

9515321.0972

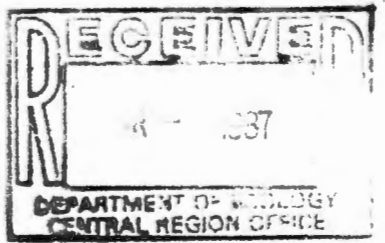
0039748



Department of Energy

Richland Operations Office  
P.O. Box 550  
Richland, Washington 99352

FEB 26 1987



Mr. Roger Stanley  
Washington Department of Ecology  
Mail Stop PV-11  
Olympia, Washington 98504

Dear Mr. Stanley:

RELEASE OF SIMULATED HIGH LEVEL WASTE SLURRY

This letter and attachment provide additional information needed to fully assess the release of process chemicals to the environment and the possible need for further action as requested in your January 5, 1987, letter to this office. The attachment titled, "Report on the December 1986 Notification of Release of Process Chemical Slurries in the 1100 Area" has been prepared by the Battelle Pacific Northwest Laboratory to satisfy the request.

The report confirms that the quantity of material released was small, does not qualify as a WDOE spill of dangerous waste, nor as a CERCLA reportable spill. It is believed that the cleanup actions taken or planned at the site are more than adequate to assure protection of the environment.

Should you have any further questions regarding this matter please contact Mr. P. J. Krupin, of my staff, on (509) 376-9989.

Sincerely,

Ronald E. Gerton, Director  
Environment, Safety, and Health  
Division

ES&H:PJK

Attachment



REPORT ON THE DECEMBER 1986 NOTIFICATION OF RELEASE OF PROCESS  
CHEMICAL SLURRIES IN THE 1100 AREA

## SUMMARY

Process chemical slurries are currently stored in the 1100 Area of the Hanford site. Procured in 1977, the slurries have been periodically used for the intended purpose. In June 1986 a decision was made to investigate disposal options through Rockwell Hanford Operations (Rockwell). A use for the slurries has been identified and the slurries are not considered waste. On October 24, 1986, a Pacific Northwest Laboratory (PNL)/Rockwell inspection team noticed that eighteen carbon steel drums of the slurries were corroded and seepage of the supernate from the slurries to the soil had occurred. Initial estimates and subsequent analyses show that less than CERCLA reportable quantities of chemicals were released.

## INTRODUCTION

This report was prepared in response to a Washington Department of Ecology (WDOE) request for additional information needed to fully assess the release of the process chemical slurries and the need for further action. This report reviews the circumstances and information available regarding the release of the slurries. Internal correspondence on this incidence are provided in the appendices. In reviewing the appendices, interpretation of the term "waste" must be done carefully. The process chemical slurries are in some cases referred to as waste slurries. This reference is not the same as the WDOE reference to the term waste. The specific information requested by WDOE is shown in italics prior to each of the ten sections of this report.

## RESULTS OF INVESTIGATION

### DESCRIPTION OF SITE

*A description of the release site, including spill containment features if present, and hydrogeologic characteristics of the area, i.e., proximity to surface or ground waters.*

*The controlling contractor.*

The process chemical slurries are stored in the 1100 area of the Hanford Site. The location of the storage site is shown in Figure 1. This storage site is currently managed by J. A. Jones Construction Company. The contractor

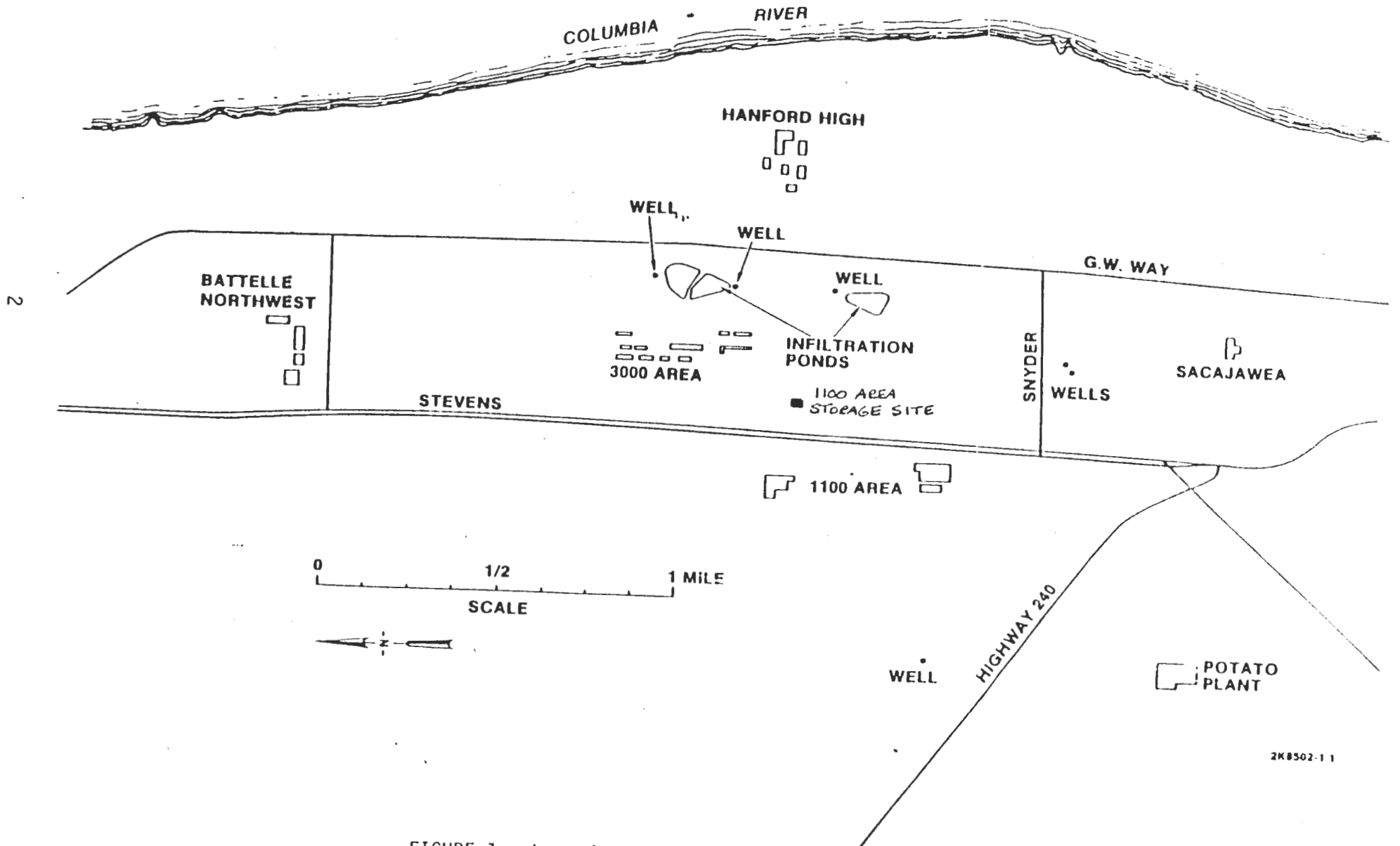


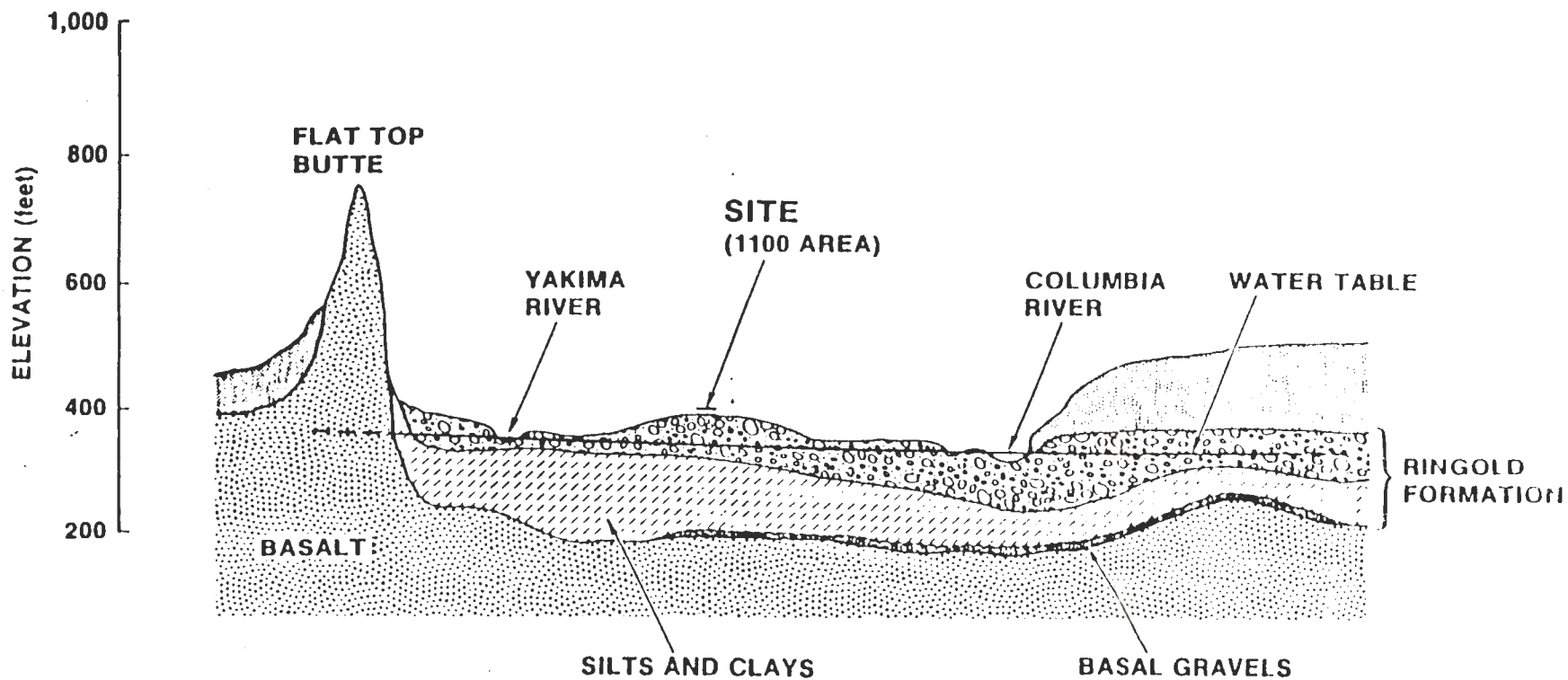
FIGURE 1. Location of the Storage Site

2K8502-1-1



FIGURE 2. Drums of Simulated High-Level Waste Slurries  
at Storage Site

# SIMPLIFIED GEOLOGIC CROSS SECTION



VERTICAL EXAGGERATION  
FOR CLARITY

2K8502-1.2

FIGURE 3. Hydrogeologic Characteristics of the 1100 Area

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extend to depths in excess of 12,000 ft (3660 m) beneath the Hanford Site. Numerous sedimentary beds within the upper part of the basalt sequence are commonly considered to be the lower portion of the Ellensburg Formation. The sediments were derived largely from the Cascade Range to the west. Because those beds pinch out to the east within a few miles (kilometers) of the present Columbia River, they probably represent the bottom of the Pasco Basin at that time or early courses of the Columbia River.

A local water level map of the 1100 Area is shown in Figure 4. This map illustrates the complex nature of the ground water flow system surrounding the 1100 Area. Water levels in this area are influenced by the City of Richland recharge ponds and water supply wells as well as a slight west to east gradient from the Yakima to the Columbia River. Water levels may change dramatically in the 1100 Area based on variations in the City of Richland pumping practices. It is estimated that the storage site is approximately 45 ft from ground water. The storage site is approximately 0.5 miles from the closest drinking water sources which are eleven drinking water wells for the City of Richland.

#### DESCRIPTION OF THE WASTE

*Copies of all letters, memoranda or data documenting the contents of these drums, i.e., contractor and U.S. DOE assessments and reports, initial and remaining volumes, initial and remaining percent solids, chemical and radiological constituents, concentrations, pH, etc.*

The process chemical slurries were procured from Research Chemical located in Phoenix, Arizona for use in development of melter systems for treatment of radioactive wastes. The original purchase order is provided in Appendix A. Qualitatively, the simulated slurries consist of metal nitrates mixed together producing a nitric acid based slurry. The slurries consist of three compositions referred to as PW-0, PW-7a, and an approximate 50/50 mixture of PW-0 and PW-7a. The composition of the chemical mixtures as procured is shown in Table 1. The slurries have been sampled and analyzed by PNL to determine the nitric acid content and the pH. The PW-0 is approximately 2.6 vol% nitric acid and the PW-7a is approximately 7.7 vol% nitric acid. The pH for the slurry compositions was less than 1.0 indicating that the slurries are corrosive. The total solids content of the slurries has not been measured and was not known initially. The slurries were procured ten years ago prior to the requirement for material safety data sheets (MSDS). Thus, the MSDS for the mixture is not available.

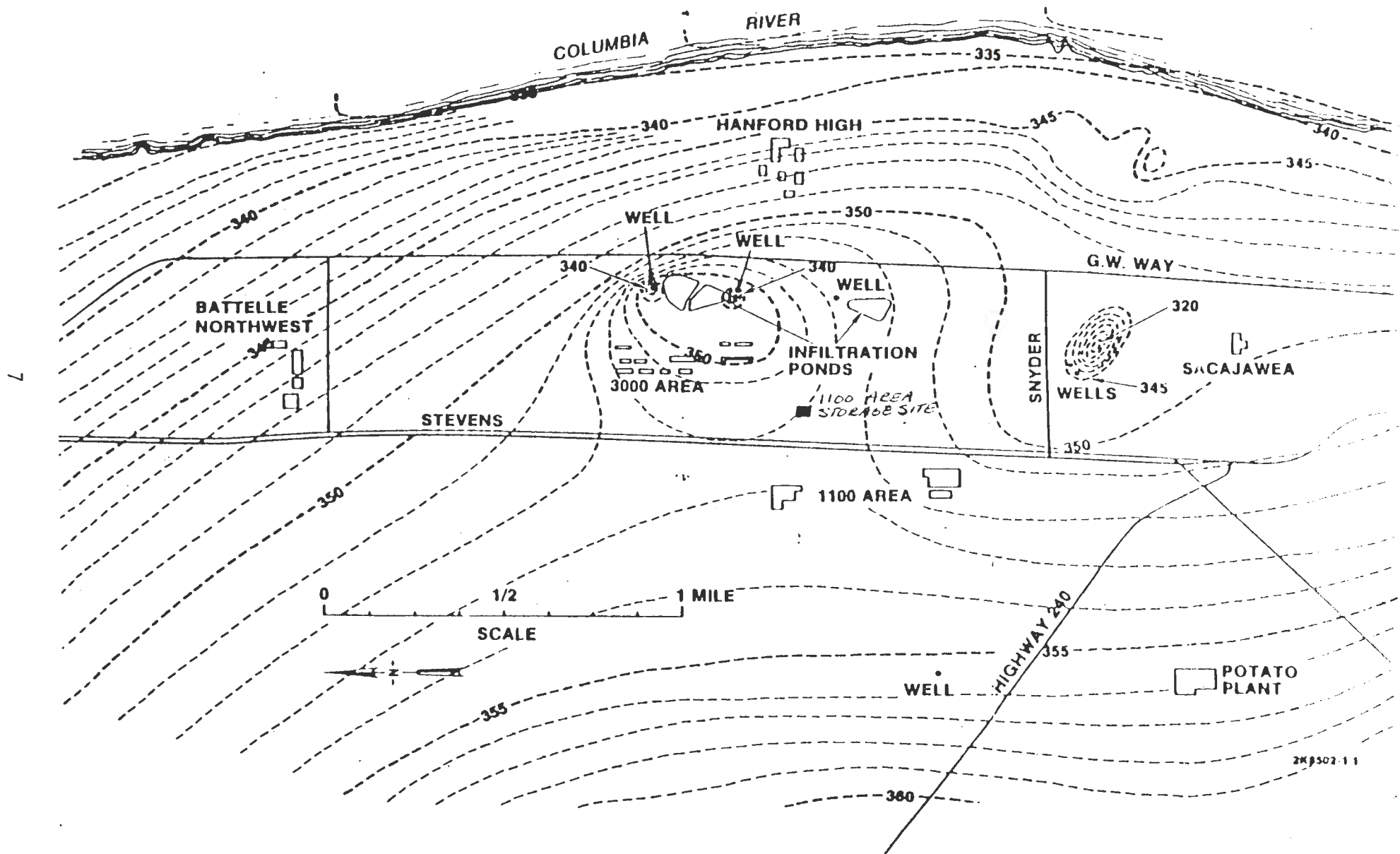


FIGURE 4 Generalized Hydrogeologic Characteristics of the Storage Site

2K9502-11

9515321.0079

TABLE 1: PW-0 and PW-7a Composition as Procured

<u>Compounds</u>	<u>Concentration (g/L)</u>	
	PW-0	PW-7a
AgNO <sub>3</sub>	1.80	0
Ba(NO <sub>3</sub> ) <sub>2</sub>	37.28	0
Cd(NO <sub>3</sub> ) <sub>2</sub> · 4H <sub>2</sub> O	3.26	0
Co(NO <sub>3</sub> ) <sub>2</sub> · 6H <sub>2</sub> O	15.38	0
Cr(NO <sub>3</sub> ) <sub>3</sub> · 9H <sub>2</sub> O	25.37	0
Fe(NO <sub>3</sub> ) <sub>3</sub> · 9H <sub>2</sub> O	232.66	106.72
KNO <sub>3</sub>	34.18	0
NaNO <sub>3</sub>	0	263.15
Ni(NO <sub>3</sub> ) <sub>2</sub> · 6H <sub>2</sub> O	56.85	0
Sr(NO <sub>3</sub> ) <sub>2</sub>	30.19	0
ZrO(NO <sub>3</sub> ) <sub>2</sub> · 2H <sub>2</sub> O	149.68	0
MoO <sub>3</sub>	88.95	0
Ce	45.90	73.29
Rare Earths	301.53	279.47
Volume (gal)	3940	3620
pH <sup>(1)</sup>	<1	<1

(1) Measured December 1986

NOTE: There is also 60 gal. of approximately a 50/50 mixture of PW-0 and PW-7a



The simulated mixtures are stored in 30 gal. carbon steel drums with either polyethylene or vinyl liners. Each drum contains approximately 20 gal. of the slurries. The current volumes of the mixtures are 3940 gal (192 drums) of PW-0, 3620 gal (181 drums) of PW-7a, and 60 gal (3 drums) of a 50/50 mixture of PW-0 and PW-7a. The current volumes include rinse water added during repackaging of the slurries in 1983. Originally, 10,500 gals were procured. To date, approximately 25% of the original slurries have been used in the melter programs.

## HISTORY

*Data documenting the origination and length of time the subject drums have been in storage.*

*Additional information regarding the designation of these "materials" as PW-7A and PW-0.*

*Information documenting their status at the time of discovery and at present, i.e., had or have these "materials" served their intended purpose.*

The process chemical slurries were purchased over a period of years beginning in 1977 through an off-site procurement by the Nuclear Waste Processing and Development Program. The mixtures were non-radioactive simulants of waste streams and were feed streams to ceramic melters as part of the vitrification technology development program. The chemical mixtures were referred to as PW-0 and PW-7a representing two specific PUREX Waste (PW) stream simulants. Approximately twenty-five percent of the original inventory was used in subsequent years for research and development activities per their intended purpose. The chemical mixtures have been stored for planned experiments.

The slurries have been stored at the 1100 Area storage site since initial procurement. The slurries were originally received in 5 gal. plastic buckets, but after a time it was recognized that the integrity of the buckets would not be adequate for continued storage. In 1983, the mixtures were repackaged into 30-gal carbon steel drums with polyethylene liners. In 1985, some of the 30 gal drums were showing signs of corrosion and the contents were therefore overpacked into 30 gal drums with heavy vinyl liners. At this time, it was still anticipated that the slurries would be used in melter programs. In addition, discussions were conducted with other national laboratories and vitrification facilities to identify research and development activities for using the slurries. The West Valley Demonstration Project in West Valley, New York and Oak Ridge National Laboratory in Tennessee demonstrated interest in obtaining the slurries.

In June 1986, it appeared that these usage options were diminishing. Therefore, disposal options were initiated in accordance with Hanford site procedures. It was anticipated that the slurries would be labpacked and shipped out as a hazardous waste. Due to the volume of slurry, and environmental disposal concerns, continued efforts were directed at identifying existing research programs which could use the slurries as chemical feed stocks. While usage

options continued to be evaluated, a burial compliance checksheet was submitted to Rockwell to obtain additional information on disposal options in October 1986. Specifically the container type and packaging instructions which would be required if disposal was necessary was requested. In November a beneficial use for the slurries was confirmed. In December 1986, a plan was prepared for conducting a large-scale In Situ Vitrification (ISV) demonstration in which the slurries would be used as the chemical feed stock. The ISV demonstration is discussed on page 17 of this report.

SLURRY CHARACTERISTICS

*Please document the designation of drum contents per the EPA's RCRA, and Washington's Dangerous Waste, regulations (include copies of all contractor and U.S. DOE calculations and documentation pertaining to their designation).*

Upon evaluation by the dangerous waste designation procedure, it was determined that the slurries exhibited dangerous waste properties per WDOE dangerous waste regulations. The dangerous waste properties for each slurry composition are shown in Table 2. The calculations for the designations are provided in Appendix B.

RADIOLOGICAL CHARACTERISTICS

*Copies of all letters, memoranda or data documenting the contents of these drums, i.e., contractor and U.S. DOE assessments and reports, initial and remaining volumes, initial and remaining percent solids, chemical and radiological constituents, concentrations, pH, etc.*

A radiological survey of the drums was conducted to evaluate shipping and transportation requirements from the Hanford site. Although the supplier did not classify the slurries as radioactive, the drums surveyed were found to be emitting a radiation count above background. Samples of the slurries were therefore obtained and submitted for analysis to determine the source of the radioactivity. The radionuclide analysis is provided in Table 3. The analysis indicates that the radioactivity is most likely the result of naturally occurring radioactivity present in the blend of rare earth chemicals. The rare earth portion of the chemical simulants were a major chemical component added by the supplier in the preparation of the mixtures (see Table 1). The radionuclide analytical results are included in Appendix C.

TABLE 2: Waste Designations Summary

<u>Mixture</u>	<u>Designation</u> (1)	<u>Reason</u>
PW-0	Dangerous Waste	EP Toxic Toxic waste Mixture Ignitable
PW-7a	Dangerous Waste	Ignitable
50/50 Mixture	Dangerous Waste	EP Toxic Toxic Waste Mixture Ignitable

(1) Per WDOE Dangerous Waste Regulations

TABLE 3: Radioactive Constituents

	<u>Concentration (pCi/g)</u>		
	<u>PW-0</u>	<u>PW-7a</u>	<u>50/50 Mixture</u>
GROSS BETA	82.9	66.9	129
GROSS ALPHA	389	150	600
<sup>228</sup> Ac	65	16.7	118
<sup>214</sup> Bi	11	3.5	41
<sup>223</sup> Ra	135	163	284
<sup>40</sup> K	14.8	<.81	6.85
Instrument Reading	400 counts/min	400 counts/min	800 counts/min
Background Reading	200 counts/min		

## DESCRIPTION OF RELEASE/NOTIFICATION/ACTIONS

*A description of any continuing investigative actions including review of preventative operational measures.*

*Please note whether or not a photographic record of this incident exists.*

An October 24, 1986 PNL/Rockwell inspection team found 11 drums of the PW-7a slurry and 7 drums of the PW-0 slurry were corroded and some seepage of the supernate from the slurry had obviously occurred. On October 25, 1986, the corroded drums were overpacked into 55-gal. drums with liners. The bottoms of all 18 drums were found to be intact, but corrosion at weld seams and in some cases extensive corrosion of the side walls was observed. The plastic liners, however, appeared to be intact. Crystal-like deposits at some corrosion sites indicated some seepage and evaporation had occurred. Leaks on the soil were visible by the orange colored rust stains. The rust stains were only on the top of the soil. Removing rocks and scraping the soil lightly removed the stains visually indicating that the leaks did not penetrate a significant distance into the soil.

On November 12, 1986, the Washington Department of Ecology (WDOE) was notified by telephone by the Department of Energy-Richland Operations (DOE-RL) regarding the potential for this incident to be a CERCLA - Dangerous Waste Release. Further calculation and evaluation indicated that the quantity of material released did not appear to qualify as a Washington Department of Ecology spill of dangerous waste, nor as a CERCLA reportable spill. This information was submitted by DOE-RL to WDOE in writing on December 12, 1986. The sequence of events is summarized in Table 4.

Photographs of five corroded drums were taken prior to overpacking. Photos of these drums are shown in Figure 5. Many factors contributed to the corrosion. In addition to the corrosive slurry, the drums are carbon steel and are stored outside and are therefore subject to changing weather conditions. Also, condensation of acidic water vapor inside the drums probably contributed to the corrosion. No visual damage to the liners was observed. Pin hole leaks in the liners could be present. Subsequent to the incident, thorough weekly inspection of all drums was implemented. Any suspect drums are identified and overpacked immediately into 55-gal drums.

## ENVIRONMENTAL IMPACT

Available data indicates that very little seepage occurred from the 18 drums. Although the exact volumetric loss could not be determined, upon examination of the containers, it was estimated that the seepage was less than two gallons for each of the 18 drums. There was visual evidence suggesting a loss of no more than 2 gallons for each of the 18 drums. Leakage is visible as orange (rust) stains resulting from the iron (Fe) in the waste as well as the corrosion of the carbon steel drums. The two-gallon mixture loss would be greater than 20 lbs. which would be quite obvious. To determine if a reportable quantity

TABLE 4. Major Events Chronology

1977	Initiated Procurement of Simulated High Level Waste Slurries. The Slurries Were Stored in the 1100 Area Storage Site.
1983	Slurries Repackaged from 5 Gal buckets to 30 Gal drums.
1985	Some Slurries Repackaged
1986 (June)	Usage and Disposal Options Evaluated
1986 (October)	Inspection Identified Corroded Drums and Evidence of Seepage and Evaporation
1986 (November)	WDOE Notified of Possible Release by Telephone
1986 (December)	WDOE Notified in Writing of Release Which was not Classified as a CERCLA Reportable Spill
1986 (December)	Plan Prepared for ISV Demonstration



FIGURE 5. Photographs of Corroded Drums



FIGURE 5. Photographs of Corroded Drums (Cont'd)



FIGURE 5. Photograph of Corroded Drums (Cont'd)



of slurry was released, two criteria, 1) WDOE limit of 400 lbs for spills of dangerous wastes and 2) the CERCLA reportable quantities, were considered. It is estimated that less than 400 lbs. was released from the drums. There was no visual evidence of perforations of the liner in the drum indicating whatever release occurred could not have been significant. The CERCLA calculations were made on the worst case assumption of hazardous materials by assuming the reportable quantity for  $\text{Cr}^{+6}$  which is 1 lb.  $\text{Cr}^{+6}$  is the reference component with the smallest reportable quantity. The calculation showed that 54 gal would have to be released to result in a CERCLA reportable spill. It is estimated that less than 36 gal. was released. It was determined that the quantity of material released, does not qualify as a WDOE spill of dangerous waste, nor as a CERCLA reportable spill. The analyses of soil samples described below further supports the conclusion that a small quantity was released and there was no adverse effect to the environment.

#### ANALYSIS OF SOIL SAMPLES

*A description of cleanup actions taken or planned in response to this incident including a description of analyses to determine the extent of contamination.*

Samples of the soil beneath a pallet of the corroded drums were analyzed after the incident. A reference soil sample was also taken from a location an adequate distance away from the seepage for comparison. The results of the analyses are shown in Table 5. There was very little difference between the soil samples and the reference, thus, indicating that no significant contamination of soil occurred. Collection of additional soil samples and a radionuclide analysis of the soil samples is underway, to further confirm the initial findings.

#### CLEAN UP ACTIONS

*A description of cleanup actions taken or planned in response to this incident including a description of analyses to determine the extent of contamination.*

The release of the slurries occurred in the immediate vicinity of the 18 drums. The surface soil which shows evidence of seepage from the drums will be excavated once the drums are removed. The slurry, drums and evacuated soil will all be used in the future test described below.

#### FUTURE PLANS FOR USING THE SLURRIES

*A description of U.S. DOE's plans for future use and/or disposal of the subject "material."*

The final decision on disposition of these slurries has not been made. Disposal options as well as usage options for the mixtures have been evaluated. A need for these process chemical slurries has been identified and a plan to

TABLE 5. 1100 Area Soil Analysis (Wt %)

Component	Soil/Chemical on Surface	1 in. Below Surface				Clean Soil
		Sample #1	Sample #2	Sample #3	Sample #4	
Al	6.35	6.35	6.61	6.61	6.56	6.34
B	0	0.02	0.02	0	0.02	0
Ba*	0.08	0.06	0.08	0.06	0.06	0.07
Ca	3.45	3.52	3.42	3.63	3.83	2.63
Ce*	0.23	0.31	0.003	0	0.005	0
Cu	0	0.06	0	0.02	0	0
Dy*	0.03	0.03	0	0	0.02	0
Fe*	5.46	5.75	5.44	5.27	6.16	4.83
K*	0.86	1.95	0.72	1.43	0.84	0.91
La*	0.13	0.18	0.03	0.02	0.05	0
Li	0.02	0.02	0.01	0.02	0.01	0
Mg	1.33	1.35	1.36	1.41	1.51	1.27
Mn	0.08	0.08	0.10	0.09	0.09	0.09
Na*	2.28	2.11	2.29	1.05	1.10	2.00
Nd*	0.09	0.13	0	0	0.03	0
Si	27.16	26.88	28.23	27.91	27.53	27.7
Sr*	0.03	0.03	0.04	0.03	0.03	0.03
Ti	0.78	0.77	0.81	0.82	0.86	0.77
V*	0.02	0.02	0.02	0.02	0.02	0.02
Y*	0.01	0.02	0	0	0	0
Zr*	0.04	0.03	0.03	0.01	0.23	0.02

\* Components in simulated chemical mixture

NOTE: Ag\*, Cr\*, Cd\*, Co\*, Mo\*, and Ni\* below detection limits.

use the slurries as chemical feed stock as part of the development testing for In Situ Vitrification (ISV) has been prepared. The ISV process is a thermal treatment technique that converts contaminated soil into a chemically inert and stable glass and crystalline product. Additional information on the ISV process is provided in Appendix D. In situ vitrification was developed by PNL for the U.S. Department of Energy as a possible treatment for radioactive waste sites. The operator of PNL, Battelle Memorial Institute, is endeavoring to transfer this technology to industry for treatment of hazardous wastes. In order to do so, a number of tests are required. Since the PW-0 and PW-7a slurries contain many types of chemicals, substantial data relative to vitrification of a wide variety of chemical wastes can be obtained from this testing. Prior to this testing all needed permits and approvals will be obtained. The current schedule shows that one ISV demonstration which would require all the remaining PW-0 and PW-7a slurries could be completed in Fiscal Year 1987 provided timely approvals are received.

APPENDIX A

ORIGINAL PURCHASE ORDER FOR THE SLURRIES



Pacific Northwest Laboratories  
 Battelle Boulevard  
 P.O. Box 999  
 Richland, Washington 99352

95/3321-0992  
 PURCHASE ORDER

SHOW PURCHASE ORDER NUMBER  
 ON ALL PACKAGES, INVOICES AND  
 CORRESPONDENCE.  
 COMPLETE PACKING LIST MUST  
 ACCOMPANY EACH SHIPMENT.

TO BE CONSIDERED FOR FUTURE ORDERS - - - MEET YOUR DELIVERY COMMITMENTS

MO: DAY YR: 4 19 77	PAGE 1	INQUIRY NO. 43035	DOE - 2	CERTIFIED UNDER 245 REG-1	VENDOR CODE E953	ORDER NUMBER 43036 AR 7
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RESEARCH CHEMICAL  
 P O BOX 14588  
 PHOENIX AZ 85031

- S  
H  
I  
P  
T  
O
- 1) BATTELLE FOR US ERDA  
C/O ARMCO - 166 BLDG.  
RICHLAND, WA 99352
  - 2) BATTELLE  
6TH STREET WHSE.  
RICHLAND, WA 99352
  - 3) AS INDICATED BELOW

FOB PHOENIX, AZ	DATE DELIVERY REQUIRED AT FOB POINT 9-15-77 (SEE PG 4)	BUYER MW SCHLATTER (509) 942-024
TERMS OF PAYMENT NET 30 DAYS	CODE SHIP VIA 35	ONC TRUCK - SHIP FREIGHT COLLECT

ITEM	QUANTITY	U/M	DESCRIPTION	UNIT PRICE	TOTAL PRICE
211987654321	54321		CONFIRMING ORDER IF CHECKED <input type="checkbox"/>	098754321	987654321
1	1050	UN	PREMIXED CHEMICALS PW-0 IN ACCORDANCE WITH SPECIFICATIONS LISTED BELOW	91.75	96337.50
2	1050	UN	PREMIXED CHEMICALS PW-7A-2M IN ACCORDANCE WITH SPECIFICATIONS LISTED BELOW	67.30	70665.00
SPECIFICATIONS FOR PRE-MIXED CHEMICALS 1. CHEMICAL PURITY EACH CHEMICAL, PURITY GREATER THAN 98.5%. CL, F AND S EACH ≤ 0.01% OF TOTAL MIXTURE. 2. HOMOGENEITY LESS THAN 5% VARIATION IN THE AMOUNT OF EACH ELEMENT FROM THE MIXTURE COMPOSITION IN ANY UNIT. 3. THE MIXTURES SHALL BE SUPPLIED AS LIQUIDS. LIQUID VOLUME SHALL NOT EXCEED 5 GAL. PER UNIT. 4. SHIPPING CONTAINER SHALL BE PLASTIC CONTAINERS SIZED TO CONTAIN ONE UNIT OF MIXTURE. 5. EACH CONTAINER SHALL BE LABELED ON ITS EXTERIOR WITH THE MIXTURE NUMBER. (EG.) PW-0 OR PW-7A-2M (EG.) OR PW-7A-2M					

PROVISIONS OF THE ATTACHED PURCHASE ORDER

SUPPLEMENT A-271 CONSTITUTE A PART OF THIS ORDER Addendum 1A & 1B

BILLING INSTRUCTIONS: RENDER INVOICES IN TRIPLICATE: ATT. ACCOUNTS PAYABLE INCLUDE YOUR VENDOR CODE NO. SHOWN ABOVE ON YOUR INVOICE.

ATTACH ORIGINAL BILL OF LADING ON ALL COLLECT SHIPMENTS AND SUPPORT ALL PREPAID FREIGHT CHARGES WITH THE ORIGINAL PAID FREIGHT BILL AND BILL OF LADING.

PACIFIC NORTHWEST LABORATORIES  
 BATTELLE MEMORIAL INSTITUTE

ITEM	ORGANIZATION	FM	ACCT CLASS - W/O - PROJ	AUTHOR	BLDG/ROOM	AREA	APPRO
01-02U D7H30		1830	31%A-05705 69%C-98660	JH HAMMER	324/302	300	
				DELIVER TO			
				JH HAMMER	324/302	300	



Pacific Northwest Laboratories  
 Battelle Boulevard  
 P.O. Box 999  
 Richland, Washington 99352

PURCHASE ORDER

IMPORTANT

SHOW PURCHASE ORDER NUMBER  
 ON ALL PACKAGES, INVOICES AND  
 CORRESPONDENCE.  
 COMPLETE PACKING LIST MUST  
 ACCOMPANY EACH SHIPMENT.

TO BE CONSIDERED FOR FUTURE ORDERS - - - MEET YOUR DELIVERY COMMITMENTS!

MO.	DAY	YR.	PAGE	INQUIRY NO.	CERTIFIED UNDER DMS REG-1	VENDOR CODE	ORDER NUMBER
			2		DOE	E953 15	43036 AR

RESEARCH CHEMICAL

- 1 } BATTELLE  
C/O ARMCO - 1100 BLDG.  
RICHLAND, WA 99352
- 2 } BATTELLE  
6TH STREET WHSE.  
RICHLAND, WA 99352
- 3 } AS INDICATED BELOW

FOB	DATE DELIVERY REQUIRED AT FOB POINT	BUYER
		MW SCHLATTER
TERMS OF PAYMENT	CODE SHIP VIA	

ITEM	QUANTITY	U/M	DESCRIPTION	UNIT PRICE	TOTAL PRICE
21	987654321	54321	CONFIRMING ORDER IF CHECKED <input type="checkbox"/>	0.9876	987654321
			6. CE MAY BE SUPPLIED IN THE FORM OF A RARE EARTH MIXTURE.		
			7. THE OTHER RARE EARTHS MAY CONSIST OF ANY OR ALL THE RARE EARTH ELEMENTS.		
			8. COMPOSITIONS -		
			(SEE PAGE 3)		

PROVISIONS OF THE ATTACHED PURCHASE ORDER  
 SUPPLEMENT \_\_\_\_\_ CONSTITUTE  
 A PART OF THIS ORDER.

BILLING INSTRUCTIONS: RENDER INVOICES IN TRIPLICATE:  
 ATT. ACCOUNTS PAYABLE, INCLUDE YOUR VENDOR CODE  
 NO. SHOWN ABOVE, ON YOUR INVOICE.  
 ATTACH ORIGINAL BILL OF LADING ON ALL COLLECT  
 SHIPMENTS AND SUPPORT ALL PREPAID FREIGHT  
 CHARGES WITH THE ORIGINAL PAID FREIGHT BILL AND  
 BILL OF LADING.

PACIFIC NORTHWEST LABORATORIES  
 BATTELLE MEMORIAL INSTITUTE

ITEM	ORGANIZATION	FM	ACCT CLASS - W/O - PROJ	AUTHOR	BLDG/ROOM	AREA	APPROV.
01-02U	D7H30		31%A-05705 69%C-98660	JH HAMMER	324/302	300	
	1830			COPY TO			
				DELIVER TO			
				JH HAMMER	324/302	300	
5	W	LSV	PSP	C	VAR	IFSC	PAT
54-1050-005 (5-74)							

AUTHOR

PAGE	NUMBER
3	43036

ELEMENTS AS SOLUBLE NITRATES	SUGGESTED COMPOUNDS	ANALYSIS FOR MIXTURES (PERCENT)	
		PW-0 GM MOLES/UNIT	PW-7A-2M GM MOLES/UNIT
AG	AgNO <sub>3</sub>	0.20	
BA	Ba(NO <sub>3</sub> ) <sub>2</sub>	2.7	
Cd	Cd(NO <sub>3</sub> ) <sub>2</sub> ·4H <sub>2</sub> O	0.20	
Co	Co(NO <sub>3</sub> ) <sub>2</sub> ·6H <sub>2</sub> O	1.0	
Cr	Cr(NO <sub>3</sub> ) <sub>3</sub> ·9H <sub>2</sub> O	1.2	
Fe	Fe(NO <sub>3</sub> ) <sub>3</sub> ·9H <sub>2</sub> O	10.9	
K	KNO <sub>3</sub>	6.4	
Na	NaNO <sub>3</sub>		58.6
Ni	Ni(NO <sub>3</sub> ) <sub>2</sub> ·6H <sub>2</sub> O	3.7	
Sr	Sr(NO <sub>3</sub> ) <sub>2</sub>	2.7	
Zr	ZrO(NO <sub>3</sub> ) <sub>2</sub> ·2H <sub>2</sub> O	10.6	
Ce		6.2	9.9
OTHER RARE EARTHS		16.4	15.2
Mo	MoO <sub>3</sub>	11.7	

THE BATTLE NORTHWEST LABORATORIES, INC. HAS BEEN ADVISED BY THE  
 FEDERAL BUREAU OF INVESTIGATION THAT THE ABOVE LISTED MATERIALS  
 ARE BEING USED IN THE DEVELOPMENT OF A NEW TYPE OF MISSILE WHICH  
 IS BEING DEVELOPED BY THE ARMY RESEARCH OFFICE-DURHAM, NORTH  
 CAROLINA. THE BATTLE NORTHWEST LABORATORIES, INC. HAS BEEN ADVISED  
 THAT THE ABOVE LISTED MATERIALS ARE BEING USED IN THE DEVELOPMENT  
 OF A NEW TYPE OF MISSILE WHICH IS BEING DEVELOPED BY THE ARMY  
 RESEARCH OFFICE-DURHAM, NORTH CAROLINA. THE BATTLE NORTHWEST  
 LABORATORIES, INC. HAS BEEN ADVISED THAT THE ABOVE LISTED MATERIALS  
 ARE BEING USED IN THE DEVELOPMENT OF A NEW TYPE OF MISSILE WHICH  
 IS BEING DEVELOPED BY THE ARMY RESEARCH OFFICE-DURHAM, NORTH  
 CAROLINA.

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SELLER SHALL SUBMIT CHEMICAL ANALYSIS FOR EACH ITEM (1 EACH) FOR BUYERS REVIEW PRIOR TO SHIPMENT OF EACH LOT.

**DELIVERY SCHEDULE**

200 UNITS EACH PW-0 AND PW-7A-2M	JUNE 1, 1977
200 UNITS EACH PW-0 AND PW-7A-2M	JULY 1, 1977
250 UNITS EACH PW-0 AND PW-7A-2M	SEPTEMBER 1, 1977
400 UNITS EACH PW-0 AND PW-7A-2M	SEPTEMBER 15, 1977

**201. DOCUMENTATION**

SELLER SHALL MAIL ALL DOCUMENTATION REQUIREMENTS PERTAINING TO QUALITY CLAUSES HEREIN DESIGNATED, INCLUDING THOSE CERTIFICATIONS REPRESENTING EACH MATERIAL SHIPMENT, TO THE ATTENTION OF MW SCHLATTER  
BATTELLE-NORTHWEST, P.O. BOX 999, RICHLAND, WASHINGTON 99352.

**220. CERTIFICATION OF CONFORMANCE**

A CERTIFICATE OF CONFORMANCE INDICATING PURCHASE ORDER OR CONTRACT NUMBER, APPLICABLE DRAWING AND SPECIFICATION NUMBERS AND NOMENCLATURE, AND BEARING THE AUTHORIZED SIGNATURE AND TITLE OF A RESPONSIBLE CONTRACT REPRESENTATIVE OF THE SELLER SHALL BE REQUIRED TO REPRESENT EACH SHIPMENT AGAINST THIS CONTRACT. CERTIFICATIONS SHALL BE MAILED TO BNW PER CLAUSE 201. EACH CERTIFICATION SHALL INCLUDE APPLICABLE, OF THE TWO FOLLOWING STATEMENTS:

- A. ITEMS IN THIS CONTRACT HAVE BEEN PRODUCED FROM BATTELLE-NORTHWEST FURNISHED MATERIAL ON BNW SHIPPER NO.
- B. MATERIALS AND/OR PARTS, COMPONENTS, OR SERVICES FURNISHED UNDER THIS CONTRACT HAVE BEEN MANUFACTURED AND INSPECTED IN ACCORDANCE WITH ALL APPLICABLE CONTRACT REQUIREMENTS AND SPECIFICATIONS AND SUCH INSPECTION RECORDS AS REQUIRED BY THIS CONTRACT ARE ON FILE AND AVAILABLE FOR REVIEW/INSPECTION.

UTILIZATION OF MINORITY BUSINESS ENTERPRISES

(A) IT IS THE POLICY OF THE GOVERNMENT THAT MINORITY BUSINESS ENTERPRISES SHALL HAVE THE MAXIMUM PRACTICABLE OPPORTUNITY TO PARTICIPATE IN THE PERFORMANCE OF GOVERNMENT CONTRACTS.

(B) THE SELLER AGREES TO USE HIS BEST EFFORTS TO CARRY OUT THIS POLICY IN THE AWARD OF HIS SUBCONTRACTS TO THE FULLEST EXTENT CONSISTENT WITH THE EFFICIENT PERFORMANCE OF THIS ORDER. AS USED IN THIS ORDER, THE TERM "MINORITY BUSINESS ENTERPRISE" MEANS A BUSINESS, AT LEAST 50 PERCENT OF WHICH IS OWNED BY MINORITY GROUP MEMBERS OR, IN CASE OF PUBLICLY OWNED BUSINESSES, AT LEAST 51 PERCENT OF THE STOCK OF WHICH IS OWNED BY MINORITY

CONTINUE -----



9513321-0996

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GROUP MEMBERS. FOR THE PURPOSES OF THIS DEFINITION, MINORITY GROUP MEMBERS ARE NEGROES, SPANISH-SPEAKING AMERICAN PERSONS, AMERICAN-ORIENTALS, AMERICAN-INDIANS, AMERICAN-ESKIMOS, AND AMERICAN-ALEUTS, SELLERS MAY RELY ON WRITTEN REPRESENTATIONS BY SUB-CONTRACTORS REGARDING THEIR STATUS AS MINORITY BUSINESS ENTERPRISES IN LIEU OF AN INDEPENDENT INVESTIGATION.

LISTING OF EMPLOYMENT OPENINGS

SELLER SHOULD NOTE THAT THIS AWARD INCLUDES A PROVISION REQUIRING THE LISTING OF EMPLOYMENT OPENINGS WITH THE LOCAL OFFICE OF THE FEDERAL-STATE EMPLOYMENT SERVICE SYSTEM. THE CLAUSE ENTITLED, "LISTING OF EMPLOYMENT OPENINGS" - FPR 1-12.1102-2 AND FPR TEMPORARY REGULATION 39 IS APPLICABLE PURSUANT TO 41 CFR 50-250.

SHIP FREIGHT COLLECT. SHOW ON THE BILL OF LADING--THIS SHIPMENT IS THE PROPERTY OF AND THE FREIGHT CHARGES ARE ASSUMED BY BATTELLE FOR US ERDA.

THIS CONSTITUTES OUR ACCEPTANCE OF YOUR WRITTEN OFFER DATED 2-24-77; AND YOUR 3-19-77 AMENDMENT LETTER FOR REVISED QUANTITIES AND UNIT PRICES; BOTH SIGNED BY YOUR J. W. CUNNINGHAM.

*K. K. Leeser*  
K. K. LEESER  
CONTROLLER

APPENDIX B

RESULTS FROM WASTE DESIGNATION PROCEDURE

HAZARDOUS WASTE DESIGNATION

ITEM/COMPOSITION FLU-C

phase SL density \_\_\_\_\_

1. DISCARDED CHEMICAL PRODUCT? No

2. DANGEROUS WASTE SOURCE? No

3. DANGEROUS WASTE MIXTURE?

● TOXICITY?  $EC = \frac{.27}{1,000} + \frac{1.4+1.6+5+3.7+14.3}{10,000} = .0032$  DW WTD2

● PERSISTENCE? No FH, No FLH

● CARCINOGENIC? No

4. CHARACTERISTIC DANGEROUS WASTE?

● IGNITABLE? Yes 16.42 DOT OXIDIZER D001

● CORROSIVE? No

● REACTIVE? No

● EP TOXIC? Yes D011(DW) D005(DW) D006(DW) D007(DW)

DETERMINATION: WASTE CLASS: DW WASTE NUMBERS: WTD2, D011, D005, D006, D007, D001

JSDOT PROPER SHIPPING NAME: Waste <sup>NITRAL</sup> ~~Corrosive~~ ~~Flammable~~ NOS  
HAZARD CLASS: OXIDIZER  
ID #: ~~NA1477~~ NA1477 LABELS: OXIDIZER  
PACKAGE REFERENCE: 173.153/154

NOTES: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

HAZARDOUS WASTE DESIGNATION

ITEM/COMPOSITION PW-7a Slurry

phase sl density \_\_\_\_\_

1. DISCARDED CHEMICAL PRODUCT? No

2. DANGEROUS WASTE SOURCE? No

3. DANGEROUS WASTE MIXTURE?

• TOXICITY? No

• PERSISTENCE? No

• CARCINOGENIC? No

4. CHARACTERISTIC DANGEROUS WASTE?

• IGNITABLE? YES DOT OXIDIZER (6.1.2)

• CORROSIVE? No

• REACTIVE? No

• EP TOXIC? No

DETERMINATION: WASTE CLASS: DW WASTE NUMBERS: D001

USDOT PROPER SHIPPING NAME: Waste Nitrate Oxidizer NOS

HAZARD CLASS: OXIDIZER

ID #: NA 1477 LABELS: OXIDIZER

PACKAGE REFERENCE: \_\_\_\_\_

NOTES: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

9513321.1000

DATE \_\_\_\_\_

WASTE DESIGNATION

ITEM/COMPOSITION Amoco PW-7a and PW-C

phase S/L density \_\_\_\_\_

1. DISCARDED CHEMICAL PRODUCT? No

2. DANGEROUS WASTE SOURCE? No

3. DANGEROUS WASTE MIXTURE?

● TOXICITY? EC =  $\frac{.135}{1,000} + \frac{0.7 \cdot 0.8 \cdot 25 + 1.85 \cdot 7.15}{10,000} = .00142$  DW WT02

● PERSISTENCE? No HH No PAH

● CARCINOGENIC? No

4. CHARACTERISTIC DANGEROUS WASTE?

● IGNITABLE? YES DOT OXIDIZER D001 (41.22)

● CORROSIVE? No

● REACTIVE? No

● EP TOXIC? YES D005 (DW) D011 (DW) D006 (DW) D007 (DW)

DETERMINATION: WASTE CLASS: DW WASTE NUMBERS: D001, WT02, D005, D006, D007, D011

USDOT PROPER SHIPPING NAME: Waste Nitrate NOS

HAZARD CLASS: OXIDIZER

ID #: ~A1477 LABELS: OXIDIZER

PACKAGE REFERENCE: 173.153/1.182

NOTES: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

APPENDIX C

RADIONUCLIDE ANALYSIS



**Battelle**  
Pacific Northwest Laboratories

Project Number \_\_\_\_\_

Internal Distribution \_\_\_\_\_

Date September 5, 1986  
To Tom Hinkle  
From C. W. Thomas *C. W. Thomas*  
Subject Analysis of PW and PW-0 Waste Liquids

The concentration of gamma emitting radionuclides, gross beta activity, and gross alpha activity are shown in the attached table. The gross beta activity was calculated assuming energies similar to  $^{90}\text{Sr}$ - $^{90}\text{Y}$ , while the gross alpha activity was calculated by spiking replica samples with a known amount of  $^{242}\text{Pu}$  to determine absorption effects from residual salts. The radiochemical composition of the waste is from natural thorium, uranium, and actinium chain members.

attachment  
CWT/kja

RECEIVED BY  
SEP 15 1986  
R. A. KALDOR

RECEIVED BY  
1986  
R. A. KALDOR

Attachment 1 pge 2 of 2

## Radiochemical Composition of PW and PW-0 Waste Solutions

	<u>PW 7A</u>	<u>50-50 PW-7A+PW-0</u> pCi/gram	<u>PW-0</u>
*Gross Beta	66.9	129	82.9
Gross Alpha	150	600	389
**228Ac (Th)	1.85 (16.7)	13.1 (118)	7.21 (65)
***214Bi (U)	0.70 (3.5)	8.23 (41)	2.21 (11)
****223Ra (Ac)	40.8 (163)	71.1 (284)	33.8 (135)
40K	<0.81	6.85	14.8

---

\*Assuming  $^{90}\text{Sr}$ - $^{90}\text{Y}$  beta energies

\*\*Concentration in parenthesis assumes equilibrium with 9 chain members

\*\*\*Concentration in parenthesis assumes equilibrium with 5 chain members

\*\*\*\*Concentration in parenthesis assumes equilibrium with 4 chain members



APPENDIX D

INFORMATION ON THE IN SITU VITRIFICATION PROCESS