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DOE/RL-2007-29
Revision 0

Radioactive Air Emissions Notice of Construction for the Decontamination Trailer

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

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

Approved for Public Release;
Further Dissemination Unlimited

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TERMS

ALARA	as low as reasonably achievable
ALARACT	as low as reasonably achievable control technology
BARCT	best available radionuclide control technology
CFR	Code of Federal Regulations
DOE-RL	U.S. Department of Energy, Richland Operations Office
FH	Fluor Hanford
HVAC	heating, ventilation, and air conditioning
LIGO	Laser Interferometer Gravitational Wave Observatory
MEI	maximally exposed individual
NOC	notice of construction
PCM	periodic confirmatory measurements
PUREX	Plutonium-Uranium Extraction (Plant)
REDOX	Reduction oxidation (S Plant)
SEPA	*State Environmental Policy Act of 1971*
TEDE	total effective dose equivalent
UO_3	Uranium Trioxide Facility
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	0.03937	inches
inches	2.54	centimeters	centimeters	0.393701	inches
feet	0.3048	meters	meters	3.28084	feet
yards	0.9144	meters	meters	1.0936	yards
miles (statute)	1.60934	kilometers	kilometers	0.62137	miles (statute)
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.09290304	square meters	square meters	10.7639	square feet
square yards	0.8361274	square meters	square meters	1.19599	square yards
square miles	2.59	square kilometers	square kilometers	0.386102	square miles
acres	0.404687	hectares	hectares	2.47104	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir)	28.34952	grams	grams	0.035274	ounces (avoir)
pounds	0.45359237	kilograms	kilograms	2.204623	pounds (avoir)
tons (short)	0.9071847	tons (metric)	tons (metric)	1.1023	tons (short)
Volume			**Volume**		
ounces (U.S., liquid)	29.57353	milliliters	milliliters	0.033814	ounces (U.S., liquid)
quarts (U.S., liquid)	0.9463529	liters	liters	1.0567	quarts (U.S., liquid)
gallons (U.S., liquid)	3.7854	liters	liters	0.26417	gallons (U.S., liquid)
cubic feet	0.02831685	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.7645549	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	0.94782	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds (force) per square inch	6.894757	kilopascals	kilopascals	0.14504	pounds per square inch

06/2001

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Third Ed., 1993, Professional Publications, Inc., Belmont, California.

RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION FOR DECONTAMINATION TRAILER

This document serves as a notice of construction (NOC) pursuant to the requirements of *Washington Administrative Code* (WAC) 246-247-060 for operation of a mobile decontamination trailer.

Emergency decontamination of personnel who have external radioactive and/or chemical contaminants on clothing and/or skin could be required in the event of an accident during operations on the Hanford Site. However, this application only addresses the radiological portion of decontamination activities. Typically, such contamination would be treated immediately and directly at the location of the event (e.g., within a building or job site). However, it might be necessary to provide additional decontamination capabilities in an isolated location near the job site to minimize personnel exposure and to minimize the potential for spread of radioactive contamination offsite. The decontamination trailer will be stationed and used throughout the 200 Areas and adjacent 600 Area locales[1] to support ongoing activities.

The estimated potential total effective dose equivalent (TEDE) to the maximally exposed individual (MEI) resulting from the unabated radioactive emissions from operation of the decontamination trailer is 3.73 E-4 millirem per year. Because no credit is taken for abatement equipment for the decontamination trailer, the abated TEDE to the MEI also is 3.73 E-4 millirem per year.

1.0 LOCATION

Name and address of the facility, and location (latitude and longitude) of the emission unit(s).

The location of the emission unit includes the 200 Areas and adjacent 600 Area[1] on the Hanford Site (Figure 1).

The address and geodetic coordinates for the Central Plateau (represented by the Hanford Meteorological Station) are as follows:

U.S. Department of Energy, Richland Operations Office (DOE-RL)
Hanford Site
Richland, Washington 99352

46° 33' 48" North Latitude
119° 36' 22"West Longitude.

[1] The adjacent 600 Area is intended to mean the area up to 70 meters south of the 200E Area, as far west as B-pond, as far north as the 212-N, P and R buildings, the area between the 200E and 200 W Areas and as far south-west as S-pond.

2.0 RESPONSIBLE MANAGER

Name, title, address, and phone number of the responsible manager.

Mr. Matthew S. McCormick, Assistant Manager for Central Plateau
U.S. Department of Energy, Richland Operations Office
P.O. Box 550
Richland, Washington 99352
(509) 373-9971

3.0 PROPOSED ACTION

Identify the type of proposed action for which this application is submitted.
a. Construction of new emission unit(s), or
b. Modification of existing emission unit(s); identify whether this is a significant modification.

The proposed action is to construct a new portable emission unit, a decontamination trailer, to decontaminate personnel who have been contaminated with radioactive material. In an inadvertent release, personnel could be exposed to radioactive contamination. Initial decontamination activities would take place at the location of the release, and due to their accident-related nature are not included within the scope of this NOC. However, if additional decontamination is warranted, personnel would be transferred to the decontamination trailer and its use and continued operation would represent a new emission unit under this NOC.

Decontamination activities in the decontamination trailer would include removal and packaging of contaminated clothing and isolation/removal of skin contamination.

- Before transport of personnel to the decontamination trailer, appropriate measures would be taken to contain potentially dispersible contamination. To the extent practicable, contaminated clothing would be removed and disposed. Any remaining contamination would be isolated by bagging, taping, or other appropriate means.

- Inside the trailer, any additional contamination covering (e.g., coveralls, modesty clothing) would be removed, as appropriate, and packaged (e.g., plastic bags) for disposition. Various means to reduce/remove skin contamination would be used as appropriate. For small areas of contamination, deconning with soap and water or chemical cleaner would be used. For gross contamination, shower(s) would be used.

All liquids would be collected and contained in a catch tank system located beneath the decontamination trailer. The trailer and tank systems vent directly to the atmosphere.

4.0 STATE ENVIRONMENTAL POLICY ACT

If this project is subject to the requirements of the State Environmental Policy Act of 1971 (SEPA) contained in Chapter 197-11 WAC, provide the name of the lead agency, lead agency contact person, and their phone number.

The proposed activities are exempt categorically from SEPA requirements in accordance with WAC 197-11-845.

5.0 PROCESS DESCRIPTION

Describe the chemical and physical processes upstream of the emission unit(s).

A description of the decontamination activities in the decontamination trailer is provided in the following sections.

5.1 FACILITY DESCRIPTION

The decontamination trailer will be comprised of two rooms; one for decontamination activities, and one for support equipment (Figure 2). The decontamination room will have overhead showers (one low flow and one higher flow-see below) and washing and decontamination fixtures. A support equipment room will be adjacent to the decontamination room and contain the support systems e.g. generator, water storage, pumps. It will be self contained to include a generator, heating, ventilation, and air conditioning (HVAC), clean water storage, and waste water collection systems. It will be moved from job to job.

Decontamination Room

- Approximately 8.5 feet wide by 19 feet long.
- Will include a water tight storage area for cleaning supplies, towels, etc.
- Will include walls made of water impervious material for general draining and easy decontamination.
- Utility tub style sink with hot and cold water and a position next to it for someone to sit on/at the side with foot/feet in the tub for decontamination.
- Overhead low gallons per minute shower head for radiological decontamination.
- Overhead chemical flush shower head to deliver 20 gallons per minute for 15 minutes.
- Eye/Face Wash to deliver 3 gallons per minute for 15 minutes.

Water Systems

- The decontamination trailer will be equipped with matching 500-gallon potable and grey water capacity tank systems.
- The potable water supply tank(s) and systems will be designed to facilitate draining and cleaning.
- The waste holding tank system will:
  - Have a water-tight tank(s).
  - Be leak-proof in nature and have service assesses, access ports, risers, lids, and covers.
  - Have a method to secure the lids and covers from inappropriate or unapproved access.
  - Have method of venting and should exhaust above the roof line of the building.
  - Have impervious surfaces around the access ports to allow cleaning.
  - Have both audible and visual alarm factions to signal "time-to-pump" and "exceeding reserve storage volume" (1/2 and ¾ full) levels and only the audible alarm may be turned off by the user.

HVAC

- Roof mounted (dual electric) HVAC system,
- Must be supplied with HVAC system capable of providing for comfort heat and cooling sized for their area.

5.2 DECONTAMINATION ACTIVITIES

All work will be performed in accordance with approved radiological control methods and as low as reasonably achievable (ALARA) program requirements. These requirements will be carried out through radiological control procedures.

The general physical processes associated with decontamination activities in the decontamination trailer will consist of following:

- On identification of the need for additional decontamination of personnel, affected individuals will be escorted to the decontamination trailer.
- As appropriate, contaminated clothing, coverings, and/or articles will be removed, packaged, and dispositioned in accordance with applicable facility waste handling procedures.
- Personnel decontamination processes might include various methods or a combination of cleaning agents (e.g., soap and water, pre-moistened towelettes, shaving cream-type foam decontamination agents for facial areas; removal of hair; and abrasive soaps for toughened skin surfaces [e.g., hands and feet]).
- Spent decontamination solutions will be transferred from the holding tank system directly to a disposal unit or containerized (e.g., packaged in absorbents in drums or placed in drums or carboys) and transported to existing facilities on the Hanford Site for disposal.
- Maintenance activities and inspections of the decontamination trailer will be performed without use of containment or portable exhausters.

6.0 PROPOSED CONTROLS

Describe the existing and proposed (as applicable) abatement technology. Describe the basis for the use of the proposed system. Include expected efficiency of each control device, and the annual average volumetric flow rate(s) in meters^3/sec for the emission unit(s).

There is no abatement control equipment associated with the decontamination trailer; the trailer is vented actively with a HEPA-like filtered exhauster exhausting out one end of the trailer near the roof and through a ceiling vent. The exhauster and vent will be used intermittently, as needed. The emission controls used for the diffuse and fugitive emissions during decontamination operations are administrative, based on ALARA principles and consist of ALARA techniques. The decontamination operations will be performed in accordance with the controls specified in radiological control procedures.

Airborne radioactive emissions resulting from the decontamination operations would be minimal because of the following:

- All activities would be conducted under the auspices of radiological control technicians.
- The expected frequency of personnel contamination requiring use of the decontamination trailer would generally be very small (estimate less than 10 times per year).
- The maximum radionuclide inventory associated with personnel contamination would generally be very small. Initial decontamination would be conducted at the immediate location of the event; only residual contamination would be associated with personnel escorted to the decontamination trailer.
- The likelihood of airborne particulate emissions being generated from any contaminated clothing would be very small as the significant portion of the radionuclide inventory would be contained within the matrix of the fabric. The methods and processes used to remove and package the clothing likely would not generate substantial airborne radionuclide contaminants.
- Most decontamination methods utilize wet techniques.
- The collection tank system will be fitted only with passive vessel vents.
- The interior of the decontamination trailer will be maintained as free as possible of contamination between uses.

7.0 DRAWINGS OF CONTROLS

Provide conceptual drawings showing all applicable control technology components from the point of entry of radionuclides into the vapor space to release to the environment.

Conceptual drawings are not applicable because the emissions controls to be used during these activities are defined administratively, based on ALARA principles and consist of ALARA techniques. There is no radionuclide abatement control equipment proposed for the decontamination operations; the decontamination trailer is ventilated through a HEPA-like filtered exhauster exhausting out one end of the trailer near the roof and through a ceiling vent, doors, and windows. No collection efficiencies are assigned to the control technology components (i.e., no credit is taken for reduction of emissions). The collection tank system will be fitted only with passive vessel vents.

8.0 RADIONUCLIDES OF CONCERN

Identify each radionuclide that could contribute greater than ten percent of the potential-to-emit TEDE to the MEI, or greater than 0.1 mrem/yr potential-to-emit TEDE to the MEI.

Any radionuclide might be present in the decontamination trailer. The radionuclides of concern for this activity are calculation-based. As shown in section 10.0, conservative dose/emission calculations are based on alpha (americium-241) and beta/gamma (cesium-137+D).

9.0 MONITORING

Describe the effluent monitoring system for the proposed control system. Describe each piece of monitoring equipment and its monitoring capability, including detection limits, for each radionuclide that could contribute greater than ten percent of the potential-to-emit TEDE to the MEI, or greater than 0.1 mrem/yr potential-to-emit TEDE to the MEI, or greater than twenty-five percent of the TEDE to the MEI, after controls. Describe the method for monitoring or calculating those radionuclide emissions. Describe the method with detail sufficient to demonstrate compliance with the applicable requirements.

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) would be made to verify the low emissions.

The proposed PCM for the vented and diffuse and fugitive emissions would consist of the radiological surveys during personnel decontamination operations (e.g., smears and hand-held radiation monitoring measurements of the interior/exterior of the decontamination trailer). These methods of PCM are not a direct measurement of effluent emissions. Emissions will be estimated for reporting purposes. The methods are intended to demonstrate compliance by showing that remaining under the contamination levels by which work is controlled, the actual emissions inherently will be below the emission estimates provided herein.

10.0 ANNUAL POSSESSION QUANTITY

Indicate the annual possession quantity for each radionuclide.

The annual possession quantity is based on alpha (as americium-241) and beta/gamma (as cesium-137+D). For conservatism, 2.01 E-2 curies alpha and 1.01 E-1 curies beta/gamma would be assumed to be associated with personnel contamination in a calendar year. This is based on decontaminating up to 100 individuals (24 ft^2/individual -- According to ICRP Publication 23 as reprinted in Shelien 1998. Handbook of Health Physics and Radiological Health, Third Edition, Edited by B. Shelien, L.A. Slaback, Jr., and B.K. Birky, Williams & Wilkins, Baltimore, MD, 1998.) extensively contaminated up to 2,000,000 dpm/100 cm^2 alpha (assumed all Am-241) and up to 10,000,000 dpm/100 cm^2 beta-gamma (assumed all Cs-137). The resulting estimate of annual possession quantity is 3.73 E-4 mrem/yr.

11.0 PHYSICAL FORM

Indicate the physical form of each radionuclide in inventory: Solid, particulate solids, liquid, or gas.

The physical form of the radionuclides is particulate solid, with negligible amounts of liquid or gaseous radionuclides.

12.0 RELEASE FORM

Indicate the release form of each radionuclide in inventory: Particulate solids, vapor or gas. Give the chemical form and ICRP 30 solubility class, if known.

The release form of the radionuclides is particulate solid with negligible amounts in the form of liquid or gaseous radionuclides.

13.0 RELEASE RATES

Release Rates:
a. New emission unit(s): Give predicted release rates without any emission control equipment (the potential-to-emit) and with the proposed control equipment using the efficiencies described in subsection (6) of this section, or b. Modified emission units(s): Give predicted release rates without any emissions control equipment (the potential-to-emit) and with the existing and proposed control equipment using the efficiencies described in subsection (6) of this section. Provide the latest year's emissions data or emissions estimates. Indicate whether the emission unit is operating in a batch or continuous mode.

The predicted release rates for each radionuclide, without any emissions control equipment (unabated), are presented in Table 1 using the appropriate WAC 246-247-030 (21)(a) release fractions. The total potential release rates for the radionuclides of concern (unabated) are summarized in Table 2. Because there are no collection efficiencies assumed for the ventilation components, the estimate of abated releases are the same as for the unabated releases.

The decontamination trailer would operate in a batch mode, used in the event of accidental personnel contamination. It would also provide a potential for fugitive/diffuse emissions after initial use. The actual and potential fugitive emissions from the proposed activities are not expected to numerically affect the overall release rates for the decontamination trailer, and therefore are not included in Tables 1 or 2.

14.0 LOCATION OF MAXIMALLY EXPOSED INDIVIDUAL

Identify the MEI by distance and direction from the emission unit(s). The MEI is determined by considering distance, windrose data, presence of vegetable gardens, and meat or milk producing animals at unrestricted areas surrounding the emission unit.

The decontamination trailer will be stationed in the 200 Areas; therefore, based upon parameters in the DOE/RL-2006-29, the MEI is assumed to be located at the Laser Interferometer Gravitational Wave Observatory (LIGO) (Figure 1). LIGO is more than 9,000 meters southeast from the 200 and immediately adjacent associated areas.

15.0 TOTAL EFFECTIVE DOSE EQUIVALENT TO THE MAXIMALLY EXPOSED INDIVIDUAL (MEI)

Calculate the TEDE to the MEI using an approved procedure (see WAC 246-247-085). For each radionuclide identified in subsection(8) of this section, determine the TEDE to the MEI for existing and proposed emission controls, and without emission controls (the potential-to-emit) using the release rates from subsection (13) of this section. Provide all input data used in the calculations.

Using the unit dose conversion factors (DOE/RL-2006-29, Rev. 0) for cesium 137+D (+D designation indicates that the doses from progeny are included in the reported dose) and americium-241, the estimated potential TEDE to the MEI resulting from the unabated point source, passive, diffuse, or fugitive emissions from baseline activities, for the hypothetical bounding location described in Section 14.0 is 3.73 E-4 millirem per year.

16.0 COST FACTORS OF CONTROL TECHNOLOGY COMPONENTS

Provide cost factors for construction, operation, and maintenance of the proposed control technology components and system, if a BARCT or ALARACT demonstration is not submitted with the NOC.

There are no collection efficiencies assumed for any control technology components or systems; therefore, there are no cost factors associated with the proposed activity. The emission controls used during the decontamination activities administratively would be defined and consist of ALARA principles and techniques, as described in Section 6.0.

17.0 DURATION OR LIFETIME

Provide an estimate of the lifetime for the facility process with the emission rates provided in this application.

Decontamination trailer operations would be conducted on an as-needed basis; the expected life of the trailer would be approximately 20 years.

18.0 STANDARDS

Indicate which of the following control technology standards have been considered and will be complied with in the design and operation of the emission unit(s) described in this application:

The listed control technology standards have been considered. No collection efficiencies are assumed for any abatement control equipment. The administratively defined ALARA based emission controls proposed for these decontamination activities are proposed as best available controls to limit and control emissions.

19.0 REFERENCES

DOE/RL-2003-19, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 2002*, June 2003, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2006-29, *Calculating Potential-to-Emit Radiological Releases and Doses*, May 2006, Fluor Hanford, Richland, Washington.

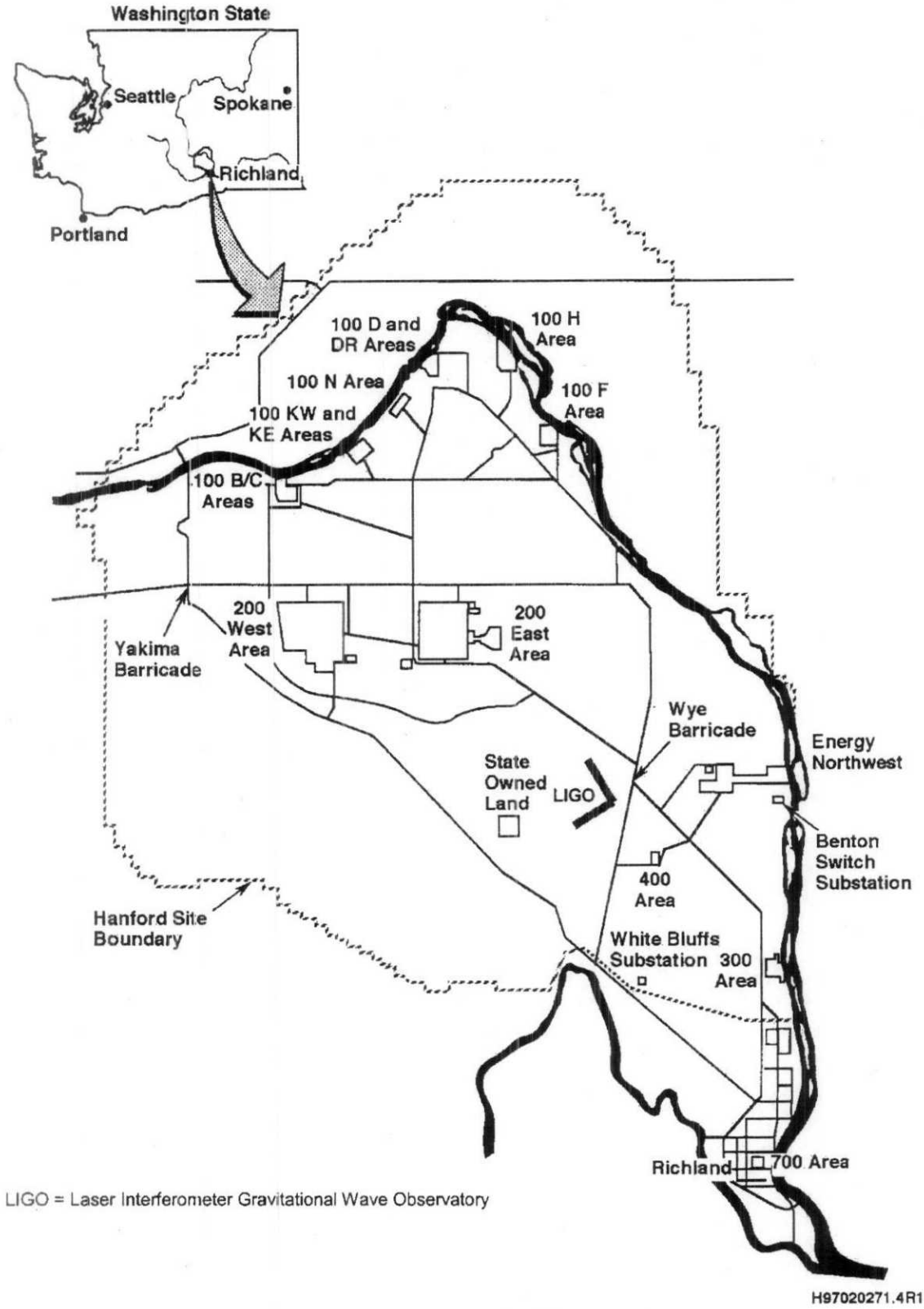

Figure 1. Hanford Site.

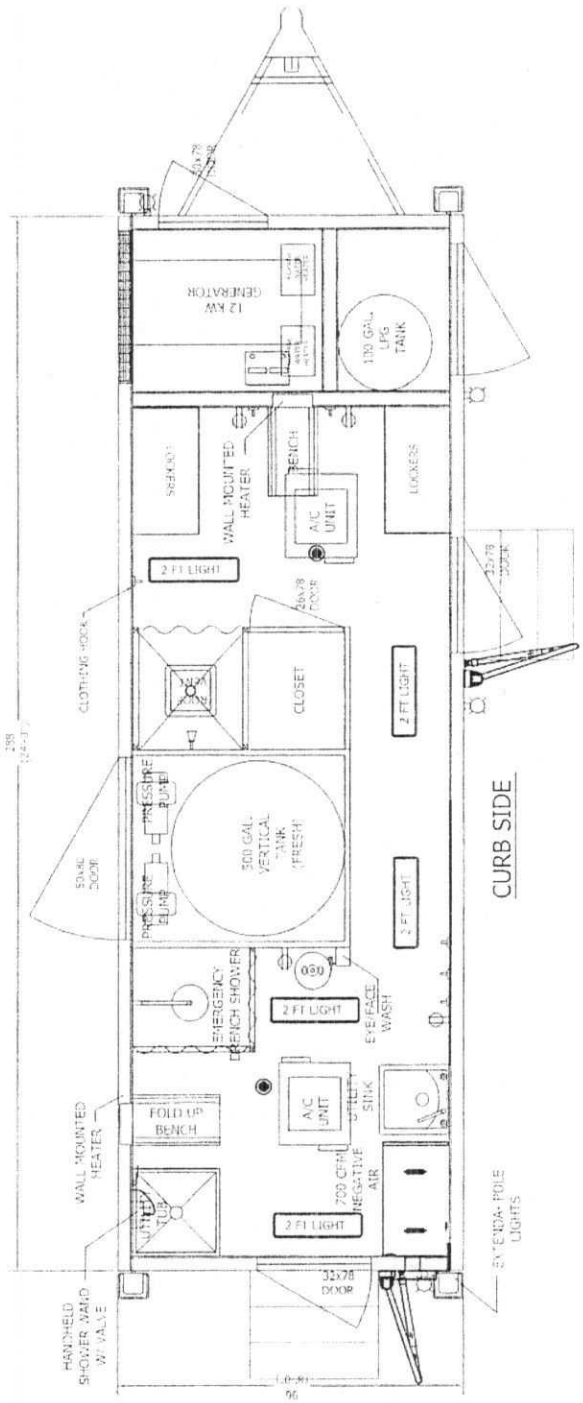

Figure 2. Conceptual Configuration for the Decontamination Trailer
(the waste water system is located under the trailer with the passive vent above the roof line).

Table 1. Decontamination Trailer Inventory.

Radionuclides	Physical Form	Inventory (curies)	WAC 246-247 Release Fraction	Potential Release (Ci/yr)
Americium 241	Particulate Solid	2.0 E-2	1.0 E-3	2.0 E-5
Cesium 137+D[1]	Particulate Solid	1.0 E-1	1.0 E-3	1.0 E-4

[1] +D designation indicates that the doses from progeny are included in the reported dose.

Table 2. Decontamination Trailer Potential-to-Emit.

Radionuclides	Potential Unabated Release (Ci/yr)	Potential Abated Release (Ci/yr)	Dose Factor CAP88 PC[1] (mrem/Ci)	Unabated Onsite Public Dose (mrem/yr)	Abated Onsite Public Dose (mrem/yr)
Americium 241	2.0 E-5	2.0 E-5	1.7 E+1	3.42 E-4	3.42 E-4
Cesium 137+D[2]	1.0 E-4	1.0 E-4	3.1 E-1	3.12 E-5	3.12 E-5
Total				**3.73 E-4**	**3.73 E-4**

[1] DOE/RL-2006-29, Rev. 0.
[2] +D designation indicates that the doses from progeny are included in the reported dose.

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