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Revision 0

Radioactive Air Emissions Notice of Construction Application for Installation and Operation of a Waste Retrieval System in Tanks 241-AN-101, 241-AN-102, 241-AN-103, 241-AN-104, 241-AN-105, and 241-AN-107

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Assistant Secretary for Environmental Management

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Chris Willingham — 5/15/00

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RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION FOR APPLICATION INSTALLATION AND OPERATIONS OF A WASTE RETRIEVAL SYSTEM IN TANKS 241-AN-101, 241-AN-102, 241-AN-103, 241-AN-104, 241-AN-105 AND 241-AN-107

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K. If Additional Comments, Please Attach Separate Sheet

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FIGURE

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TERMS

ALARA	As Low As Reasonably Achievable
ALARACT	As Low As Reasonably Achievable Control Technology
ANSI	American National Standards Institute
AMSE	American Society of Mechanical Engineers
APQ	Annual Possession Quantity
BARCT	Best Available Radionuclide Control Technology
CAM	Continuous Air Monitor
Ci	Curie
DST	Double-Shell Tank
DOE/ORP	U.S. Department of Energy, Office of River Protection
DOE-RL	U.S. Department of Energy, Richland Operations Office
EPA	U.S. Environmental Protection Agency
FIC	Food Industry Corporation
GTAW	Gas Tungsten Arc Welding
HEPA	High-Efficiency Particulate Air
HPT	Health Physics Technician
HNF	Hanford Nuclear Facility (document identifier)
ITRS	Initial Tank Retrieval Systems
LLCE	Long-Length Contaminated Equipment
MEI	Maximally Exposed Individual
mrem	Millirem
NOC	Notice of Construction
PCM	Periodic Confirmatory Measurements
PTE	Potential-To-Emit
RPP	River Protection Project
RWP	Radiological Work Permit
SEPA	*State Environmental Policy Act of 1971*
SST	Single-Shell Tank
TEDE	Total Effective Dose Equivalent
TWRS	Tank Waste Remediation System
WAC	Washington Administrative Code
WDOH	Washington State Department of Health
WHC	Westinghouse Hanford Company
WSCF	Waste Sampling and Characterization Facility

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 APPLICATION FOR INSTALLATION AND OPERATION OF A WASTE RETRIEVAL SYSTEM IN TANKS 241-AN-101, 241-AN-102, 241-AN-103, 241-AN-104, 241-AN-105, AND 241-AN-107

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 modify pursuant to 40 Code* of Federal Regulations (CFR) 61.07, for the installation and operation of one waste retrieval system in each of the following tanks; 241-AN-101, -AN-102, -AN-103, -AN-104, -AN-105 and -AN-107.

Pursuant to 40 CFR 61.09 (a)(1), this application is also intended to provide anticipated initial start-up notification. It is requested that EPA approval of this application will also constitute EPA acceptance of the initial start-up notification.

This NOC covers the installation and operation of a waste retrieval system in tanks 241-AN-101, -AN-102, -AN-103, -AN-104, -AN-105 and -AN-107, and the 241-AN-A/-B Valve Pits. Generally, this includes removal of existing equipment, installation of new equipment, and construction of new ancillary equipment and buildings between now and the year 2011. Tanks 241-AN-101, -AN-102, -AN-103, -AN-104, -AN-105 and -AN-107 will provide waste feed for immobilization into a low activity waste (LAW) product.

Section 15 of this NOC discusses the estimated total effective dose equivalent (TEDE) to the offsite maximally exposed individual (MEI) resulting from the unabated and abated emissions for operating two mixer pumps in the 241-AN-101, -102, -103, -104, -105 and -107 tanks, and from unabated emissions from the construction activities discussed in this NOC.

As requested by the EPA and WDOH, a new MEI evaluation was performed. Results of the new evaluation showed that the nearest public on-site receptor (Energy Northwest) would receive approximately the same dose as the dose resulting from using the currently approved dose conversion factors in *Calculating Potential to Emit Releases and Doses for FEMPs and NOCs* HNF-3602.

As requested by WDOH, the spreadsheets at the end of Attachment J provides a summary of the new MEI evaluation. However, because HNF-3602 dose conversion factors generally result in essentially the same or a more conservate estimate of the TEDE to the MEI, and for ease of calculating a maximum envelope of emissions for the project, the HNF-3602 dose conversion factors have been used in the discussion in Section 15. Those doses are 3.34 E-02 mrem/year for pipe cutting, 2.86 E-02 mrem/year for pit work, 1.61 E-02 mrem/year for hand digging, 6.96 E-02 mrem/year for operation of the guzzler, and 3.98 E-02 mrem/year for operation of the mixer pumps.

1.0 LOCATION

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

The AN Tank Farm is located:

U.S. Department of Energy, Office of River Protection
Hanford Site,
200 East Area Tank Farms
Richland, Washington 99352

The 241-AN Tank Farm is located northeast of the AZ Tank Farm in the 200 East Area, at the corner of Canton Avenue and Seventh Street. The geodetic coordinates for the center of the AN Tank Farm are as follows and the exhauster stack is registered as 296-A-29.

Latitude: 46° 33 ' 24" N
Longitude: 119° 31 ' 00" W

2.0 RESPONSIBLE MANAGER

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

Mr. R. T. French, Manager
U.S. Department of Energy, Office of River Protection
P. O. Box 550
Richland, Washington 99352
(509) 376-6677

3.0 PROPOSED ACTIONS

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 represents an insignificant modification to an existing emission unit, the 241-AN Tank Farm, ventilated through the 296-A-29 Stack. The proposed modification is to install and operate a waste retrieval system (up to two mixer pumps per tank and other required equipment) in the 241-AN-101, -AN-102, -AN-103, -AN-104, -AN-105 and the -AN-107 tanks. The pumps will operate in a batch mode as needed. The waste capacity of the tanks will not be altered, nor will the ventilation system. Additionally, fugitive emission sources will be created during excavation activities, pipe cutting, removing and installation of in-take equipment, and while performing work in open pits.

4.0 STATE ENVIRONMENTAL POLICY ACT

If this project is subject to the requirements of the State Environmental Policy Act (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 categorically exempt from State Environmental Policy Act (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).

The 241-AN-101, -102, -103, -104, -105 and -107 tanks are 75-foot diameter double-shell tanks (DST) constructed from the latest generation of tank designs, with a reinforced concrete shell and dome, and an insulating concrete base. A heat-treated, stress relieved, primary steel liner and a non-stress-relieved, outer steel liner are separated by a 2.5-foot annulus and contained inside the concrete shell. The tanks have a flat bottom with a usable waste depth of approximately 35 feet (1,160,000 gallons). The pump pits, for the tanks described above, have approximate dimensions of 14 feet long by 8.5 feet wide with a depth of 6 feet.

The 241-AN-A Valve Pit is connected to tanks 241-AN-104, -105, -106, and -107 and contains the valves and jumpers to allow routing waste to other destinations within the 200-East Area of tank farms. The 241-AN-B Valve Pit is connected to tanks 241-AN-101, -102 and -103 and contains the valves and jumpers to allow routing waste to other destinations within the 200-East Area of tank farms. The 241-AN-A and -B Valve Pits have approximate dimensions of 12 feet long by 12 feet wide with a depth of 6 feet.

Current design calls for modifications to the AN-101, -102, -103, -104, -105, and -107 tanks and associated equipment to allow installation of waste retrieval system equipment, including the following major components.

New In-Tank Equipment

- Installation of up to two mixer pumps in each tank for mobilizing the settled solids. The pumps will be capable of pumping waste through each of two, horizontally opposed, discharge nozzles, located approximately 18 inches above the bottom of the tank.

- Installation of a high-pressure spray wash system on top of each of the riser used for mixer pumps. The spray wash system will be used for future decontamination of the mixer pumps as they are removed from the tank.

- Installation of one transfer pump in each tank for the transfer of waste.

- Installation of one closed circuit television system for each tank, as required.

- Installation of one thermocouple tree for each tank, as required.

New Ancillary Equipment and Buildings

- Installation of electrical power and instrument cables and other utility tie-ins and/or upgrades (e.g., sanitary and raw water, and telecommunications).

- Construction of a dilution and caustic supply system, to bring waste properties into compliance with the feed specifications, to flush and preheat transfer lines. It will be capable of providing approximately 140 gallons per minute of pH-adjusted water. It will consist of a package boiler, a

chemical injection pump, a diluent/flush pump, a diluent/flush tank (approximately 5,000 gallons), and a spill containment pad for caustic delivery trucks. The system will be located in an area central to and outside of the 241-AN, -AY, and -AZ tank farms. A favorable location appears to be in the proximity of N42250-W47850.

- New pit coverblocks for AN-01A, AN-02A, AN-03A, AN-04A, AN-05A and AN-07A.

- Installation of new water and diluent piping to and from the process pits. A total of approximately 2,800 linear feet of piping will be installed at a depth of up to 5 feet underground.

- Installation of new process jumpers inside existing central pump pits (AN01A, AN02A, AN03A, AN04A, AN05A and AN07A) and the 241-AN-A/-B Valve Pits.

- Installation of miscellaneous concrete pads for electrical and mechanical equipment.

- Installation of chain-link fencing and gates.

Removal, Decontamination and Demolition of Existing Equipment

- Removal of transfer pumps.

- Removal of mixer pumps.

- Removal of thermocouple probes.

- Removal of camera/multi-port riser from tanks AN-103, AN-104, and AN-105. (Camera will be reused in another riser on the tank.)

- Removal of slurry distributors.

- Removal of jumpers from each of the central pits, and central pump pit cover blocks.

- Removal of multi-function instrument trees or multi-purpose probes from tanks 241-AN-101, -102, -103, -104, -105, and -107.

- Use of equipment and containers for removal, cleaning, decontamination, transport, storage, and burial of in-tank components and soil.

Miscellaneous

- Performance of miscellaneous activities in support of construction and operation activities that will not increase emissions above those estimated in Section 10.0, *Release Rates*, of this NOC.

- Repair of road crossings (asphalt paving).

5.1 CONSTRUCTION ACTIVITIES WITH THE POTENTIAL TO EMIT

Construction activities with the potential to emit include soil excavation, work in pump pits, pipe cutting, removal of, and installation of in-tank equipment. Some of these activities are described in, and will be done in accordance with, an applicable Tank Farm ALARACT demonstration, HNF-4327 latest revision,

Control of Airborne Radioactive Emissions for Frequently Performed TWRS Work Activities. The specific activities and corresponding ALARACT demonstration are called out as they apply in the following text.

If needed or chosen for use during these activities, the Regulated Guzzler, a Portable/Temporary Radioactive Air Emission Unit, and a HEPA Filtered Vacuum Radioactive Air Emission Unit may be used in accordance with the latest revisions of their NOCs (98-EAP-037, DOE/RL-96-75, and DOE/RL-97-50 respectively).

The 241-AN Tank Farm is posted and maintained as a radiological buffer area, free of surface contamination (entrance is made in street clothes). There are no recorded spills or leaks. Therefore, encountering contamination is not expected during soil excavation activities. Because of the possibility of encountering previously undetected subsurface contamination, all work is performed in accordance with the Hanford Site Radiological Control Manual and the RPP As Low As Reasonably Achievable (ALARA) Program requirements. These requirements are carried out through the activity work packages and associated radiological work permit (RWP).

5.1.1 Soil Excavation

Soil will be excavated inside and outside the 241-AN Tank Farm to install new piping, mixer pump slabs, and caustic supply system. A total of approximately 6,000 cubic yards will be excavated, which includes approximately 3,600 cubic yards inside the tank farm. Backfill will be made with the original removed soil or non-contaminated controlled density fill (sand, water and a small amount of cement).

Soil excavation activities inside the tank farm fence will be performed in accordance with ALARACT Demonstration 5, *TWRS ALARACT Demonstration for Soil Excavation (Using Hand Tools)* (Appendix A). Clean soil piles may be moved from one place to another within the tank farm with heavy equipment (backhoe, front-end loader, etc.). Soil excavation outside the tank farm fence also may be performed with heavy equipment. The Regulated Guzzler may also be used as described in its NOC for use in the 241-A Tank Farm Complex (98-EAP-037).

5.1.2 Pipe Cutting

Any required cuts of contaminated piping will be made, inside a glove bag, using appropriate equipment such as a sawzall or tri-tool. In order to perform a cut without a glove bag, the riser will be surveyed/smeared to verify removable contamination levels are equal to or less than 10,000 dpm/100cm^2 beta gamma and 200 dpm/100cm^2 alpha. The tie-ins will be made at the new pit nozzles. If any welding is required, the glove bag will be removed and the weld made.

If needed or chosen for use during these activities, a Portable/Temporary Radioactive Air Emission Unit, and a HEPA Filtered Vacuum Radioactive Air Emission Unit may be used in accordance with the latest revisions of their NOCs (DOE/RL-96-75, and DOE/RL-97-50 respectively).

5.1.3 Pit Work

Work to be performed in pump pits includes replacing existing sets of cover blocks with newly designed cover blocks, core drilling (equivalent of one hundred, 14-inch diameter, holes), installing new nozzles removing existing jumpers, and installing riser extensions (total of two 42-inch diameter per pit).

Pit access and work will be performed in accordance with ALARACT Demonstrations 6 and 14, *TWRS ALARACT Demonstration for Pit Access,* and *TWRS ALARACT Demonstration for Pit Work* (Appendix B and C, respectively). Activities not covered in these ALARACTs are described below.

If needed or chosen for use during these activities, a Portable/Temporary Radioactive Air Emission Unit, and a HEPA Filtered Vacuum Radioactive Air Emission Unit may be used in accordance with the latest revisions of their NOCs (DOE/RL-96-75, and DOE/RL-97-50 respectively).

At the start of the pit work, the cover blocks will be lifted off and radiologically surveyed to determine appropriate disposal protocol. A new cover block will be installed when all work in the pit has been completed.

Core drilling will be performed below grade level, on the outside of the pit. The hole will be drilled from the outside to the inside, with the temporary pit cover in place. The drilling bit may be water-cooled. Nozzle installation will generally proceed immediately after the hole is completed. If immediate nozzle installation is not possible, the hole will be temporarily sealed with a plug, tape, or equivalent device, until the nozzle can be installed.

Installation of new nozzles in existing pits will take place in an open pit. All parts of the nozzle will be assembled ahead of time, and will be lowered into position as a single unit. The piping in the back of the nozzle will be threaded through the hole (from the inside of the pit to the outside) and pulled tight into place from the outside of the pit. Grout will be used to secure and seal the nozzle into place. The front opening of the nozzle, inside the pit, will be fitted with a temporary cap/seal until a jumper is connected to it. Once the nozzle(s) is/are installed, the temporary pit cover will be replaced until other work inside the pit requires its removal.

Installation of the 42-inch diameter riser extensions will take place in an open pit. Risers that will house either a mixer pump or an in-tank camera will have an extension installed. The riser will be open during the step. Mixer pump extensions will be sealed to the cover block with metal bellows. The extensions will be equipped with spray wash rings that will provide a means of decontamination for future equipment removals. They will also provide confinement between the component and the inside of the pit during future component removals, which will be possible without removing the pit cover blocks.

5.1.4 Removal of In-Tank Equipment

Various in-tank equipment will be removed from the tanks to make room for the waste retrieval equipment, or to be replaced with equivalent equipment built to withstand the mixer pump jet forces. The existing flexible receiver equipment will be used to remove and decontaminate long-length components, to acceptable levels. Equipment removal will be performed in accordance with ALARACT Demonstration 13, *TWRS ALARACT Demonstration for Installation, Operation, and Removal of Tank Equipment* (Appendix D). Activities not covered in this ALARACT are described below.

If needed or chosen for use during these activities, a Portable/Temporary Radioactive Air Emission Unit, and a HEPA Filtered Vacuum Radioactive Air Emission Unit may be used in accordance with the latest revisions of their NOCs (DOE/RL-96-75, and DOE/RL-97-50 respectively).

Decontamination of removed equipment is not desired, the fewer decontamination activities undertaken the less exposure possibilities there are to the worker and the environment. Contingency decontamination plans, however, are in place if needed. The most likely equipment to be decontaminated would be sections of the flexible receiver. If contingency decontamination is required a two-roomed

decontamination tent will be set up within the tank farm fence. Decontamination work will take place in one room and the other will be maintained clean.

5.1.4.1 Flexible Receiver Bagging Process

Use of the flexible receiver involves connecting to and disconnecting from a tank riser or pit; lifting/removing the equipment; washing down/decontaminating the equipment; and bagging the equipment. Various flexible receiver equipment includes a washer assembly, a radiation monitoring and camera assembly, a bag cinch and cut assembly, a secondary bag seal assembly, and an appropriately sized receiving bag.

The connection process to risers in a concrete pit is different than that to risers outside at, or below, grade level. For risers in pits, the cover block is removed and replaced with the flex receiver platform. The gap between the pit and the platform is sealed with plastic and tape. The equipment is lifted off the riser, to slightly above the platform, long enough to position the split plates that will support the equipment when it is lowered back down to the platform. Generally this step takes less than fifteen minutes and during this time the riser is open around the equipment as it is raised. The equipment is lowered to rest/seal on the split plates. In some instances a gasket may be used between the split plates and the equipment to enhance the seal. At this point confinement is considered restored and work can take place on the upper portion of the piece of equipment, if needed, to prepare it for removal. Once the preparatory work is complete, the equipment is raised slightly to remove the split plates and then lowered back down to rest/seal on the riser. An adapter spool piece assembly (includes the spool piece, the spray wash unit, and alignment bellows) is placed over and around the riser, and the equipment setting on top of the riser. The adapter spool piece is equipped with a rubber seal on the bottom, which provides a seal against the floor of the pit, and the alignment bellows are bolted to the platform providing a seal against the platform. An impact limiter is installed on top of the platform, around the opening, as a precaution if the equipment free falls during the remote bagging process. The piece of equipment is again raised to rest/seal on the impact limiter. Here again, the riser is open around the equipment during the approximately fifteen minute process to lift it to the top of the impact limiter. Subsequent confinement is provided by the gaskets between equipment/assembly pieces and the rubber seal on the bottom of the adapter spool piece. The remainder of the flex receiver equipment is bolted into place above the impact limiter.

For risers that cannot accommodate an adapter spool piece (outside risers), a split spool piece is used to bolt the flex receiver equipment to the riser flange. In this instance, a seal against a floor cannot be made, so a glove bag is used to confine contamination. A glove bag, with the spool piece in it, is sealed around the riser, the riser is opened, the equipment is raised slightly to allow installation of the split spool piece onto the riser flange. Generally this step takes less than fifteen minutes and during this time the riser is open (within the glove bag) around the equipment as it is raised. The equipment is lowered back down to rest/seal on the split spool piece and the spray wash unit is bolted to the split spool piece. The remainder of the flex receiver equipment, in its entirety, is swung into position, the bottom component is slipped into the glove bag and then bolted to the spray wash unit within the glove bag.

After the riser connection process has been completed, the equipment is slowly lifted through the riser (approximately 1 foot per minute). The washing process takes place concurrently with lifting and uses preheated water pressurized up to 3,000 pounds per square inch. Washing takes place outside of the vapor space and the run-off is returned to the tank through the riser.

After a section of the equipment has been washed it is pulled through the radiation monitoring assembly. Here, spectrum analysis is performed on the equipment and it is viewed via the camera to determine if the washing process needs to be repeated.

Once washed and dripped dry, the equipment is pulled into the flex receiver bag. Once the equipment is completely in the bag, an absorbent mat is attached inside the bag. Next, a mechanical sealing device cinches the bag closed with wire rope and crimps the bottom of the bag in two places, one below the other. The bag is then cut between the two crimps, leaving a sealed top section containing the equipment, and a sealed bottom section sealing the riser opening. The bag is then hoisted into position for secondary bagging of the first seal. Secondary bagging involves lowering the bagged equipment, sealed end first, into another bag that fits around the bottom of the first bag. The secondary bag is also cinched closed with wire rope. The portion of the first bag that was cinched at the riser is then removed and disposed of and the riser is closed. From here the equipment is ready for waste packaging for storage and/or burial.

5.1.4.2 LLCE Waste Packaging Process

The waste packaging process takes place immediately after the equipment bagging process. It is called the Long Length Contaminated Equipment (LLCE) Disposal System and was designed specifically for application at Hanford Tank Farms. It packages non-contact, remote handled, radioactive waste, for storage or burial. In general, the process involves pushing the LLCE into a storage/burial container and filling the container with lightweight grout to attain a greater than or equal to 90 percent filled container.

The previously bagged equipment is placed into the skid assembly of the tilt trailer. The skid assembly is pushed into the container already in place on the transport trailer. The endcap is welded closed and leak tested in place. A vent penetration is installed at the top of the end cap for venting displaced air while filling. Another penetration is also put into the endcap for installation of the trimmie tube (distributes grout evenly into the container). The vent penetration is fitted with, or piped to, a high-efficiency particulate air (HEPA) filter to satisfy ALARA requirements. At the storage/burial area, the container is removed from the transport trailer and placed for storage or burial.

5.1.5 In-Tank Equipment Installation

Equipment installation will be performed in accordance with TWRS ALARACT Demonstration 13, *Installation, Operation, and Removal of Tank Equipment* (Appendix D). A schematic of the tank with the waste retrieval equipment installed is shown in Figure 1.

5.2 WASTE STAGING AND RETRIEVAL PROCESS OVERVIEW

The retrieval process at the 241-AN-101, -102, -103, -104, -105 and -107 tanks will provide feed stock to a waste treatment facility. The low activity waste received from the source tanks may be conditioned and/or diluted to deliver compliant waste. Mixing and dilution may also take place at the source tanks to meet the waste specifications of 241-AN- 101, -102, -103, -104, -105 and -107 (i.e., solids content must be within a predetermined amount). In-coming waste will be staged in the tank(s) until enough has been accumulated to send, and the treatment facility is ready to receive, a batch. The mixer pump will then be operated to maintain waste uniformity during staging and to mix the waste for a short period of time before transferring it. The mixer pump will be operated at full speed until waste samples verify that adequate mixing has been achieved. Waste samples will be collected in accordance with TWRS ALARACT Demonstration 7, *Tank Waste Grab Sampling*. If dilution/conditioning is needed, the pH and temperature of the diluent will be adjusted by means of the Caustic Supply System. Once the waste is verified acceptable, the transfer lines will be preheated/flushed with diluent, and a decant waste transfer to the treatment facility will follow. After the transfer, the lines will be flushed again with diluent.

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).

6.1 CONTROLS UTILIZED DURING CONSTRUCTION ACTIVITIES

Emission controls used during the construction activities are administrative, based on ALARA principles and consist of ALARA techniques. They are discussed individually below with respect to their associated activities, as described earlier in Section 5.0.

6.1.1 Soil Excavation

Soil excavation activities will be performed in accordance with ALARACT Demonstration 5, *TWRS ALARACT Demonstration for Soil Excavation (Using Hand Tools)* (Appendix A), and will follow the radiological controls specified in that ALARACT.

If the Regulated Guzzler is used to excavate soil, radiological and administrative controls as described in its NOC for use in the A Tank Farm Complex (98-EAP-037) will be followed. Description of the emissions control technology for the Regulated Guzzler is also provided in that NOC.

6.1.2 Pipe Cutting

If required, pipe cutting and weld preparation will be performed in a glove bag if the levels of removable contamination in the cut and weld area are greater than 10,000 dpm/100cm^2 beta gamma and 200 dpm/100 cm^2 alpha. HPT coverage will be provided. Although the key measure relied upon to control air emissions during cutting is the glove bag, measures such as expandable foam or fixatives may be applied on or around a pipe cut as an additional measure to help fix contamination. The decision to use expandable foam or fixatives will be made on a case by case basis after excavation exposes the pipe to be cut. When used, the expandable foam will help fix any contamination to the pipe wall in the area of the cut and will help prevent migration of contamination present in the pipe upstream or downstream of the cut. Welding will commence once removable contamination levels in the cut and weld area are reduced to ALARA. The goal will be equal to or less than 1,000 dpm/100 cm^2 beta gamma and 20 dpm/100 cm^2 alpha, but may not always be attainable.

If required, riser cutting and weld preparation will take place in a glove bag if the levels of removable contamination in the cut and weld area are greater than 10,000 dpm/100cm^2 beta gamma and 200 dpm/100 cm^2 alpha. Welding will commence once removable contamination levels in the cut and weld area are reduced to ALARA. The goal will be equal to or less than 1,000 dpm/100 cm^2 beta gamma and 20 dpm/100 cm^2 alpha, but may not always be attainable. HPT coverage will also be provided during the work.

Work in glove bags will not be performed if sustained wind speeds are greater than 30 miles per hour.

If a Portable/Temporary Radioactive Air Emission Unit or a HEPA Filtered Vacuum Radioactive Air Emission Unit is used during the pipe cutting activities, controls as described in their NOCs (DOE/RL-96-75, and DOE/RL-97-50) will be followed. Descriptions of the emissions control technology for those units are also provided in those NOCs.

6.1.3 Pit Work

Pit access and work will be performed in accordance with ALARACT Demonstrations 6 and 14, *TWRS ALARACT Demonstration for Pit Access,* and *TWRS ALARACT Demonstration for Pit Work* (Appendix B and C, respectively) and will follow the radiological controls specified in those ALARACTs. Controls not covered in these ALARACTs are described below.

All pit work will be performed in an appropriately configured confinement structure, as required by the applicable work package and its associated RWP, to maximize ALARA for contamination migration while allowing entry to perform the work. HPT coverage will be provided during all pit work. Pit work will not be performed if sustained wind speeds are greater than 25 miles per hour. The 42-inch riser extensions will be installed with continuous tank ventilation.

If a Portable/Temporary Radioactive Air Emission Unit or a HEPA Filtered Vacuum Radioactive Air Emission Unit is used during the pit work activities, controls as described in their NOCs (DOE/RL-96-75, and DOE/RL-97-50) will be followed. Descriptions of the emissions control technology for those units are also provided in those NOCs.

6.1.4 Removal and Installation of In-Tank Equipment

Equipment removal and installation activities will be performed in accordance with ALARACT Demonstration 13, *TWRS ALARACT Demonstration for Installation, Operation, and Removal of Tank Equipment (Appendix D)*, and will follow the radiological controls specified in that ALARACT.

Controls specific to the flexible receiver bagging processes include maintaining vapor space confinement through seals in the bolted on equipment, reducing surface contamination on the equipment through water washing, and double sealing the equipment bag once the equipment is inside.

Controls specific to the LLCE waste packaging process include fitting the vent penetration installed in the LLCE storage container with, or piping it to, a HEPA filter to filter displaced air while the container is being filled.

If a Portable/Temporary Radioactive Air Emission Unit or a HEPA Filtered Vacuum Radioactive Air Emission Unit is used during the removal or installation of in-tank equipment activities, controls as described in their NOCs (DOE/RL-96-75, and DOE/RL-97-50) will be followed. Descriptions of the emissions control technology for those units are also provided in those NOCs.

6.2 TANK VENTILATION AND EMISSIONS CONTROL SYSTEM

The existing ventilation and emissions control systems for the 241-AN Tank Farm will be used during the mixing and transferring of waste in the AN-101, -102, -103, -104, -105 and -107 tanks. No modifications will be made to the existing ventilation or emissions control systems under this NOC. The 241-AN Tank Farm exhaust system was built in 1984 and provides ventilation for all seven 241-AN tank primary vapor spaces. The system removes heat, water vapor and particulates, and maintains a negative pressure on the tanks. The reference for the following information is WHC-SD-W314-ES-022 Rev. 0. The emission point is the 296-A-29 Stack.

Inlet air for the 241-AN-101, -102, -103, -104, -105 and -107 tanks are provided through the inlet air filters. Air is exhausted from each tank independently through 12-inch diameter, underground, carbon steel ducts. The ducts connect to a common 12-inch diameter header, passing underground to the Central Exhaust Station. The exhaust station consists of two filtration subsystems and the stack. Either subsystem can collectively ventilate all the tanks together at a maximum flow rate of approximately 900 cubic feet per minute (approximately 0.42 cubic meters per second). Only one system operates at a time, while the other remains in standby as a backup. A schematic of the 241-AN Tank Farm exhaust system is shown in Figure 2.

Each filtration subsystem consists of a de-entrainer, for the removal of moisture; an electric heater that operates intermittently, for lowering the relative humidity; a pre-filter, for reducing the number of large particles; and two stages of HEPA filters. Either de-entrainer can be used with either heater/filter combination by way of a ducting crosstie. The de-entrainer vaults, filter housings and related piping are enclosed within an 8-foot high shielding wall on the Central Exhaust Station pad. The system fans and stack are located outside of the enclosure. The stack is 10 inches in diameter and is 15 feet 9.25 inches high. The cumulative effect at the filtration system, however, is negligible, because the exhaust streams from the two tanks are diluted when mixed with the air streams from the other six tanks prior to entering the filtration system.

Each HEPA filter is rated for 100 cubic feet per minute and is equipped with fluid seals. The HEPAs are individually tested annually (per ASME N510) to a minimum efficiency of 99.95 percent for the removal of particulates with a median diameter of 0.3 microns.

It is proposed that the existing AN Tank Farm ventilation and control systems be approved for as low as reasonably achievable control technology (ALARACT) for operations of up to two mixer pump in each of the 241-AN-101, -102, -103, -104, -105, and -107 tanks. All the radionuclides contributing 10 percent or more of the dose are in particulate form. The WDOH has provided guidance in the past that HEPA filtration is considered best available radionuclide control technology (BARCT) for particulate emissions.

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.

See Figure 1 of this document.

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.

Radionuclides of concern are listed in Appendix E. For each activity with the potential to emit discussed below, the estimated percentage does contribution of the TEDE to the MEI as been calculated for each isotope.

8.1 POTENTIAL TO EMIT FOR SOIL EXCAVATION ACTIVITIES

Appendix F contains a table that summarizes the PTE for manual soil excavation and the use of the guzzler.

8.2 POTENTIAL TO EMIT FOR PIPE CUTTING ACTIVITIES

Appendix G contains a table that summarizes the PTE for pipe cutting activities.

8.3 POTENTIAL TO EMIT FOR PIT WORK AND IN-TANK EQUIPMENT REMOVAL ACTIVITIES

Appendix H contains the tables that summarizes the PTE for the pit work and the in-tank equipment removal activities for each tank and a combined PTE for the areas covered by this NOC.

8.4 POTENTIAL TO EMIT FOR MIXER PUMP EMISSIONS

Appendix I contains a table that summarizes the PTE for the mixer pump operations.

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, annual, unabated total effective offsite dose for installing and operating the waste retrieval systems in the AN Tank Farm in conjunction with the current potential unabated offsite dose from the AN Tank Farm, is 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.

9.1 MONITORING DURING CONSTRUCTION ACTIVITIES

During soil excavation activities, soil contamination surveys as described in Section 6.1.1 will constitute the PCM to verify low emissions. If the Regulated Guzzler is used PCM will be performed as required by its NOC.

During pipe cutting activities surface contamination surveys, as described in Section 6.1.2, will constitute the PCM to verify low emissions. If a Portable/Temporary Radioactive Air Emission Unit or a HEPA Filtered Vacuum Radioactive Air Emission Unit is used, PCM will be performed as required by their NOCs.

During pit work activities surface contamination surveys as described in Section 6.1.3, will constitute the PCM to verify low emissions. If a Portable/Temporary Radioactive Air Emission Unit or a HEPA Filtered Vacuum Radioactive Air Emission Unit is used, PCM will be performed as required by their NOCs.

During in-tank equipment removal and installation activities surface contamination surveys, as described in ALARACT Demonstration 13, *TWRS ALARACT Demonstration for Installation, Operation and*

Removal of Tank Equipment (Appendix D), will constitute the PCM to verify low emissions. If a Portable/Temporary Radioactive Air Emission Unit or a HEPA Filtered Vacuum Radioactive Air Emission Unit is used, PCM will be performed as required by their NOCs.

9.2 MONITORING DURING OPERATIONS

Confirmatory measurements will be obtained through use of the 241-AN Tank Farms existing sampling and monitoring system (296-A-29 stack). Samples will be collected for approximately two weeks, four times a year, and will include representative operation of the waste retrieval systems. The samples will be analyzed for gross alpha and beta analysis. While the 296-A-29 record sampler is operating, it will be inspected daily to ensure it is operating, and it will be calibrated in accordance with established practices.

The sampling and monitoring system is a generic design consisting of a record sampler and a continuous air monitor (CAM), it collects samples at a sample flow rate of 120 cubic feet per hour (2 cubic feet per minute). Its design is based on ANSI 13.1-1969 and 40 CFR 60 Appendix A Test Methods, however, it does not comply fully with these standards. Two sample probes (1 for the CAM, 1 for the sampler) are located in the stack per 40 CFR 60 Appendix A, Method 1A. The probe nozzles are configured in accordance with ANSI 13.1-1969 and are located 45 inches (CAM) and 61 inches (record sampler) from the top of the stack. The gas meter totaling the flow through the sampling system, is well within the ±2.0 percent accuracy described by Method 2A. The record sampler's collection efficiency during normal operations ranges between 34 and 49 percent for penetration of 10 micron particles (from *Deposition 4.0* calculations). A complete description of the sampling system is provided in WHC-SD-WM-ES-291-1 Rev. 1.

10.0 ANNUAL POSSESSION QUANTITY

Indicate the annual possession quantity for each radionuclide.

The annual possession quantity consists of the highest curie value for each radionuclide, from all the tanks listed in the table in Appendix E. Individual tank radionuclide inventories, as well as the annual possession quantity, are shown in Appendix E.

11.0 PHYSICAL FORM

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

The physical form of each radionuclide of concern in the inventory is listed in the table in Appendix E.

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 each radionuclide on concern in the inventory is listed in the table in Appendix I.

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.

Construction activities are scheduled to be completed within nine years, however, for conservatism in the emissions estimate and flexibility to adapt to schedule changes, the unabated emissions are assumed to be released over a one-year period. Potential unabated emissions from the following general categories of construction activities are discussed below and calculated in Appendices F, G, H, and I.

13.1 SOIL EXCAVATION

13.1.1 Manual Excavation

Unabated emissions for manual soil excavation activities were determined by assuming the entire volume of soil excavated (6,000 cubic yards) was at the same contamination concentration and the 40 CFR 61 Appendix D release factor for particulates was applied to the total volume.

The 241-AN Tank Farm is managed as a clean farm. There is no known surface contamination and no historical spills or leaks, therefore, no contamination is expected during excavation. To determine a potential to emit if contamination is encountered as monitored by standard radiological field instrumentation, the administrative limit of 100,000 dpm/100 cm^2 beta/gamma correlates to 10,000 cpm per probe area as used in the calculations. For alpha, the administrative limit of 35 dpm/100 cm^2 above background correlates to 5 cpm; however, 10 cpm was used in the calculations to account for variations in obtaining background readings. To determine the corresponding soil concentration in picocuries per grams of individual radionuclides, conversion factors, as developed in the study *Soil Contamination Standards for Protection of Personnel* (HNF-2418), were used. The average soil density was assumed to be 1,570 kilograms per cubic meter. The beta-gamma contributing radionuclide was assumed to be Sr-90 and the alpha contributing radionuclide was assumed to be Am-241. The potential unabated emissions from manual soil excavation activities are shown in Appendix F.

13.1.2 Regulated Guzzler Excavation

Unabated emissions for soil excavation with the Regulated Guzzler are included by reference from 98-EAP-037. It is not known at this time if, or how much, soil will be excavated by the Regulated Guzzler, therefore, the entire soil volume was used to determine the potential emissions. The potential unabated emissions from Regulated Guzzler excavation activities are also shown in Appendix F.

13.2 PIPE CUTTING

To determine the unabated emissions from pipe cutting activities, it was assumed that a section of the pipe to be cut was full of the average 241-AN Tank Farm waste, and the 40 CFR 61 Appendix D release factor of 1.0E-03 for particulates was applied to that volume of pipe (using the pipe volume is conservative with respect to the volume of the cut). The pipe volume was derived from a 2-foot section of a 2-inch Schedule 40 pipe (representing any needed cuts on a 2-inch pipe), a 2 foot section of an 8-inch Schedule 40 pipe (representing any needed cuts on an 8-inch pipe), and a 2-foot section of a 42-inch Schedule 40 riser (representing any needed cuts to lengthen the riser). The pipe volume was multiplied by the average 241-AN tank inventory and then multiplied by the 1.0 E-03 release factor for particulates. The potential unabated emissions from pipe cutting activities are shown in Appendix G.

13.3 PIT WORK AND REMOVAL OF IN-TANK EQUIPMENT

The unabated emissions estimate for pit work are based on smearable contamination data from the pits and the 40 CFR 61 Appendix D release factor for particulates. The entire surface area from the walls and floors of the pit, and the enclosed equipment, was assumed to be uniformly contaminated at the highest smearable readings for beta/gamma (1,000,000 dpm/100 cm^2) and alpha (700,000 dpm/100 cm^2) that could be read on portable instruments. The beta-gamma contributing radionuclide was assumed to be Sr-90 and the alpha contributing radionuclide was assumed to be Am-241. The potential unabated emissions from pit work activities are shown in Appendix H.

The unabated emissions estimate for the removal of in-tank equipment was determined by assuming a 0.16 centimeter layer of the applicable tank inventory being uniformly distributed across the surface area of the equipment, and applying the 40 CFR 61 Appendix D release factor for particulates to the total volume contained over that surface area. The biggest equipment from each tank (one mixer pump and one transfer pump for each tank even though not all tanks have a mixer pump) was chosen to represent the total unabated emissions for all removals and relocations. That equipment includes removal of an existing mixer pumps, transfer pumps, thermocouple probes and multi-function instrument trees. Free liquids are not expected to be held up in this equipment because the equipment is designed as self-draining. The small amount of liquid (less than one liter) that may be trapped behind a transfer pump impeller will be immobilized in the absorbent mat secured inside the flex receiver bag and will not be released by the grouting process. The potential unabated emissions from in-tank equipment removals are shown in Appendix H.

13.4 POTENTIAL UNABATED EMISSIONS DURING MIXER PUMP OPERATIONS

Potential annual unabated emissions during mixer pump operations are based on the maximum envelope tank inventory presented in Section 7.0 and a measured partition fraction (1.02 E-09) representative of particulates generated in a double shell tank during the operation of two air lift circulators (RHO-RE-SA-216P). This partition fraction was chosen because it would result in a more accurate estimate than the 40 CFR 61 Appendix D release factor for particulates and it would also provide a conservative estimate when applied to the operation of a mixer pump because air lift circulation is a more aggressive process than mixer pump circulation. This partition fraction for a mixer pumps was previously approved by WDOH and EPA in the NOC submitted for tanks 241-AP-102 and 241-AP-104 (DOE/ORP-99-09).

The partition fraction was derived from samples collected over a two-hour period, representing only two hours of air-lift operations. Mixer pump operations, however, will be intermittent for various amounts of

time through out a year. To apply the partition fraction over longer periods of operation, it was divided by two (air lift circulator hours) and multiplied by the hours of mixer pump operation in a year.

The hours of mixer pump operation per year may vary from year to year depending on which source tanks, or combination of source tanks, provide waste to the 241-AN tanks. To find a maximum number of hours that would be flexible enough to account for source tank scheduling changes, and keep emissions low (0.05 mrem/yr), a spreadsheet was used to calculate annual emissions while varying the times for the operational hours (Appendix F). A maximum of 450 hours a year of mixer pump operation was found to satisfy both requirements.

The potential annual unabated emissions during mixer pump operations in the 241-AN-101, -102, -103, -104, -105 and -107 tanks are shown in Appendix F.

13.5 POTENTIAL ABATED EMISSIONS DURING MIXER PUMP OPERATIONS

The potential annual abated emissions during mixer pump operations are also shown in Appendix F. The abated emissions were calculated from the unabated emissions and the decontamination factor for a single HEPA filter with a minimum efficiency of 99.95% for particles with a median diameter of 0.3 microns. For constituents released in a vapor phase (Tritium, Carbon-14, Ra-226, and Ra-228) the efficiency was considered 0%.

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 MEI for this application is located at the Hanford Site boundary, 20.2 kilometers to the east/southeast of the 200 East Area (PUREX). As shown in Attachment N, alternative MEI's on the Hanford Site and the associated CAP88PC (version 2) run have been provided.

15.0 TOTAL EFFECTIVE DOSE EQUIVALENT TO THE MAXIMALLY EXPOSED INDIVIDUAL

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.

This section discusses the TEDE to the offsite MEI resulting from the unabated and abated emission estimates for operating two mixer pumps in the 241-AN-101, -102, -103, -104, -105 and -107 tanks, and from unabated emissions from the construction activities. As requested by the EPA and WDOH, a new MEI evaluation was performed. Results of the new evaluation showed that the nearest public on-site receptor (Energy Northwest) would receive approximately the same dose as the doses resulting from using the currently approved dose conversion factors in *Calculating Potential to Emit Releases and Doses for FEMPs and NOCs* HNF-3602. As requested by WDOH, Attachment J provides a summary of the new MEI evaluation; however, because HNF-3602 dose conversion factors generally result in essentially the same or more conservate estimate TEDE to the MEI, and for ease of calculating a maximum envelope

of emissions for the project, the HNF-3602 dose conversion factors have been used in the following discussion.

The potential unabated offsite dose from all the construction activities combined together is 1.20E-01 millirem per year (Appendices C, D, & E). The potential unabated offsite dose from operation of the mixer pumps is 3.98E-2 millirem per year (Appendix F).

The current potential unabated offsite dose estimate for the 241-AN Tank Farm exhauster stack is 4.09E-04 millirem per year (HNF-SD-EMP-031 Rev. 3). The potential unabated dose for mixer pump operations is 3.98E-2 millirem per year. Mixer pump operations in the 241-AN-101, -102, -103, -104, -105 and AN-107 tanks will not increase the current potential dose for the 241-AN Tank Farm stack to greater than or equal to 0.1 millirem per year.

The total effective dose equivalent from all 1998 Hanford Site air emissions (point sources, diffuse and fugitive sources, and Radon and Thoron) was 0.038 millirem (DOE/RL-99-41). The emissions resulting from the construction and operation of a mixer pump in the AN-103, AN-104, AN-105, and AN-107 tanks, in conjunction with other operations at the Hanford Site, will not result in a violation of the National Emission Standard of 10 millirem per year.

16.0 COST FACTOR IF NO ANALYSIS

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.

It is proposed that the HEPA filtration system, as described in Section 8.0, be approved as ALARACT for this application. The WDOH has provided guidance in the past that HEPA filtration is considered best available radionuclide control technology (BARCT) for particulate emissions. As such, cost factors for construction, operation, and maintenance of the control technology components and system have not been provided.

17.0 DURATION OR LIFETIME

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

The 241-AN-101, -102, -103, -104, -105 and -107 retrieval systems have a design life of 20 years, including component replacement as necessary. Emissions from the modification described in this NOC are based on the transfer/handling of LAW through the year 2011. It is also not unrealistic to anticipate continued operation of the mixer pumps, in a batch mode, until closure (retrieval) of the DST system, which is currently scheduled for 2028.

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:

ASME/ANSI AG-1
ASME/ANSI N509
ASME/ANSI N510

ANSI/ASME NQA-1
40 CFR 60, Appendix A, Methods 1,1A, 2, 2A, 2C, 2D, 4,5, and 17
ANSI N13.1

Operating the mixer pumps, in a batch mode, in the 241-AN tanks has the potential to emit less than 0.1 millirem per year TEDE to the MEI. Therefore, the design must meet, as applicable and to the extent justified by a cost/benefit evaluation, the technology standards listed under WAC 246-247-110 (18). This section discusses compliance with major sections of these standards and provides justification to support adequacy of the design for sections of these standards, which are not met.

18.1 AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) AG-1

This equipment specific code consists of five primary sections, which are applicable to this unit. The applicable sections are fans (Section BA), ductwork (Section SA), HEPA filters (Section FC), dampers (Section DA) and Quality Assurance (QA) (Section AA).

The fan section of AG-1 (Section BA) covers the construction and testing requirements for fans. This fan meets the applicable criteria identified in AG-1, except for one area. It can not be shown the shaft leakage criteria is met (Section BA 4142.2). This is acceptable because the leakage would be minimal and the leakage point is located after the HEPA filters.

The next applicable requirement is the ductwork section of AG-1 (Section SA). As was the case for the fan, this section identifies several requirements for ductwork. This includes acceptable material, fabrication, and testing criteria. The ductwork used is metal and meets the applicable criteria identified in ASME AG-1. However, it can not be shown that the ductwork was pressure tested per the applicable criteria identified in AG-1 and N510 prior to operation. This is acceptable because the ductwork is under negative pressure and has shown no sign of failure or degradation.

The HEPA filter section of AG-1 (Section FC) is also applicable in this instance. The criteria identified in AG-1 were previously located in military specification 51068 and ASME 509. The filters meet the applicable sections of AG-1, except for two areas dealing with filter qualification testing. Justification for this exception was discussed with and approved by WDOH at the December, 1998 Routine Technical Assistance Meeting.

The dampers installed on the exhauster do meet the applicable AG-1 criteria. This includes design, construction and testing. The manufacturer performs a generic leak test on the butterfly valves prior to shipping.

The quality assurance section of AG-1 relies on ASME NQA-1. The general QA criteria are located in Section AA. Specific component/system criteria are located in each section throughout AG-1. It can not be shown the overall system meets the applicable quality assurance criteria. However, based on past operating history, and evaluating the major components of the system (e.g., fans, filter housings, and HEPA filters), it can be shown those components meet the criteria.

AG-1 contains several other sections, however they do not apply to this system. Finally, several sections of AG-1 are not yet completed. This includes the filter housing section and will be discussed below in the N509 Section.

18.2 ASME N509

This standard deals with the individual components and how they relate to the overall system. The primary section of N509 that will be discussed is the filter housing section and heater section.

The filter housings for the exhauster are not compliant with the applicable sections of the N509 criteria. This includes design of housing, mounting frames, materials, and testing.

The heater used in this exhauster meets the N509 criteria. The reason for the heater is to assure the relative humidity of the air stream is below 70%, reducing the opportunity for condensation in the filter housing.

18.3 ASME N510

This standard pertains to the testing of nuclear air cleaning systems. The first requirement identified in N510 is to perform a pressure decay test. This is to assure there are no infiltration or outward leak paths from the system. This is a standard test for the filter housings at the housing manufacturer's facility. However, no documentation can be located to show whether or not the filter housings were pressure tested once installed in the field. This is acceptable because of the past operating history of the system, and the fact the testing was completed at the manufacturing facility.

This system meets the leak test criteria identified per N510. Test sections and manifolds are located in the exhaust train to allow for proper independent testing of both HEPA filters on both trains.

18.4 ANSI/ASME NQA-1

Quality assurance is addressed by HNF-MP-599, latest revision, "Project Hanford Quality Assurance Program Description" (Chapter 2.0, Section 3.3 and Chapter 7.0, Section 3.2) and by HNF-0528-3, "National Emission Standards for Hazardous Air Pollutants (NESHAP) Quality Assurance Project Plan for Radioactive Airborne Emissions", (all of Sections 2.0, 3.0 and 5.0) as a compatible alternative to NQA-1.

18.5 40 CFR 60, Appendix A

Method 2C (Determination of Stack Gas Velocity and Volumetric Flow Rate In Small Stacks or Ducts (Standard Pitot Tube) as identified in Appendix A is used.

18.6 ANSI N13.1

The probe position is a minimum of five diameters downstream from abrupt changes in flow direction and the system contains proper filter holders and support.

The sampling probe configuration contains less than five times the internal diameter radius bends and precisely tapered probe end edges.

The sample tubing is minimized as much as physically practical, there are bends located in the tubing and a long horizontal section which reduce the deposition efficiency. Deposition losses for 10-micron sized particles have been estimated to be between 34 to 99 percent.

19.0 REFERENCES

98-EAP-037, J. E. Rasmussen, U. S. Department of Energy, Richland Field Office, to J. Leitch, U. S. Environmental Protection Agency, Region 10, *Short Form Radioactive Air Emissions Notice of Construction (NOC) for Guzzler Excavation and Backfilling Activities in Support of the 200 East Area A Farm Complex*, January 30, 1998.

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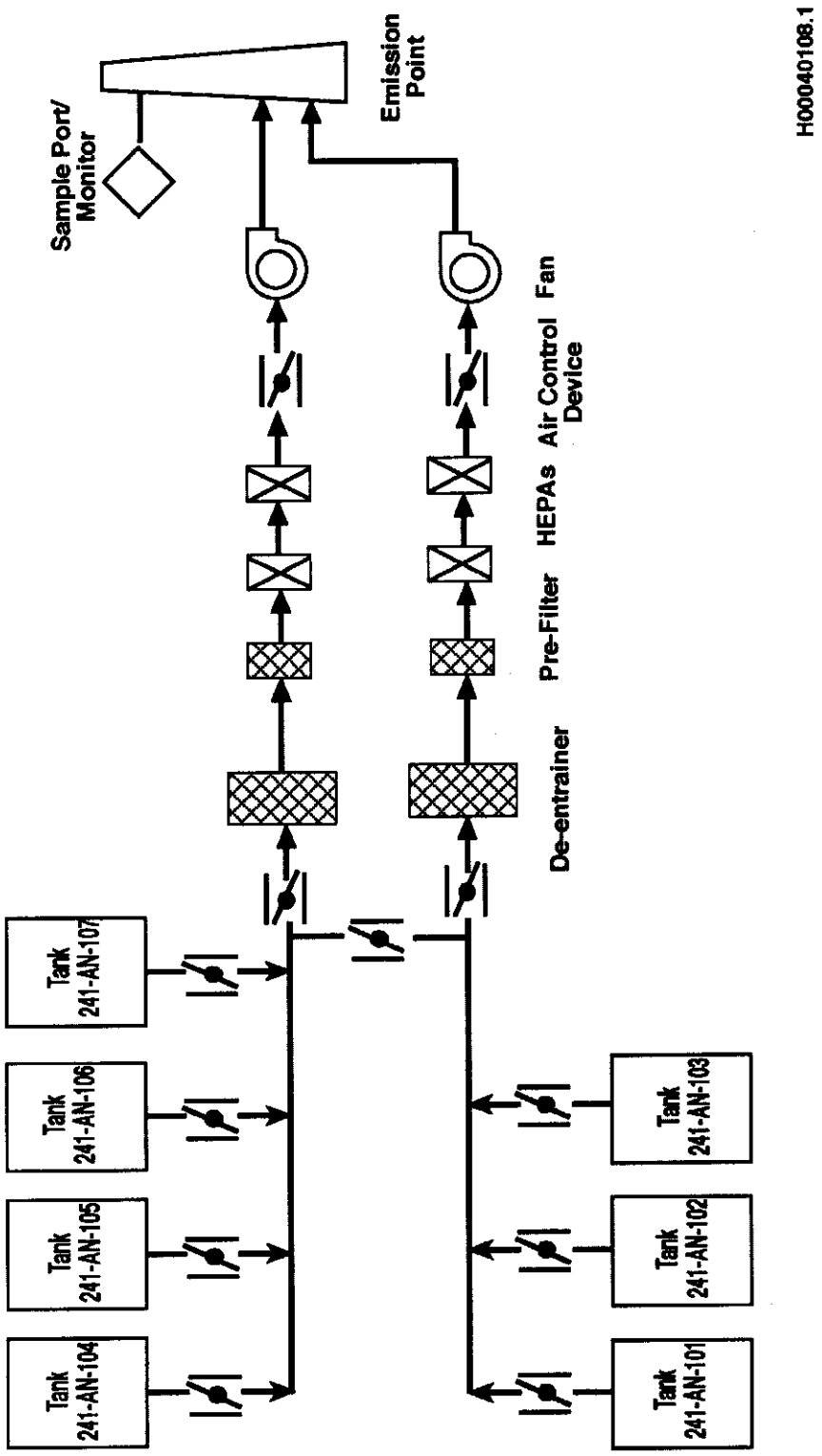

Figure 1. 200 East Area Tank Farms.

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APPENDIX A

ALARACT 5, TWRS ALARACT DEMONSTRATION FOR SOIL EXCAVATION (USING HANDTOOLS)

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ALARACT 5

TWRS ALARACT DEMONSTRATION FOR SOIL EXCAVATION (USING HAND TOOLS)

Washington State Department of Health	4-5-99 Date
U.S. Department of Energy - Richland Operations	3/15/99 Date
Fluor Daniel Hanford	3/1/99 Date
Lockheed Martin Hanford Corporation	2/20/99 Date

Rev. 0
2/18/99

TWRS ALARACT DEMONSTRATION FOR SOIL EXCAVATION (USING HAND TOOLS)

1. Description of Activity/Requirements:

Soil is routinely excavated in the TWRS facilities to support riser preparation, repair and maintenance activities, soil sampling, cleanup of contamination, removal of vegetation and biological hazards, and operational activities (laying conduit or cables for power). An initial survey is performed of the area to be excavated. Surveys are performed throughout the excavation to assure that worker safety and environmental protection is maintained. Once the excavation begins, water is used, as necessary, to prevent the spread of dust. To the extent practicable using hand held instrument field survey techniques, the clean soil is separated from the soil identified as contaminated. The contaminated soil has a fixative applied or is covered by plastic at the end of the shift, and as necessary, to stabilize the contaminated soil. The activities covered by this ALARACT demonstration do not include D&D. All radioactively contaminated soil excavation is conducted using hand tools.

2. Radiological Controls:

- Follow TWRS ALARACT demonstration for "Packaging and Transportation of Waste" (ALARACT 4)
- HPT coverage will be performed as specified in the radiological work permit.
- A beta-gamma survey of the ground surface is required prior to excavation in Contamination Areas (CA's), High Contamination Areas (HCA's), Soil Contamination Areas (SCA's), and Underground Radioactive Material Areas (URMA's). An alpha survey may be required prior to excavation per the "Justification for Dual Survey Exemption in Tank Farm Facilities" HNF-3391.
- For excavation in CA's, HCA's, SCA's, and URMA's, if beta-gamma activity greater than 1000 dpm/probe area (5000 dpm/100cm^2) is identified, alpha surveys will also be performed.
- Suppressants such as water, fixatives, covers, or windscreens will be used as necessary, including at the end of each shift or when sustained or predicted winds are >20mph.
- If the net alpha for the general area is greater than 140 dpm/probe area, OR if the net beta-gamma activity for the general area is greater than 500,000 dpm/probe area, work will be suspended and worker safety evaluated by TWRS Radiological Control. Direct contact will also be made to WDOH. After it is determined that there is no threat to worker safety, WDOH has been

contacted, and the proper controls (e.g., water fixatives, covers, windscreens) have been put in place, excavation may continue. A contact of WDOH will not be needed if the contamination consists of a hot speck. If hot specks are detected during the radiological surveys, the specks will be removed and contained before the activity is allowed to continue unless located in the bottom of the trench after excavation has been completed. Specks found in the bottom of the completed trench may be covered with clean fill. A hot speck will be defined as a very small amount (i.e. less than or equal to 100 cm^2) of contamination reading greater than or equal to 1,000,000 dpm/probe size beta-gamma and/or greater than or equal to 490 dpm/probe size alpha.

3. Monitoring:

   - Radiological surveys (direct surveys of soil)
   - Post job survey(s)

4. Records/Documentation:

   - Work package
   - Radiological work permit
   - Radiological survey report(s)

5. Emission Pathway:

   - Existing passive (fugitive/diffuse)

6. TWRS Facility Description:

   - All TWRS facilities

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APPENDIX B

ALARACT 6, TWRS ALARACT DEMONSTRATION FOR PIT ACCESS

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ALARACT 6

TWRS ALARACT DEMONSTRATION FOR PIT ACCESS

Washington State Department of Health	4-5-99 Date
U.S. Department of Energy - Richland Operations	3/15/99 Date
Fluor Daniel Hanford	3/1/99 Date
Lockheed Martin Hanford Corporation	2/20/99 Date

Rev. 0
2/18/99

TWRS ALARACT DEMONSTRATION FOR PIT ACCESS

This ALARACT demonstration applies to all pits except 241-ER-152, 241-S-151, 241-UX-154, 241-TX-154, 244-CR Vault DCRT, 244-A Lift Station DCRT, and 244-TX DCRT.

1. Description of Activity/Requirements:

PREPARATION WORK: A pre-job survey is performed on the exterior surface of the pit and the surrounding area. A fall protection handrail is installed around the pit. The fall protection is draped in plastic sheeting that extends to the top of the pit. This establishes a splash guard around the pit. Before the cover blocks are removed, an approved fixative may be applied inside the pit or the pit may be decontaminated as described below. These processes are generally performed through an access port. If there is no access port(s), the cover blocks are raised and suspended, a radiological survey is performed, and/or a fixative may be applied inside the pit as described in Section 2, Radiological Control. The cover blocks are removed.

DECONTAMINATION: Uniformly distributed removable contamination levels in the pit are decontaminated/fixed to less than 100,000 dpm/100cm^2 beta/gamma and 2,000 dpm/100cm^2 alpha by washing and/or an approved fixative is applied to pit surfaces. Fixative will matrix the contamination to ensure minimization of potential airborne contamination. If a high pressure (up to 3,000 psi) or low pressure (approximately 125 psi) whirly is installed, it is done through an opening (if one exists) in the cover blocks and the pit is washed down. The cover blocks are lifted and contained if the removable level is greater than 50,000 dpm/100 cm^2 beta/gamma and 20 dpm/100 cm^2 alpha. The cover blocks are then moved to a storage area. With the cover blocks off, additional decontamination activities may include the use of chemicals, peel and strip paints, water, or manual scrub brushes. When decontamination activities are complete, other work may begin or a temporary cover is installed over the pit.

CLOSURE: After all activities in the pit are completed, the cover blocks are reinstalled and the splash guard is removed.

2. Radiological Controls:

- Follow TWRS ALARACT demonstration for "Riser Preparation/Opening" (ALARACT 1)
- Follow TWRS ALARACT demonstration for "Packaging and Transportation of Waste" (ALARACT 4)
- Use of a splash guard extending to the edge of the pit

- Uniformly distributed removable contamination levels within the pit are decontaminated or fixed so that a swipe reads less than 100,000 dpm/100 cm^2 beta/gamma and 2,000 dpm/100 cm^2 alpha. An approved fixative will be applied to pit surfaces if contamination levels exceed the limits stated above or as needed. Note: The fixative will matrix the contamination to ensure minimization of potential airborne contamination.
- Splash guard will be taped or sealed to the edge of the pit
- Pit work will not be performed if sustained winds are >25 mph
- HPT coverage will be performed as specified in the Radiological Work Permit

3. Monitoring:

- Radiological surveys of the work area as required by the work package. Swipes for removable contamination are required.
- Swipes will be taken to determine that splash guards are to be maintained below 50,000 dpm/100 cm^2 beta/gamma and 20 dpm/100 cm^2 alpha
- Post job survey(s)

4. Records/Documentation:

- Work package
- Radiological work permit
- Radiological survey report(s)

5. Emission Pathway:

- Existing passive non-point sources

6. TWRS Facility Description:

- Pits at all TWRS facilities
- This ALARACT demonstration applies to all pits except 241-ER-152, 241-S-151, 241-UX-154, 241-TX-154, 244-CR Vault DCRT, 244-A Lift Station DCRT, and 244-TX DCRT.

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APPENDIX C

ALARACT 14, TWRS ALARACT DEMONSTRATION FOR PIT WORK

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ALARACT 14

TWRS ALARACT DEMONSTRATION FOR PIT WORK

Washington State Department of Health	4-5-99 Date
U.S. Department of Energy - Richland Operations	3/15/99 Date
Fluor Daniel Hanford	3/1/99 Date
Lockheed Martin Hanford Corporation	2/20/99 Date

Rev. 0
2/18/99

TWRS ALARACT DEMONSTRATION FOR PIT WORK

This ALARACT demonstration applies to all pits except 241-ER-152, 241-S-151, 241-UX-154, 241-TX-154, 244-CR Vault DCRT, 244-A Lift Station DCRT, and 244-TX DCRT.

1. Description of Activity/Requirements:

When entering or exiting the pit, ALARACT 6 "Pit Access" must be complied with.

All equipment removed from the pit is decontaminated or contained. A temporary or permanent cover is placed over the pit if ever left unattended.

Installing pit leak detectors, unplugging drains, and housekeeping/waste removal activities are performed following the above description.

Specific activities performed in pits follows:

Jumper Work

Before any jumper work takes place, the affected lines are flushed (if possible) and an approved fixative is applied. The fixative will be applied in accordance with ALARACT 6 "Pit Access" and reapplied as necessary.

Swipes of the splash guard will be taken during the jumper work. If a used jumper is to be removed from the pit, it is drained and a fixative is applied. If removable contamination is greater than 50,000 dpm/100 cm^2 beta/gamma and/or 20 dpm/100 cm^2 alpha, the jumper will be contained and/or decontaminated.

If jumpers are cut, they are cut by hydraulic shears or a portable band saw within the pit. The pieces are contained before they are removed from the pit.

Pressure Testing Lines

A pressure test assembly is installed on the line to be tested in one pit. A blank with a drain is installed on the other end of the line in a separate pit. Temporary and/or permanent covers are placed over the pits during the pressure test.

2. Radiological Controls:

- Follow TWRS ALARACT demonstration for "Riser Preparation/Opening" (ALARACT 1)
- Follow TWRS ALARACT demonstration for "Packaging and Transportation of Waste" (ALARACT 4)
- Follow TWRS ALARACT demonstration for "Pit Access" (ALARACT 6)
- Follow TWRS ALARACT demonstration for "Packaging and Transportation of Equipment and Vehicles" (ALARACT 12)
- A splash guard will extend to the edge of the pit were it is taped or sealed.
- Uniformly distributed removable contamination levels within the pit are decontaminated or fixed so that a swipe reads less than 100,000 dpm/100 cm^2 beta/gamma and 2,000 dpm/100 cm^2 alpha. An approved fixative will be applied to pit surfaces if contamination levels exceed the limits stated above or as needed. Note: The fixative will matrix the contamination to ensure minimization of potential airborne contamination.
- If a used jumper is to be removed from the pit, it is drained and a fixative is applied. If removable contamination is greater than 50,000 dpm/100 cm^2 beta/gamma and/or 20 dpm/100 cm^2 alpha, the jumper will be contained and/or decontaminated.
- A temporary or permanent cover is placed over the pit if the pit is ever left unattended
- Pit work will not be performed if sustained winds are >25 mph
- HPT coverage will be performed as specified in the Radiological Work Permit

3. Monitoring:

- Radiological surveys of the work area as required by the work package. Swipes for removalbe contamination are required.
- Swipes will be taken to determine that splash guards are maintained below 50,000 dpm/100 cm^2 beta/gamma and 20 dpm/100 cm^2 alpha
- Post job survey(s)

4. Records/Documentation:

   - Work package
   - Radiological work permit
   - Radiological survey report(s)

5. Emission Pathway:

   - Existing passive non-point sources

6. Locations:

   - All TWRS facilities
   - This ALARACT demonstration applies to all pits except 241-ER-152, 241-S-151, 241-UX-154, 241-TX-154, 244-CR Vault DCRT, 244-A Lift Station DCRT, and 244-TX DCRT.

APPENDIX D

ALARACT 13, TWRS ALARACT DEMONSTRATION FOR INSTALLATION, OPERATION, AND REMOVAL OF TANK EQUIPMENT

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ALARACT 13

TWRS ALARACT DEMONSTRATION FOR INSTALLATION, OPERATION, AND REMOVAL OF TANK EQUIPMENT

Washington State Department of Health	Date 4-5-99
U.S. Department of Energy - Richland Operations	Date 3/15/99
Fluor Daniel Hanford	Date 3/1/99
Lockheed Martin Hanford Corporation	Date 2/26/99

Rev. 0
2/18/99

TWRS ALARACT DEMONSTRATION FOR INSTALLATION, OPERATION, AND REMOVAL OF TANK EQUIPMENT

1. Description on Activity/Requirements:

This ALARACT demonstration does not provide approval for the following activities: waste sampling, sluicing, lancing, operations of mixer pumps, and use of the LDUA. While operating under these activities, the applicable ALARACT demonstrations must be complied with.

A multitude of equipment may be installed, operated, and removed from tanks (actively and passively ventilated).

When installing and removing equipment from tanks, risers and pits are opened. ALARACT 1 (Riser Preparation/Opening) and ALARACT 6 (Pit Access) describe the activities necessary to prepare the risers and pits.

If water lancing is performed to assist in the installation of equipment, it will be done in accordance with ALARACT 10 (Water Lancing).

Equipment is lowered into and removed from tanks either manually or remotely (e.g. using a crane). Once the equipment is installed, mating surfaces of the equipment and riser are sealed.

All equipment removed from tanks is contained using glovebags, sleeving, or other containment devices in accordance with the latest revision of the containment matrix guide from HNF-IP-0842.

The riser is closed under ALARACT 1 (Riser Preparation/Opening) and the pit is closed under ALARACT 6 (Pit Access) following installation or removal of equipment.

Waste is packaged and transported per ALARACT 4 (Packaging and Transportation of Waste). Equipment is packaged and transported per ALARACT 12 (Packaging and Transportation of Equipment and Vehicles).

2. Radiological Controls:

- Follow TWRS ALARACT demonstration for "Riser Preparation/Opening" (ALARACT 1)
- Follow TWRS ALARACT demonstration for "Packaging and Transportation of Waste" (ALARACT 4)
- Follow TWRS ALARACT demonstration for "Pit Access" (ALARACT 6)
- Follow TWRS ALARACT demonstration for "Water Lancing" (ALARACT 10)

- Follow TWRS ALARACT demonstration for "Packaging and Transportation of Equipment and Vehicles" (ALARACT 12)
- Equipment is decontaminated or contained when removed from tanks.
- Swipes will be taken to determine that the surface of the item or the outermost surface of the container are maintained <50,000 dpm/100cm^2 beta/gama and/or <20 dpm/ 100cm^2 alpha
- HPT coverage will be performed as specified in the Radiological Work Permit
- Do not install or remove equipment if sustained winds are >25 mi/hr
- When containment is used, it will be in accordance with the latest revision of the containment matrix guide from HNF-IP-0842.

3. Monitoring:
   - Radiological surveys of the work area as required by the work package. Swipes for removable contamination are required.
   - Post job survey(s)
4. Records/Documentation:
   - Work package
   - Radiological work permit
   - Radiological survey report(s)
5. Emission Pathway:
   - Existing passive or active point & non-point sources
6. TWRS Facility Description:
   - All TWRS facilities

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APPENDIX E

241-AN TANK FARM RADIONUCLIDE INVENTORY DATA

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241-AN TANK FARM RADIONUCLIDE INVENTORY DATA									
Radionuclide	**Physical State**	**AN-101 Curies**	**AN-102 Curies**	**AN-103 Curies**	**AN-104 Curies**	**AN-105 Curies**	**AN-106 Curies**	**AN-107 Curies**	**Maximum Envelope Curies**
3H	Liquid	4.190E+01	1.270E+00	9.310E+00	4.330E+01	1.410E+03	2.750E+01	9.290E+02	1.41E+03
14C	Liquid	5.760E+00	6.480E-01	1.120E+02	1.040E+02	1.980E+02	3.570E+00	1.480E+02	1.98E+02
59Ni	Particulate	3.560E-01	1.150E+01	7.580E+00	5.610E+00	1.110E+01	2.570E-01	6.490E+00	1.15E+01
60Co	Particulate	2.280E+00	7.590E+02	1.120E+02	1.490E+02	1.240E+02	4.870E+00	2.000E+02	7.59E+02
63Ni	Particulate	3.470E+01	1.140E+03	7.470E+02	5.520E+02	1.090E+03	2.210E+01	6.420E+02	1.14E+03
79Se	Particulate	5.800E-01	1.010E+00	1.230E+01	1.130E+01	2.190E+01	4.580E-01	1.450E+01	2.19E+01
90Sr	Particulate	1.740E+02	3.680E+05	8.030E+03	9.380E+04	3.360E+04	1.370E+02	5.540E+05	5.54E+05
90Y	Particulate	1.740E+02	3.680E+05	8.030E+03	9.380E+04	3.360E+04	1.370E+02	5.540E+05	5.54E+05
93mNb	Particulate	2.090E+00	7.380E+01	4.320E+01	4.020E+01	7.760E+01	1.620E+00	5.100E+01	7.76E+01
93Zr	Particulate	2.840E+00	1.030E+02	5.960E+01	5.530E+01	1.060E+02	2.200E+00	7.130E+01	1.06E+02
99Tc	Particulate	4.210E+01	4.970E+01	4.560E+02	3.450E+02	1.170E+03	2.630E+01	1.160E+03	1.17E+03
106Ru	Particulate	1.090E-03	4.850E-02	5.330E-02	3.230E-02	5.600E-02	1.780E-03	3.560E-02	5.60E-02
113mCd	Particulate	1.440E+01	5.650E+02	3.020E+02	2.900E+02	5.520E+02	1.090E+01	3.990E+02	5.65E+02
125Sb	Particulate	2.880E+01	1.590E+02	8.650E+02	7.450E+02	1.330E+03	3.120E+01	9.510E+02	1.33E+03
126Sn	Particulate	8.780E-01	3.150E+01	1.880E+01	1.720E+01	3.320E+01	6.990E-01	2.180E+01	3.32E+01
129I	Particulate	8.100E-02	3.170E+00	8.320E+00	7.530E+00	1.100E+01	5.070E-02	2.250E+00	1.10E+01
134Cs	Particulate	7.730E+00	1.970E+01	1.890E+02	1.230E+02	2.080E+02	5.280E+00	5.710E+01	2.08E+02
137Cs	Particulate	4.430E+04	1.490E+06	2.310E+06	2.320E+06	8.360E+05	2.050E+04	1.500E+06	2.32E+06
151Sm	Particulate	2.050E+03	7.340E+04	4.360E+04	4.000E+04	7.720E+04	1.620E+03	5.080E+04	7.72E+04
152Eu	Particulate	5.760E-01	4.070E+01	1.580E+01	1.450E+01	2.690E+01	5.360E-01	2.000E+01	4.07E+01
154Eu	Particulate	9.960E+01	3.750E+02	6.040E+02	6.760E+02	5.650E+02	7.890E+01	3.030E+03	3.03E+03
155Eu	Particulate	3.370E+01	3.220E+02	3.300E+03	4.730E+03	2.260E+03	3.320E+01	1.220E+03	4.73E+03
226Ra	Particulate	2.640E-05	7.950E-04	5.810E-04	4.630E-04	9.140E-04	2.000E-05	5.290E-04	9.14E-04
227Ac	Particulate	1.610E-04	4.900E-03	3.550E-03	2.860E-03	5.650E-03	1.240E-04	3.260E-03	5.65E-03
228Ra	Particulate	3.050E-02	1.720E+00	1.050E+00	1.030E+00	2.030E+00	2.810E-02	2.050E+00	2.05E+00
229Th	Particulate	7.130E-04	3.990E-02	2.430E-02	2.390E-02	4.710E-02	6.530E-04	4.740E-02	4.74E-02
231Pa	Particulate	7.170E-04	2.350E-02	1.430E-02	1.280E-02	2.490E-02	5.100E-04	1.600E-02	2.49E-02
232Th	Particulate	3.060E-03	1.830E-01	1.030E-01	1.090E-01	2.120E-01	2.710E-03	2.320E-01	2.32E-01
232U	Particulate	1.080E-01	5.330E+00	3.590E+00	3.170E+00	6.320E+00	9.920E-02	5.480E+00	6.32E+00
233U	Particulate	4.140E-01	2.040E+01	1.380E+01	1.210E+01	2.420E+01	3.800E-01	2.100E+01	2.42E+01
234U	Particulate	1.600E-01	4.220E+00	4.870E+00	3.590E+00	5.500E+00	2.270E-01	2.690E+00	5.50E+00
235U	Particulate	6.510E-03	1.680E-01	1.890E-01	1.400E-01	2.160E-01	8.760E-03	1.040E-01	2.16E-01
236U	Particulate	5.540E-03	1.500E-01	2.850E-01	1.930E-01	2.490E-01	1.500E-02	9.510E-02	2.85E-01
237Np	Particulate	1.590E-01	4.770E-01	3.100E+01	3.070E+01	2.580E+01	9.400E-02	3.980E+00	3.10E+01
238Pu	Particulate	2.480E-01	1.170E+01	1.260E+01	7.970E+00	1.180E+01	5.280E-01	5.980E+00	1.26E+01
238U	Particulate	1.740E-01	5.360E+00	4.840E+00	3.860E+00	6.530E+00	2.010E-01	4.070E+00	6.53E+00
239Pu	Particulate	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.110E+00	0.000E+00	9.11E+00
240Pu	Particulate	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.850E+00	0.000E+00	1.85E+00
241Am	Particulate	9.740E-01	8.130E+02	2.170E+01	5.000E+01	1.010E+01	1.140E+01	3.650E+03	3.65E+03
241Pu	Particulate	1.820E+01	6.720E+02	1.060E+03	6.640E+02	9.200E+02	4.780E+01	4.290E+02	1.06E+03
242Cm	Particulate	2.050E-02	1.390E-03	6.230E-01	5.240E-01	9.870E-01	2.160E-02	6.330E-01	9.87E-01
242Pu	Particulate	9.120E-05	3.590E-03	4.970E-03	3.060E-03	4.570E-03	2.060E-04	2.290E-03	4.97E-03
243Am	Particulate	3.570E-04	1.380E-02	2.090E-03	1.240E-03	1.880E-02	8.610E-04	9.910E-03	1.88E-02
243Cm	Particulate	1.910E-03	5.130E-01	4.850E+00	4.800E-01	1.700E-01	2.170E-03	6.330E-02	4.85E+00
244Cm	Particulate	1.900E-02	1.540E+01	1.300E+01	1.200E+01	4.100E+00	3.090E-02	4.630E-01	1.54E+01
Total		**4.704E+04**	**2.305E+06**	**2.378E+06**	**2.556E+06**	**9.906E+05**	**2.272E+04**	**2.672E+06**	**3.525E+06**

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APPENDIX F

POTENTIAL UNABATED EMISSIONS AND DOSE FOR SOIL EXCAVATION ACTIVITIES

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POTENTIAL UNABATED EMISSIONS AND DOSE FOR SOIL EXCAVATION ACTIVITIES						
HAND DIGGING SOIL EXCAVATION ACTIVITIES						
MAXIMUM SOIL EXCAVATED	6000	YARDS^3				
MAXIMUM SOIL EXCAVATED	162,000	FEET^3				
SOIL DENSITY	98	POUNDS/FEET^3				
TOTAL MASS OF SOIL	7.201E+09	GRAMS				
MAXIMUM ALPHA READING	10	CPM				
MAXIMUM BETA/GAMMA READING	10,000	CPM				
RELEASE FRACTION	1.00E-03					
ASSUMED ISOTOPE	**CONVERSION FACTOR (pCi/gram)/cpm (a)**	**TOTAL POSSESSION QUANTITY (b) Ci**	**UNABATED RELEASE, Ci**	**OFFSITE DOSE FACTOR, mrem/Ci**	**UNABATED DOSE, mrem**	**% UNABATED OFFSITE DOSE**
Sr-90	0.35	2.551E+01	2.55E-02	1.10E-01	2.81E-03	17.43%
Am-241	14.20	1.023E+00	1.02E-03	1.30E+01	1.33E-02	82.57%
TOTAL		**2.654E+01**	**2.65E-02**		**1.61E-02**	**100.00%**
GUZZLER SOIL EXCAVATION ACTIVITIES						
MAXIMUM SOIL EXCAVATED	700	FEET^3				
SOIL DENSITY	98	POUNDS/FEET^3				
TOTAL MASS OF SOIL	3.112E+07	GRAMS				
MAXIMUM ALPHA READING	10	CPM				
MAXIMUM BETA/GAMMA READING	10,000	CPM				
RELEASE FRACTION	1.00E+00					
ASSUMED ISOTOPE	**CONVERSION FACTOR (pCi/gram)/cpm (a)**	**TOTAL POSSESSION QUANTITY (b) Ci**	**UNABATED RELEASE, Ci**	**OFFSITE DOSE FACTOR, mrem/Ci**	**UNABATED DOSE, mrem**	**% UNABATED OFFSITE DOSE**
Sr-90	0.35	1.102E-01	1.10E-01	1.10E-01	1.21E-02	17.43%
Am-241	14.20	4.419E-03	4.42E-03	1.30E+01	5.74E-02	82.57%
TOTAL		**1.147E-01**	**1.15E-01**		**6.96E-02**	**100.00%**
Notes:						
(a)	FROM TABLE 4 HNF-2418.					
(b)	WEIGHT OF SOIL X FIELD INSTRUMENT READING X CONVERSION FACTOR.					

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APPENDIX G

POTENTIAL UNABATED EMISSIONS AND DOSE FOR PIPE CUTTING ACTIVITIES

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POTENTIAL UNABATED EMISSIONS AND DOSE FOR PIPE CUTTING ACTIVITIES								
HANFORD SITE AREA	200-EAST							
2 INCH, SCH 40 PIPE	2.000	INCH						
8 INCH, SCH 40 PIPE	8.000	INCH						
42 INCH, SCH 40 PIPE	42.000	INCH						
TOTAL PIPE VOLUME (two linear feet per pipe size)	149.49	GALLONS						
AN TANK VOLUME	1,095,000	GALLONS						
Constituent Name	**State**	**Concentration Curies/Gal**	**Pipe Inventory Curies**	**Release Fraction**	**Unabated Release Curies**	**Offsite Dose Factor mrem/Curie (HNF-3602)**	**Offsite Unabated Dose mrem/year**	**Percent of Unabated Offsite Dose**
3H	Liquid	1.82E-03	2.72E-01	1.00E-03	2.72E-04	2.50E-05	6.79E-09	0.00%
14C	Liquid	2.55E-04	3.81E-02	1.00E-03	3.81E-05	1.90E-03	7.24E-08	0.00%
59Ni	Particulate	1.48E-05	2.21E-03	1.00E-03	2.21E-06	3.10E-04	6.87E-10	0.00%
60Co	Particulate	9.78E-04	1.46E-01	1.00E-03	1.46E-04	2.50E-01	3.65E-05	0.11%
63Ni	Particulate	1.47E-03	2.20E-01	1.00E-03	2.20E-04	2.60E-04	5.71E-08	0.00%
79Se	Particulate	2.82E-05	4.22E-03	1.00E-03	4.22E-06	1.30E-01	5.48E-07	0.00%
90Sr	Particulate	7.14E-01	1.07E+02	1.00E-03	1.07E-01	1.10E-01	1.17E-02	35.08%
90Y	Particulate	7.14E-01	1.07E+02	1.00E-03	1.07E-01	3.40E-04	3.63E-05	0.11%
93mNb	Particulate	1.00E-04	1.49E-02	1.00E-03	1.49E-05	2.10E-03	3.14E-08	0.00%
93Zr	Particulate	1.37E-04	2.04E-02	1.00E-03	2.04E-05	1.30E-03	2.65E-08	0.00%
99Tc	Particulate	1.51E-03	2.25E-01	1.00E-03	2.25E-04	2.30E-02	5.18E-06	0.02%
106Ru	Particulate	7.21E-08	1.08E-05	1.00E-03	1.08E-08	1.60E-02	1.73E-10	0.00%
113mCd	Particulate	7.28E-04	1.09E-01	1.00E-03	1.09E-04	1.30E-01	1.41E-05	0.04%
125Sb	Particulate	1.71E-03	2.56E-01	1.00E-03	2.56E-04	2.60E-02	6.66E-06	0.02%
126Sn	Particulate	4.28E-05	6.39E-03	1.00E-03	6.39E-06	4.70E-02	3.00E-07	0.00%
129I	Particulate	1.42E-05	2.12E-03	1.00E-03	2.12E-06	2.00E-01	4.24E-07	0.00%
134Cs	Particulate	2.68E-04	4.01E-02	1.00E-03	4.01E-05	1.00E-01	4.01E-06	0.01%
137Cs	Particulate	2.99E+00	4.47E+02	1.00E-03	4.47E-01	2.70E-02	1.21E-02	36.06%
151Sm	Particulate	9.94E-02	1.49E+01	1.00E-03	1.49E-02	7.50E-04	1.11E-05	0.03%
152Eu	Particulate	5.24E-05	7.84E-03	1.00E-03	7.84E-06	2.40E-01	1.88E-06	0.01%
154Eu	Particulate	3.90E-03	5.83E-01	1.00E-03	5.83E-04	2.00E-01	1.17E-04	0.35%
155Eu	Particulate	6.09E-03	9.11E-01	1.00E-03	9.11E-04	8.00E-03	7.29E-06	0.02%
226Ra	Gas	1.18E-09	1.76E-07	1.00E+00	1.76E-07	4.60E-01	8.10E-08	0.00%
227Ac	Particulate	7.28E-09	1.09E-06	1.00E-03	1.09E-09	1.50E+01	1.63E-08	0.00%
228Ra	Gas	2.64E-06	3.95E-04	1.00E+00	3.95E-04	1.90E-01	7.50E-05	0.22%
229Th	Particulate	6.11E-08	9.13E-06	1.00E-03	9.13E-09	1.60E+01	1.46E-07	0.00%
231Pa	Particulate	3.21E-08	4.80E-06	1.00E-03	4.80E-09	1.20E+01	5.75E-08	0.00%
232Th	Particulate	2.99E-07	4.47E-05	1.00E-03	4.47E-08	8.00E+00	3.57E-07	0.00%
232U	Particulate	8.14E-06	1.22E-03	1.00E-03	1.22E-06	1.10E+01	1.34E-05	0.04%
233U	Particulate	3.12E-05	4.66E-03	1.00E-03	4.66E-06	3.10E+00	1.44E-05	0.04%
234U	Particulate	7.09E-06	1.06E-03	1.00E-03	1.06E-06	3.10E+00	3.28E-06	0.01%
235U	Particulate	2.78E-07	4.16E-05	1.00E-03	4.16E-08	3.00E+00	1.25E-07	0.00%
236U	Particulate	3.67E-07	5.49E-05	1.00E-03	5.49E-08	2.90E+00	1.59E-07	0.00%
237Np	Particulate	3.99E-05	5.97E-03	1.00E-03	5.97E-06	1.20E+01	7.16E-05	0.21%
238Pu	Particulate	1.62E-05	2.43E-03	1.00E-03	2.43E-06	7.60E+00	1.84E-05	0.06%
238U	Particulate	8.41E-06	1.26E-03	1.00E-03	1.26E-06	2.80E+00	3.52E-06	0.01%
239Pu	Particulate	1.17E-05	1.75E-03	1.00E-03	1.75E-06	8.20E+00	1.44E-05	0.04%
240Pu	Particulate	2.38E-06	3.56E-04	1.00E-03	3.56E-07	8.20E+00	2.92E-06	0.01%
241Am	Particulate	4.70E-03	7.03E-01	1.00E-03	7.03E-04	1.30E+01	9.14E-03	27.32%
241Pu	Particulate	1.37E-03	2.04E-01	1.00E-03	2.04E-04	1.30E-01	2.65E-05	0.08%
242Cm	Particulate	1.27E-06	1.90E-04	1.00E-03	1.90E-07	4.10E-01	7.79E-08	0.00%
242Pu	Particulate	6.40E-09	9.57E-07	1.00E-03	9.57E-10	7.80E+00	7.47E-09	0.00%
243Am	Particulate	2.42E-08	3.62E-06	1.00E-03	3.62E-09	1.30E+01	4.71E-08	0.00%
243Cm	Particulate	6.25E-06	9.34E-04	1.00E-03	9.34E-07	8.50E+00	7.94E-06	0.02%
244Cm	Particulate	1.98E-05	2.97E-03	1.00E-03	2.97E-06	6.70E+00	1.99E-05	0.06%
TOTAL		**4.54E+00**	**6.79E+02**		**6.79E-01**		**3.34E-02**	**100.00%**

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APPENDIX H

POTENTIAL UNABATED EMISSIONS AND DOSE FOR PIT AND EQUIPMENT INSTALLATION REMOVAL ACTIVITIES

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POTENTIAL UNABATED EMISSIONS AND DOSE FOR PIT AND EQUIPMENT INSTALLATION REMOVAL ACTIVITIES								
MIXER PUMP SURFACE AREA	500	FT^2						
TRANSFER PUMP SURFACE AREA	44	FT^2						
TOTAL CONTAMINATED SURFACE AREA	544	FT^2						
WASTE LAYER THICKNESS	0.083	INCH						
WASTE VOLUME ON EQUIPMENT	21.196	GALLONS						
TOTAL NUMBER OF TANKS	6.000							
TOTAL WASTE VOLUME	127.177	GALLONS						
AN TANK FARM AVERAGE VOLUME	776,285.7	GALLONS	(HNF-EP-0182-141 - DECEMBER 31, 1999)					
Constituent Name	Tank Inventory Curies	Concentration Curies/gallon	Inventory On Equipment Curies	Release Fraction	Unabated Release Curies	Offsite Dose Factor mrem/Curie (HNF-3602)	Offsite Unabated Dose mrem/year	Percent of Unabated Offsite Dose
3H	1.41E+03	1.82E-03	2.31E-01	1.00E-03	2.31E-04	2.50E-05	5.77E-09	0.00%
14C	1.98E+02	2.55E-04	3.24E-02	1.00E-03	3.24E-05	1.90E-03	6.16E-08	0.00%
59Ni	1.15E+01	1.48E-05	1.88E-03	1.00E-03	1.88E-06	3.10E-04	5.84E-10	0.00%
60Co	7.59E+02	9.78E-04	1.24E-01	1.00E-03	1.24E-04	2.50E-01	3.11E-05	0.11%
63Ni	1.14E+03	1.47E-03	1.87E-01	1.00E-03	1.87E-04	2.60E-04	4.86E-08	0.00%
79Se	2.19E+01	2.82E-05	3.59E-03	1.00E-03	3.59E-06	1.30E-01	4.66E-07	0.00%
90Sr	5.54E+05	7.14E-01	9.08E+01	1.00E-03	9.08E-02	1.10E-01	9.98E-03	35.08%
90Y	5.54E+05	7.14E-01	9.08E+01	1.00E-03	9.08E-02	3.40E-04	3.09E-05	0.11%
93mNb	7.76E+01	1.00E-04	1.27E-02	1.00E-03	1.27E-05	2.10E-03	2.67E-08	0.00%
93Zr	1.06E+02	1.37E-04	1.74E-02	1.00E-03	1.74E-05	1.30E-03	2.26E-08	0.00%
99Tc	1.17E+03	1.51E-03	1.92E-01	1.00E-03	1.92E-04	2.30E-02	4.41E-06	0.02%
106Ru	5.60E-02	7.21E-08	9.17E-06	1.00E-03	9.17E-09	1.60E-02	1.47E-10	0.00%
113mCd	5.65E+02	7.28E-04	9.26E-02	1.00E-03	9.26E-05	1.30E-01	1.20E-05	0.04%
125Sb	1.33E+03	1.71E-03	2.18E-01	1.00E-03	2.18E-04	2.60E-02	5.67E-06	0.02%
126Sn	3.32E+01	4.28E-05	5.44E-03	1.00E-03	5.44E-06	4.70E-02	2.56E-07	0.00%
129I	1.10E+01	1.42E-05	1.80E-03	1.00E-03	1.80E-06	2.00E-01	3.60E-07	0.00%
134Cs	2.08E+02	2.68E-04	3.41E-02	1.00E-03	3.41E-05	1.00E-01	3.41E-06	0.01%
137Cs	2.32E+06	2.99E+00	3.80E+02	1.00E-03	3.80E-01	2.70E-02	1.03E-02	36.06%
151Sm	7.72E+04	9.94E-02	1.26E+01	1.00E-03	1.26E-02	7.50E-04	9.49E-06	0.03%
152Eu	4.07E+01	5.24E-05	6.67E-03	1.00E-03	6.67E-06	2.40E-01	1.60E-06	0.01%
154Eu	3.03E+03	3.90E-03	4.96E-01	1.00E-03	4.96E-04	2.00E-01	9.93E-05	0.35%
155Eu	4.73E+03	6.09E-03	7.75E-01	1.00E-03	7.75E-04	8.00E-03	6.20E-06	0.02%
226Ra	9.14E-04	1.18E-09	1.50E-07	1.00E+00	1.50E-07	4.60E-01	6.89E-08	0.00%
227Ac	5.65E-03	7.28E-09	9.26E-07	1.00E-03	9.26E-10	1.50E+01	1.39E-08	0.00%
228Ra	2.05E+00	2.64E-06	3.36E-04	1.00E+00	3.36E-04	1.90E-01	6.38E-05	0.22%
229Th	4.74E-02	6.11E-08	7.77E-06	1.00E-03	7.77E-09	1.60E+01	1.24E-07	0.00%
231Pa	2.49E-02	3.21E-08	4.08E-06	1.00E-03	4.08E-09	1.20E+01	4.90E-08	0.00%
232Th	2.32E-01	2.99E-07	3.80E-05	1.00E-03	3.80E-08	8.00E+00	3.04E-07	0.00%
232U	6.32E+00	8.14E-06	1.04E-03	1.00E-03	1.04E-06	1.10E+01	1.14E-05	0.04%
233U	2.42E+01	3.12E-05	3.96E-03	1.00E-03	3.96E-06	3.10E+00	1.23E-05	0.04%
234U	5.50E+00	7.09E-06	9.01E-04	1.00E-03	9.01E-07	3.10E+00	2.79E-06	0.01%
235U	2.16E-01	2.78E-07	3.54E-05	1.00E-03	3.54E-08	3.00E+00	1.06E-07	0.00%
236U	2.85E-01	3.67E-07	4.67E-05	1.00E-03	4.67E-08	2.90E+00	1.35E-07	0.00%
237Np	3.10E+01	3.99E-05	5.08E-03	1.00E-03	5.08E-06	1.20E+01	6.09E-05	0.21%
238Pu	1.26E+01	1.62E-05	2.06E-03	1.00E-03	2.06E-06	7.60E+00	1.57E-05	0.06%
238U	6.53E+00	8.41E-06	1.07E-03	1.00E-03	1.07E-06	2.80E+00	3.00E-06	0.01%
239Pu	9.11E+00	1.17E-05	1.49E-03	1.00E-03	1.49E-06	8.20E+00	1.22E-05	0.04%
240Pu	1.85E+00	2.38E-06	3.03E-04	1.00E-03	3.03E-07	8.20E+00	2.49E-06	0.01%
241Am	3.65E+03	4.70E-03	5.98E-01	1.00E-03	5.98E-04	1.30E+01	7.77E-03	27.32%
241Pu	1.06E+03	1.37E-03	1.74E-01	1.00E-03	1.74E-04	1.30E-01	2.26E-05	0.08%
242Cm	9.87E-01	1.27E-06	1.62E-04	1.00E-03	1.62E-07	4.10E-01	6.63E-08	0.00%
242Pu	4.97E-03	6.40E-09	8.14E-07	1.00E-03	8.14E-10	7.80E+00	6.35E-09	0.00%
243Am	1.88E-02	2.42E-08	3.08E-06	1.00E-03	3.08E-09	1.30E+01	4.00E-08	0.00%
243Cm	4.85E+00	6.25E-06	7.95E-04	1.00E-03	7.95E-07	8.50E+00	6.75E-06	0.02%
244Cm	1.54E+01	1.98E-05	2.52E-03	1.00E-03	2.52E-06	6.70E+00	1.69E-05	0.06%
TOTAL		4.84E+00	5.77E+02		5.78E-01		2.85E-02	100.00%

POTENTIAL UNABATED EMISSIONS AND DOSE FOR PIT AND EQUIPMENT INSTALLATION REMOVAL ACTIVITIES					
AN-101 PUMP PIT	508.00	FT^2			
AN-102 PUMP PIT	508.00	FT^2			
AN-103 PUMP PIT	508.00	FT^2			
AN-104 PUMP PIT	508.00	FT^2			
AN-105 PUMP PIT	508.00	FT^2			
AN-107 PUMP PIT	508.00	FT^2			
AN-A VALVE PIT	576.00	FT^2			
AN-B VALVE PIT	576.00	FT^2			
AN 101 JUMPER/STEEL SURFACE AREA	200.00	FT^2			
AN 102 JUMPER/STEEL SURFACE AREA	200.00	FT^2			
AN 103 JUMPER/STEEL SURFACE AREA	200.00	FT^2			
AN 104 JUMPER/STEEL SURFACE AREA	200.00	FT^2			
AN 105 JUMPER/STEEL SURFACE AREA	200.00	FT^2			
AN 107 JUMPER/STEEL SURFACE AREA	200.00	FT^2			
AN-A JUMPER/STEEL SURFACE AREA	200.00	FT^2			
AN-B JUMPER/STEEL SURFACE AREA	200.00	FT^2			
CORE DRILLING (EQUIVALENT SURFACE AREA OF 100, 14 INCH DIAMETER CUTS)	106.90	FT^2			
TOTAL PIT SURFACE AREA	5,906.90	FT^2			
CURIE (DEFINITION)	3.7E+10	DPS/CURIE			
TOTAL PIT SURFACE AREA	5.49E+06	CM^2			
AVERAGE SURFACE CONTAMINATION (BETA/GAMMA)	1,000,000	DPM/100*CM^2			
RAD CONCENTRATION (BETA/GAMMA)	4.5E-07	CURIE/100*CM^2			
AVERAGE SURFACE CONTAMINATION (ALPHA)	700,000	DPM/100*CM^2			
RAD CONCENTRATION (ALPHA)	3.2E-07	CURIE/100*CM^2			
RELEASE FRACTION	1.00E-03				
ASSUMED ISOTOPE	TOTAL POSSESSION QUANTITY Ci	UNABATED RELEASE Ci	OFFSITE DOSE FACTOR mrem/Ci	UNABATED DOSE mrem	% UNABATED OFFSITE DOSE
Sr-90	2.47E-02	2.47E-05	1.10E-01	2.72E-06	1.19%
Am-241	1.73E-02	1.73E-05	1.30E+01	2.25E-04	98.81%
TOTAL	**4.202E-02**	**4.20E-05**		**2.28E-04**	**100.00%**

POTENTIAL UNABATED EMISSIONS AND DOSE FOR PIT AND EQUIPMENT INSTALLATION REMOVAL ACTIVITIES					
Constituent Name	Annual Possession Quantity Curies	Unabated Release Curies	Offsite Dose Factor mrem/Curie (HNF-3602)	Offsite Unabated Dose mrem/year	Percent of Unabated Offsite Dose
3H	2.31E-01	2.31E-04	2.50E-05	5.77E-09	0.00%
14C	3.24E-02	3.24E-05	1.90E-03	6.16E-08	0.00%
59Ni	1.88E-03	1.88E-06	3.10E-04	5.84E-10	0.00%
60Co	1.24E-01	1.24E-04	2.50E-01	3.11E-05	0.11%
63Ni	1.87E-01	1.87E-04	2.60E-04	4.86E-08	0.00%
79Se	3.59E-03	3.59E-06	1.30E-01	4.66E-07	0.00%
90Sr	9.08E+01	9.08E-02	1.10E-01	9.98E-03	35.08%
90Y	9.08E+01	9.08E-02	3.40E-04	3.09E-05	0.11%
93mNb	1.27E-02	1.27E-05	2.10E-03	2.67E-08	0.00%
93Zr	1.74E-02	1.74E-05	1.30E-03	2.26E-08	0.00%
99Tc	1.92E-01	1.92E-04	2.30E-02	4.41E-06	0.02%
106Ru	9.17E-06	9.17E-09	1.60E-02	1.47E-10	0.00%
113mCd	9.26E-02	9.26E-05	1.30E-01	1.20E-05	0.04%
125Sb	2.18E-01	2.18E-04	2.60E-02	5.67E-06	0.02%
126Sn	5.44E-03	5.44E-06	4.70E-02	2.56E-07	0.00%
129I	1.80E-03	1.80E-06	2.00E-01	3.60E-07	0.00%
134Cs	3.41E-02	3.41E-05	1.00E-01	3.41E-06	0.01%
137Cs	3.80E+02	3.80E-01	2.70E-02	1.03E-02	36.06%
151Sm	1.26E+01	1.26E-02	7.50E-04	9.49E-06	0.03%
152Eu	6.67E-03	6.67E-06	2.40E-01	1.60E-06	0.01%
154Eu	4.96E-01	4.96E-04	2.00E-01	9.93E-05	0.35%
155Eu	7.75E-01	7.75E-04	8.00E-03	6.20E-06	0.02%
226Ra	1.50E-07	1.50E-07	4.60E-01	6.89E-08	0.00%
227Ac	9.26E-07	9.26E-10	1.50E+01	1.39E-08	0.00%
228Ra	3.36E-04	3.36E-04	1.90E-01	6.38E-05	0.22%
229Th	7.77E-06	7.77E-09	1.60E+01	1.24E-07	0.00%
231Pa	4.08E-06	4.08E-09	1.20E+01	4.90E-08	0.00%
232Th	3.80E-05	3.80E-08	8.00E+00	3.04E-07	0.00%
232U	1.04E-03	1.04E-06	1.10E+01	1.14E-05	0.04%
233U	3.96E-03	3.96E-06	3.10E+00	1.23E-05	0.04%
234U	9.01E-04	9.01E-07	3.10E+00	2.79E-06	0.01%
235U	3.54E-05	3.54E-08	3.00E+00	1.06E-07	0.00%
236U	4.67E-05	4.67E-08	2.90E+00	1.35E-07	0.00%
237Np	5.08E-03	5.08E-06	1.20E+01	6.09E-05	0.21%
238Pu	2.06E-03	2.06E-06	7.60E+00	1.57E-05	0.06%
238U	1.07E-03	1.07E-06	2.80E+00	3.00E-06	0.01%
239Pu	1.49E-03	1.49E-06	8.20E+00	1.22E-05	0.04%
240Pu	3.03E-04	3.03E-07	8.20E+00	2.49E-06	0.01%
241Am	5.98E-01	5.98E-04	1.30E+01	7.77E-03	27.32%
241Pu	1.74E-01	1.74E-04	1.30E-01	2.26E-05	0.08%
242Cm	1.62E-04	1.62E-07	4.10E-01	6.63E-08	0.00%
242Pu	8.14E-07	8.14E-10	7.80E+00	6.35E-09	0.00%
243Am	3.08E-06	3.08E-09	1.30E+01	4.00E-08	0.00%
243Cm	7.95E-04	7.95E-07	8.50E+00	6.75E-06	0.02%
244Cm	2.52E-03	2.52E-06	6.70E+00	1.69E-05	0.06%
TOTAL	5.77E+02	5.78E-01		2.85E-02	100.00%

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APPENDIX I

POTENTIAL UNABATED AND ABATED EMISSIONS AND DOSE FOR MIXER PUMP OPERATIONS

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HANFORD SITE AREA			200-EAST							
NUMBER OF HEPA FILTERS			1							
HEPA FILTER EFFICIENCY			99.95%							
PARTITION FRACTION			1.020E-09							
PARTITION FRACTION ACTUAL TIME DURATION	HOURS		2							
MAXIMUM TIME FOR MIXER PUMP OPERATION PER YEAR	HOURS		450							
Constituent Name	Maximum Envelope Inventory Curies	Release Factor	Release State	Unabated Release Curies	Abated Release Curies	Offsite Dose Factor mrem/Curie (HNF-3602)	Offsite Unabated Dose mrem/year	Offsite Abated Dose mrem/year	Percent of Unabated Offsite Dose	Percent of Abated Offsite Dose
3H	1.41E+03	2.30E-07	Vapor	3.24E-04	3.24E-04	2.50E-05	8.09E-09	8.09E-09	0.00%	0.04%
14C	1.98E+02	2.30E-07	Vapor	4.54E-05	4.54E-05	1.90E-03	8.63E-08	8.63E-08	0.00%	0.42%
59Ni	1.15E+01	2.30E-07	Particulate	2.64E-06	1.32E-09	3.10E-04	8.18E-10	4.09E-13	0.00%	0.00%
60Co	7.59E+02	2.30E-07	Particulate	1.74E-04	8.71E-08	2.50E-01	4.35E-05	2.18E-08	0.11%	0.11%
63Ni	1.14E+03	2.30E-07	Particulate	2.62E-04	1.31E-07	2.60E-04	6.80E-08	3.40E-11	0.00%	0.00%
79Se	2.19E+01	2.30E-07	Particulate	5.03E-06	2.51E-09	1.30E-01	6.53E-07	3.27E-10	0.00%	0.00%
90Sr	5.54E+05	2.30E-07	Particulate	1.27E-01	6.36E-05	1.10E-01	1.40E-02	6.99E-06	35.16%	33.99%
90Y	5.54E+05	2.30E-07	Particulate	1.27E-01	6.36E-05	3.40E-04	4.32E-05	2.16E-08	0.11%	0.11%
93mNb	7.76E+01	2.30E-07	Particulate	1.78E-05	8.90E-09	2.10E-03	3.74E-08	1.87E-11	0.00%	0.00%
93Zr	1.06E+02	2.30E-07	Particulate	2.43E-05	1.22E-08	1.30E-03	3.16E-08	1.58E-11	0.00%	0.00%
99Tc	1.17E+03	2.30E-07	Particulate	2.69E-04	1.34E-07	2.30E-02	6.18E-06	3.09E-09	0.02%	0.02%
106Ru	5.60E-02	2.30E-07	Particulate	1.29E-08	6.43E-12	1.60E-02	2.06E-10	1.03E-13	0.00%	0.00%
113mCd	5.65E+02	2.30E-07	Particulate	1.30E-04	6.48E-08	1.30E-01	1.69E-05	8.43E-09	0.04%	0.04%
125Sb	1.33E+03	2.30E-07	Particulate	3.05E-04	1.53E-07	2.60E-02	7.94E-06	3.97E-09	0.02%	0.02%
126Sn	3.32E+01	2.30E-07	Particulate	7.62E-06	3.81E-09	4.70E-02	3.58E-07	1.79E-10	0.00%	0.00%
129I	1.10E+01	2.30E-07	Particulate	2.52E-06	2.52E-06	2.00E-01	5.05E-07	5.05E-07	0.00%	2.45%
134Cs	2.08E+02	2.30E-07	Particulate	4.77E-05	2.39E-08	1.00E-01	4.77E-06	2.39E-09	0.01%	0.01%
137Cs	2.32E+06	2.30E-07	Particulate	5.32E-01	2.66E-04	2.70E-02	1.44E-02	7.19E-06	36.14%	34.93%
151Sm	7.72E+04	2.30E-07	Particulate	1.77E-02	8.86E-06	7.50E-04	1.33E-05	6.64E-09	0.03%	0.03%
152Eu	4.07E+01	2.30E-07	Particulate	9.34E-06	4.67E-09	2.40E-01	2.24E-06	1.12E-09	0.01%	0.01%
154Eu	3.03E+03	2.30E-07	Particulate	6.95E-04	3.48E-07	2.00E-01	1.39E-04	6.95E-08	0.35%	0.34%
155Eu	4.73E+03	2.30E-07	Particulate	1.09E-03	5.43E-07	8.00E-03	8.68E-06	4.34E-09	0.02%	0.02%
226Ra	9.14E-04	2.30E-07	Vapor	2.10E-10	2.10E-10	4.60E-01	9.65E-11	9.65E-11	0.00%	0.00%
227Ac	5.65E-03	2.30E-07	Particulate	1.30E-09	6.48E-13	1.50E+01	1.95E-08	9.73E-12	0.00%	0.00%
228Ra	2.05E+00	2.30E-07	Vapor	4.70E-07	4.70E-07	1.90E-01	8.94E-08	8.94E-08	0.00%	0.43%
229Th	4.74E-02	2.30E-07	Particulate	1.09E-08	5.44E-12	1.60E+01	1.74E-07	8.70E-11	0.00%	0.00%
231Pa	2.49E-02	2.30E-07	Particulate	5.71E-09	2.86E-12	1.20E+01	6.86E-08	3.43E-11	0.00%	0.00%
232Th	2.32E-01	2.30E-07	Particulate	5.32E-08	2.66E-11	8.00E+00	4.26E-07	2.13E-10	0.00%	0.00%
232U	6.32E+00	2.30E-07	Particulate	1.45E-06	7.25E-10	1.10E+01	1.60E-05	7.98E-09	0.04%	0.04%
233U	2.42E+01	2.30E-07	Particulate	5.55E-06	2.78E-09	3.10E+00	1.72E-05	8.61E-09	0.04%	0.04%
234U	5.50E+00	2.30E-07	Particulate	1.26E-06	6.31E-10	3.10E+00	3.91E-06	1.96E-09	0.01%	0.01%
235U	2.16E-01	2.30E-07	Particulate	4.96E-08	2.48E-11	3.00E+00	1.49E-07	7.44E-11	0.00%	0.00%
236U	2.85E-01	2.30E-07	Particulate	6.54E-08	3.27E-11	2.90E+00	1.90E-07	9.48E-11	0.00%	0.00%
237Np	3.10E+01	2.30E-07	Particulate	7.11E-06	3.56E-09	1.20E+01	8.54E-05	4.27E-08	0.21%	0.21%
238Pu	1.26E+01	2.30E-07	Particulate	2.89E-06	1.45E-09	7.60E+00	2.20E-05	1.10E-08	0.06%	0.05%
238U	6.53E+00	2.30E-07	Particulate	1.50E-06	7.49E-10	2.80E+00	4.20E-06	2.10E-09	0.01%	0.01%
239Pu	9.11E+00	2.30E-07	Particulate	2.09E-06	1.05E-09	8.20E+00	1.71E-05	8.57E-09	0.04%	0.04%
240Pu	1.85E+00	2.30E-07	Particulate	4.25E-07	2.12E-10	8.20E+00	3.48E-06	1.74E-09	0.01%	0.01%
241Am	3.65E+03	2.30E-07	Particulate	8.38E-04	4.19E-07	1.30E+01	1.09E-02	5.44E-06	27.38%	26.46%
241Pu	1.06E+03	2.30E-07	Particulate	2.43E-04	1.22E-07	1.30E-01	3.16E-05	1.58E-08	0.08%	0.08%
242Cm	9.87E-01	2.30E-07	Particulate	2.27E-07	1.13E-10	4.10E-01	9.29E-08	4.64E-11	0.00%	0.00%
242Pu	4.97E-03	2.30E-07	Particulate	1.14E-09	5.70E-13	7.80E+00	8.90E-09	4.45E-12	0.00%	0.00%
243Am	1.88E-02	2.30E-07	Particulate	4.31E-09	2.16E-12	1.30E+01	5.61E-08	2.80E-11	0.00%	0.00%
243Cm	4.85E+00	2.30E-07	Particulate	1.11E-06	5.57E-10	8.50E+00	9.46E-06	4.73E-09	0.02%	0.02%
244Cm	1.54E+01	2.30E-07	Particulate	3.53E-06	1.77E-09	6.70E+00	2.37E-05	1.18E-08	0.06%	0.06%
TOTAL	3.52E+06			8.09E-01	7.76E-04		3.98E-02	2.06E-05	100.00%	100.00%

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APPENDIX J

CAP88 PC SYNOPSIS REPORT FILES

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Hanford Map Distances Version 1.8
by Paul D. Rittmann PhD CHP

Map Data File (HMD.DAT): Map Coordinate File PDR 5/13/98

Release Location: PUREX

Special Point Number	Longitude	Latitude	Transport Direction	Distance	
1	24.590	27.615	15 SE	13.01 km	(LIGO)
2	23.411	29.083	15 SE	12.25 km	(WYE BARRICADE)
3	20.051	28.316	14 ESE	16.60 km	(ENERGY NORTHWEST)

Notes:
(1) NRC Regulatory Guide 1.145 (Rev 1, 1982) requires finding the smallest distance in a 45 degree sector centered on the direction of interest.
(2) The last digit is questionable, and is for information only.

Release Location: PUREX

Boundary Definition:
Highway 240 + the Near Bank of the Columbia River

Table of Distances from the Release Location to the Boundary

Transport Direction	*Distances, meters* Sector	NRC 1.145
1 S	9270	8550 m
2 SSW	8550	8550 m
3 SW	8550	8550 m
4 WSW	9270	8550 m
5 W	12440	9270 m
6 WNW	16170	12440 m
7 NW	12930	12920 m
8 NNW	12920	12920 m
9 N	15470	12920 m
10 NNE	13490	11120 m
11 NE	11120	10980 m
12 ENE	10980	10980 m
13 E	13110	10980 m
14 ESE	19270	12300 m
15 SE	12300	12300 m
16 SSE	12520	9270 m

Notes:
(1) NRC Regulatory Guide 1.145 (Rev 1, 1982) requires finding the smallest distance in a 45 degree sector centered on the direction of interest.
(2) The last digit is questionable, and is for information only.

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Apr 18, 2000 11:29 am

Facility: 241-AN TANK FRAM
Address: CH2MHILL HANFORD GROUP
200-EAST AREA HANFORD SITE
City: RICHLAND
State: WA Zip: 99352

Source Category:
Source Type: Stack
Emission Year: 2000

Comments: GUZZLER - Excavation Activities

Effective Dose Equivalent
(mrem/year)

1.47E-01

At This Location: 8550 Meters East Southeast

Dataset Name: AN TANK FARM
Dataset Date: Apr 18, 2000 11:29 am
Wind File: C:\CAP88PC2\WNDFILES\HS200E10.WND

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 8550 Meters East Southeast
Lifetime Fatal Cancer Risk: 8.55E-07

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	3.15E-02
BREAST	3.64E-03
R MAR	2.39E-01
LUNGS	2.07E-02
THYROID	3.51E-03
ENDOST	2.51E+00
RMNDR	1.08E-01
EFFEC	1.47E-01

RADIONUCLIDE EMISSIONS DURING THE YEAR 2000

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
SR-90	D	1.00	1.1E-01	1.1E-01
AM-241	W	1.00	4.4E-03	4.4E-03

SITE INFORMATION

Temperature:	10	degrees C
Precipitation:	100	cm/y
Mixing Height:	1000	m

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 1.
Diameter (m): 0.

Plume Rise Pasquill Cat:	A	B	C	D	E	F	G
Fixed (m): (Fixed Rise)	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.000	0.000	0.000
Fraction From Assessment Area:	1.000	1.000	1.000
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

8550 9270 10980 11120 12250 12300 12440 12520 12920 12930
13010 13110 13490 15470 16170 16600 19270

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment

Apr 17, 2000 11:56 am

Facility: PUREX
Address: CH2MHILL HANFORD GROUP
200-EAST AREA HANFORD SITE
City: RICHLAND
State: WA Zip: 99352

Source Category:
Source Type: Stack
Emission Year: 2000

Comments: Hand Excavation Activities

Effective Dose Equivalent (mrem/year)
3.42E-02

At This Location: 8550 Meters East Southeast

Dataset Name: AN TANK FARM
Dataset Date: Apr 17, 2000 11:56 am
Wind File: C:\CAP88PC2\WNDFILES\HS200E10.WND

Apr 17, 2000 11:56 am

SYNOPSIS
Page 1

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 8550 Meters East Southeast
Lifetime Fatal Cancer Risk: 1.93E-07

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	7.38E-03
BREAST	8.20E-04
R MAR	5.37E-02
LUNGS	4.87E-03
THYROID	7.98E-04
ENDOST	5.85E-01
RMNDR	2.53E-02
EFFEC	3.42E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 2000

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
AM-241	W	1.00	1.0E-03	1.0E-03
SR-90	D	1.00	2.5E-02	2.5E-02

SITE INFORMATION

Temperature:	12 degrees C
Precipitation:	16 cm/y
Mixing Height:	1000 m

Apr 17, 2000 11:56 am

SYNOPSIS
Page 3

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 1.
Diameter (m): 0.

Plume Rise Pasquill Cat:	A	B	C	D	E	F	G
Fixed (m): (Fixed Rise)	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.000	0.000	0.000
Fraction From Assessment Area:	1.000	1.000	1.000
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

8550	9270	10980	11120	12250	12300	12440	12520	12920	12930
13010	13110	13490	15470	16170	16600	19270			

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Apr 10, 2000 10:52 am

Facility: PUREX
Address: CH2MHILL HANFORD GROUP
200-EAST AREA HANFORD SITE
City: RICHLAND
State: WA Zip: 99352

Source Category:
Source Type: Stack
Emission Year: 2000

Comments: MIXER PUMP OPERATIONS RUN #1

Effective Dose Equivalent (mrem/year)
1.81E-02

At This Location: 8550 Meters East Southeast

Dataset Name: AN FARM
Dataset Date: Apr 10, 2000 10:52 am
Wind File: C:\CAP88PC2\WNDFILES\HS200E10.WND

Apr 10, 2000 10:52 am

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 8550 Meters East Southeast
Lifetime Fatal Cancer Risk: 4.02E-07

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	1.03E-02
BREAST	1.11E-02
R MAR	4.79E-02
LUNGS	1.07E-02
THYROID	1.17E-02
ENDOST	9.18E-02
RMNDR	1.23E-02
EFFEC	1.81E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 2000

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
H-3	*	0.00	3.2E-04	3.2E-04
C-14	*	0.00	4.5E-04	4.5E-04
NI-59	W	1.00	2.6E-06	2.6E-06
NI-63	W	1.00	2.6E-04	2.6E-04
CO-60	Y	1.00	1.7E-04	1.7E-04
SR-90	D	1.00	1.3E-01	1.3E-01
Y-90	Y	1.00	1.3E-01	1.3E-01
ZR-93	W	1.00	2.4E-05	2.4E-05
TC-99	W	1.00	2.7E-04	2.7E-04
RH-106	Y	1.00	1.3E-08	1.3E-08
SB-125	W	1.00	3.0E-04	3.0E-04
SN-126	W	1.00	7.6E-06	7.6E-06
I-129	D	1.00	2.5E-06	2.5E-06
CS-134	D	1.00	4.8E-05	4.8E-05
CS-137	D	1.00	5.3E-01	5.3E-01
SM-151	W	1.00	1.8E-02	1.8E-02
EU-152	W	1.00	9.3E-06	9.3E-06
EU-154	W	1.00	6.9E-04	6.9E-04
EU-155	W	1.00	1.1E-03	1.1E-03
RA-226	W	1.00	2.1E-10	2.1E-10
RA-228	W	1.00	4.7E-07	4.7E-07
AC-227	Y	1.00	1.3E-09	1.3E-09
TH-229	Y	1.00	1.1E-08	1.1E-08
TH-232	Y	1.00	5.3E-08	5.3E-08
PA-231	Y	1.00	5.7E-09	5.7E-09
SE-79	-	0.00	5.0E-06	5.0E-06

SITE INFORMATION

Temperature: 12 degrees C
Precipitation: 16 cm/y
Mixing Height: 1000 m

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 1.
Diameter (m): 0.

Plume Rise Pasquill Cat:	A	B	C	D	E	F	G
Fixed (m): (Fixed Rise)	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.000	0.000	0.000
Fraction From Assessment Area:	1.000	1.000	1.000
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

8550 9270 10980 11120 12250 12300 12440 12520 12920 12930
13010 13110 13490 15470 16170 16600 19270

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Apr 10, 2000 11:35 am

Facility: PUREX
Address: CH2MHILL HANFORD GROUP
200-EAST AREA HANFORD SITE
City: RICHLAND
State: WA Zip: 99352

Source Category:
Source Type: Stack
Emission Year: 2000

Comments: AN TANK FARM MIXER PUMP OPERATION RUN #2

Effective Dose Equivalent (mrem/year)
2.74E-02

At This Location: 8550 Meters East Southeast

Dataset Name: AN FARM
Dataset Date: Apr 10, 2000 11:35 am
Wind File: C:\CAP88PC2\WNDFILES\HS200E10.WND

Apr 10, 2000 11:35 am

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 8550 Meters East Southeast
Lifetime Fatal Cancer Risk: 1.41E-07

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	6.10E-03
BREAST	6.32E-04
R MAR	3.84E-02
LUNGS	5.33E-03
THYROID	6.14E-04
ENDOST	4.74E-01
RMNDR	2.10E-02
EFFEC	2.74E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 2000

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
U-232	Y	1.00	1.5E-06	1.5E-06
U-233	Y	1.00	5.5E-06	5.5E-06
U-234	Y	1.00	1.3E-06	1.3E-06
U-235	Y	1.00	5.0E-08	5.0E-08
U-236	Y	1.00	6.5E-08	6.5E-08
U-238	Y	1.00	1.5E-06	1.5E-06
NP-237	W	1.00	7.1E-06	7.1E-06
PU-238	Y	1.00	2.9E-06	2.9E-06
PU-239	Y	1.00	2.1E-06	2.1E-06
PU-240	Y	1.00	4.2E-07	4.2E-07
PU-241	Y	1.00	2.4E-04	2.4E-04
PU-242	Y	1.00	1.1E-09	1.1E-09
AM-241	W	1.00	8.4E-04	8.4E-04
AM-243	W	1.00	4.3E-09	4.3E-09
CM-242	W	1.00	2.3E-07	2.3E-07
CM-243	W	1.00	1.1E-06	1.1E-06
CM-244	W	1.00	3.5E-06	3.5E-06

SITE INFORMATION

Temperature:	12 degrees C
Precipitation:	16 cm/y
Mixing Height:	1000 m

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 1.
Diameter (m): 0.

Plume Rise Pasquill Cat:	A	B	C	D	E	F	G
Fixed (m): (Fixed Rise)	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.000	0.000	0.000
Fraction From Assessment Area:	1.000	1.000	1.000
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

8550	9270	10980	11120	12250	12300	12440	12520	12920	12930
13010	13110	13490	15470	16170	16600	19270			

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Apr 18, 2000 10:07 am

Facility: PUREX
Address: CH2MHILL HANFORD GROUP
200-EAST AREA HANFORD SITE
City: RICHLAND
State: WA Zip: 99352

Source Category:
Source Type: Stack
Emission Year: 2000

Comments: AN TANK FARM PIPE CUTS RUN #1

Effective Dose Equivalent
(mrem/year)

1.53E-02

At This Location: 8550 Meters East Southeast

Dataset Name: AN TANK FARM
Dataset Date: Apr 18, 2000 10:06 am
Wind File: C:\CAP88PC2\WNDFILES\HS200E10.WND

Apr 18, 2000 10:07 am

SYNOPSIS
Page 1

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 8550 Meters East Southeast
Lifetime Fatal Cancer Risk: 3.39E-07

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	8.64E-03
BREAST	9.35E-03
R MAR	4.04E-02
LUNGS	9.33E-03
THYROID	9.88E-03
ENDOST	7.80E-02
RMNDR	1.03E-02
EFFEC	1.53E-02

Apr 18, 2000 10:07 am

RADIONUCLIDE EMISSIONS DURING THE YEAR 2000

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
H-3	*	0.00	2.7E-04	2.7E-04
C-14	*	0.00	3.8E-05	3.8E-05
NI-59	W	1.00	2.2E-06	2.2E-06
NI-63	W	1.00	2.2E-04	2.2E-04
CO-60	Y	1.00	1.5E-04	1.5E-04
SR-90	D	1.00	1.1E-01	1.1E-01
Y-90	Y	1.00	1.1E-01	1.1E-01
ZR-93	W	1.00	2.0E-05	2.0E-05
TC-99	W	1.00	2.2E-04	2.2E-04
RH-106	Y	1.00	1.1E-08	1.1E-08
SB-125	W	1.00	2.6E-04	2.6E-04
SN-126	W	1.00	6.4E-06	6.4E-06
I-129	D	1.00	2.1E-06	2.1E-06
CS-134	D	1.00	4.0E-05	4.0E-05
CS-137	D	1.00	4.5E-01	4.5E-01
SM-151	W	1.00	1.5E-02	1.5E-02
EU-152	W	1.00	7.8E-06	7.8E-06
EU-154	W	1.00	5.8E-04	5.8E-04
EU-155	W	1.00	9.1E-04	9.1E-04
RA-226	W	1.00	1.8E-07	1.8E-07
RA-228	W	1.00	4.0E-04	4.0E-04
AC-227	Y	1.00	1.1E-09	1.1E-09
TH-229	Y	1.00	9.1E-09	9.1E-09
TH-232	Y	1.00	4.5E-08	4.5E-08
PA-231	Y	1.00	4.8E-09	4.8E-09
SE-79	-	0.00	4.2E-06	4.2E-06

SITE INFORMATION

Temperature:	12 degrees C
Precipitation:	16 cm/y
Mixing Height:	1000 m

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 1.
Diameter (m): 0.

Plume Rise Pasquill Cat:	A	B	C	D	E	F	G
Fixed (m): (Fixed Rise)	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.000	0.000	0.000
Fraction From Assessment Area:	1.000	1.000	1.000
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

8550 9270 10980 11120 12250 12300 12440 12520 12920 12930
13010 13110 13490 15470 16170 16600 19270

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Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Apr 18, 2000 10:10 am

Facility: PUREX
Address: CH2MHILL HANFORD GROUP
200-EAST AREA HANFORD SITE
City: RICHLAND
State: WA Zip: 99352

Source Category:
Source Type: Stack
Emission Year: 2000

Comments: AN TANK FARM PIPE CUTS RUN #2

Effective Dose Equivalent
(mrem/year)

2.30E-02

At This Location: 8550 Meters East Southeast

Dataset Name: AN TANK FARM
Dataset Date: Apr 18, 2000 10:09 am
Wind File: C:\CAP88PC2\WNDFILES\HS200E10.WND

Apr 18, 2000 10:10 am

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 8550 Meters East Southeast
Lifetime Fatal Cancer Risk: 1.18E-07

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	5.12E-03
BREAST	5.30E-04
R MAR	3.22E-02
LUNGS	4.47E-03
THYROID	5.15E-04
ENDOST	3.97E-01
RMNDR	1.76E-02
EFFEC	2.30E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 2000

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
U-232	Y	1.00	1.2E-06	1.2E-06
U-233	Y	1.00	4.7E-06	4.7E-06
U-234	Y	1.00	1.1E-06	1.1E-06
U-235	Y	1.00	4.2E-08	4.2E-08
U-236	Y	1.00	5.5E-08	5.5E-08
U-238	Y	1.00	1.3E-06	1.3E-06
NP-237	W	1.00	6.0E-06	6.0E-06
PU-238	Y	1.00	2.4E-06	2.4E-06
PU-239	Y	1.00	1.8E-06	1.8E-06
PU-240	Y	1.00	3.6E-07	3.6E-07
PU-241	Y	1.00	2.0E-04	2.0E-04
PU-242	Y	1.00	9.6E-10	9.6E-10
AM-241	W	1.00	7.0E-04	7.0E-04
AM-243	W	1.00	3.6E-09	3.6E-09
CM-242	W	1.00	1.9E-07	1.9E-07
CM-243	W	1.00	9.3E-07	9.3E-07
CM-244	W	1.00	3.0E-06	3.0E-06

SITE INFORMATION

Temperature:	12 degrees C
Precipitation:	16 cm/y
Mixing Height:	1000 m

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 1.
Diameter (m): 0.

Plume Rise Pasquill Cat:	A	B	C	D	E	F	G
Fixed (m): (Fixed Rise)	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.000	0.000	0.000
Fraction From Assessment Area:	1.000	1.000	1.000
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

8550	9270	10980	11120	12250	12300	12440	12520	12920	12930
13010	13110	13490	15470	16170	16600	19270			

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Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Apr 18, 2000 09:10 am

Facility: PUREX
Address: CH2MHILL HANFORD GROUP
200-EAST AREA HANFORD SITE
City: RICHLAND
State: WA Zip: 99352

Source Category:
Source Type: Stack
Emission Year: 2000

Comments: AN TANK FARM PIT WORK RUN #1

Effective Dose Equivalent
(mrem/year)

1.30E-02

At This Location: 8550 Meters East Southeast

Dataset Name: AN TANK FARM
Dataset Date: Apr 18, 2000 09:10 am
Wind File: C:\CAP88PC2\WNDFILES\HS200E10.WND

Apr 18, 2000 09:10 am

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 8550 Meters East Southeast
Lifetime Fatal Cancer Risk: 2.88E-07

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	7.34E-03
BREAST	7.95E-03
R MAR	3.43E-02
LUNGS	7.93E-03
THYROID	8.40E-03
ENDOST	6.62E-02
RMNDR	8.79E-03
EFFEC	1.30E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 2000

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
H-3	*	0.00	2.3E-04	2.3E-04
C-14	•	0.00	3.2E-05	3.2E-05
NI-59	W	1.00	1.9E-06	1.9E-06
NI-63	W	1.00	1.9E-04	1.9E-04
CO-60	Y	1.00	1.2E-04	1.2E-04
SR-90	D	1.00	9.1E-02	9.1E-02
Y-90	Y	1.00	9.1E-02	9.1E-02
ZR-93	W	1.00	1.7E-05	1.7E-05
TC-99	W	1.00	1.9E-04	1.9E-04
RH-106	Y	1.00	9.2E-09	9.2E-09
SB-125	W	1.00	2.2E-04	2.2E-04
SN-126	W	1.00	5.4E-06	5.4E-06
I-129	D	1.00	1.8E-06	1.8E-06
CS-134	D	1.00	3.4E-05	3.4E-05
CS-137	D	1.00	3.8E-01	3.8E-01
SM-151	W	1.00	1.3E-02	1.3E-02
EU-152	W	1.00	6.7E-06	6.7E-06
EU-154	W	1.00	5.0E-04	5.0E-04
EU-155	W	1.00	7.8E-04	7.8E-04
RA-226	W	1.00	1.5E-07	1.5E-07
RA-228	W	1.00	3.4E-04	3.4E-04
AC-227	Y	1.00	9.3E-10	9.3E-10
TH-229	Y	1.00	7.8E-09	7.8E-09
TH-232	Y	1.00	3.8E-08	3.8E-08
PA-231	Y	1.00	4.1E-09	4.1E-09
SE-79	-	0.00	3.6E-06	3.6E-06

SITE INFORMATION

Temperature: 12 degrees C
Precipitation: 16 cm/y
Mixing Height: 1000 m

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 1.
Diameter (m): 0.

Plume Rise Pasquill Cat:	A	B	C	D	E	F	G
Fixed (m): (Fixed Rise)	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.000	0.000	0.000
Fraction From Assessment Area:	1.000	1.000	1.000
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

8550 9270 10980 11120 12250 12300 12440 12520 12920 12930
13010 13110 13490 15470 16170 16600 19270

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Apr 10, 2000 03:44 pm

Facility: PUREX
Address: CH2MHILL HANFORD GROUP
200-EAST AREA HANFORD SITE
City: RICHLAND
State: WA Zip: 99352

Source Category:
Source Type: Stack
Emission Year: 2000

Comments: AN TANK FARM PIT WORK RUN #2

Effective Dose Equivalent
(mrem/year)

1.95E-02

At This Location: 8550 Meters East Southeast

Dataset Name: AN TANK FARM
Dataset Date: Apr 10, 2000 03:44 pm
Wind File: C:\CAP88PC2\WNDFILES\HS200E10.WND

Apr 10, 2000 03:44 pm

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 8550 Meters East Southeast
Lifetime Fatal Cancer Risk: 1.01E-07

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	4.36E-03
BREAST	4.51E-04
R MAR	2.74E-02
LUNGS	3.80E-03
THYROID	4.38E-04
ENDOST	3.38E-01
RMNDR	1.50E-02
EFFEC	1.95E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 2000

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
U-232	Y	1.00	1.0E-06	1.0E-06
U-233	Y	1.00	4.0E-06	4.0E-06
U-234	Y	1.00	9.0E-07	9.0E-07
U-235	Y	1.00	3.5E-08	3.5E-08
U-236	Y	1.00	4.7E-08	4.7E-08
U-238	Y	1.00	1.1E-06	1.1E-06
NP-237	W	1.00	5.1E-06	5.1E-06
PU-238	Y	1.00	2.1E-06	2.1E-06
PU-239	Y	1.00	1.5E-06	1.5E-06
PU-240	Y	1.00	3.0E-07	3.0E-07
PU-241	Y	1.00	1.7E-04	1.7E-04
PU-242	Y	1.00	8.1E-10	8.1E-10
AM-241	W	1.00	6.0E-04	6.0E-04
AM-243	W	1.00	3.1E-09	3.1E-09
CM-242	W	1.00	1.6E-07	1.6E-07
CM-243	W	1.00	8.0E-07	8.0E-07
CM-244	W	1.00	2.5E-06	2.5E-06

SITE INFORMATION

Temperature:	12 degrees C
Precipitation:	16 cm/y
Mixing Height:	1000 m

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 1.
Diameter (m): 0.

Plume Rise Pasquill Cat:	A	B	C	D	E	F	G
Fixed (m): (Fixed Rise)	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.000	0.000	0.000
Fraction From Assessment Area:	1.000	1.000	1.000
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

8550 9270 10980 11120 12250 12300 12440 12520 12920 12930
13010 13110 13490 15470 16170 16600 19270

DOSE TO MEI - MILLIREM/YEAR																	
					DISTANCES IN METERS												
DIRECTION	8550	9270	10980	11120	12250 (WYE BARRICADE)	12300	12440	12520	12920	12930	13010 (LIGO)	13110	13490	15470	16170	16600 (ENERGY NORTHWEST)	19270
N														1.50E-02			
NNW									1.60E-02								
NW																	
WNW										1.50E-02					1.50E-02		
W							1.50E-02										
WSW		1.50E-02															
SW	1.60E-02																
SSW	1.60E-02																
S		1.60E-02															
SSE								1.50E-02									
SE					1.60E-02	1.60E-02					1.60E-02						
ESE																1.60E-02	1.60E-02
E												1.60E-02					
ENE			1.60E-02														
NE				1.60E-02													
NNE													1.50E-02				
LARGEST VALUE	1.60E-02	MILLIREM/YEAR															

DOSE TO MEI - MILLIREM/YEAR																	
					DISTANCES IN METERS												
DIRECTION	8550	9270	10980	11120	12250 (WYE BARRICADE)	12300	12440	12520	12920	12930	13010 (LIGO)	13110	13490	15470	16170	16600 (ENERGY NORTHWEST)	19270
N														3.20E-03			
NNW									3.80E-03								
NW										5.10E-03							
WNW															2.90E-03		
W							3.30E-03										
WSW		3.70E-03															
SW	4.40E-03																
SSW	4.40E-03																
S		4.60E-03															
SSE								4.00E-03									
SE					9.10E-03	9.10E-03					8.50E-03						
ESE																1.20E-02	9.70E-03
E												1.00E-02					
ENE			7.40E-03														
NE				4.70E-03													
NNE													3.00E-03				
LARGEST VALUE	1.20E-02	MILLIREM/YEAR															

MIXER PUMP OPS TOTAL

DOSE TO MEI - MILLIREM/YEAR																	
					DISTANCES IN METERS												
DIRECTION	8550	9270	10980	11120	12250 (WYE BARRICADE)	12300	12440	12520	12920	12930	13010 (LIGO)	13110	13490	15470	16170	16600 (ENERGY NORTHWEST)	19270
N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-02	0.00E+00	0.00E+00	0.00E+00
NNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.98E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E-02	0.00E+00	0.00E+00
W	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSW	0.00E+00	1.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SW	2.04E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSW	2.04E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S	0.00E+00	2.05E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.51E-02	2.51E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E-02	2.57E-02
SE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ESE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ENE	0.00E+00	0.00E+00	2.34E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE	0.00E+00	0.00E+00	0.00E+00	2.07E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00					
LARGEST VALUE	2.80E-02	MILLIREM/YEAR															

DOSE TO MEI - MILLIREM/YEAR																	
					DISTANCES IN METERS												
DIRECTION	8550	9270	10980	11120	12250 (WYE BARRICADE)	12300	12440	12520	12920	12930	13010 (LIGO)	13110	13490	15470	16170	16600 (ENERGY NORTHWEST)	19270
N														1.10E-02			
NNW									1.10E-02								
NW										1.10E-02					1.10E-02		
WNW							1.10E-02										
W		1.10E-02															
WSW	1.10E-02																
SW	1.10E-02																
SSW		1.10E-02															
S								1.10E-02									
SSE					1.10E-02	1.10E-02					1.10E-02					1.20E-02	1.20E-02
SE												1.20E-02					
ESE																	
E			1.10E-02														
ENE				1.10E-02									1.10E-02				
NE																	
NNE																	
LARGEST VALUE	1.20E-02	MILLIREM/YEAR															

DOSE TO MEI - MILLIREM/YEAR																	
					DISTANCES IN METERS												
DIRECTION	8550	9270	10980	11120	12250 (WYE BARRICADE)	12300	12440	12520	12920	12930	13010 (LIGO)	13110	13490	15470	16170	16600 (ENERGY NORTHWEST)	19270
N														2.30E-03			
NNW									3.80E-03								
NW										3.60E-03							
WNW															2.10E-03		
W							2.30E-03										
WSW		2.60E-03															
SW	3.10E-03																
SSW	3.10E-03																
S		3.30E-03															
SSE								2.80E-03									
SE					6.50E-03	6.50E-03					6.00E-03						
ESE																8.30E-03	6.90E-03
E												7.50E-03					
ENE			5.20E-03														
NE				3.40E-03													
NNE													2.20E-03				
LARGEST	8.30E-03	MILLIREM/YEAR															

DOSE TO MEI - MILLIREM/YEAR																	
				DISTANCES IN METERS													
DIRECTION	8550	9270	10980	11120	12250 (WYE BARRICADE)	12300	12440	12520	12920	12930	13010 (LIGO)	13110	13490	15470	16170	16600 (ENERGY NORTHWEST)	19270
N														1.30E-02			
NNW									1.30E-02								
NW										1.30E-02							
WNW															1.30E-02		
W							1.30E-02										
WSW		1.30E-02															
SW	1.30E-02																
SSW	1.30E-02																
S		1.30E-02															
SSE								1.30E-02									
SE					1.40E-02	1.40E-02					1.30E-02						
ESE																1.40E-02	1.40E-02
E												1.40E-02					
ENE			1.30E-02														
NE				1.30E-02													
NNE													1.30E-02				
LARGEST VALUE	1.40E-02	MILLIREM/YEAR															

DOSE TO MEI - MILLIREM/YEAR																	
					DISTANCES IN METERS												
DIRECTION	8550	9270	10980	11120	12250 (WYE BARRICADE)	12300	12440	12520	12920	12930	13010 (LIGO)	13110	13490	15470	16170	16600 (ENERGY NORTHWEST)	19270
N														2.70E-03			
NNW									4.40E-03								
NW										4.30E-03							
WNW															2.40E-03		
W							2.80E-03										
WSW		3.10E-03															
SW	3.70E-03																
SSW	3.70E-03																
S		3.10E-03															
SSE								3.30E-03									
SE					7.60E-03	7.60E-03					7.10E-03						
ESE																9.80E-03	8.10E-03
E												8.80E-03					
ENE			6.20E-03														
NE				4.00E-03													
NNE													2.50E-03				
LARGEST VALUE	9.80E-03	MILLIREM/YEAR															

DOSE TO MEI - MILLIREM/YEAR																	
					DISTANCES IN METERS												
DIRECTION	8550	9270	10980	11120	12250 (WYE BARRICADE)	12300	12440	12520	12920	12930	13010 (LIGO)	13110	13490	15470	16170	18600 (ENERGY NORTHWEST)	19270
N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.57E-02	0.00E+00	0.00E+00	0.00E+00
NNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-02	0.00E+00	0.00E+00
W	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSW	0.00E+00	1.61E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SW	1.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSW	1.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S	0.00E+00	1.61E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-02	2.16E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ESE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-02	2.21E-02
E	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ENE	0.00E+00	0.00E+00	1.92E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE	0.00E+00	0.00E+00	0.00E+00	1.70E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
																-	
LARGEST VALUE	2.38E-02	MILLIREM/YEAR															

DOSE TO MEI - MILLIREM/YEAR																	
					DISTANCES IN METERS												
DIRECTION	8550	9270	10980	11120	12250 (WYE BARRICADE)	12300	12440	12520	12920	12930	13010 (LIGO)	13110	13490	15470	16170	16600 (ENERGY NORTHWEST)	19270
N														5.10E-03			
NNW									7.50E-03								
NW										7.30E-03							
WNW															4.70E-03		
W							5.10E-03										
WSW		5.60E-03															
SW	6.40E-03																
SSW	6.50E-03																
S		6.80E-03															
SSE								6.00E-03									
SE					1.20E-02	1.20E-02					1.10E-02						
ESE																1.50E-02	1.30E-02
E												1.40E-02					
ENE			1.00E-02														
NE				6.90E-03													
NNE													4.80E-03				
LARGEST VALUE	1.50E-02	MILLIREM/YEAR															

DOSE TO MEI - MILLIREM/YEAR																	
					DISTANCES IN METERS												
DIRECTION	8550	9270	10980	11120	12250 (WYE BARRICADE)	12300	12440	12520	12920	12930	13010 (LIGO)	13110	13490	15470	16170	16600 (ENERGY NORTHWEST)	19270
N														2.40E-02			
NNW									3.40E-02								
NW										3.30E-02							
WNW															2.20E-02		
W							2.40E-02										
WSW		2.60E-02															
SW	2.90E-02																
SSW	3.00E-02																
S		3.10E-02															
SSE								2.70E-02									
SE					5.30E-02	5.30E-02					5.00E-02						
ESE																6.80E-02	5.60E-02
E												6.00E-02					
ENE			4.50E-02														
NE				3.10E-02													
NNE													2.30E-02				
LARGEST VALUE	6.60E-02	MILLIREM/YEAR															

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