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7. Abstract

The soil characterization plans for the following facilities are discussed:

- 1324-N Surface Impoundment and North Pond
- 1324-NA Percolation Pond
- South Pond.

Background sampling at a site south of 1324-N/NA is also discussed. The background sampling and 1324-N sampling are to be conducted in FY 1989. The dates for the remaining sampling activities are not yet established. These facilities are scheduled for sampling prior to closure because of their status as treatment/storage/disposal facilities under the Resource Conservation and Recovery Act of 1976.

Since 1977, various effluent streams were discharged to one or more of the ponds. Effluents from the 163-N Demineralization Plant cation and anion regeneration cycles were analyzed, found to exhibit high and low pH characteristics, and are therefore considered corrosive, dangerous wastes as defined in 40 CFR 261.22 (a)(1) and WAC 173-303-090 (6)(a)(i).

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INTRODUCTION

The 1324-N/NA Surface Impoundment/Percolation Pond Facility (Figure 1) is scheduled for closure because of its status as treatment/storage/disposal (TSD) facility under the Resource Conservation and Recovery Act of 1976 (RCRA). Information gained from this sampling activity will provide the basis for determining cleanup methods and determine closure plans for the site. The facility description and history information contained in this plan are based on the Part B Permit Application--1324-N Surface Impoundment (DOE 1986) and the Preliminary Closure Plan--1324-NA Percolation Pond (DOE 1987).

The 1324-N/NA Surface Impoundment/Percolation Pond Facility has been in operation in various forms since 1977. During this period, effluents from the 163 Demineralization Plant cation and anion regeneration cycles, 163-N process and cooling waters, and filter backwash water wastes from the 183-N Filtered Water Plant were discharged into the North and South Settling Ponds, the 1324-N Surface Impoundment, and the 1324-NA Percolation Pond. The waste streams have been analyzed, and the anion and cation regeneration cycle wastes exhibit high and low pH characteristics and are considered corrosive, dangerous wastes. The wastes exhibited no other dangerous waste characteristics or criteria and did not contain any listed hazardous wastes or dangerous waste sources (Washington Department of Ecology [Ecology] 1989). Since 1986, the wastes have been neutralized before being discharged to the 1324-NA Percolation Pond.

Groundwater testing and analysis are not covered as part of this plan. Groundwater sampling has been underway since December of 1987. The analysis of the first year's data has put the groundwater monitoring program in the assessment phase.

Prior to 1977, these waste streams were discharged to the Columbia River. They were rerouted to land disposal site at the U.S. Environmental Protection Agency's (EPA) request during the national pollutant discharge elimination system (NPDES) permitting process.

This plan identifies the sampling needed to determine the waste constituent concentrations in the soils at the sites of the 1324-N Surface Impoundment, 1324-NA Percolation Pond, and the North and South Settling Ponds. Also identified are the samples needed to establish background concentrations in the soil.

The sampling activity described in this plan is to be initiated in FY 1989. It is expected that the background sampling and 1324-N Surface Impoundment sampling will be completed by October 1989. Other sampling activity has not been scheduled at this time.

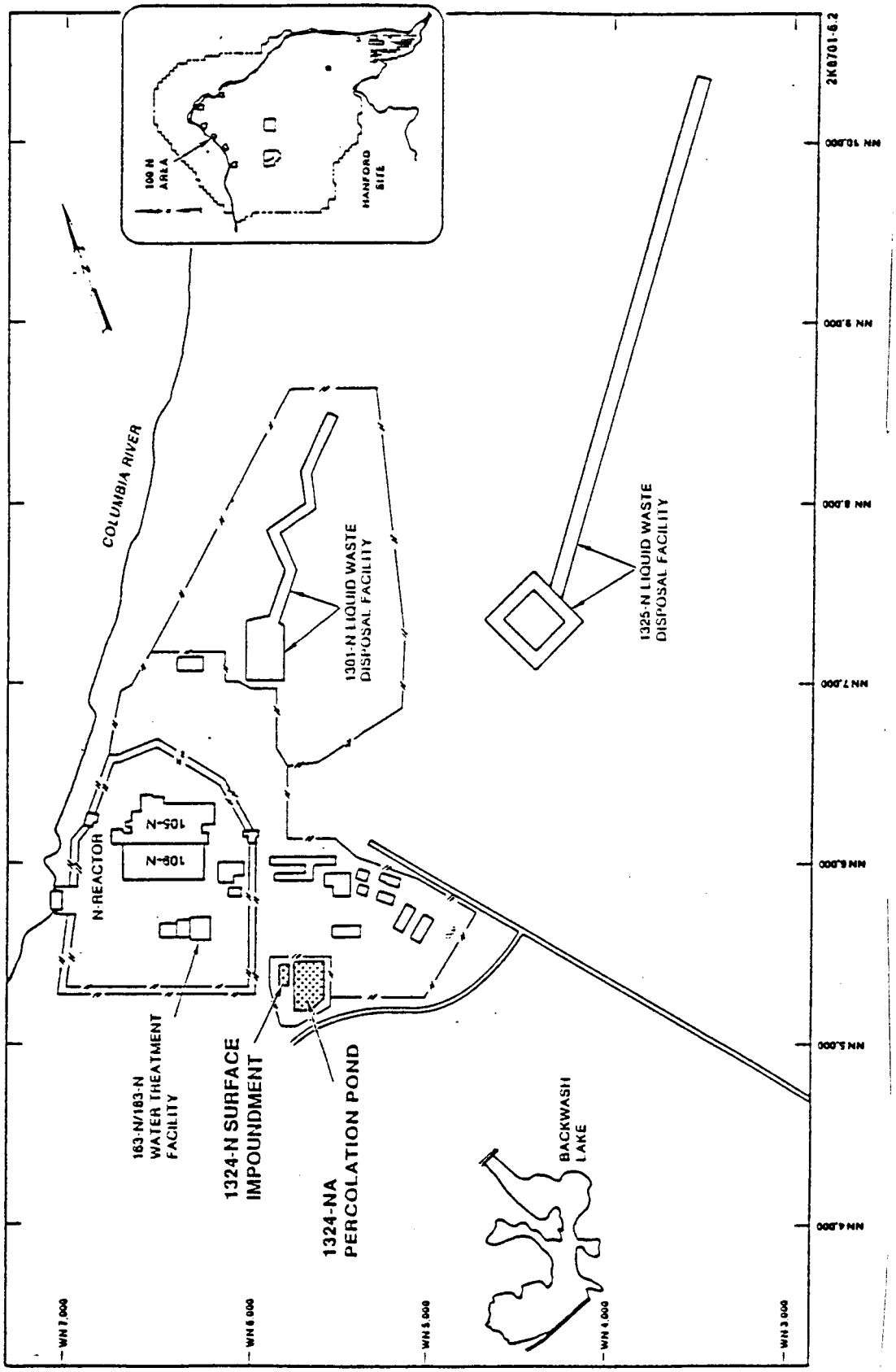


Figure 1. 100-N Area Facilities

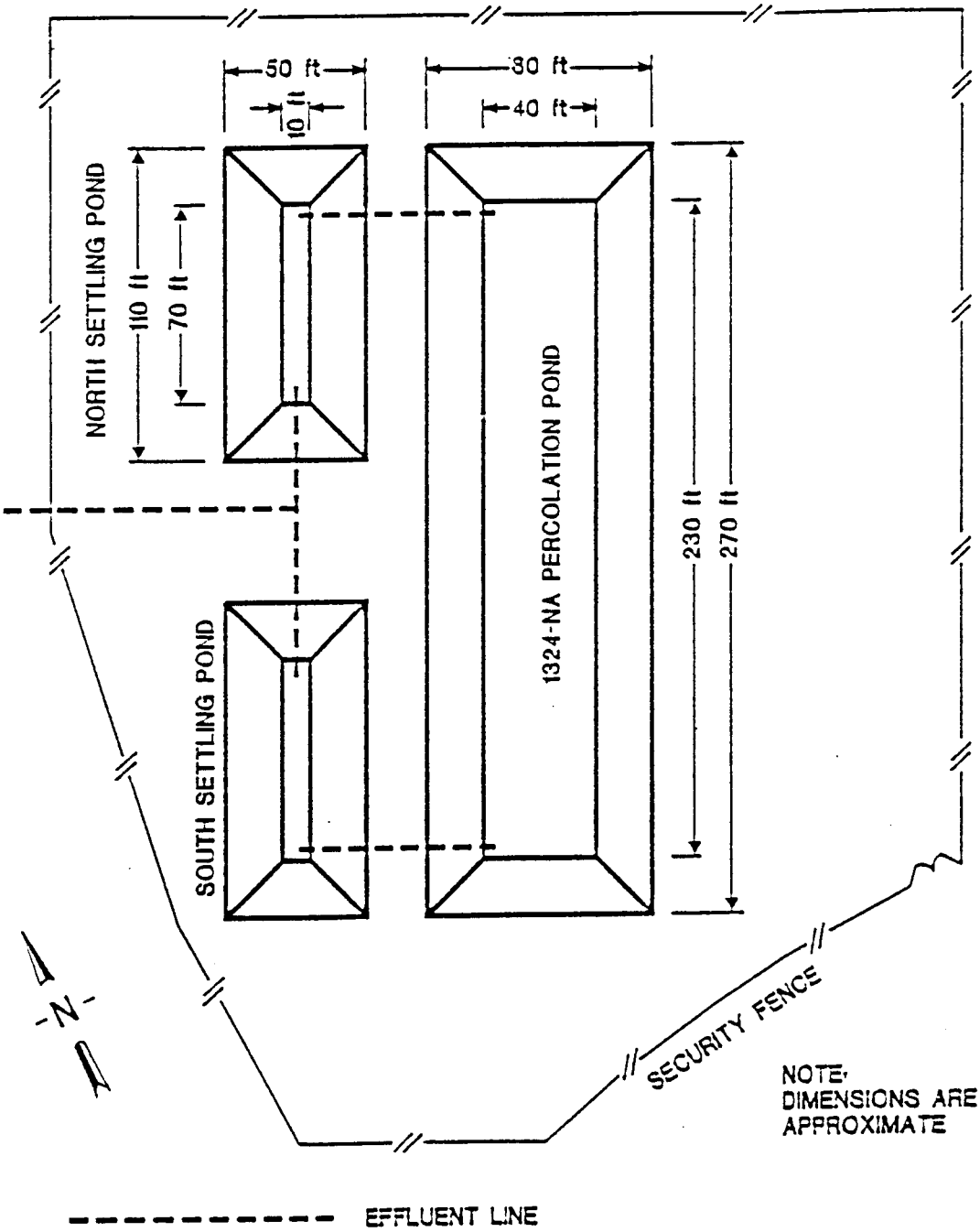


Figure 2. 1324-NA Facility Diagram With Dimensions, 1977 to 1983

FACILITY DESCRIPTION

The 1324-N/NA Surface Impoundment/Percolation Pond Facility is located in the 100-N Area of the Hanford Site, approximately 1,000 yd southeast of the 105-N Reactor Facility. The 1324-NA Percolation Pond and the North and South Settling Ponds (Figure 2) were placed in service in August 1977 and received corrosive regeneration wastes from the 163-N Demineralization Plant and filter backwash water from the 183-N Filtered Water Plant. The settling ponds were removed from service in early 1983. Subsequently, the South Pond was backfilled to grade, and the North Pond was modified to provide the foundation for the 1324-N Surface Impoundment (Figure 3).

In the spring of 1983, the 1324-NA Percolation Pond was enlarged from a bottom area of 9,200 ft^2 with a volume of approximately 1,200,000 gal to a bottom area of 29,000 ft^2. This enlarged pond (Figure 3) was designed to contain up to 3,000,000 gal of corrosive wastes from the regeneration of ion exchange columns in the 163-N Demineralization Plant. The entire bottom area of the pond has not been covered with wastes since the enlargement of the pond. The filter backwash water was routed to a new disposal basin when the expansion took place.

Use of the 1324-NA Percolation Pond for hazardous wastes was discontinued by May 13, 1986, when the 1324-N Surface Impoundment was put into service to treat the corrosive wastes. This facility (in operation until November 8, 1988) received only nonradioactive dangerous waste exhibiting corrosive characteristics produced during the regeneration of ion exchange column resins in the 163-N Demineralization Plant. These wastes were neutralized to a pH of between 4.0 and 11.0 and discharged to the adjacent 1324-NA Percolation Pond.

The 1324-N Surface Impoundment is a rectangular-shaped pond (Figure 4) with sloping sides. The impoundment was designed to contain a volume of 424,000 gal. Two 45-mil liners (Figure 5) were installed in the impoundment along with a leak-detection system between the liners.

In 1988, the 1324-N Surface Impoundment ceased receiving discharges and was rendered inoperative. It was replaced by an elementary neutralization unit. The 1324-NA Percolation Pond is still in operation.

WASTE AND PROCESS INFORMATION

The discharges to the 1324-NA Percolation Pond, 1324-N Surface Impoundment and the North and South Settling Ponds included effluents from the 163-N Demineralization Plant cation and anion regeneration cycles, fresh 163-N process and cooling waters, and filter backwash water wastes from the 183-N Filtered Water Plant. The discharges from the 163-N regeneration cycles exhibit the low and high pH characteristics of a corrosive, dangerous waste. The waste exhibited no other dangerous waste characteristics or criteria, and analysis indicated that it did not contain

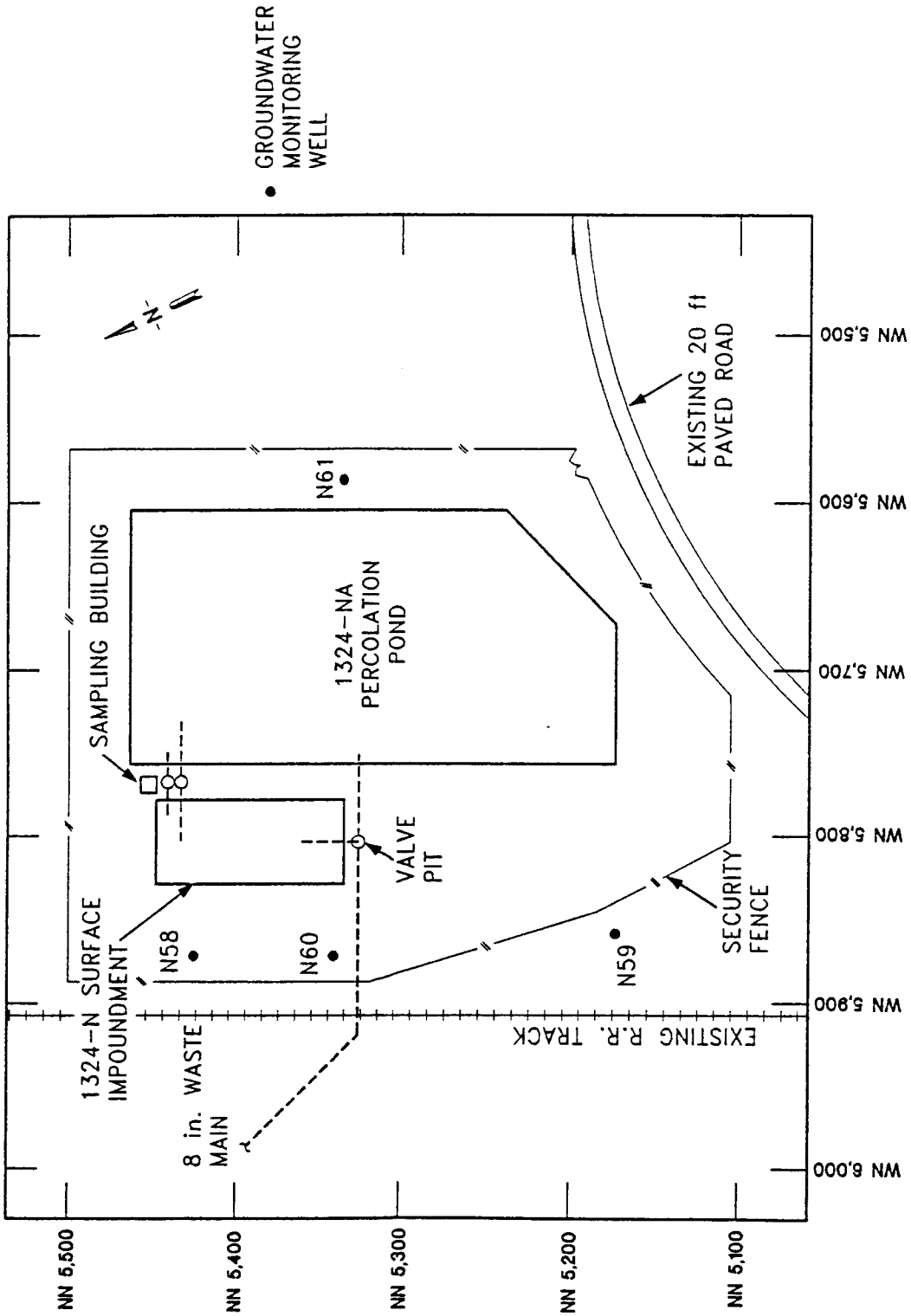
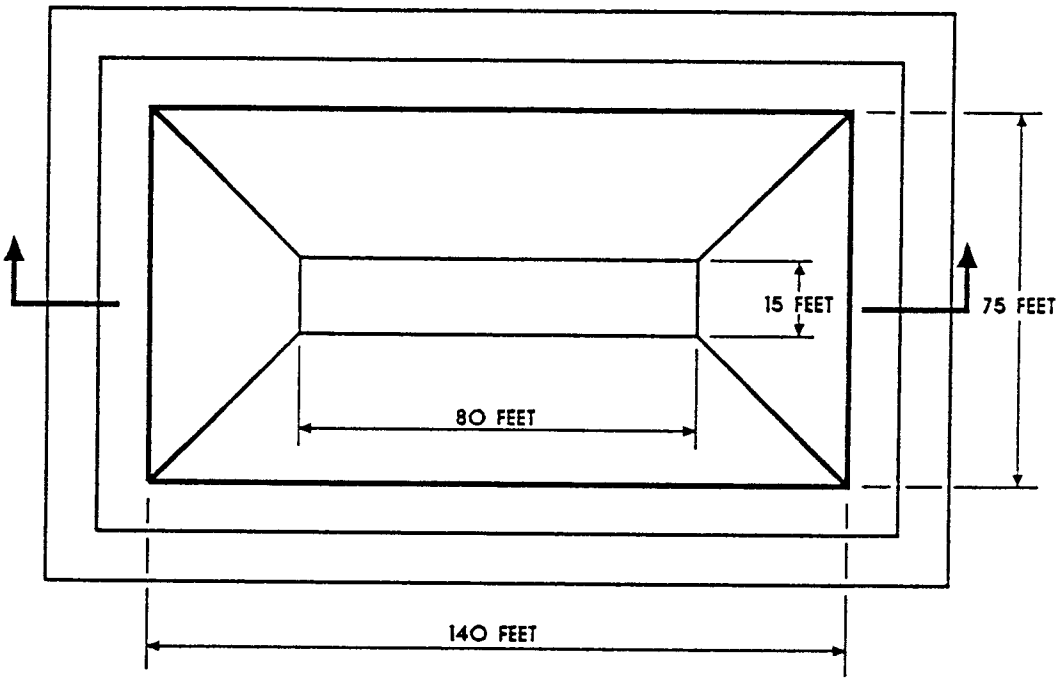
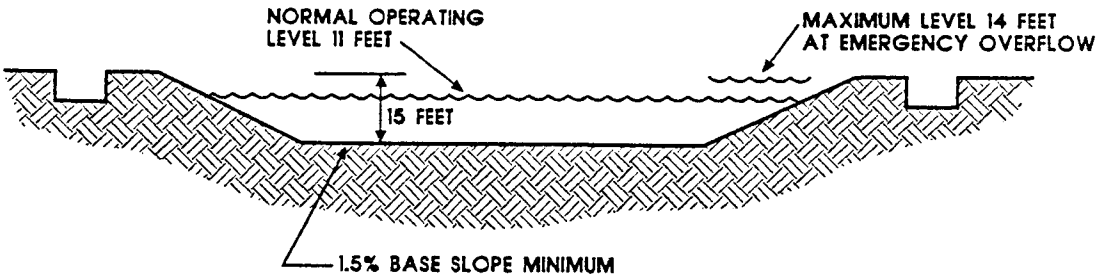


Figure 3. 1324-N/NA Surface Impoundment/Percolation Pond 1986 to 1988



PLAN VIEW



SECTION VIEW

Figure 4. 1324-N Surface Impoundment Physical Dimensions

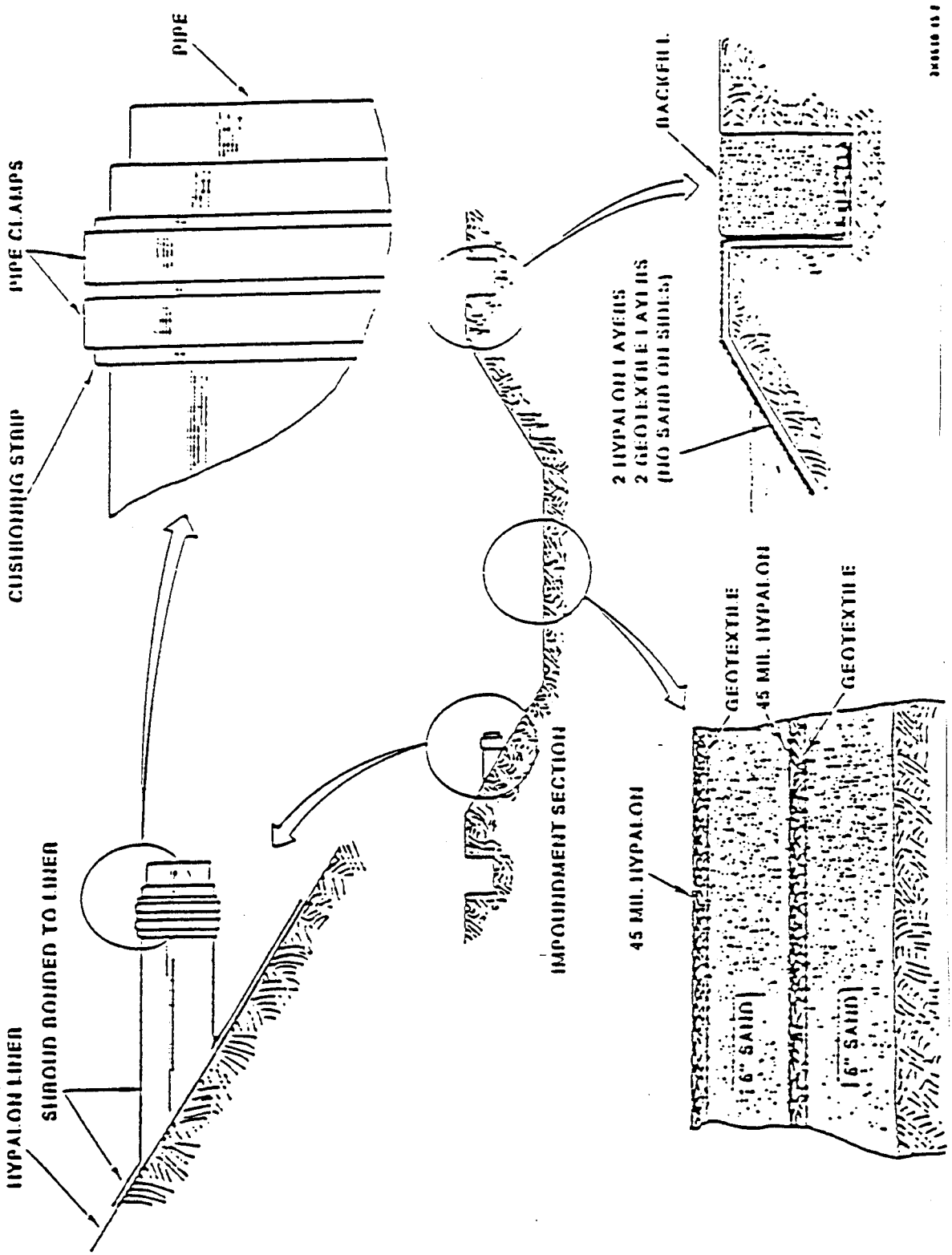


Figure 5. Liner Construction Details

any listed hazardous wastes or dangerous waste sources (Ecology 1987). The 163-N process and cooling waters are not a dangerous waste prior to being mixed with the regeneration wastes. The 183-N filter backwash effluent is of neutral pH and contains low concentrations of several anion and cations. The filter backwash waste did not exhibit any dangerous waste characteristics or criteria, and analysis indicated that it did not contain any listed dangerous wastes or dangerous waste sources (Ecology 1987).

From 1977 to 1983, effluent from the 163-N Demineralization Plant cation and anion regeneration cycles were combined with process and cooling waters from the 163-N Demineralization Plant and discharged into the North and South Settling Ponds and then into the 1324-NA Percolation Pond. Additionally, the filter backwash water wastes from the 183-N Filtered Water Plant were discharged into the North and South Ponds. The solids in this waste stream settled out and the liquid portion was discharged into the 1324-NA Percolation Pond.

Between 1983 and 1986, the North and South Settling Ponds were closed, and the 183-N Filtered Water Plant effluent was discharged to another facility. The South Pond was backfilled and the North Pond was eventually replaced by the 1324-N Surface Impoundment. The 163-N Demineralization Plant effluent was discharged directly to the 1324-NA Percolation Pond.

From 1986 to 1988, the 1324-N Surface Impoundment was used to neutralize 163-N Demineralization Plant effluent prior to its discharge into the 1324-NA Percolation Pond. Process and cooling waters from the 163-N Demineralization Plant were also discharged directly into the 1324-NA Percolation Pond.

In 1988, the 1324-N Surface Impoundment was replaced by an elementary neutralization unit. Effluent from this unit and processing and cooling waters from the 163-N Demineralization Plant are discharged directly into the 1324-NA Percolation Pond.

WASTE STREAMS

A summary of the sources and quantities of discharges into the 1324-N/NA facility is presented in Table 1. Analyses of the effluents, in the form of single-point readings, are included in the following tables. These readings are believed to be typical of the waste stream and do not represent the results of formal analysis of many readings taken over the noted time periods. The quantities presented are nominal daily averages and should not be used to determine total quantities over time. Daily discharges may have ranged from about 35% to 400% of the nominal average.

163-N Demineralization Plant--Anion Regeneration

The 163-N Demineralization Plant uses four primary anion exchange units and four secondary units to provide a source of high-quality demineralized water for cooling needs at N Reactor. These columns are regenerated using sodium hydroxide (NaOH) at a 4% dilution and then rinsed with filtered

Table 1. Sources and Quantities of Discharge to the 1324-N/NA Facilities

FACILITY	1977 to 1983		1983 to 1986		1986 to 1988		1988 to Present	
	SOURCE	QUANTITY AVERAGE GAL/DAY*	SOURCE	QUANTITY AVERAGE GAL/DAY*	SOURCE	QUANTITY AVERAGE GAL/DAY*	SOURCE	QUANTITY AVERAGE GAL/DAY*
North and South Ponds	163-N Anion[a] 163-N Cation[b] 163-N P&C	160,000	CLOSED		CLOSED		CLOSED	
	183-N Filter[c] Plant	300,000						
1324-NA	North Pond South Pond	450,000	163-N Anion[a] 163-N Cation[b]	450,000	1324-N[d] 163-N P&C[d]	430,000	163-N ENU[d] 163-N P&C	
1324-N	Not Built		Not Built		163-N Anion[a] 163-N Cation[b] 163-N P&C H_2SO_4 NaOH	430,000	CLOSED	

* The quantities shown in this table are nominal values of the total daily regeneration discharge.

[a] See Table 2.
[b] See Table 3.
[c] See Table 4.
[d] See Appendix A.

P&C = Process and Cooling Water ENU = Elemental Neutralization Unit

water. The 163-N process and cooling waters are combined with the waste stream to lower the viscosity so it will flow through the piping system to the ponds.

The anion regeneration cycle wastes have been analyzed, and the results are contained in Table 2. The waste exhibits the high pH characteristics (greater than or equal to 12.5) as defined in 40 CFR 261.22(a)(1) and Washington Administration Code (WAC) 173-303-090 (6)(a)(i) and is a corrosive, dangerous waste. This waste exhibited no other dangerous waste characteristics or criteria and did not contain any discarded chemical products or dangerous waste sources.

163-N Demineralization Plant--Cation Regeneration

The 163-N Demineralization Plant uses four primary cation exchange units and four secondary units to provide a source of high-quality demineralized water for cooling needs at N Reactor. These columns are regenerated using 2 to 4% sulfuric acid (H_2SO_4) and rinsed with filtered water. The 163-N process and cooling waters are combined with the waste stream to lower the viscosity so it will flow through the piping system to the ponds.

The cation regeneration cycle wastes have been analyzed and the results are contained in Table 3. The waste exhibits the low pH characteristic (less than or equal to 2.0) as defined in 40 CFR 261.22(a)(1) and WAC 173-303-090 (6)(a)(i) and is corrosive, dangerous waste. It also has been analyzed for the characteristic of corrosivity according to 40 CFR 261.22(a)(2) and WAC 173-303-090 (6)(a)(ii); at pH of <3.5 standard units, this waste will corrode SAE 1020 steel at a rate >0.250 in/yr at a temperature of 55°C. This waste exhibited no other dangerous waste characteristics or criteria and did not contain any discarded chemical products or dangerous waste sources.

183-N Filtered Water Plant--Filter Backwash Water

The filter backwash effluent from the 183-N Filtered Water Plant has been analyzed, and the results are contained in Table 4. This waste stream is of neutral pH and contains low concentrations of several anions and cations. The filter backwash waste did not exhibit any dangerous waste characteristics or criteria nor did it contain any discarded chemical products or dangerous waste sources.

163-N Demineralization Plant--Process and Cooling Water

Process and cooling waters from the 163-N Demineralization Plant are not dangerous waste prior to being mixed with the regeneration wastes. An analysis of the discharge is presented in Appendix A.

Table 2. 163-N Demineralization Plant Regeneration Effluent Waste Analysis, Anion Regeneration Cycle (Samples Taken 1987).

Parameters	Minimum Detection Limit, ppm	Sample			
		1	2	3	Average
pH, std units	--	13.72	13.74	13.77	13.74
Conductivity, mho	--	62,000	60,000	70,000	64,000
Mercury	0.0001	0.00018	0.00013	0.00019	0.00017
Ethylene glycol	10	LD	LD	LD	LD
Enhanced thiourea	0.2	LD	LD	LD	LD
TOC	1	462	499	456	472
Cyanide	0.01	0.010	0.015	LD	0.013
Barium	0.6	LD	LD	LD	LD
Cadmium	0.2	LD	LD	LD	LD
Chromium	1	LD	LD	LD	LD
Lead	0.2	LD	LD	LD	LD
Silver	1	LD	LD	LD	LD
Sodium	10	26,910	28,200	26,330	27,150
Nickel	1	LD	LD	LD	LD
Copper	1	LD	LD	LD	LD
Vanadium	0.5	LD	LD	LD	LD
Antimony	10	LD	LD	LD	LD
Aluminum	15	LD	LD	LD	LD
Manganese	0.5	LD	LD	LD	LD
Magnesium	5	LD	LD	LD	LD
Potassium	10	26.5	27.2	26.3	26.7
Iron	5	LD	LD	LD	LD
Beryllium	0.5	LD	LD	LD	LD
Osmium	30	LD	LD	LD	LD
Strontium	30	LD	LD	LD	LD
Zinc	0.5	LD	LD	LD	LD
Calcium	5	LD	LD	LD	LD
Nitrate	0.5	1.0	1.4	0.9	1.1
Sulphate	0.5	30.9	30.6	30.6	30.7
Fluoride	0.5	LD	LD	LD	LD
Chloride	0.5	2.5	2.3	2.3	2.4
Phosphate	1	LD	LD	LD	LD
Phosphorus pesticides	0.005	LD	LD	LD	LD
Chlorinated pesticides	0.001	LD	LD	LD	LD
Enhanced ABN list	--	LD	LD	LD	LD
Citrus Red	1	LD	LD	LD	LD
Arsenic	0.2	LD	LD	LD	LD
Ammonium ion	0.05	2.3	2.7	2.8	2.6
Coliform	2.2	LD	LD	LD	LD
Selenium	0.002	LD	LD	LD	LD
Thallium	0.4	LD	LD	LD	LD
Enhanced VOA	10	26	28	26	27

LD = less than detectable.

Table 3. 163-N Demineralization Plant Regeneration Effluent Waste Analysis, Cation Regeneration Cycle (Samples Taken August 1985).

Parameters	Minimum Detection Limit, ppm	Sample			
		1	2	3	Average
pH, std units	1	0.894	0.936	0.922	0.917
Conductivity, mho	2	37,000	40,100	35,000	37,367
Mercury	0.0001	LD	LD	LD	LD
Ethylene glycol	10	LD	LD	LD	LD
Enhanced thiourea	0.2	LD	LD	LD	LD
TOC	1	0.0013	0.0019	0.0018	0.0016
Cyanide	0.01	LD	LD	LD	LD
Barium	0.006	0.030	0.023	0.020	0.024
Cadmium	0.002	0.003	0.002	0.003	0.003
Chromium	0.01	LD	LD	LD	LD
Lead	0.03	LD	LD	LD	LD
Silver	0.01	LD	LD	LD	LD
Sodium	0.1	12.2	16.5	9.6	12.8
Nickel	0.01	LD	LD	LD	LD
Copper	0.01	LD	LD	LD	LD
Vanadium	0.005	0.025	0.027	0.020	0.024
Antimony	0.1	LD	LD	LD	LD
Aluminum	0.15	0.725	0.842	0.655	0.741
Manganese	0.005	0.027	0.035	0.027	0.030
Potassium	0.1	12.2	15.5	14.8	14.2
Iron	0.5	1.1	1.2	1.0	1.1
Beryllium	0.005	LD	LD	LD	LD
Osmium	0.3	LD	LD	LD	LD
Strontium	0.3	1.3	1.4	1.2	1.3
Zinc	0.005	0.016	0.024	0.067	0.036
Calcium	0.05	282.6	347.4	324.9	318.3
Nitrate	0.5	1.0	0.5	0.8	0.8
Sulphate	0.5	2,310	4,271	2,952	3,201
Fluoride	0.5	LD	LD	LD	LD
Chloride	0.5	2.0	1.8	1.9	1.9
Phosphate	1	LD	LD	LD	LD
Phosphorus pesticides	0.005	LD	LD	LD	LD
Chlorinated pesticides	0.001	LD	LD	LD	LD
Enhanced ABN list	--	LD	LD	LD	LD
Citrus Red	1	LD	LD	LD	LD
Arsenic	0.005	LD	LD	LD	LD
Ammonium ion	0.05	LD	LD	LD	LD
Coliform	3	LD	LD	LD	LD
Selenium	0.005	LD	LD	LD	LD
Thallium	0.01	LD	LD	LD	LD
Enhanced VOA	10	26	28	26	27

LD = less than detectable.

Table 4. 183-N Filtered Water Plant Backwash Effluent Analysis
(Samples Taken August 1985)

Parameters	Minimum Detection Limit, ppm	Sample			
		1	2	3	Average
pH, std units	1	7.08	7.65	7.64	7.46
Conductivity, mho	2	260	150	150	153
Mercury	0.001	LD	LD	LD	LD
Ethylene glycol	10	LD	LD	LD	LD
Enhanced thiourea	0.2	LD	LD	LD	LD
TOC	1	0.00277	0.002185	0.002257	0.002404
Cyanide	0.01	LD	LD	LD	LD
Barium	0.006	0.030	0.031	0.030	0.030
Cadmium	0.002	0.004	0.002	0.002	0.003
Chromium	0.01	LD	LD	LD	LD
Lead	0.03	LD	LD	LD	LD
Silver	0.01	LD	LD	LD	LD
Sodium	0.1	2.202	2.287	2.186	2.225
Nickel	0.01	LD	LD	LD	LD
Copper	0.01	LD	LD	LD	LD
Vanadium	0.005	LD	LD	LD	LD
Antimony	0.1	LD	LD	LD	LD
Aluminum	0.15	0.392	0.389	0.376	0.386
Manganese	0.005	0.020	0.015	0.014	0.016
Potassium	0.1	0.799	0.814	0.762	0.792
Iron	0.5	LD	LD	LD	LD
Beryllium	0.005	LD	LD	LD	LD
Osmium	0.3	LD	LD	LD	LD
Strontium	0.3	LD	LD	LD	LD
Zinc	0.005	LD	LD	LD	LD
Calcium	0.05	17.340	17.720	17.020	17.360
Nitrate	0.5	0.789	0.500	0.500	0.596
Sulphate	0.5	18.900	20.980	19.110	19.663
Fluoride	0.5	LD	LD	LD	LD
Chloride	0.5	2.846	2.671	2.901	2.806
Phosphate	1	LD	LD	LD	LD
Phosphorus pesticides	0.005	LD	LD	LD	LD
Chlorinated pesticides	0.001	LD	LD	LD	LD
Enhanced ABN list	--	LD	LD	LD	LD
Citrus Red	1	LD	LD	LD	LD
Arsenic	0.005	LD	LD	LD	LD
Ammonium ion	0.05	LD	LD	LD	LD
Coliform	3	0.240	2.400	2.400	1.680
Selenium	0.005	LD	LD	LD	LD
Thallium	0.01	LD	LD	LD	LD
Enhanced VOA	10	--	0.024	0.025	0.025

LD = less than detectable.

1324-N Surface Impoundment Discharge

The caustic wastes from a regeneration of the anion exchange column resins were generally neutralized in 1324-N by the addition of the acidic wastes from one or more regenerations of the cation column resins. Acid wastes from cation column resin regenerations were thus similarly neutralized by the addition of caustic anion column resin regeneration wastes. Minimal sulfuric acid (H_2SO_4) or sodium hydroxide (NaOH) were added if needed to bring the pH within the 4.0 to 11.0 range. An analysis of the discharge to 1324-NA is presented in Appendix A.

CHEMICAL HAZARDS SUMMARY

During the operating life of these facilities, wastes outside the pH range of 4.0 to 1.0 have been discharged into the settling ponds or the percolation pond. Any adverse consequences of the caustic and acidic effluent were expected to be reduced by three processes:
(1) coneutralization, (2) dilution, and (3) soil-chemical reactions. Since 1986, when the 1324-N Surface Impoundment began operation, no wastes were discharged to 1324-NA that were outside of acceptable pH range. The discharge to the 1324-NA Percolation Pond from the 1324-N Surface Impoundment and 163-N process and cooling water effluent were analyzed quarterly during 1988. The results of the analysis are summarized in Appendix A. Consequently, no chemical hazards are expected to be encountered. However, a site health and safety plan will be prepared and approved prior to initiating work.

FIELD SAMPLING INFORMATION

This sampling plan establishes the field work that will characterize the 1324-N/NA Site with respect to dangerous wastes or dangerous waste sources, dangerous waste characteristics, or criteria as defined in WAC 173-303. The documentation available indicates that the only discharge of concern is corrosive waste as defined in WAC 173-303. However, a general sampling program will be conducted to determine if any discarded chemical products or dangerous wastes are present. These sampling efforts will be limited to background sampling, the soils at 1324-N Surface Impoundment and North Settling Pond, 1324-NA Percolation Pond and the South Settling Pond, and the 1324-N Surface Impoundment interliner fill material. Information gained from this sampling activity will be used to guide further characterization efforts, to provide the basis for determining cleanup methods, and to determine closure plans for the site.

Sampling objectives addressed in this section are based on the sampling plan development information contained in SW-846 (EPA 1986) and other EPA guidance manuals and technical documents (DeVera et al. 1980; Mason 1983;

Barth and Mason 1984; EPA 1983; Ford et al. 1984; Ford and Torina 1985). The following sampling objectives are established to characterize the 1324-N/NA facility:

- Ascertain background concentrations for hazardous waste constituents.
- Ascertain the presence of corrosive waste
- Ascertain whether or not the soils are contaminated by other hazardous waste constituents.
- Provide data and information for input to development of closure plans for this site.

WORK PLAN

PHASE I: WATER SAMPLING

Effluents were sampled in 1985, 1987, and 1988, and the results are presented in Tables 2, 3, 4 and Appendix A. The effluents did not contain any discarded chemical products or dangerous waste sources but, at various times, did exhibit high and low pH characteristics and as such were corrosive, dangerous wastes. No additional water samples are planned as part of this activity.

PHASE II: SOIL SAMPLING

There are three distinct facilities at the 1324-N/NA facility (Table 1), and a unique plan is developed for each one. The background and 1324-N sampling are to be completed in FY 1989. The results from sampling at one facility may suggest revisions in the proposed sampling for the other facilities or aid in interpreting the results from the other facilities. The entire site is similar, so one set of samples will be used to determine background values. Sampling is to be conducted in accordance with characterization and procedure documents listed in Appendix B.

1324-NA Percolation Pond

The 1324-NA Percolation Pond was operated as a pond 80- by 270- by 10-ft deep from 1977 to 1983. In 1983, it was enlarged to approximately 175- by 270-ft in area and deepened to 12 ft. The eastern portion of the pond is built up so that it is not covered with effluent during normal operations. The western portion of the pond has been dredged on at least one occasion and the material redistributed.

A sampling program has been prepared for 1324-NA which treats the original pond area (western) as a separate entity from the enlarged area (eastern). Treating these as separate areas reflects the different histories of the two sections. The western portion has a long history of percolation use (since 1977) and has had material removed by dredging. The eastern portion has had limited use for percolation.

Eight sampling locations will be randomly selected in both the eastern and western portions of the pond (Appendix C), for a total of 16 locations. The western portion of the pond will be further divided into north and south ends, with four sampling locations in both. This stratification reflects the different histories of the two pond segments. Both segments had a similar history until 1986, when 1324-N was put into operation, and its effluent entered the north end. At that time, no effluent was directly input to the south end. In 1987, the pond was dredged, creating a small dam mid-pond. This held effluent in the north end for a brief period, allowing some settling to take place.

Random sample sites will be selected using the following protocol:

- A grid system will be established over the area of each portion of the pond.
- A scale interval in feet will be established along each axis of the grid.
- Two random numbers (X, Y coordinates) will be drawn from a random numbers table. The point of intersection will be the location of the sample site. (If a given coordinate is beyond the appropriate axis, a second number will be selected).
- The actual soil sampling site will be located in the field.

Samples will be taken at each of the 16 specified locations (eight from both the eastern and western portions). Two duplicate samples will be selected at random, making a total of 18 samples. Samples will be collected from a 3 ft interval, at a depth of 0 to 3 ft. Additional samples could be collected from greater depths at a later time if warranted.

Previous experience with the soils in the 100 Area suggests the upper levels (20 ft) may contain a high percentage of boulders and cobble. If this is the case, it may be difficult to collect samples at the selected sites. Because the 1324-NA Percolation Pond has been excavated to a depth of 10 to 12 ft, sampling may begin at a depth where the boulders and cobble do not represent a problem. Each sampling location will consist of a 3ft square. The sampling location within the square shall be determined by quartering the square, assigning the numbers 1 to 4 to the quarters, and randomly selecting the quarter to be tested. To ensure that sufficient samples are collected, the following sampling methods and equipment shall be used in sequence if needed: (1) thief, (2) trier, (3) auger, and (4) scoop and shovel.

Before abandoning one sampling method and selecting the next one on the list, a second location should be selected (within the quarter) and the method repeated. If it is necessary to move to a new quarter, it should be randomly selected (Appendix C).

1324-N Surface Impoundment

The North Settling Pond was operated as a 50- by 110- by 10-ft deep pond during the period 1977-1983. During this period, the pond was frequently dredged and material removed. In 1986, the 1324-N Surface Impoundment went into operation at the North Settling Pond Site. The 1324-N was 75- by 140- by 15-ft deep, and as such, much of the base material from the North Pond was removed during construction. The 1324-N was lined with two liners, separated by 6 in. of sand and placed on a 6 in. sand base (Figure 5). A leak detection system was installed between the liners. The 1324-N Surface Impoundment was closed in 1988 and steps are being taken to remove piping for sampling access in accordance with the Part B Permit Application (DOE 1986) and other guidance documents.

Eight sampling locations will be selected at random in the flat base area of the 1324-N Surface Impoundment (Appendix C).

There is no record of liner leakage since the start of the 1324-N operations in 1986. Soil contamination, if present, probably occured from 1977 to 1983, when the site was the North Settling Pond. The 1324-N Surface Impoundment overlays the North Pond, but is slightly greater in area. Samples will be collected only from the area of overlap. Random methods will be used to determine sample locations using the following protocol:

- A grid system will be established over the base area of the surface impoundment.
- A scale interval in feet will be established along each axis of the grid.
- Two random numbers (X, Y coordinates) will be drawn from a random numbers table. The point of intersection will be the location of the sample site. (If a given coordinate is beyond the appropriate axis, a second number will be selected).
- The actual sampling site will be located in the field.

Three samples will be taken at each of the eight selected locations. Four duplicate samples will be selected at random, making a total of 28 samples. The first sample at each location shall be taken from the 6 in. sand layer between the two liners. The second sample will be taken from the 0 to 1 ft interval below the liner. The remaining sample will be collected between 1 ft and 3 ft below the bottom liner. Additional samples could be collected from greater depths at a later time if warranted.

Previous experience with the 100 Area soils indicates that they may be difficult to sample because of boulders and cobble in the upper levels. The 1324-N area has been excavated to a depth of 15 ft, so sampling may be at a depth below the bulk of the boulders and cobble. Each sampling location is to consist of a 3 ft square. The sampling location within the square shall be determined by quartering the square, assigning the numbers 1 to 4 to the quarters, and randomly selecting the quarter to be tested. To ensure that sufficient samples are collected, the following sampling methods and equipment shall be used in sequence as needed: (1) thief, (2) trier, (3) auger, and (4) scoop and shovel.

Before abandoning one sampling method and selecting the next one on the list, a second location should be selected (within the quarter) and the method repeated. If it is necessary to move to a new quarter, it should be randomly selected (Appendix C).

South Settling Pond

The South Settling Pond was operated as a 50- by 110- by 10-ft deep pond during the period 1977-1983. During that time, the pond was frequently dredged and material removed. In 1983, the pond was taken out of service and backfilled with clean soil.

Previous experience in the 100 Area indicates that the soil may be difficult to sample because of boulders and cobble in the upper levels. The South Pond backfill consisted of the same soil and probably would represent the same degree of sampling difficulty as undisturbed soil. At this location, it is necessary to first penetrate the 10 ft of backfill to reach the sampling horizon. Samples are then taken over the next several feet for characterization.

Because of the anticipated difficulty in sampling, a trench shall be excavated to the 10 ft level. The trench shall be centered over the pond site. The sampling area will be approximately 24 ft long and have a 3 ft working width. It will be divided into eight squares, 3 ft on a side (Appendix C). Each square consists of a sampling location. The sampling locations within each square shall be determined by quartering the square, assigning the numbers 1 to 4 to the quarters, and randomly selecting the quarter to be tested.

One sample will be taken at each of the eight selected locations. One duplicate sample will be selected at random making a total of nine samples. Samples at each location will be collected from the 0 to 3 ft interval below the bottom of the trench. To ensure that sufficient samples are collected, the following sampling methods and equipment shall be used in sequence as needed: (1) thief, (2) trier, (3) auger, and (4) scoop and shovel.

Before abandoning one sampling method and selecting the next one on the list, a second location should be selected (within the quarter) and the method repeated. If it is necessary to move to a new quarter, it should be randomly selected (Appendix C).

Background Samples

Background soil samples will be collected to establish baseline values for concentrations of hazardous waste constituents of concern. A minimum of five samples shall be collected from the soil at an approximate depth of 10 ft. Additionally, one duplicate sample will be selected at random. Because samples are to be collected at a depth of 10 ft below the surface, a trench will be excavated to provide access to the sampling horizon. The samples shall be taken at a 1 ft depth, below the trench level. Background locations shall be surveyed and documented after samples have been taken.

Previous experience with the 100 Area soils indicate that they may be difficult to sample because of boulders and cobble. The trench will be excavated to a depth of 10 ft and may be at a depth below the bulk of the boulders and cobble. Each sampling location is to consist of a 3 ft square. The sampling location within the square shall be determined by quartering the square, assigning the numbers 1 to 4 to the quarters, and randomly selecting the quarter to be tested (Appendix C). To ensure that sufficient samples are taken, the following sampling methods and equipment shall be used in sequence as needed: (1) thief, (2) trier, (3) auger, and (4) scoop and shovel.

Before abandoning one sampling method and selecting the next one on the list, a second location should be selected (within the quarter) and the method repeated. If it is necessary to move to a new quarter, it should be randomly selected (Appendix C).

Background samples will be taken from areas nearby the 1324-N/NA facility but not so close that they could be affected by past operations or by activity from other facilities. Additionally, samples will be taken from similar geologic strata and at depths similar to the strata and depths (mean sea level) of the 1324-N/NA facility. These samples will be compared with those taken from the 1324-N/NA facility.

The geology of the 100-N Area is summarized in the 1324-NA Percolation Pond Closure Plan (DOE 1987). A generalized geologic column of the 100-N Area is shown in Figure 6. The interval of interest (10 to 25 ft) is in the Hanford Formation and consists of thinly, interbedded sediments (sand, silt and gravel up to boulder size). Conditions similar to the generalized column are found at the 1324-N/NA facility. Figure 7 is an as-built diagram from the construction of Groundwater Monitoring Well 199-N-61 which is located adjacent to the 1324-NA pond (Figure 3).

Given the present use of land in the 100-N Area, the best location to use for the collection of background samples will be to the south of the 1324-N/NA facility. The specific locations will need to be selected in the field using the following protocol:

- Identify a location which shows no evidence of prior use or disturbance which would penetrate below 10 ft.
- Excavate the trench.

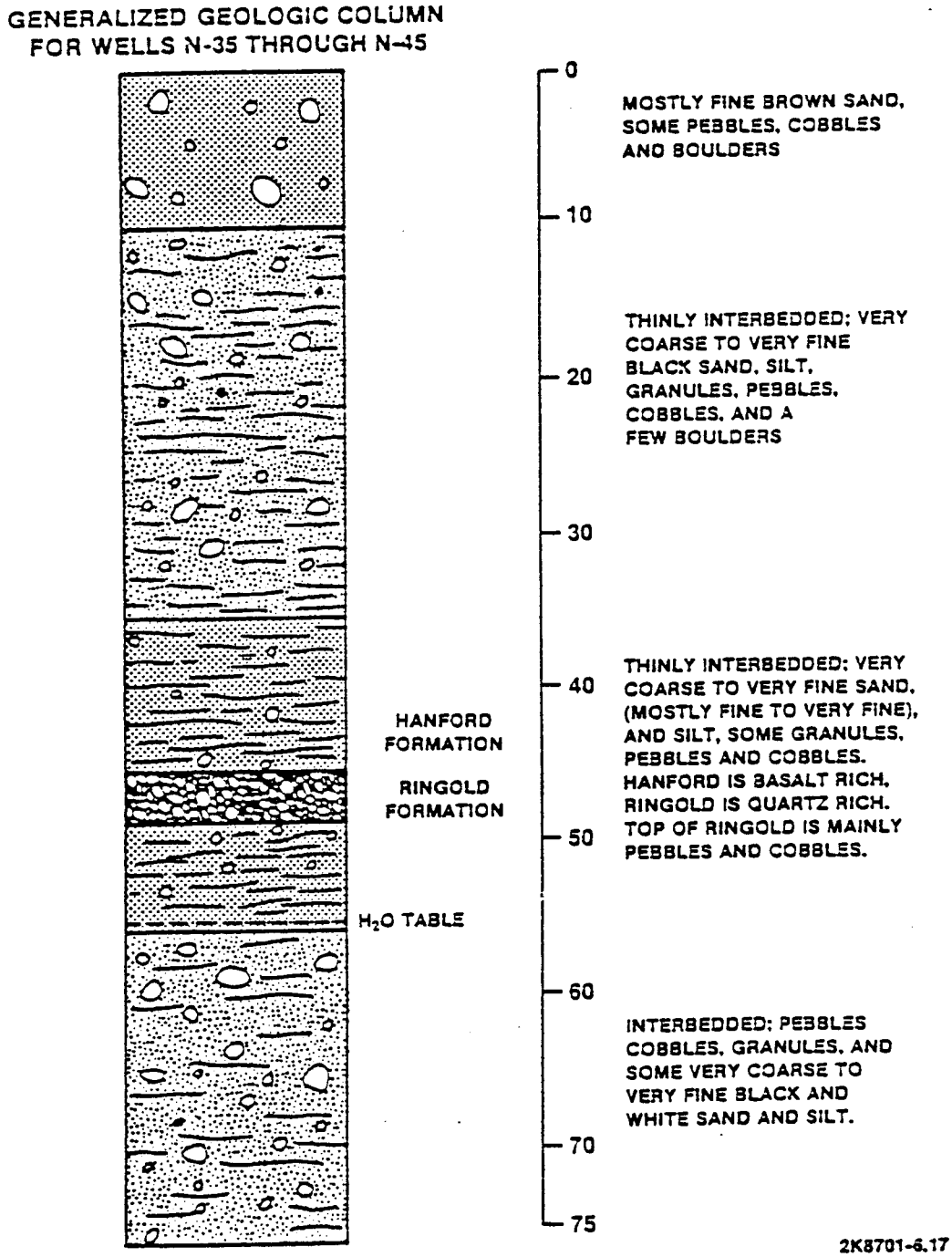


Figure 6. Generalized Geologic Column of the 100-N Area

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Pacific Northwest Laboratories

AS-BUILT DIAGRAM

Well Number 199-N-61 Geologist Karen R. Oster Page 1 of 1

Reviewed by [signature] Date 11/30/87

Construction Data: Description	Construction Data: Diagram	Depth in Feet	Geologic/Hydrologic Data: Diagram Litho.	Geologic/Hydrologic Data: Lithologic Description	Drill Rate
~20' of 12" Carbon Steel		5		SILTY SANDY GRAVEL	—
Surface Pipe (Removed)		10			—
70' of 10" Carbon Steel		15			—
Casing (Removed)		20		SANDY GRAVEL	2.6'/hr
53' of 6" Stainless Steel		25		SILTY SANDY GRAVEL	2.5'/h
(304) Casing		30			3.4'/hr
Factory Welded Centralizers		35			5.5'/h
		40			4.2'/hr
		45		SANDY GRAVEL	3.6'/hr
		50		Static H_2O Level @ 55.1' b.l.s. 10/2/87	4.3'/hr
15' of 6" Stainless Steel		55		SILTY SANDY GRAVEL	3.1'/h
(304) 20 slot Screen		60		Ringold Contact @ 59' b.l.s.	3.75'/h
		65		(FINE) SAND	3.7'/hr
Completion Depth = 66.6' b.l.s.		70		Drilled Depth = 67.5' b.l.s.	

Completion Symbols
- + Concrete Seal
- / Granular Bentonite Seal
- X Bentonite Pellet Seal
- • Artificial Sand Pack
- Natural Gravel Pack

Lithologic Symbols
- ~ Clay
- — Silt
- • Sand
- O Gravel
- O Gravel with Weathering Rinds
- □ Caliche

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Figure 7. As-Built Diagram 199-N-61 Groundwater Monitoring Well

- Survey in the sample locations.
- Survey in the trench location.

PHASE III: ADDITIONAL SAMPLING

If no hazardous materials are found in levels of concern as a result of Phase II sampling or if the site is determined to have been adequately characterized by Phase I and II efforts, then no further soil and sediment characterization is anticipated. However, there are several situations that would require additional sampling. These include the following:

- Highly variable sample results, requiring additional sample points to establish acceptable statistical confidence
- Unanticipated results, requiring additional sampling to provide an explanation.

Phase III and any subsequent soil/sediment sampling will be planned in response to specific situations or to answer specific questions. Because of the specific nature of this sampling, specifying plans prior to analysis of data resulting from earlier sampling efforts is impossible. An addendum to this sampling plan will be prepared for Phase III sampling.

ANALYTICAL CONSTITUENTS

The constsituents of the effluent streams have been evaluated for potential concern according to the following criteria:

- Were present in the effluent streams (Tables 2, 3, 4 and Appendix A) at greater than detection levels
- Were listed under WAC 173-303-081, "Discarded Chemical Products" or WAC 173-303-082, "Dangerous Waste Sources"
- Were listed under WAC 173-303-090, "Dangerous Waste Characteristics"
- Were listed under WAC 173-303-084, "Dangerous Waste Mixtures" or WAC 173-303-101 through 103, "Toxic Dangerous Wastes," "Persistent Dangerous Wastes," and "Carcinogenic Dangerous Wastes"
- Were listed under 40 CFR 265.92(b)(2) and (3) Subpart F, "Groundwater Quality and Groundwater Contaminants"
- Were listed under 40 CFR 265, Appendix III, "Drinking Water Quality."

The constituents for which tests will be made during Phase II are listed in column 7 of Table 5, along with the guidance used to include them in the table. Some laboratory test procedures treat constituents as a group and may provide (at no additional cost) analytical results for a larger list of constituents than identified in Table 5. These results shall be included in the analyses report.

REPORTING

All data collected will be analyzed and tabulated for evaluation using the methods described in SW-846 and other guidance documents (Barth and Mason 1984; EPA 1986). Actual values received from the laboratory will be presented in an appendix to the site closure plan.

Within 20 d after the last sample values have been received from the analytical laboratory, they will be issued by means of an Engineering Data Transmittal.

Within 180 d after the last sample values have been received from the analytical laboratory, an interim report will be issued covering findings to date. The interim report will provide soil characterization data needed to prepare the closure plan. This will include actual sample locations, numbers of samples, and specific methods used for collection. Data received from the laboratory will be reviewed, analyzed, and summarized statistically. A discussion of the laboratory quality assurance activities will be included.

SAMPLING EQUIPMENT AND PROCEDURES

GENERAL PROTOCOL FOR FIELD ACTIVITY

The following procedures will apply each time personnel make a site entry:

- One of the persons entering the site will be designated to be in charge.
- No personnel will be at the site without a designated "Buddy."
- Personal Protective Equipment will be worn as specified. Approved deviations will be entered in the field logbook and signed by the Field Team Leader (Cognizant Engineer) and the Site Safety Officer.
- Field work will be planned prior to site entry.

Table 5. Table of Analytical Constituents

CONSTITUENTS	1	2	3	4	5	6	7
aluminum	X						*
ammonium	X			X			X
barium	X		X	X	X	X	X
cadmium	X		X	X	X	X	X
calcium	X						*
chloride	X			X		X	X
chromium	X		X	X	X	X	X
copper	X						*
cyanide	X	X		X	X		X
fluoride	X			X		X	X
gamma scan							X
gross alpha						X	X
iron	X			X		X	X
magnesium	X						*
manganese	X			X		X	X
mercury	X	X	X	X	X	X	X
morpholine	X			X			X
nitrate	X			X		X	X
pH	X		X			X	X
potassium	X						*
selenium	X		X	X	X	X	X
semivolatile organics		X		X	X		X
sodium	X			X		X	X
strontium	X						*
sulfate	X			X		X	X
total organic carbons	X	X		X	X	X	X
total organic halides	X	X		X	X	X	X
vanadium	X						*
volatile organic analysis	X	X		X	X		X
zinc	X						*

Column 1: Present at greater than detection levels in Tables 2, 3, 4, and Appendix A.

Column 2: Listed under WAC 173-303-081 or 082. (WAC 173-303-9903, 9904).

Column 3: Designated by the characteristics of WAC 173-303-090.

Column 4: Designated by WAC 173-303-084 or -101 through -103.

Column 5: Designated by WAC 173-303-140 (WAC 173-303-9905).

Column 6: Designated by 40 CFR 265.92(b)(2) Subpart F, 40 CFR 265, Appendix III or 40 CFR 265.92 (b)(3) Subpart F.

Column 7: Analytes to be tested for.

* These constituents are listed because they are analyzed for during the testing for other metals using EPA testing method SW-846, No. 1310 (EPA 1986).

- Equipment needed for work will be inventoried and inspected prior to site visit to assure that all is present and in operable condition.
- Special attention shall be paid to the potential corrosive characteristics of the soil and liquids that are present at the site.
- Prior to sampling, the lab will be contacted and its capacity for analysis will be confirmed. This will avoid samples being stored for long periods at the lab.
- Samples will not be taken unless they can be transported to the testing lab within 24 hours for analysis initiated within an appropriate time interval.

CARE OF SAMPLES

Sample Containers

Containers for hazardous waste samples shall be chosen based on their compatibility with the waste, their resistance to leaking or breakage, their ability to seal tightly, and the required volume for an optimum sample in accordance with EII 5.2, Revision 0 (WHC 1988). Sampling equipment that may come in contact with samples will be made of stainless steel where practical. However, other appropriate materials may be used. Containers for collecting and storing hazardous waste samples are generally made of either high-density plastic or borosilicate glass. The containers shall have tight, screw-type lids with teflon or plastic liners for glass bottles. The 300 series I chem containers were selected for this sampling activity.

Storage of Samples

Once a sample has been collected, various steps may be required to preserve the chemical and physical integrity of the sample. The method of sample preservation may vary according to sample type and parameter to be analyzed. Preservation and storage requirements should be in accordance with EII 5.2, Revision 0 (WHC 1988).

Samples collected from radiation zones are required to be checked by a Radiation Protection Technologist (RPT) and labeled according to the Radiation Work Permit (RWP) for the site.

Contamination Prevention

Prior to sampling each day, and between each sample if necessary, reused equipment that contacts the sample will be decontaminated. Cross contamination will be prevented by the use of disposable sampling sleeves or by using cleaned equipment whenever possible.

Sampling Equipment

Sample collection may be accomplished by any of four techniques, depending upon soil conditions. The choice of equipment will depend upon the presence of boulders or cobble in the soil and upon soil moisture. The following equipment will be used in sequence as needed: (1) thief, (2) trier, (3) auger, and (4) scoop and shovel.

A description of this equipment and procedures for use is provided in EII 5.2, Revision 0 (WHC 1988).

A list of the site equipment is included as part of the Site Health and Safety Plan (Appendix D).

DECONTAMINATION

Personnel Decontamination Procedures

A decontamination area will be established near the control station and upwind of sampling activity whenever possible. "Level D" personnel decontamination has three stations. At Station 1, personnel deposit equipment used onsite (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the top reduces the probability of cross-contamination. At Station 2, personnel remove outer boots and gloves and deposit them in a container with a plastic liner. At Station 3, personnel remove boots, chemical-resistant splash suit, and inner gloves and deposit them in separate containers lined with plastic.

Equipment Decontamination

Extreme care is necessary in field sampling to ensure no cross-contamination of samples by sampling equipment. To prevent this source of contamination, freshly cleaned or disposable sampling tools will be used. When equipment must be reused in the field, it will be cleaned as thoroughly as practical. For this purpose, stringent laboratory cleaning procedures have been modified for field conditions. Equipment decontamination procedures will comply with the EII 5.2, Revision 0 (WHC 1988). A field decontamination station will be established in the field after evaluating site and weather conditions.

Sampling Container Decontamination Procedures

After analysis, sample containers will be disposed of. Containers are purchased precleaned from the factory and kept under strict chain-of-custody to preserve the integrity of the samples from collection through disposal.

Disposal Procedures, Onsite

Excess sample material may be replaced in approximate site of origin. Wash water will be tested with pH paper, and if within acceptable limits, (pH 4.0 to 11.0) will be disposed of at the site. Nothing else transported to the site will be disposed of on site.

Disposal Procedures, Offsite

All nonradioactive hazardous waste disposal will be in accordance with EII 4.1, Revision 0 (WHC 1988). Articles such as protective clothing that have been soiled with potentially contaminated materials will be temporarily placed in plastic-lined containers. These containers will be stored in a designated area at the hazardous waste site until the media (soil, sludge) is tested for hazardous wastes. If the contaminants are found to be hazardous, arrangements will be made for proper disposal offsite. If they are discovered to be nonhazardous, materials will be laundered or disposed according to onsite procedures.

Containers for temporary storage will be properly marked as hazardous waste. Three containers will be used and labeled as: Reusable Clothing (for laundy), Disposable Articles, or Contaminated Equipment.

FIELD AND SAMPLE-HANDLING QUALITY ASSURANCE/QUALITY CONTROL

A vital part of any sampling and analysis plan for characterization requires the assurance that all the information and data associated with each sample are accurate and verifiable. The types of records and documentation required to provide traceability for all samples are summarized below.

SAMPLE PLAN MODIFICATIONS

Under field conditions, the optimal aspects of preliminary sample design are often not achievable. Factors influencing these efforts can be equipment malfunction or breakdown, weather conditions, improper equipment, soil conditions, physical barriers to coring equipment, and overly optimistic evaluation of capabilities at sites with no previous history of hazardous waste characterization. Due to unforseen field conditions, modifications to the planned activity may be necessary as decided by the Field Team Leader (Cognizant Engineer). When conditions are encountered that require modifications in the field, it will be done in accordance with EII 5.2, Revision 0 and EII 1.4 (WHC 1988).

FIELD LOGBOOK

The Field Team Leader (Cognizant Engineer) will maintain an official logbook during the characterization effort in accordance with EII 1.5, Revision 0 (WHC 1988). The book should be bound, preferably with consecutively numbered pages. All information pertinent to the sampling must be recorded in the logbook in a legible fashion, with indelible ink. All prefield activities, such as equipment checkout, calibration, and container storage and preparation shall be documented in the Field Logbook.

Each day's activities or separate sampling episodes must be signed by the Field Team Leader (Cognizant Engineer). The Project Team Leader (Cognizant Manager) will review and sign the Field Logbook routinely, and will sign each day (or as soon as possible) when major deviations from the approved characterization plan occur. The logbook should be protected, kept in a safe file or other repository, and kept as a permanent record. The following are types of information that must be included:

- Site map, sketch, drawing, or other definitive site description
- Locations of all sampling points, including reference points and scale
- Sample method, equipment and containers used
- Date and time of collection
- Collector's name
- Number, type, volume of samples taken
- Identification number for each sample
- Field observation (weather conditions--temperature, wind, humidity, etc.)
- General geotechnical and physical description (wetness, appearance, etc.) of samples
- Laboratory of destination
- Field measurements (if any)
- Signature of recording personnel.

Additional items that may be included as warranted are as follows:

- Name and address of field contact
- Producer of waste
- Type of process

- Type of waste
- Type/purpose of sampling
- Suspected waste concentrations
- Sample distribution and transportation method
- Photographs of site for field conditions and site location verification
- Other pertinent information.

SAMPLE BLANKS AND DUPLICATE SAMPLES

Sample blanks will be used in accordance with the latest version of SW-846 (EPA 1986). One equipment blank and field blank shall be analyzed with every 20 samples, for each sampling activity (i.e., background, 1324-N, 1324-NA, and south pond). One trip blank shall be analyzed for each 20 trips for each samping activity.

Equipment Blank--Usually an organic or aqueous solution of known composition that is as free of analyte as possible and is transported to the site, opened in the field, and poured over or through the sample collection device, collected in a sample container, and returned to the laboratory. This serves as a check on sampling device cleanliness.

Field Blank--Usually an organic or aqueous solution of known composition that is as free of analyte as possible and is transferred from one vessel to another at the sampling site and preserved with the appropriate reagents. This serves as a check on reagent and environmental contamination.

Trip Blank--Usually an organic or aqueous solution of known composition that is as free of analyte as possible and is transported to the sampling site and returned to the laboratory without being opened. This serves as a check on sample contamination originating from sample transport, shipping, and from the site conditions.

Duplicate Samples--A minimum of one duplicate sample shall be collected for each sampling activity. Additional duplicate samples (for statistical analysis) are specified in the workplan section.

SAMPLE LABELS

Labels shall be attached to each sample to prevent misidentification. They may be stick-on paper labels or tags and should be affixed to the proper sample containers prior to, or at the time of, collection. All

information should be filled out at the time of collection. Indelible ink should be used. Samples may be double-bagged with the label in the outer bag. Each label should contain at least the following information:

- Site contractor (Field Team Leader's Name)
- Date and time collected
- Sample and logbook number

An example is provided in Figure 8.

SAMPLE SEALS

Sample seals should be used to prevent or detect preanalyses sample tampering. They should be applied to the sample containers before leaving the sample location, and in a manner that requires breaking of the seal in order to open the container.

CHAIN-OF-CUSTODY RECORD

To ensure the integrity of the samples from collection through analyses and to final disposition, documentation EII 5.1, Revision 0 (WHC 1988) is necessary to trace possession and handling. This documentation generally takes the form of a record providing a history of persons having custody of the sample. Custody includes situations where the sample is:

- In person's physical possession
- In view of person
- Secured by individual so tampering is impossible
- Placed in an area restricted to authorized personnel only.

SAMPLE ANALYSIS REQUEST

The sample analysis request form (EII 5.1, Revision 1, WHC 1988) accompanies the samples to the laboratory and designates the analyses to be performed on each sample. It also provides a check to ensure that all samples have been received and that correlation between sample analysis and sample numbers is finalized and complete. A reminder will be provided with sample analysis requests to assure that the analytical laboratory recognizes critical holding time deadlines.

WESTINGHOUSE HANFORD COMPANY
Process Chem. & Engr. Lab.
MO-037/200-W, Richland, WA 99352

Person Collecting Sample:_____

Sample No.:_____

Date Collected:_____ Time:_____

Place Collected:_____

_____

Figure 8. Example of General Sample Label

SAMPLING ASSURANCE FORM

The Cognizant Engineer will be responsible for assuring that samples are taken in the proper location, that sample containers are properly labeled, and that samples are properly cared for. One person will be identified by the team leader to assure proper sampling procedure and to safeguard against sampling error. This person will confirm proper sampling procedure and certify by initialing the Checklist shown in Figure 9.

SAMPLE DISPOSAL

After all analyses have been completed as requested, reports shall be reviewed for anomalous data. Requests for reanalysis or data checks should be made as soon as possible. At the certified completion of all analyses, the samples shall be disposed of or archived in accordance with existing procedures. In no case shall the samples be held longer than 3 yr, unless specifically designated.

LABORATORY PROCEDURES/INFORMATION

ANALYTICAL PROCEDURES/QUALITY ASSURANCE

All laboratory work aspects are to be covered by procedures and by quality assurance and quality control manuals. Table 6 summarizes the list of constituents for analysis and identifies the associated analytical method. The latest available SW-846 methods will be used; however, where SW-846 does not provide sufficient information to analyze for a particular constituent, another standard method will be used (EPA 1986).

LABORATORY RECEIPTS AND SAMPLE LOGGING

In the laboratory, a sample custodian will be assigned to receive the samples. Upon receipt of a sample, the custodian will inspect the condition of the sample and the sample seal; reconcile the information on the sample label against that on the chain-of-custody record; assign a laboratory number; log in the sample in the laboratory logbook; store the sample in a secured sample storage room or cabinet, under appropriate environmental conditions; and report missing or damaged samples immediately.

PERSONNEL TRAINING

The primary concern of Westinghouse Hanford Company and field personnel during sampling activity is the health and safety of sampling personnel. One mechanism to ensure this is to prevent access to a hazardous waste site

SAMPLING ASSURANCE CHECKLIST

Sample Number	#_____	#_____	#_____	#_____
Sample number correct in logbook	_____	_____	_____	_____
Sample location correct in logbook	_____	_____	_____	_____
Tools properly cleaned before use	_____	_____	_____	_____
Sample containers properly sealed and labeled	_____	_____	_____	_____
Chain-of-Custody form filled out	_____	_____	_____	_____
Request for Analysis form filled out	_____	_____	_____	_____
Sample placed immediately in cooler with ice	_____	_____	_____	_____

_____ _____
Signature Date

Figure 9. Sampling Assurance Checklist

Table 6. U.S. Environmental Protection Agency Testing Methods

Analysis	Analytes Determined	Environmental Protection Agency Method Number[a]
gross alpha	alpha emitters (TRU)	EPA 680/4-75-001
metals	b	SW-846, No. 1310
mercury	mercury	SW-846, No. 7470
ammonium	NH_4^+	ASTM D1426
anions	Cl^-, F^-, NO_X^-, SO_4^{--}, PO_4^{---}	ion chromatography
TOC	total organic carbon	SW-846, No. 9060
TOH	total organic halides	SW-846, No. 9020
volatile organics	(53 organics)	SW-846, No. 8240
semivolatile organics		SW-846, No. 8270
morpholine	morpholine	
cyanide	CN^-	SW-846, No. 9010
pH		SW-846, No. 9045

[a] When EPA methods are not available, techniques from Standard Methods (16th edition) will be used whenever possible.

[b] Aluminum, silver, barium, beryllium, calcium, cadmium, chromium, copper, iron, potassium, magnesium, manganese, sodium, nickel, lead, antimony, tin, strontium, vanadium, and zinc.

by unessential or unqualified individuals. Formal training requirements are established in EII 1.7, Revision 0 (WHC 1988). Additional requirements include:

- Annual physical
- Three days on-the-job training under the supervision of an experienced person before full responsibilities may be assumed
- First aid training desirable but not mandatory for work on the Hanford Site
- All personnel collecting and handling samples on the hazardous waste site must have read the site characterization plan (this document) and submit documentation to the Cognizant Manager certifying understanding.

Training requirements are documented on the Personal Safety Data Sheet, found at the back of the Health and Safety Plan (Appendix D).

REFERENCES

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EPA 1986, Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, 3rd Ed. SW-846, U.S. Environmental Protection Agency, Washington, D.C.

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Resource Conservation and Recovery Act of 1976, Public Law 94-580, 90 Stat. 2795, 42 USC 6901 et seq.

WHC, Environmental Investigations and Site Characterization Manual, WHC-CM-7-7, Volume 1, Westinghouse Hanford Company, Richland, Washington, 1988.

APPENDIX A

During 1988, the liquid effluent to the 1324-NA Percolation Pond was tested on a quarterly basis. These results are summarized in Table A-1, Table A-2, and Table A-3. Table A-1 reports those constituents which exceeded the Minimum Detection Limits in at least one of the analyses for the effluent from the 1324-N Surface Impoundment to the 1324-NA Percolation Pond. Table A-2 reports similar information for the effluent of 163-N Process and Cooling Water to the 1324-NA Percolation Pond. Table A-3 is a complete listing of the September 1988 analysis of the 163-N effluent, showing the total list of constituents for which tests were performed.

The engineering information in this appendix was provided by Defense Waste Engineering.

Constituent	Units	Result Feb. 1988	Result MAR. 1988	Result June 1988	Result Sept. 1988
Aluminum	p/m	0.180	LD	LD	0.400
Ammonium	p/m	LD	LD	0.084	0.084
Barium	p/m	0.062	0.036	0.055	0.097
Calcium	p/m	50.000	18.000	33.000	240.000
Chloride	p/m	22.000	1.900	4.000	14.000
Chloroform	p/m	LD	LD	0.012	LD
Copper	p/m	0.010	LD	LD	0.024
Fluoride	p/m	4.700			2.000
Fluoride	p/m	2.500	0.180	0.350	1.100
Iron	p/m	0.270	0.039	0.057	0.290
Magnesium	p/m	12.000	3.900	7.500	53.000
Manganese	p/m	0.014	LD	0.014	0.036
Mercury	p/m	LD	LD	LD	0.0001
Morpholine	p/m	LD	LD	0.02	LD
Nitrate	p/m	5.200	0.650	LD	1.100
Potassium	p/m	2.400	0.600	1.200	7.100
Sodium	p/m	1200.000	74.000	65.000	640.000
Strontium	p/m	0.240	0.085	0.130	1.000
Sulfate	p/m	2400.000	160.000	150.000	2000.000
Total Organic Carbon	p/m	5.800	LD	2.100	3.200
Total Organic Halide	p/m	0.090	0.032	0.087	0.100
Vanadium	p/m	LD	LD	LD	0.007
Zinc	p/m	0.044	0.013	0.042	0.130

Table A-1 Analysis of Effluent From 1324-N to 1324-NA

Constituent	Units	Result Mar. 1988	Result Mar. 1988	Result May 1988	Result Sept. 1988
Acetone	p/m	LD	LD	LD	0.05
Ammonium	p/m	LD	LD	0.058	LD
Barium	p/m	0.029	0.021	0.034	LD
Calcium	p/m	21.000	17.000	18.000	1.000
Chloride	p/m	1.200	1.200	2.200	LD
Chloroform	p/m	0.009	0.007	0.020	0.021
Fluoride	p/m	0.100	0.160	0.150	0.043
Magnesium	p/m	5.000	4.100	4.400	0.230
Manganese	p/m	LD	LD	0.005	LD
Morpholine	p/m	LD	LD	0.019	LD
Potassium	p/m	0.730	0.550	0.690	LD
Sodium	p/m	2.100	1.600	2.300	2.300
Strontium	p/m	0.100	0.088	0.079	LD
Sulfate	p/m	19.000	17.000	23.000	6.200
Total Organic Carbon	p/m	1.300	LD	1.600	LD
Total Organic Halide	p/m	0.450	0.076	LD	0.050
Zinc	p/m	0.010	0.009	0.011	0.006

Table A-2 Analysis of Effluent from 163 Process and Cooling Water to 132

Meaningful Results

Constituent	Result	Sample Size	Dil Num	Extract Date	Analysis Date
Acetone	5.00E+01	5.00	0		9/22/88
Calcium	1.00E+03	100.00	0	9/27/88	10/03/88
Chloroform	2.10E+01	5.00	0		9/22/88
Fluoride	4.30E+01	50.00	0		10/07/88
Iron	4.00E+01	100.00	0	9/27/88	10/03/88
Magnesium	2.30E+02	100.00	0	9/27/88	10/03/88
Sodium	2.30E+03	100.00	0	9/27/88	10/03/88
Sulfate	6.20E+03	0.05	0		9/21/88
Total Organic Halide (ppb)	5.00E+01	100.00	0		11/27/88
Zinc	6.00E+00	100.00	0	9/27/88	10/03/88

Sample Number 50458 taken 9/21/88 9:59 from 163N, Type "1", Group 103:

Minimum Detectable Amounts

Constituent	MDA	Sample Size	Dil Num	Extract Date	Analysis Date
Acetonitrile	<3.00E+03	5.00	0		9/22/88
Acetophenone	<1.00E+01	1000.00	0	9/23/88	10/17/88
2-Acetylaminofluorene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Acrolein	<1.00E+01	5.00	0		9/22/88
Acrylamine	<1.00E+04	0.00	0		10/14/88
Acrylonitrile	<1.00E+01	5.00	0		9/22/88
Allyl alcohol	<2.50E+03	0.00	0		10/14/88
Aluminum	<1.50E+02	100.00	0	9/27/88	10/03/88
4-Aminobiphenyl	<1.00E+01	1000.00	0	9/23/88	10/17/88
5-(Aminoethyl)-3-isoxazolol	<1.00E+01	1000.00	0	9/23/88	10/17/88
Amitrole	<1.00E+01	1000.00	0	9/23/88	10/17/88
Ammonium	<5.00E+01	100.00	0		9/21/88
Aniline	<1.00E+01	1000.00	0	9/23/88	10/17/88
Antimony	<1.00E+02	100.00	0	9/27/88	10/03/88
Aramite	<1.00E+01	1000.00	0	9/23/88	10/17/88
Auramine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Barium	<6.00E+00	100.00	0	9/27/88	10/03/88
Benzene	<5.00E+00	5.00	0		9/22/88
Thiophenol	<1.00E+01	1000.00	0	9/23/88	10/17/88
Benzidine	<1.00E+01	1000.00	0	9/23/88	10/17/88
p-Benzoquinone	<1.00E+01	1000.00	0	9/23/88	10/17/88
Benzo[a]pyrene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Benzo[b]fluoranthene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Benzo[j]fluoranthene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Benzyl chloride	<1.00E+01	1000.00	0	9/23/88	10/17/88

Table A-3 Typical Liquid Effluent Analysis Report

Constituent	MDA	Sample Size	Dil Num	Extract Date	Analysis Date
Benz[c]acridine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Benz[a]anthracene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Beryllium	<5.00E+00	100.00	0	9/27/88	10/03/88
Bis(2-chloroethoxy) ether	<1.00E+01	1000.00	0	9/23/88	10/17/88
Bis(2-chloroethoxy)methane	<1.00E+01	1000.00	0	9/23/88	10/17/88
Bis(2-chloroisopropyl) ether	<1.00E+01	1000.00	0	9/23/88	10/17/88
Bis(chloromethyl) ether	<1.00E+01	5.00	0		9/22/88
Bis(2-ethylhexyl) phthalate	<1.00E+01	1000.00	0	9/23/88	10/17/88
Acetonyl bromide	<1.00E+01	5.00	0		9/22/88
Bromoform	<1.00E+01	5.00	0		9/22/88
4-Bromophenyl phenyl ether	<1.00E+01	1000.00	0	9/23/88	10/17/88
Butylbenzyl phthalate	<1.00E+01	1000.00	0	9/23/88	10/17/88
2-(1-Methylpropyl)-4,6-dinitro	<1.00E+01	1000.00	0	9/23/88	10/17/88
Cadmium	<2.00E+00	100.00	0	9/27/88	10/03/88
Carbon disulfide	<1.00E+01	5.00	0		9/22/88
Carbon tetrachloride	<5.00E+00	5.00	0		9/22/88
Chloride	<5.00E+02	0.05	0		9/21/88
Chloronaphazine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Chloroacetaldehyde	<1.60E+04	0.00	0		10/14/88
Chloroalkyl ethers	<1.00E+01	1000.00	0	9/23/88	10/17/88
p-Chloroaniline	<1.00E+01	1000.00	0	9/23/88	10/17/88
Phenyl chloride	<1.00E+01	5.00	0		9/22/88
p-Chloro-m-cresol	<1.00E+01	1000.00	0	9/23/88	10/17/88
1-Chloro-2,3-epoxypropane	<1.00E+01	1000.00	0	9/23/88	10/17/88
2-Chloroethylvinyl ether	<1.00E+01	5.00	0		9/22/88
Chloromethyl methyl ether	<1.00E+01	5.00	0		9/22/88
2-Chloronapthalene	<1.00E+01	1000.00	0	9/23/88	10/17/88
2-Chlorophenol	<1.00E+01	1000.00	0	9/23/88	10/17/88
3-Chloropropionitrile	<4.00E+03	0.00	0		10/14/88
Chromium	<1.00E+01	100.00	0	9/27/88	10/03/88
Chrysene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Copper	<1.00E+01	100.00	0	9/27/88	10/03/88
Cresol	<1.00E+01	1000.00	0	9/23/88	10/17/88
Crotonaldehyde	<1.00E+01	5.00	0		9/22/88
Cyanide	<1.00E+01	500.00	0	9/28/88	10/13/88
2-Cyclohexyl-4,6-dinitrophenol	<1.00E+01	1000.00	0	9/23/88	10/17/88
Dibenz[a,h]acridine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Dibenz[a,j]acridine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Dibenz[a,h]anthracene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Dibenzo[a,h]pyrene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Dibenzo[a,e]pyrene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Benzo[rst]pentaphene	<1.00E+01	1000.00	0	9/23/88	10/17/88
7H-Dibenzo[c,g]carbazole	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,2-Dibromoethane	<1.00E+01	5.00	0		9/22/88
Dibromomethane	<1.00E+01	5.00	0		9/22/88

Table A-3 Typical Liquid Effluent Analysis Report (continued)

Constituent	MDA	Sample Size	Dil Num	Extract Date	Analysis Date
1,2-Dibromo-3-chloropropane	<1.00E+01	5.00	0		9/22/88
Di-n-butyl phthalate	<1.00E+01	1000.00	0	9/23/88	10/17/88
p-Dichlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
m-Dichlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
o-Dichlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
3,3'-Dichlorobenzidine	<2.00E+01	1000.00	0	9/23/88	10/17/88
Dichlorodifluoromethane	<1.00E+01	5.00	0		9/22/88
1,1-Dichloroethane	<1.00E+01	5.00	0		9/22/88
1,2-Dichloroethane	<1.00E+01	5.00	0		9/22/88
1,2-Dichloroethylene	<1.00E+01	5.00	0		9/22/88
Vinylidene dichloride	<1.00E+01	5.00	0		9/22/88
Dichloromethylbenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
2,6-Dichlorophenol	<1.00E+01	1000.00	0	9/23/88	10/17/88
2,4-DCP	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,2-Dichloropropane	<1.00E+01	5.00	0		9/22/88
1,3-Dichloropropane	<1.00E+01	5.00	0		9/22/88
1,4-Dichloro-2-butene	<1.00E+01	5.00	0		9/22/88
Diethyl phthalate	<1.00E+01	1000.00	0	9/23/88	10/17/88
Diethylarsine	<1.00E+01	5.00	0		9/22/88
Sym-Diethylhydrazine	<1.00E+01	5.00	0		9/22/88
Dihydrosafrole	<1.00E+01	1000.00	0	9/23/88	10/17/88
3,3'-Dimethoxybenzidine	<1.00E+01	1000.00	0	9/23/88	10/17/88
p-Dimethylaminoazobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,12-Dimethylbenz[a]anthracene	<1.00E+01	1000.00	0	9/23/88	10/17/88
3,3'-Dimethylbenzidine	<1.00E+01	1000.00	0	9/23/88	10/17/88
2-Phenyl-tert-butylamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
2,4-Dimethylphenol	<1.00E+01	1000.00	0	9/23/88	10/17/88
Dimethyl phthalate	<1.00E+01	1000.00	0	9/23/88	10/17/88
Dinitrobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
4,6-Dinitro-o-cresol and salts	<1.00E+01	1000.00	0	9/23/88	10/17/88
2,4-Dinitrophenol	<5.00E+01	1000.00	0	9/23/88	10/17/88
2,6-Dinitrotoluene	<1.00E+01	1000.00	0	9/23/88	10/17/88
2,4-Dinitrotoluene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Di-n-octyl phthalate	<1.00E+01	1000.00	0	9/23/88	10/17/88
p-Dioxane	<5.00E+02	5.00	0		9/22/88
Diphenylamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Sym-Diphenylhydrazine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Di-n-propylnitorsamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Urethane	<5.00E+03	0.00	0		10/14/88
Ethyl cyanide	<2.00E+03	0.00	0		10/14/88
Ethyl methacrylate	<1.00E+01	5.00	0		9/22/88
Ethyl methanesulfonate	<1.00E+01	1000.00	0	9/23/88	10/17/88
ETO	<3.00E+03	5.00	0		9/22/88
Aminoethylene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Fluoranthene	<1.00E+01	1000.00	0	9/23/88	10/17/88

Table A-3 Typical Liquid Effluent Analysis Report (continued)

Constituent	MDA	Sample Size	Dil Num	Extract Date	Analysis Date
Fluoride	<5.00E+02	0.05	0		9/21/88
Formaldehyde	<5.00E+02	5.00	0		9/22/88
Perchlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Perchlorobutadiene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Hexachlorocyclopentadiene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Hexachloroethane	<1.00E+01	1000.00	0	9/23/88	10/17/88
Hexachlorophene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Hexachloropropene	<1.00E+01	1000.00	0	9/23/88	10/17/88
MIBK, (Hexone)	<1.00E+01	5.00	0		9/22/88
Hydrazine	<3.00E+03	0.00	0		10/14/88
Hydrogen sulfide	<1.00E+01	5.00	0		9/22/88
Indeno(1,2,3-cd)pyrene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Iodomethane	<1.00E+01	5.00	0		9/22/88
Isosafrole	<1.00E+01	1000.00	0	9/23/88	10/17/88
Isobutyl alcohol	<1.00E+03	0.00	0		10/14/88
Kerosene	<1.00E+04	1000.00	0	9/23/88	10/17/88
Lead	<5.00E+00	100.00	0		10/05/88
Maleic hydrazide	<5.00E+02	1000.00	0	9/23/88	10/17/88
Malononitrile	<1.00E+01	1000.00	0	9/23/88	10/17/88
Manganese	<5.00E+00	100.00	0	9/27/88	10/03/88
Melphalan	<1.00E+01	1000.00	0	9/23/88	10/17/88
Mercury	<1.00E-01	100.00	0		10/11/88
Methacrylonitrile	<1.00E+01	5.00	0		9/22/88
Methyl mercaptan	<1.00E+01	5.00	0		9/22/88
Methapyrilene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Metholonyl	<1.00E+01	1000.00	0	9/23/88	10/17/88
2-Methylaziridine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Methyl bromide	<1.00E+01	5.00	0		9/22/88
3-Methylcholanthrene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Methyl chloride	<1.00E+01	5.00	0		9/22/88
Methylene chloride	<1.00E+01	5.00	0		9/22/88
4,4'-Methylenebis-2-chloroanil	<1.00E+01	1000.00	0	9/23/88	10/17/88
Methyl ethyl ketone	<1.00E+01	5.00	0		9/22/88
Methyl methacrylate	<1.00E+01	5.00	0		9/22/88
Methyl methanesulfonate	<1.00E+01	1000.00	0	9/23/88	10/17/88
2-Methyllactonitrile	<1.00E+01	1000.00	0	9/23/88	10/17/88
Aldicarb	<1.00E+01	1000.00	0	9/23/88	10/17/88
Methylthiouracil	<1.00E+01	1000.00	0	9/23/88	10/17/88
1-Naphthalamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Naphthalene	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,4-Naphthalenedione	<1.00E+01	1000.00	0	9/23/88	10/17/88
2-Aminonapthalene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Nickel	<1.00E+01	100.00	0	9/27/88	10/03/88
Nicotinic acid	<1.00E+02	1000.00	0	9/23/88	10/17/88
Nitrate	<5.00E+02	0.05	0		9/21/88

Table A-3 Typical Liquid Effluent Analysis Report (continued)

Constituent	MDA	Sample Size	Dil Num	Extract Date	Analysis Date
p-Nitroaniline	<5.00E+01	1000.00	0	9/23/88	10/17/88
Nitrobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
4-Nitrophenol	<5.00E+01	1000.00	0	9/23/88	10/17/88
Di-n-butylnitrosamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
N-Nitrosodiethanolamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Diethylnitrosamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Dimethylnitrosamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
N-Nitrosomethylethylamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Methylnitrosourethane	<1.00E+01	1000.00	0	9/23/88	10/17/88
Methylnitrosovinylamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
N-Nitrosomorpholine	<1.00E+01	1000.00	0	9/23/88	10/17/88
N-Nitrosonornicotine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Nitrosopiperidine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Nitrosopyrrolidine	<1.00E+01	1000.00	0	9/23/88	10/17/88
5-Nitro-o-toluidine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Paraldehyde	<2.00E+03	0.00	0		10/14/88
Pentachlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Pentachloroethane	<1.00E+01	5.00	0		9/22/88
Pentachloronitrobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
Pentachlorophenol	<5.00E+01	1000.00	0	9/23/88	10/17/88
Phenacetin	<1.00E+01	1000.00	0	9/23/88	10/17/88
Phenol	<1.00E+01	1000.00	0	9/23/88	10/17/88
p-Phenylenediamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Phosphate	<1.00E+03	0.05	0		9/21/88
Phthalic acid esters	<1.00E+01	1000.00	0	9/23/88	10/17/88
2-Methylpyridine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Potassium	<1.00E+02	100.00	0	9/27/88	10/03/88
Pronamide	<1.00E+01	1000.00	0	9/23/88	10/17/88
1-Propanamine	<1.00E+04	0.00	0		10/14/88
Propargyl alcohol	<8.00E+03	0.00	0		10/14/88
Pyridine	<5.00E+02	5.00	0		9/22/88
Reserpine	<1.00E+01	1000.00	0	9/23/88	10/17/88
Resorcinol	<1.00E+01	1000.00	0	9/23/88	10/17/88
Safrol	<1.00E+01	1000.00	0	9/23/88	10/17/88
Silver	<1.00E+01	100.00	0	9/27/88	10/03/88
Strontium	<2.00E+01	100.00	0	9/27/88	10/03/88
Strychnine	<5.00E+01	1000.00	0	9/23/88	10/17/88
Sulfide	<1.00E+03	1000.00	0		9/23/88
1,2,3,5-Tetrachlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,2,4,5-Tetrachlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,2,3,4-Tetrachlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,1,2,2-Tetrachloroethane	<1.00E+01	5.00	0		9/22/88
1,1,1,2-Tetrachloroethane	<1.00E+01	5.00	0		9/22/88
Perchloroethylene	<5.00E+00	5.00	0		9/22/88
2,3,4,6-Tetrachlorophenol	<1.00E+01	1000.00	0	9/23/88	10/17/88

Table A-3 Typical Liquid Effluent Analysis Report (continued)

Constituent	MDA	Sample Size	Dil Num	Extract Date	Analysis Date
Thiofanox	<1.00E+01	1000.00	0	9/23/88	10/17/88
Thiuram	<1.00E+01	1000.00	0	9/23/88	10/17/88
Toluene	<5.00E+00	5.00	0		9/22/88
Toluenediamine	<1.00E+01	1000.00	0	9/23/88	10/17/88
o-Toluidine hydrochloride	<1.00E+01	1000.00	0	9/23/88	10/17/88
Total Organic Carbon (ppb)	<7.00E+02	1.00	0		10/14/88
Tributyl phosphate	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,2,3-Trichlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,2,4-Trichlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,3,5-Trichlorobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
1,1,2-Trichloroethane	<5.00E+00	5.00	0		9/22/88
1,1,1-Trichloroethane	<5.00E+00	5.00	0		9/22/88
Trichloroethene	<5.00E+00	5.00	0		9/22/88
Trichloropropane	<1.00E+01	5.00	0		9/22/88
Trichloromethanethiol	<1.00E+01	5.00	0		9/22/88
Trichloromonofluoromethane	<1.00E+01	5.00	0		9/22/88
2,4,6-Trichlorophenol	<1.00E+01	1000.00	0	9/23/88	10/17/88
2,4,5-Trichlorophenol	<5.00E+01	1000.00	0	9/23/88	10/17/88
1,2,3-Trichloropropane	<1.00E+01	5.00	0		9/22/88
o,o,o-Triethylphosphorothioate	<1.00E+01	1000.00	0	9/23/88	10/17/88
sym-Trinitrobenzene	<1.00E+01	1000.00	0	9/23/88	10/17/88
TRIS	<1.00E+01	1000.00	0	9/23/88	10/17/88
Vanadium	<5.00E+00	100.00	0	9/27/88	10/03/88
Vinyl chloride	<1.00E+01	5.00	0		9/22/88
Warfarin	<1.00E+01	1000.00	0	9/23/88	10/17/88
m-Xylene	<5.00E+00	5.00	0		9/22/88
o-p-Xylene	<5.00E+00	5.00	0		9/22/88

Table A-3 Typical Liquid Effluent Analysis Report (continued)

APPENDIX B

PROCEDURES FOR SOIL/SEDIMENT CHARACTERIZATION

DOE Order 5480.1A, "Environmental Protection, Safety and Health Protection Program for DOE Operations"

DOE-RL Order 5480.1, "Environmental Protection, Safety and Health Protection Program for Richland Operations"

DOE Order 5480.2, "Hazardous and Radioactive Mixed Waste Management"

DOE Order 5480.4, "Environmental Protection, Safety and Health Protection Standards"

DOE-RL Order 5480.4, "Environmental Protection, Safety and Health Protection Standards"

DOE-RL Order 5480.11, "Requirements for Radiation Protection"

DOE Order 5480.14, "Comprehensive Environmental Response, Compensation and Liability Act Program"

DOE Order 5484.1, "Environmental Protection, Safety and Health Protection Information Reporting Requirements"

DOE-RL Order 5484.1, "Environmental Protection, Safety and Health Protection Information Reporting Requirements"

DOE Order 5700.6A, "Quality Assurance"

DOE-RL Order 5700.1A, "Quality Assurance"

Title 42 USC 6901, Et. Seq., "Resource Conservation and Recovery Act of 1976 as amended (RCRA)"

Title 41, USC 9601, Et. Seq., (Superfund), "Comprehensive Environmental Response, Compensation, and Liability Act of 1980"

Pub. L. 99-499, "Superfund Amendments and Reauthorization Act of 1986" (SARA)

Title 29, USC 655, 657, "Occupational Safety and Health Act of 1970" (OSHA)

29 CFR 1910, "Hazardous Waste Operations and Emergency"

Response, "OSHA Interim Final Rule, Federal Register, Vol. 51, No. 244, December 19, 1986"

SOIL AND SEDIMENT SAMPLING PROCEDURES

Soil or rock-like material	ASTM Standard D420-69
Soil-like material	ASTM Standard D1452-80

Samplers and Sampling Procedures for Hazardous Waste Streams (1980) EPA-600/2-80-018

Characterization of Hazardous Waste Sites--A Methods Manual (1984) EPA-600/4-4-076

Preparation of Soil Sampling Protocol: Techniques and Strategies (1983) EPA-600/4-83-020

Soil Sampling Quality Assurance User's Guide (1984) EPA-600/4-84-043.

APPENDIX C

SAMPLING LOCATIONS

1324-NA PERCOLATION POND

Sample locations in 1324-NA will be determined in the field, at the time of sampling, and according to the following guidance.

Eastern Portion of Pond

The X, Y coordinates of eight sample locations are to be selected at random in the eastern portion of the 1324-NA pond. Coordinates will be eliminated for the following reasons:

- The sampling location is on the steep sidewall of the pond.
- The sampling location is outside of the eastern portion of the pond (i.e., the southeast corner).
- The sampling location has coordinates within 3 ft of another location. This will prevent overlap of the 3 ft sampling areas.

Table C-1 contains the random numbers to be used for the eastern portion of 1324-NA. Sample locations shall be selected sequentially from this table. They were generated using the software "Lotus Symphony" (release 2.0). Figure C-1 portrays the 1324-NA pond.

Once a sample location is selected, it represents the lower left corner of a 3 ft square. The square is quartered as shown in Figure C-1 and the quarters identified. Random numbers in Table C-2 identify the sequence in which the quarters are to be sampled, if required, as discussed in the sampling plan.

Western Portion of the Pond

The X, Y coordinates of eight sample locations are to be selected at random in the western portion of the 1324-NA pond, four in the north and four in the south. The X, Y coordinates of the sample location will be selected from a random numbers table. Coordinates will be eliminated for the following reasons:

- The sampling location is on the steep sidewall of the pond.
- The sampling location has coordinates within 3 ft of another location. This will prevent overlap of the 3 ft sampling areas.

EASTERN PORTION		NORTH SECTION		SOUTH SECTION	
X	Y	X	Y	X	Y
35	146	22	46	55	70
73	62	6	18	49	2
16	205	29	3	55	30
105	26	37	121	36	134
5	62	18	51	71	50
103	261	30	126	61	51
43	19	56	109	33	72
6	87	71	48	11	98
69	85	34	6	39	141
56	2	76	117	73	27
20	250	72	26	21	5
81	196	23	62	11	114
24	6	49	100	25	63
17	148	47	89	37	54
118	122	37	50	61	119
4	187	17	86	11	21
74	271	2	16	66	142
2	53	26	82	77	130
88	17	46	126	7	30
32	283	17	48	57	136
58	157	57	102	9	9
83	52	56	33	63	13
58	119	39	34	56	9
52	272	45	146	70	119
30	238	53	81	20	19
109	239	9	1	40	145
88	98	21	41	2	87
20	209	43	130	36	128
24	161	74	146	52	15
34	25	8	90	54	75
100	254	71	76	37	56

Note: Random numbers generated using Lotus Symphony (Release 2.0, 5.25")

TABLE C-1 Random Numbers For 1324-NA Sampling Locations

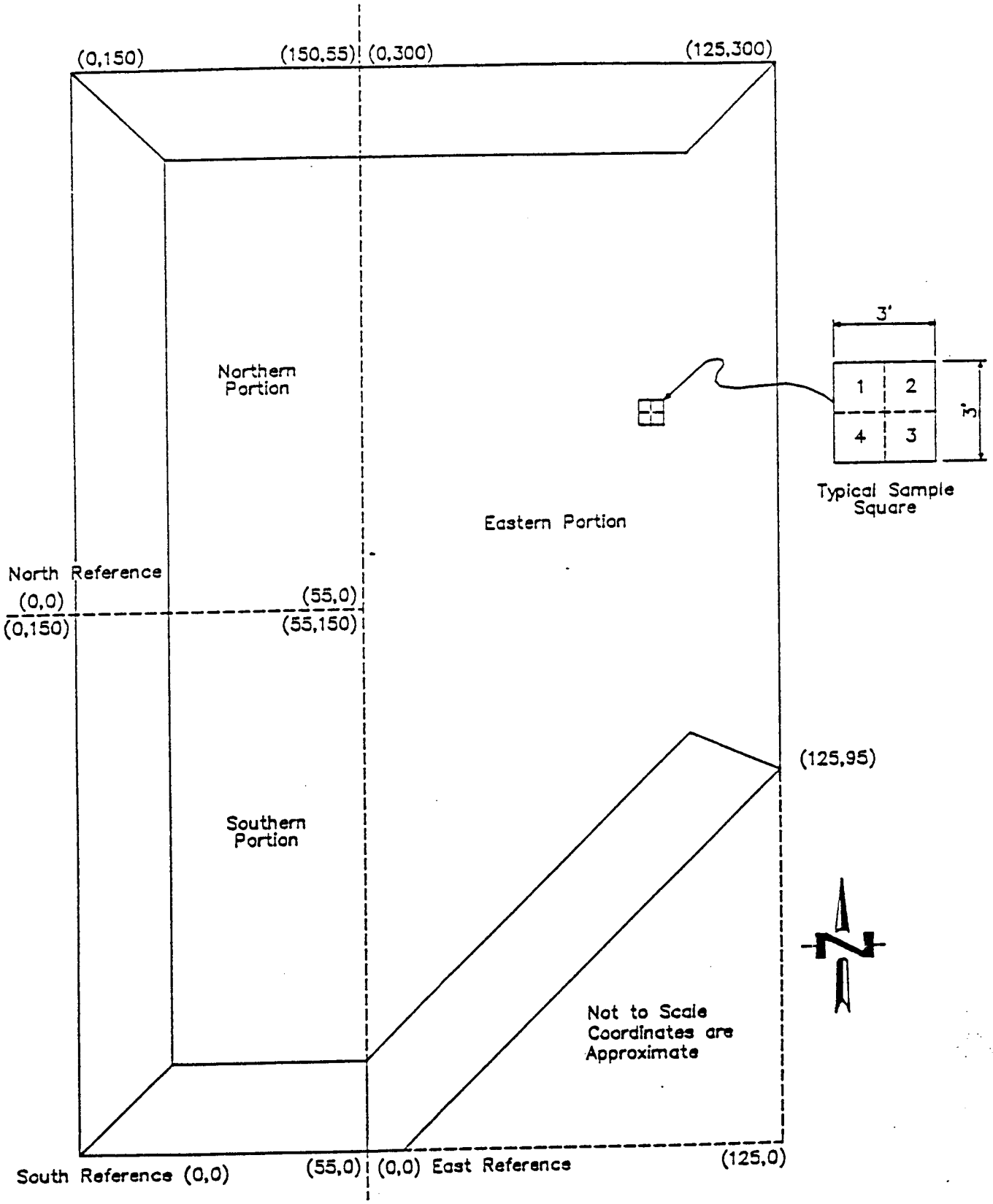


Figure C-1. 1324-NA Percolation Pond - Sampling Locations

Random Number Sequence for 1324-NA Sampling Squares

Eastern Portion

I	J	K	L	M	N	O	P
1	2	2	3	3	1	2	1
3	2	2	2	3	2	3	2
3	1	3	4	4	3	2	3
3	2	2		1		2	
3	2	2				2	
3	1	1				1	
3	4						
3							
1							
2							

Sampling Sequence

I	J	K	L	M	N	O	P	
1	2	2	3	3	1	2	1	From Above
3	1	3	2	4	2	3	2	
2	4	1	4	1	3	1	3	
4	3	4	1	2	4	4	4	Remaining Quarter

Western Portion (North) (South)

A	B	C	D	E	F	G	H
1	1	1	2	3	2	1	2
4	2	3	2	2	3	3	3
3	1	4	3	4	4	2	3
	3		2				1
			4				

Sampling Sequence

A	B	C	D	E	F	G	H	
1	1	1	2	3	2	1	2	From Above
4	2	3	3	2	3	3	3	
3	3	4	4	4	4	2	1	
2	4	2	1	1	1	4	4	Remaining Quarter

Note: These random numbers were generated using Lotus Symphony (Release 2.0, 5.25" Version).

Table C-2 Sampling Sequence - 1324-NA

Table C-1 contains the random numbers to be used for the western portion of 1324-NA. They were generated using the software "Lotus Symphony" (release 2.0). Figure C-1 portrays the 1324-NA pond.

Once a sample location is selected, it represents the lower left corner of a 3 ft square. The square is quartered as shown in Figure C-1 and the quarters identified. Random numbers in Table C-2 identify the sequence in which the quarters are to be sampled, if required, as discussed in the sampling plan.

1324-N SURFACE IMPOUNDMENT

Eight sample locations shall be selected at random in the area of overlap between the 1324-N Surface Impoundment and the North Settling Pond (Figure C-2). Coordinates shall be eliminated in the field for the following reasons:

- The sampling location has coordinates within 3 ft of another location. This will prevent overlap of the 3 ft sampling areas.
- The sampling location is inaccessible because of pipe buried in the inter-liner soil.

Table C-3 contains the random numbers used for 1324-N Surface Impoundment. They were generated using "Lotus Symphony" (release 2.0). The first eight acceptable locations will be deisgnated A-H.

Once a sample location is selected, it represents the lower left corner of a 3 ft square. The square is quartered as shown in Figure C-2 and the quarters identified. Random numbers (Table C-3) identify the sequence in which the quarters are to be sampled, if required.

SOUTH SETTLING POND

Eight sample locations are to be selected in the South Pond area (Figure C-3). The X, Y coordinates of the southeast corner of the 24- by 3-ft sampling trench were selected at random using "Lotus Symphony" (release 2.0).

Once a sample location is selected, it represented the lower left corner of a 3 ft square. The square is quartered as shown in Figure C-3 and the quarters identified. Random numbers (Table C-4) identify the sequence in which the quarters are to be sampled, if required.

BACKGROUND SAMPLES

Background sample locations are to be selected sequentially from the Background Sample Trench as shown in Figure C-4. The Background Trench is subdivided into 3 ft sampling squares. The square is quartered as shown in Figure C-4 and the quarters identified. Random numbers (Table C-5) identify the sequence in which the quarters are to be sampled, if required.

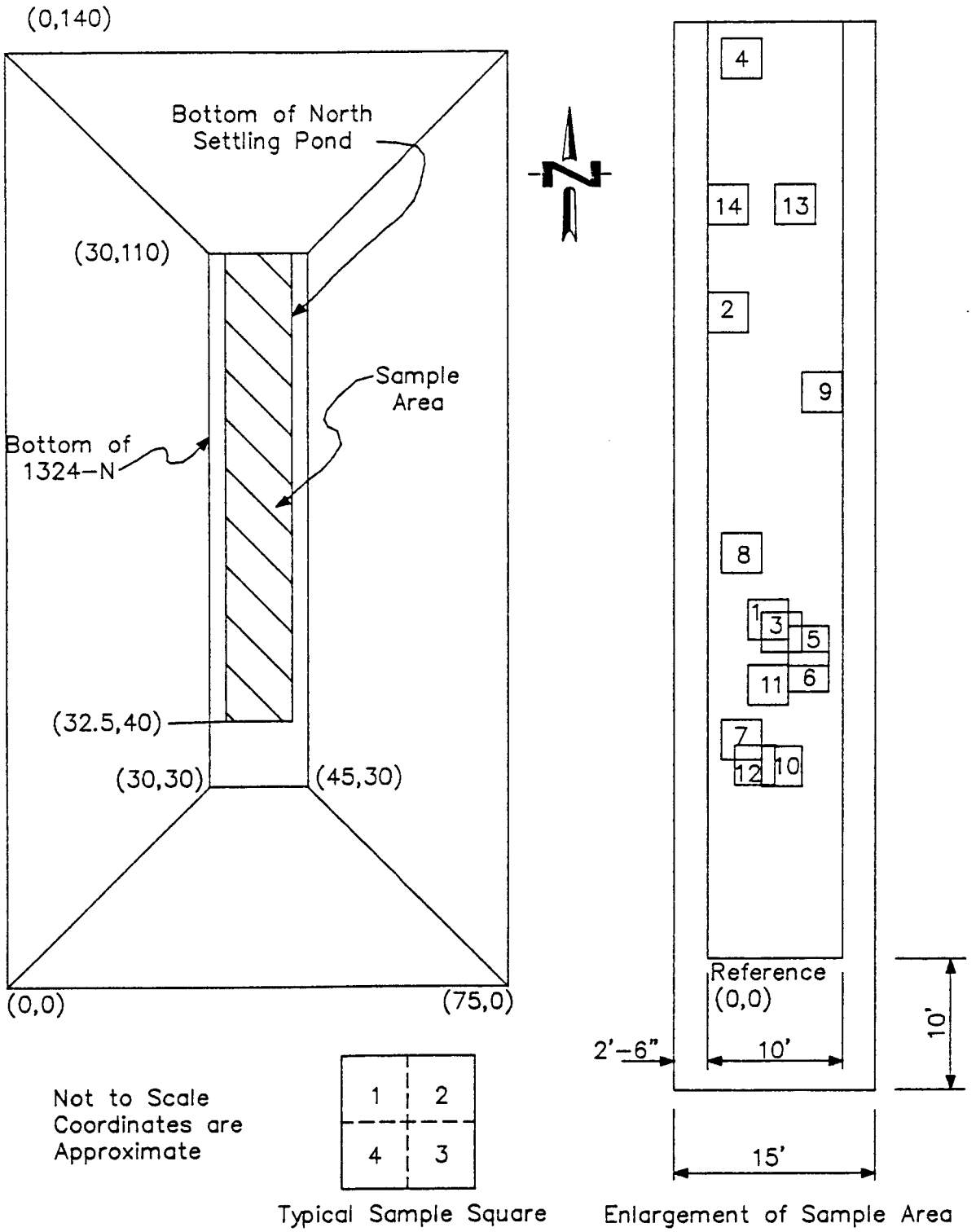


Figure C-2. 1324-N Surface Impoundment - Sampling Locations

Random Number Sequence for Selection of 1324-N Sampling Locations

Coordinate		Location Number
X	Y	
3	24	1
0	47	2
4	23	3
1	66	4
6	22	5
6	20	6
1	15	7
1	29	8
7	41	9
4	13	10
3	19	11
2	13	12
5	55	13
0	55	14

Random Number Sequence for 1324-N Sampling Squares

A	B	C	D	E	F	G	H
2	2	3	3	3	1	1	3
1	2	2	1	3	1	2	2
4	4	3	3	4	1	1	3
	2	3	3	3	4	4	4
	1	4	2	4	1		
				2	2		

Sampling Sequence

A	B	C	D	E	F	G	H	
2	2	3	3	3	1	1	3	From Above
1	4	2	1	4	4	2	2	
4	1	4	2	2	2	4	4	
3	3	1	4	1	1	3	1	Remaining Quarter

Note: These random numbers were generated using Lotus Symphony (Release 2.0, 5.25" Version)

Table C-3 Sampling Locations and Sequence - 1324-N

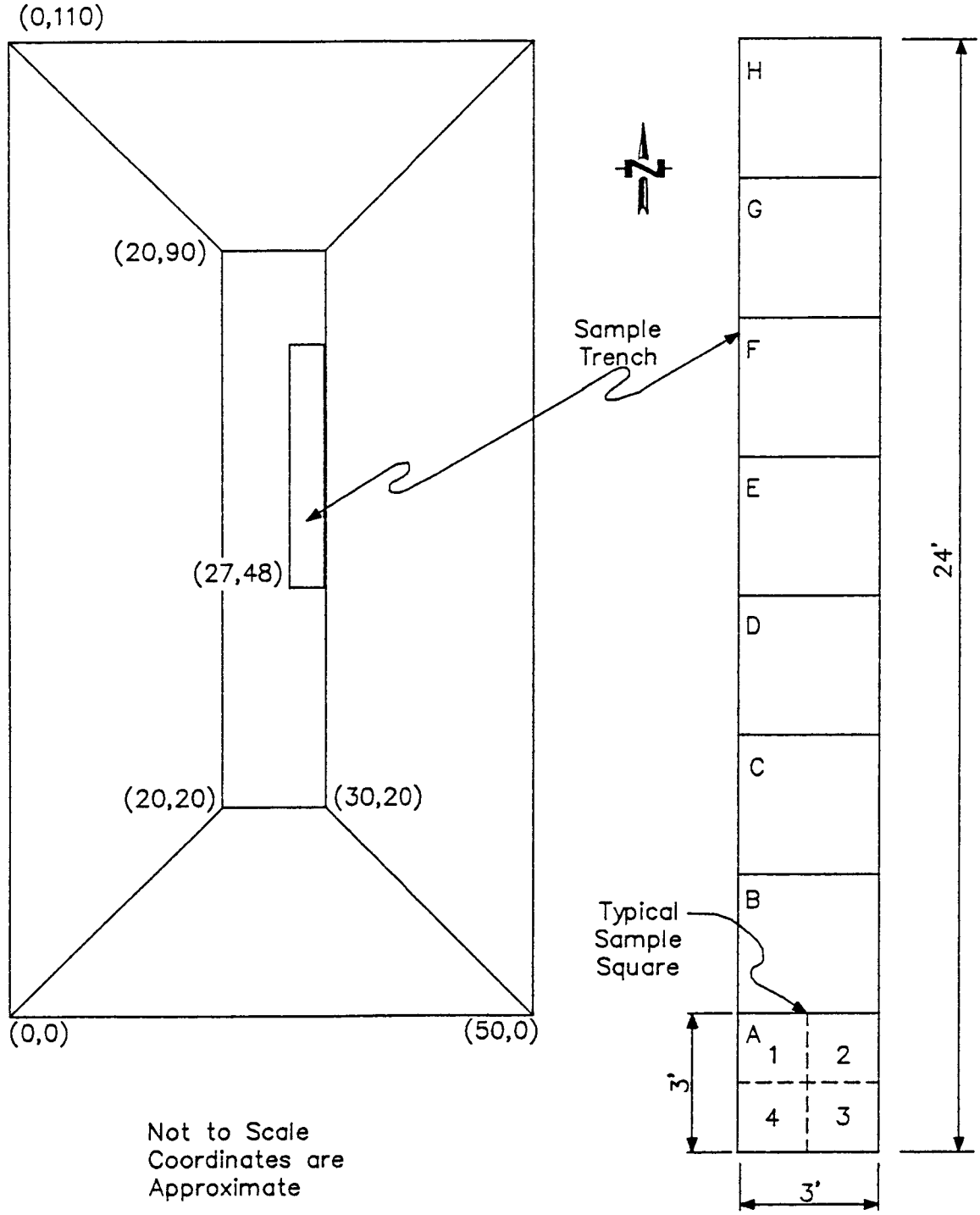


Figure C–3. South Settling Pond – Sampling Locations

Random Number Selected for Location of South Pond

Coordinates

X	Y
27	48

Random Number Sequence for South Pond Sampling Squares

A	B	C	D	E	F	G	H
3	2	4	3	4	1	4	3
3	2	2	3	4	2	1	1
3	2	3	1	2	3	3	4
3	3		3	2			
1	3		1	2			
3	3		2	1			
4	2						
	3						
	3						
	4						

Sampling Sequence

A	B	C	D	E	F	G	H	
3	2	4	3	4	1	4	3	From Above
1	3	2	1	2	2	1	1	
4	4	3	2	1	3	3	4	
2	1	1	4	3	4	2	2	Remaining Quarter

Note: These random numbers were generated using Lotus Symphony (Release 2.0, 5.25" Version)

Table C-4 Trench Location and Sampling Sequence for South Pond

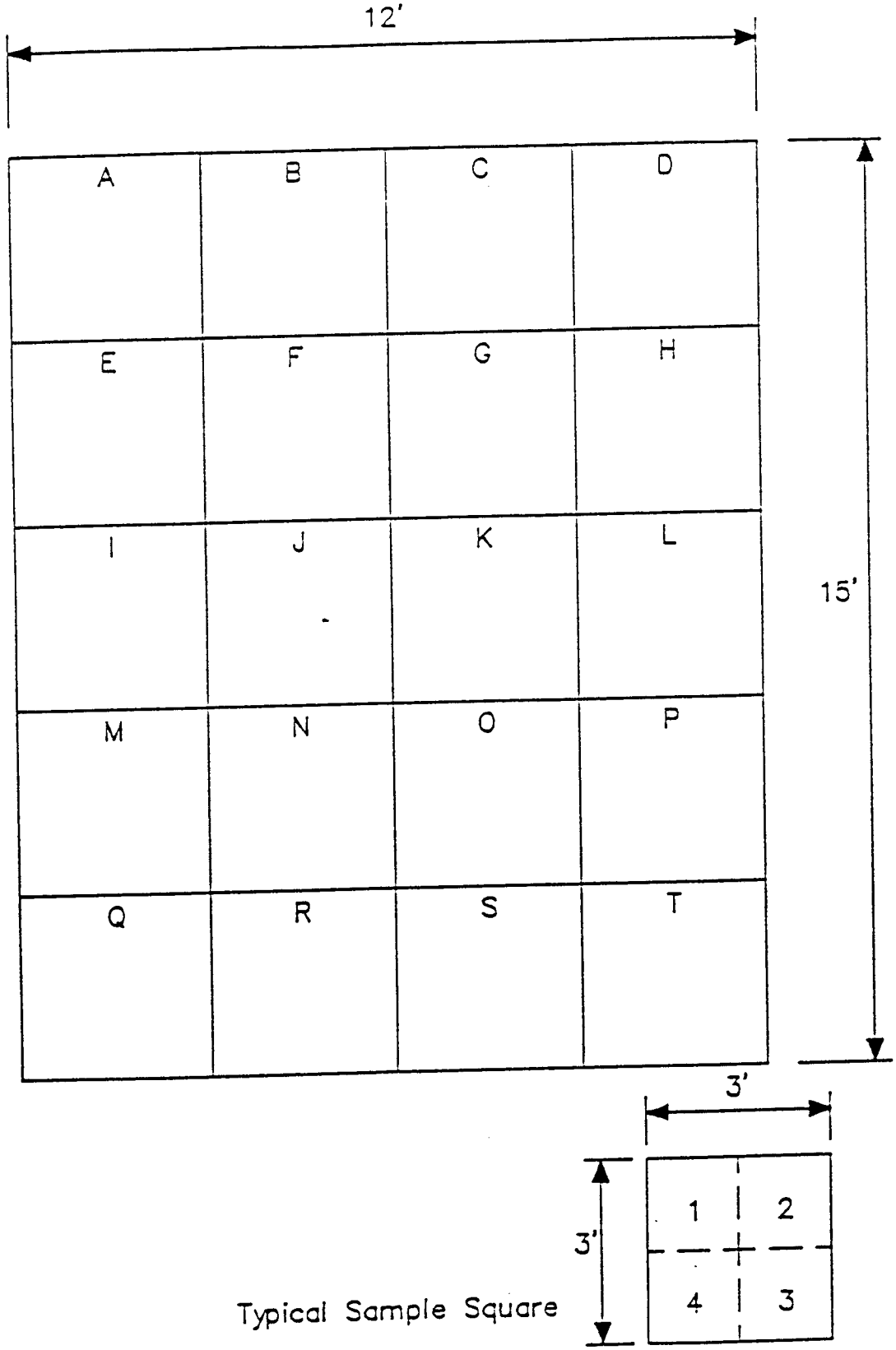


Figure C-4. Sample Locations and Sequence – Background

Table C-5. Trench Location and Sampling Sequence for South Pond

RANDOM NUMBER SEQUENCE FOR BACKGROUND SAMPLES

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
2	1	3	4	1	1	4	3	2	3	3	1	1	1	3	3	4	2	3	4
4	2	2	3	3	1	2	3	4	1	4	2	2	2	3	1	3	1	4	2
2	4	3	1	3	2	4	4	4	2	3	1	3	4	2	2	2	1	2	1
3		2		3	2	3	2	3		1	3			1			2		
		4		2	2												1		
					4												2		
																	2		
																	3		

SAMPLING SEQUENCE

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	
2	1	3	4	1	1	4	3	2	3	3	1	1	1	3	3	4	2	3	4	From Above
4	2	2	3	3	2	2	4	4	1	4	2	2	2	2	1	3	1	4	2	
3	4	4	1	2	4	3	2	3	2	1	3	3	4	1	2	2	3	2	1	
1	3	1	2	4	3	1	1	1	4	2	4	4	3	4	4	1	4	1	3	Remaining Quarter

Note: These random numbers were generated using Lotus Symphony (release 2.0).

APPENDIX D

HEALTH AND SAFETY PLAN

The health and safety plan for this activity consists of a series of pre-job safety plans prepared and approved prior to the start of each sampling activity. The 1324-N/NA Surface Impoundment/Percolation Pond Soil Characterization Plan shall be revised to incorporate the additional pre-job safety plans as they are approved. The following are the required plans:

Attachments	Approval Date
1: 1324-N-1 (Background Sampling)	4/20/89
2: 1324-N #1	5/25/89
3: 1324-NA	TBD
4: South Pond	TBD

I. Pre-Job Safety Plan: 1324-N Pond Sampling Project (Background Sampling)

A. References

1. "Draft 1324-N/NA Surface Impoundment/Percolation Pond

Soil Characterization Plan
February 1989, A. D. Krug

B. Scope

Westinghouse Hanford Company (WHC) Environmental Engineering & Technology Function (EE&T) is scheduled (during fiscal year 1989) to perform soil sampling and analysis of the 1324-NA site to determine:

- o background concentrations of hazardous waste constituents,
- o if pond soils are contaminated by hazardous waste constituents,
- o distribution of contaminants, if present
- o closure plan information.

This Pre-Job Safety Plan will be limited to efforts involved with collecting and analyzing soil samples from a background site which will be located in an undisturbed site to the south of the 1324-N Pond. The samples will be taken from an external trench 10′ deep with a 1.5 to 1 ratio with bottom dimensions of 15′ x 12′.

In addition to sampling equipment and additional support equipment, a back-hoe will be utilized to excavate the sampling trench.

The purpose of this Pre-Job Safety Plan is to provide specific health and safety controls for the sampling in the bottom of the excavation. This plan is a precursor to the Health and Safety Plan to be prepared for the soil sampling of the impoundments. All participants, including visitors, are required to abide by this plan. The field team leader is responsible for ensuring that the plan is followed.

C. Duration

The sampling is scheduled to begin on April 24, 1989, and should take approximately 80 hours to complete.

D. Assigned Individuals

The sampling team will consist of the following personnel:

Site Team Leader: Y. Sada
Sampler: W. A. Skelly, K. A. Woodworth, R. C. Roos, A. D. Krug, N. M. Naiknimbalker, J. M. Frain
Surveyor: V. T. Coyne, S. R. Wray
Radiation Protection Technologist: R. L. Bumgarner, J. A. Hyde
Operator: W. D. Blakeman
Site Safety Officer: J. V. Mohatt, B. G. Tuttle, J. Vaughn

The Site Safety Officer will monitor for potential contaminants as necessary. Conditions may allow one of the team members (knowledgeable in the use of equipment) to provide monitoring as needed.

Since the background sampling area is not a listed site, training requirements under 29 CFR 1910.120 do not apply. However, if hazardous materials are unexpectedly encountered, the team will promptly move to the established control point. A decision to continue to utilize the site as a background sampling location will then be determined. If re-entry is required, then it will only be accomplished with individuals fully trained under WHC-CM-7-7, with an approved Health and Safety Plan.

E. Site Control

No one will enter the excavated trench until approval is granted by the Site Team Leader. At no time will anyone be in the excavation while equipment is operating.

The trench will be marked and provided with appropriate signage so that a reasonable person would not come close to the excavation.

Any visitors will be required to read this plan prior to entry to the area and will be required to be escorted by the Site Team Leader at all times.

All team members will stay clear of earth moving equipment.

F. Risks & Mitigation

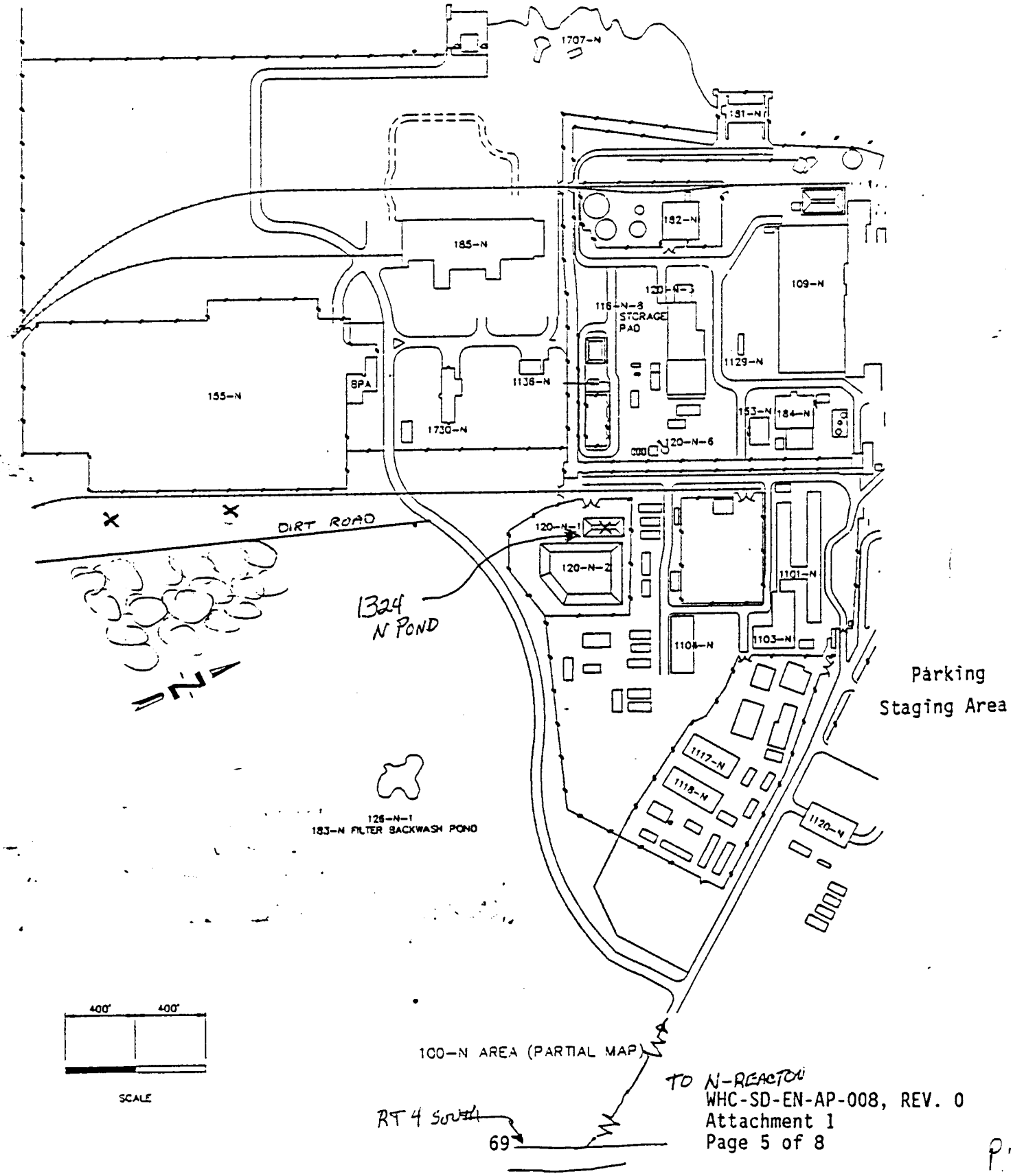
The following provides a discussion of the risks that are judged to be credible too this operation.

It should be pointed out that situations may change as the sampling proceeds which may either require elimination or addition of controls. When changes occur they will be approved by the Site Team Leader and Site Safety Officer.

A Pre-Job Safety Meeting will be conducted for all site personnel prior to the commencement of work at the drill site. Daily tailgate meetings will be held.

RISKS	MITIGATION	
	PRE-JOB	ON-JOB
Underground/Overhead Physical Hazards	Obtain excavation permit through WHC.	
	Brief back hoe operator to be observant for any buried objects i.e., pipes, marker, tape, or discolorations, etc.	
	Reconnaissance of the area for any overhead electrical lines.	Stop Work - Call Landlord Engineer and elevate prior to any further excavation.
Subsidence/Sloughing Injury	Ensure that personnel do not enter trench without permission.	N/A
	Ensure spoil pile is set back away from the edge of cut.	
Noise	Stay away from earth moving equipment.	If noise level at personnel location exceeds 85dBA, hearing protection will be worn.
Heat	Recognize symptoms of heat stress and responses.	Mandate frequent hydration & rest periods if WB6T>80°
	Provide shaded area for rest.	(Presume coveralls will be worn).
	Provide ample supply of cold water with cups.	
	Provide heat stress meter when required.	
Sanitation	Provide on site or provide for quick means of travel to restrooms and washing facilities.	N/A

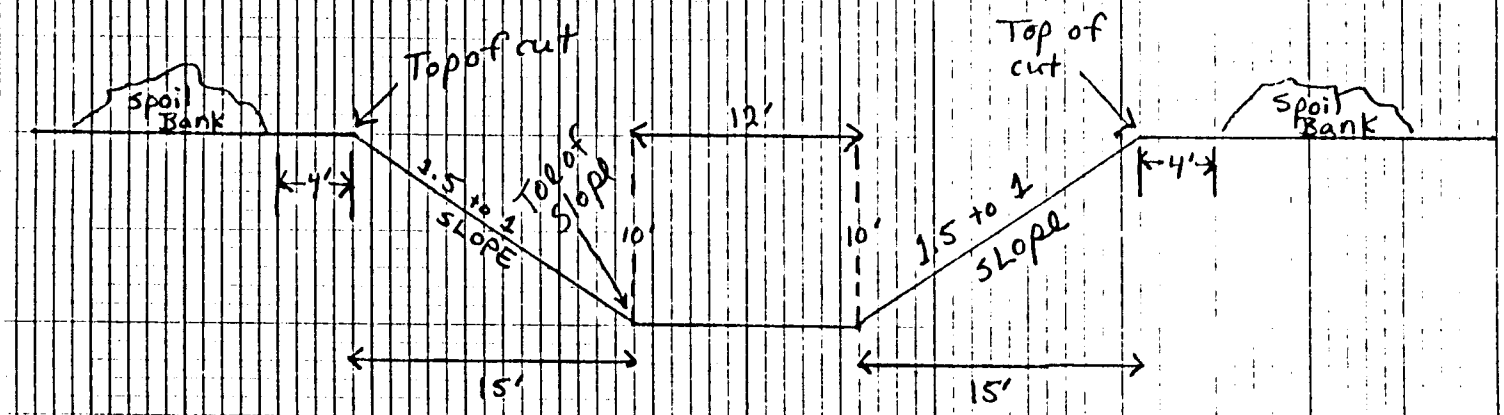
RISKS	MITIGATION	
	PRE-JOB	ON-JOB
Chemical/Organics (Unlikely)	Provide a HNU photo-ionization detection with a 10.2 EV probe on site as required. Establish warning level of 3ppm > background at breathing zone TWA for 15 mins.	Provide periodic monitoring of excavation material. At warning level all personnel will move upwind to command post. Cease using site as background sampling area.
Emergency Response	Notify the fire department of location prior to sampling. Ensure that immediate communication to emergency response personnel is available as a result of injury or incident.	


1707-N
181-N
182-N
185-N
109-N
116-N-8
STORAGE
PAD
1129-N
155-N
BPA
1136-N
1730-N
153-N
184-N
120-N-6
DIRT ROAD
120-N-1
120-N-2
1324
N POND
1101-N
1104-N
1103-N
Parking
Staging Area
1117-N
1118-N
1120-N
126-N-1
183-N FILTER BACKWASH POND
400'
400'
SCALE
100-N AREA (PARTIAL MAP)
TO N-REACTOR
RT 4 South
69

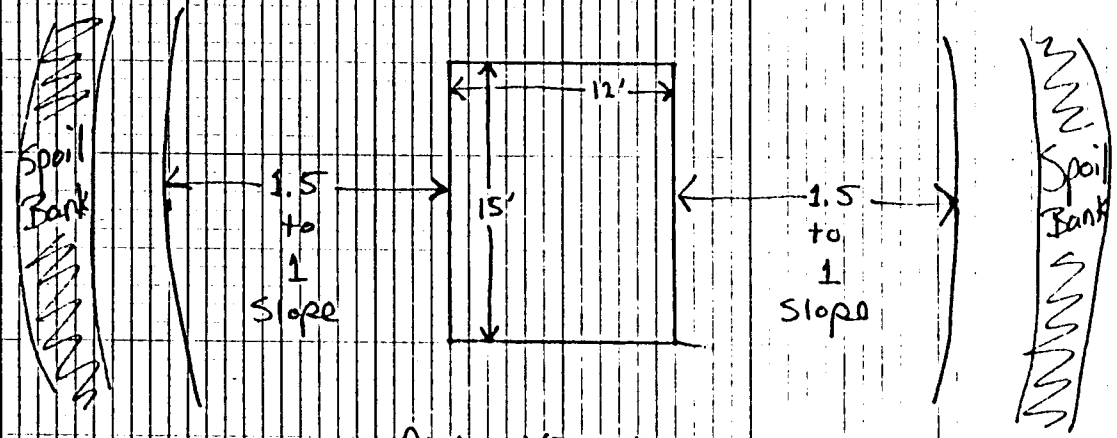
p. 1

NO. 341-10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

MODIFIED TRENCH PLAN -- 1324-N Pond Background Sampling



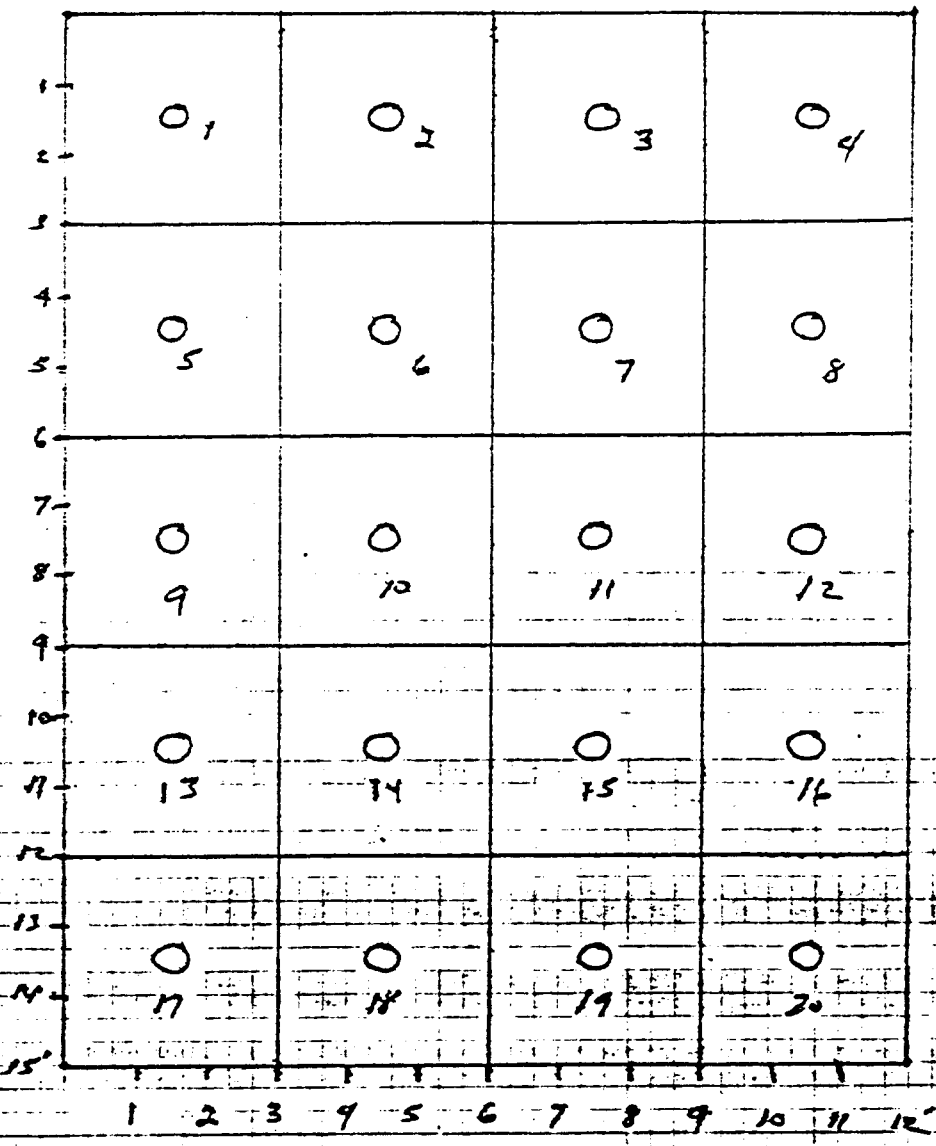
CROSS-SECTION
LONG END VIEW



PLAN VIEW -
LONG END

Scale: 1 square = 1 foot

9-19-89 D. J. Alexander



PLAN VIEW OF
Trench Bottom
Test Hole Location

SCALE: 3 SQUARES = 1 FOOT

4/14/89 G. E. McPherson

Approvals:

Manager, Environmental Health, Safety, Quality and Pesticide Services	4-20-89 Date
Industrial Safety & Health	4-19-89 Date
Site Team Leader	4/20/89 Date
Author/Site Safety Officer	4-20-89 Date

cc: Manager, Environmental Engineering
Manager, Environmental Field Services

ENVIRONMENTAL ENGINEERING AND TECHNOLOGY FUNCTION HEALTH & SAFETY PLAN APPROVAL SHEET	Number 1324-N #1	Rev 0	Page 1 of 19

Document Title:

Health & Safety Plan for 1324-N Pond Soil Characterization

Supporting Document As Applicable:
Sampling Plan ___ # Separate
Hazardous Work Permit ___ # _____
Radiation Work Permit ___ # Separate
Excavation Permit ___ # Separate
Work Plan ___ # Separate

Abstract:

This plan provides Health & Safety requirements for characterizaiton of the 1324-N Pond.

*	Distribution	Name	MSIN
*	M. R. Adams		H4-55
*	J. V. Mohatt		S0-03
*	Y. Sada		H4-55

(Continued on reverse side)

Prepared By: B. G. Tuttle Date: 5/15/89

See Reverse Side for Additional Approvals

* COMPLETE DOCUMENT
(No asterisk, title page/summary of revision page only)

Page 2 of	Number	Rev No.	HEALTH AND SAFETY PLAN APPROVAL SHEET
	1324-N #1	0	

Approvals (Type and Sign Name)	Date	Distribution	Name	MSIN
H.W. McKellar for W. H. Price	5-17-89			
Author's immediate Manager B M Tuttle	5-15-89			
Health & Safety Engineer (EE&T)				
Field Team Leader yule Sada	5/24/89			
Project Coordinator, Environmental Engineering and Technology yule Sada	5/25/89			
Environmental Engineering and Technology Manager MA Dan	5-25-89			
Industrial ~~Health~~ Safety and Fire Protection DA Meade	5-18-89			
Operational Health Physics				

Health & Safety Plan for
1324-N Pond Soil Characterization

By

B. G. Tuttle

The purpose of this Health and Safety Plan is to assign responsibilities, specify operating procedures, establish personal protection standards, and provide contingencies for emergency situations that may arise during the course of this work. The information gathered during this sampling effort will assist in developing a supporting document for Part B, Closure/Post Closure Permit Application.

1 BACKGROUND There are three facilities at the 1324-N/NA Site (Figure 1). These are the 1324-N Surface Impoundment, and the 1324-NA Percolation Ponds and the South Settling Pond which is buried. Effluents from facilities entering the pond were sampled and exhibited high and low pH characteristics and as such were corrosive dangerous wastes. However, the effluents exhibited no other dangerous waste characteristics or criteria and did not contain any listed hazardous wastes or dangerous waste sources. For further information concerning the history and description of the facility refer to the 1324-N/NA Surface Impoundment/Percolation Pond Soil Characterization Plan.

2 SCOPE Twelve sampling locations, chosen from a computer random list, will be available at the bottom grid of the pond. Ten sand samples, including two duplicates, will be taken from eight holes cut in the bottom liners. Three soil samples will be taken from each hole with 12" difference in elevation. Samples will be taken with hand sampling tools.

3 LOCATION OF SITES The 1324-N/NA Site is located approximately 1000 yards Southeast of the 105-N Reactor Facility in the 100-N Area of the Hanford Site.

4 DURATION It is expected that it will take approximately four weeks to complete the planned sampling effort. However, additional time may be necessary depending on unexpected difficulty in obtaining samples, equipment problems or manpower shortages.

5 PERSONNEL Table 1 shows the list of personnel involved (including alternatives) in the project. It is expected that no more than five individuals will be on site during a given day. All participants, including visitors, are required to abide by this health and safety plan and any other procedures or policies which may be imposed at the site.

6 HAZARD EVALUATION The following section discusses the risks that are judged to be credible relative to this operation. Following the identification of each risk is a discussion of the engineering and administrative controls to be imposed at the site to mitigate that risk. It should be pointed out that a particular control may not be entirely applicable at the job site if situations change as the job proceeds. In such cases the Site Safety Officer and the Field Team Leader may make changes provided they are documented in the Safety Log Book and discussed with involved individuals.

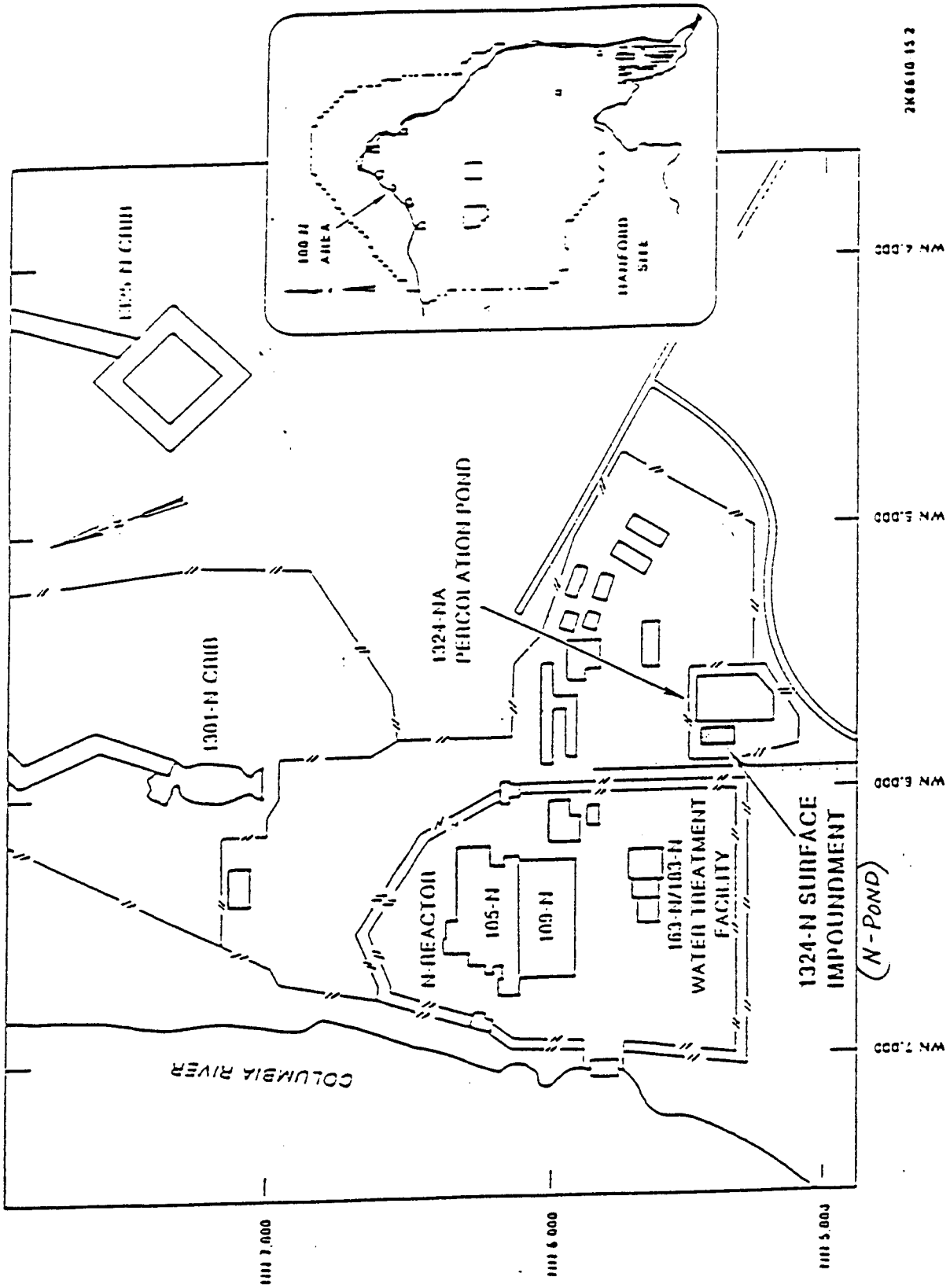


FIGURE 1
100-N AREA FACILITIES

6.1 CORROSIVES The primary risk to be encountered by personnel during the sampling effort is exposure to corrosive materials i.e., high or low pH. Of primary concern is possible tissue burns from these exposures.

To prevent exposure to corrosives during sampling personnel will wear goggles, face shield, PVC gloves, tingly boots and chemical resistant coveralls. Respiratory protection will be available at the site. A portable emergency eyewash and deluge shower will be available at the site for emergency first aid. The pH of sample areas will be checked routinely. Personal protective equipment will be upgraded or downgraded as per conditions at the site. MSDS's are attached for NaOH and H2SO4. (Attachment 1)

6.2 EXCAVATIONS/WALKING WORKING SURFACES Routine sampling efforts will involve access into and out of excavations, ponds and trenches with sloped sides. Additionally, general uneven walking surfaces are to be expected at the site. Personnel in these situations are subject to slips, trips, and falls. A 7/8" manilla rope properly secured will be used to prevent slipping on the plastic pond liner. The pond sides are sloped approximately 2:1. Personnel must be alert to any possible tripping hazards and plan access routes to avoid them.

6.3 CHEMICAL/ORGANICS Based on the results of the sampling of effluents entering the 1324-N Site it is not expected that hazardous chemical substances will be encountered. However, monitoring with a properly calibrated organic vapor detecting instrument will be carried out periodically during the sampling. The HNU Photoionization detector with a 10.2 EV probe will be used. Background levels will be established prior to start of work. If monitoring indicates a reading of 3 ppm in the breathing zone, for 15 minutes, a warning level will be established. Personnel will cease operations and move upwind to the control point. The Site Safety Officer will don protective gear and initiate monitoring to identify substances. Decisions will be made at this time concerning continued operation and additional protective equipment.

6.4 HEAT STRESS Personnel working in high temperature and high humidity are subject to possible heat-related illnesses such as heat exhaustion, heat stroke or heat cramps. Each is related to the bodies ability to deal with heat. Personal factors such as overall physical condition, medications taken, diet and sleep habits all may contribute to the incidence of heat stress. Each condition has differing symptoms such as:

Heat Exhaustion - Pale and clammy skin, profuse perspiration, rapid and shallow breathing, weakness, dizziness and headache

Heat Cramps - Painful muscle cramps in legs and abdomen, faintness, and profuse perspiration

TABLE 1

PERSONNEL INVOLVED IN 1324-N POND SAMPLING PROJECT

Name	Group	Duty	Payroll Number
W. D. Blakeman	DOE	Driver	56144
R. L. Bumgarner	RPT	Radiation Monitor	5
M. W. Caldwell	D&D	Worker	6B658
V. T. Coyne	KE	Surveyor	01-2509
R. V. Cram	Lab.	Decontamination	64412
N. P. Fastabend	KE	Surveyor	91-2057
M. L. Foss	D&D	Rigger	56114
J. M. Frain	EE	Sampler	80476
D. R. Golden	D&D	Operator	55675
W. M. Hayward	D&D	Engineer	66516
J. A. Hyde	D&D	Radiation Monitor	54869
D. G. Kachele	D&D	Project Control Analyst	57129
J. L. Kilgore	D&D	Worker	6B691
A. D. Krug	EE	Sampler	65308
C. S. McClellan	Lab.	Decontamination	6C354
N. M. Naiknimbalkar	EE	Sampler	6A866
D. E. Nelson	Lab.	Decontamination	62059
K. W. Playter	D&D	Worker	6C955
L. C. Powers	D&D	Driver	56012
M. L. Ray	D&D	Rigger	54733
J. D. Reeve	RPT	Radiation Monitor	56178
D. L. Roberts	D&D	Worker	6C957
R. C. Roos	EE	Sampler	58230
G. D. Rowlette	D&D	Worker	6C959
Y. Sada	EE	Team Leader	80474
W. A. Skelly	EE	Sampler	6A390
V. B. Subrahmanyam	Lab.	Sampler	69938
G. B. Wagner	KE	Surveyor	91-3017
K. A. Woodworth	EE	Sampler	80044
S. R. Wray	KE	Surveyor	

Heat Stroke - Face is red and flushed, skin is hot and dry with no sweating, unconsciousness results

The Site Safety Officer will monitor the work environment periodically with a heat stress monitor to determine the WBGT. Additionally, all individuals must be alert for signs of heat stress. Provisions will be made for adequate breaks in cooler shaded areas and personnel will drink cool water provided at the site.

7.0 SITE OPERATIONS During site operations the sampling team will work in a control zone designated with visible barrier tape or fence. This zone will encircle the N-Pond. Two samplers will collect samples and two persons will decontaminate sampling equipment. The work table will be positioned at the control point upwind and the decontamination table downwind. Wind direction will be monitored at the site.

Overall site access is controlled by a fence and gate. Only those personnel listed on Table 1 will be allowed access. Visitors must check in with the Field Team Leader, read the HASP and the sampling plan and be escorted while on site. Visitors will wear safety equipment as required by this plan. No one will enter the pond until approval is given by the Field Team Leader.

The following section discusses general responsibilities of the Field Team Leader, Site Safety Officer and the Field Sampling Crew.

Field Team Leader (Cognizant Engineer):

* The Field Team Leader (Cognizant Engineer) must be appraised of all activities on the site

* Allocating and administering the resources required to successfully comply with all regulations and health and safety requirements

* Verifying that all permits, supporting documentation and clearances are in place, i.e., excavation permit, health and safety plan, etc.

* Provide technical advice during operations and emergencies

* Resolve any conflicts which may arrise at the site

* Control and coordinate emergency response activities of field personnel

* Conduct pre-job safety meeting and field safety meeting as necessary

* Conduct safety briefing as necessary

Site Safety Officer

* Responsible for implementation of the health and safety plan
* Monitor and assess hazards present
* Monitor performance of all personnel to ensure that safety procedures are followed
* Halt operations immediately if necessary (unsafe condition)
* Conduct safety briefings as necessary

Field Sampling Crew

* Be familiar with sampling plan and health and safety plan
* Advise Field Team Leader or Site Safety Officer of any limitations or changes in personal health and safety

8.0 PERSONAL PROTECTIVE EQUIPMENT It is anticipated that Level D protection will be worn during this project. Specific types are discussed in section 6, Hazard Evaluation. A protective equipment checklist (Attachment 2) will be used at the site to assure all protective equipment is on site prior to start of work.

9.0 PERSONNEL TRAINING All personnel having duties at the site must be hazardous waste worker trained in accordance with EII 1.7. Documentation of training is located in the Environmental Field Services Group training files. Documentation of training for personnel outside of Environmental Engineering and Technology will be verified at the site by the Field Team Leader.

10. DECONTAMINAITON Decontamination of personnel safety gear and part of the excavating equipment will be carried out on site down wind from the control point. Sampling equipment, spoons, bowls and scoopulas will be decontaminated at a 200 West Area lab at the end of each day. In both cases, the rinsate will be collected into 55 gallon stainless steel drums. Hazardous waste will be disposed of in accordance with WHC-CM-5-16, "Non-Radioactive Dangerous Waste Packaging and Disposal Requirements."

11. SAFETY MEETINGS Prior to beginning work at the 1324-N Site a pre-job safety meeting will be conducted by the Field Team Leader. This meeting will cover the contents of this HASP and other matters pertinent to the project. Tailgate safety meetings will be held regularly at the site. Any pre-sampling site set up (non-intrusive) by D & D will be done in accordance with existing D & D procedures.

12. MEDICAL SURVEILLANCE All employees receive medical examinations at the start of their employment and annually thereafter. These examinations allow medical staff to monitor employees for any adverse health effects related to exposure to contaminants during site characterization.

Employee medical records are maintained as required by 29 CFR 1910.120. All employee field exposure data, required by 29 CFR 1910.120, will be provided to HEHF on an annual basis.

13. SANITATION Sanitation facilities for site personnel are located outside the fenced area at the closet 100-N facility.

14. EMERGENCY PROCEDURES

Hanford Emergency Phone # 811

Hanford Emergency Radio Frequency: Transportation Frequency, Station 1. Describe location and request assistance.

Office Radio: None

Nearest First Aid Location: 1100N/100N Area Phone: 3-1695

Hospital: Kadlec Hospital, Richland 946-4611

Poison Control Center: (800) 572-5842

Site Resources:

Water: X Drinking X Fire X Decontamination

Telephone Location: 1120N

Radio Location: In vehicle

Other:

Emergency Contacts:

	Phone	Location
Site Safety Officer		
J. V. Mohatt	3-5566	MO-407 200E
J. Vaughn	3-5843	MO-407 200E
B. G. Tuttle	3-5884	MO-407 200E
Site Landlord		
Joseph Zoric	3-4315	100N
Vern Rice	3-1448	100K
Field Team Leader/Cognizant Engineer		
Yule Sada	6-8596	450 Hills/3000 Area

Industrial Safety and Fire Protection
Bill Rowe 3-1438
or 85-720 Radio Pager

Staging Area
If an emergency alarm, 3 to 6 minutes steady siren, is sounded the team members will stop work and procede to the staging area outside of the fenced area.

Attachment 2

Material Safety Data Sheet

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 1529
SULFURIC ACID, CONCENTRATED
Revision C
Issued: October 1980
Revised: February 1986

SECTION 1. MATERIAL IDENTIFICATION

MATERIAL NAME: SULFURIC ACID, CONCENTRATED

OTHER DESIGNATIONS: Oil of Vitriol, Hydrogen Sulfate; H_2SO_4; CAS #7664-93-9

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
Allied Corporation, PO Box 2064R, Morristown, NJ 07960; Telephone: 800 631-8050

HMIS
H: 3
F: 0
R: 2
PPE: *
* See Sect. 8

R 1
I 3
S 4
K 0

SECTION 2. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Hydrogen Sulfate (H_2SO_4) Water	93-98 Balance*	8-hr TWA: 1 mg/m^3 Human, Mist Inhalation, TCLo: 3 mg/m^3, 24 wk. (Toxic Mouth Effects) Rat, Oral. LD_{50}: 2140 mg/kg

* Material is obtained by the reaction of SO_3 and water. Can contain low impurity levels, such as 0.02% max of iron as Fe. Properties vary with H_2SO_4 content.

Current OSHA standard and ACGIH (1985-86) TLV. NIOSH has a 10-hr TWA, 40-hr. work week, of 1 mg/m^3.

SECTION 3. PHYSICAL DATA

	93.19% H_2SO_4	98.33% H_2SO_4	100% H_2SO_4
Boiling Point, 1 atm, deg C	ca 281	ca 338	ca 330 (dc)
Specific Gravity (60/60°F)	1.8354	1.84	1.84
Volatiles, % @ 340°C	ca 100	ca 100	ca 100
Melting Point, deg C	ca -34	ca 3	10.4

Water Solubility – Complete Miscible
Vapor Pressure, mm Hg @ 100°F – <1 (93.19% H_2SO_4); Deg. Baume – 66 (93.19% H_2SO_4) - Density of H_2SO_4 is often reported in degrees Baume Be). Formula is Be=145 [145/sp gr for liquids heavier than water].

Appearance and odor: Clear, colorless, hygroscopic, oily liquid with no odor. Mists greater than 1 mg/m^3 are easily recognizable. Those at 5 mg/m^3 are distinctly objectionable.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
None - Nonflammable	NA	NA	NA	NA

Sulfuric acid is nonflammable; however, it is a strong oxidizing agent and may cause ignition by contact with combustible materials. Small fires may be smothered with suitable dry chemical. Cool exterior of storage tanks of H_2SO_4 with water to avoid rupture if exposed to fire. Do not add water or other liquid to the acid! The acid, especially when diluted with water, can react with metals to liberate flammable hydrogen gas.
Sulfuric acid mists and vapors from a fire area are corrosive (see sect. 5).
Fire fighters must wear self-contained breathing equipment and fully protective clothing.

SECTION 5. REACTIVITY DATA

Sulfuric acid is stable under normal conditions of use and storage. It does not undergo hazardous polymerization. It is a strong mineral acid reacting with bases and metals. The concentrated acid is also a dehydrating agent, picking up moisture readily from the air or other materials. Hydrogen gas may be generated within a H_2SO_4 container. Vent drums cautiously.

This material reacts exothermically with water. (Acid should always be added slowly to water. Water added to acid can cause boiling and uncontrolled splashing of the acid.) Sulfur oxides can result from decomposition and from oxidizing reactions of sulfuric acid.

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SECTION 6. HEALTH HAZARD INFORMATION TLV

Concentrated sulfuric acid is a strong mineral acid, an oxidizing agent, and a dehydrating agent that is rapidly damaging to all human tissue with which it comes in contact. Ingestion may cause severe injury or death. Eye contact produces severe or permanent injury. Inhalation of mists can damage both the upper respiratory tract and the lungs. Sulfuric acid is not listed as a carcinogen by the NTP, IARC, or OSHA.

FIRST AID: EYE CONTACT: Immediately flush eyes (including under eyelids) with plenty of running water for at least 15 minutes. Speed in diluting and rinsing out acid with water is extremely important if permanent eye damage is to be avoided. Obtain medical help as soon as possible.* SKIN CONTACT: Immediately flush affected areas with water, removing contaminated clothing while under the safety shower. Continue washing with water and get medical attention.*

INHALATION: Remove to fresh air. Restore breathing. Call a physician immediately. INGESTION: Dilute acid immediately with large amounts of milk or water, then give milk of magnesia to neutralize. Never give anything by mouth to an unconscious person. Do not induce vomiting; if it occurs spontaneously, continue to administer fluid. Obtain medical attention as soon as possible.*

Maintain observation of patient for possible delayed onset of pulmonary edema.

* GET MEDICAL HELP = In plant, paramedic, community.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Handle major spills by a predetermined plan. Contact supplier for assistance in this planning, in meeting local regulations, and for disposing of large amounts. Notify safety personnel. Provide optimum ventilation; vapors are extremely irritating. Stop leak if you can do so without risk.

Cleanup personnel need protection against inhalation or contact. Keep upwind. Contain spill. Minor leaks or spills can be diluted with much water and neutralized with soda ash or lime. If water is not available, cover contaminated area with sand, ashes, or gravel and neutralize cautiously with soda ash or lime.

DISPOSAL: Follow Federal, state, and local regulations. Runoff to sewer may create hydrogen gas, which is a fire or explosion hazard. EPA (CWA) RQ 1000 lbs. (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general ventilation to meet current TLV requirements in the workplace. Where mists are up to 50 mg/m^3, a high-efficiency particulate respirator with full facepiece is warranted; a type-C supplier-air respirator with full facepiece operated in pressure-demand mode is used to 100 mg/m^3.

Avoid eye contact by use of chemical safety goggles or face shield where splashing may occur. Acid-resistant protective clothing, such as rubber gloves, aprons, boots, and suits, is recommended to avoid body contact.

Eyewash fountain and safety showers with deluge type of heads should be readily available where this material is handled or stored.

Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

Comprehensive preplacement and annual medical examinations with emphasis on dental erosion, cardiopulmonary system, and mucous membrane irritation and cough are indicated.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Sulfuric acid in carboys or drums should be stored in clean, ventilated storage areas having acid-resistant floors with good drainage. Keep out of direct sunlight, do not store above 89.6°F (32°C). Storage facilities are to be separate from organic materials, metallic powders, chromates, chlorates, nitrates, carbides, oxidizables, etc. Soda ash, sand, or lime should be kept in general storage or work areas for emergency use. Protect containers against physical damage. Glass bottles need extra protection. Sulfuric acid is highly corrosive to most metals, especially below 77% H_2SO_4. Avoid breathing mist or vapors. Avoid contact with skin or eyes. Do not ingest. Do not add water to concentrated acid. Drums may contain hydrogen gas, so open cautiously. Use nonsparking tools free of oil, dirt, and grit and vapor-proof electrical fixtures

DOT Classification: Corrosive Material. ID No.: UN1830 Label: Corrosive

Data Source(s) Code: 1-12, 19, 20, 24, 26, 31, 37-39, 42, 82. CK

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Approvals J.C. Marucco, 6/86.

Indust. Hygiene/Safety DW 6/86

Medical Review

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J. T. BAKER CHEMICAL CO. 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865

M A T E R I A L S A F E T Y D A T A S H E E T

24-HOUR EMERGENCY TELEPHONE -- (201) 859-2151

CHEMTREC # (800) 424-9300 -- NATIONAL RESPONSE CENTER # (800) 424-8802

MSDS #1157

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: SODIUM HYDROXIDE
FORMULA: NAOH
FORMULA WT: 40.00
CAS NO.: 01310-73-2
NIOSH/RTECS NO.: WB4900000
COMMON SYNONYMS: CAUSTIC SODA; SODIUM HYDRATE; LYE
PRODUCT CODES: 3730,3722,5312,5104,3729,3734,3726,5045,3728,3723,5022,3736

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	3	(POISON)
FLAMMABILITY	-	0	
REACTIVITY	-	2	
CONTACT	-	4	(CORROSIVE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER
CAUSES SEVERE BURNS
MAY BE FATAL IF SWALLOWED

DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
AVOID BREATHING DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

SECTION II - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
SODIUM HYDROXIDE	90-100	1310-73-2

SECTION III - PHYSICAL DATA

BOILING POINT: 1390 C (2534 F)
VAPOR PRESSURE(MM HG): 0

MELTING POINT: 318 C (604 F)
VAPOR DENSITY(AIR=1): N/A

SPECIFIC GRAVITY: 2.13 (H2O=1)
EVAPORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): APPRECIABLE (MORE THAN 10 %)
% VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: WHITE, ODORLESS SOLID (FLAKES).

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

MSDS # 119

FLASH POINT: N/A NFPA 704M RATING: 3-0-1

FIRE EXTINGUISHING MEDIA
USE WATER SPRAY.

UNUSUAL FIRE & EXPLOSION HAZARDS
CONTACT WITH MOISTURE OR WATER MAY GENERATE SUFFICIENT HEAT TO IGNITE COMBUSTIBLE MATERIALS.
REACTS VIOLENTLY WITH WATER LIBERATING AND IGNITING HYDROGEN.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 2 MG/M3 (PPM)

EFFECTS OF OVEREXPOSURE
INGESTION MAY RESULT IN SEVERE INTESTINAL IRRITATION WITH BURNS TO MOUTH.
CONTACT WITH SKIN OR EYES MAY CAUSE SEVERE IRRITATION OR BURNS.

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING; IF CONSCIOUS, GIVE LARGE AMOUNTS OF WATER. FOLLOW WITH DILUTED VINEGAR, FRUIT JUICE OR WHITES OF EGGS, BEATEN WITH WATER.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FO AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
WASH CLOTHING BEFORE RE-USE.

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: MOISTURE

INCOMPATIBLES: WATER, STRONG ACIDS, MOST COMMON METALS

SECTION VII - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

J. T. BAKER NEUTRACIT-2(R) CAUSTIC NEUTRALIZER IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

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SECTION VII - SPILL AND DISPOSAL PROCEDURES (CONTINUED)

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D002, D003 (CORROSIVE, REACTIVE WASTE)

SECTION VIII - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 60 PPM, A HIGH-EFFICIENCY PARTICULATE RESPIRATOR IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, RUBBER GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE STRIPE

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN CORROSION-PROOF AREA.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	SODIUM HYDROXIDE, DRY SOLID
HAZARD CLASS	CORROSIVE MATERIAL (SOLID)
UN/NA	UN1823
LABELS	CORROSIVE
REPORTABLE QUANTITY	1000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	SODIUM HYDROXIDE, SOLID
HAZARD CLASS	8
UN/NA	UN1823
LABELS	CORROSIVE

(TM) AND (R) DESIGNATE TRADEMARKS.
N/A = NOT APPLICABLE OR NOT AVAILABLE

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THE INFORMATION PUBLISHED IN THIS MATERIAL SAFETY DATA SHEET HAS BEEN COMPILED FROM OUR EXPERIENCE AND DATA PRESENTED IN VARIOUS TECHNICAL PUBLICATIONS. IT IS THE USER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF THIS INFORMATION FOR THE ADOPTION OF NECESSARY SAFETY PRECAUTIONS. WE RESERVE THE RIGHT TO REVISE MATERIAL SAFETY DATA SHEETS PERIODICALLY AS NEW INFORMATION BECOMES AVAILABLE.

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EQUIPMENT CHECKLIST

A. PROTECTIVE GEAR

LEVEL B		LEVEL C	
Cascade breathing air	____	Ultra-Twin Respirator	____
SCBA	____	Powered Air Purifying Respirator	____
Spare Air Tanks	____	Cartridges (Type	
Protective Coveralls	____	_____)	____
(Saranax or Chemorel	____	Escape Mask	____
Rain Suit	____	Protective Coveralls	
Surgical Gloves	____	(Type _____)	____
Gloves (Vitrol, Buna	____	Rain Suit	____
Rubber, Polypropylene)	____	Butyl Apron	____
Outer Work Gloves	____	Surgical Gloves	____
Neoprene Outer Boots	____	Gloves (Type _____)	
Booties	____	Outer Work Gloves	____
Hard Hat	____	Neoprene Outer Boots	____
Acid Suit	____	Hard Hat	____
Hearing Protection	____	Hearing Protection	____
Leather Safety Boots	____	Leather Safety Boots	____
_____	____	_____	____
_____	____	_____	____
_____	____		

LEVEL D	
Ultra-Twin Respirator	____
(Available)	____
Cartridges (Type _____)	____
Escape Mask (Available)	____
Protective Coveralls	____
(Saranex or Chemorel)	____
Rain Suit	____
Neoprene Outer Boots	____
Booties	____
Work Gloves	____
Hard Hat	____
Safety Glasses, goggles or shield	____
Outer Gloves	____
Hearing Protection	____
Leather Safety Boots	____
_____	____
_____	____
_____	____

B. WELDING EQUIPMENT	
Helmet with face shield	____
Leathers	____
Blanket	____
Welder's Coveralls	____
_____	____
_____	____
_____	____

C. INSTRUMENTATION	
OVA	____
HNU (Probe_____)	____
O_2/Explosimeter	____
Magnetometer	____
Radiation Dosimeters	____
Light Meter	____
Sound Level Meter	____
WBGT Instrument	____
Radiation Meter (Type_____)	____
Pipe Locator	____
Wind Sock	____
Brunton Compass	____
Draeger Pump	____
Draeger Tubes (Type _____)	____
Smoke Tube	____
Folding Tables	____
Solar Shielding (canopy, umberella, etc.)	____
_____	____
_____	____

D. FIRST AID	
First Aid Kit	____
Stretcher	____
Portable Eye Wash	____
Fire Extinguisher	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____

E. DECON EQUIPMENT	
Wash Tubs	____
Buckets	____
Scrub Brushes	____
Sponges	____
Pressurized Sprayer	____
Detergent (Type_____)	____
Cover	____
Trash Boxes	____
Masking Tape	____
Duct Tape	____
Paper Towels	____
Folding Chairs	____
Step Ladders	____
Cloth Towels/Rags	____
_____	____
_____	____
_____	____
_____	____

F. SAMPLING EQUIPMENT	
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____

G. MISCELLANEOUS	
Tables	____
Camera	____
Film	____
AC/DC Generator	____
Two-way Radio	____
Cool Water with Cups	____
_____	____