUT	H-2-25163 ROOM-5	H-2-3156 RM 38 THRU 45
H-2-26016 OFFICE ADDITION	H-2-29330 ROOM-6A	H-2-29314 ROOM 46
H-2-64020 DN DRAFT FACIL	H-2-31797 ROOM-16	H-2-3054 RM 47 THRU 50
H-2-29302-05 BLDG VENT	H-2-3566 ROOM-17	H-2-64278 RM 39 & RM 40
H-2-33780 FIRE ALARM SYS	H-2-33798 ROOM-25	H-2-44311 SH 103 & PLANT MAP
H-2-64105 RM 39 PIPING	H-2-33784 CRITICALITY ALARM	H-2-33714 MAINT CLEAN RM (78)
H-2-26692 SPRINKLER SYSTEM	H-2-68037 FIRE DETECTOR ZONES

RM	ITEM	EQUIPMENT	REF
37	61	LATHE AUXILIARIES	
60	62	SPUTTERING CHAMBER	
7-A	63	100,000 PSI PUMPING UNIT	CVL-13711
22	64	GLOVE BOX 22-2	H-2-65945
50	65	PREPARATION GLOVE BOX (50-2)	H-2-3062
50	66	UNIVERSAL TESTING MACHINE	BALDWIN 44000LB-BTE
50	67	TESTING MACH GLOVE BOX (50-1)	H-2-67999
34	68	VENT DUCT EXTENSION	H-2-31287
5	69	VAC SYSTEM (FOR 5-3)	H-2-68102
45	70	GLOVE BOX 45-1	H-2-25755
5	71	METALLOGRAPHY GLOVE BOX (3-1)	H-2-31775
3	72	TUKON TESTER GLOVE BOX (3-2)	H-2-10195
3	73	CUT OFF SAW & BELT SANDER	
48	74	CREEP GLOVE BOX (48-1)	H-2-31271
2	75	DRYING GLOVE BOX (2-4)	H-2-20961
2	76	DRYING GLOVE BOX (2-5)	H-2-20961
37	77	GORTON LATHE GLOVE BOX 37-2	H-2-23240
36	78	SHEFFIELD GAGE GLOVE BOX 26-3	H-2-19958
33	79	OPEN FACE HOOD (3-5)	BPF-77231
50	80	TENSILE TESTING GLOVE BOX (50-4)	H-2-32223
34	81	LATHE GLOVE BOX (34-3)	H-2-25170
36	82	ASSEMBLY GLOVE BOX (36-2)	H-2-67750
4	83	HEAT TREATING	
46	84	PU RESEARCH GLOVE BOX (46-1)	H-2-29307
2	85	BALANCE GLOVE BOX (2-17-3)	H-2-25176
5	86	DILATOMETER & DIA GLOVE BOX (5-4)	H-2-25156
31/2A	87	FUME HOOD	KEWAUNEE
39	88	DUAL HEAD VAC. SYS.	R-1830
15	89	ELECTRON MICROSCOPE	
50	90	HIGH SPEED MECH TEST GLOVE BOX (50-5)	H-2-25219
15	91	OPEN FACE HOOD (15-2)	H-2-25715
24	92	DEGREASER	WESTINGHOUSE 652 J032
46	93	EVACUABLE GLOVE BOX GB-46-3	H-2-25795
46	94	PREPARATION GLOVE BOX GB-46-2	H-2-25794
18	95	WELDING CHAMBER	H-2-20808
2	96	CAPACITOR DISCHARGE G.B. (1-6)	H-2-25150
22	97	X-RAY GLOVE BOX (GB 22-3)	H-2-67789
49	98	RF VAC. SYS.	R-1825
39	99	CLEAN AIR BENCH	DEXON
49	100	CLEAN AIR BENCH	LIBERTY INDUST.
54	101	OUTGASSING FURNACE PD 88841	WETHERINGTON INC
64	102	CRYOGENIC FACILITY	
46	103	CATHODIC ETCHER	
15	104	METALLOGRAPH	ZEISS
10	105	ION MILLING	
10	106	RADIOGRAPHY DEVELOPING	
10	107	DRIER	G-E
17	108	X-RAY FLUORESCENCE	
7A	109	OMEGA-X MACHINE	
49	110	VAC. SYSTEM	
49	111	SCANNING CALORIMETER	
RM	1	POWDER PKG GLOVE BOX (1-2)	H-2-3502 SHI
1	2	POWDER PREP GLOVE BOX (1-3)	H-2-32187
1	3	POWDER PRESS GLOVE BOX (1-4)	H-2-32185
6B	5	GLOVE BOX 6A-1	H-2-65733
36	6	EXTENSION	H-2-62377
2	7	ROLLING MILL G.B. (2-3)	H-2-3354
6-A	8	X-RAY DIFFRACTION GLOVE BOX (6A-1)	H-2-29324
10	9	ELECTRON BEAM FURNACE HOOD	H-2-31114
18	10	ELECTRON BEAM WELDER	
1	11	GLOVE BOX (1-8)	H-2-64201
39	12	GLOVE BOX (39-1A)	H-2-62325
17	13	SCANNING ELECTRON MICR.	AUTOSCAN 8755 CORP
50	14	INSTROM	
7-A	15	5000 TON PRESS & HYD UNIT	
7-A	16	5000 TON PRESS GLOVE BOX	H-2-31688
15	17	SAMPLE DECONTAMINATION GB (5-1)	H-2-25745
16	18	X-RAY GEN	
16	19	X-RAY GLOVE BOX (16-1)	H-2-25751
29	20	X-RAY DEVELOPER	
3	21	SYNTRON POLISHERS	
1	22	FUME HOOD MODIFICATION	H-2-64202
31	23	OPEN FACE HOOD	BPF-77231
2	24	EDM GLOVE BOX 2-6	H-2-65721
32	25	TRANSMISSION ELECTRON MICR	JEM 7
22	26	G.B. 22-2 EXTENSION	H-2-65951
5	27	CHIP PREP GLOVE BOX (5-1)	H-2-31475
4	28	1000 TON PRESS GLOVE BOX (4-3)	H-2-31380
37	29	NIKON SURFACE MICROSCOPE (GB 37-3)	H-2-67723
4	30	GEN PURPOSE GLOVE BOX (4-4)	H-2-31470
4	31	PREP GLOVE BOX (4-2)	H-2-3608
4	32	VACUUM GLOVE BOX (4-1)	H-2-3509
13	33	TRANSFER DUCT EXTENSION	H-2-64230
22	34	GLOVE BOX (22-1)	H-2-64229
39	35	GLOVE BOX (39-1B)	H-2-62325
39	36	P.P. GLOVE BOX LINE	H-2-64224
39	37	6\" PORTABLE VAC SYSTEM	H-2-62333
37	38	TRANSFER DUCT	H-2-3389
36	39	7.5 KG-BAL GLOVE BOX (36-1)	H-2-3853
5	40	EVALUATION GLOVE BOX (5-5)	H-2-25757
5	41	VACUUM PLATE GLOVE BOX (5-2)	H-2-31665
39	42	GAS TESTING GLOVE BOX (39-1)	H-2-3290
5	43	ARC FURNACE GLOVE BOX (5-3)	H-2-31802
41	44	GLOVE BOX 41-1	H-2-25224
3	45	POLISHER	
10	46	VAC COATER	NRC
34	47	GLOVE BOX (34-4)	H-2-64240
34	48	GLOVE BOX (34-1)	H-2-33764
37	49	GORTON LATHE GLOVE BOX (37-1)	H-2-25764
30	50	MACRO CAMERA	
51			
30-A	52	ENLARGER & CONTACT PRINTER	
30-A	53	DRYER	
54	54	DUCT EXTENSION	H-2-31787
54	55	FURNACE GLOVE BOX (34-2)	H-2-29350
47	56	VAC MELT FURNACE 30KW	BPF-10223
47	57	VAC MELT PREP GLOVE BOX (47-1A)	H-2-25733
49	58	ASSEMBLY GLOVE BOX (49-4)	H-2-3352
49	59	INSPECTION GLOVE BOX (49-2)	H-2-3166
10	60	VACUUM COATER	WEINSTEIN ENGLAND

○ DESIGNATES ALARM CIRCUIT NUMBER
○ SECURITY DOOR NUMBER

U. S. ATOMIC ENERGY COMMISSION			
RICHLAND OPERATION OFFICE			
THIS PACIFIC NORTHWEST LABORATORY IS A DIVISION OF BATTTELLE MEMORIAL INSTITUTE, PACIFIC NORTHWEST LABORATORY, RICHLAND, WASH.			
FIRST FLOOR ARRANGEMENT 231-Z BLDG			
10 GENERAL REVISIONS UP DATED	11-10-60	11-10-60	11-10-60
9 BROUGHT UP TO DATE	11-10-60	11-10-60	11-10-60
8 BROUGHT UP TO DATE	11-10-60	11-10-60	11-10-60
7 BROUGHT UP TO DATE	11-10-60	11-10-60	11-10-60
6 GENERAL REVISIONS	11-10-60	11-10-60	11-10-60
5 GENERAL REVISIONS	11-10-60	11-10-60	11-10-60
4 GENERAL REVISIONS	11-10-60	11-10-60	11-10-60
3 GEN REVISION UP DATED	11-10-60	11-10-60	11-10-60
2 OF ORIGINAL REDRAWN DUE TO CONDITION	11-10-60	11-10-60	11-10-60
1 GENERAL REVISION	11-10-60	11-10-60	11-10-60
DESCRIPTION	DATE	BY	FOR DATE
NONE			

ATTACHMENT 2

FIRST FLOOR

EQUIPMENT EXIT ROUTES

FIRST FLOOR EQUIPMENT EXIT ROUTES

ATTACHMENT 3

DUCT LEVEL

EQUIPMENT EXIT ROUTES

DUCT LEVEL EQUIPMENT EXIT ROUTES

ATTACHMENT 4

SUMMARY OF GLOVE BOXES

TO BE REMOVED:

DIMENSIONS AND EXIT ROUTES

ATTACHMENT 4
SUMMARY OF GLOVE BOXES
TO BE REMOVED:
DIMENSIONS AND EXIT ROUTES

Room No.	Glove Box	Dimensions						Exit Route
		Length		Width		Height		
		Ft.	In.	Ft.	In.	Ft.	In.	
1	1-8 (A)	15	1	2	9	6	3	2
1	1-8 (B)	4	0	2	4	5	0	2
1	1-3 (A)	9	0	3	4	7	3	3
1	1-3 (B)	11	0	3	5	3	0	3
1	1-4	3	7	2	8	3	6	3
2	2-4	4	6	3	0	3	0	3
2	2-5	4	3	3	0	3	0	3
2	2-6	11	0	3	11	5	2	2
2	2-3 (A)	4	6	7	7	4	4	2
2	2-3 (B)	11	3	2	1	2	10	3
2	1-6	3	6	3	5	3	4	3
3	3-2	4	1	3	9	5	2	3
3	3-1 (A)	9	2	4	2	3	6	3
3	3-1 (B)	5	1	4	8	5	0	3
3	3-1 (C)	9	5	4	5	3	0	3
3	3-1 (D)	8	2	4	6	3	7	3
4	4-3	12	5	3	9	4	8	2
4	4-4	13	6	4	0	4	4	2
4	4-1	4	5	2	3	5	6	3
4	4-2	3	10	2	5	4	2	3
5	5-1	13	10	2	4	4	6	5
5	5-2	9	8	3	3	4	3	5
5	5-3	3	10	2	2	3	8	5
5	5-4	9	6	2	9	4	3	5
6A	6A-1	4	0	4	6	3	3	4
6B	6B-1	9	7	3	10	6	10	4

Attachment 4 (cont'd)

Room No.	Glove Box	Dimensions						Exit Route
		Length		Width		Height		
		Ft.	In.	Ft.	In.	Ft.	In.	
7A	7-1	14	0	4	3	4	9	1
15	15-1	4	6	2	3	3	2	5
15	Open Front Hood	2	0	2	1	2	8	5
16	16-1	7	6	3	3	4	5	5
19	Downdraft Table	3	6	2	0	3	4	7
22	22-2	10	9	3	0	6	4	9
22	22-1	8	8	4	1	8	9	9
22	Conveyor	3	2	1	9	2	8	9
25	22-3	4	8	12	0	2	8	9
31	Open Front Hood	4	2	2	4	5	0	5
33	Open Front Hood	4	0	2	4	5	2	7
34	34-4	11	4	3	10	8	1	7
34	34-2	11	4	3	9	3	8	7
34	34-3	12	4	3	10	5	8	7
36	36-3	11	6	4	8	9	3	7
36	36-2 (A)	7	10	4	0	8	0	7
36	36-2 (B)	8	10	3	8	6	9	7
36	36-1 (A)	7	3	3	1	4	6	7
36	36-1 (B)	3	0	1	0	3	6	7
36	Conveyor (A)	8	3	2	0	2	0	7
36	Conveyor (B)	5	5	2	0	2	0	7
36	Conveyor (C)	11	3	2	0	3	1	7
36	Conveyor (D)	4	10	2	0	2	8	7
37	37-1	12	7	3	9	8	4	7
37	37-2	13	0	4	6	6	6	7
37	37-3	2	7	2	9	2	4	7
37	Conveyor	22	2	1	9	2	8	7
39	39-1	14	9	4	7	4	0	8
39	39-9	9	0	4	3	6	8	9
39	39-8	10	0	4	2	10	0	9

Attachment 4 (cont'd)

Room No.	Glove Box	Dimensions						Exit Route
		Length		Width		Height		
		Ft.	In.	Ft.	In.	Ft.	In.	
39	39-7	7	6	4	2	7	4	9
39	39-6	10	1	4	2	4	2	9
39	39-5	7	6	4	2	7	4	9
39	39-4	10	0	5	8	6	0	9
39	Conveyor	10	4	2	3	2	5	9
41	41-1	9	10	4	0	7	2	8
45	45-1	10	2	4	0	7	2	8
46	46-1 (A)	10	3	2	6	3	2	7
46	46-1 (B)	8	7	2	6	4	2	7
46	46-2	8	4	2	7	4	8	7
46	46-3	6	5	2	6	3	4	7
47	47-1	8	0	3	10	10	0	7
47	47-1A	10	9	2	5	3	2	7
47	Transfer Duct	3	10	2	0	1	8	7
48	48-1	8	5	2	2	7	8	6
50	50-2	9	0	2	5	3	0	6
50	50-5	6	1	2	5	4	10	6
50	50-1	4	10	2	9	4	3	6
50	50-4	5	6	7	4	9	0	6
Duct Level	Rm 1- Recirculating	10	1	3	7	7	1	11
DL	36-3 (A)	7	7	3	2	2	6	10
UL	37-1 (A)	7	4	3	2	2	7	10
DL	37-2 (A)	8	2	5	1	4	7	10
DL	Filter Cages (26)	3	0	3	0	4	0	10
DL	Final Filter	6	6	6	0	6	6	10
DL	Ductwork	45		4"	dia			10
DL	Ductwork	500		8"	dia			10
DL	Ductwork	200		10"	dia			10
DL	Ductwork	400		14"	dia			10

Attachment 4 (cont'd)

Room No.	Glove Box	Dimensions						Exit Route
		Length		Width		Height		
		Ft.	In.	Ft.	In.	Ft.	In.	
DL	Ductwork	35		16"	dia			10
DL	Ductwork	10		20"	dia			10
DL	Ductwork	35		16"	dia			10
DL	Ductwork	10		20"	dia			10
DL	Ductwork	39		22"	dia			10
DL	Ductwork	100		24"	dia			10
DL	Exhaust Stack	50		32"	dia			Outside
DL	Exhaust Fans (2)	8		3	6	7		10

ATTACHMENT 5

SEQUENCE AND ESTIMATED COMPLETION SCHEDULE
OF ACTIVITIES

SEQUENCE OF ACTIVITIES AND ESTIMATED COMPLETION SCHEDULE
DECONTAMINATION AND RESTORATION OF THE 231-Z FACILITY

5-1

(1) NOTE: TIME SCHEDULE IS BASED ON FUNDING PLAN AS OF 1-5-76 AND ON TOTAL PROJECT COST OF \$4761K. THE ACTUAL COMPLETION SCHEDULE AND TOTAL COST WILL DEPEND HEAVILY ON FY-1977 FUNDING. A REVISED SCHEDULE MAY BE REQUIRED WHEN A FIRM FUNDING PLAN IS DEVELOPED.

FY-76 - \$ 240K
FY-76A - 109
FY-77 - 3500
FY-78 - BALANCE

ATTACHMENT 6
SAMPLE CHECK SHEETS

SAMPLE 6-A. GLOVE BOX CHECK SHEET

1. Glove box identification _____ Room _____ HEW # _____
2. Other HEW equipment in/or attached to glove box:

3. Oil drained from vacuum or hydraulic systems _____
4. Attached equipment to be removed: _____ Completed _____

5. Cleanout completed _____ Date _____
6. Plutonium value assigned _____ Date _____
7. Disposal request prepared _____ Ref. Document No. _____
8. Sectioning required _____ Pieces _____
9. Outside dimensions: a) _____ b) _____ c) _____ d) _____
10. Fire alarm/detector disconnected _____
11. E-4 disconnected _____
12. Exit route _____
13. Placed in burial vault No. _____

SAMPLE 6-B. BURIAL VAULT CHECKSHEET

A) Vault No. _____

B) Weight: Empty _____ Loaded _____

	<u>Contents</u>	<u>Weight</u>	<u>Pu Value</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____

C) Total Pu Content _____

D) Date Sealed _____

E) Solid Waste Burial Document No. _____

F) Burial Location _____

G) Date Buried _____

SAMPLE 6-C. ROOM CHECKSHEET

1. Room No. _____

2. Glove boxes to be removed for burial:

<u>Identification</u>	<u>HEW No.</u>	<u>Date Removed</u>	<u>Pu Value</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

3. Other equipment requiring removal:

<u>Identification</u>	<u>Hew No.</u>	<u>Disposition</u>	<u>Date Removed</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

4. Wall, door or floor modifications required: _____

5. Service lines to be removed:

<u>Description</u>	<u>Date Completed</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

6. No. of floor drains to be sealed: _____
Date completed: _____

SAMPLE 6-C. (Cont'd)

7. Alarm systems to be removed:

Description	Date Completed

8. Results of RM Survey: _____

Survey Record No. _____

9. Description of covered contamination: _____

Photographic Record

10. Finishing required:

[illegible]

11. Room Restoration Complete -- Date _____

ATTACHMENT 7
COST/SCHEDULE DATA

MONTHLY COST PLAN (\$K)
DECONTAMINATION AND RESTORATION OF 231-Z

	FY-76										FY-76T			FY-77												FY-78						TOTALS	
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	
JAJ	-	-	-	-	-	-	20	20	20	20	25	25	25	115	115	125	250	250	250	250	250	250	250	250	250	170	150	150	100	50			3380
PNL	9	18	20	10	13	50	10	10	10	10	11	11	12	25	25	25	90	90	90	90	90	90	90	90	100	80	60	50	25	25	25	27	1381
JAJ										80			75												2605							620	
TOTALS:																																	
PNL										<u>160</u>			<u>34</u>												<u>895</u>							<u>292</u>	
										240			109												3500							912	4761

NOTE: THE TOTAL COST ESTIMATE OF \$4761K HAS NOT BEEN ESCALATED ALTHOUGH THE PROJECT IS SHOWN CONTINUING INTO FY-1978. THE ACTUAL COMPLETION SCHEDULE AND TOTAL COST WILL BE HEAVILY DEPENDENT ON FY-1977 FUNDING (TIMING AND AMOUNT). REVISIONS TO THIS SCHEDULE WILL BE REQUIRED WHEN A FIRM FUNDING PLAN IS DEVELOPED.

J. A. JONES COSTS:
DECONTAMINATION AND RESTORATION OF 231-Z

PACIFIC NORTHWEST LABORATORY COSTS:
DECONTAMINATION AND RESTORATION OF 231-Z

TOTAL COSTS:
DECONTAMINATION AND RESTORATION OF 231-Z

MAJOR TASKS, COSTS, AND ESTIMATED PERCENT OF PROJECT
DECONTAMINATION AND RESTORATION OF 231-Z

MAJOR TASK	SEQUENCE ⁽¹⁾ STEPS	ESTIMATED COST (\$K)	% OF PROJECT	CUMULATIVE	
				%	COST(\$K)
1	1-7	379	8.0	8.0	379
2	8-11	119	2.5	10.5	498
3	12-17	129	2.7	13.2	627
4	18-21	61	1.3	14.5	688
5	22-24	106	2.2	16.7	794
6	25-28	135	2.8	19.5	929
7	29-33	156	3.3	22.8	1085
8	34-37	114	2.4	25.2	1199
9	38-41	101	2.1	27.3	1300
10	42-43	39	0.8	28.1	1339
11	44-50	220	4.6	32.7	1559
12	51-62	302	6.3	39.0	1861
13	63-68	253	5.3	44.3	2114
14	70-76	615	12.9	57.2	2729
15	77-92	605	12.8	70.0	3334
16	93-96	73	1.5	71.5	3407
17	97-100	404	8.6	80.1	3811
18	101-103	625	13.1	93.2	4436
19	104-105	140	2.9	96.1	4576
20	106-107	66	1.4	97.5	4642
21	108	67	1.4	98.9	4709
22	109	52	1.1	100	4761

⁽¹⁾ FROM DETAILED PLAN - ATTACHMENT 5

COMPLETION SCHEDULE:
DECONTAMINATION AND RESTORATION OF 231-Z

COST/BUDGET COMPARISON:
DECONTAMINATION AND RESTORATION OF 231-Z

ATTACHMENT 8

WORK SCHEDULE

WORK SCHEDULE DECONTAMINATION AND RESTORATION OF THE 231-Z FACILITY

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