DOE/RL-2001-31
Revision 0

Radioactive Air Emissions Notice of Construction for Demolition of 303-K Storage Facility

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

United States Department of Energy
P.O. Box 550
Richland, Washington 99352

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Chris Gallinghouse 4-26-01
Release Approval Date

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TERMS

ALARA	as low as reasonably achievable
ALARACT	as low as reasonably achievable control technology
CAM	continuous air monitor
CFR	Code of Federal Regulations
Ci	curie
DOE-RL	U.S. Department of Energy, Richland Operations Office
dpm	disintegrations per minute
EPA	U.S. Environmental Protection Agency
HEPA	high efficiency particulate air (filter)
HPT	health physics technician
LIGO	Laser Inferometer Gravitational Wave Observatory
MEI	maximally exposed individual
mrem	millirem
NOC	notice of construction
PCM	periodic confirmatory measurements
PTRAEU	portable temporary radioactive air emissions unit
SEPA	State Environmental Policy Act of 1971
TEDE	total effective dose equivalent
WAC	Washington Administrative Code

METRIC CONVERSION CHART

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.0393	inches
inches	2.54	centimeters	centimeters	0.393	inches
feet	0.3048	meters	meters	3.2808	feet
yards	0.914	meters	meters	1.09	yards
miles	1.609	kilometers	kilometers	0.62	miles
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092	square meters	square meters	10.7639	square feet
square yards	0.836	square meters	square meters	1.20	square yards
square miles	2.59	square kilometers	square kilometers	0.39	square miles
acres	0.404	hectares	hectares	2.471	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.0352	ounces
pounds	0.453	kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
Volume			**Volume**		
fluid ounces	29.57	milliliters	milliliters	0.03	fluid ounces
quarts	0.95	liters	liters	1.057	quarts
gallons	3.79	liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.76456	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Energy			**Energy**		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.948	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds per square inch	6.895	kilopascals	kilopascals	0.14504	pounds per square inch

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Second Ed., 1990, Professional Publications, Inc., Belmont, California.

RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION FOR DEMOLITION OF 303-K STORAGE FACILITY

This document serves as a notice of construction (NOC) pursuant to the requirements of Washington Administrative Code (WAC) 246-247-060, and as a request for approval to construct pursuant to 40 Code of Federal Regulations (CFR) 61.07, for demolition of the 303-K Storage Facility.

The 303-K Storage Facility is a small building that was designed and constructed in 1943 primarily for the storage of uranium metal and fuel elements in the 300 Area of the Hanford Site. Radioactive decontamination activities also have been conducted in the 303-K Storage Facility. The structure most recently stored solid and liquid radioactive and mixed waste materials that have been removed. Current storage of uranium dioxide powder, pellets, pins and assemblies, and thorium powder will be removed and transported to the 200 Areas Plateau for disposition. The vacated structure has no identified future use and will be demolished.

Demolition of the 3707-G Building, an adjacent structure used as a change room, will be conducted in parallel with 303-K Storage Facility demolition activities.

The estimated potential total effective dose equivalent (TEDE) to the maximally exposed individual (MEI) resulting from the unabated, fugitive emissions from demolition of the 303-K Storage Facility and 3707-G Building is 1.3 E-03 millirem per year.

1.0 LOCATION

The 303-K Storage Facility is located in the 300 Area (Figures 1, 2 and 3). The address and geodetic coordinates for the 303-K Storage Facility are as follows:

U.S. Department of Energy, Richland Operations Office (DOE-RL)
Hanford Site
Richland, Washington 99352
300 Area, 303-K Storage Facility

46° 22" 14' North Latitude
119° 16" 42' West Longitude

2.0 RESPONSIBLE MANAGER

Mr. David T. Evans, Manager Facility Transition Division
U.S. Department of Energy, Richland Operations Office
P.O. Box 550
Richland, Washington 99352
(509) 373-9278

3.0 PROPOSED ACTION

The proposed action is to demolish a Hanford Site building, and adjacent structure, that has no future identified mission. As such, a potential new source will be created. The anticipated emissions associated with this activity are insignificant.

4.0 STATE ENVIRONMENTAL POLICY ACT

A State Environmental Policy Act (SEPA) environmental checklist form was submitted with *the 303-K Radioactive Mixed-Waste Storage Facility RCRA Closure Plan* (DOE/RL-90-04, Revision 2A), satisfying the requirements in accordance with WAC 197-11-845.

5.0 PROCESS DESCRIPTION

Descriptions of the 303-K Storage Facility, 3707-G Building, and demolition activities are provided in the following sections.

5.1 FACILITY DESCRIPTION

The 303-K Storage Facility is located in the northwest portion of the 300 Area (Figures 1 and 2). Operations began at the 303-K Storage Facility in 1943, and continue today.

The 303-K Storage Facility was designed and constructed in 1943. There is a sliding door on the north wall, a personnel door on the west wall, and there are no windows in the building. This cinder-block building has a poured concrete ceiling and no interior insulation or wallboard. The interior cinder-block walls were painted in 1977. The dimensions of the north end of the building are approximately 7.47 meters (24.5 feet) by 7.62 meters (25 feet) on the ground and 3.05 meters (10 feet) high. An H-shaped drainage trench was added to the north end of the building in 1953, at the same time the cinder-block wall was built dividing the building into northern and southern halves.

A high-efficiency particulate air (HEPA) exhaust system was installed in 1977 and was used until the fall of 1982. The HEPA exhaust system was turned on only at the end of the curing operation for the concreted billets of recyclable scrap uranium chips and fines or if hydrogen levels indicated a billet fire had occurred. Air was discharged horizontally from the exhaust system approximately 4 meters (13 feet) above ground [0.6 meters (2 feet) above the roof]. The HEPA exhaust system has not been used since the concrete curing operation was discontinued in 1982.

The 303-K Storage Facility was designed and constructed primarily for the storage of radioactive and mixed waste generated in the 300 Area. The following is a summary of the operational history:

- 1943 to 1953--building was used to store uranium metal (in various shapes) and fuel elements (aluminum-canned uranium).
- August 1953--building was remodeled to provide two rooms (north and south), and drainage trenches were added in the north room.
- 1953 to 1971--north end of the building was used to remove radioactive contamination from aluminum spacers used in the reactors.
- 1953 to 1996--radioactive and mixed waste has been stored outside the building on concrete, gravel, and asphalt pads (Note: these areas are not within the scope of this NOC).

- 1971 to 1977--north room was used for storage and removal of radioactive contamination from equipment.

- 1977--north room was used to cure concreted billets of recyclable scrap uranium chips and fines from the 304 Concretion Facility. The curing process was discontinued in the fall of 1982.

- 1982 to 1986--equipment storage and the removal of radioactive contamination, using alkaline solutions, continued at the 303-K Storage Facility.

- January 1986 to 1996--used for storage of containers filled with low-level radioactive waste and mixed waste (north end of building).

- 1995 to present--used for storage of uranium dioxide powder and thorium powder, pellets, pins and assemblies, and thorium powder (south end of building).

It is recognized that several factors associated with past operations might have resulted in contamination of the 303-K Storage Facility. These factors include radioactive decontamination processes, stored waste, and billet fires that occurred during concretion operations. However, there are no records of spills or leaks.

The 3707-G Building is a changeroom adjacent to, but not part of, the 303-K Storage Facility (Figures 1 and 2). This building is the small shed-like structure located to the west of the 303-K Storage Facility. The building is a single story cinder-block structure measuring 8.2 meters (29 feet) wide by 14.6 meters (48 feet) long. The sloped roof is constructed of precast concrete covered with felt, tar, and gravel. There is no evidence indicating that the interior of the 3707-G Building is contaminated with hazardous or radioactive substances. However, an area of the southern outside wall (approximately 36 square feet) has been designated as a fixed contamination area. Annual surveys are conducted, with general beta/gamma contamination identified[1].

5.2 DEMOLITION ACTIVITIES

All work will be performed in accordance with the approved radiological control procedures and as low as reasonably achievable (ALARA) program requirements. These requirements are carried out through the activity work packages and associated radiological work permits.

The roof, walls, floor, and foundation of the 303-K Storage Facility will be removed. The roof and walls of the 3707-G Building will be removed. As necessary, existing utilities and piping would be isolated and blanked, and the HEPA exhaust system would be dismantled and packaged for disposal. Demolition methods will be selected based on the structural elements to be demolished, remaining radionuclide contamination, location, and integrity of the structures. Demolition methods could include use of an excavator with a hoe-ram, a hydraulic shear with steel shear jaws, concrete pulverizer/breaker jaws, crane with wrecking ball, cutters, or mechanical/power saws. Heavy equipment would be used to demolish the 303-K Storage Facility. Heavy equipment such as a track-mounted excavator with bucket and thumb attachment would demolish the walls and roof of the building. As appropriate, dust suppressants would be used.

Once the building was brought completely to the ground, heavy equipment such as a front-end loader and the excavator would be used to load the debris into disposal transport trucks (e.g., roll on/roll off boxes or

[1] Fixed contamination levels for the 3707-G Building (a 36-square foot area) are reported as ~5,000 to 10,000 disintegrations per minute (per 100 square centimeters) general beta/gamma.

dump trucks). The disturbed area would be leveled and stabilized. The adjacent outside concrete and asphalt pads, and adjoining gravel area would remain in place. These pads and the gravel area would continue to provide protection by stabilizing any underlying soil that might be contaminated.

If needed or chosen for use during these activities, a portable temporary radioactive air emissions unit (PTRAEU) exhauster or HEPA filtered vacuum radioactive air emission unit could be used in accordance with the latest revisions of their NOCs (DOE/RL-96-75 and DOE/RL-97-50 respectively).

6.0 PROPOSED CONTROLS

Many of the emission controls used during the demolition activities are administrative, based on ALARA principles and consist of ALARA techniques. It is proposed that these controls be approved as low as reasonably achievable control technology (ALARACT) for demolition of the 303-K Storage Facility.

1. Health physics technician (HPT) coverage will be provided during all demolition activities.

2. Appropriate controls such as water, fixatives, covers, containment tents, or windscreens will be applied, if needed, as determined by the Health Physics organization.

3. After leveling, the soil surface radiological contamination levels will be verified less than 5,000 dpm/100 cm^2 beta/gamma and less than 100 dpm/100 cm^2 alpha. If contamination is present above these levels, soil will be removed and containerized for disposal or covered or fixed to provide containment of the contamination.

4. As appropriate, before starting work on isolating utilities and piping or dismantling the exhaust system, removable contamination in the affected area(s) will be reduced to ALARA. Measures such as expandable foam, fixatives, or glovebags also could be used to help reduce contamination.

5. If a PTRAEU or HEPA filtered vacuum radioactive air emission unit is used, controls as described in DOE/RL-96-75 or DOE/RL-97-50 will be followed.

7.0 DRAWINGS OF CONTROLS

Drawings of controls are not applicable because the emission controls to be used during these activities administratively are defined, based on ALARA principles and consist of ALARA techniques.

8.0 RADIONUCLIDES OF CONCERN

The radionuclides of concern are technecium-99 (representing beta/gamma contamination), and uranium-234 and uranium-238 (representing alpha contamination).

9.0 MONITORING

The potential unabated offsite dose associated with this activity is calculated to be less than 0.1 millirem per year. Therefore in accordance with 40 CFR 61, Subpart H, periodic confirmatory measurements (PCM) will be made to verify the low emissions.

The proposed PCM will consist of radiological surveys (smear samples). These methods of PCM are not a direct measurement of effluent emissions. The surveys will be performed to demonstrate that contamination levels are below the criteria specified in Section 6.0. As such, the actual emissions would be below the estimated emissions, as estimated emissions rates are based on smearable contamination levels (refer to Sections 10.0 and 13.0).

If a PTRAEU or HEPA filtered vacuum radioactive air emission unit are used, PCM for emissions from those units will be performed as required by DOE/RL-96-75 and DOE/RL-97-50 respectively.

10.0 ANNUAL POSSESSION QUANTITY

The annual possession quantity associated with demolition of the 303-K Storage Facility is based on the following conservative assumptions.

1. From the Closure Plan (DOE/RL-90-04, Revision 2A, Section 2.0, F2-4 & F2-7):

   Facility dimensions are ~ 48' x 27' x 10.5'

Floor + ceiling = 2 x 48' x 27'	=	~2,600 ft^2
N/S walls = 2 x 27' x 10.5'	=	567 ft^2
E/W walls = 2 x 48' x 10.5'	=	1,008 ft^2
Total Surface Area	=	~4,200 ft^2

   929.034 cm^2 = 1 ft^2

   Therefore, Total Surface Area = ~4,000,000 cm^2.

   Isotope breakdown (Ci/MTU) from HNF-SD-NR-HC-006, Rev. 1, *Hazard Classification for Fuel Supply Shutdown Facility*:

   U-234 5.8×10^{-1}
   U-235 2.7×10^{-2}
   U-237 4.7×10^{-2}
   U-238 3.5×10^{-1}
   Tc-99 1.7×10^{-1}.

   The alpha emitters are U-234, U-235, and U-238. For calculations, it is assumed that 60% of alpha is U-234 and 40% is U-238.=:

   U-234 = 1.4×10^{10} dpm/g = 6.3×10^{-3} Ci/g
   U-238 = 7.5×10^{5} dpm/g = 3.4×10^{-7} Ci/g.

   The beta emitters are U-237 and Tc-99. Because of the very short half-life of U-237 (days), for calculations it is assumed that 100% of the beta activity is due to Tc-99:

   Tc-99 = 3.8×10^{10} dpm/g; 1.7×10^{-2} Ci/g.

2. Survey Report No. V010101 for the 303-K North Building and Bull Pen indicated maximum smearable activity on the floors and walls to be 2,000 dpm/100 cm^2 beta/gamma and 140 dpm/100 cm^2 alpha. This is assumed to be the worst case of releasable material.

   Alpha:

   60% is U-234 (0.6) x 140 dpm/100 cm^2 x 4,000,000 cm^2 x 1 g/1.4 x 10^{10} dpm x 6.3 x 10^{-3} Ci/g = 1.5 x 10^{-6} Ci U-234

   40% is U-238 (0.4) x 140 dpm/100 cm^2 x 4,000,000 cm^2 x 1 g/7.5 x 10^{5} dpm x 3.4 x 10^{-7} Ci/g = 1.0 x 10^{-6} Ci U-238.

   Beta:

   100% is Tc-99 (1) x 2,000 dpm/100 cm^2 x 4,000,000 cm^2 x 1 g/3.8 x 10^{10} dpm x 1.7 x 10^{-2} Ci/g = 3.6 x 10^{-5} Ci Tc-99.

3. For the 3707-G Building, assume all beta/gamma activity in the fixed contamination area is attributable to Tc-99, given the 36 ft^2 area.

   Then: (1) x 10,000 dpm/100 cm^2 x 33,500 cm^2 x 1 g/3.8 x 10^{10} dpm x 1.7 x 10^{-2} Ci/g = 1.5 x 10^{-6} Ci Tc-99.

11.0 PHYSICAL FORM

The physical form of the radionuclides in the 303-K Storage Facility is particulate solid.

12.0 RELEASE FORM

The release form of the radionuclides is particulate solid.

13.0 RELEASE RATES

Unabated release rates resulting from these demolition activities are provided in Table 1 and are expected to be low. Unabated release rates were determined by applying the 40 CFR 61, Appendix D, release factor for particulates to the calculated inventory. The radionuclides of concern are technecium-99 (representing beta/gamma emitters), and uranium-234 and uranium-238 (representing alpha contamination). Abated emission rates are not provided in Table 1, as engineered abatement systems will not be used.

The proposed modification will be considered 'batch mode' operation in accordance with WAC 246-247-110(13)(b).

14.0 LOCATION OF MAXIMALLY EXPOSED INDIVIDUAL

The maximum public receptor (MPR) was assumed to be a non-DOE worker who works within the Hanford Site boundary and who eats food grown regionally. The MPR was assumed to be located at the

313 Building, Kaiser Extrusion Facility, in the 300 Area. This is assumed to be 100 meters to the northwest.

15.0 TOTAL EFFECTIVE DOSE EQUIVALENT TO THE MAXIMALLY EXPOSED INDIVIDUAL

The CAP88PC computer code (Parks 1992) was used to model atmospheric releases using Hanford-specific parameters[2]. The MPR was assumed to be located at the 313 Building, Kaiser Extrusion Facility, in the 300 Area. Conservative calculations assumed a worker 100 meters to the northwest, with a release from a 10-meter stack. Using those calculated unit dose conversion factors, the estimated potential TEDE to the MEI resulting from the unabated, fugitive emissions from demolition of the 303-K Storage Facility is 1.3 E-03 millirem per year (refer to Table 1).

The TEDE from all 1999 Hanford Site air emissions (point sources, diffuse, and fugitive sources) was 0.068 millirem (DOE/RL-2000-37). The emissions resulting from the demolition of the 303-K Storage Facility, in conjunction with other operations on the Hanford Site, will not result in a violation of the National Emission Standard of 10 millirem per year (40 CFR 61, Subpart H).

16.0 COST FACTORS OF CONTROL TECHNOLOGY COMPONENTS

Cost factor inclusion is not applicable because the emission controls used during the characterization activities are administratively defined and consist of ALARA techniques.

17.0 DURATION OR LIFETIME

Demolition activities are scheduled to take place between July 2001 and December 2001.

18.0 STANDARDS

None of the standards apply to the administratively defined, ALARA based emission controls planned for the demolition activities.

19.0 REFERENCES

DOE/RL-90-04 Rev. 2A, *303-K Storage Facility Closure Plan,* June, 1995, U.S. Department of Energy, Richland Washington.

DOE/RL-96-75 Rev. 2, *Radioactive Air Emissions Notice of Construction Portable/Temporary Radioactive Air Emissions Units,* September 1999, U.S. Department of Energy, Richland Washington.

[2] Permission to use Hanford-specific parameters granted in letter from DE Hardesty of EPA to JH Hebdon at DOE-RL, dated March 22, 2001, Subject: U.S. Environmental Protection Agency's third response to the new maximally exposed individual definition.

DOE/RL-97-50 Rev.1, *Radioactive Air Emissions Notice of Construction for HEPA Filtered Vacuum Radioactive Air Emission Units*, September 1999, U.S. Department of Energy, Richland Washington.

DOE/RL-2000-37, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1999*, June 2000, U.S. Department of Energy, Richland, Washington.

Dose Calculations for Unit Curie Release of Radionuclides from 300 Area for Maximum Public Receptor with Regional Ingestion Using Hanford-Specific Parameters, L.H. Staven, April 11, 2001, Pacific Northwest National Laboratory, Richland, Washington.

Parks, B. S., *User's Guide for CAP88-PC Version 1.0*, 402-B-92-001, U. S. Environmental Protection Agency, Washington, DC, 1992.

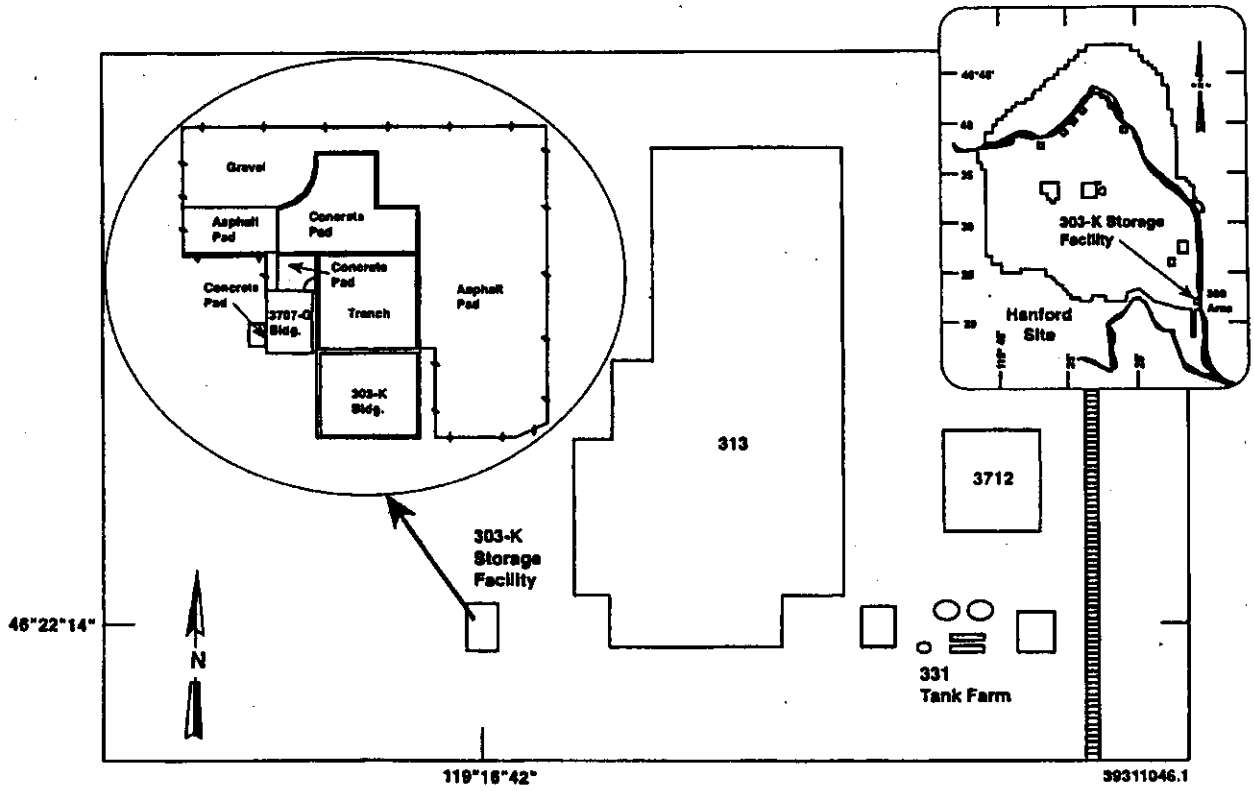

Figure 1. Relative Location of the 303-K Storage Facility and 3707-G Building.

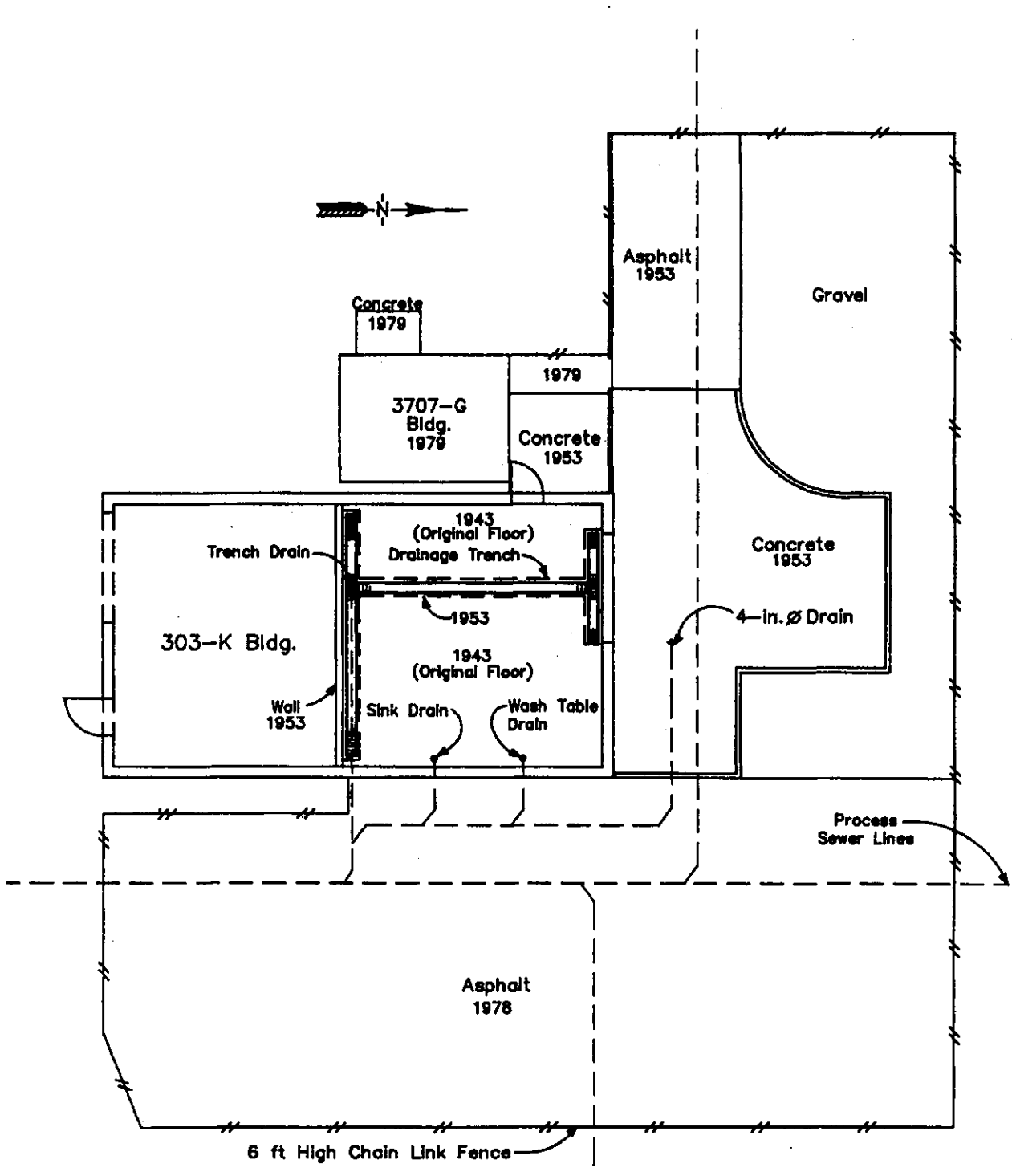

Figure 2. Floorplan of the 303-K Storage Facility, Outside Storage Area, and the 3707-G Building.

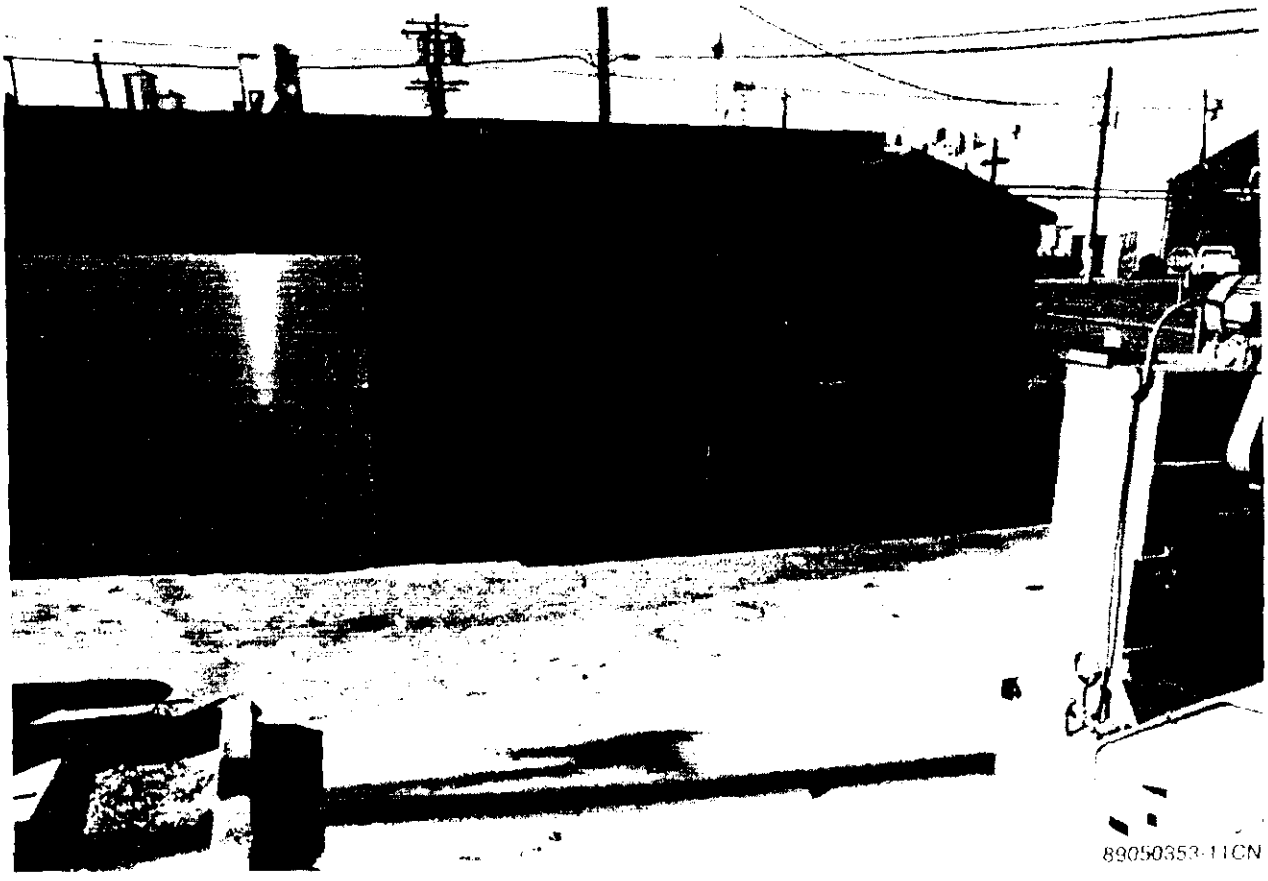

Figure 3. North Side of 303-K Storage Facility is Shown with the Sliding Door Open. The 3707-G Building is the Small Building Attached to the West Side of the 303-K Storage Facility

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Table 1. 303-K Storage Facility Demolition Release Rates and Dose Estimates.

Radionuclide	Total inventory (curies)	Release factor	Unabated release (Ci)	Unit dose factor[b]	Unabated TEDE to the MEI (millirem per year)
Tc-99[a]	3.8×10^{-3}	1	3.8×10^{-3}	0.041	1.6×10^{-6}
U-234	1.5×10^{-6}	1	1.5×10^{-6}	577	9×10^{-4}
U-238	1.0×10^{-6}	1	1.0×10^{-6}	513	5×10^{-4}
Total					**1.4×10^{-3}**

[a]-Contribution both from 303-K Storage Facility and 3707-G Building.
[b]-*Dose Calculations for Unit Curie Release of Radionuclides from 300 Area for Maximum Public Receptor with Regional Ingestion Using Hanford-Specific Parameters,* L.H. Staven, April 11, 2001.

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