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Richland Operations Office
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Mr. Jerry Leitch
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Mr. Robert R. Mooney, Head
Environmental Radiation Section
Radiation Protection Division
Department of Health
Mail Stop LE-13
Olympia, Washington 98504-0095

Dear Messrs. Leitch and Mooney:

AIR EMISSIONS - 600 AREA PURGEWATER STORAGE AND TREATMENT FACILITY

In a September 25, 1989, teleconference between representatives of the U.S. Environmental Protection Agency, Region X, and the Westinghouse Hanford Company, it was determined that the appropriate level of documentation pursuant to the Clean Air Act (CAA) for proposed purgewater storage in the 600 Area Purgewater Storage and Treatment Facility would be a letter of notification of planned activities. This package transmits the notification in the form of an analysis of the air emissions associated with the storage of Hanford Site purgewater in the 600 Area Storage and Treatment Facility for your information.

The enclosure examines recent past purgewater emissions and potential near-future emissions which could result from proposed storage measures. It is concluded in the enclosure that use of the proposed purgewater handling facility does not constitute a modification (as defined in the pertinent air regulations) requiring further documentation pursuant to the CAA. No additional submittals will be required pursuant to the CAA for the proposed actions.

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If you have any questions regarding this notification, please contact Mr. R. G. Holt of my staff on (509) 376-9989.

Sincerely,

Margo Anthony for
R. D. Izatt, Director
Environmental Restoration Division

Enclosure:
Analysis of Air Emissions Associated with the Storage of Hanford Site Purgewater in the 600 Area Purgewater Storage and Treatment Facility

cc w/encl:
P. Cooke, APCA
P. T. Day, EPA
J. Willenberg, Ecology
R. E. Lerch, WHC

ANALYSIS OF AIR EMISSIONS ASSOCIATED WITH THE CONTAINMENT OF HANFORD SITE PURGEWATER IN THE 600 AREA PURGEWATER STORAGE AND TREATMENT FACILITY

1.0 INTRODUCTION

Monitoring of groundwater for radioactive and chemical constituents at the Hanford Site is required by the U.S. Department of Energy-Richland Operations Office (DOE-RL), the Washington State Department of Ecology (Ecology), and the U.S. Environmental Protection Agency (EPA). Groundwater is withdrawn from wells to develop newly constructed monitoring wells, to conduct aquifer testing, to purge wells before groundwater sample collection, and to facilitate periodic cleaning and renovation of existing wells. Groundwater extracted for these purposes is commonly referred to as purgewater. Much of the purgewater removed from beneath the Hanford Site operational areas (100 Areas, 200 Areas, 300 Area, etc.) is contaminated with low levels of radioactivity. It has been agreed, in informal discussions between representatives of Westinghouse Hanford Company and the regulating agencies, that Hanford Site purgewater is a sitewide source of low-level radioactive air emissions. Therefore, any changes in purgewater handling methods must be closely examined pursuant to the Clean Air Act.

Until recently, purgewater was disposed of by direct discharge to the soil surface. However, some of the purgewater may contain very small quantities of hazardous or toxic substances as a result of the past operational practice of disposing of chemical process effluent to the soil. For purposes of environmental compliance and cleanup, future purgewater handling measures will require the containment and treatment, as appropriate, of newly generated purgewater in appropriately permitted facilities. Until a planned multisource effluent treatment facility is constructed at Hanford in the 1990's, the DOE-RL proposes to contain purgewater as necessary in individual units of the 600 Area Purgewater Storage and Treatment Facility (600 PSTF), located just east of the 200 East Area.

The DOE-RL has concluded that proposed future purgewater handling measures will not result in increased emissions, and thus will not constitute a modification (as defined in 40 CFR 52.21, 40 CFR 61.15, and WAC 402-80) to an existing source of emissions. This notification serves as the requested written follow-up to telephone conversations which lead to this conclusion.

2.0 PAST PURGEWATER DISPOSAL PRACTICES

Disposal of contaminated purgewater was first addressed at the Hanford Site in August 1987 when the U.S. Department of Energy (DOE) issued criteria for the management of contaminated purgewater in operational areas. At that time, purgewater was analyzed prior to disposal to assess its radionuclide content and to determine whether it should be classified as a regulated dangerous waste. Depending on the results of the analysis, purgewater was packaged as regulated waste or disposed of by direct discharge

to existing liquid radioactive effluent disposal facilities (e.g., cribs and ponds) or to the soil surface. During the 12 month period from July 1988 to June 89, groundwater monitoring activities generated approximately 1,000,000 gal of purgewater, which was discharged to 55-gal drums, covered cattle troughs, liquid radioactive effluent disposal facilities, or, in most instances, to the soil surface. In April 1989, disposal of purgewater to the soil was discontinued.

To prevent the improper disposal of purgewater and to allow monitoring to continue on schedule, beginning in late October, 1989, purgewater generated in areas of potential groundwater contamination was collected and allowed to accumulate in two aboveground storage tanks in the Hanford Site 100-KW Area. These two tanks served as a temporary containment measure to collect and store Hanford Site purgewater until the 600 PSTF became available for purgewater receipt in January 1990. There are no existing plans to reuse the 100-KW tanks for purgewater storage.

2.1 EMISSIONS ASSOCIATED WITH PAST POLICY

Historical analytical results from purgewater sampling indicate that levels of chemical and radiological contamination in purge water vary widely across the Hanford Site. Tables 1 and 2 list maximum and average concentrations of chemical and radionuclide contaminants found in purgewater samples taken between January 1987 and May 1989. Levels of chemical contaminants are on the whole very low, and certainly below any level that could result in the emission of chemical pollutants in significant quantities.

Like the chemical contaminants, the majority of radionuclides detected in Hanford Site purgewater are found in quite low concentrations. For radionuclide emissions, however, air quality regulations provide essentially no *de minimis* levels; hence, the quantification of potential past purgewater radionuclide emissions is considered necessary. Tritium exists in the purgewater at a concentration several orders of magnitude greater than that of other radionuclides, and it is readily volatilized. Tritium is a common purgewater contaminant site-wide and is frequently tested for as a part of the Hanford Site groundwater monitoring program. For these reasons, the evaluation of potential past purgewater radionuclide emissions is limited to tritium emissions.

Radionuclide emission calculations were performed using field and laboratory data gathered between July 1, 1988, and June 30, 1989. This recent 12-month period was used for several reasons. First, the quantity of purgewater produced during the period and the disposition of that water is consistent with, and therefore representative of, purgewater handling activities of the past. Second, the contaminant levels recorded during this period are fairly consistent with levels seen in other years and expected to be seen in the future. In addition, emissions limitations provided in the air regulations are given on an annualized basis, and for the purpose of comparing emissions of past activities with those of future activities, the use of a recent past 12-month period is considered preferred in the regulations.

Table 1. Miscellaneous Chemical Constituents in Purgewater. (sheet 1 of 2)

Constituent	(ppb) Maximum	Average
Acetone	110	5
Aluminum, filtered	570	180
Aluminum	1,100	60
Ammonium	370	250
Arsenic	51	---
Barium	255	53
Barium, filtered	45	20
Benzene	49	---
Beryllium	8	---
Bis(2-ethylhexyl)phthalate	29	2
Cadmium	20	1
Calcium	64,000	57,400
Carbon tetrachloride	8,100	20
Chloride	34,000	23,000
Chloroform	1,650	<1
Chromium	1,690	31
Copper	274	4
Cyanide	1,690	10
1,2 dichloroethane	6	5
Fluoride	12,800	730
Iron, filtered	600	67
Iron	1,600[a]	120
Lead, filtered	11	5
Lead	132	2
Magnesium	21,000	13,000
Manganese, filtered	30	7
Manganese	49	4
Mercury	0.54	---
Methylene chloride	1,800	120
N-nitrosodimethylamine	40	3
Nickel, filtered	20	11
Nickel	518	4
Nitrate	2,810,000	93,200
Polychlorinated biphenyls	23.8	---
Perchloroethylene	52	8
Phenol	8	1
Phosphate	11,000	1,150
Potassium	7,600	7,300
Selenium	54	1
Silver	25	---
Sodium, filtered	94,000	19,500
Sodium	93,000	27,500

Table 1. Miscellaneous Chemical Constituents in Purgewater. (sheet 2 of 2)

Constituent	(ppb) Maximum	Average
Strontium, filtered	470	311
Strontium	340	249
Sulfate	90,000	72,000
Sulfide	1,350	---
Total organic halogen	1,600	70
Total alkalinity	593,000	89,000
Total organic carbon	1,800	830
Trans-1,2-dichloroethene	70	9
1,1,1-trichloroethane	120	8
Trichloroethene	38	8
Natural uranium	16,600	67
Vanadium	40	18
Zinc	240	87

[a]A spurious analysis of 222,000 ppb iron was not included.

Table 2. Miscellaneous Radionuclides in Purgewater.

Constituent	(pCi/L) Maximum	Average
Tritium	14,000,000	85,000
Carbon-14	<700	---
Cobalt-60	550	4
Nickel-63	<3,000	---
Strontium-90	23,000	24
Technetium-99	37,000	239
Ruthenium-103	<500	---
Ruthenium-106	900	3
Antimony-125	<500	4
Iodine-129	90	3
Iodine-131	29,000	202
Cesium-137	2,500	1
Radium	4	---
Maximum uranium	12,000	~40
Plutonium-238	0.4	---
Plutonium-239/240	72	---
Americium-241	<0.3	---

The emission calculations were carried out in three parts. A weighted average tritium concentration in the purgewater disposed to the soil column was first calculated. Then assumptions were made concerning the quantity of purgewater that was evaporated to the atmosphere from the soil. Finally, the annualized quantity of tritium that was released as a result of past purgewater disposal practices was calculated.

2.1.1 Weighted Average Tritium Concentration in Purgewater

Over the period from July 1, 1988, to June 30, 1989, sampling activities leading to soil disposal of purgewater produced an average of 264 gal of purgewater at each of 1601 sampling activities. Over the same period, well development and aquifer testing activities leading to soil disposal of purgewater produced an average of 27,300 gal of purgewater at each of 18 wells. The total volume of purgewater withdrawn between July 1, 1988, and June 30, 1989 and disposed to the soil column was approximately 914,000 gal.

To compute the concentration of tritium in this 914,000 gal of purgewater, the measured/recorded tritium concentration from each purgewater withdrawal episode was weighted according to the volume of purgewater withdrawn. The formula for the weighted average concentration of tritium in this purge water is as follows:

$$\text{Weighted Concentration} = \frac{(EC_X) \times (EV_X)}{TV}$$

where,

EC_X = Tritium concentration per purge episode

EV_X = Volume of water withdrawn per purge episode

TV = Total volume of water withdrawn during the year and disposed to the soil column.

The calculation provides a weighted purge water tritium concentration of approximately 5.25 E-07 Ci/L.

2.1.2 Quantity of Purgewater Evaporated from the Soil

Most of the purgewater produced in the past was disposed of to porous Hanford Site soils, which quickly absorb the water. However, the net annual evaporation rate at the Hanford Site is quite high (40 in./yr). Any water pooled on the soil surface or released to vegetated surfaces will, in general, evaporate completely. For these emissions calculations, it was assumed that all purgewater, which was produced over the annual period being evaluated and was disposed of directly to the soil surface (914,000 gal), was evaporated completely. Assuming there was no soil sorption of the tritium radionuclide and that tritiated water evaporated at the same rate as normal water, the

entire tritium inventory of purgewater disposed to the soil surface would have been released to the atmosphere.

2.1.3 Quantity of Tritium Vaporized from the Soil

The weighted average tritium concentration calculated above was 5.25 E-07 Ci/L. The total number of curies released from July 1, 1988, to June 30, 1989, as a result of the evaporation of tritium in purgewater disposed of to the soil surface is estimated as

(5.25 E-07 Ci/L) x (914,000 gal) x (3.78 L/gal) = 1.81 Ci.

3.0 PROPOSED PURGEWATER CONTAINMENT POLICY

Beginning in late October, 1989, purgewater generated in areas of potential groundwater contamination was collected and allowed to accumulate in two aboveground, 180,000-gal capacity, storage tanks in the Hanford Site 100-KW Area. These two tanks served as a temporary containment measure to collect and store sample collection purgewater until the 600 PSTF became available for purgewater receipt in January 1990.

The 600 PSTF presently contains two aboveground, 1,000,000-gal units for purgewater containment. The facility is large enough to allow for augmentation of purgewater storage capacity by the addition of up to four more identical units. At this time, there is no defined schedule for the addition of extra units. Excess capacity will be provided as needed for purgewater storage and for safety in the event that a filled unit is found leaking. The DOE-RL intends to use the 600 PSTF units as the primary purgewater storage containers until a planned multisource effluent treatment facility is constructed.

3.1 ANTICIPATED FUTURE EMISSIONS

Low concentrations of chemical constituents in purgewater produced over the 12-month period from July 1, 1988, to June 30, 1989, clearly indicate that the purgewater beneath the Hanford Site does not have the potential to release significant levels of chemicals to the air. However, potential radionuclide emissions associated with the containment of purgewater in the 100-KW tanks and the 600 PSTF units must be examined in accordance with air quality regulations. These two potential sources of radionuclide emissions are discussed below. Extremely low-level fugitive emissions may also result as purgewater is transferred from tank trucks to the 600 PSTF units. No attempt was made to quantify fugitive emissions.

3.1.1 100-KW Tanks

The 100-KW Area structures that were utilized for purgewater containment are two aboveground, cylindrical, vented, 180,000-gal steel tanks. Each tank is 20 ft in height and measures approximately 40 ft in diameter. The only outlet to the atmosphere from each of the tanks is through a 6 in.-diameter air vent, which allows tank liquid levels to compensate for temperature and pressure changes. The 100-KW tanks began receiving purgewater in late October, 1989, and the tanks were used for purgewater containment for three months. There are no current plans to use the 100-KW tanks for purgewater containment in the future.

Emissions calculations show that radionuclide emissions from the 100-KW tanks must have been extremely low. The calculations assumed a maximized contained purgewater tritium concentration of 8.82 E-07 Ci/L (a number taken from early estimates of potential maximum tritium concentrations in purgewater), summer temperatures, and a half-filled storage tank. Given these assumptions, an estimated 7.2 E-04 Ci would have been released per year per 100-KW tank due to tritium volatilization. Actual emissions were likely far below this estimate; the measured tritium concentration in the purgewater actually contained in these tanks was approximately 2.7 E-08 Ci/L, and the tanks were used for only three months.

3.1.2 600 PSTF Units

The 600 PSTF presently comprises two aboveground, doubly-lined, covered, 1,000,000-gallon containment units placed northwest of the 216-B-3 Pond in the 600 Area. These units, together with up to four additional units, will be the primary storage containers for purgewater until a planned multisource effluent treatment facility is constructed at Hanford. Each unit measures approximately 184 ft by 184 ft and is 5 ft deep. The exterior of each unit is high-density polyethylene supported by a network of galvanized metal supports.

Each containment unit is equipped with a floating cover to inhibit evaporation and reduce the volatilization of any radionuclides which may be present in the contained purgewater. The covers will battened down on all sides of the units, attached such that almost no contained air can escape from the units around the edges of the cover. A small (3- to 6-inch diameter) hole is provided in each floating cover to allow for purgewater transfer to the units and for atmospheric pressure equilibration. Like the previously discussed tanks, the covered 600 PSTF units will emit radionuclides at extremely low levels.

Emission calculations assumed a maximized contained purgewater tritium concentration level of 8.82 E-07 Ci/L and a temperature of 60°F. Given these assumptions, an estimated 5.7 E-10 Ci could potentially be released per year per containment unit as a result of tritium volatilization. However, actual tritium concentrations are expected to be well below the value used in the calculations, and actual emissions will likely be far below this estimate.

4.0 CONCLUSIONS

Hanford Site purgewater handling practices, both past and future, were evaluated in this document for their potential impact on ambient air quality. It was found that no purgewater chemical constituents could have been released in significant quantities, as defined by clean air regulations. Radionuclide releases were calculated for tritium, which is the predominant radionuclide in the groundwater beneath the Hanford Site and which is the one of the most readily volatilized purgewater radionuclides.

Emissions calculations in Section 2.1 showed that past releases of tritium from groundwater evaporating from the soil could have measured up to 1.81 Ci/yr. For comparison, the annual tritium output of the PUREX main stack, documented in WHC-EP-0141-1 (Coony and Thomas 1989), is 500 Ci/yr. The total body dose to the hypothetical maximally exposed off-site individual resulting from combined radiological emissions from all Hanford Operations during 1988 was 0.3 mR (PNL 1989). This dose is well below the established regulatory limit of 10 mR per year to the whole body (40 CFR 61.92).

All radionuclide emissions are regulated by the provisions of the Clean Air Act. Therefore, activities related to the handling of contaminated Hanford Site purgewater are subject to regulation under the Clean Air Act. Calculations were performed to estimate the quantity of airborne radioactivity that could be released on an annual basis as a result of proposed changes in the method of purgewater handling. It was found that only extremely small quantities of tritium-produced radioactivity would be emitted as a result of recent past and proposed future purgewater handling measures.

The calculations demonstrate that the proposed purgewater handling activities will not result in increased emissions of radionuclides; hence, the activities will not be considered a modification, as defined in 40 CFR 52.21, 40 CFR 61.15, and WAC 402-80, to the Hanford Site purgewater source of emissions. Because there will be no increase in radionuclide emissions, it is concluded that no further Clean Air Act permitting activities are required for the proposed actions.

Engineering studies are now being conducted to examine the option of storing purgewater in uncovered 600 PSTF units and treating the purgewater by solar evaporation. This potential activity could result in increased radiological emissions as a result of purgewater evaporation. If the DOE-RL decides that storage in uncovered 600 PSTF units is a feasible option, a review will be conducted to examine the potential emissions to the atmosphere. The results of this review will be reported to the appropriate regulating agencies, either in the form of a notification of planned activities, or as a part of an application for approval to construct.

5.0 REFERENCES

Coony, F. M. and S. P. Thomas, 1989, *Westinghouse Hanford Company Effluent Discharges and Solid Waste Management Report for Calendar Year 1988: 200/600 Areas*, WHC-EP-0141-1, Westinghouse Hanford Company, Richland, Washington.

Kleingartner, L. G., 1977, *Data on Weather from 1924 to 1976, Irrigated Agriculture Research and Extension Center near Prosser, Washington*, Bulletin 858, Washington State University College of Agriculture Research Center, Pullman, Washington.

PNL, 1989, *Hanford Site Environmental Report for Calendar Year 1988*, PNL-6825, Pacific Northwest Laboratory, Richland, Washington.

WSU, 1970, *Washington Climate*, EM 3127, Washington State University College of Agriculture, Department of Agriculture Cooperative Extension Service, Pullman, Washington.

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AIR EMISSIONS - 600 AREA PURGEWATER STORAGE AND TREATMENT FACILITY

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