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WHC-SD-EN-TI-296
Revision 0

Concrete Characterization for the 300 Area Solvent Evaporator Closure Site

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management



Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

Approved for Public Release



FEB 21 1995

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ENGINEERING DATA TRANSMITTAL 7513336.1839

Page 1 of 1

1. EDT No 610992

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) RCRA Unit Closures	4. Related EDT No.: NA
5. Proj./Prog./Dept./Div.: 01821	6. Cog. Engr.: A. L. Prignano	7. Purchase Order No.: NA
8. Originator Remarks: This report summarizes the sampling activities and the analytical results obtained during concrete characterization at the 300 Area Solvent Evaporator (300 ASE) closure site.		9. Equip./Component No.: NA
11. Receiver Remarks:		10. System/Bldg./Facility: NA
		12. Major Assm. Dwg. No.: NA
		13. Permit/Permit Application No.: NA
		14. Required Response Date: NA

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-EN-TI-296		0	Concrete Characterization for the 300 ASE closure site	NA	2	1	

16. KEY					
Approval Designator (F)		Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval	4. Review	1. Approved	4. Reviewed no/comment	
	2. Release	5. Post-Review	2. Approved w/comment	5. Reviewed w/comment	
	3. Information	6. Dist. (Receipt Acknow. Required)	3. Disapproved w/comment	6. Receipt acknowledged	

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G)	(H)	(J) Name (K) Signature (L) Date (M) MSIN				(G) (H)					
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1	1	Cog. Eng. A. L. Prignano	<i>[Signature]</i>	2/15/95	H6-23	OSTI (2)	<i>[Signature]</i>	2/15/95	H6-23	3	
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		QA									
		Safety									
		Env.									

18. Signature of EDT Originator <i>[Signature]</i> A. L. Prignano Date: 2/15/95	19. Authorized Representative for Receiving Organization <i>[Signature]</i> A. L. Prignano Date: 2/15/95	20. Cognizant Manager <i>[Signature]</i> F. A. Ruck, III Date: 2/15/95	21. DOE APPROVAL (if required) Ctrl. No. - <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments
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RELEASE AUTHORIZATION

Document Number: WHC-SD-EN-TI-296, Rev. 0

Document Title: Concrete Characterization for the 300 Area Solvent
Evaporator Closure Site

Release Date: 02/21/95

This document was reviewed following the
procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

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2/21/95

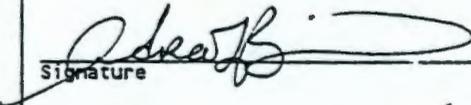
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2. Title Concrete Characterization for the 300 Area Solvent Evaporator Closure Site	3. Number WHC-SD-EN-TI-296	4. Rev No. 0
5. Key Words Concrete Characterization, 300 Area Solvent Evaporator, RCRA Closure	6. Author Name: A. L. Prignano  Signature Organization/Charge Code 01821 / K344E	

7. Abstract

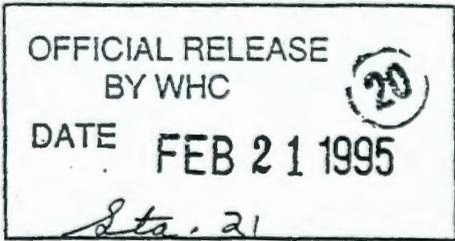
This report summarizes the sampling activities undertaken and the analytical results obtained in a concrete sampling and analyses study performed for the 300 Area Solvent Evaporator (300 ASE) closure site. The 300 ASE is identified as a Resource Conservation and Recovery Act (RCRA) treatment, storage, or disposal (TSD) unit that will be closed in accordance with the applicable laws and regulations.

No constituents of concern were found in concentrations indicating contamination of the concrete by 300 ASE operations.

8. RELEASE STAMP

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CONTENTS

1
2
3
4 1.0 INTRODUCTION 1
5 1.1 REGULATORY BACKGROUND 1
6 1.2 TREATMENT UNIT INFORMATION 2
7 1.2.1 Operation as a Treatment, Storage, and/or
8 Disposal Unit 2
9 1.2.2 Treatment Unit Location 2
10
11 2.0 SAMPLING 3
12 2.1 SAMPLE LOCATIONS 3
13 2.2 SAMPLE COLLECTION 3
14 2.3 FIELD QUALITY ASSURANCE AND QUALITY CONTROL 4
15
16 3.0 PERFORMANCE STANDARDS 5
17 3.1 BACKGROUND 5
18 3.2 HEALTH-BASED LEVELS 6
19
20 4.0 ANALYSES 6
21 4.1 ORGANIC ANALYSES 7
22 4.2 INORGANIC ANALYSES 8
23
24 5.0 DATA VALIDATION 8
25
26 6.0 DATA EVALUATION 9
27 6.1 ORGANICS 9
28 6.2 INORGANICS 10
29
30 7.0 CONCLUSIONS 11
31
32 8.0 REFERENCES 12
33

APPENDICES

34
35
36
37
38
39 A MAXIMA AND 95/95 REFERENCE THRESHOLD VALUES FOR
40 HANFORD SITE SOIL BACKGROUND APP A-i
41
42 B WASHINGTON ADMINISTRATIVE CODE MODEL TOXICS CONTROL ACT
43 CLEANUP STANDARDS APP B-i
44
45
46
47

1
2
3

FIGURES

4	1.	300 Area Solvent Evaporator Location	F1
5	2.	Layout of 300 Area Solvent Evaporator Closure Area and	
6		618-1 Burial Ground	F2
7	3.	Concrete Closure Area, Sampling Locations, and Sample Intervals . . .	F3
8	4.	Sample Analyses Form 94-126	F4
9			

10
11

TABLES

12			
13			
14			
15	1.	Routine and Quality Control Samples	T1
16	2.	300 Area Solvent Evaporator Concrete Results, Volatile	
17		Organics Analysis	T2
18	3.	300 Area Solvent Evaporator Concrete Results, Inorganic	
19		Analyses	T3
20			

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CONCRETE CHARACTERIZATION FOR THE 300 AREA SOLVENT EVAPORATOR CLOSURE SITE

1.0 INTRODUCTION

This data evaluation report summarizes the sampling activities undertaken and the analytical results obtained in a concrete sampling and analyses study performed at the 300 Area Solvent Evaporator (300 ASE) *Resource Conservation and Recovery Act* (RCRA) of 1976 closure site. The results of this study will be used in assessing contamination of the concrete, at the surface and at depth, due to 300 ASE and attendant barrel storage operations. The 300 ASE treated radioactively contaminated dangerous waste and, thus, was a mixed waste treatment unit.

There are no performance standards with which to evaluate concrete. Therefore, based on Washington State Department of Ecology (Ecology) guidance, for analytes found in concentrations above detection, soil clean-up levels were used. Of the analytes that showed concentration levels above sample quantitation limits, none indicate contamination.

A separate sampling event was completed on the soil portion of the 300 ASE closure site. The results from the soil study were reported separately (WHC 1994). Those results indicated that there was no contamination in the soil due to 300 ASE operations.

1.1 REGULATORY BACKGROUND

The U.S. Environmental Protection Agency (EPA) and Ecology jointly administer RCRA in the State of Washington. The EPA retains oversight authority while delegating to Ecology enforcement of a state program that is consistent with or more stringent than the corresponding federal program. The implementing regulations can be found in the *Washington Administrative Code* (WAC) 173-303, "Dangerous Waste Regulations," and Title 40, *Code of Federal Regulations* (CFR), Parts 260-270. Ecology's authorization includes administering closure of treatment, storage, and/or disposal (TSD) units.

The U.S. Department of Energy (DOE), the EPA, and Ecology have entered into an agreement called the *Hanford Federal Facility Agreement and Consent Order* [Tri-Party Agreement (Ecology et al. 1994)]. This agreement affects environmental regulation on the Hanford Facility. One purpose of this agreement is to ensure that environmental impacts associated with past activities are investigated and appropriate response actions taken, as necessary, to protect human health and the environment. The agreement seeks to promote this goal, in part, by identifying TSD units, identifying which units will undergo closure, and promoting compliance with relevant RCRA permitting requirements.

The 300 ASE is a RCRA TSD unit that will be closed in accordance with applicable laws and regulations. The 300 ASE is considered an interim status

1 tank treatment unit, which was located in the 300 Area of the Hanford Facility
2 from 1975 to 1986 and was managed for the DOE by the UNC Nuclear Industries,
3 Incorporated.
4
5

6 1.2 TREATMENT UNIT INFORMATION 7

8 The 300 ASE was a modified 'Brooks' load lugger (i.e., dumpster)
9 constructed of carbon steel with a hinged aluminum sheet metal canopy over the
10 top. The canopy (added in 1978) prevented entry of precipitation while
11 allowing airflow across the top of the solvent. The canopy was hinged so one
12 end could be lifted for pouring the contents of barrels into the cutout side
13 of the evaporator. The 300 ASE was about 244 centimeters long,
14 140 centimeters high, 173 centimeters wide across the canopy, and
15 135 centimeters long at the bottom. The 300 ASE had been placed in four known
16 locations in the southwest portion of the original 333 East Concrete Pad.
17

18 The 300 ASE closure area consists of two subareas: (1) a gravel area on
19 the south side of the 333 East Concrete Pad (approximately 3 meters wide by
20 15 meters long) and; (2) a concrete area about 15 meters long on the south
21 portion of the original 333 East Concrete Pad that extends about 10 meters to
22 the north and then tapers towards the original 10-centimeter-diameter pad
23 drain.
24
25

26 1.2.1 Operation as a Treatment, Storage, and/or Disposal Unit 27

28 The 300 ASE was installed in the spring of 1976. The 300 ASE was a
29 treatment tank (evaporator) that received barrel-transferred solvent waste
30 from degreasing operations associated with the N Reactor fuel manufacturing.
31 Degreaser solvent barrels were stored routinely (up to 1 year) within about
32 6 meters of the 300 ASE, until poured into the 300 ASE. Small quantities of
33 solvent were poured by hand directly into the 300 ASE. Typical 300 ASE waste
34 was composed of perchloroethylene (PCE), trichloroethylene (TCE),
35 1,1,1,-trichloromethane (TCA), ethyl acetate/bromine solution, paint shop
36 solvents, and possibly used oil. Small amounts of uranium and alloys of
37 copper, zirconium, and possibly zirconium/beryllium also were present in the
38 degreaser solvents as particulates. In 1985, the 300 ASE was phased out and
39 the unit was demolished in 1985 to 1986.
40
41

42 1.2.2 Treatment Unit Location 43

44 The location of the 300 ASE closure area and proximity to other 300 Area
45 structures are shown in Figures 1 and 2.
46

47 The 300 ASE and associated barrel storage areas were situated in the
48 northeast corner of the 300 Area near the 333 Building, the 334 Building, and
49 the 303-M Building, as shown in Figures 1 and 2. The site for the 300 ASE was
50 chosen for its proximity to the operations of N Reactor fuel manufacturing in
51 the 333 Building.
52

2.0 SAMPLING

Concrete coring was performed on April 27 and 28, 1994 following the sampling and analysis plan (SAP) provided in the 300 ASE Closure Plan (DOE-RL 1988). There were five concrete core locations. Samples were taken at various intervals from these cores. A total of 14 samples were collected (13 samples and 1 co-located duplicate).

2.1 SAMPLE LOCATIONS

The concrete core locations and the sampling intervals within each core are shown in Figure 3. There were five concrete core locations. Cores 1 and 2 were from the southwest part of the exposed 333 East Concrete Pad. Core 1 was located on a fracture in the original 333 East Concrete Pad. This fracture could have provided a pathway through the concrete. Also, this core location is near the last position of the 300 ASE. Core 2 was in line with the preexisting drain in the lowest point on the downgradient part of the exposed pad. Any ponding of fluid would be expected to occur at this location.

Cores 3, 4, and 5 were from a section of the 333 East Concrete that was later covered by a concrete overlay pad, the 333 Overlay Pad. The purpose of these cores is to determine the presence or absence of 300 ASE solvents that might have leaked from barrels onto the original 333 East Concrete Pad. Core 3 was located in the southeastern portion of the pad, near a known temporary storage site for barrels. Core 4 was approximately 0.3 meter south of the plugged drain to verify that any solvents originating from leaking barrels on the original 333 East Concrete Pad did not reach the drain. Core 5 was from an area outside of the closure area away from 300 ASE affected activities and the samples were collected for information only.

2.2 SAMPLE COLLECTION

The concrete cores were collected on April 27 and 28, 1994 with an electric water-cooled concrete coring tool. The SAP called for one core of 3.3-centimeter diameter to be taken at each coring location. However, after discussion with the laboratory, it was determined that this one core would not produce adequate sample material for analyses. Therefore, four cores of 10-centimeter diameter each were taken at each core location. The cores were adjacent to each other; in most cases the cores overlapped.

The following day, the cores were divided into samples as indicated in Figure 3. Samples consisted of the top, middle, and/or bottom portion of the cores. Each core was divided by placing it into a Ziploc* plastic bag and breaking it into pieces with a sledge hammer. Care was taken to ensure that the chips from the top, middle, and bottom sections of each core did not mix.

* Ziploc is a trademark of Dowbrands, Inc.

1 The concrete chips for volatile organics analysis (VOA) were collected and
2 placed into VOA vials as directed by 222-S Laboratory personnel. The samples
3 were transported to the 222-S Laboratory on May 2, 1994. The samples for
4 inorganic analyses were placed into individual plastic bags and shipped to
5 TMA/Norcal Laboratory in Richmond, California on May 13, 1994. All samples
6 were cooled to 4 °Celsius during storage and transportation to the offsite and
7 onsite laboratories. All samples were analyzed within holding times.

8
9 The sampling equipment was decontaminated in the 1706 KE Laboratory in
10 accordance with Environmental Investigation Instruction 5.5, "Laboratory
11 Cleaning of RCRA/CERCLA Sampling Equipment" (WHC 1988). There was no
12 equipment decontamination in the field.

13
14 Table 1 summarizes sample number, sample identification, and description.

15 16 17 2.3 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

18
19 Trip blanks are prepared when samples are taken for volatile organic
20 compounds (VOC). The trip blanks for this study consisted of clean sand that
21 was placed in a VOA vial in an uncontaminated area. The trip blank was
22 subjected to the same handling as other samples and was analyzed to identify
23 contamination from sample containers or transportation and storage procedures.
24 The trip blank was submitted to the 222-S Laboratory along with the VOA
25 samples.

26
27 Field blanks are identical to trip blanks except that the sample bottles
28 are opened in the field for the typical sampling time, closed, transported,
29 and submitted to the analytical laboratory with the field samples. Two field
30 blanks were collected at core location 1. The field blanks were opened during
31 the entire coring process. One field blank was submitted to each of the
32 laboratories, the 222-S Laboratory and the TMA/Norcal Laboratory, along with
33 the concrete samples.

34
35 Equipment blanks consist of clean sand poured over or through the
36 sampling device after decontamination, collected in a sample bottle, and
37 transported to the laboratory for analysis. Equipment blanks test for
38 residual contamination from decontamination of the sampling equipment. One
39 equipment blank was prepared for each laboratory, 222-S Laboratory and the
40 TMA/Norcal Laboratory, and was submitted along with the concrete samples. The
41 equipment blanks were contacted with sampling equipment that had been
42 decontaminated at the 1706 KE Facility and provided for this sampling effort.
43 The equipment blanks were collected after completing the sampling event.

44
45 Even though coring took place over two days, only one set of field and
46 equipment blanks was collected with this sampling effort. However, because
47 the purpose of the field blanks is to test for contamination because of
48 sampling activities and no evidence of such contamination was found during the
49 analytical process, the limited number of field blanks have no effect on data
50 interpretation.

3.0 PERFORMANCE STANDARDS

1
2
3
4 The performance standards, or action levels, for concrete defined in the
5 300 ASE Closure Plan (DOE-RL 1988), Section E-1.2.2, apply to VOC. For each
6 analyte, the primary performance standard is the limit of quantitation and the
7 alternate performance standard is a health-based level. The exceptions are
8 1,1-dichloroethane, for which background is the primary performance standard,
9 and petroleum naphtha, for which a health- or safety-based level is the
10 primary standard and a secondary standard is not listed.

11
12 Section E-1.4 of the 300 ASE Closure Plan (DOE-RL 1988) states that
13 inorganic constituents in concrete will be determined for information only.
14 The closure plan, Section E-1.2.2, states that only very small amounts of
15 inorganic constituents, if any, would have accompanied spills or leaks from
16 the 300 ASE, and organic waste constituents are the only reliable indicators
17 of contamination originating from the 300 ASE operations. Also, the data from
18 analysis of the raw waste indicates that the concentrations of the inorganic
19 analytes were undetectable in most cases. In addition, the 618-1 Burial
20 Ground is located immediately below the closure area. The 618-1 Burial Ground
21 was operated from 1944 to 1951 and received uranium and other metallic and
22 non-metallic materials.

23
24 This data evaluation report examines concrete with respect to limit of
25 quantitation for volatile organic constituents as a primary performance
26 standard. For the alternate performance standard, a health-based level, there
27 is no health-based performance standard specific to concrete. Ecology took
28 note of this in its document *Guidance for Clean Closure of Dangerous Waste*
29 *Facilities*, August 1994, Section 5.8.1, "Contained-in Policy" (Ecology 1994).
30 In this document, Ecology stated, "...there are no standards which are
31 routinely used to define contained-in concentrations for concrete," however,
32 the document stated that soil cleanup levels determined under the *Model Toxics*
33 *Control Act* (MTCA) (WAC 173-340) using residential exposure assumptions
34 represent conservative assessments of the potential exposure risks posed by
35 concrete.

36
37 Therefore, the specific analytes of concern at the 300 ASE were evaluated
38 with respect to MTCA Method B for soil for health-based level comparisons.
39 The MTCA Method B allows the use of background as a clean closure performance
40 standard. Therefore, soil background levels based on the Hanford Site
41 background (DOE-RL 1994) will be used as part of the health-based performance
42 standard for clean closure at the 300 ASE. Additional information on the
43 Hanford Site background cleanup levels is provided in Section 3.1 and in
44 Appendix A. Information on MTCA Method B health-based levels is provided in
45 Section 3.2 and in Appendix B.

3.1 BACKGROUND

46
47
48
49
50 Hanford Site background is a sitewide approach to determining background
51 levels and was developed as an alternative to local unit-based background
52 determinations at the Hanford Site. Using local backgrounds for each TSD unit

1 can lead to different definitions of contamination and different assessments
2 of remediation goals and risk for different TSD units. The Hanford Site
3 background approach is based on the premise that (1) all the waste management
4 units are part of a common sequence of vadose zone sediments, and (2) that the
5 basic characteristics that control the chemical composition of these sediments
6 are similar throughout the Hanford Site. The range of natural soil
7 compositions is used to establish a single set of soil background data. Use
8 of the Hanford Site background for environmental restoration on the Hanford
9 Site is technically preferable to the use of the unit-based background because
10 the former more accurately represents the natural variability in soil
11 composition, and also provides a more consistent, credible, and efficient
12 basis for evaluating contamination in soil.

13
14 The Hanford Site background threshold values are summarized in
15 Appendix A. The background threshold is the concentration level defining the
16 upper limit of the background population. Background thresholds are based on
17 a tolerance interval approach. The calculated threshold levels depend on the
18 confidence interval and percentile used in the calculation. The
19 WAC 173-340-708(11)(d) specifies a tolerance coefficient of 95 percent and a
20 coverage of 95 percent. The Hanford Site background threshold values are
21 based on this 95/95 confidence interval. Statistical calculations are
22 described in the source document (DOE-RL 1994a).

23 24 25 3.2 HEALTH-BASED LEVELS

26
27 The calculated health-based cleanup levels in this data evaluation report
28 are from the equations, risk levels, and exposure assumptions found in the
29 MTCA Method B [WAC 173-340-740 (3)(a)(iii)]. For noncarcinogens, the
30 principal variable is the oral reference dose. The oral reference dose is
31 defined as the level of daily human exposure at or below which no adverse
32 effect is expected to occur during a lifetime. For carcinogens, the cancer
33 slope factor is the basis for determining human health effects; it is a
34 measurement of the risk per unit dose. The oral reference dose and the cancer
35 slope factor are chemical-specific and are obtained from the *Integrated Risk*
36 *Information System* (IRIS) database (EPA 1995), if available. Secondary
37 sources for these toxicity values are from the EPA or Ecology. Health-based
38 thresholds, references, and calculations are reported in Appendix B.

39 40 41 42 4.0 ANALYSES

43
44
45 All samples were analyzed for the specified VOC; naphtha, bromide,
46 barium, beryllium, cadmium, copper, silver, zirconium, lead, and total uranium
47 (refer to Tables 2 and 3).

48
49 The concrete was analyzed for VOC at the 222-S Laboratory. The concrete
50 was prepared for VOA using a procedure developed at the 222-S Laboratory for
51 the 300 ASE closure (WHC 1994b).

1 For the analysis of inorganics, concrete samples were sent to an offsite
2 laboratory. The analytical methods prescribed for soils were used for the
3 analysis of inorganics in the concrete samples.

4
5 All data received were validated according to standard onsite procedures
6 (refer to Section 5.0).

9 4.1 ORGANIC ANALYSES

10
11 The concrete samples were analyzed for VOC at the 222-S Laboratory. The
12 concrete was prepared for VOA using a procedure developed at the
13 222-S Laboratory (WHC 1994b). The procedure uses sonification to desorb the
14 volatile organics from the concrete into high-purity water. The water is then
15 analyzed by gas chromatography/mass spectroscopy (GC/MS) using a procedure
16 based on EPA Method 8260. The sonification procedure followed by the GC/MS
17 analysis was found to have acceptable matrix spike recovery for most target
18 analytes when the spike was added to water that was in contact with the
19 concrete.

20
21 However, one part of the method development study shows that there might
22 not be complete extraction of the VOC from the concrete. When an attempt was
23 made to spike dry concrete, recovery was as low as 20 percent. However, it is
24 possible that the low recovery was because of problems in concrete preparation
25 and not because of poor VOC extraction. Even when spiking dry concrete, the
26 method could qualitatively detect the compounds when present a 1 part per
27 million, which is sufficient for the 300 ASE closure. With the detection
28 limits obtainable with the GC/MS method, concentrations of concern for the
29 300 ASE closure would be detectable using this method.

30
31 The VOC requested were perchloroethylene, 1,1,1-trichloroethane,
32 trichloroethylene, methyl ethyl ketone, ethyl acetate, dichloromethane
33 (methylene chloride), petroleum naphtha, 1,1-dichloroethylene,
34 trans-1,2-dichloroethylene, 1,1-dichloroethane, 1,2-dichloroethane, vinyl
35 chloride. Additional VOC were determined as part of this analysis. Those
36 results were transmitted separately as part of the complete data package
37 (DOE-RL 1994b). These additional analytes will not be evaluated in this
38 report. Results for the analytes of concern for the 300 ASE closure are
39 summarized in Table 2.

40
41 Ethyl acetate and petroleum naphtha are not standard target analytes and,
42 therefore, were treated as library search compounds. Unidentified compounds
43 in each sample (described in the following) underwent a computer-generated
44 library search and mass spectral interpretation. Neither compound was
45 detected in any sample.

46
47 The compound trans-1,2-dichloroethylene was determined as part of total
48 1,2-dichloroethylene. Note that a limitation on the sonification procedure is
49 that trichloroethylene and 1,1-dichloroethylene spike recoveries were high on
50 standard tests of the procedure. It is believed that 1,1,2,2-tetrachlorethane
51 and 1,1,2-trichloroethane react on the concrete surfaces to produce these two
52 compounds. In addition, vinyl acetate showed low spike recovery during these

1 tests of the procedure, which is thought to indicate decomposition of the
2 compound on the concrete surface. The inadequate recoveries, high for
3 trichloroethylene and 1,1-dichloroethylene and low for vinyl acetate, are
4 believed to be because of reactions of compounds on the concrete surfaces and
5 not because of the determinative procedure.
6
7

8 4.2 INORGANIC ANALYSES 9

10 Samples were analyzed for inorganic analytes by the TMA/Norcal Laboratory
11 in Richmond, California. The EPA Method 6010 (inductively coupled plasma -
12 atomic emission spectroscopy) was used to determine concentrations of barium,
13 beryllium, cadmium, copper, silver, and zirconium. Although additional metals
14 were determined, those metals were not identified in the closure plan and,
15 therefore, are not presented in this data evaluation report. Those results
16 were transmitted separately as part of the complete data package
17 (DOE-RL 1994b). Lead was determined using EPA Method 7421, atomic absorption,
18 furnace technique. Bromide was determined using EPA Method 300.0, ion
19 chromatography. Total uranium was determined using a laboratory-specific
20 procedure, EA-01C, laser-induced kinetic phosphorescence analysis. Results
21 for the inorganic analytes of concern for the 300 ASE closure are summarized
22 in Table 3.
23

24 As is stated in the 300 ASE Closure Plan, all inorganic results are
25 presented for information only. The 618-1 Burial Ground is located
26 approximately 1.2 meters below the 300 ASE closure area. The 618-1 Burial
27 Ground received uranium as well as other metallic and nonmetallic materials
28 during its operation and will be remediated as part of the 300-FF-2 operable
29 unit. No closure decisions will be based on the results reported for
30 inorganic analytes.
31
32
33

34 5.0 DATA VALIDATION 35 36

37 Data validation was performed by the Los Alamos Technical Associates
38 (LATA), in accordance with Level D as defined in *Data Validation Procedures*
39 *for Chemical Analysis* (WHC 1993b) and *Data Validation Procedures for*
40 *Radiochemical Analysis* (WHC 1993a). Level D validation includes evaluation
41 and qualification of results based on analytical holding times, method blank
42 results, matrix spikes and duplicates, surrogate recoveries, and analytical
43 method blanks.
44

45 The data validation procedure establishes the following qualifiers and
46 definitions to describe the associated data.
47

- 48 U Indicates the compound or analyte was analyzed for and not detected
49 in the sample. The value reported is the sample quantitation limit
50 corrected for sample dilution and moisture content.
51

- 1 UJ Indicates the compound or analyte was analyzed for and not detected
2 in the sample. Because of a quality control deficiency identified
3 during data validation, the associated quantitation limit is an
4 estimate.
5
- 6 J Indicates the compound or analyte was analyzed for and detected.
7 The associated concentration is an estimate, but the data are usable
8 for decision making purposes.
9
- 10 B For organic data, indicates that the analyte was detected in both
11 the sample and the associated blank. For inorganic data, indicates
12 that the analyte concentration is less than the contract required
13 detection limit, but greater than the instrument detection limits.
14

15 For both the VOA and the inorganic analyses, no major deficiencies were
16 identified during the data validation process that would have qualified the
17 data as unusable. All results were deemed valid. Minor deficiencies were
18 identified during both the VOA and inorganic analyses validation process that
19 resulted in the associated data being qualified as estimated (J/UJ) or in some
20 cases as not detected (U). The data qualifiers are noted in Tables 2 and 3.
21 Information on the data validation is provided in more detail in the data
22 validation package (DOE-RL 1994b).
23
24
25

26 6.0 DATA EVALUATION 27 28

29 The closure plan proposed comparing organic compounds in concrete to
30 concentrations that exceed limit of quantitation as the primary action level,
31 and concentrations exceeding health-based protection or safety levels as a
32 alternative action level. Constituents will be evaluated using this method.
33 Analytical results below the detection level will not be considered to signify
34 contamination. The samples will be considered clean with respect to that
35 analyte. The health-based protection levels will be based on MTCA Method B as
36 applied to soil. The risk of any analyte found in concentration greater than
37 this health-based level will need to be evaluated further.
38
39

40 6.1 ORGANICS 41

42 The results for the organics analyses are summarized in Table 2. Results
43 below the limit of quantitation are not considered to signify contamination.
44

45 The only analyte of concern noted in the organics data was
46 perchloroethylene at 0.10 part per billion in sample number BOBQR1. This
47 result was estimated by the laboratory because it is below the method
48 detection limit. Sample BOBQR1 is from the top of the underlying 333 East Pad
49 in Core 4. Only three other organics results were noted in the data. Toluene
50 and total xylenes also were reported for sample BOBQR1 at concentrations of
51 0.60 part per billion and 0.10 part per billion, respectively. The only other
52 organic compound reported was acetone at 39 parts per billion in sample

1 BOBQQ8. This sample is from the top portion of Core 2. The acetone value was
2 qualified as B by the laboratory, indicating that acetone also was found in
3 the blank.
4

5 Of the four organic compounds, only one, perchloroethylene, is listed as
6 a constituent of concern in the 300 ASE Closure Plan. The health-based
7 cleanup levels for this compound are 91 parts per million. A 20-percent
8 efficiency for the sonification procedure used in the analyses would result in
9 a total concentration in the sample of concrete of 0.5 part per billion
10 perchloroethylene. This is well below the calculated health-based level and
11 therefore is not considered to be of concern.
12
13

14 6.2 INORGANICS

15
16 The 333 East Pad is known to be contaminated with inorganic constituents
17 from the past-practice activities [as described in Chapter 1.0, Section 1.1.2
18 of the 300 ASE Closure Plan (DOE-RL 1988)] in larger amounts than any amount
19 that could have come from the 300 ASE operations. Therefore, organic
20 constituents, which made up nearly 100 percent of the RCRA waste are regarded
21 as the only reliable indicators of 300 ASE-derived contamination because:
22 (1) it would not be possible to discriminate 300 ASE-derived inorganic
23 contamination from past-practice derived contamination and (2) any detectable
24 inorganic contamination or contamination patterns are more likely attributable
25 to past-practice activities.
26

27 As stated in the closure plan, the concentrations of the inorganic
28 constituents (zirconium, beryllium, bromine, uranium, copper, barium, cadmium,
29 lead, and silver) were determined for information only and not for RCRA
30 closure decisionmaking purposes. The concentrations found are listed in
31 Table 3.
32

33 Note that all beryllium, lead, and silver results were at levels below
34 the Hanford Site Background. Barium, cadmium, and copper are at
35 concentrations below the MTCA Method B. There is no MTCA Method B value for
36 zirconium. However, of the 14 samples analyzed, only one sample showed a
37 zirconium value above the Hanford Site background of 53 parts per million.
38 This zirconium value, 90.8 parts per million, was found in Core 4 at the top
39 of the underlying 333 East Pad. Dragun (1988) reports native soil
40 concentrations of 60 to 2,000 parts per million zirconium. The value reported
41 for Core 4 is at the low end of this range.
42

43 Bromide and uranium do not have Hanford Site background or MTCA Method B
44 performance standards. However, all of the bromide values were below the
45 instrument detection limit.
46

47 According to Dragun (1988), the typical range of uranium concentration in
48 native soil is 0.9 to 9.0 micrograms/gram. Dragun also notes an extreme limit
49 for uranium as less than 250 micrograms/gram. The concentrations at the
50 300 ASE range from 0.20 to 16 micrograms/grams that are well below this
51 extreme limit. In addition, uranium concentrations, like all inorganic
52 constituents in concrete, are not being used for closure decisions.

7.0 CONCLUSIONS

1
2
3
4 Only organic compounds were constituents of concern for RCRA activities
5 during the 300 ASE operations. Because there are no performance standards for
6 organic compounds in concrete, the concentrations found for constituents of
7 concern in the concrete analyses were evaluated by comparison to soil cleanup
8 levels. For each analyte found above the limit of quantitation, first the
9 analyte concentration was compared with the Hanford Site background level and,
10 if this background was exceeded, the concentration was compared with MTCA
11 Method B. Of the analytes that showed concentration levels above the limit of
12 quantitation, none indicate contamination.

13
14 Only four organic compounds were detected in any of the core samples.
15 Three were detected from the top of the underlying 333 East Pad at Core 4.
16 The other, acetone, was found in the top of Core 2. Of the four constituents,
17 only one, perchloroethylene, is listed as a constituent of concern in the
18 300 ASE Closure Plan. Even if assuming a 20-percent extraction efficiency for
19 the analytical method, the compound was found in a concentration below the
20 MTCA Method B residential limits.

21
22 Selected inorganic constituents were determined to provide information
23 for the 300-FF-2 operable unit. For inorganics, zirconium was found in one
24 sample in a concentration above Hanford Site background. There is no MTCA B
25 cleanup level for zirconium. However, this concentration is found to be at
26 the low end of native concentrations of zirconium in soils.

27
28 There is no Hanford Site background or MTCA Method B performance standard
29 for uranium. Some uranium concentrations were above the typical concentration
30 range reported by Dragun (1988) for native soils. However, all uranium
31 concentrations were below the extreme limit noted by Dragun.

32
33 In addition, all inorganic concentrations are being determined for
34 information only because of the presence of the 618-1 Burial Ground
35 immediately below the 300 ASE closure site. The 619-1 Burial Ground received
36 uranium and other metallic and nonmetallic material during its operation and
37 will be remediated as part of the 300-FF-2 Operable Unit.

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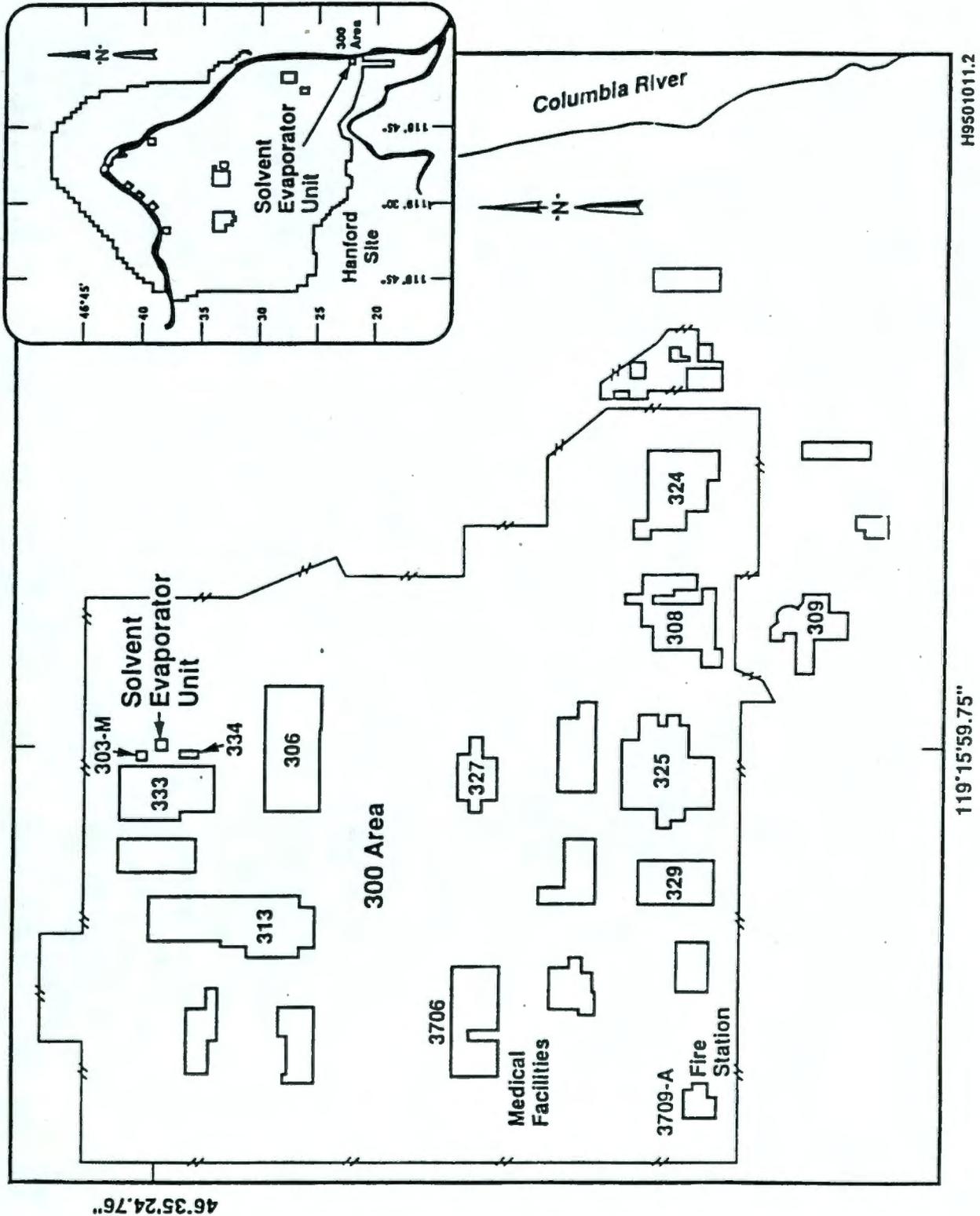
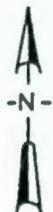
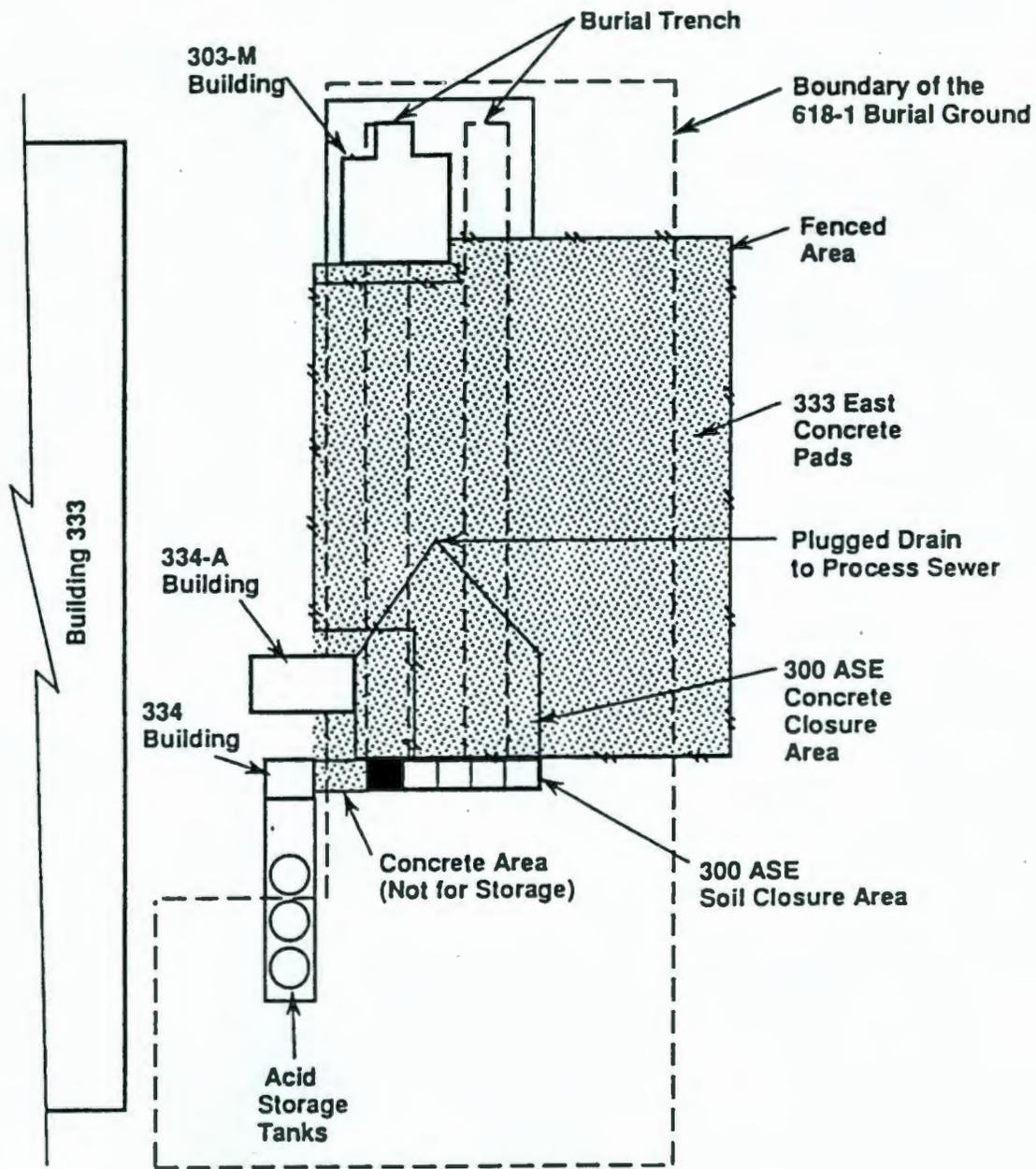


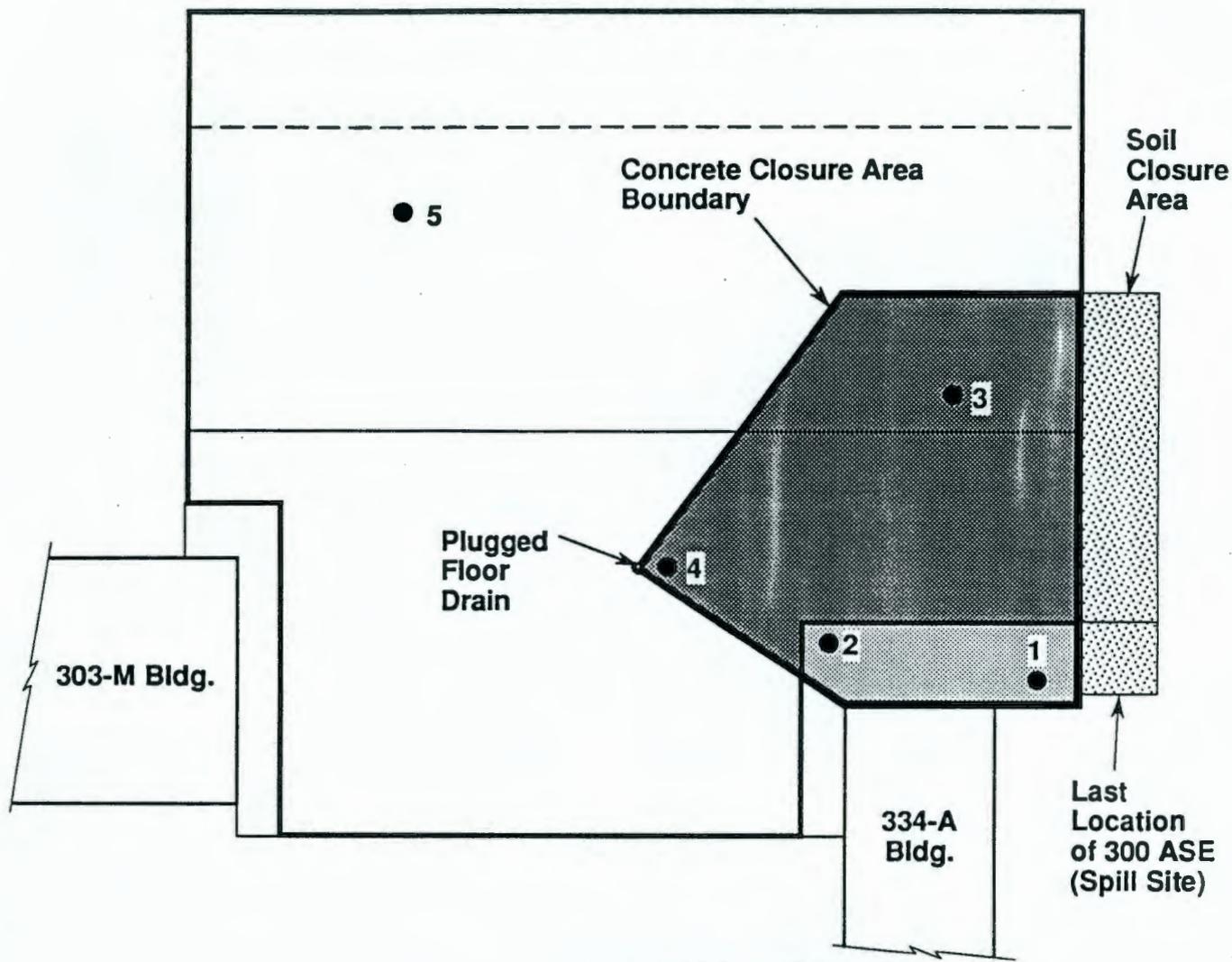
Figure 1. 300 Area Solvent Evaporator Location.



■ Last Location of 300 ASE and Spill Site

(2-5-90)
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Figure 2. Layout of 300 Area Solvent Evaporator Closure Area and 618-1 Burial Ground.



- 5 Core Reference Number
- Core Sample Locations
- x Vertical Position of Sample Within Core

x	BOBQQ2	x	BOBQQ6
x	BOBQQ3		
x	BOBQQ4		
x	BOBQQ5	x	BOBQQ7

Not To Scale

Core No. 1 Core No. 2

		x	BOBQR0	x	BOBQR3
x	BOBQQ8	x	BOBQR1	x	BOBQR4
x	BOBQQ9	x	BOBQR2	x	BOBQR5

Core No. 3 Core No. 4 Core No. 5

79001095.6a

Figure 3. Concrete Closure Area, Sampling Locations, and Sample Intervals.

OFFICE OF SAMPLE MANAGEMENT FIELD SAMPLING REQUIREMENTS				94-126 SAF Number
Requirements are for TMA				<i>WFS 5/19/93</i>
REV 1		05/09/93		
PARAMETER/ ANALYSIS	ANALYTICAL METHODS	CONTAINER ¹ / VOLUME	PRESERVATION	HOLDING TIME
1. ICP Metals - TAL - To Include Zirconium	6010	P/G 250 mL	Cool 4°C	6 Months
AA Metals - Lead	7421			
2. IC Anions - Br	EPA 300.0	P/G 125 mL	Cool 4°C	28 Days
3. Total Uranium	EA-01C	P/G 1 g	None	6 Months
4. Total α, Total β, GEA	Lab Specific	G or P small vial (at least 22 mL)	None	ASAP

Requirements are for TMA Concrete Samples				94-126 SAF Number
REV 1		05/09/93		
PARAMETER/ ANALYSIS	ANALYTICAL METHODS	CONTAINER ¹ / VOLUME	PRESERVATION	HOLDING TIME
1. ICP Metals - TAL - To Include Zirconium	6010	P 1 kg	Cool 4°C	6 Months
AA Metals - Lead	7421			6 Months
IC Anions - Br	EPA 300.0			28 Days
Total Uranium	EA-01C			6 Months
2. Total α, Total β, GEA	Lab Specific	G or P small vial (at least 22 mL)	None	ASAP

- ¹ Container Types:
- | | |
|--|--|
| P = Plastic (Polyethylene) | PW = Plastic (Polyethylene)/wide mouth jar |
| G = Glass | PP = Polypropylene |
| Gs = Glass w/septum cap | AG = Amber Glass |
| Gw = Glass/wide mouth jar | T = Fluorocarbon Resins |
| Gs = Glass w/septum cap --
No head space in container | AGs = Amber Glass w/septum cap |

² 7 Days for Extraction, 60 Days for Analysis

Note — Concrete chip sample size is too large to fit in sample bottles. Samples will be shipped in plastic zip-lock bags.

Figure 4. Sample Analyses Form 94-126.

Table 1. Routine and Quality Control Samples. (sheet 1 of 2)

Sample number	Sample identification*	Description **
BOBQQ1	Field blank (silica sand)	Color: White Texture: Fine
BOBQQ2	Core 1 Top	Gravel Color: Grey Texture: Medium
BOBQQ3	Core 1 Top, Duplicate	Gravel Color: Grey Texture: Medium
BOBQQ4	Core 1 Middle	Gravel Color: Grey Texture: Medium
BOBQQ5	Core 1 Bottom	Gravel Color: Grey Texture: Medium
BOBQQ6	Core 2 Top	Gravel Color: Grey Texture: Medium
BOBQQ7	Core 2 Bottom	Gravel Color: Grey Texture: Medium
BOBQQ8	Core 3 Top (of underlying 333 East Pad)	Gravel Color: Grey Texture: Medium
BOBQQ9	Core 3 Bottom (of underlying 333 East Pad)	Gravel Color: Grey Texture: Medium
BOBQR0	Core 4 Middle (of overlay pad)	Gravel Color: Grey Texture: Medium
BOBQR1	Core 4 Top (of underlying 333 East Pad)	Gravel Color: Grey Texture: Medium
BOBQR2	Core 4 Bottom (of underlying 333 East Pad)	Gravel Color: Grey Texture: Medium
BOBQR3	Core 5 Middle (of overly pad)	Gravel Color: Grey Texture: Medium
BOBQR4	Core 5 Top (of underlying 333 East Pad)	Gravel Color: Grey Texture: Medium
BOBQR5	Core 5 Bottom (of underlying 333 East Pad)	Gravel Color: Grey Texture: Medium

Table 1. Routine and Quality Control Samples. (sheet 2 of 2)

Sample number	Sample identification*	Description **
BOBQR6	Trip blank (silica sand)	
BOBQR7	Equipment blank (silica sand)	Color: White Texture: Fine

NOTE: All samples submitted to both 222-S and TMA/Norcal laboratories; except BOBQR6, trip blank, submitted to 222-S Laboratory only.

* Sample locations and intervals are further described in Figure 3.

** Sample description as given by TMA/Norcal Laboratory.

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Table 2. 300 Area Solvent Evaporator Concrete Results, Volatile Organics Analysis. (sheet 1 of 2)

Sample number	Perchloroethylene $\mu\text{g}/\text{kg}$	1,1,1-trichloroethane $\mu\text{g}/\text{kg}$	Trichloroethylene $\mu\text{g}/\text{kg}$	Methyl ethyl ketone $\mu\text{g}/\text{kg}$	Ethyl acetate $\mu\text{g}/\text{kg}$	Dichloromethane $\mu\text{g}/\text{kg}$
BOBQQ1	11.0 U	11.0 U	11.0 U	11.0 U	ND	11.0 U
BOBQQ2	19.0 U	19.0 U	19.0 U	19.0 U	ND	19.0 U
BOBQQ3	17.0 U	17.0 U	17.0 U	17.0 U	ND	17.0 U
BOBQQ4	17.0 U	17.0 U	17.0 U	17.0 U	ND	17.0 U
BOBQQ5	14.0 U	14.0 U	14.0 U	14.0 U	ND	14.0 U
BOBQQ6	17.0 U	17.0 U	17.0 U	17.0 U	ND	17.0 U
BOBQQ7	14.0 U	14.0 U	14.0 U	14.0 U	ND	14.0 U
BOBQQ8	16.0 U	16.0 U	16.0 U	16.0 U	ND	16.0 U
BOBQQ9	13.0 U	13.0 U	13.0 U	13.0 U	ND	13.0 U
BOBQR0	15.0 U	15.0 U	15.0 U	15.0 U	ND	15.0 U
BOBQR1	0.10 J	11.0 U	11.0 U	11.0 U	ND	11.0 U
BOBQR2	13.0 U	13.0 U	13.0 U	13.0 U	ND	13.0 U
BOBQR3	13.0 U	13.0 U	13.0 U	13.0 U	ND	13.0 U
BOBQR4	18.0 U	18.0 U	18.0 U	18.0 U	ND	18.0 U
BOBQR5	15.0 UJ	15.0 UJ	15.0 UJ	15.0 UJ	ND	15.0 UJ
BOBQR6	11.0 U	11.0 U	11.0 U	11.0 U	ND	11.0 U
BOBQR7	9.0	9.0 U	9.0 U	9.0 U	ND	9.0 U
MTCA*	19.6	7200	91.0	48000	72000	130

T2.1

WHC-SD-EN-TI-296, Rev. 0
9513336.1864

Table 2. 300 Area Solvent Evaporator Concrete Results, Volatile Organics Analysis. (sheet 2 of 2)

Sample number	Petroleum naphtha $\mu\text{g}/\text{kg}$	1,1-Dichloroethylene $\mu\text{g}/\text{kg}$	1,2-dichloroethylene $\mu\text{g}/\text{kg}$	1,1-Dichloroethane $\mu\text{g}/\text{kg}$	1,2-Dichloroethane $\mu\text{g}/\text{kg}$	Vinyl chloride $\mu\text{g}/\text{kg}$
BOBQQ1	ND	11.0 U	11.0 U	11.0 U	11.0 U	11.0 U
BOBQQ2	ND	19.0 U	19.0 U	19.0 U	19.0 U	19.0 U
BOBQQ3	ND	17.0 U	17.0 U	17.0 U	17.0 U	17.0 U
BOBQQ4	ND	17.0 U	17.0 U	17.0 U	17.0 U	17.0 U
BOBQQ5	ND	14.0 U	14.0 U	14.0 U	14.0 U	14.0 U
BOBQQ6	ND	17.0 U	17.0 U	17.0 U	17.0 U	17.0 U
BOBQQ7	ND	14.0 U	14.0 U	14.0 U	14.0 U	14.0 U
BOBQQ8	ND	16.0 U	16.0 U	16.0 U	16.0 U	16.0 U
BOBQQ9	ND	13.0 U	13.0 U	13.0 U	13.0 U	13.0 U
BOBQR0	ND	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
BOBQR1	ND	11.0 U	11.0 U	11.0 U	11.0 U	11.0 U
BOBQR2	ND	13.0 U	13.0 U	13.0 U	13.0 U	13.0 U
BOBQR3	ND	13.0 U	13.0 U	13.0 U	13.0 U	13.0 U
BOBQR4	ND	18.0 U	18.0 U	18.0 U	18.0 U	18.0 U
BOBQR5	ND	15.0 UJ	15.0 UJ	15.0 UJ	15.0 U	15.0 UJ
BOBQR6	ND	11.0 U	11.0 U	11.0 U	11.0 U	11.0 U
BOBQR7	ND	9.0 U		9.0 U	9.0 U	9.0 U
MTCA ^a	NA	1.7	1600 ^b	8000	11.0	0.53

$\mu\text{g}/\text{kg}$ = microgram/kilogram (parts per billion).

Note: Qualifiers are defined in Section 5.0, Data Validation. U indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the limit of quantitation corrected for sample dilution and moisture content.

Analytical methods are described in Section 4.1.

NA = not available.

ND = not detected as a library search compound.

^a WAC-173-340, 1992, "The Model Toxics Control Act Cleanup Regulations", Washington Administrative Code, as amended (Appendix B).

^b MTCA value is for trans-1,2-dichloroethylene.

Table 3. 300 Area Solvent Evaporator Concrete Results, Inorganic Analyses.

Sample number	Bromide mg/kg	Barium mg/kg	Beryllium mg/kg	Cadmium mg/kg	Copper mg/kg	Lead mg/kg	Silver mg/kg	Zirconium mg/kg	Total Uranium $\mu\text{g/g}$
BOBQQ1	2.5 U	0.40 UJ	0.04 U	0.11 UJ	0.59 UJ	0.44 J	0.35 U	8.6 UJ	0.20
BOBQQ2	8.7 U	244 J	0.36 B	1.0 J	17.4 J	2.4 J	0.36 U	25.7 J	5.8
BOBQQ3	9.4 U	256 J	0.39 B	0.11 UJ	25.9 J	3.5 J	0.36 U	29.3 J	6.1
BOBQQ4	9.3 U	217 J	0.33 B	0.55 UJ	24.2 J	5.1 J	0.38 U	26.0 J	4.4
BOBQQ5	9.0 U	224 J	0.39 B	0.30 UJ	18.4 J	3.5 J	0.38 U	25.5 J	2.2
BOBQQ6	9.5 U	212 J	0.33 B	0.40 UJ	60.2 J	5.0 J	0.37 U	21.6 J	16
BOBQQ7	8.5 U	246 J	0.36 B	0.15 UJ	19.8 J	3.4 J	0.38 U	23.0 J	2.2
BOBQQ8	9.7 U	177 J	0.40 B	0.16 UJ	16.2 J	3.3 J	0.39 U	22.5 J	3.5
BOBQQ9	9.7 U	163 J	0.35 B	0.11 UJ	16.2 J	3.4 J	0.36 U	26.2 J	16
BOBQR0	9.7 U	117 J	0.32 B	0.12 UJ	33.2 J	3.9 J	0.39 U	18.3 J	1.9
BOBQR1	9.7 U	165 J	0.34 B	0.11 UJ	42.6 J	4.8 J	0.51 B	90.8 J	8.0
BOBQR2	9.6 U	151 J	0.35 B	0.12 UJ	38.3 J	3.2 J	0.38 U	43.4 J	8.5
BOBQR3	8.7 U	200 J	0.30 B	0.14 UJ	15.9 J	3.2 J	0.37 U	12.9 J	1.3
BOBQR4	9.4 U	203 J	0.33 B	1.1 J	29.3 J	3.1 J	0.37 U	18.7 J	5.9
BOBQR5	9.3 U	227 J	0.31 B	0.12 UJ	15.1 J	4.1 J	0.38 U	22.3 J	9.7
BOBQR7	2.5 U	0.45 UJ	0.04 U	0.11 UJ	0.57 UJ	0.46 UJ	0.36 U	8.7 UJ	0.16
Hanford Site Background ^a	NA	175	1.8	LOQ ^b =0.79	30	14.9	2.1	53	NA
MTCA ^c	NA	5600	0.23	40	3000	250	400	NA	NA
Common Ranges in Soils ^d		100-3000	0.1 - 40	0.1 - 7	2 - 100	2 - 200	0.01 - 5	60 - 2000	0.9 - 9, extreme 250

mg/kg = milligrams/kilogram (parts per million).

$\mu\text{g/g}$ = microgram/gram (parts per million).

NOTE: Qualifiers are defined in Section 5.0, Data Validation. U indicates the compound or analyte was analyzed and not detected in the sample. The value reported is the limit of quantitation.

NA = not available.

^a Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes, DOE/RL-92-24, Rev. 2 (Appendix A).

^b LOQ = limit of quantitation.

^c WAC-173-340, 1992, "The Model Toxics Control Act Cleanup Regulations", Washington Administrative Code, as amended (Appendix B). All values listed are from MTCA Method B soil, except for lead, which is from MTCA Method A soil table.

^d Adapted from Dragun, James, The Soil Chemistry of Hazardous Materials, 1988, The Hazardous Materials Research Institute, Silver Springs, Maryland.

APPENDICES

CONTENTS

1	
2	
3	
4	
5	
6	
7	A
8	
9	
10	B

MAXIMA AND 95/95 REFERENCE THRESHOLD VALUES FOR HANFORD SITE SOIL BACKGROUND

MODEL TOXICS CONTROL ACT CLEANUP STANDARDS FOR SPECIFIC ANALYTES

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APPENDIX A

MAXIMA AND 95/95 REFERENCE THRESHOLD VALUES FOR HANFORD SITE
SOIL BACKGROUND

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APPENDIX A

MAXIMA AND 95/95 REFERENCE THRESHOLDS FOR HANFORD SITE SOIL BACKGROUND*

Analyte	Limit of detection	Limit of quantitation	95/95 threshold (mg/kg)	Maximum concentration (mg/kg)	Sample with maximum concentration#
Barium	0.87	2.7	175	480	VOLCANIC ASH
Beryllium	NA	NA	1.8	10	VOLCANIC ASH
Cadmium	0.24	0.79	NC	11	VOLCANIC ASH
Copper	2.1	6.2	30	61	VOLCANIC ASH
Lead	NA	NA	14.9	74.1	TOPSOIL
Silver	2.1	4.5	2.1	14.6	RANDOM SAMPLE 6
Zirconium	NA	NA	53	84.8	RANDOM SAMPLE 10

mg/kg = milligrams/kilogram.

NA = Not available.

NC = Not calculated.

* DOE-RL, 1994, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, DOE/RL-92-24, Rev. 2.

The 95/95 thresholds values represent the upper 95% confidence interval of the 95th percentile of the distribution. Information on the statistics is provided in the source document.

= For further information refer to source document (DOE-RL 1994).

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WHC-SD-EN-TI-296, Rev. 0

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APPENDIX B

WASHINGTON ADMINISTRATIVE CODE
MODEL TOXICS CONTROL ACT
CLEANUP STANDARDS

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WHC-SD-EN-TI-296, Rev. 0

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APPENDIX B

MODEL TOXICS CONTROL ACT* CLEANUP STANDARDS FOR SPECIFIC ANALYTES

Compound	RfD ^a	Cleanup level ^b (mg/kg)	CPF ^a	Cleanup level ^b (mg/kg)	Carcinogenic class ^a
Perchloroethylene (Tetrachloroethylene)	0.01	800	0.052 ^c	19	NA
1,1,1-Trichloroethane	0.09 ^e	7200	NA	NA	D
Trichloroethylene	0.006 ^c	480	0.011 ^e	91	B2
Methyl Ethyl Ketone	0.61	48000	NA	NA	D
Ethyl Acetate	0.91	72000	NA	NA	NA
Dichloromethane	0.06	4800	0.0075	130	B2
Petroleum Naptha	NA	NA	NA	NA	NA
1,1-Dichloroethylene	0.009	720	0.6	1.7	C
trans-1,2-Dichlorethylene	0.02	1600	NA	NA	NA
1,1-Dichlorethane	0.1 ^e	8000	NA	NA	NA
1,2-Dichloroethane	NA	NA	0.091 ^e	11	B2
Vinyl Chloride	NA	NA	1.9 ^f	0.53	NA
Barium	0.07	5600	NA	NA	NA
Beryllium	0.005	400	4.3	0.23	B2
Cadmium	0.001	40	NA	NA	B1
Copper	0.04	3000	NA	NA	D
Lead	NA	250 ^d	NA	NA	B2
Silver	0.005	400	NA	NA	D
Zirconium	NA	NA	NA	NA	NA

1 NA = not available.

2
3 * WAC 173-340, 1992.

- 4
5 ^a Except where noted, information is taken from the Integrated Risk
6 Information System (IRIS) database, U.S. Environmental Protection
7 Agency, Washington, D.C. 1994.
8 RfD = Reference dose
9 CPF = Carcinogenic potency factor (cancer slope factor)
10 A = Human carcinogen.
11 B = Probable human carcinogen:
12 B1 indicates limited human evidence
13 B2 indicates sufficient evidence in animals and inadequate or no
14 evidence in humans.
15 D = Not classifiable as to human carcinogenicity.

- 16
17 ^b MTCA Method B Soil Cleanup Levels Calculations:
18 for noncarcinogens:

$$\text{Soil Cleanup Level, mg/Kg,} = \frac{\text{RFD} \times \text{ABW} \times \text{UCF} \times \text{HQ}}{\text{SIR} \times \text{AB1} \times \text{FOC}}$$

19 for carcinogens:

$$\text{Soil Cleanup Level, mg/Kg,} = \frac{\text{RISK} \times \text{ABW} \times \text{LIFE} \times \text{UCF}}{\text{CPF} \times \text{SIR} \times \text{AB1} \times \text{DUR} \times \text{FOC}}$$

20 where:

- 21
22 RfD = Reference dose (mg/kg/day)
23 CPF = Carcinogenic potency factor (Cancer Slope Factor) (kg-day/mg)
24 ABW = Average body weight (16 kg)
25 UCF = Unit conversion factor (1.0×10^6 mg/kg)
26 SIR = Soil ingestion rate (200 mg/day)
27 AB1 = Gastrointestinal adsorption rate (1.0)
28 FOC = Frequency of contact (1.0)
29 HQ = Hazard quotient (1)
30 RISK = Acceptable cancer risk (1.0×10^{-6})
31 LIFE = Lifetime (75 years)
32 DUR = Duration of exposure (6 years).
33

- 34 ^c Values from the Superfund Technical Support Center, Environmental
35 Protection Agency, Environmental Criteria Assessment Office,
36 Washington, D.C.

- 37
38 ^d Cleanup Level is from MTCA Method A table. No data are available for
39 calculation of MTCA Method B Level.

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41 ^e Federal Register, Volume 55, Number 145, July 1990, "Proposed Rules".
42

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