DOE/RL-98-19
Draft A

Surveillance and Maintenance Plan for the 202-S Reduction Oxidation (REDOX) Facility

United States
Department of Energy
Richland, Washington

DOE/RL-98-19

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Surveillance and Maintenance Plan for the 202-S Reduction Oxidation (REDOX) Facility

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Acronyms and Abbreviations

ALARA	as low as reasonably achievable
ARA	airborne radioactivity area
BED	building emergency director
BHI	Bechtel Hanford, Inc.
CA	contamination area
CFR	*Code of Federal Regulations*
CMP	crane maintenance platform
CWC	Central Waste Complex
DOE	U.S. Department of Energy
DOH	Washington State Department of Health
dp	differential pressure
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERC	Environmental Restoration Contractor
FCA	fixed contamination area
FSWM	Field Support Waste Management
FY	fiscal year
HCA	high contamination area
HEPA	high efficiency particulate air
HRA	high radiation area
kV	kilovolt
MCC	motor control center
NDA	nondestructive assay
PCB	polychlorinated biphenyls
PHMC	Project Hanford Management Contractor
ppm	parts per million
PR	product removal
RA	radiation area
RBA	radiological buffer area
RCRA	*Resource Conservation and Recovery Act of 1976*
RCT	Radiological Control technician
REDOX	reduction oxidation
RL	U.S. Department of Energy, Richland Operations Office
RMA	radiation material area
RWP	radiation work permit
SAA	satellite accumulation area
S&M	surveillance and maintenance
SSWMI	site-specific waste management instruction

Acronyms and Abbreviations (cont.)

Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and/or disposal
V	volt
WAC	*Washington Administrative Code*
WHC	Westinghouse Hanford Company

Metric Conversion Chart

The following conversion chart is provided to the reader as a tool to aid in conversion.

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
inches	25.4	Millimeters	millimeters	0.039	Inches
inches	2.54	Centimeters	centimeters	0.394	Inches
feet	0.305	Meters	meters	3.281	Feet
yards	0.914	Meters	meters	1.094	yards
miles	1.609	Kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.0836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	Hectares	hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
Ounces	28.35	Grams	grams	0.035	ounces
Pounds	0.454	Kilograms	kilograms	2.205	pounds
Ton	0.907	Metric ton	metric ton	1.102	ton
Volume			**Volume**		
teaspoons	5	Milliliters	milliliters	0.033	fluid ounces
tablespoons	15	Milliliters			
fluid ounces	30	Milliliters			
cups	0.24	Liters			
pints	0.47	Liters	liters	2.1	pints
quarts	0.95	Liters	liters	1.057	quarts
gallons	3.8	liters	liters	0.264	gallons
cubic feet	0.028	cubic meters	cubic meters	35.315	cubic feet
cubic yards	0.765	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	Multiply by 9/5, then add 32	Fahrenheit

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1.0 INTRODUCTION

This document provides a plan for implementing surveillance and maintenance (S&M) activities to ensure the 202-S Reduction Oxidation (REDOX) Facility is maintained in a safe, environmentally secure, and cost effective manner until subsequent closure during the final disposition phase of decommissioning. This plan has been prepared in accordance with the guidelines provided in the U.S. Department of Energy (DOE) Office of Environmental Management (EM) Decommissioning Resource Manual (DOE 1995), and Section 8.6 of Change Form P-08-97-011 to the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology, et al. 1996). Specific objectives of the S&M program are as follows:

- To ensure adequate confinement of hazardous substances.
- To provide physical safety and security controls.
- To maintain the facilities in a manner that will minimize potential hazards to the public and workers.
- To provide adequate frequency of inspections to identify potential hazards.
- To maintain selected systems or equipment that will be essential for decommissioning activities in a shutdown but standby or operational mode, if economically justified.
- To provide a mechanism for the identification and compliance with applicable environmental, safety and health, and safeguard and security requirements.

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2.0 FACILITY DESCRIPTION

This chapter provides a description of the REDOX facility including ancillary facilities. In addition to supplying an overall understanding of the facility, the facility description section identifies S&M activities. Further, more detailed information is contained within BHI-01142, Rev. 0, *REDOX Facility Safety Analysis Report* (Kerr 1998).

2.1 FACILITY HISTORY

2.1.1 Introduction

The REDOX Facility, also known as S Plant, is located in the southwest portion of 200 West Area of the Hanford Site. The physical layout is shown in Figure 2-1, and a listing of the buildings included in the REDOX Facility is given in Table 2-1. The 202-S Canyon Building is unoccupied except for periodic S&M.

2.1.2 Requirements

The REDOX Facility was constructed between 1950 and 1952 in accordance to the design codes, standards, and regulations in place at the time. The S&M of the REDOX Facility is conducted in accordance with the requirement, identified in section 3.0 of this plan.

2.1.3 Facility Overview

The REDOX Facility, constructed from 1950 to 1952, became the first large-scale, continuous-flow, solvent-extraction process plant built in the United States for the recovery of plutonium from irradiated uranium fuel. The extraction process, which replaced the batch precipitation methods first used at the Hanford Site, was designed to separate uranium, plutonium, and neptunium as individual product streams from associated fission products in the irradiated fuel. Plant operations continued from 1952 until 1967 when the plant was shut down. Deactivation started in 1967 and was completed in August 1969 when the REDOX Facility received the abandon Category 5 classification. The deactivation of the REDOX facility is detailed in ISO-1108, *REDOX Deactivation* (Foster 1977). Deactivation included multiple flushes of water, diluted hot nitric acid, permanganate, and oxalic acid. Regular flushing with water was conducted for nearly a year after the initial cleaning.

The deactivated REDOX Facility contains buildings and process equipment formerly used for dissolution and separation of uranium, neptunium, and plutonium, as well as deactivated equipment formerly used for waste concentration, waste neutralization, and solvent recovery. In addition to the main process areas, the REDOX Facility includes buildings that were formerly used to store chemicals and materials, and support systems such as ventilation, exhaust stacks,

Table 2-1. The REDOX Facility

Building Number	Building Name
202-S	Canyon Building
291-S	Exhaust Fan Building, Sand Filter, and Exhaust Stack (291-S-1)
276-S	Solvent Handling Building
292-S	Control and Jet Pit House
293-S	Nitric Acid Recovery and Iodine Backup Building
2718-S	Sand Filter Sample Building
211-S	Liquid Chemical Storage Tank Farm
2711-S	Stack Gas Monitoring Building
2715-S	Storage Building
2904-SA	Cooling Water Sampling Building
2710-S	Nitrogen Storage Building
2706-S	Storage Building

and environmental monitoring systems. Former offices located in the 202-S Canyon Building are not occupied; the REDOX Facility will remain unoccupied for the duration of S&M activities.

2.2 202-S REDOX CANYON BUILDING

The 202-S REDOX Canyon Building is a reinforced concrete structure consisting of the canyon area, the galleries, the silo area, the east end, and the attached service areas. Figures 2-2 through 2-7 show general floor plans of the 202-S Canyon Building. An equipment arrangement is provided in Figure 2-7. The building is 468 ft long and 161 ft wide. The canyon area is 83 ft high, with 60 ft above grade. The silo area is 132 ft high, with 117 ft above grade.

2.2.1 202-S Canyon

The canyon area of the building originally contained fuel-processing areas. Today, the canyon fuel processing areas contain the original plant deactivated equipment that was formerly used for dissolution, separation, and decontamination of uranium and plutonium as well as waste concentration, waste neutralization, and solvent recovery (BHI 1994). The canyon area, which will not be accessed under S&M, is defined as the process cells and cover blocks, deck, and the

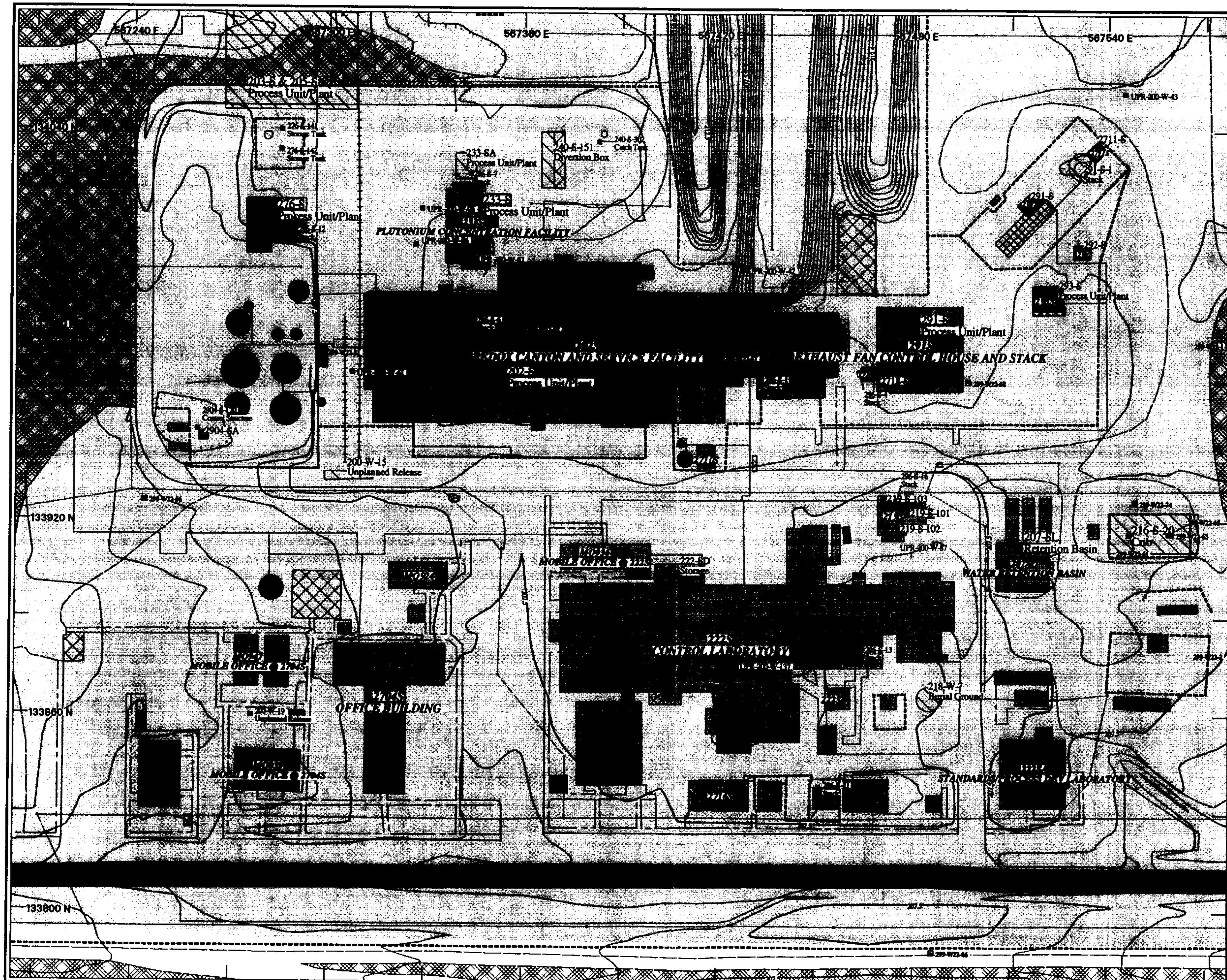


Figure 2-1. REDOX Complex Layout.

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
HANFORD ENVIRONMENTAL RESTORATION PROGRAM

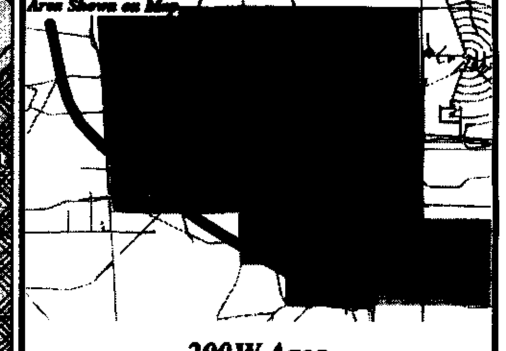
BECHTEL HANFORD, INC.
RICHLAND, WASHINGTON

Bechtel Job No.: 22192 | DOE Contract Number: DE-AC06-93RL12367
AML: atlas_indiv | Service File: s_plant | Date: 11-MAY-1998

Projection .... Lambert Conformal Conic
Coordinate System .... Washington State Plane, South Zone
Horizontal Datum .... North American Datum, 1983 (NAD83)
Vertical Datum .. North American Vertical Datum, 1988 (NAVD88)

Spatial and attribute data are maintained by the Environmental Data Management Group of the Environmental Restoration Contractor.

Area Shown on Map



200W Area

Legend: 200W Area; Water; Disturbed; Building; Concrete-Pad; Misc.-Concrete; Above-ground Tank; Waste Site; Paved Road; Unpaved Road; Railroad; Sidewalk; 2.5m Contour; 2.5m Depression Contour; .5m Contour; .5m Depression Contour; Utility Line; Utility-Misc.; Fence; Pipelines; Utility pole; Well; Well – Abandoned/Decomm.; Waste Site (dimensions unknown)

0m 10m 20m 30m 40m 50m
0ft 100ft

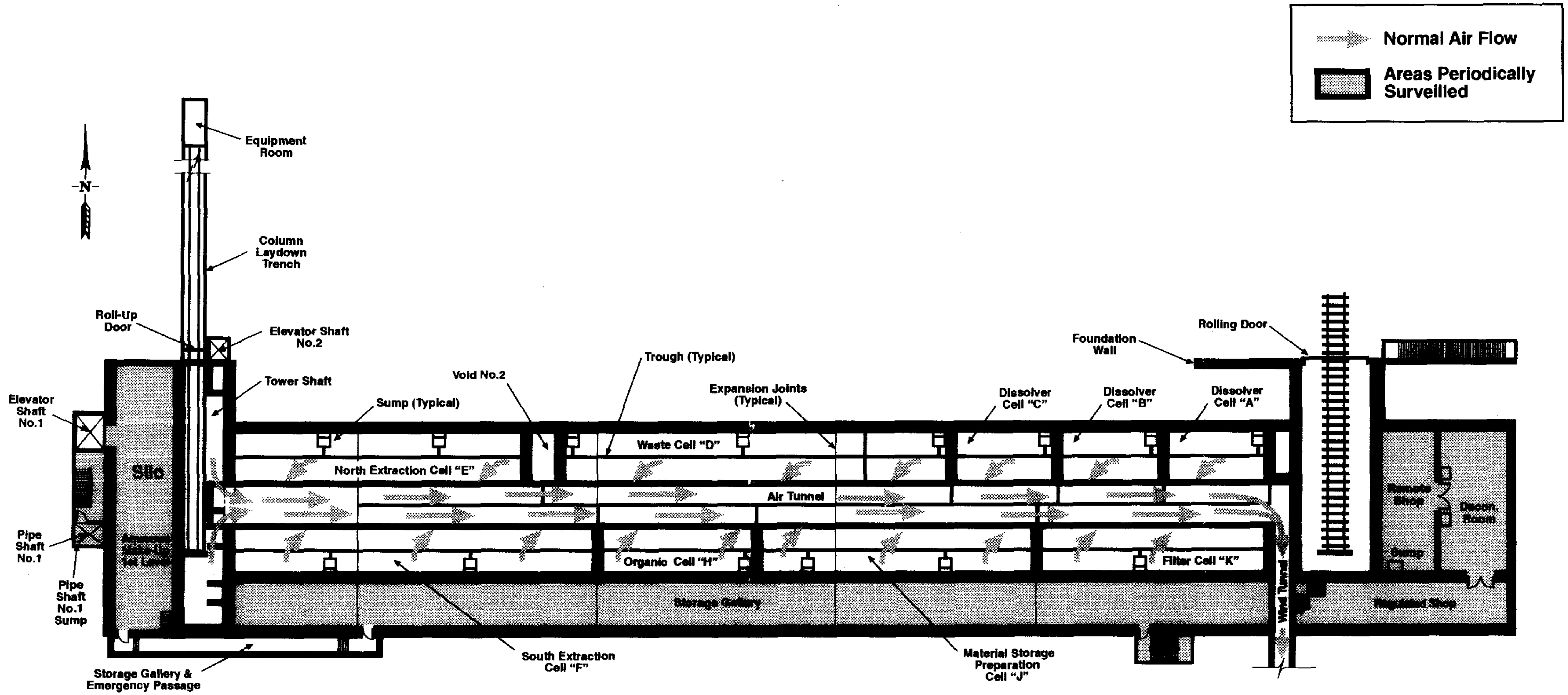
HANFORD — Hanford Geographic Information System

ERC:jrc 04/18/97 atlas_indiv.aml rev. B Database: 11-MAY-1998

For additional copies of this map, the Hanford Site Atlas, or other Geographic Information System (GIS) services, contact the HGIS staff at erc_data_management@rl.gov or call (509) 372-9368.

Figure 2-2. Plan View Cell Floor Level.

Plan View Cell Floor Level



FOR ILLUSTRATIVE PURPOSES ONLY.

Ref. HW-18700 / Figure XI-5b / From DWG. H-2-7402

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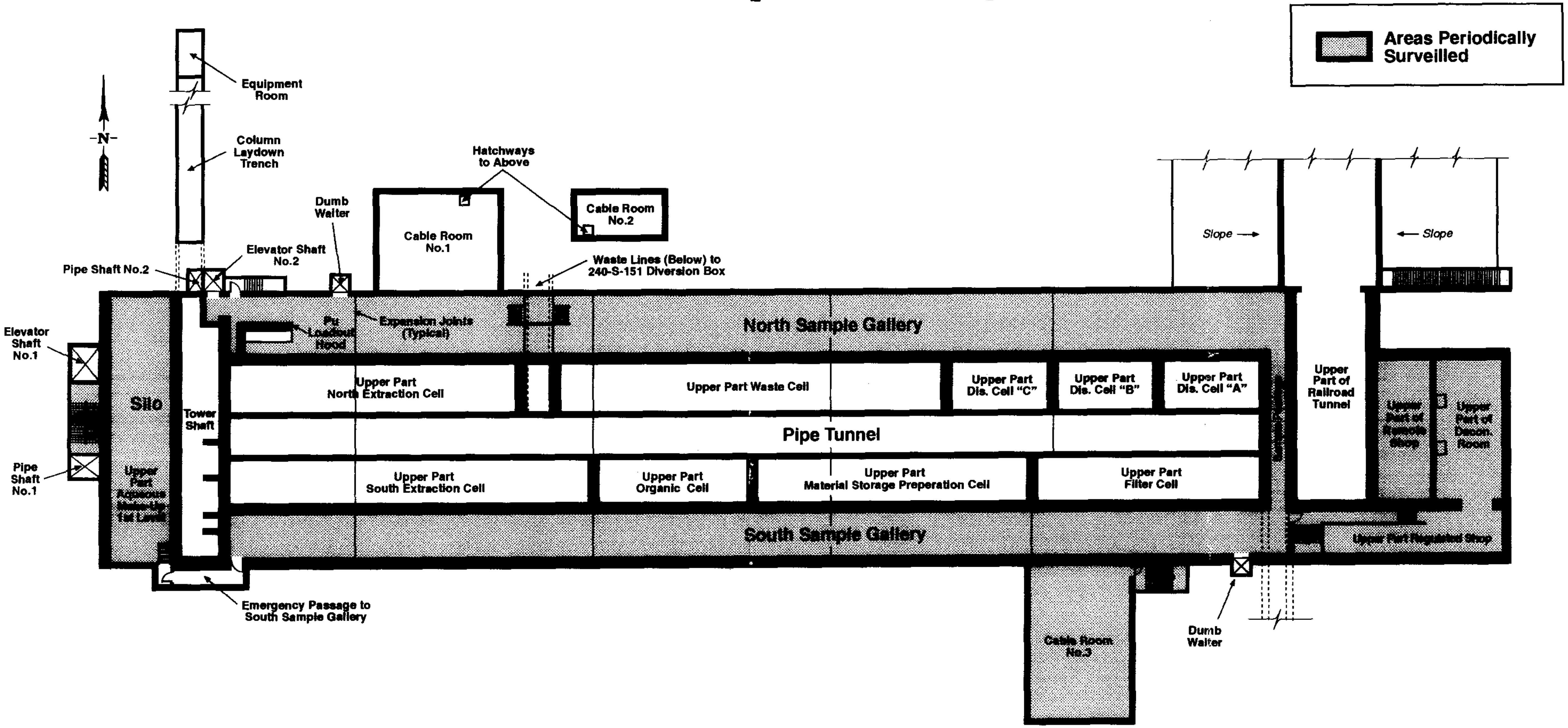
Figure 2-3. Plan View Sample Gallery Level.

Plan View Sample Gallery Level



FOR ILLUSTRATIVE PURPOSES ONLY.

Ref. HW-18700 / Figure XI-5a / From DWG. H-2-7402

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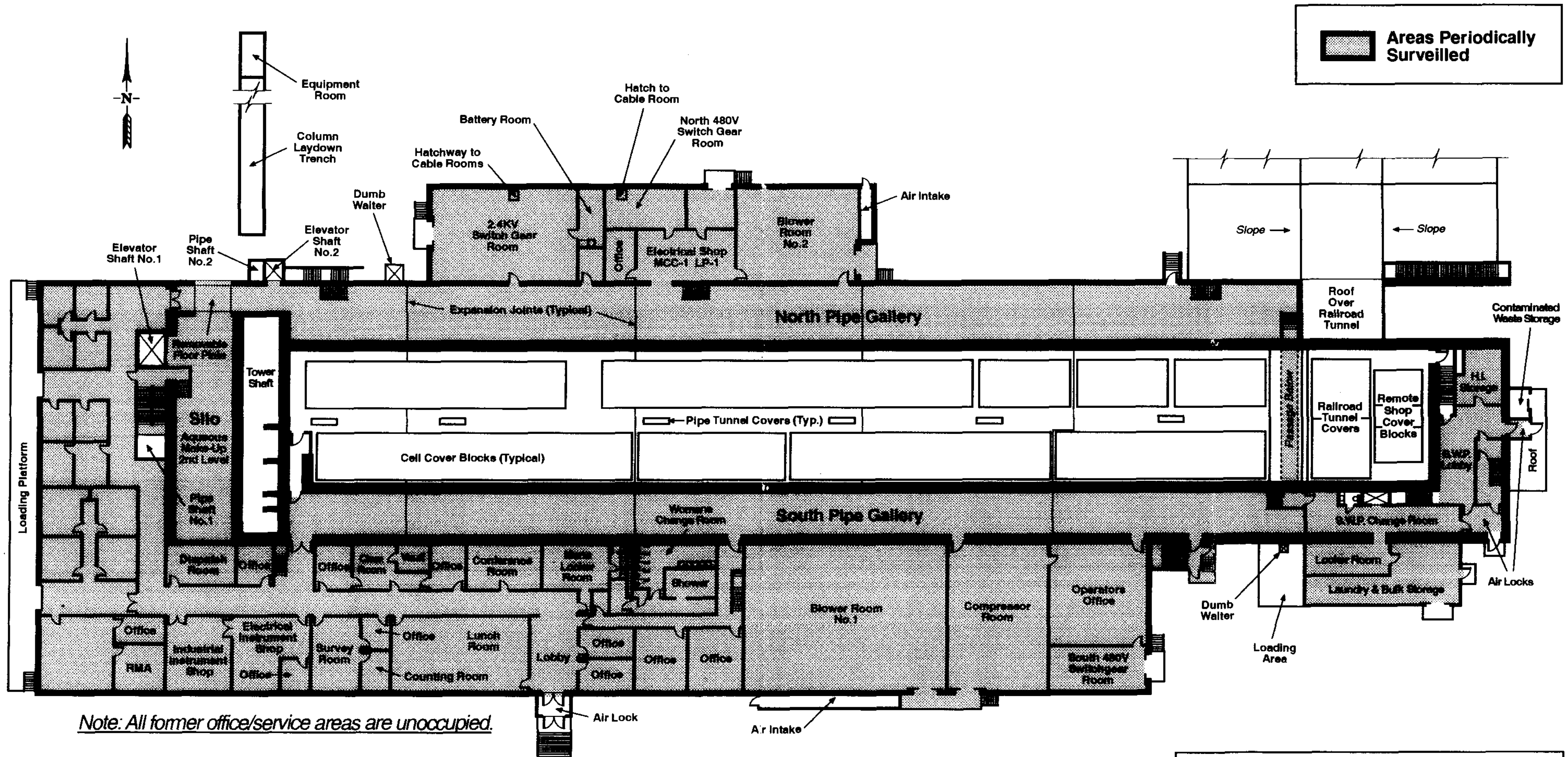
Figure 2-4. Plan View Pipe Gallery Level.

Plan View Pipe Gallery Level



Note: All former office/service areas are unoccupied.

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Ref. HW-18700 / Figure XI-6 / From DWG. H-2-7403

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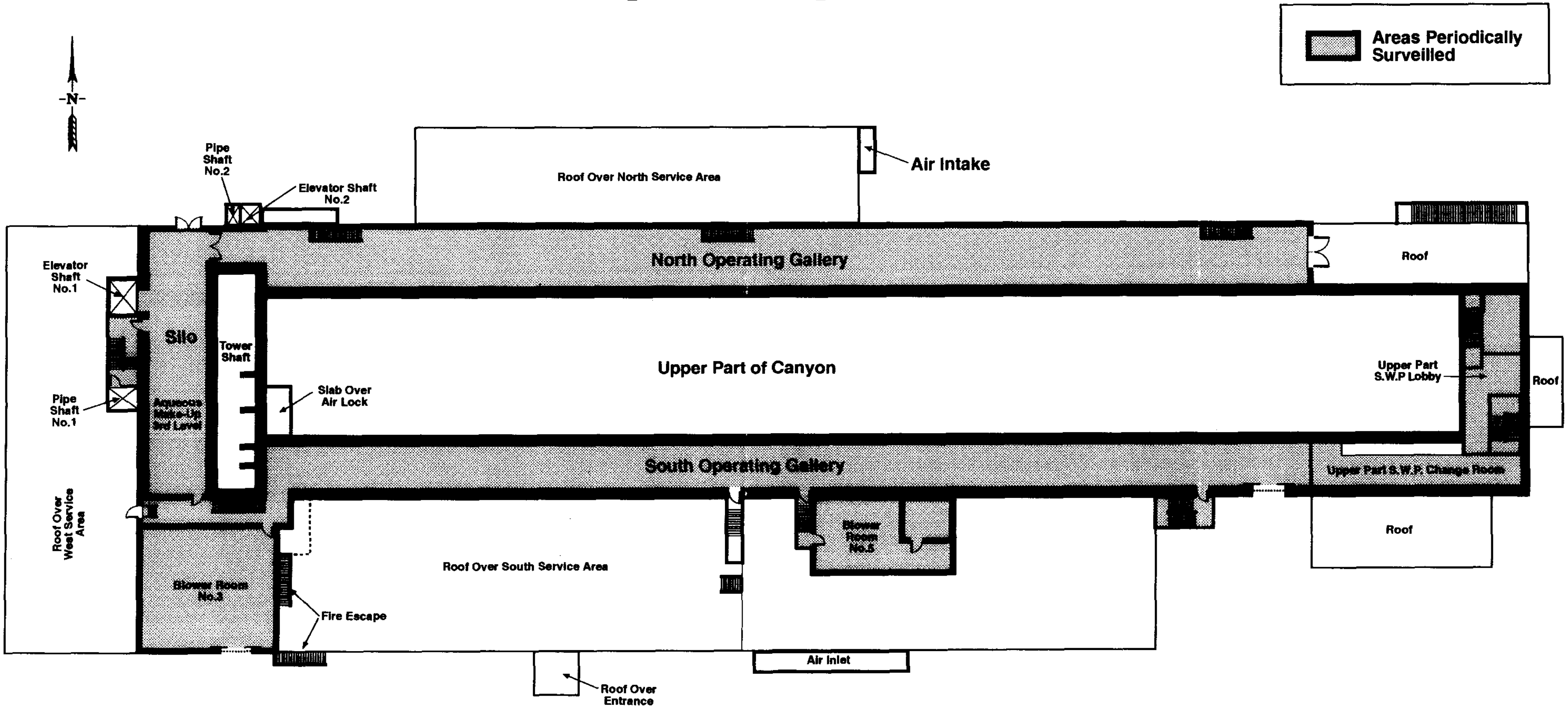
Figure 2-5. Plan View Operating Gallery Level.

Plan View Operating Gallery Level



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Ref. HW-18700 / Figure XI-7b / From DWG. H-2-7404

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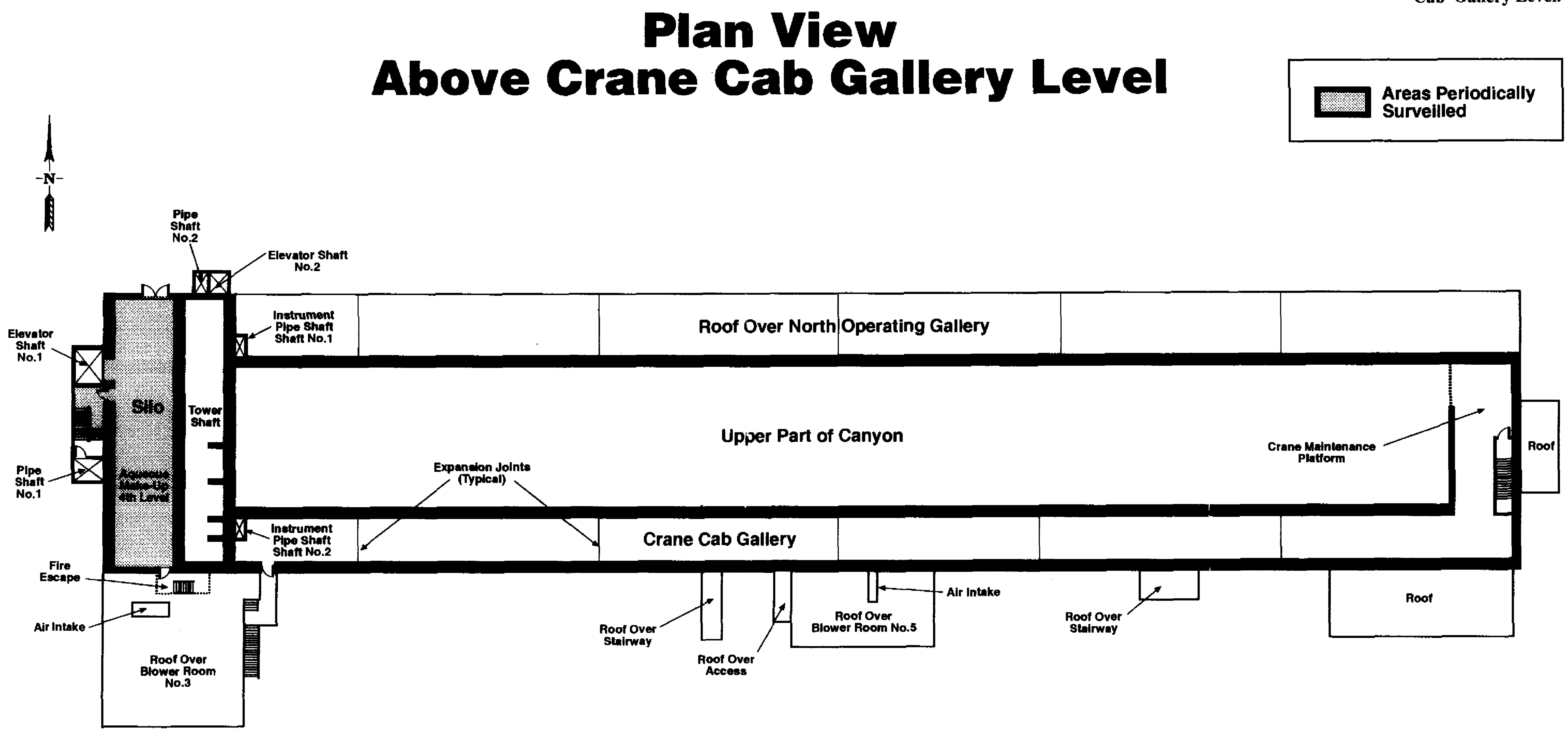
Figure 2-6. Plan View Above Crane Cab Gallery Level.



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Ref. HW-18700 / Figure XI-7a / From DWG. H-2-7404

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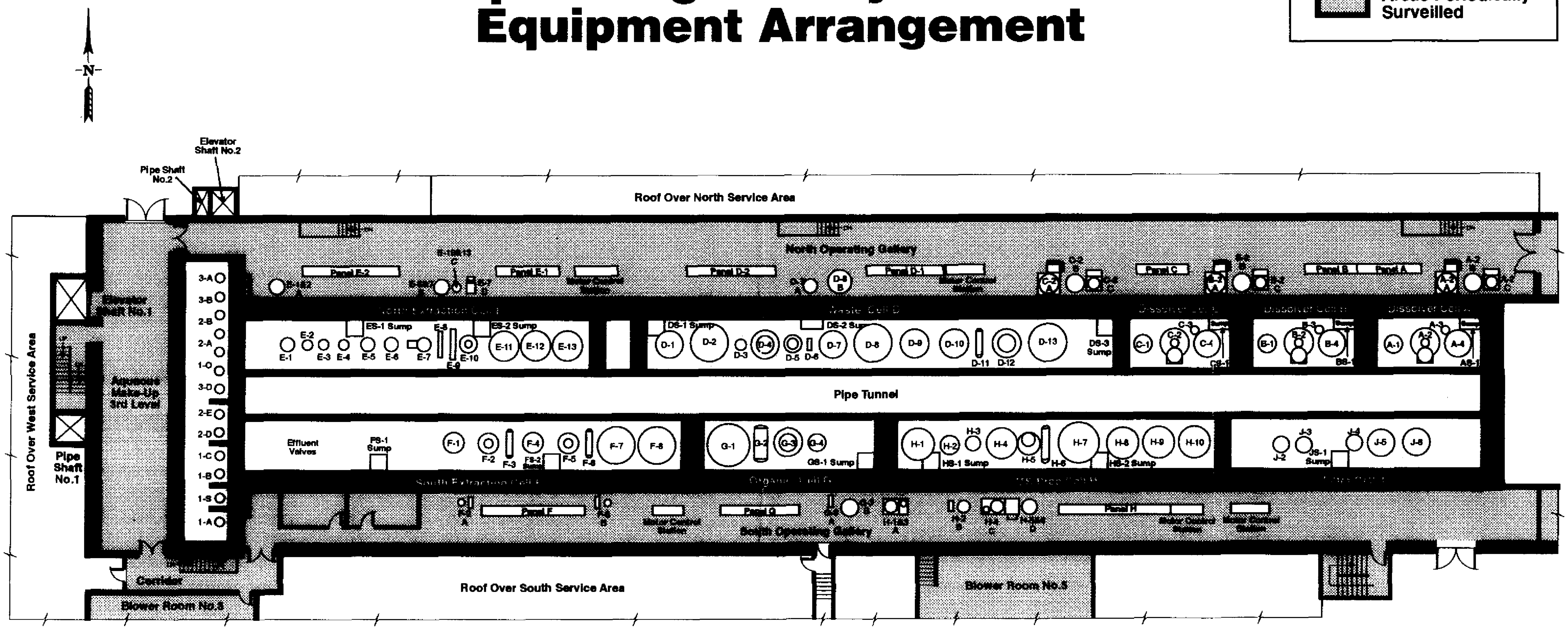
Figure 2-7. Plan View Canyon, North and South Operating Gallery Process Equipment Arrangement.

Plan View Canyon, North & South Operating Gallery Process Equipment Arrangement



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Ref. HW-18700 / Figure XI-9 / From DWG. H-2-8010, and DWGS. H-2-9441 Thru H-2-9472

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overhead space. The canyon area does not include the crane maintenance platform (CMP) or the crane cab gallery. The canyon area operated at high levels of radioactivity and is separated from the canyon service areas by massive concrete shielding. The canyon area is arranged in two parallel rows of process cells running east and west separated by 2-ft-thick concrete walls for shielding. Letters designates the nine cells of the canyon, as follows:

- Cell A - Dissolver Cell
- Cell B - Dissolver Cell
- Cell C - Dissolver Cell
- Cell D - Waste Cell (Treatment)
- Cell E - North Extraction Cell
- Cell F - South Extraction Cell
- Cell G - Organic Cell (Recovery)
- Cell H - Metal Solution Preparation Cell
- Cell J - Filter Cell.

Removable 4-ft-thick concrete process cell cover blocks form the canyon deck above the cells. The cell cover blocks are stepped and tapered to eliminate a path for direct radiation streaming and skyshine.

2.2.2 Galleries

Piping, operating, and sample galleries exist on the north and south side of the canyon. A storage gallery is located under the south sample gallery. The original Product Removal (PR) Cage, which served as the plutonium loadout hood, is located in the north sample gallery.

2.2.3 202-S Silo

The silo area, located at the west end of the canyon, houses deactivated solvent-extraction columns and aqueous makeup vessels. The tower process area was specifically designed to house long non-pulsed extraction columns so that column solutions cascaded from one column to the next. The silo is 132 ft high, 84 ft long, and 41 ft wide, and consists of former process and operating areas.

2.2.4 East End

The east end segment contains the former hot shops for the facility and the railroad access tunnel to the canyon processing area.

2.2.5 Attached Service Areas

2.2.5.1 North Service Area. The north service area contains a 2.4-kilovolt (kV) switchgear room, a wet cell battery room, the deactivated north 480-volt (V) switchgear room, blower room No. 2, and the former electric shop and office. Blower room No. 2 contains a deactivated supply fan for the north pipe and operating galleries. The electrical shop contains the motor control center (MCC) and lighting panel for the operating equipment in REDOX.

2.2.5.2 South and West Service Area. The south and west service areas contain blower room No. 1, a compressor room, the south 480-V switchgear room, and former chemical storage, equipment, shop, and office areas. Blower room No. 1 houses three deactivated supply fans for REDOX. The compressor room contains an operating air compressor and an instrument air dryer. The south 480-V switchgear room contains MCCs that have been deactivated.

2.3 SURVEILLANCE AND MAINTENANCE

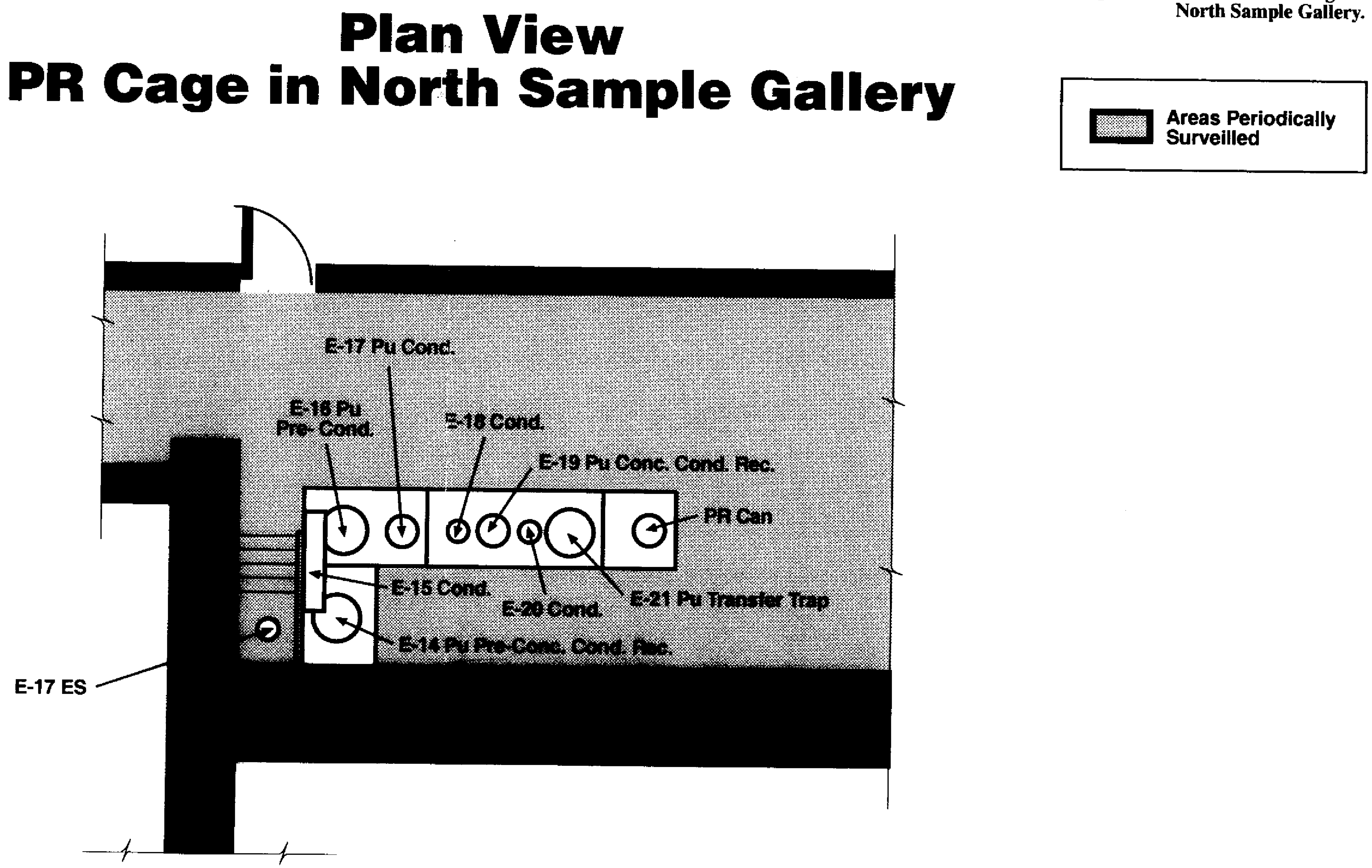
This section provides a description of the activities and operations envisioned for REDOX during this portion of its life cycle, prior to its ultimate disposition, (e.g., decontamination and decommissioning). This section identifies preplanned surveillance and preventive maintenance that maintains confinement of hazardous substances and protects the worker, public, and the environment. This work scope includes activities that are anticipated but not defined by pre-approved procedures. Examples of planned activities without pre-approved procedures include specific asbestos abatement actions, replacement or upgrades of postings and barriers, container management, demand repairs to structures, systems and components, spill response, characterization, and response or investigation of nontypical surveillance reports. Programmatic controls, described further in sections 3.0 through 7.0, are in place to ensure that S&M activities are within the Authorization Basis and protect the worker, public, and the environment. Maintenance activities are conducted in accordance with BHI-01044, *ERC Maintenance Implementation Plan for Nuclear Facilities* (BHI 1997a).

2.3.1 Surveillance

Figures 2-2 through 2-16 show areas that are periodically inspected as follows:

- Surveillance and Maintenance of Barriers and Postings
  Barriers and postings are used to prevent unwarranted access to hazardous areas and to inform personnel of conditions that exist at the REDOX Facility. Examples include locks and tags, door locks, fencing with locked access gates, confined space postings, and radiological area postings. Installation and inspection of barriers and postings is conducted as part of the REDOX S&M activities and is performed on a quarterly basis, as specified in BHI-FS-01, *Field Support Administration*, Section 2, Job Control, and Section 3, Surveillance and Maintenance. Any discrepant conditions regarding barriers or postings are identified on associated data/inspection sheets. Other general surveillance includes the following sections.

Figure 2-8. Plan View PR Cage in North Sample Gallery.



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Ref. HW-18700 / Figure XI-9 / From DWG. H-2-8010

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Figure 2-9. Plan View Silo Processing Aqueous Make-Up 2nd Level.

Plan View Silo Processing Aqueous Make-Up 2nd Level

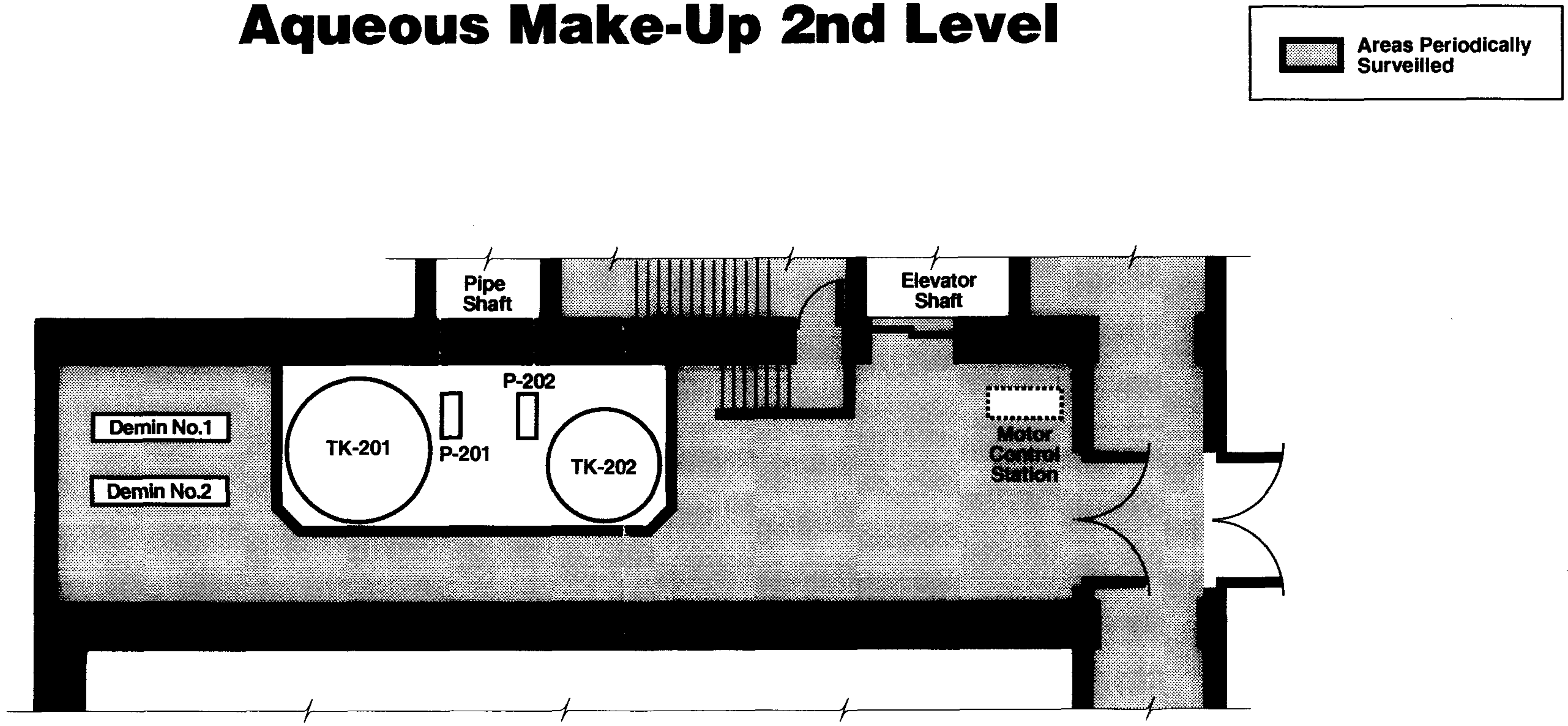

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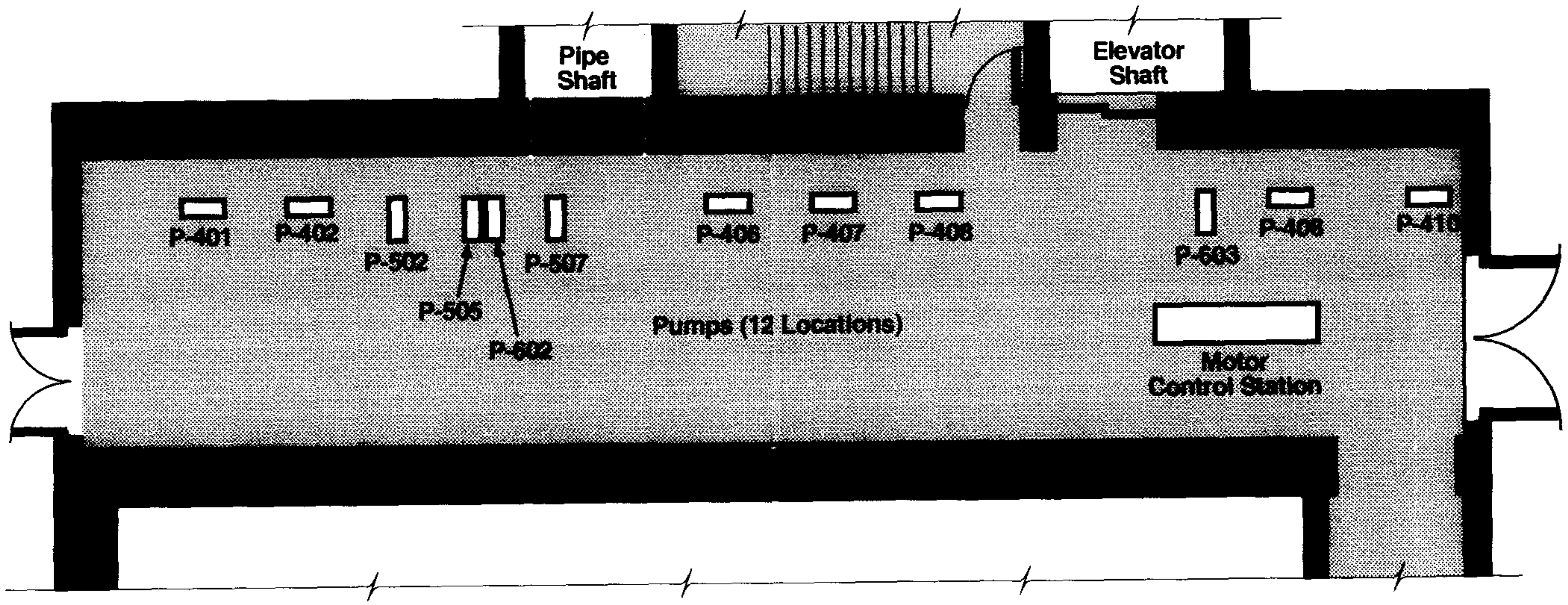
Figure 2-10. Plan View Silo Processing Aqueous Make-Up 3rd Level.

Plan View Silo Processing Aqueous Make-Up 3rd Level

Areas Periodically Surveilled



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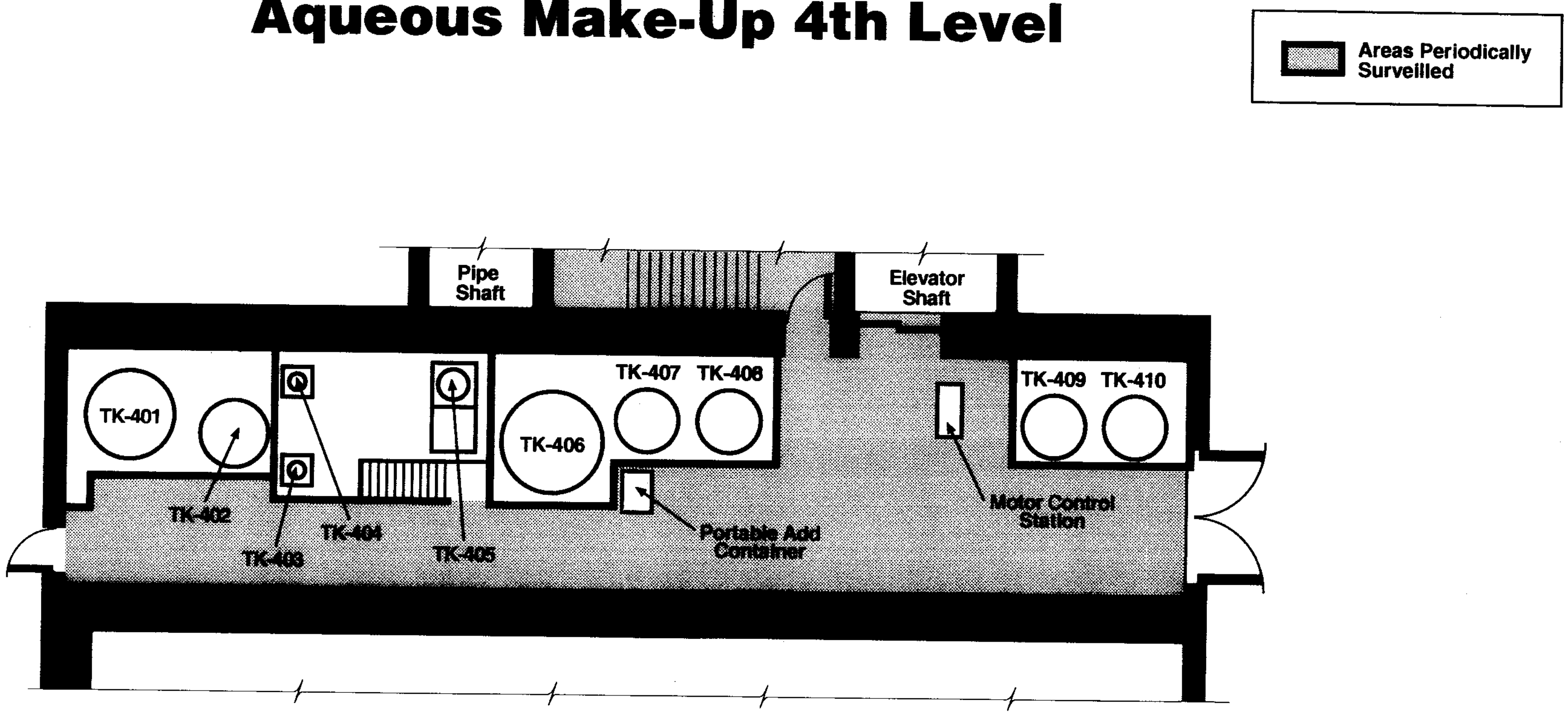
Plan View Silo Processing Aqueous Make-Up 4th Level

Figure 2-11. Plan View Silo Processing Aqueous Make-Up 4th Level.



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Ref. HW-18700 / Figure XI-9 / From DWG. H-2-8010

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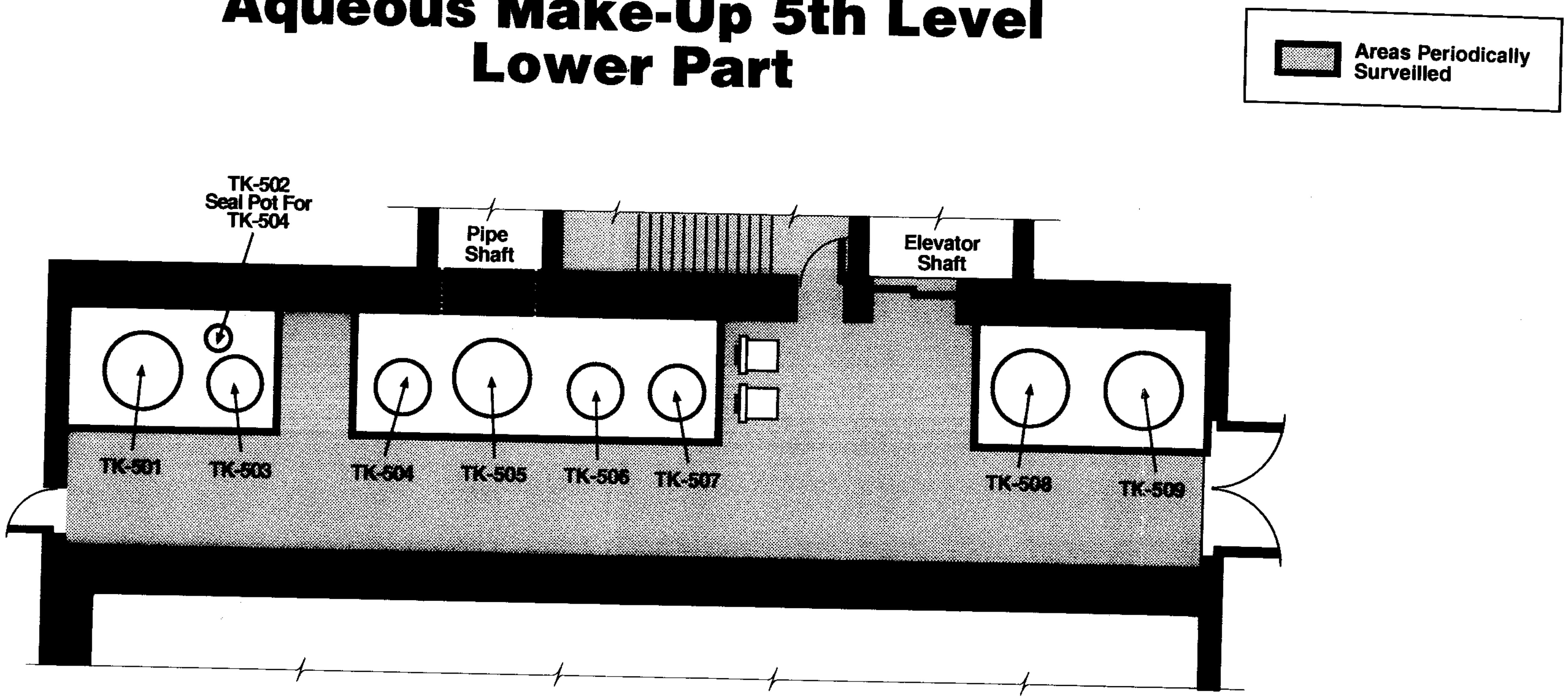
Figure 2-12. Plan View Silo Processing Aqueous Make-Up 5th Level Lower Part.

Plan View Silo Processing Aqueous Make-Up 5th Level Lower Part



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Ref. HW-18700 / Figure XI-9 / From DWG. H-2-8010

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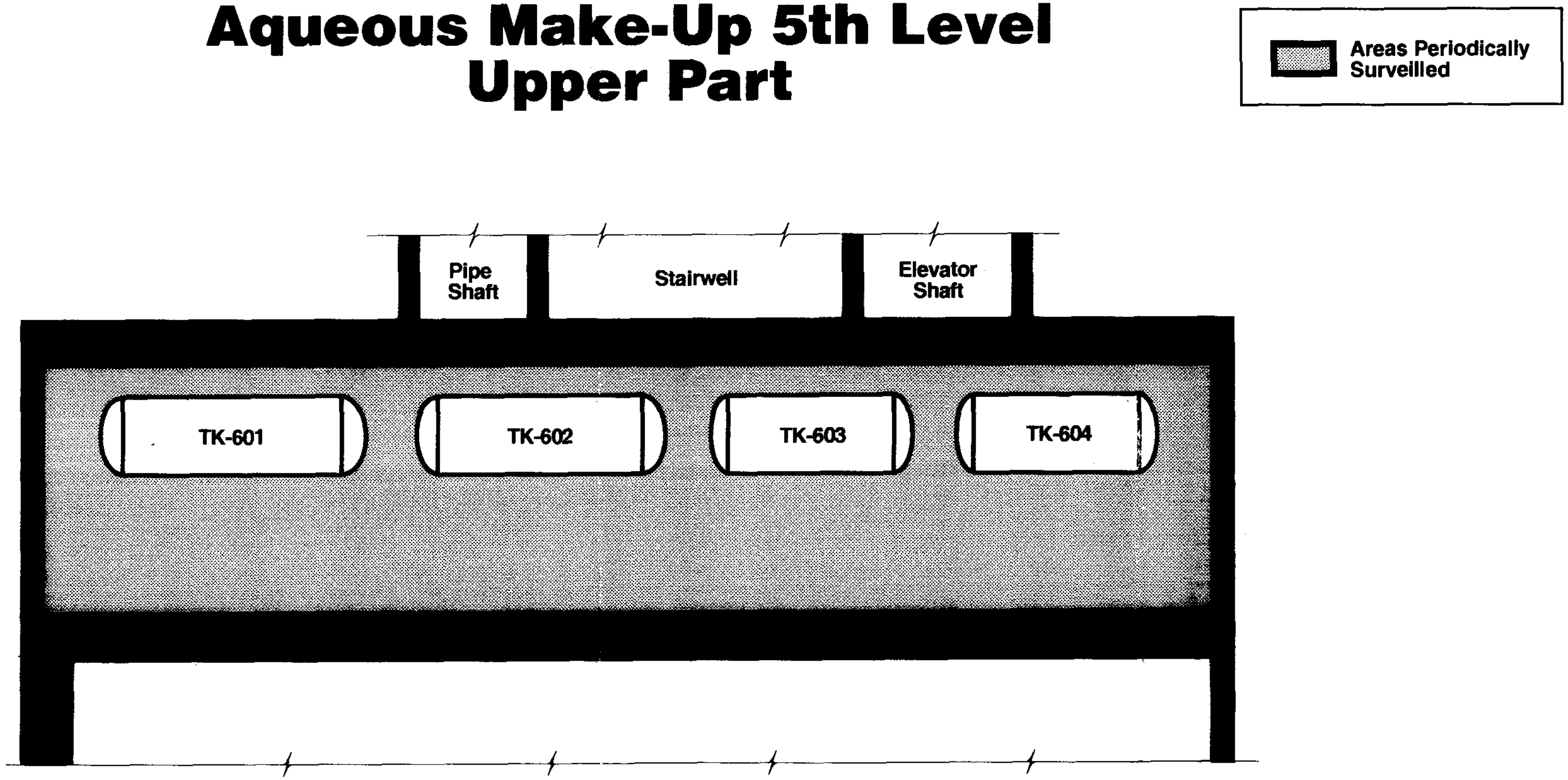
Figure 2-13. Plan View Silo Processing Aqueous Make-Up 5th Level Upper Part.

Plan View Silo Processing Aqueous Make-Up 5th Level Upper Part



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Ref. HW-18700 / Figure XI-9 / From DWG. H-2-8010

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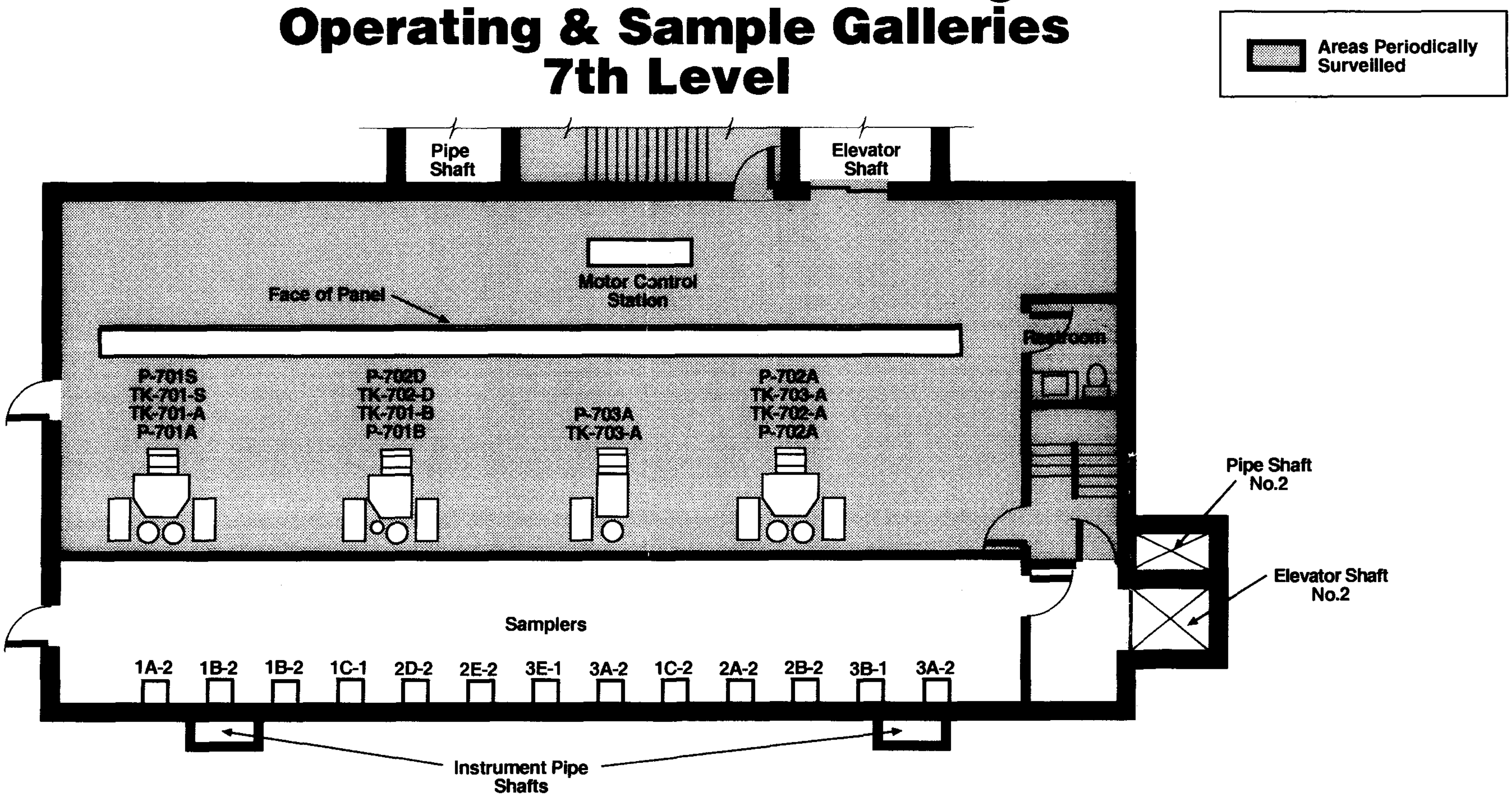
Figure 2-14. Plan View Silo Processing Operating and Sample Galleries 7th Level.

Plan View Silo Processing Operating & Sample Galleries 7th Level



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Ref. HW-18700 / Figure XI-9 / From DWG. H-2-8010

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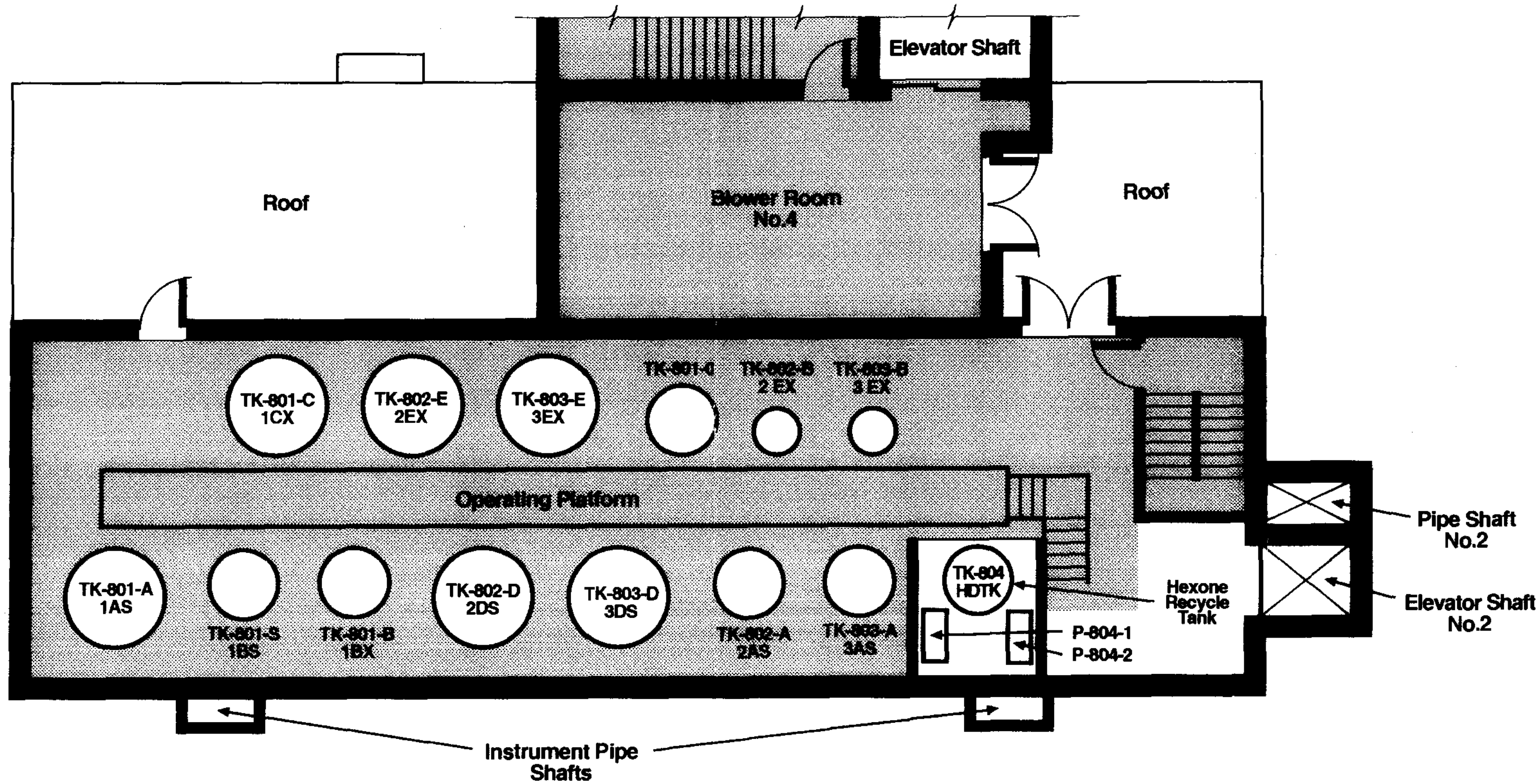
Figure 2-15. Plan View Silo Processing Feed Tank Area 7 1/2 Level.

Plan View Silo Processing Feed Tank Area 7 1/2 Level

Areas Periodically Surveilled



FOR ILLUSTRATIVE PURPOSES ONLY.

Ref. HW-18700 / Figure XI-9 / From DWG. H-2-8010

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Figure 2-16. Plan View Silo Crane Level 6th Level.

Plan View Silo Crane Level 6th Level

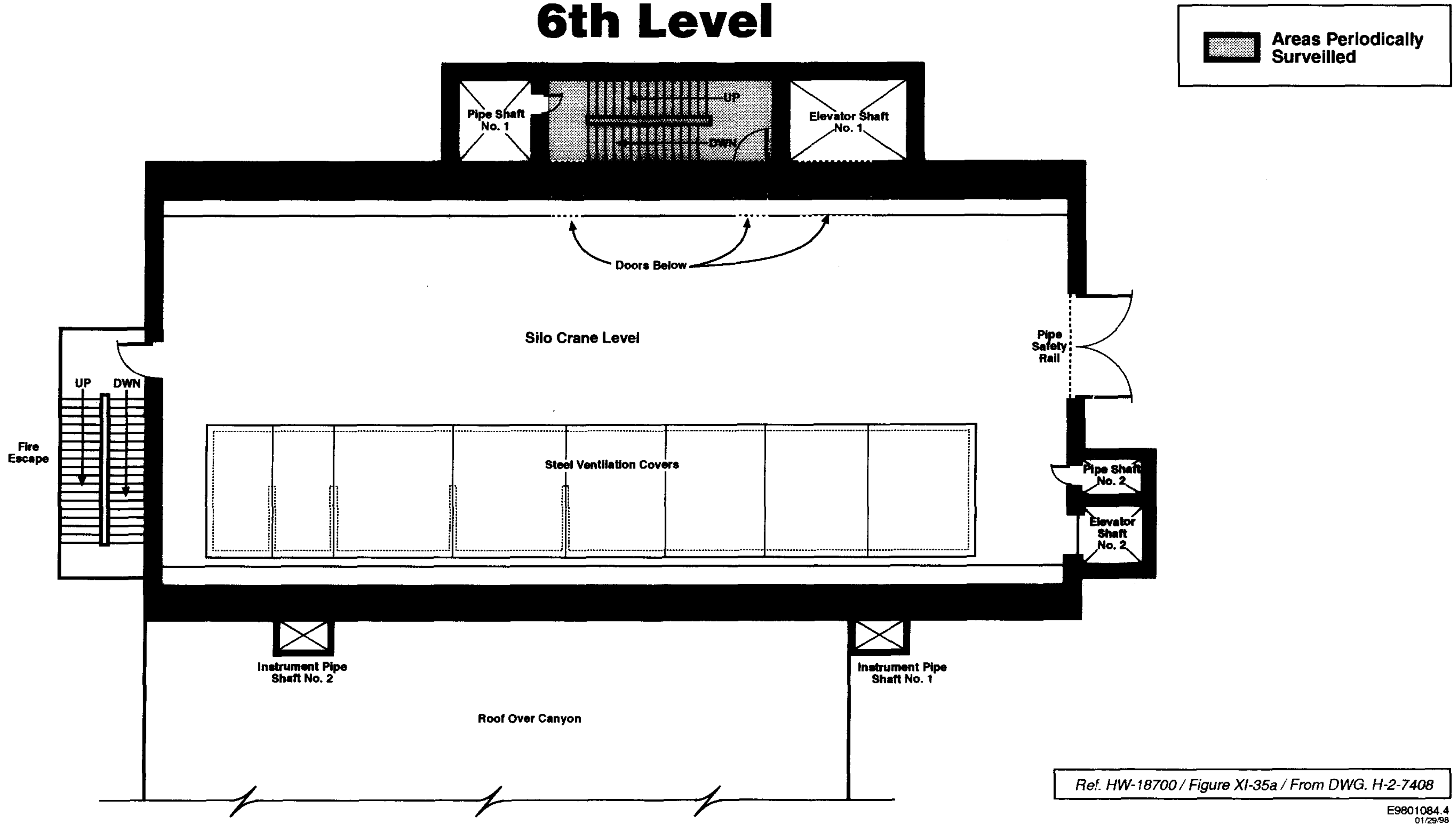

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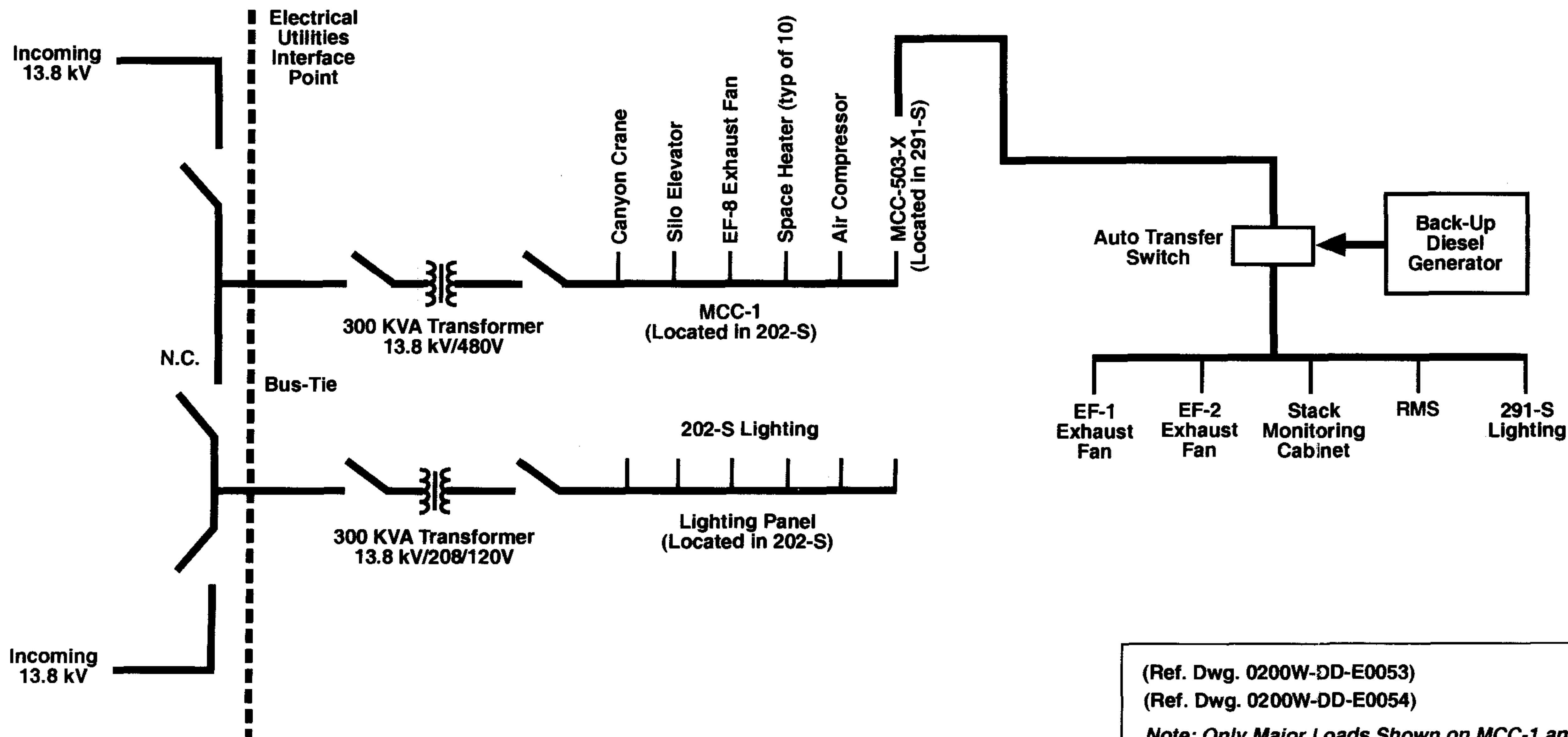
Figure 2-17. One-Line Electrical Schematic of REDOX Complex.

One-Line Electrical Schematic of REDOX Facility



(Ref. Dwg. 0200W-DD-E0053)
(Ref. Dwg. 0200W-DD-E0054)
Note: Only Major Loads Shown on MCC-1 and MCC 503-X

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- Identification and Removal of Asbestos
  Asbestos-containing materials or presumed asbestos-containing materials are inspected prior to commencement of renovation or demolition activity. If damaged friable asbestos is present, the area is posted as a regulated area. Depending on the scope and severity of the damage, repair, encapsulation, or removal is undertaken through the asbestos abatement program and appropriate radiological and industrial hygiene requirements are implemented.

- Container Management
  Quarterly surveillance activities include inspection of existing containers and sampling, identification, and labeling of unlabeled containers. Containers are removed and transported to a permitted storage facility for treatment, storage, and/or disposal (TSD). Periodic container inspections are performed to identify container deterioration or signs of leakage. If a deteriorating or leaking container is found, the container is repackaged and moved to an appropriate disposal facility. Corrective action is taken to prevent recurrence.

- Inspection for and Response to Spills
  The REDOX Facility is routinely surveyed on a quarterly basis for indications of spills of hazardous substances. If a spill is discovered, the affected area will be isolated to prevent personnel exposure, corrective measures will be determined, and the spilled material will be packaged and shipped to an appropriate disposal facility.

Other surveillances are conducted as follows:

- Daily monitoring of the REDOX Remote Monitoring System in accordance with BHI-FS-04, *Field Support Operating Procedures*, Procedure S-200-004, "Operation of the REDOX and U Plant Remote Monitoring System," Section 10.1, 'Shift Routines.'

- Engineering structural inspection, conducted on the REDOX Facility including interior, exterior, and roof, is conducted annually.

- As needed, nondestructive assay (NDA), waste characterization, and sampling may be performed in the REDOX Facility. The activities will be performed in accordance with established programs and procedures and shall comply with special controls (e.g., criticality reviews) as established in the Authorization Bases documentation. These activities may be performed to better identify and characterize radioactive material inventory and location, determine quantity and makeup of newly discovered materials, or to support planning for eventual disposition.

- Asbestos-containing materials or presumed asbestos-containing materials are inspected prior to commencement of renovation or demolition activity. If damaged friable asbestos is present, the area is posted as a regulated area. Depending on the scope and severity of he damage, repair, encapsulation, or removal will be undertaken through the asbestos abatement program and appropriate radiological and industrial hygiene requirements.

2.3.2 Maintenance

There are two types of maintenance: (1) preventive and (2) corrective. Preventive maintenance is conducted on a pre-scheduled basis to ensure proper functioning of operational equipment. Corrective maintenance is performed after equipment has malfunctioned or structural repair due to degradation or to upgrade facilities and/or equipment.

Preventive maintenance schedules are established based on manufacture recommendations, judgement based on performance history, and other field experience. A periodic review of the maintenance records is used to validate maintenance frequency.

Preventive maintenance includes routine calibration and testing conducted as appropriate on equipment such as level monitoring systems, fire extinguishers, batteries, ventilation systems, and electrical components. Elements and schedules for these activities are included in procedures and task instructions.

Corrective maintenance includes the following:

- Structural components necessary to ensure confinement will be repaired or upgraded to maintain control of hazardous substances. Corrective action will be performed in accordance with established programs and procedures. Changes will be evaluated on a case-by-case basis to determine if these are within the bounds of the authorization basis.
- Repair of confinement system is performed to confine hazardous substances within REDOX. Upgrades or physical changes to these systems may be undertaken if the changes provide equivalent or improved confinement. Changes will be evaluated on a case-by-case basis to determine if these are within the bounds of the authorization basis. The repair or upgrade to a confinement system will be evaluated against the existing design.

Other maintenance may include removal of nonprocess equipment or decon activities may be performed in REDOX in support of reducing the risks from known hazards (e.g., removing abandoned conduits, removing unused but energized electrical equipment) and redeploying obsolete equipment as spare and replacement equipment (e.g., switchgear and MCCs, etc.). These activities will be performed in accordance with established programs and procedures.

2.4 202-S CANYON BUILDING VENTILATION

The 202-S ventilation system is currently active to maintain confinement of contamination within the facility. The system maintains a negative differential pressure (dp) on the facility and exhausts air through two active stacks (291-S-1 and 296-S-2). Air is filtered through high efficiency particulate air (HEPA) filters prior to discharge to the environment. Both stacks are sampled one week each quarter to obtain record samples required by the Washington State Department of Health (DOH) regulation and the DOH Radioactive Air Emissions Permit No. FF01.

2.5 EQUIPMENT AND FLOOR DRAINS

The REDOX Facility sumps and internal drains in the operating sections of the building are inactive (plugged) and are not used. All process operations at the 202-S Canyon Building have been shut down for many years, and accumulations of liquids in equipment and floor drains is not subject to significant change. No significant accumulation of liquids exists in the equipment and floor drains of the 202-S Canyon Building. Connections to the sanitary from the north operating gallery bathroom are still in service.

At the 202-S Canyon Building, there are level indicators in all of process cell sumps and several deactivated process tanks that have air bubbler (weight factor) level instruments provided. These level instruments are believed to be functional; however, because they are located within the canyon process cells, this condition cannot be verified. Level indication for these sump and tank levels is provided both locally in the 202-S Canyon Building's operating galleries, and remotely in 271-U Building. According to plant staff, no significant changes in level have occurred in the last ten years.

Condensate forming in the 291-S-1 stack drains to the 292-S drain seal tank (191-S). Other liquid wastes are disposed of in accordance with established procedures.

2.6 SUPPORT SYSTEMS

2.6.1 Fire Protection Systems

A description of fire protection systems is contained in the Fire Hazard Analysis contained in Appendix D of BHI-01142 (Kerr 1998).

2.6.2 Radiation Detection Systems

Hand and foot monitors are placed at select entry and exit locations. The portal monitors are equipped with gas proportional detectors that use P-10 (90% argon, 10% methane) gas.

2.6.3 Remote Monitoring System

The REDOX Facility also has remote monitoring capability for continual surveillance of the following:

- Fifteen sumps and tanks in the canyon area.

- One sump and tank in 292-S.
- Differential pressure on the canyon, sample gallery, wind tunnel, sand filter, and 296-S-2 HEPA filter.
- Gallery to atmosphere dp.
- Sanitary water pressure.
- Exhaust fan bearing vibration and temperature.
- Stack samples for 292-S-2 and 291-S-1.
- Monitor and control capability for select equipment (i.e., exhaust fans and lighting).

2.7 UTILITY DISTRIBUTION SYSTEMS

Active utility distribution systems include electrical power, lighting, communication, and compressed air. There is no breathing air supply at REDOX. Steam supplies to the REDOX Facility have been physically isolated.

2.7.1 Electrical Power, Lighting, and Communications

Electrical power is supplied to the REDOX facility a single 13.8-kV to 480-V and 208/12-V line. An emergency 13.8-kV to 2.4-kV line passes through the 202-S Building and provides electrical power to the E8x115 aerial line. This line provides power to selective parts of the 242-S Building and monitoring equipment in the S Tank Farms. Actions are underway to terminate this power within REDOX and provide an alternate source. Once this is accomplished, the switchgear and wet-cell batteries within 202-S will be deactivated and removed from service.

A simplified one-line diagram of the electrical supply system and major loads is provided in Figure 2-17. Power at the 202-S Canyon Building is fed from a 480V MCC and various 208/120V lighting panels. The 202-S Canyon Building provides normal electrical power for the exhaust fan MCC located in the 291-S Building.

In the event of a loss of normal power, a standby diesel generator will start and power the exhaust fan MCC in the 291-S Building, providing power to EF-2, the 291-S stack pack, the remote monitoring and control system at the 202-S and 291-S Buildings, and lighting in 291-S. The diesel generator has remote indication, alarm, and operating status. Backup power is not provided for other equipment or systems of the REDOX Facility.

Communications for surveillance personnel are provided by an active telephone system at the 202-S Canyon Building, radios, and cellular telephones.

2.8 COMPRESSED AIR SYSTEM

Compressed air is provided for control air functions in the REDOX Facility. A single compressor, air receiver, and air dryer are skid mounted in the 202-S Compressor Room. All air is dried and supplied to one of two main branches.

One of the branch lines supplies air to the 291-S Building where it is reduced in pressure and used for control of EF-1 and EF-2 fan dampers and control functions of the MCC. This line also supplies the bubbler level instrumentation in 292-S Building. A second branch line supplies various monitoring instruments located in the 202-S Canyon Building.

As of the end of 1997, the REDOX Facility has the following remote instrument air monitoring and control capabilities:

- Air compressor operating status (feeder breaker position)—local start/stop control only
- Air compressor/dryer alarms
- Header blowdown features
- Remote indication of 292-S Building bubbler cabinet pressure.

2.9 WATER SYSTEMS

An existing 20-in. raw water main and a parallel 12-in. sanitary water main are located on the west side of the REDOX Facility exterior to the 202-S Building. From these mains, a 12-in. raw water line and a 6-in. sanitary line are extended to fenced area within the compound. The 6-in. sanitary line and 12-in. raw water line are terminated in the yard exterior to the buildings. In addition, a 12-in. raw water line and a 12- to 6-in. sanitary water line are extended down the west and south side of the facility; these lines are also terminating at the exterior of the buildings. The sanitary water main and branch line supply hydrants in the yard only and are used in manual fire fighting.

2.10 AUXILIARY SYSTEM AND SUPPORT FACILITIES

A variety of facilities that were involved in the waste generation, transfer, treatment, storage, or disposal are described in the following sections; additional information is contained in BHI-01142 (Kerr 1998).

2.10.1 291-S Exhaust Fan Building and Sand Filter

EF-1 and EF-2 for the 202-S Canyon Building are located outside of the 291-S Building. There are two identical, stainless steel, direct-driven blowers, installed in parallel, and powered by 60-horsepower electric motors. The fan (EF-1) located on the west end is referred to as the primary exhaust fan, while the other fan (EF-2) is the referred to as the standby exhaust fan. The 291-S Building is not occupied but entered quarterly for surveillance. Heavy weather damage to asbestos insulation in and around the building has occurred.

The 291-S sand filter removes radioactive particles from canyon exhaust air before discharge to the atmosphere. The sand filter is a below grade structure, approximately 85 ft by 85 ft by 20 ft, consisting of approximately 12 ft of sand and 8 ft of air space in a concrete shell. The filter media decreases in particle size from coarse gravel at the bottom to 30-mesh sand at the top. The roof over the sand filter was recently covered with urethane foam and silicone overcoating and is in good condition.

2.10.2 291-S-1 and 296-S-2 Operating Stacks

The 291-S-1 stack is the elevated effluent release point that ensures exposure of personnel to radioactivity is minimized. The stack is 14 ft in diameter at the base and stands 200 ft tall. The 291-S-1 and 296-S-2 stacks are currently included in the DOH Radioactive Air Emissions Permit - Permit No. FF01. Because normal operating emissions do not exceed 0.1 mrem/yr in accordance with 40 *Code of Federal Regulations* (CFR) 61 (National Emissions Standards for Hazardous Air Pollutants, these two stacks are NOT classified as "designated" or "major" stacks).

The 291-S-1 and 296-S-2 stacks have been included in the 1997 initial issuance of Hanford Site Air Operating Permit for 40 CFR 70 and *Washington Administrative Code* (WAC) 173-401. Under the proposed Hanford Site Air Operating Permit, the State of Washington Department of Ecology (Ecology) and the DOH share responsibilities for oversight and compliance, with Ecology responsible for nonradioactive airborne emissions and the DOH responsible for radioactive airborne emissions.

2.10.3 276-S Solvent Handling Facility

The 276-S Solvent Handling Building was formerly used for bulk storage of pure hexone in the outdoor underground S-141 and S-142 tanks and chemical treatment of new and recycled hexone in the internal building's three tanks. Hexone was used in the extraction of plutonium and uranium from dissolved fuel elements (WHC 1992). The building is located north and west of the 202-S Silo. This aboveground concrete building is 43 ft-2 in. wide by 58 ft long. The building was built in two sections, the process section and service/operating section.

The process section is 26 ft wide by 58 ft long with 2-ft-thick concrete walls on the south, east, and west sides. The north wall is constructed of a steel frame with corrugated asbestos siding. The process section housed three aluminum storage tanks used for treatment and storage of hexone. Since deactivation and cleanup of the building in 1967, the hexone storage tanks within the 276-S Building process section have not been used and were confirmed empty and clean in 1989.

The service/operating section is 15 ft wide by 58 ft long and has a steel framework with asbestos siding on all four walls and the roof. A 2-ft-thick concrete wall separates the process and operating sections with no interconnecting doors. All doors from both sections open to the outside. Valves required for operation have extension handles that pass through the center concrete wall separating the two sections.

Hexone storage tanks (276-S-141 and 276-S-142) are buried north of the 276-S Building. These single-shelled carbon steel storage tanks each have a capacity of 24,000 gal and were formerly used to store pure hexone for REDOX during operations. During deactivation, recovered hexone from the REDOX Building was placed in these tanks, as well as other on and offsite sources were placed in these tanks. From 1990 through 1992, 35,000 gal of the solvent remaining in the tanks was recovered from the tank, distilled, and incinerated. The process used to drain and flush the waste solvent is discussed in WHC-EP-0570, *The Distillation and Incineration of 132,000 Liters (35,000 Gallons) of Mixed-Waste Hexone Solvents from Hanford's REDOX Plant* (WHC 1992). This document, with the exception of 100 to 200 gallons of sludge which are presently under a Part A permit, reported these tanks to be empty and only sandblasting the interior of the tanks is required for final disposition. In addition, characterization of these former hexone storage tanks have shown that residuals are significantly below the lowest explosive limit and no special precautions are required (BHI 1998a).

2.10.4 292-S Control and Jet Pit House

The 292-S Building was built as part of the original REDOX Facility and formerly provided the control point for the discharge jets on dissolver vessels within cells A, B, and C of the 202-S Canyon Building. The jets have been deactivated. An exhaust jet pit (located directly beneath the building) housed jets and actuators which formerly controlled discharges from dissolver vessels and from the 291-S Building.

A second pit (located adjacent to the exhaust jet pit) is covered by exterior cover blocks. This 35-feet deep pit contains the drain seal tank (191-S) for discharge dissolver vent lines from 202-S Canyon Building and a sump that collects liquid from all vents and trenches in the 291-S, 292-S, and 293-S Buildings. Approximately 7 ft of water remains in the pit. Prior to cessation of REDOX operations, this liquid condensate remaining in the sump was air jetted into the drain seal tank (191-S) and then jetted to D-cell (waste cell) in the 202-S Canyon Building. Adequate liquid level exists in the drain seal vessel to ensure isolation of each contributing drain and vent line. Two liquid-level monitors are located in the 292-S Building to provide information on the status of the liquid in the sump and drain seal tank. S&M activities do not encompass liquid condensate removal. Therefore, work packages reviewed by the unreviewed safety question process must be prepared to drain this pit and drain seal tank.

2.10.5 293-S Nitric Acid Recovery and Iodine Backup Facility

The 293-S Nitric Acid Recovery and Iodine Backup Building was constructed in 1957 and formerly provided filter backup capabilities for radioactive iodine removal in combination with recovery of nitric acid vapors that developed when irradiated uranium fuel was dissolved. This building was not constructed as part of the original REDOX facility; it was added in 1957 and deactivated in 1969. The radioactive iodine was removed using a caustic scrubber system, and the acid fumes were captured in a nitric acid absorber. The recovered nitric acid (HNO_3) was stored in an underground, cylindrical, stainless steel, nitric acid storage tank (10 ft high by 10 ft in diameter) located directly west of the 293-S Building and sent back to 202-S for reuse. The tank is empty.

2.10.6 2718-S Sand Filter Sample Building

The 2718-S Sand Filter Sample Building is a wooden structure with sampling ports that were used to monitor performance of the exhaust air from the 291-S Sand Filter. The present sand filter dp gauge, which measures the pressure differential across the sand filter, is adjacent to this building.

2.10.7 211-S Liquid Chemical Storage Tank Farm

Liquid chemicals used in the REDOX process were received and stored in the 211-S Tank Farm. The tank farm contains eight above grade storage tanks of various sizes ranging from 4,300 gal to 149,000 gal. The tanks were constructed of mild steel, stainless steel, and aluminum, depending on the contents of the tank. The chemicals stored at the 211-S Tank Farm were nitric acid, sodium hydroxide, sodium dichromate, and aluminum nitrate nonahydrate. All tanks are empty.

2.10.8 2711-S Stack Gas Monitoring Building

The 2711-S Stack Gas Monitoring Building is a small wooden structure 12 ft by 14 ft by 8 ft in dimension with a sloping roof. The building was originally used for gas monitoring and storing samples from the 291-S-1 stack. The building is being used for original equipment storage. The interior, exterior, and roof of the building are in poor condition.

2.10.9 2715-S Storage Building

The 2715-S Building is a steel-framed structure with metal walls and roof that was used to store miscellaneous materials. The building is empty and it contains no hazardous materials or energies.

2.10.10 2904-SA Cooling Water Sampling Building

The 2904-SA Cooling Water Sampling Building was built in 1956 to provide sampling of process waste flowing from the 202-S Canyon Building through the 2904-S-170 weir to liquid waste disposal sites. The 2904-SA Building is an 8-ft by 8-ft by 8-ft high-prefabricated metal building that rests on a concrete foundation. The sampling equipment inside consists of a below grade, 2 ft by 3-ft stainless-steel tank with a sample riser coming up through the building floor and associated piping. The sample building extends 3 ft over the southern end of the 2904-S-170 weir. The building is no longer active.

2.10.11 2710-S Nitrogen Storage Building

The wood-framed 2710-S Nitrogen Storage Building was originally used to generate nitrogen gas for the REDOX canyon vessels and is presently not in use. Interior, exterior, and roof of the building are in poor condition.

2.10.12 2706-S Storage Building

The 2706-S Storage Building is a pre-engineered, metal building contains store equipment used for remote REDOX canyon crane maintenance (i.e., impact wrenches). The overall building is in good condition.

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3.0 WASTE MANAGEMENT AND ENVIRONMENTAL COMPLIANCE REQUIREMENTS

Waste management requirements during S&M activities at REDOX may apply to management and disposal of small quantities of various types of materials generated from routine S&M activities. Routine activities include handling and disposition of waste generated from small-scale cleanup, spill cleanup, and housekeeping activities. There are no routine waste streams resulting from REDOX S&M activities.

Environmental protection requirements directly related to the S&M scope of work include, inspections of differential air pressures for facility HEPA filtration systems, ensuring compliance with air emissions regulations, inspections of nitrogen flow meters and liquid level monitors for two underground dangerous waste storage tanks, and reporting of routine and non-routine releases and conditions. Requirements appropriate for monitoring and control of radiological conditions in the REDOX Facility are presented in section 4.0 and are not addressed here.

3.1 WASTE MANAGEMENT STANDARDS

REDOX is a deactivated surplus facility with the majority of hazardous materials consisting of fairly adherent films and residues in deactivated equipment and systems. Various NDA and sampling techniques are used for identification and characterization of potentially hazardous materials encountered or anticipated during S&M activities. Materials and determination methods are developed on a job-specific basis. The S&M activities involve handling and disposition of small quantities of waste generated from small-scale cleanup, spill cleanup, and housekeeping activities. The potential regulated wastes involve the following:

- Heavy metals (e.g., lead, mercury)
- Light bulbs
- Radioactively-contaminated rain water
- Contaminated oils
- Fuels
- Batteries
- Miscellaneous chemicals
- Miscellaneous liquids
- Asbestos
- Polychlorinated biphenyls (PCB)

Waste management requirements for hazardous (Washington State dangerous) and radioactive mixed wastes are primarily derived from WAC 173-303 and 40 CFR 260 through 268. With the exception of the hexone tanks, federal and state regulations pertaining to *Resource Conservation* *and Recovery Act of 1976* (RCRA) TSD units do not apply to materials residing within the REDOX complex until such time as the accumulated materials are physically disturbed (e.g., removed from the facility or treated or repackaged within the facility).

3.1.1 276-S Facility

The 276-S Facility is the only permitted TSD facility associated with the 202-S REDOX Facility complex. The hexone storage tank area is a fenced facility located due east of the 233-S Facility and adjacent to and east of the railroad spur servicing the REDOX complex. The TSD is comprised of two 24,000-gallon subsurface carbon steel tanks (276-S-141 and -142) that received liquid mixed waste from REDOX and possibly the Strontium Semiworks Facility. No solutions are thought to remain in the tanks. However, each tank contains a sludge heel of approximately one inch. The wastes are subject to the applicable requirements of WAC 173-303. However, dangerous waste management activities are not currently being applied to the tanks.

A brief history and a more detailed description of the 276-S Facility is provided in BHI-SH-03, Volume 3, Section 7.0, "Emergency Action Plan 202-S Hexone Underground Storage Tanks," which is used as a supplement to DOE/RL-93-75, *Hanford Facility Contingency Plan* (DOE-RL 1993), to ensure compliance with the contingency plan requirements of WAC 173-303 for RCRA waste management units.

Near-future waste generating activities associated with 276-S, other than normal maintenance activities (e.g., charcoal filter changeouts), are not anticipated. Any 276-S waste generating activities, whether normal maintenance or special circumstance, will be governed by a site-specific waste management instruction (SSWMI), that provides waste stream-specific guidance and is mandated by and adheres to all applicable requirements of BHI-EE-02, *Environmental Requirements*, and BHI-EE-10, *Waste Management Plan.*

The 276-S Facility is being closed under interim status. Interim S&M activities are performed in accordance with the permit and objectives of this plan.

3.1.2 202-S Facility

Dangerous wastes contained in REDOX process vessels will remain in the vessels during the S&M phase of the Facility. Generation of dangerous waste subject to the requirements of WAC 173-303, other than those wastes generated from routine S&M, is not anticipated. Dangerous waste generated during S&M activities may include, but are not limited to, hexone sampling tubes, battery acid and associated rags. The management of all dangerous waste generated from REDOX will comply with the applicable regulatory requirements of BHI-EE-02 and BHI-EE-10.

Radioactive constituents are inherent in regulated waste generated from REDOX S&M activities. Radioactive wastes are accumulated and managed in radioactive material areas (RMA) established and controlled in accordance with BHI-SH-02, Volume 1, *Safety and Health Procedures*, Procedure 1.19, "Designating and Controlling Radioactive Material Areas (RMAs)."

Additionally, radioactive wastes that are also regulated as dangerous waste (i.e., mixed waste), per WAC 173-303, are stored in RMAs that also meet the regulatory requirements for satellite accumulation areas (SAA) as provided in WAC 173-303-200 (2) and (3).

The number of RMAs and/or SAAs maintained in REDOX may vary if S&M waste generating processes or locations change. However, the variance should be minimal. As of the date this Plan was developed, REDOX contained five long term RMAs, of which one RMA also functions as a SAA containing mixed waste. An example of the REDOX RMA/SAA listing is listed in Table 3-1.

Table 3-1. Sample Listing of Radiological Material Areas and Satellite Accumulation Areas at the REDOX Facility

RMA No.	Description	Indoor/Outdoor	Active (A)/Inactive (I)
IFSM-95-0001	East end of REDOX	Indoor	A
IFSM-95-0002	Old Lad West end REDOX	Indoor	A
IFSM-96-0001	West Dock REDOX (b. box)	Outdoor	A
IFSM-96-0002 (SAA)	N. Switch Gear Rm. REDOX	Indoor	A
IFSM-96-0003	291-S	Outdoor	A

REDOX waste identification is accomplished via sampling and analyses and/or through the application of process knowledge. Utilizing the sample analyses and/or process knowledge provided by the Project, waste designation is performed by Field Support Waste Management (FSWM) in accordance with BHI-FS-03, *Field Support Waste Management Instructions*, Work Instruction W002, "Waste Certification."

All Environmental Restoration Contractor (ERC) generated waste, including REDOX S&M waste, is managed per the directives of a SSWMI provided by the Project, as mandated by BHI-EE-10. If the Project requests the assistance of FSWM with the preparation of the SSWMI, the formatting prescribed in BHI-FS-03, Work Instruction W006, "Site Specific Waste Management Instructions," is used for SSWMI development. The SSWMI provides waste stream specific management requirements including designation, separation and segregation, waste minimization, packaging, marking and labeling, storage, inspection, transportation, and tracking and traceability.

Quantities of regulated waste generated annually during REDOX S&M activities will vary with the with the special circumstances or projects undertaken in any given year that would be considered outside the normal scope of facility S&M. During fiscal year (FY) 1997, REDOX produced approximately 200 cubic feet of radioactive-only waste and approximately 46 cubic feet of mixed waste. The current select disposal facility for radioactive-only waste is the 200 West Area Burial Grounds, operated by the Project Hanford Management Contractor (PHMC). Mixed waste, when approaching the waste stream-specific quantity limits for SAAs (55-gal. for dangerous waste or one quart of acutely hazardous waste), is transferred to an ERC less than 90-day accumulation area (e.g., 1330N Waste Handling Facility) for interim storage prior to final transport to the 200 West Area Central Waste Complex (CWC). The CWC is also operated by the PHMC.

The movement of regulated waste from REDOX to a less than 90-day accumulation area (e.g., 1330N Waste Handling and Storage Facility) or a permitted TSD will be facilitated by a FSWM or other Hanford Site authorized shipper. The shipment will be certified via the shipper's signature on the appropriate shipping documents

Two underground hexone tanks at REDOX are designated as RCRA TSD units. These tanks are not in active use and are considered unfit for service. Because process liquids have been removed and only a mixed-waste sludge containing four curies of radioactive material and minor quantities of organic solvents remains, release of liquids from these tanks is considered to be low risk. Inspection of these tanks in accordance with WAC 173-303-320 is required pending completion of RCRA closure activities. As agreed to by the regulatory agencies, the WAC 173-303-320 inspection requirement will be met by weekly inspections of the nitrogen cover system and liquid level monitors associated with these tanks

DOE Order 5820.2A, *Radioactive Waste Management*, is used as the applicable standard for radioactive and mixed waste under the provisions of the *Atomic Energy Act of 1954*. Federal standards under the *Clean Air Act of 1955* and *Toxic Substances Control Act of 1976* are the primary standards applicable to the management of asbestos waste and PCBs, respectively.

Detailed information regarding waste management requirements applicable to REDOX S&M activities are presented below.

3.1.3 Dangerous/Hazardous Waste Standards

3.1.3.1 Generator Standards. Dangerous waste generator standards would apply to any regulated dangerous waste resulting from S&M activities. WAC 173-303-070 requires that a generator determine whether a waste is subject to regulation as a dangerous waste. Sampling and testing methods to be used in making dangerous waste determinations are specified in WAC 173-303-110. 40 CFR 262.11 requires that the generator also determine the status of any RCRA regulated waste with respect to the land disposal restriction standards of 40 CFR 268.

Dangerous waste generated by S&M activities at REDOX would most likely be managed in containers. Container management standards are specified in WAC 173-303-630, and include provisions for container integrity, labeling, compatibility, separation and segregation, inspections, and provision of secondary containment. WAC 173-303-160 establishes requirements for determining whether a container may be considered "empty" and therefore exempt from dangerous waste management standards.

Since there are no permitted container storage areas at REDOX, containerized dangerous waste from S&M activities would be subject to the accumulation standards of WAC 173-303-200. With the exception of SAAs, a 90-day accumulation limit is applicable and specified personnel training, preparedness and prevention, contingency planning and emergency preparedness, and general inspection requirements would be imposed. Requirements for SAAs (specified in WAC 173-303-200(2)) are somewhat less stringent. There is no specified time limit for SAAs; however, quantities are limited to 55 gallons of dangerous waste or one quart of acutely hazardous waste. Generators of RCRA regulated wastes would also be subject to a variety of generator responsibilities established in the land disposal restriction regulations of 40 CFR 268.

3.1.3.2 Treatment, Storage, and Disposal Facility Standards. Certain TSD standards of WAC 173-303 apply to the hexone storage tanks at REDOX. These tanks have been deemed unfit for use and are therefore subject to the requirements of 40 CFR 265.196 as invoked by WAC 173-303-400. In addition, WAC 173-303-400 invokes standards of WAC 173-303-280 through -440, including provisions for security, personnel training, general inspections, contingency planning and emergency preparedness, and facility recordkeeping and reporting. Particularly relevant with regards to the REDOX S&M activities are the inspection requirements of WAC 173-303-320. As agreed to with the regulators, these requirements are met by performing a weekly inspection to ensure proper operation of the associated nitrogen cover system. Additionally, weekly inspection of the liquid level monitors is performed. Any problems identified during inspections are remedied. Inspection records are kept in the Hanford Facility Operating Record. (Close Out Form for Environmental Compliance Issues Identified in DOE/RL Letter 95-PCA-342, dated July 6, 1995; Tracking Number 16.6.2: 40.16, approved January 13, 1997 [DOE-RL 1995].)

3.1.4 Radioactive Waste Standards

Chapter III of DOE Order 5820.2A establishes a variety of requirements that are applicable to S&M activities at REDOX involving the generation of low-level radioactive or mixed waste. These include the following:

- Per item 3(c)(1) of the Order, technical and administrative controls are required to ensure reduction in the gross volume of waste generated and/or the amount of radioactivity requiring disposal.

- Per 3(c)(2), auditable programs must be in place to assure that the amount of low-level waste generated or shipped for disposal is minimized.

- Per 3(d), low-level waste must be characterized with sufficient accuracy to permit proper segregation, TSD. Characterization must ensure that the actual physical and chemical characteristics and major radionuclides are recorded and known during all phases of waste management. Characterization records must be maintained.

- Per item 3(e)(1), waste generators must ensure that low-level waste shipped to another facility is done in accordance with the receiving facility requirements.

- Per 3(e)(3), generators shall implement a waste certification program to provide assurance that the receiving facility waste acceptance criteria are met.

- Per 3(f)(1), low-level waste must be treated by an appropriate method to ensure disposal can be done in a manner that is protective of public health and safety.

- Per 3(g)(4), each low-level waste package must be labeled to show the type of waste contained.

In addition to these DOE Order requirements pertaining to the generation of low-level waste, Chapter III item 3(k)(2) requires monitoring of non-operational low-level TSD facilities in order to allow for measure to prevent migration of radionuclides. This requirement is applicable to areas of REDOX where low-level waste exists, including waste sites covered by the REDOX S&M program.

3.1.5 Asbestos Standards

The REDOX S&M activities include the cleanup of small amounts of asbestos. Asbestos cleanup activities are done in accordance with 40 CFR 61.150. Per this standard, asbestos cleanup must be done in a manner that prevents any visible emissions to the outside air. Asbestos-containing waste must be adequately wetted then sealed in leak-tight containers or wrapping. Containers or wrapped materials must be labeled. Disposal at an appropriate waste disposal site must occur as soon as practical.

3.1.6 Polychlorinated Biphenyl Standards

Spills or discharges of materials containing greater than 50 parts per million (ppm) of PCB (measured prior to the spill or discharge) are subject to PCB regulations of 40 CFR 761. Specific PCB testing methods are identified in 40 CFR 761.60(g). Regulations at 40 CFR 761.125 establish requirements for PCB spill cleanup. Included are provisions for reporting, cleanup methodology and decontamination requirements, disposal of cleanup debris and materials, and recordkeeping. Cleanup actions must be completed within 48 hours of discovery of the spill for low-concentration spills involving less than 1 pound of PCB. Cleanup actions for high-concentration spills or spills involving more than 1 pound of low-concentration PCBs must be completed within 24 hours. Post-cleanup sampling is required in accordance with 40 CFR 761.130. 40 CFR 761.65(c) establishes standards for temporary storage of PCB cleanup wastes in specified containers for a period of up to 30 days. Containers in temporary storage must be properly dated, inspected, and labeled; PCB storage records must be maintained. After 30 days, the containers must be moved to an approved PCB disposal or storage-for-disposal facility. PCBs are regulated as dangerous waste (W001) in concentrations between 2 to 50 ppm (WAC 173-303-9904).

3.2 ENVIRONMENTAL PROTECTION STANDARDS

In addition to waste management standards described in Section 3.1, environmental protection requirements address releases to air and soil, emergency/contingency planning, and environmental reporting requirements.

Standards for surface water discharges and underground injection of rainwater are not applicable to the REDOX facility because all drains have been plugged as part of deactivation. However, the potential exists for external discharge of contaminated rainwater through cracks and joints in the floor. Because the piping systems were drained as part of transition, significant quantities of liquids are not likely to remain. Therefore, any spills are expected to be fully contained within the building. A variety of release reporting requirements may apply if a release to the environment were to occur. In addition to spill and release reporting requirements, routine reporting requirements apply to S&M activities at REDOX.

Standards contained in WAC 246-247 are applicable to airborne radionuclide emissions from the REDOX facility. In addition, a best management practice inspection standard for differential air pressures for HEPA filters has been established.

Detailed information regarding environmental protection requirements applicable to REDOX S&M activities are presented below.

3.2.1 Air Emission Standards

In accordance with 40 CFR 61, Subpart H, and WAC 246-247, radionuclide airborne emissions from all combined operations at the Hanford site may not exceed 10 mrem/yr effective dose equivalent to the hypothetical offsite maximally exposed individual. WAC 246-247 requires verification of compliance, typically through periodic confirmatory air sampling.

Two exhaust stacks at REDOX (stacks 291-S-1 and 296-S-2) are subject to confirmatory radionuclide emissions monitoring required by WAC 246-247-075. Per agreement with the U.S. Environmental Protection Agency (EPA), sampling of the REDOX stacks is required four weeks per year, one week per quarter, for gross alpha and gross beta. (See memo, J. E. Rasmussen [RL] to A. W. Conklin [DOH], "National Emission Standards for Hazardous Air Pollutants Federal Facility Compliance Agreement: Periodic Confirmatory Measurement Protocol," [DOE-RL 1996b]) Sampling records must be kept.

Per WAC 246-247-075, training records must be kept demonstrating that appropriate supervisors and workers are adequately trained in the use and maintenance of emission control and monitoring systems, as well as in the performance of associated test and emergency response procedures. To demonstrate compliance with "as low as reasonably achievable control technology" requirements of WAC 246-247, REDOX exhaust system maintenance and calibration records must also be maintained.

Two additional requirements are imposed on the REDOX exhaust systems as best management practices. First, in accordance with guidance provided in the *Nuclear Air Cleaning Handbook*, dp drops across HEPA filters are monitored, with filter changeout required when the pressure drop across the filter exceeds 5-in water gauge. Second, flow rate measurements and filter efficiency tests of the REDOX exhaust systems are required on an annual basis.

In addition to the noted application to the on-going exhaust systems, radionuclide emission standards would apply to S&M activities undertaken at REDOX if such activities could result in fugitive, diffuse, or point-source air emissions of radionuclides. If the potential exists for any non-zero radioactive emissions, "best available radionuclide control technology" would be required pursuant to WAC 246-247. If S&M activities could result in an increase of nonradioactive toxic air pollutants to the atmosphere above the small quantity emission rates, implementation of "best available control technology for toxics" would be required in accordance with WAC 173-460.

3.3 REPORTING STANDARDS

3.3.1 Reporting Requirements for Nonroutine Releases or Abnormal Conditions

3.3.1.1 Federal Hazardous Substance. 40 CFR 302 requires immediate notification to the National Response Center upon discovery of a release of a hazardous substance into the environment in excess of a reportable quantity.

40 CFR 355 requires immediate notification to the community emergency coordinator for the local emergency planning committee and to the State emergency response commission for a release of a reportable quantity of an extremely hazardous substance or a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* hazardous substance.

3.3.1.2 Dangerous Waste/State Hazardous Substance. WAC 173-303-145 requires immediate notification for any release of a dangerous waste or a state hazardous substance such that human health or the environment is threatened, regardless of the quantity. Notifications must be made to Ecology as well as to local authorities in accordance with the local emergency plan.

WAC 173-303-360 requires immediate notification to Ecology in the event of a release, fire, or explosion at a dangerous waste TSD facility or from a less-than-90-day accumulation area if the event represents an emergency that could threaten human health or the environment. In addition, immediate notification to local authorities is required if the facility emergency coordinator determines that evacuation of local areas may be advisable. A written report on any incident that requires implementation of the facility contingency plan must be submitted to Ecology within 15 days in accordance with WAC 173-303-360(2)(k).

3.3.1.3 Air Emission System Failure. WAC 246-247-080(5) requires notification to the DOH within 24 hours of any shutdown, or of any transient abnormal condition lasting more than four hours, or other change in facility operations which, if allowed to persist, would result in emissions of radionuclides in excess of applicable standards. If requested by DOH, a written report must be submitted within 10 days.

3.3.1.4 PCB Spills. 40 CFR 761.125 requires notification in the shortest time possible after discovery (but no later than 24 hours) to the Pesticides and Toxics Substances Branch of the EPA regional office for PCB spills in excess of 10 pounds.

3.3.2 Reporting Requirements for Routine Releases

3.3.2.1 Dangerous Waste Reports. In accordance with WAC 173-303-390 and condition I.E.22 of the Hanford Sitewide RCRA Permit, an annual report is required for facilities that treat, store, or dispose of dangerous waste. This requirement would apply to the hexone storage tanks at REDOX.

WAC 173-303-220 requires an annual report from generators of dangerous waste. This provision would apply to any S&M activities undertaken at REDOX resulting in the generation of a dangerous waste.

The Tri-Party Agreement requires an annual report pertaining to any land disposal restricted mixed waste generated, treated, stored, or disposed at Hanford. REDOX S&M activities involving land disposal restricted mixed waste would need to be included in this report.

The PHMC coordinates preparation and compiles the dangerous waste reports. The REDOX S&M program will need to provide applicable information to the PHMC to support development of these reports.

3.3.2.2 Air Emissions Report. WAC 246-247-080 requires an annual air emissions report. Information pertaining to the two REDOX exhaust stacks will need to PHMC for use in compiling this report.

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4.0 RADIOLOGICAL CONTROLS

Radiological conditions for facilities within the Surveillance/Maintenance and Transition Project have been assessed to ensure adequate radiological controls have been implemented to perform S&M activities safely. The radiological control activities implemented for the facilities to demonstrate compliance with DOE Order 5480.1, *Radiation Protection for Occupational Workers*, are described in the following:

- 10 CFR 835, *Occupational Radiation Protection*
- HSRCM-1 *Hanford Site Radiological Control Program*,
- BHI-SH-01, *ERC Environmental Safety and Health Program*, Section 10.2, "Radiological Controls,"
- BHI-SH-02, Volume 1, <u>General Procedures</u>,
- BHI-SH-02, Volume 2, <u>Radiological Control Implementing Procedures</u>, and
- BHI-SH-04, *Radiological Control Work Instructions*.

Prior to the performance of surveillance or maintenance activities, the proposed activity is discussed with the Radiological Controls organization to determine the scope of the activity and radiological survey requirements needed.

The REDOX Facility contains a variety of radiological areas. These areas include the following:

- Radiological Buffer Areas (RBA),
- Fixed Contamination Areas (FCA),
- Contamination Areas (CA),
- High Contamination Areas (HCA),
- Radiation Areas (RA),
- High Radiation Areas (HRA), and
- Airborne Radioactivity Areas (ARA).

The areas of the building most frequently entered for S&M activities consist of FCAs, RBAs, and CAs. These areas are surveyed and controlled in accordance with Bechtel Hanford, Inc. (BHI) procedures and the Radiation Protection Program.

Current conditions for some specific areas are outlined below. If conditions change, the appropriate radiological controls and postings will be implemented in accordance with approved BHI procedures. The sample gallery is posted as a CA and an ARA. The north sample gallery has some areas that are posted as HCAs. The Plutonium Load-out Hood is located in the north sample gallery and is posted as a HCA. The appropriate respiratory protection and protective clothing, and dosimeter requirements are specified on the Radiation Work Permit (RWP) for entry into this area.

The remote shop is posted as a HCA, RA, and ARA. This area is normally included on the surveillance that is performed for the sample gallery. Entry requirements are specified on the RWP for this area.

The CMP is posted as a HCA, ARA, and RA. A RWP, Level 1 as low as reasonably achievable (ALARA) review, and technical assessments for air sampling and survey requirements are required for entry. The RWP specifies the dosimeter, protective clothing and respiratory protection requirements for entry.

A portion of the silo at the crane level is posted as a HRA. This area is not entered for routine surveillance or maintenance. Entry would require a minimum of a RWP, Level 1 ALARA review, technical assessments for air sampling and survey requirements, surveys performed by Radiological Control Technicians (RCT), a HRA Access Plan, and a current survey of the area.

The canyon area of REDOX is posted as a HRA, HCA, and ARA. This area is not entered for surveillance or maintenance purposes.

Technical assessment documentation may be issued by the Radiological Control organization to provide direction concerning the isotopes of concern, any specific survey and/or air sampling requirements. Additionally, dependent upon work scope and expected radiological conditions, an ALARA review may be performed. RCTs assess radiological conditions of the work/surveillance area in accordance with BHI procedures and issue technical assessments, document survey results, and ensure correct radiological postings/boundaries of the area.

Based upon the results of the radiological survey, a RWP is issued describing the appropriate personnel protective clothing, dosimeter requirements, respiratory protection and RCT coverage requirements.

5.0 QUALITY ASSURANCE

The ERC Quality Program as documented in BHI-QA-01, *ERC Quality Program,* satisfies the requirements of both DOE Order 5700.6C, *Quality Assurance*, and 10 CFR 830.120, "Quality Assurance Requirements." For the S&M of the REDOX Facility, BHI-QA-01 is augmented by WHC-EP-0536-3, *Quality Assurance Program Plan for Radionuclide Airborne Emissions Monitoring* (WHC 1995), and BHI-QA-03, *ERC Quality Assurance Program Plans,* Plan No. 3.2, "Quality Assurance Program Plan for the Surveillance and Maintenance of Nuclear Facilities."

5.1 TRAINING AND QUALIFICATION

Training requirements for ERC personnel performing and/or supporting activities in nuclear facilities are documented in the "Training Implementation Matrix for ERC Managed Nuclear Facilities," Appendix 3, 'REDOX Facility' (BHI 1998c), which contains the training requirements specific to REDOX.

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6.0 SAFETY AND HEALTH /EMERGENCY PREPAREDNESS

6.1 HAZARDS

Hazard analyses are conducted for S&M activities in accordance with the work control process. The team examines available facility data and proposed activities and processes for hazards, and develops controls for hazards that may pose a threat to workers, the public, or the environment. BHI-SH-02, Procedure 1.7, "Project Safety Planning and Documentation," in concert with BHI-FS-01, Procedure 2.1, "Work Control," ensures that the appropriate level of safety documentation is implemented for all S&M work activities.

6.2 EMERGENCY PREPAREDNESS

Administration (preparedness and planning) of the emergency management program for the 202-S (REDOX) Facility is found in BHI-SH-03, *Emergency Management Program*, Volume 2, Section 3.0, "Emergency Action Plan 200 Area S/M&T." BHI-SH-03 meets the requirements of DOE/RL-94-02, *Hanford Emergency Response Plan* (DOE-RL 1996a), and the applicable emergency management DOE Orders and state and federal regulations.

If an emergency occurs at the REDOX facility, the response to mitigate would not be part of the S&M, rather would fall under the ERC Emergency Management Program as outlined in BHI-SH-03, which implements the applicable DOE *Emergency Plan Implementing Procedures* (DOE-RL 1998).

The following documents the Emergency Management measures taken at the REDOX Facility during S&M.

6.2.1 Emergency Preparedness (Training of Personnel)

The REDOX Facility is locked and unoccupied. S&M personnel make entries into the compound during monthly routine and quarterly surveillances. Therefore, no permanent emergency equipment, communications equipment, warning systems, personal protective equipment, spill control, and containment supplies are located within the facility.

Prior to routine and quarterly entries, personnel will review the appropriate procedures and attend pre-job safety meetings. The procedures, emergency plan, and meetings dictate the appropriate emergency equipment to be taken into the work area(s), will identify the facility specific hazards, and the appropriate evacuation routes and notifications if an incident occurs.

6.2.2 Emergency Planning (Development of the Emergency Action Plan)

Emergency Plan (emergency action plan [BHI-SH-03, Volume 2, Section 3.0]) has been developed to ensure proper response(s) of employees if an emergency occurs. Facility-specific hazards have been outlined in BHI-00066, *Hanford Surplus Facilities Hazards Identification Document* (Egge 1997) and/or 0202S-SSHS-G0001, "REDOX Site Specific Health and Safety Plan (200 West Area)" (BHI 1998b). Primary and Alternate Building Emergency Directors (BED) and appropriate evacuation routes are included in the emergency plan. The emergency plan for REDOX is an Emergency Evacuation Information Board posted just inside the east entrance for employees to review prior to conducting S&M.

6.2.3 Emergency Response (Evacuation)

If an emergency or abnormal incident occurs during S&M activities, personnel will evacuate the facility and communicate the abnormal condition information to the Patrol Operations Center on 911 (if using a cellular phone, 373-3800), their supervisor, and the BED.

6.2.4 Emergency Prevention

Performance of post-deactivation S&M activities and personnel training mitigates contamination migration and/or minimizes the potential for unplanned sudden radiological or hazardous releases.

6.2.5 Incident Response

The initial response to any emergency is to immediately protect the health and safety of individuals in the immediate area and to initiate a request for emergency response.

7.0 HAZARDOUS SUBSTANCE INVENTORY MANAGEMENT AND PROTECTION

The following hazardous substances will be managed in accordance with ALARA considerations and applicable requirements provided in section 3.0 above. Compliance with hazardous material protection requirements are ensured as described in BHI-SH-01, BHI-SH-02, Volumes 1 and 4, and BHI-SH-05, *Industrial Hygiene Work Instructions*.

7.1 INVENTORY OF RADIOACTIVE MATERIALS

The majority of the radiological inventory at the REDOX Facility is located within the cells of the canyon in the 202-S Building and 291-S exhaust system sand filter. Relatively minor quantities exist in other buildings, typically as residues or surface contamination. Table 7-1 presents the inventory for the 202-S Canyon Building and sand filter. The values in Table 7-1 are based on the best available data. For radiological consequence calculation purposes, the alpha activity is assumed to be plutonium-239, and the beta activity is assumed to be strontium-90. These assumptions are conservative in that plutonium-239 and strontium-90 have the largest dose conversion factors of those radionuclides potentially present in significant quantities.

In general, detailed radionuclide characterization data (i.e., form, quantity, and location) for the 202-S Canyon Building does not exist. The values listed in Table 7-1 are based on best available information. Recent surveys (BHI 1997b) have identified significant accumulations of residual materials in the North Sample Gallery, located primarily in PR Cage processing equipment (see Table 7-2). The summary of fissionable material listed in Table 7-2 is based upon limited features of the PR Cage; however, the likelihood that other vessels and piping associated with the PR Cage contain significant fissionable inventories is low. Because of the extensive chemical cleaning of the process vessels and piping followed by weekly flushing with water (Foster 1977), the radioactive material remaining in these confinement systems are likely encrusted and fixed to the internal surfaces and not easily dislodged. The balance of the radioactive material is assumed to be loose surface contamination distributed throughout the structure.

The inventory of radioactive material in the 202-S Canyon Building presents both an external exposure and internal deposition hazard to facility workers. Dose rate and surface contamination surveys and air sampling are routinely performed.

Table 7-1. REDOX Facility Radiological Inventory.[a]

Facility	Inventory/Location	Source Document	Remarks
202-S Canyon Building	1,500 Ci alpha (24,500 g of ^{239}Pu 9,000 Ci beta (64 g of ^{90}Sr) No location specified. Assumed distributed about the facility. Primarily concentrated in the canyon process cells, silo, and processing equipment	SD-DD-FL-001 (RHO 1982)	Based on historical published data, the basis of which is unknown. Assumption is that all alpha is $^{239/240}Pu$ and all beta is ^{90}Sr.
202-S North Sample Gallery	140 Ci of ^{239}Pu (2,155 g ^{239}Pu) 840 Ci of ^{90}Sr (6.0 g of ^{90}Sr)	BHI-00994 (BHI 1997b)	See Table 7-2
291-S Sand Filter	340 Ci alpha (5,600 g of ^{239}Pu) 8,000 Ci beta (57 g of ^{90}Sr)	Calculation 0200W-CA-N0007 (BHI 1998a)	Estimated inventory based on stack emission data and assumed sand filter efficiency of 99.95%.

Pu – plutonium; Sr – strontium

Table 7-2. Fissionable Material in the 202-S Sample Galleries.[a]

Component	Pu Inventory (g)	^{239}Pu Inventory (Ci)
H-4 Transfer Line (488 ft)	45.4	0.049
E-3 to L-12 Transfer Line (29 ft)	0.8	0.05
233-S Floor Drain Line (26 ft)	2.0	0.12
233-S Pipe Trench Line (10 ft)	0.6	0.04
PR Cage Sump (6 in. by 6 in. by 6 in.)	5.9	0.36
E-16 Pre-Concentrator	1,450	88.9
E-17 Concentrator	650	40
TOTAL	2,155	132.1[(1)]

Source: BHI-00994 (BHI 1997b), uncertainty is approximately ±10% (one sigma)
[(1)] Assumed to be 140 Ci of ^{239}Pu in document for conservatism.
Pu – pluotium

[a] BHI-01142, *REDOX Safety Analysis Report* (Kerr 1998)

7.2 HAZARDOUS CHEMICAL AND TOXIC MATERIAL INVENTORIES

Exposure to hazardous chemicals at the REDOX Facility was rated as "low to negligible" in a risk management study of Hanford Site surplus facilities (WHC 1994). The study identified loose containerized chemicals, lead shielding and counterweights, deteriorating and flaking lead-based paints, mercury switches, and fluid-filled manometers present inside facility buildings and surrounding grounds.

The REDOX Facility formerly used large amounts of the following hazardous chemicals:

- Acetylene tetrabromide
- Hexone
- Nitric acid
- Sodium nitrate
- Sodium hydroxide
- Coating and caulking compounds
- Zirconium cladding material
- Ammonium fluoride - ammonium nitrate
- Tributyl phosphate
- Normal paraffin hydrocarbon (kerosene).

While deactivation activities removed a vast majority of these chemicals, minor quantities of residual chemicals are expected to be found in the process vessels and piping located in the various buildings throughout the facility. Deactivation procedures specified the use of nitric acid, permanganate, and oxalic acid that are also likely to be present in residual quantities.
In addition to residual quantities of process and deactivation chemicals, PCB light ballast, lead paint, lead material used for shielding, mercury in switches and lights, and used oils may be encountered during the conduct of S&M activities.

Asbestos-insulated steam lines run throughout the REDOX Facility. Asbestos was also used as a building material in the walls in the operating area of the 276-S Solvent Handling Building. The pre-existing conditions surveys (BHI 1994) noted several instances of friable asbestos in the various facility buildings, predominately in piping insulation.

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8.0 SAFEGUARDS AND SECURITY

Currently, the REDOX Facility is classified as a Hazard Category 2 nuclear facility. A letter requesting writing off the remaining Special Nuclear Material inventory as normal operating loss has been approved by the U.S. Department of Energy, Richland Operations Office (RL) (BHI 1995). Section 7.0 contains a summary of the remaining residual radionuclides remaining at the REDOX Facility. If during S&M of the REDOX Facility, any item or container is found that may be suspected to contain special nuclear material, notification shall be made to BHI management as appropriate.

During S&M the REDOX Facility and most of the ancillaries are unoccupied, locked, and/or sealed. A chain link perimeter fence with locked access gates deters physical access. Entry into the REDOX Facility fenced areas and buildings is limited to authorized personnel with proper training. Signs are posted accordingly throughout the facility identifying restricted access. The facility is entered only for S&M activities. Access control for REDOX and other surplus facilities is described in BHI-FS-01, *Field Support Administration*, Section 1.1, "Access Control and Administration for ERC Facilities."

There are no intrusion alarms or routine security patrols within the perimeter fence of the REDOX Facility. Hanford Patrol continues to provide routine security patrols in the vicinity as part of their patrols throughout the 200 West Area.

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9.0 COST AND SCHEDULE

Total estimated cost for S&M at the REDOX Facility on an annual basis is as follows:

Quarterly surveillance	$160K
Maintenance	900K

Activities described in section 2.3 are scheduled throughout the year in accordance with the applicable FY detailed work plan and the Field Support work package system described in BHI-FS-01.

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10.0 REFERENCES

10 CFR 830.120, "Quality Assurance Requirements," *Code of Federal Regulations*, as amended.

10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, as amended.

40 CFR 61, "National Emissions Standards in Hazardous Air Pollutants," *Code of Federal Regulations*, as amended.

40 CFR 70, "State Operating Permit Program," *Code of Federal Regulations*, as amended.

40 CFR 260, "Hazardous Waste Management System: General," *Code of Federal Regulations*, as amended.

40 CFR 261, "Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, as amended.

40 CFR 262, "Standards Applicable to Transporters of Hazardous Waste," *Code of Federal Regulations*, as amended.

40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste," *Code of Federal Regulations*, as amended.

40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.

40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.

40 CFR 266, "Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities," *Code of Federal Regulations*, as amended.

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*, as amended.

40 CFR 302, "Designation, Reportable Quantities, and Notification," *Code of Federal Regulations*, as amended.

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40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing Distribution in Commence, and Use Prohibitions," *Code of Federal Regulations*, as amended.

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BHI-FS-01, *Field Support Administration*, Bechtel Hanford, Inc., Richland, Washington.

BHI-FS-03, *Field Support Waste Management Instructions*, Bechtel Hanford, Inc., Richland, Washington.

BHI-FS-04, *Field Support Operating Procedures*, Bechtel Hanford, Inc., Richland, Washington.

BHI-QA-01, *ERC Quality Program*, Bechtel Hanford, Inc., Richland, Washington.

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