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Radioactive Air Emissions Notice of Construction for 105-KW Filter Vessel Sparging Vent

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V. L. Birkland 2/23/98

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GLOSSARY

ALARA	as low as reasonable achievable
ALARACT	as low as reasonably achievable control technology
BARCT	best available radionuclide control technology
CFR	Code of Federal Regulations
HEPA	high-efficiency particulate air
HNF	Hanford Nuclear Facility (document identifier)
IWTS	integrated water treatment system
MEI	maximally exposed individual
MCO	multi-canister overpack
NOC	notice of construction
PTE	potential to emit
SEPA	(Washington) *State Environmental Policy Act of 1971*
SNF	spent nuclear fuel
SPR	single pass reactor
TEDE	total effective dose equivalent
WAC	Washington Administrative Code
WDOH	Washington State Department of Health
Ci	curies
mrem	milliroentgen equivalent man
MTU	metric tons of uranium
rem	roentgen equivalent man
μCi	microcuries
μCi/ml	microcuries per milliliter
μCi/L	microcuries per liter

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	25.40	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
square miles	259	hectares	hectares	0.00391	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	0.76	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

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

RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION FOR 105-KW FILTER VESSEL SPARGING VENT

1.0 INTRODUCTION

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 the Integrated Water Treatment System (IWTS) Filter Vessel Sparging Vent at 105-KW Basin.

Additionally, the following description, and references are provided as the notices of startup, pursuant to 40 CFR 61.09(a)(1) and (2) in accordance with Title 40 Code of Federal Regulations, Part 61, National Emission Standards for Hazardous Air Pollutants.

The 105-K West Reactor and its associated spent nuclear fuel (SNF) storage basin were constructed in the early 1950s and are located on the Hanford Site in the 100-K Area about 1,400 feet from the Columbia River. The 105-KW Basin contains 964 Metric Tons of SNF stored under water in approximately 3,800 closed canisters. This SNF has been stored for varying periods of time ranging from 8 to 17 years. The 105-KW Basin is constructed of concrete with an epoxy coating and contains approximately 1.3 million gallons of water with an asphaltic membrane beneath the pool.

The IWTS, which has been described in the Radioactive Air Emissions NOC for Fuel Removal for 105-KW Basin (DOE/RL-97-28 and page changes per U.S. Department of Energy, Richland Operations Office letter 97-EAP-814) will be used to remove radionuclides from the basin water during fuel removal operations. The purpose of the modification described herein is to provide operational flexibility for the IWTS at the 105-KW basin.

The proposed modification is scheduled to begin in calendar year 1998.

2.0 FACILITY LOCATION (Requirement 1)

The 105-KW Basin is located within the 105-KW Reactor structure in the 100-K Area of the Hanford Site. The 100-K Area is approximately 25 miles northwest of the city of Richland, Washington. Figure 2-1 shows the location of the 100-K Area within the Hanford Site and Figure 2-2 shows the location of the 105-KW and 105-KE Basins.

The latitude and longitude for the 105-KW Basin is:

46 degrees 38' 50.72868" N 119 degrees 36' 13.50006" W

Address: U.S. Department of Energy, Richland Operations Office
Hanford Site
100-K Area, 105-KE and 105-KW Basins
Richland, Washington 99352.

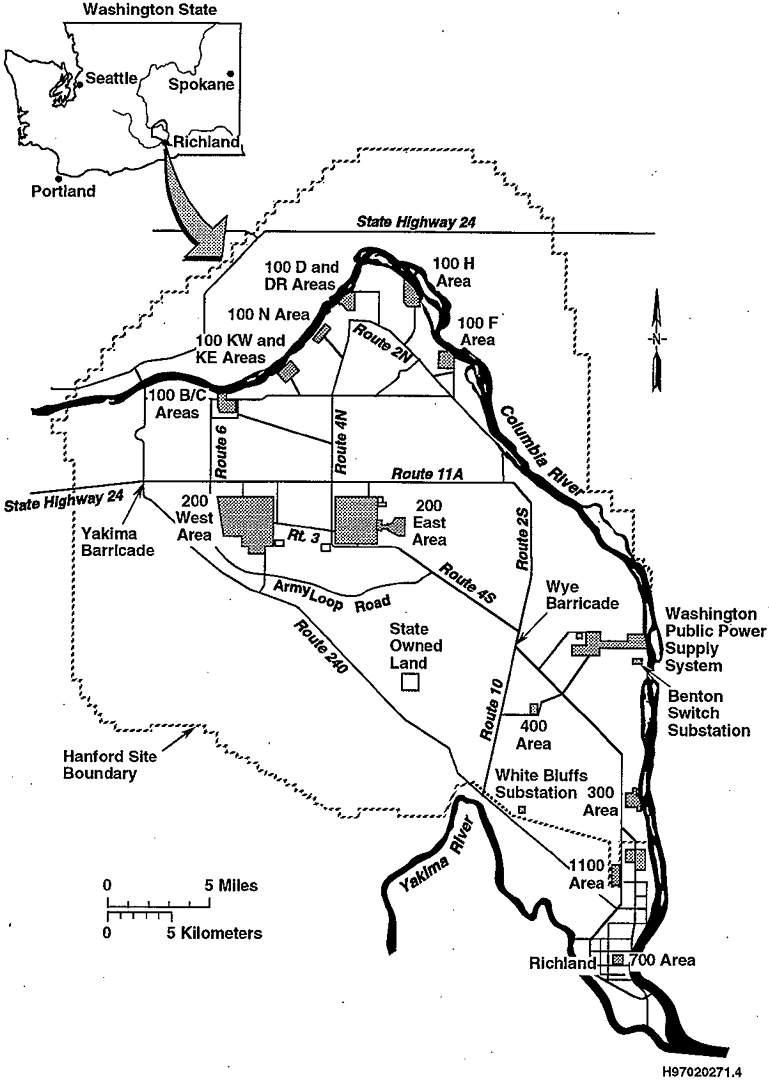

Figure 2-1. Location of the 100-K Area within the Hanford Site.

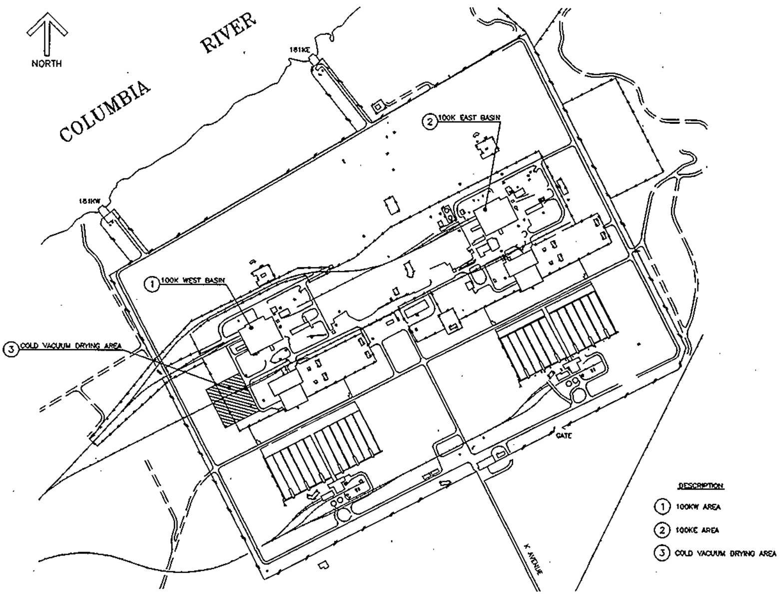

Figure 2-2. Location of 105-KW and 105-KE Basins within the 100-K Area.

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3.0 RESPONSIBLE MANAGER (Requirement 2)

The responsible manager's name and address are as follows:

Ms. E. D. Sellers, Division Director
Spent Nuclear Fuels Project Division
U.S. Department of Energy
Richland Operations Office
Mail Stop S7-41
P.O. Box 550
Richland, WA. 99352
(509) 373-9860.

4.0 TYPE OF PROPOSED ACTION (Requirement 3)

The proposed action consists of the installation, operation, and maintenance of the integrated water treatment system filter vessel sparging equipment and associated vent.

This proposed action is considered a significant modification to the existing facility and operations at the 105-KW Basin in accordance with WAC 246-247-030 (16) and (25).

5.0 STATE ENVIRONMENTAL POLICY ACT (Requirement 4)

The proposed activity is categorically exempt from SEPA requirements per WAC 197-11-845(1).

6.0 PROCESS DESCRIPTION (Requirements 5 and 7)

BACKGROUND INFORMATION

The 105-KW Basin is a rectangular, reinforced concrete basin measuring 125 feet long by 66 feet wide by 21 feet deep with three main storage bays separated by concrete partitions open at each end, two loadout pits, viewing pits, and a discharge chute. Structures for transporting fuel are at the west end where the railroad tracks enter through a large rollup door providing access to the (south) loadout pit. A 32-ton bridge crane will be used for lifting multi-canister overpacks (MCOs) from the trailer into and out of the loadout pit. Metal grating is suspended over the entire basin, 21 feet above the basin floor (5 feet over the nominal water level) to provide a working surface from which operators maneuver the fuel canisters. Canisters are moved by using a hoist and monorail system that runs throughout the 105-KW Basin.

When the basin was refurbished for storage of N Reactor fuel, an epoxy coating was applied to the basin walls to minimize absorption of radionuclides into the concrete walls. Fuel storage operations at the 105-KW Basin have been continuous since 1980. The main storage bay floor is equipped with racks designed to house fuel canisters. The racks maintain the canisters upright in a fixed geometric array. The existing canisters consist of two cylinders approximately 9 inches in diameter by 26 inches tall, made of aluminum or stainless steel, and joined by trunnions to facilitate handling.

A canister can hold a maximum of 14 N Reactor fuel elements. Each canister was encapsulated (injected with a corrosion inhibitor then sealed) before storage. A gas trap was provided through the canister lid to allow the escape of gases and still isolate the contents from the basin water. Studies have shown that for some of the canisters, the seals are no longer effective and basin water has entered the canisters (DOE/RL-97-28).

The water level of the 105-KW Basin is maintained at approximately 16 feet deep to cool the fuel and to provide radiological shielding for personnel. To maintain low concentrations of radionuclides, the water is circulated through a closed-loop water treatment system, the IWTS, to remove radionuclides from the basin water .

A complete description of the 105-KW Basin can be found in the safety analysis report (WHC-SD-WM-SAR-062) and in technical safety requirements.

It is planned to remove fuel from the basin for storage in the Container Storage Building (CSB). The IWTS will support these fuel removal operations by minimizing levels of radionuclides in the basin water. Details of the fuel removal activities and the IWTS equipment have been described previously (DOE/RL-97-28 and 97-EAP-814).

PROCESS MODIFICATION

The proposed modification involves only a specific portion of the IWTS, the filter vessels. The modification consists of a change in the mode of operation and venting. The construction will result in the creation of a new emission point for the 105-KW basin. Refer to Figures 6-1, 6-2 and 6-3 for a configuration schematic of the venting arrangement of Filter vessels for various modes of operation.

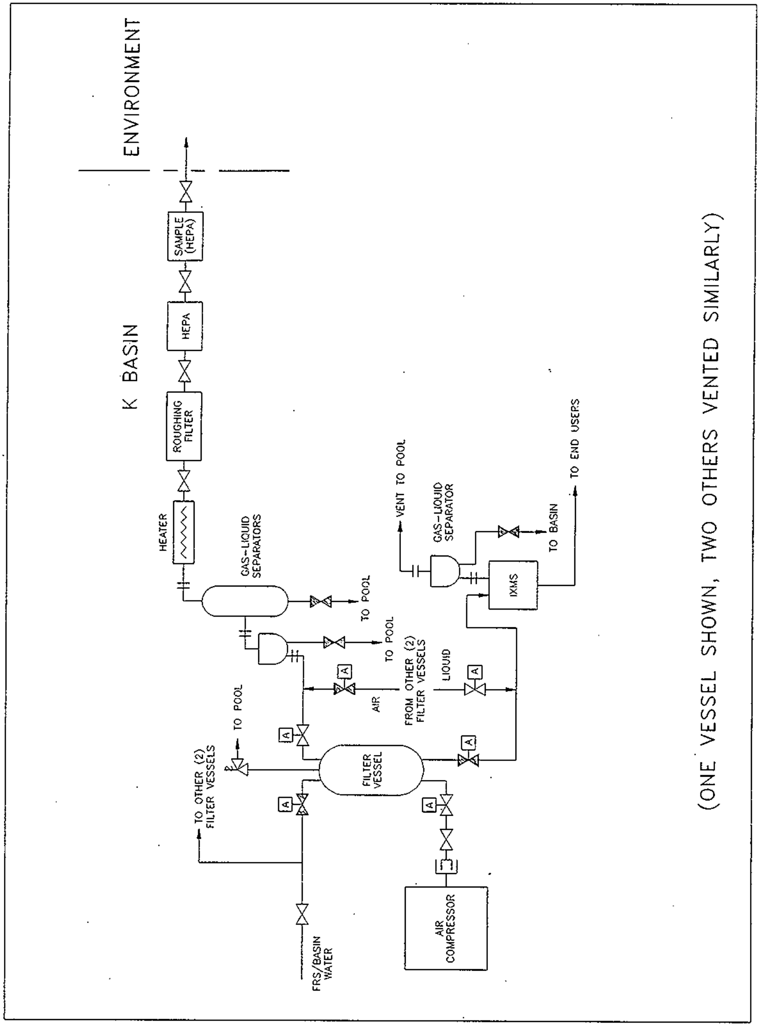

Figure 6-1. Venting Arrangement for Air Sparge of Vessels.

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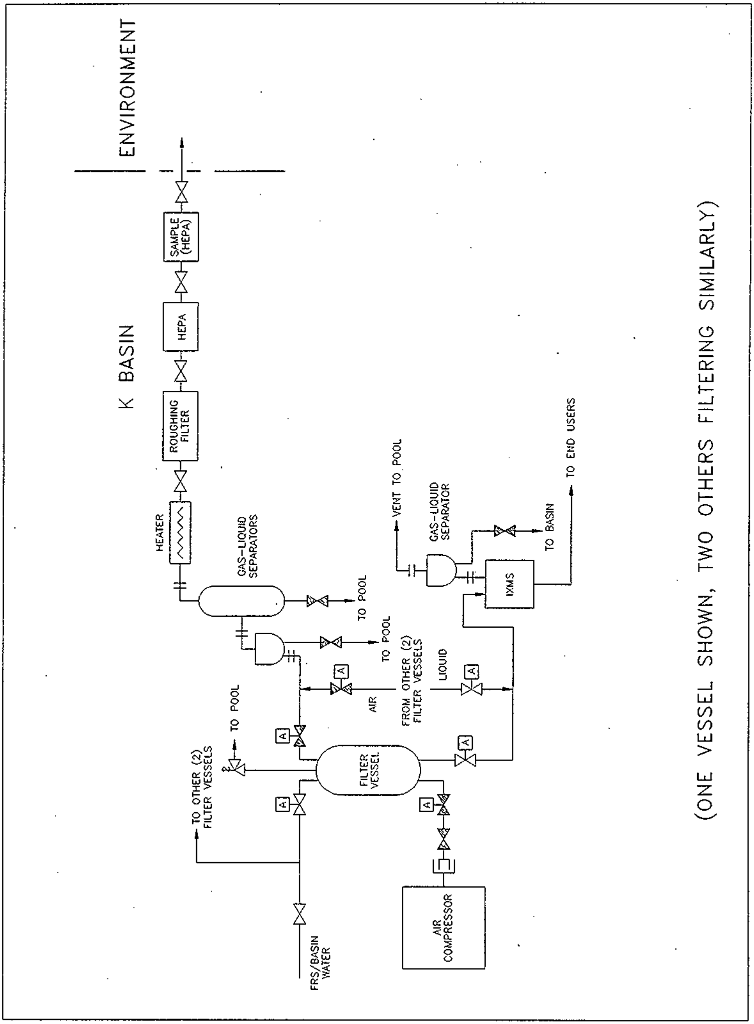

Figure 6-2. Venting Arrangement for Normal Operation of Filter Vessels

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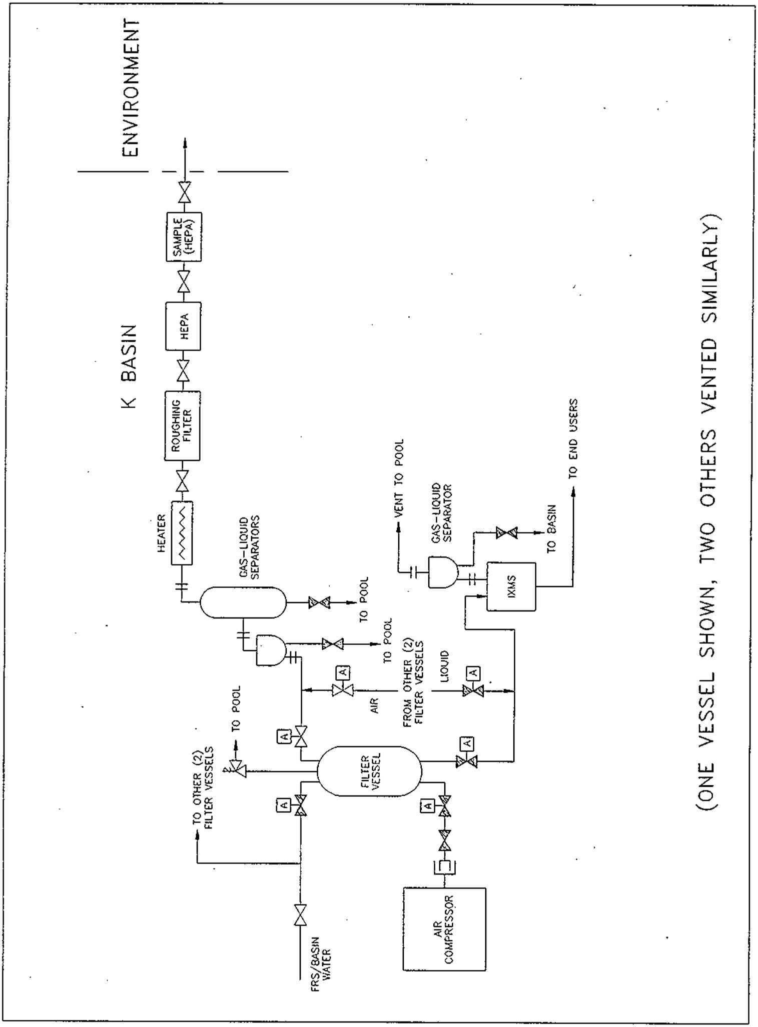

Figure 6-3. Venting Arrangement of Filter Vessels During IWTS Shutdown.

6.1 EXISTING IWTS FILTER VESSEL EQUIPMENT AND PROCESS DESCRIPTION

The IWTS will treat the basin water by filtering, settling, cooling, and providing ion exchange capabilities. Filtering of coarse particulates released into the water during fuel handling will be accomplished by means of deep bed sandfilters, i.e., mechanical filters. The deep bed sandfilters will be contained in three filter vessels, which are approximately 200 cubic feet each in volume and are located above the water in the transfer area of the basin. The filter vessels will contain a filter media sized to remove particulates. Each filter vessel has the filter media arranged in an annular fashion inside the vessel.

During IWTS operation, the filter vessels will be full of water. As particulates accumulate on the filter media in the vessels, the vessels will be backwashed periodically. Backwashing is accomplished by reversing the water flow through the vessels and directing the effluent stream for collection underwater in another portion of the IWTS.

During IWTS shutdown, water can drain from the filter media in the vessels and gasses might be generated from hydrolysis of water retained in the filter media. A float valve is provided in the filter vessel design to allow passive venting into the basin airspace during IWTS shutdown.

The IWTS filter vessels are similar in nature to the large sandfilter that has been in operation at 105-KW Basin for many years and is passively vented in a similar fashion.

6.2 PROPOSED IWTS FILTER VESSEL MODIFICATION AND PROCESS DESCRIPTION

The proposed modification is limited to the IWTS filter vessels. To provide operational flexibility, it is proposed to modify the operation of the filter vessels. Backwashing of the vessels, as described previously, is expected to remove 95 percent or greater of the radionuclides that accumulate on the filter media. In the event that backwashing is not as effective as desired, e.g., the back pressure remains too high, or excessive backwashing is required, air sparging of the filter bed is proposed.

Air sparging consists of the injection of compressed air into the filter vessel media bed to disturb the aggregate. Air sparging has been employed on similar equipment off site to restore filter efficiency. The filter vessels have existing valves and flanges to allow for connecting a compressed air source. The compressed air source either will be connected permanently or connected as needed. Air sparging, when performed, typically would involve air flows of approximately 140 standard cubic feet per minute (scfm) for periods of time of approximately 1 hour. Only one filter vessel would be sparged at any given time.

The air displaced from the filter vessel will be directed, through valved vent piping, into an exhaust stack. The existing filter vessel passive vent would be disconnected from a vent pathway back to the basin and connected to the same exhaust. The exhaust would be HEPA filtered and provision for sampling the air stream incorporated into the design. The effluent would be directed out of the transfer area through the wall or roof.

During normal operation, a valve in the vent piping will be closed and no air emissions from the filter vessels will occur (Figure 6-2). During IWTS shutdown, automatic valve arrangements will occur that will create a vent pathway to the exhaust stack (Figure 6-3). When air sparging operations are underway, automatic valve arrangements also will ensure the discharge from air sparging operations will occur through the exhaust stack (Figure 6-1).

6.3 CONSTRUCTION ACTIVITIES

The construction of the IWTS sparging stack will involve placement of uncontaminated new equipment into the transfer area in the basin. There are no known areas of contamination expected to be encountered during this construction. However, normal as low as reasonably achievable (ALARA) measures will be employed before and after construction (e.g., HEPA filtered ventilation, performance of radiological surveys before, during and after work) to minimize the spread of contamination, should contamination be encountered. The processes employed for this construction typically involve the following:

- Drilling, including but not limited to, steel, wood, asbestos, concrete
- Grinding, cutting, and abrading of metals
- Carpentry activities
- Welding activities
- Electrical wiring installation, reconfiguration, and rerouting
- Pipe, hose, and valve installation, reconfiguration, and rerouting
- Instrument installation, reconfiguration, and rerouting
- Paint and coating removal and application
- Structural steel removal, replacement, reconfiguration, and upgrade
- Cement, mortar, grouting and concrete removal, replacement, reconfiguration, and installation
- Lifting, hoisting, lowering, dragging, pulling, and pushing of construction supplies and equipment
- Use of hydraulic, pneumatic, and electric hand-tools and equipment.

The potential to emit (PTE) for the above construction activities will be additive to the emissions from the roof vents in the 105-KW Basin. In Table 10-2 of DOE/RL-97-28, the PTE for above water activities for the Fuel

Removal Project was determined to be 1.5 E-05 curies that would result in a dose of 5.99 E-06 mrem/yr TEDE to the MEI. The construction activities proposed will involve much less activity than that of the Fuel Removal Project. Therefore, the PTE of the construction activities will conservatively be represented by adopting the additive values of 1.5 E-05 curies and a dose of 5.99 E-06 mrem/yr TEDE to the MEI.

7.0 ANNUAL POSSESSION QUANTITY AND PHYSICAL FORM

(Requirements 10 and 11)

The 105-KW Basin contains approximately 961 MTU of N Reactor fuel (approximately 3,800 canisters) and 22 canisters filled with 2.9 MTU of single pass reactor (SPR) fuel. The N Reactor fuel consists of slightly enriched metallic uranium completely enclosed and bonded to a layer of zirconium alloy (Zircaloy-2), also known as the cladding. The SPR fuel is very similar, except the fuel is of smaller dimensions and is clad in aluminum. The cladding is designed to provide a barrier against the escape of the radionuclide source term (fission products and fissile materials).

The N Reactor fuel was discharged between 1975 and 1987. The fuel has decayed sufficiently to essentially eliminate iodine-131, as well as other short half-life radionuclides. Following discharge of the fuel from the N Reactor, the fuel was allowed to cool for a minimum of 150 days in N Basin. The fuel was encapsulated in closed canisters, loaded onto railcars, and transported to the 105-KW Basin for storage. Some of the canisters are known to have leaked and corrosion has occurred in the fuel stored within the canisters. The majority of fuel corrosion products within the canisters as well as the majority of the corrosion products released to the water during fuel removal activities will be treated by the IWTS and associated filter vessels.

SOURCE TERM DESCRIPTION

Based on the latest characterization data, the current best estimate of the quantity of canister sludge is 4.25 MTU. The conservatism of this value can be judged by comparison with the quantity presented in the KE Fuel Removal NOC of 3.79 MTU (DOE/RL-96-101). In addition, another 3.9 MTU is estimated to be generated by the fuel removal process. Hence, a total of 8.15 MTU of sludge (the number used in calculations to identify the source term) would be presented to the IWTS during fuel removal operations. An upper bound, used for safety analyses, is that a total of 16.2 MTU of fuel corrosion products would be handled by the IWTS system. This estimate is approximately double the best estimate and is highly conservative.

Table 7-1 represents the source term in 16.2 MTU of fuel that would be passed through the IWTS. A total of 964 MTU of fuel is present in the basin in the source term as previously described in Table 7-1 of DOE/RL-97-28. Each of the IWTS source term entries listed in Table 7-1 of this document was calculated by applying the ratio (16.2/964) times the quantities listed in Table 7-1 of DOE/RL-97-28. Other isotopes identified in Table 7-1 of DOE/RL-97-28 are present in the source term but are not accounted for in Table 7-1 of this NOC. Since the proportions of these isotopes are identical in both cases, only those that might change the calculated TEDE to the MEI have been included in this NOC.

Table 7-1. Integrated Water Treatment System Source Term Throughput.
(physical state = particulate solid)

Radionuclide	Inventory (Ci)
H^3	3.22 E+02
Co^{60}	3.74 E+01
Kr^{85}	5.31 E+03
Sr^{90}	8.80 E+04
Ru^{106}	9.71 E+00
Sb^{125}	3.12 E+02
Cs^{134}	1.74 E+02
Cs^{137}	1.13 E+05
Eu^{154}	9.47 E+02
Eu^{155}	1.94 E+02
Pu^{238}	8.63 E+02
$Pu^{239/240}$	2.60 E+03
Pu^{241}	5.09 E+04
Am^{241}	2.82 E+03
Total	2.66 E+05

8.0 CONTROL SYSTEM (Requirement 6)

The 105-KW Basin does not provide for inlet supply air and exhausted air is not filtered. However, the filter vessel vent will be HEPA filtered and exhausted through a separate vent path other than the basin roof exhausters.

CONTROL EQUIPMENT

Two HEPA filters will be provided in the filter vessel vent, the second one employed to serve as a sample collector. The filters are sized to accommodate a 150 cfm air flow rate and are approximately 12 inches by 12 inches by 6 inches in size. Both HEPA filters are in-place tested to remove 99.95 percent of particulates at 0.3μ median diameter from the air stream. HEPA filters will be designed per ASME N-509 standards and be designed to test to ASME N-510 standards. Differential pressure gauges will be provided for each filter. Isolation valves will be installed prior to and after each HEPA filter. The HEPA filter housings will utilize a bag-in bag-out housing constructed of stainless steel. Detailed design drawings of the system will be available for inspection at the facility.

A stainless steel moisture separator will be employed ahead of the HEPA filters to remove a minimum of 99 percent of the water from the filter vessel vent. Water collected by the moisture separator either will be drained into a portable tank for disposal or piped directly back into the basin. The system incorporates a prefilter ahead of the HEPA filters. The prefilter consists of a glass microfiber paper filter rated at 60 to 65 percent ASHRAE efficiency. Finally, a preheater has been incorporated into the design to ensure moisture does not impair HEPA performance.

The air discharged from the HEPA filters will be piped outside of the building in the northwest corner of the transfer area of the basin.

9.0 MONITORING SYSTEM (Requirement 9)

The 105-KW Basin does not provide inlet supply air and exhausted air is not filtered. Air is exhausted from the building via roof vents, two over the basin and two over the transfer high bay area. The new exhaust path created would create a separate emission point for the basin. As required by 40 Code of Federal Regulations (CFR) 61, Subpart H, the emission measurements need to be in conformance with the requirements of 61.93(b). Included in Section 61.93(b)4(i) is the statement: "With prior Environmental Protection Agency (EPA) approval, DOE may determine these emissions through alternative procedures." Because of circumstances that will be explained below, a request for alternative monitoring pursuant to 40 CFR 61.93(2)(i) is incorporated into this NOC.

The sparging vent is a new source and the request for approval of the alternative method is consistent with requirements specified in 40 CFR 61.93(b)3 for existing sources (before December 15, 1989). The requirements of 40 CFR 61.93(b)3 are as follows:

> "When it is impractical to measure the effluent flow rate at an existing source in accordance with the requirements of paragraph (b)(1) of this section or to monitor or sample an effluent stream at an existing source in accordance with the site selection and sample extraction requirements of paragraph (b)(2) of this section, the facility owner or operator may use alternative effluent flow rate measurement procedures or site selection and sample extraction procedures provided that:
>
> (A) It can be shown that the requirements of paragraph (b)(1) or (2) of this section are impractical for the effluent stream;
> (B) The alternative procedure will not significantly underestimate the emissions;
> (C) The alternative procedure is fully documented;
> (D) The owner or operator has received prior approval from EPA."

The following describes the criteria to justify use of an alternative method.

A. Requirements Are Impractical

The sparging vent will normally be closed and will open intermittently for either passive ventilation during IWTS shutdown or for forced ventilation during sparging (See Figures 6-1, 6-2 and 6-3). The system would need to be designed for continuous flow to accommodate a flow monitoring and record sampler installation. These increased emissions would be counter to as low as reasonably achievable (ALARA) guidelines.

B. Alternative Procedure Will Not Underestimate Emissions

1. Particulate Emissions

The proposed alternative approach involves using a second HEPA filter as the sampler for the entire air stream. The capture efficiency of the second HEPA filter will be 99.95 percent for particles with a median diameter of 0.3 micron. The second HEPA filter will undergo non destructive assay (NDA) to detect the gamma rays emitted from the decay of the cesium-137 isotope using a gamma spectrometer (HPJ 1996). Because the entire exhausted flow is routed through the sample filter, essentially all emissions will be measured and accounted for. The assumption is made that whatever is on the sample filter would be exhausted to the atmosphere. This results in a highly conservative estimate of emissions, and does not under estimate emissions. Because the sample filter has at least a 95.95 percent efficiency for 0.3 micron particulates, better than 95 percent of the particulate emissions are expected to be collected on the filter. Assuming that the material collected on the filter was exhausted is extremely conservative for estimating actual emissions.

2. Gaseous Emissions

There are no measurable concentrations of gaseous radionuclides expected to be released. As a result, gaseous radionuclides would not contribute more than ten percent of the potential offsite dose. Therefore, only particulate samples are required.

C. Full Documentation of the Alternative Procedure

The alternate procedure is that the second HEPA filter will undergo NDA analysis to measure Cs-137. The filter will be removed and relocated for assay using gamma ray spectroscopy. Detection limits are 100 nanocuries or less for Cs-137. It is unlikely that other isotopes will be detectible. The measurements will be done quarterly whenever air sparging has been operated, i.e., a forced air flow has been used. If the vessels are only passively ventilated, i.e., air sparging has not been operated, then the measurements will be done at least annually. The increase in radionuclide content of the HEPA filter will be considered the emissions released over the period. The procedure includes the following.

1. The samples will be representative.

2. A log will be maintained with the date of filter installation and NDA, along with previous NDA results. NDA testing will be performed quarterly when sparging has been performed, or at least annually when used as passive ventilation.

3. The quality assurance program will follow the onsite quality assurance program plan for radionuclide airborne emissions monitoring.

4. Aerosol testing will be performed annually on the both HEPA filters to ensure the filters maintain 99.95 percent removal efficiency of the test aerosol.

The particulate radionuclides contributing 10 percent or more of the potential to emit total effective dose equivalent (TEDE) to the maximum exposed individual (MEI) are plutonium-239/240 and americium-241. The particulate radionuclides that could contribute greater than 0.1 mrem of the potential to emit TEDE to the MEI are plutonium 238, plutonium 239/240, plutonium-241, americium-241, cesium-137, and strontium-90. The particulate radionuclides that could contribute greater than twenty five percent of the TEDE to the MEI, after controls, are plutonium 239/240 and americium-241.

For the NDA assay, any isotopes listed above that are not detected will be estimated from the measured cesium-137 values. The estimate will assume that isotopes are present in proportion to those listed in Table 7-1. These proportions are generally reflective of the proportions reported for previous 105-KW radioactive air emissions. As an example, the quantity of Pu-239/240 emissions from the 105-KW facility in 1996 was 1.7 E-07 Ci, which is 1.8 percent of the Cs-137 emissions of 9.1 E-06 Ci (see Table 10-2 of DOE/RL-97-28). Using Table 7-1 values from this NOC, the plutonium-239/240 is 2.3 percent of the cesium-137. Therefore, it is believed that using Table 7-1 ratios conservatively estimate the emissions of other isotopes. The measured quantities and estimated values will be reported as the emissions for the filter vessel vent for the sample period.

10.0 RELEASE RATES (Requirements 12 and 13)

The following provides projections of potential emissions based on good engineering judgment, actual emissions data, and the required assumptions regarding absence of emissions control equipment.

10.1 PROJECTED EMISSIONS WITHOUT ABATEMENT CONTROLS IN PLACE (POTENTIAL TO EMIT)

The PTE will be determined by using a release factor of 0.001 for particulate solids in accordance with Appendix D to 40 CFR 61. There is considerable uncertainty as to the number of cycles and frequency of air sparging operations that will be required. In addition, the source term that remains in the filter media when air sparging occurs is variable and uncertain. Therefore, to allow for maximum flexibility, the entire IWTS source term throughput will be assumed, i.e., the values presented in Table 7-1. This results in a very conservative PTE in that all sludge is assumed to be processed by the IWTS filter vessels in a 1 year period, and none is assumed to be retained in the settlers and polishing filters. Because of the fragmentation of the source into small particulates, all gasses are assumed to have escaped elsewhere in the process and are not accounted for in the release. The physical state of all radionuclides is solid. Gasses are assumed to have been released earlier in the process from particulates. The results are shown in Table 10-1 and are equal to 260 curies.

The potential to emit (PTE) for the construction activities will be additive to the emissions from the roof vents in the 105-KW Basin. In Table 10-2 of DOE/RL-97-28, the PTE for above water activities for the Fuel Removal Project was determined to be 1.5 E-05 curies that would result in a dose of 5.99 E-06 mrem/yr TEDE to the MEI. The construction activities proposed will involve much less activity than that of the Fuel Removal Project. Therefore, the PTE of the construction activities will conservatively be represented by adopting the additive values of 1.5 E-05 curies and a dose of 5.99 E-06 mrem/yr TEDE to the MEI.

Table 10-1. Projected Unabated Radioactive Air Emissions for Integrated Water Treatment System Filter Vessels (Potential to Emit).

Radionuclide	Inventory (curie), from Table 7-1	40 CFR 61 Appendix D Release Factor*	Estimated release, potential to emit (curie)
Co^{60}	3.74 E+01	.001	3.74 E-02
Sr^{90}	8.80 E+04	.001	8.80 E+01
Ru^{106}	9.71 E+00	.001	9.71 E-03
Sb^{125}	3.12 E+02	.001	3.12 E-01
Cs^{134}	1.74 E+02	.001	1.74 E-01
Cs^{137}	1.13 E+05	.001	1.13 E+02
Eu^{154}	9.47 E+02	.001	9.47 E-01
Eu^{155}	1.94 E+02	.001	1.94 E-01
Pu^{238}	8.63 E+02	.001	8.63 E-01
$Pu^{239/240}$	2.60 E+03	.001	2.6 E+00
Pu^{241}	5.09 E+04	.001	5.09 E-01
Am^{241}	2.82 E+03	.001	2.82 E-00
Total	2.60 E+05		2.60 E+02

* Release factor = 0.001 for particulate solids.

10.2 PROJECTED ABATED EMISSIONS

The estimated abated emissions are determined by assuming HEPA filter removal efficiency is equal to a factor of 2000, i.e., 1/2000 of the particulates escape. No credit has been taken for particulate removal by the sample HEPA filter or the pre-filter. All gasses also are assumed to have escaped elsewhere in the process and are not accounted for in the projection. The estimate is shown in Table 10-2, where the abated release is projected to be 0.13 curies.

Table 10-2. Projected Abated Radioactive Air Emissions for Integrated Water Treatment System Filter Vessels.

Radionuclide	Inventory (curie), from Table 7-1	40 CFR 61 Appendix D release factor	Estimated release, potential to emit (curie)	Abatement factor (HEPA = 1/2000)	Abated release (curie)
Co^{60}	3.74 E+01	.001	3.74 E-02	.0005	1.87 E-05
Sr^{90}	8.80 E+04	.001	8.80 E+01	.0005	4.4 E-02
Ru^{106}	9.71 E+00	.001	9.71 E-03	.0005	4.85 E-06
Sb^{125}	3.12 E+02	.001	3.12 E-01	.0005	1.56 E-04
Cs^{134}	1.74 E+02	.001	1.74 E-01	.0005	8.68 E-05
Cs^{137}	1.13 E+05	.001	1.13 E+02	.0005	5.66 E-02
Eu^{154}	9.47 E+02	.001	9.47 E-01	.0005	4.74 E-04
Eu^{155}	1.94 E+02	.001	1.94 E-01	.0005	9.69 E-05
Pu^{238}	8.63 E+02	.001	8.63 E-01	.0005	4.32 E-04
$Pu^{239/240}$	2.60 E+03	.001	2.60 E+00	.0005	1.30 E-03
Pu^{241}	5.09 E+04	.001	5.09 E+01	.0005	2.55 E-02
Am^{241}	2.82 E+03	.001	2.82 E+00	.0005	1.41 E-03
Total	2.60 E+05		2.60 E+02		1.30 E-01

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11.0 OFFSITE IMPACT (Requirements 8, 14 and 15)

The total effective dose equivalent (TEDE) for unabated potential emissions to the maximally exposed individual (MEI) is presented in Table 11-1. The MEI is located 6.14 miles west of the 100 Areas. The dose conversion factors used were derived from the EPA-approved CAP-88 code (EPA 1990). The projected dose for each individual radionuclide was calculated by multiplying the projected annual emission (Chapter 10.0, Table 10-1) by the dose conversion factor. The resulting dose is 118 millirem.

The TEDE to the MEI of the projected abated emissions is presented in Table 11-2. The MEI is located 6.14 miles west of the 100 Areas. The dose conversion factors used were derived from the CAP-88 code. The projected dose for each individual radionuclide is calculated by multiplying the projected annual emission from Table 10-2 by the dose conversion factor. The resulting dose is 0.059 millirem.

The particulate radionuclides contributing 10 percent or more of the PTE TEDE to the MEI are plutonium-239/240 and americium-241. The particulate radionuclides that could contribute greater than 0.1 mrem of the PTE TEDE to the MEI are plutonium-238, plutonium-239/240, plutonium-241, americium-241, cesium-137, and strontium-90. The particulate radionuclides that could contribute greater than 25 percent of the TEDE to the MEI, after controls, are plutonium-239/240 and americium-241.

As per Section 10.0, the PTE of the construction activities will conservatively be represented by adopting the additive values of 1.5 E-05 curies and a dose of 5.99 E-06 mrem/yr TEDE to the MEI.

Table 11-1. Total Effective Dose Equivalent to the Maximally Exposed Individual for the Unabated Emissions.

Radionuclide	Unabated emissions (Ci/yr)	CAP-88 Dose conversion factor (mrem/Ci)	TEDE to the MEI (mrem/yr)	Dose[a] (percent of total)
Co^{60}	3.74 E-02	4.28 E-02	1.60 E-03	<0.1
Sr^{90} [b]	8.80 E+01	6.45 E-02	5.68 E+00	4.8
Ru^{106}	9.71 E-03	3.08 E-02	2.99 E-04	<0.1
Sb^{125}	3.12 E-01	6.13 E-03	1.91 E-03	<0.1
Cs^{134}	1.74 E-01	4.62 E-02	8.02 E-03	<0.1
Cs^{137} [b]	1.13 E+02	3.53 E-02	3.99 E+00	3.38
Eu^{154}	9.47 E-01	2.69 E-02	2.55 E-02	<0.1
Eu^{155}	1.94 E-01	4.90 E-03	9.50 E-04	<0.1
Pu^{238} [b]	8.63 E-01	1.18 E+01	1.02 E+01	8.62
$Pu^{239/240}$ [b,c]	2.60 E+00	1.28 E+01	3.33 E+01	28.21[c]
Pu^{241} [b]	5.09 E+01	2.03 E-01	1.03 E+01	8.74
Am^{241} [b,c]	2.82 E+00	1.94 E+01	5.46 E+01	46.21[c]
Total	2.60 E+02		1.18 E+02	100.0

[a] Column might not add up to 100% due to rounding off.
[b] Radionuclides that could contribute greater than 0.1 mrem per year PTE TEDE to the MEI.
[c] Radionuclides that could contribute greater than 10% of the potential to emit.

Ci/yr = curie per year.
MEI = maximally exposed individual.
mrem/Ci = millirem per curie.
mrem/yr = millirem per year.
TEDE = total effective dose equivalent.

Table 11-2. Total Effective Dose Equivalent to the Maximally Exposed Individual for the Abated Emissions.

Radionuclide	Abated emissions (Ci/yr)	CAP-88 Dose conversion factor (mrem/Ci)	TEDE to the MEI (mrem/yr)	Dose[a] (percent of total)
Co^{60}	1.87 E-05	4.28 E-02	8.01 E-07	<0.1
Sr^{90}	4.40 E-02	6.45 E-02	2.84 E-03	4.8
Ru^{106}	4.85 E-06	3.08 E-02	1.50 E-07	<0.1
Sb^{125}	1.56 E-04	6.13 E-03	9.56 E-07	<0.1
Cs^{134}	8.68 E-05	4.62 E-02	4.01 E-06	<0.1
Cs^{137}	5.66 E-02	3.53 E-02	2.00 E-03	3.38
Eu^{154}	4.74 E-04	2.69 E-02	1.27 E-05	<0.1
Eu^{155}	9.69 E-05	4.90 E-03	4.75 E-07	<0.1
Pu^{238}	4.32 E-04	1.18 E+01	5.09 E-03	8.62
$Pu^{239/240}$ [b]	1.30 E-03	1.28 E+01	1.67 E-02	28.21
Pu^{241}	2.55 E-02	2.03 E-01	5.17 E-03	8.74
Am^{241} [b]	1.41 E-03	1.94 E+01	2.73 E-02	46.21
Total	1.30 E-01		5.91 E-02	100.0

[a] Column might not add up to 100% due to rounding off.
[b] Radionuclides that could contribute greater than twenty five percent of the TEDE to the MEI, after controls.

Ci/yr = curie per year.
MEI = maximally exposed individual.
mrem/Ci = millirem per curie.
mrem/yr = millirem per year.
TEDE = total effective dose equivalent.

12.0 FACILITY LIFETIME (Requirement 17)

The activities described in this NOC are scheduled to begin in calendar year 1998 and will continue approximately six years. At the point the air sparging is no longer necessary, it is anticipated that the air sparging stack will be removed, the passive vent pathway back to the basin will be restored, and a report of closure filed in accordance with WAC 246-247-080(6). The date for basin deactivation has not been established and depends on milestones established in the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1996).

13.0 TECHNOLOGY STANDARDS (Requirement 18)

The filter vessel vent HEPA filters will be designed and constructed to meet ASME N-509 and ASME N-510 standards. The design of the filter vessel vent will comply with ANSI/ASME NQA-1 quality assurance requirements. The other control technology standards described in 246-247-110 (18) are not applicable to the alternative sampling method.

During the other activities described in this NOC, good engineering practices will be employed to reduce airborne emissions. General design criteria are based on "National Consensus" codes and standards and pertinent state and local codes and standards will be used.

14.0 ACCIDENT SCENARIOS

There are no postulated accidents, with the probability of occurence of 1 in 100 during the postulated lifetime of the 105-KW Filter Vessel Sparging Vent, that would cause an accidental uncontrolled release.

15.0 REFERENCES

97-EAP-814, Correspondence from James E. Rasmussen, U.S. Department of Energy, Richland Operations Office to A. W. Conklin, Washington State Department of Health, "Radioactive Air Emissions Notice of Construction (NOC) 105 K West Fuel Removal, Page Changes", dated December 9, 1997.

DOE/RL-96-101, *Radioactive Air Emissions Notice of Construction Fuel Removal for 105-KE Basin*, U.S. Department of Energy, Richland Operations Office, Richland, Washington, 1997.

DOE/RL-97-28, *Radioactive Air Emissions Notice of Construction Fuel Removal for 105-KW Basin*, U.S. Department of Energy, Richland Operations Office, Richland, Washington, 1997.

Ecology, EPA, and DOE-RL, 1996, *Hanford Federal Facility Agreement and Consent Order*, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Richland Operations Office, Olympia, Washington, amended periodically.

EPA, 1997, Letters, OAQ-107, A. J. Frankel, Environmental Protection Agency, to J. E. Rasmussen, U.S. Department of Energy, Richland Operations Office, 291-B air filters, and LR56 Cask Truck, July 17, 1997.

HPJ, 1996, *"Six Methods To Assess Potential Radioactive Air Emissions From A Stack"*, Health Physics Journal, Volume 71, Number 5, November 1996.

WDOH, 1992, Letter, Air 92-107, A. W. Conklin, Washington State Department of Health, to J. D. Bauer, U.S. Department of Energy, Richland Operations Office, no subject, October 5, 1992.

WHC-EP-0498, *Unit Dose Calculation Methods and Summary of Facility Effluent Monitoring Plan Determinations*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-SAR-062, *K Basins Safety Analysis Report*, Rev. 3, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

DISCUSSION OF BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY

As stated in WAC 246-247-040(3), "All new construction and significant modifications of emission units commenced after August 10, 1988, shall utilize BARCT." The proposed modification is considered significant.

As stated in WAC 246-247-120, only those radionuclides comprising more than 10 percent of the unabated dose need to be evaluated. All of these are particulate radionuclides. The Washington State Department of Health has provided guidance that HEPA filters generally are considered BARCT for particulate emissions (WDOH 1992).

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