START

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U.S. Environmental Protection Agency
Region 10
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Mr. David B. Jansen, P.E.
Hanford Project Manager
State of Washington
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Dear Messrs. Day and Jansen:

THE 4843 ALKALI METAL STORAGE FACILITY CLOSURE PLAN, REVISION 0, NOTICE OF DEFICIENCY RESPONSE TABLE (S-4-1)

The 4843 Alkali Metal Storage Facility Closure Plan, Revision 0 Notice of Deficiency (NOD) Response Table is submitted by the U.S. Department of Energy, Richland Field Office (RL) and the Westinghouse Hanford Company for approval by the State of Washington Department of Ecology (Ecology). Submittal of this response fulfills the March 17, 1993, commitment date.

The NOD response table is in reply to the NOD comments resulting from Ecology's review of Revision 0 of the closure plan (Ecology letter dated December 9, 1992).

Copies of the document will be distributed to representatives of your respective organizations as follows:

D. L. Duncan, U.S. Environmental Protection Agency (2 copies)

D. C. Nylander, Ecology (1 copy)

J. J. Wallace, Ecology (4 copies)

Should you have any questions, please contact me or Mr. R. N. Krekel of RL on (509) 376-4264.

Sincerely,

James D. Bauer, Program Manager
Office of Environmental Assurance,
Permits, and Policy

EAP:RNK

R. E. Lerch, Deputy Director
Restoration and Remediation
Westinghouse Hanford Company

Enclosure:
The 4843 Alkali Metal Storage Facility Closure Plan NOD Response Table

cc w/encl:
Administrative Record (S-4-1)
D. L. Duncan, EPA
D. C. Nylander, Ecology
F. A. Ruck, WHC
J. J. Wallace, Ecology

cc w/o encl:
R. E. Lerch

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No.	Comments/Response	Concurrence
1.	General. The level of detail in this closure plan is inadequate. The closure plan must contain enough detail to allow the evaluation of whether: 1. the activities described in the plan satisfy the regulations, or 2. the conditions assumed in the plan adequately reflect the true conditions of the facility. **RL/WHC RESPONSE: Comment is too general to address. The level of detail in this closure plan is similar to the level provided in other closure plans which are nearing final approval by Ecology.**	
2.	General. According to section 4.0, Waste Characteristics, most of the waste is mixed (containing both hazardous and radioactive components). But the plan makes few references to safety protocol or cleanup procedures for the mixed waste. Control of health and safety hazards associated with the radioactive component of the waste are inadequately addressed. It is not acceptable to omit the management of the radioactive constituents from the closure plan. Revise text accordingly to incorporate measures that deal with the radioactive component of the mixed waste. **RL/WHC RESPONSE: The purpose of the closure plan is to address the dangerous wastes and the dangerous waste components of radioactive mixed waste. For the 4843 Alkali Metal Storage Facility (AMSF), the radioactive component of the radioactive mixed waste is addressed on an "information only" basis.** **The radioactive component of this waste is derived from special nuclear material (SNM). The Atomic Energy Act of 1954, as amended, is the legislation that governs this type of radioactive material.**	

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The purpose of the radiation zone in this unit is for radiation protection from the storage of radioactive mixed waste. The use of sealed, containerized storage units has prevented radioactive material from entering the environment and from creating areas of surface contamination. The routine monthly radiation surveys show no evidence of fixed or smearable surface contamination. The lack of surface contamination indicates radioactive materials have not entered the environment.

The primary focus of this closure plan is to provide sufficient information to support clean closure relative to dangerous waste. Worker safety is addressed in Section 7.3.10 "Site Safety." The information provided relative to past radioactive mixed waste storage and potential radioactive contamination is considered sufficient to support this objective.

3. <u>General.</u> All facilities are likely to have some soil contamination as a result of routine drips and spills which must be removed. The closure plan must describe the procedures and criteria to be used for evaluating the extent of soil contamination, and demonstrate that the level of decontamination will satisfy the closure performance standard.

The following information should be included in the closure plan:

1. the location for background soil measurements, etc., and
2. the sampling and analysis methods to be used to evaluate the extent of contamination.

The closure plan must describe how contaminated soils will be managed at closure. The plan should include the following:

1. an estimate of the volume of contaminated soil, and
2. a description of potential treatment or disposal techniques.

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	RL/WHC RESPONSE: It is inappropriate to assume that soil contamination is a given result of operations at this unit. This is especially true in light of existing documentation to support that no drips or spills occurred which would give cause to instigate a soil sampling program. The waste stored in the 4843 AMSF is reactive, ignitable solids (metallic sodium, metallic lithium). The waste is packaged in an inert gas (such as argon) in air-tight containers to prevent fires. This packaging was done prior to shipping the waste to the 4843 AMSF. While at the 4843 AMSF, the waste containers remain sealed until removed. Because of the use of sealed containers for waste storage, "routine" drips and spills did not occur. There are no free liquids associated with the waste stored in the 4843 AMSF. The waste is stored in a dry form. (The oil mentioned in Appendix C is absorbed oil; see response to Comment No. 4.) The metallic sodium and lithium wastes (both solids) react with moisture in the air to form solid carbonates/solid hydroxides. The equilibrium between the solid carbonates and solid hydroxides depend upon the moisture content in the air. Free liquids are not required to either generate the carbonates/hydroxides, nor are they needed for the carbonate/hydroxide equilibrium reaction. Only two spills have occurred during waste storage in the 4843 AMSF. Both spills consisted of solid radioactive mixed waste and involved small quantities of material. Each spill was immediately cleaned upon detection, as documented in the Event Fact Sheets in Appendix C. Both spills consisted of solid material from either weld seams or flanges. Neither spill entered the soil. Because of the use of sealed containers for waste storage, absence of free liquids, and solid nature of the waste, soil contamination is considered to be extremely unlikely. Since there is not a reasonable pathway for contamination to have entered the soil, soil sampling is not considered appropriate for this unit.	

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4.	General. The plan does not adequately address potential contamination from the oil the waste was stored in. Petroleum wastes are regulated under WAC 173-303, and therefore needs to be accounted for in the closure plan. All potentially regulated dangerous waste contaminants must be considered in closure. All probable dangerous waste contaminations must be targeted for sampling and analysis. Incorporate sampling, analysis, and potential decontamination for petroleum wastes into the closure plan. Address potential Polychlorinated Biphenol(*sic*) (PCB) contamination of the oil. **RL/WHC RESPONSE: The oil mentioned in the Appendix C inventory is not free liquid oil used for waste storage. This is oil from a sodium metal spill cleanup within the FFTF. The oil had been absorbed prior to disposal and is not in a free liquid state. Examination of the proper shipping names (PSN) and waste codes in Appendix C indicate that free oil is not present in the waste.** **In responding to spills of reactive metal at FFTF, a pure oil (e.g., hydraulic oil, turbine oil, or mineral oil) without additives is used. Water is not used as it would react with the sodium or lithium. These types of pure oils are generally not regulated. The status of the oil, as not-regulated, is confirmed by an examination of the PSN and waste codes in Appendix C. If the oil was regulated, it would be indicated by the PSN and waste codes.** **If polychlorinated biphenyls (PCB) were present, then they would have been identified in the waste designation process. The PSN and shipping codes do not included PCB codes.** **The arguments on the use of sealed containers in the response to Comment No. 3 also applies to the absorbed oil.**	

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	Because there was no free liquid oil present and the absorbed oil is in sealed containers, there are no reasonable pathways for the oil to have entered the environment. Also, the waste designation process indicated that the absorbed oil is not regulated and does not contain PCBs. For these reasons, the absorbed oil does not need to be addressed in the closure plan.	
5.	2-2/15-16. The closure plan describes the boundary as the area 10 feet from the exterior wall of the facility. It is not stated if the loading pads are within the specified boundary, or how the boundary determination was reached. The closure plan must account for the maximum extent of operation of the facility. Describe how the boundary determination was made, and if the boundary would include the loading pads. Discuss the temporary storage of waste outside the building and any evidence that this storage area was within the defined boundary. Identify all areas requiring decontamination, and describe in detail all the steps necessary to decontaminate equipment, structures, and soils during partial or final closure. Provide a list of potentially contaminated areas and equipment. **RL/WHC RESPONSE: The boundary of the 4843 AMSF for the purposes of closure is stated in the document to be 10 feet from the exterior walls of the building. This "boundary" was set since the unit currently does not have a legal boundary. WAC-173-303 provides no guidance on setting the boundary of a facility. The activity at the 4843 AMSF consisted of waste storage within the building as described in the closure plan. For a brief period of time (about 3 months) some drums were stored outside of the building but within the 10 foot boundary line. The concrete drive-up ramps to the unit extend 6 feet from the building. It is considered appropriate to set the unit boundary a reasonable distance away from the exterior walls of the building as has been done.** **Based on process knowledge of how the waste was normally handled, including the temporary storage of waste outside of the building, the 10 foot boundary does**	

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	cover the maximum extent of operation of the unit. From conversations with the 4843 AMSF operating personnel, the waste was stored on the loading pad located on the west end of the building. These were sealed containers that were included in the weekly inspections. As discussed in the response to Comment No. 3, there is no reasonable path for soil contamination to have occurred. All potentially contaminated areas and equipment are currently identified in the closure plan. No additional equipment is dedicated for use in this unit. The areas located outside of the boundary specified in the closure plan are beyond the scope of the 4843 AMSF closure plan. The information on the closure strategy is given in Section 6.0, and information on the closure activities and on the Decontamination Work Plan are given in Section 7.0.	
6.	2-2/38. Exhaust fans may have allowed contaminants to be dispersed to the external environment. This, along with the storage of waste outside the unit and the potential of residual spills of waste during loading and unloading, justifies soil sampling. Incorporate soil sampling into the plan as appropriate. **RL/WHC RESPONSE:** The two spills reported at the 4843 AMSF consisted of *solid* sodium carbonate and sodium hydroxide leaking from containers. The Event Reports do not indicate any airborne radioactive contamination (both spills involved radioactive material). This indicates that no dust was generated by these spills. An examination of the physical properties of these two substances reveals that neither is a volatile. Therefore, the emission of a dust or a vapor from these incidents that would be dispersed to the external environment is nonexistent. The need to develop a soil sampling program based on this potential	

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	is, therefore, considered unnecessary. **Also, see responses to Comments Nos. 3 and 5.**	
7.	3-1. It is not clear if the spent piping and equipment containing waste was internally purged with inert gas before being sealed. Elaborate on the management of the spent equipment. Specify if the equipment was purged before being sealed, if the equipment was containerized after being sealed, and if not containerized, was secondary containment utilized. **RL/WHC RESPONSE: All spent piping and equipment is internally purged before being sealed inside the containers. Most spent piping and equipment are sealed inside of various DOT containers (identified in Table 3-1) with an inert gas atmosphere. In four cases involving radioactive mixed waste (item numbers 81, 82, 95, and 96), the sodium waste was sealed in the original equipment that had been purged with an inert gas atmosphere. For these four items, the sealed equipment is considered to be the container.** **The requested information on past operations is included in Section 3.0. The description of procedures used for past operation of the 4843 AMSF will not be included and are beyond the scope of this closure plan.**	
8.	3-1/7. Incorporate the QA/QC procedures for sealing spent equipment and drums. See previous comment. **RL/WHC RESPONSE: All container sealing was done at the point of waste generation prior to shipping the waste to the 4843 AMSF. As such, the sealing operation was not part of 4843 AMSF operations.** **The requested information on past operations is included in Section 3.0. The description of procedures used for past operation of the 4843 AMSF will not be**	

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	included.	
9.	3-2/10-16. Section 3.2 discusses container management practices. Four parameters are said to be evaluated. The standard of evaluation is not provided. Elaborate on the standards used (i.e. references used). **RL/WHC RESPONSE: "Container condition" is a visual inspection of the container. It is visually inspected for change in shape, corrosion products, discoloration, or any other visual indications that the container has been damaged or breached.** **The "container seal" is a visual check that the container seal is present and is intact (e.g., a gasket for a drum or that all openings in the equipment have been welded shut).** **"Proper marking and labeling" would be determined by the requirements of Title 49, Code of Federal Regulations "Transportation" in effect at the time the waste was received at the 4843 AMSF.** **"Valid radiological release" is applied to the container when it is removed from the radiation zone the waste was generated in. A radiological release sticker must be present on the waste container and must be properly completed for the waste container to be accepted at the 4843 AMSF. The information on a radiological release includes the name of the Health Physics Technician, date, survey number, and count.** **The information discussed above will be incorporated into the Closure Plan.** **The requested information on past operations is included in Section 3.0. The description of procedures used for past operation of the 4843 AMSF will not be included.**	

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10.	3-2/36-40. Non-waste Na/K mixture is stored in this unit, yet the facility is described as having only two storage areas - one for hazardous waste and the other for mixed waste. Discuss the dual function of the unit and any impact this may have on the closure. Discuss QA/QC procedures used to segregate mixed waste from hazardous waste, and waste material from product material. **RL/WHC RESPONSE: Storage of the metallic sodium/potassium product mixture will not have any affect on closure. The product material was stored in special U.S. Department of Transpertation shipping containers that have a stainless steel tank inside a wooden box. As such, they are easily recognizable. The waste containers are either drums, sealed piping, or other sealed containers with proper waste markings, including the hazardous waste label. Segregation was assured by the weekly visual inspection.** **The requested information on past operations is included in Section 3.0. The description of procedures used for past operation of the 4843 AMSF will not be included.**	
11.	4-1/10. This sentence refers to Appendix C. See comments on Appendix C. **RL/WHC RESPONSE: See response to Comment No. 45.**	
12.	4-1/28. Segregation of waste is based on the radioactivity of the waste. Provide a detailed discussion of procedures taken to assure and maintain segregation of mixed and dangerous waste. **RL/WHC RESPONSE: The waste is segregated upon arrival at the 4843 AMSF. Segregation is based upon the labeling of the waste container with a radioactive material label upon generation. The presence of these labels was verified by the**	

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	weekly inspections. Also, the monthly radiation surveys checked all containers. Detecting radiation from a non-radioactive waste container would have generated an event fact sheet. No such events occurred at the 4843 AMSF. **The above information will be added to the closure plan.** **The requested information on past operations is included in Section 3.0. The description of procedures used for past operation of the 4843 AMSF will not be included.**	
13.	4-2/1. The text states that records of laboratory analysis of waste samples are maintained at the 340 Facility and Tanker. Was analysis conducted on spilled material to determine the composition of compounds formed? If so, provide analytical records. If not, provide a detailed discussion of how the conclusion was reached. If it cannot be substantiated that carbonates are the only product of this reaction, sampling for both hydroxides and carbonates will be required. **RL/WHC RESPONSE: Analytical tests were not performed on the limited amounts of the spilled material. The closure plan will be modified to address both hydroxides and carbonates.**	
14.	4-2/23. There is question about the actual composition of spilled waste, once reacted with its ambient environment. The text states "Carbonates are the only products considered to be produced from the reaction of the metal wastes with air." Support for this conclusion is not provided. This determination is contradicted by spill reports and later sections of the closure plan. One of the spill reports submitted with the closure plan states that Sodium Hydroxide (NaOH) was formed when the waste reacted with moisture in the atmosphere. Also, during a walk-through of the unit, it was again stated that NaOH was formed when wastes were spilled.	

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	Discuss the chemical/physical properties that govern the outcome of the reacting. Justify not considering other potential products. Provide supporting facts, references and/or analytical records. See previous comment. **RL/WHC RESPONSE: See response to Comment No. 13.**	
15.	6-1/18. Ambiguous terms such as, "potentially dangerous" and "action levels" are not appropriately defined for the function of this document. The removal or decontamination of waste residues, equipment, soils, or other materials contaminated with dangerous waste or dangerous waste residue must not exceed background environmental levels for listed or characteristic wastes or designation limits for state only waste (WAC 173-303-610(2)(b). Modify text to include background as the clean closure performance standard. Replace ambiguous terms, or define them in reference to the regulation cited above. Citations of health-based standards must be changed to background. Correlate the term "action level" with the clean closure requirements. **RL/WHC RESPONSE: The text will be changed to remove the term potentially and insert waste to read "... dangerous waste constituents..." to remain consistent with the rest of the document. The remainder of the text will remain unchanged.** **In a letter from Ecology (Roger Stanley) dated 2/4/92, addressed to all interested parties, three Cleanup/Remediation options were presented as acceptable options for Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response Compensation and Liability Act activities on the Hanford Site. In this letter, options in addition to cleanup to background levels were addressed. In light of this, the use of health based action levels as a standard for closure of RCRA units has been proposed on the Hanford Site and is being looked at in earnest by Ecology. Therefore, the use of the term "action levels" in closure plans has become common syntax and has up to this point been accepted by Ecology.**	

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	The definition of "action level" for this closure plan is given on page 6-1, lines 7-8 and also on page 6-2, line 33. The text will be modified to include the definition.	
16.	6-1/22. The text states that no post closure activities are expected. No discussion is provided to support this decision. Elaborate on why post closure will not be necessary, and explain standards used in the determination. **RL/WHC RESPONSE: The text will be modified to state that the 4843 AMSF is expected to be clean closed. Therefore, no post closure activities are expected.**	
17.	6-1/26-30. Again, explain why carbonates are considered the only possible reaction products. See comment number 14. **RL/WHC RESPONSE: See response to Comment No. 13.**	
18.	6-1(*sic*)/34. [6-2/34.] The sentence reads, "[t]he action level of the metal surfaces (walls) is the limit of quantitation of the wipe sample method". First, provide reference or detailed description of sample method used. Second, define the "quantitation limit" and state what it is for specific analytes. Action levels must be adequately defined. **RL/WHC RESPONSE: The reference for the sample method is *A Compendium of Superfund Field Operation Methods* (EPA/540/P-87/001). A description of the method is contained in Section 7.3.2. Since wipe sampling only provides a qualitative estimate of contamination, the text is in error and will be changed.**	

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19.	6-1/35-36. The closure plan does not describe methods employed for removing contaminants from the unit. Provide a detailed description of procedures utilized to remove contaminants. Be explicit. **RL/WHC RESPONSE: The intent of this section is to provide the general outline for closure. More detailed information is not appropriate. Section 7.4 of the closure plan, "Decontamination and Disposal of Building and Concrete Pad," discusses the decontamination strategy for clean closure.**	
20.	6-1/37. This sentence refers to Appendix D. See comment number 14. **RL/WHC RESPONSE: See response to Comment No. 13.**	
21.	6-1/40-46. Because wastes were externally stored, sampling and analysis outside the unit will be required. Modify text accordingly. **RL/WHC RESPONSE: See response to Comment No. 3.**	
22.	6-2/7-10. The detail of this section is insufficient. Explain how and where the waste will be removed. Describe or reference sampling, analysis, and decontamination procedures. **RL/WHC RESPONSE: The radioactive mixed waste will be moved to the Hanford Mixed Waste Complex for long-term storage. The radioactive mixed waste will remain at the Hanford Site in the 200 West area for the present time. The dangerous waste**	

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	has been transferred offsite to a licensed hazardous waste facility for disposal. **Relative to the details of decontamination, see response to Comment No. 19.** **The contents of Section 6.2 is considered to be adequate and will not be changed.**	
23.	<u>6-1/13.</u> Decontamination of building equipment below action levels is specified as the second step in the closure activities. The first comment associated with these activities evolved out of a tour of the unit on October 5, 1992. During the tour, loading/unloading practices were discussed. It was stated that a forklift was used to move pallets of waste drums, however, the lift was not present during the tour. Provide a list of equipment utilized in the operation or closure of the unit in the closure plan, and a detailed discussion of decontamination or disposal of equipment associated with the unit. Again, "action levels" are not adequately defined and therefore are not appropriate for the closure plan. See comment *[No. 15]* regarding 6-1/18. **RL/WHC RESPONSE: No forklifts are dedicated for use at or stored in this unit. Due to the containerized nature of the waste that was stored in this unit, any forklifts or other equipment used in this unit would only become contaminated in the event of a release or spill of waste. Neither of the releases of waste occurring in the 4843 AMSF involved forklifts, other equipment, or load/unloading operation. Because no material handling equipment was considered to be part of the unit, such equipment is not addressed by the closure plan.** **See the response to Comment No. 15 for "action levels."**	
24.	<u>6-2/11.</u> Action levels are not adequately defined. See comment number 14.	

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	RL/WHC RESPONSE: See response to Comment No. 15.	
25.	6-2/33-35. Action levels are not adequately defined. Compliance with regulatory requirements is not discussed, nor is the wipe sample method appropriately defined, referenced or adequately explained. See comment regarding 14. **RL/WHC RESPONSE: For action levels, please see Comment Response No. 15. The wipe sample method is referenced in Section 7.3.2.**	
26.	6-2/35-39. The intent of this sentence is unclear. Is it that the concrete floor is being considered a component of the mixture for designation purposes? The floor cannot be considered a component of the waste unless it is intended to remove the entire floor and dispose of it as dangerous waste. It appears the floor is not intended to be waste, therefore it can not be considered when designating the concentration of the waste. See WAC 173-303 for designation procedures. The mixture rule does not apply to the concrete floor. Refer to WAC 173-303-610 for decontamination guidance. Any sodium hydroxide or carbonate embedded in the floor needs to be sampled and compared with the background concentration in the clean concrete it is adhered to. **RL/WHC RESPONSE: The floor is not being considered a component of the mixture for designation purposes. The text will be modified to clarify this point.** **Sampling concrete to determine background levels has not been feasible due to the variability in the composition of concrete from the chemical constituents in the aggregate, additives, and cement. The Toxic Characteristic Leachate Procedure (TCLP) will be used for inorganic analysis. This method is most likely to**	

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	dissolve only those constituents that could mobilize in a landfill environment without dissolving the concrete itself. The justification for using TCLP for inorganic analysis in concrete is attached to the NOD response table.	
27.	7-3. Section 7.3.3 describes procedures for taking concrete samples of the floor, but does not address the rubber seams in the floor. Seams and joints in an old facility provide a pathway to the environment. They should be treated in a similar manner for sampling. No discussion of other potentially contaminated items is provided. The plan must identify the equipment or structures that will require decontaminating at closure, including floors and walls of the building, unit parking lots, roads, truck staging areas, structures associated with the unit, and trucks and heavy equipment, such as forklifts. Provide additional sampling, similar to that being done for cracks, or provide detailed justification for the proposed sampling method. **RL/WHC RESPONSE: Construction drawing FSK-70E-164 located in Appendix B identifies the cracks in the concrete under note 3 to be constructed to the following parameters:** **"Saw cut 1/8 inch wide X 3/4 inch deep or keyed construction joints"** **Whether they are constructed joints, or as a result of keying (which would have been accomplished by laying small wooden or metallic keys after pouring and then removing the keys after a short period of curing). The joints, when constructed, did not penetrate the foundation slab completely. These joints do not provide a pathway to the environment since the concrete thickness is a minimum of 6 inches. The opportunity for any waste to reach these is nonexistent since no free liquids have been stored in the unit and all spills are reported as having involved solids as is noted in Appendix D. No text change required.**	

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	The 4848 Building as described in the closure plan is the only structure potentially requiring decontamination. Any other structures, equipment, or physical plant (i.e., roads, staging areas, etc.) is beyond the scope of the 4843 AMSF Closure Plan. As discussed in the response to Comment No. 3, the waste material that was stored in the 4843 AMSF was a solid reactive material stored in sealed containers. Only two minor releases of solid (i.e., non-liquid) waste by-products have occurred. No free liquids were present in this unit. Because of these factors, the seams in the concrete floor are not considered to be likely pathways for contamination.	
28.	7-3/9. Because not all of the waste was mixed waste, using radiation surveys to determine locations to collect samples is not sufficient verification, nor is limiting sampling to rusted or stained areas. Samples will need to be collected and analyzed that will depict the condition of the entire facility. **RL/WHC RESPONSE: As discussed in the responses to Comments Nos. 3 and 27, all the waste material consisted of solid materials stored in sealed containers, no free liquids were present, and neither spill of solid material contaminated the walls.** **Due to the nature of the waste stored in the 4843 AMSF, radiation surveys and visual inspection of the surfaces are considered ample to identify those points where contamination is the most likely to be present. The wastes stored in this unit are characteristic wastes. If they ever came into contact with any part of the unit, a trace of either the radioactivity (if the waste was mixed) or the reactive or corrosive nature of the waste would pinpoint its location (i.e., discoloration or corrosion of the surface). Therefore, the use of radiation surveys and visual inspection of the unit interior is judged adequate for determining sampling location. The use of visual inspections for selection of**	

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	sample points was the primary method used for the closure of the 2727-S Facility, a similar unit.	
	Because of the nature of waste storage and handling, contamination of the walls is considered to be unlikely. For the type of waste stored in this unit, the wall sampling as described in the closure plan is adequate.	
29.	7-3/46. The text states that the unit is divided by a rope into two storage areas, but section 3.0 indicates that Na/K product was stored in the facility.	
	Discuss the dual function of the unit. See comment number 10.	
	RL/WHC RESPONSE: See response to Comment No. 10.	
30.	7-4/1. See comment number 14.	
	RL/WHC RESPONSE: See response to Comment No. 13.	
31.	7-4/9. Many distinct procedures are compiled into SW-846. Specific procedures used should be referenced by number, and any alteration of procedures require prior regulatory approval.	
	Specifically describe "the protocol" used. It is suggested that a grid pattern of the unit, inside and out, be implemented for sampling utilizing both stratified random and biased sampling methods.	
	RL/WHC RESPONSE: A reference to Appendix G will be added to identify the SW-846 protocols being used.	
	The sampling for the floor of the building is considered to be adequate and is discussed in Figure 7-2 on page F7-2 and in Table 7-1 on page T7-1.	

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	For soil sampling, see the response to Comment No. 3.	
	Clarification is requested on the definition of "stratified random" sampling.	
32.	7-4/14-31. See comment number 26.	
	RL/WHC RESPONSE: See response to Comment No. 26.	
33.	7-4/50. Laboratory procedures are cited in this sentence.	
	Specify that the current version of referenced material will be used.	
	RL/WHC RESPONSE: The Quality Assurance Project Plan (Appendix G) requires that the most current version of all Environmental Investigation and Instructions are to be used. The text will be modified so that the current version of the referenced material will be used.	
34.	7-5/40-48. This section is ambiguous.	
	Elaborate on the actual procedures or simply reference the procedures and submit a copy of the QA/QC manual with the closure plan for review and approval.	
	RL/WHC RESPONSE: The analytical laboratory quality control/quality assurance (QA/QC) procedures are beyond the scope of this closure plan and will not be provided. Regulatory review and oversight of the analytical procedures are covered in the Hanford Federal Facility Agreement and Concent Order (Article XXX). For information relative to this closure plan, see the quality assurance program plan (QAPP) in Appendix G.	
	The selection of an analytical lab is not undertaken until shortly before sampling begins; in general, the lab can be expected to follow the QA/QC outline of SW-846 for RCRA analysis.	

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35.	7-6/7. It is unclear if an EII is being referenced. Clarify whether the exact EII method will be used (i.e. incorporate method by reference) or whether the method is only similar to an EII, in this case. **RL/WHC RESPONSE: This sentence is clearly referencing the EII. Modification of the sentence is not considered necessary.**	
36.	7-6/27-31. It is not clear who is responsible for reviewing and evaluating the reports. Specify to whom the reports will be submitted. **RL/WHC RESPONSE: The text will be modified to identify that the Field Team Leader and the Hanford Technical Lead are responsible for this reporting.**	
37.	7-7/33-34. It is premature to assume that sampling will be limited to the media specified. Because waste has been stored outside the unit, soil sampling will be required. Provide procedures for soil sampling and analysis. **RL/WHC RESPONSE: See response to Comment No. 3.**	
38.	7-7/33. Soil sampling will need to be integrated into the sampling and analysis. See comments number 3 and 5. **RL/WHC RESPONSE: See response to Comments Nos. 3 and 5.**	
39.	7-9/3-24. The contents of section 7.4 are inadequate. The decommissioning work plan must be submitted to allow the procedure to be evaluated as part of the	

No.	Comments/Response	Concurrence
	closure. **RL/WHC RESPONSE: The work plan will be written just prior to the start of decontamination operations. A copy of the decommissioning work plan will be provided on an information only basis to Ecology. The decommissioning work plan will specify the details for field implementation of the closure activities described in Section 7.0.** **After reviewing Section 7.4, it has been determined that this section will be rewritten and expanded.**	
40.	<u>7-9/29.</u> Insufficient information is provided to determine if the schedule for closure is reasonable. This is also inconsistent with the regulatory time frame allowed by the Dangerous Waste Regulations. A schedule for closure must include, at a minimum, the total time required to close each dangerous waste management unit and the time required for intervening closure activities which will allow tracking of the progress (WAC 173-303-610(3)(a)(vii). A discussion of the time line provided on F7-3 will help. **RL/WHC RESPONSE: The estimated time for each closure activity is clearly presented in Figure 7-3 and called out in the document. Restating these time frames in the text is considered unnecessary.** **Also see response to Comment No. 39.**	
41.	<u>F7-1.</u> Incorporate soil sampling and analysis into the flow diagram. **RL/WHC RESPONSE: See response to Comment No. 3.**	
42.	<u>F7-2.</u> The sampling locations presented here are inadequate. The locations do	

No.	Comments/Response	Concurrence
	not appear capable of providing unbiased results representing the entire floor. The sampling locations of the floor need to be more appropriately distributed. Provide figures indicating the locations for wall and soil samples. See comment number 31. **RL/WHC RESPONSE: The sampling of the floor meets the requirements of SW-846 for random sampling. The idea of selecting samples at random is so that the sample locations are as unbiased as possible. This unbiased method of sampling is included in other closure plans which are nearing final approval by Ecology.** **For sampling of the walls, see response to Comment No. 28. For soil sampling, see response to Comment No. 3.**	
43.	F7-3. Incorporate soil sampling. **RL/WHC RESPONSE: See response to Comment No. 3.**	
44.	8-1/52. Specify the agencies that will file the survey plat. **RL/WHC RESPONSE: As stated, the U.S. Department of Energy, Richland Field Office is filing the survey plat.**	
45.	Append C. Appendix C indicates the presence of oil in some of the waste stored at the unit. Therefore, incorporate sampling and analysis for petroleum waste into the closure plan. Address potential PCB contamination. **RL/WHC RESPONSE: See response to Comment No. 4.**	
46.	Append D. One of the spill reports states that NaOH formed when a container leaked allowing the waste to react with water. This contradicts earlier statements in the closure plan that only metal carbonates were formed from such	

No.	Comments/Response	Concurrence
	an incident. Correct inconsistency. **RL/WHC RESPONSE: See response to Comment No. 13.**	
47.	Append D. The waste receiving procedures are not adequately defined. Give a detailed discussion on the procedures used for acceptance of waste at the unit. This must include any documentation available on verification of types of waste received at the unit. In other words, can it be verified that the waste identified in Appendix C table are the only wastes sent to the unit? Section 3.0 would be an appropriate location to include this discussion. **RL/WHC RESPONSE: The waste acceptance criteria are discussed in Section 3.2 and elaborated on in the response to Comment No. 9. Also, both a logbook and inventory are maintained for the 4843 AMSF. The inventory is the source of Appendix C. The weekly inspections verify that the containers identified on the inventory are the only containers in the 4843 AMSF. Any waste containers not on the inventory would have generated an event fact sheet. No such "orphan" waste has been found at the 4843 AMSF. Also, the 4843 AMSF remains locked unless waste containers are being moved in or out or when the inspections occur.** **The requested information on past operations is included in Section 3.0. The description of procedures used for past operation of the 4843 AMSF will not be included.**	
48.	7-9/22. The text states that if portions of the building do not meet the action levels presented in this closure plan, these portions will be removed and disposed of. This is not adequate. All remediation activities associated with the building,	

No.	Comments/Response	Concurrence
	In regard to dangerous wastes, must be accomplished via the closure plan. This includes the potential demolition of the site. **RL/WHC RESPONSE: See the second paragraph of the response to Comment No. 39.**	

DETERMINING INORGANIC CONTAMINATION IN CONCRETE

INTRODUCTION

Sampling and analysis of concrete for the purpose of detecting contamination is a problem being confronted with respect to the closure of RCRA TSD units. A satisfactory method for determining volatile and semivolatile organic contamination in concrete has been developed, and will be of great use to cleanup activities in the future. Development of a rationale and method for determining inorganic contamination in concrete must consider several potential problems with the sampling and analysis of concrete. This paper discusses some of these problems and proposes a method for evaluating inorganic contamination in concrete.

A basic problem involved in the inorganic evaluation of concrete is deciding the process used to recognize contamination. As with other media (e.g., soil, groundwater), concrete can vary greatly in composition. Unlike other media, it would be difficult to bracket regional background compositions of concrete because variations in composition cannot be accurately predicted. Thus, establishing background composition for concrete using conventional analytical techniques, as is often done for soil and groundwater, would be futile given the potentially extreme variability and lack of knowledge of the origin of the concrete ingredients. Evaluation of the suitability of a particular analytical technique to concrete should be inherent in any program that intends to accurately characterize this medium.

The inorganic composition of concrete is a summation of the contributions from cement, water, aggregate (rocks and sand), and any additives and contaminants. Compositional variation of the aggregate is a particular source of variability at the Hanford Site, because of the wide range of compositions in aggregate found throughout this area. The size of the particles comprising the aggregate can also affect analytical results, as will be discussed below. In addition to the aggregate, cement may contain substantial concentrations of trace elements. The type and amount of trace elements vary with the composition of the limestone and clay used to formulate the cement. These compositions vary with the location of the limestone and clay quarries.

Two sample preparation techniques will be considered: method 3050 described in SW-846 (EPA 1986), and the Toxicity Characteristic Leaching Procedure (TCLP) extraction method (40CFR Pt. 261, App. II). The former uses vigorous hot acid to dissolve at least a portion of the solid; the analysis of the resulting digestate is typically compared to background compositions determined by the same method on demonstrably uncontaminated samples. The TCLP extraction uses a weak acid at room temperature to evaluate the leachability of the solid; results from analysis of the leachate are compared to published tables (40CFR Pt. 261.24 (b)). Analytes of concern that do not currently have defined maximum concentrations could be evaluated using a health-based approach in conjunction with the TCLP extraction.

Because of the potential for wide chemical variations of the constituents in concrete analyses, any sampling and analysis strategy aimed at the evaluation of contamination would meet with complications. If background compositions were to be determined, several problems would arise:

- The samples used for background determination would have to be obtained from the same pour as the concrete to be sampled for contamination, since it cannot be assumed that all pours in a structure contained the same ingredients. The pour being sampled for background would have to be convincingly demonstrated to be uncontaminated; each analysis would be comparable only to the background of the pour it was obtained from.

- There would likely be problems in ensuring representative concrete background samples due to the size and amount of the aggregate present.

- It may be difficult to obtain the number of samples necessary for statistical validity.

To help eliminate these potential sources of error, the TCLP extraction method should be employed for inorganic analysis of concrete samples. This method is designed to leach potentially mobile constituents from a sample, and thus has the following advantages over the 3050 method for detecting inorganic contamination in concrete:

- It is less likely to leach naturally occurring elements from the concrete, thus reducing the difficulty of distinguishing contamination from naturally occurring elements.

- It will more accurately represent the type and amount of constituent likely to leach from the concrete.

- Fewer samples would be needed (no establishment of background is necessary).

- There would be less impact on the facility, and a potential for generating less waste (fewer samples would be needed).

- It is a well-established procedure.

The following sections will present chemical data and a discussion of analytical methods which could be applied to concrete.

VARIATIONS IN AGGREGATE AND CEMENT

To assess the potential for analytical variation in concrete, the composition of aggregate and cement must be evaluated. Rocks quarried for use in concrete originated from different borrow pits which can be demonstrated to have rocks of widely varied compositions. Also, the quarry locations of the limestone and clay used to produce cement vary with the manufacturer and the amount of trace elements could be different at the various locations.

Physical characteristics of the aggregate used could also affect analytical variations. The influence of physical variations may be qualitatively characterized in terms of grain size and mineral composition.

Chemical Variations

The source of the aggregate used in concrete for most of the structures on the Hanford Site is undocumented and probably not traceable with any sort of certainty. A considerable amount of aggregate was quarried from the Hanford Site proper, but much of the concrete was provided by private contractors. These contractors were located in the Pasco Basin, and almost certainly used sediments of the Hanford formation, the same formation that blankets the Hanford Site, for concrete aggregate. It has been demonstrated that a single compositional range represents the entire Hanford formation, because these sediments are all genetically related (WHC 1992). The possible compositions of the aggregate must therefore be considered to lie within the range of all compositions found in and around the Site. The same situation exists with the cement as with the aggregate. Cement could have been shipped to the concrete contractors from many locations and, as stated above, could contain substantial and various amounts of trace elements. In addition, additives to the concrete could have influenced its composition (e.g., iron added to increase density and thus radiation shielding performance).

When evaluating compositional data, it is essential to know and understand the various analytical methods employed to generate the data. Extraction techniques such as the aggressive hot acid of method 3050 will attack mineral grains, and analytical results will be a function of the solubility of the grain and its size (discussed below). Neither method 3050 nor the TCLP measures the true chemical composition of the solid, in most cases. Determination of the true composition is accomplished by utilization of other analytical and/or preparatory techniques, such as using a solid sample in XRF analysis or total acid digestion followed by a spectroscopic analytical technique (e.g., ICP, AA).

The natural range of concentrations for some of the rocks and sediments found around the area is presented in Table 1. All of these samples were analyzed according to Contract Laboratory Program (CLP) protocols, which are nearly identical to method 3050. Most of the samples used for determining the ranges presented in Table 1 were collected for the Site-wide background project, as described in Hanford Site Soil Background (DOE/RL 1992). Also included in this Table are two samples of basalt: one taken from an outcrop at the far northwestern corner of the Hanford Site (SBAS), and the other from a basalt flow that crops out south of the Hanford site, near Finley, Washington (UMAT). This latter basalt has been analyzed for its total composition, so values would be expected to be higher than the samples analyzed by CLP methods. Although it is unlikely that pure basalt was used for aggregate, some of the sediments in the Hanford formation contain over 75% basalt grains.

Tables 1 and 2 list some naturally occurring inorganic elements in aggregate and cement and are not intended to present a comprehensive list of possible contaminants. Table 1 demonstrates that aggregate samples can contain relatively high values of some of these naturally occurring trace elements, notably vanadium, barium, cobalt, copper, lead, and the halides. Table 2 shows the analytical values of two samples of Portland Type I/II Cement used at the Hanford Site Grout Treatment Facility. The cement analyses were conducted using the inductively coupled plasma (ICP) method after total digestion of the cement samples with HF and HNO_3 acids. The table shows the cement can contain relatively high concentrations of naturally occurring trace elements, such as barium.

Grain Size Variations In Aggregate

Grain size is another potential source of analytical variation when using strong acid digestion methods, such as 3050. Because the acid attacks the surface of particles most readily, the total surface area (generally, a function of grain size) will influence the amount of material dissolved. Figure 1 illustrates this effect. However, the TCLP extraction solution is less likely to mobilize the naturally occurring constituents, regardless of the physical or chemical nature of the media.

The effect of grain size on analytical values will probably be substantially smaller when using the TCLP extraction, although no data is available to test this hypothesis. The TCLP solution was designed to leach potentially mobile constituents, which would likely include any contaminants deposited on concrete. The amount of dissolution of these materials would be independent of grain size and mineral composition of the sample aggregate. Therefore, more consistent analyses would result when using TCLP extraction for detecting contamination, because neither the composition nor the grain size of the aggregate would influence the result.

CONCLUSIONS

The method used to determine if concrete has been contaminated by inorganic constituents should be decided based on the following points:

- The concrete is a conglomerate of cement, aggregate, and water.
- Of the three ingredients, aggregate and cement are the most likely sources of elevated naturally occurring trace metals.
- Naturally occurring aggregate in the Pasco Basin can contain unusually high concentrations of trace elements, owing to a substantial basalt component.
- Cement produced from naturally occurring limestone and clay can have relatively high concentrations of trace elements. The amount of trace elements in the cement vary with the location of the limestone and clay quarries.
- The analytical method typically employed in the analysis of solids (method 3050) may dissolve a portion of the aggregate.

The information presented in this report confirms the best extraction method, when analyzing concrete for inorganic constituent, is the TCLP. This method is more likely to dissolve only those constituents that could mobilize in a landfill environment.

REFERENCES

DOE/RL, 1992, Hanford Site Soil Background, DOE/RL-92-24, U.S. Department of Energy,-Richland Operations Office, Richland, Washington.

EPA, 1986, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, EPA-600/4-79-019, U.S. Environmental Protection Agency, Washington, D.C.

Hooper, J.R., and Swanson, D.A., 1989, Columbia River Basalt Group and associated volcanic rocks in the Blue Mountains Province, in Walker, G.P., Robinson, P.T., Hooper, P.R., Swanson, D.A., and McKee, E.H., eds., The geology of the Blue Mountains region of Oregon, Idaho, and Washington; Cenozoic geology of the Blue Mountains region: U.S. Geological Survey Professional Paper 1437, p. 63-99.

WHC, 1991, Characterization and Use of Soil and Groundwater Background for the Hanford Site, WHC-MR-0246, Westinghouse Hanford Company, Richland, Washington.

Table 1. Statistics on analytical values for selected analytes, showing natural range of CLP compositions for the Hanford formation (Site-wide) and two Columbia River basalts. < = less than the detection limit for this analysis, N = number of samples, NA = data is not available. SBAS = multiple CLP analyses of Umtanum basalt, UMAT is XRF analysis of Umatilla basalt, from Hooper and Swanson (1989). All data in ppm.

Analyte	N	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper
Site-wide	151								
Average		<21	<12	94.37	1.06	<0.66	11.40	11.50	15.30
Maximum		<21	<12	294.00	2.10	<0.66	33.20	17.80	36.10
SBAS	8								
Average		<0.74	<0.9	44.30	1.13	<0.3	5.54	20.71	NA
Maximum		<0.74	<0.9	71.70	1.50	<0.3	11.20	30.30	NA
UMAT	1	NA	NA	3532	NA	NA	0.00	NA	13.00

Analyte	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium
Site-wide								
Average	23978	6.23	380.9	0.25	12.93	<14.5	1.24	<22
Maximum	37000	26.60	814.0	3.80	28.40	<14.5	14.60	<22
SBAS								
Average	33250	21.23	282.1	<0.16	<3.2	<14.5	2.49	<22
Maximum	44400	42.10	401.0	<0.16	<3.2	<14.5	3.90	<22
UMAT	46408	NA	1650.0	NA	NA	NA	NA	NA

Analyte	Vanadium	Zinc	Molybdenum	NH_3	Alkalinity	Silicon	Fluorine	Chlorine
Site-wide								
Average	56.04	51.18	1.31	3.20	2977	25.24	2.11	71.91
Maximum	105.00	119.00	4.00	26.40	37600	583.00	73.30	1480.00
SBAS								
Average	170.64	78.34	<1.4	NA	530	57.54	1.63	20.52
Maximum	244.00	140.00	<1.4	NA	1280	208.00	3.48	57.10
UMAT	185.00	136.00	NA	NA	NA	346076	NA	NA

Analyte	NO_2	NO_3	$O\text{-}PO_4$	SO_4
Site-wide				
Average	<21	36.40	3.92	161.8
Maximum	<21	906.00	225.00	4340.0
SBAS				
Average	0.42	125.46	43.58	215.9
Maximum	0.85	298.00	149.00	407.0
UMAT	NA	NA	NA	NA

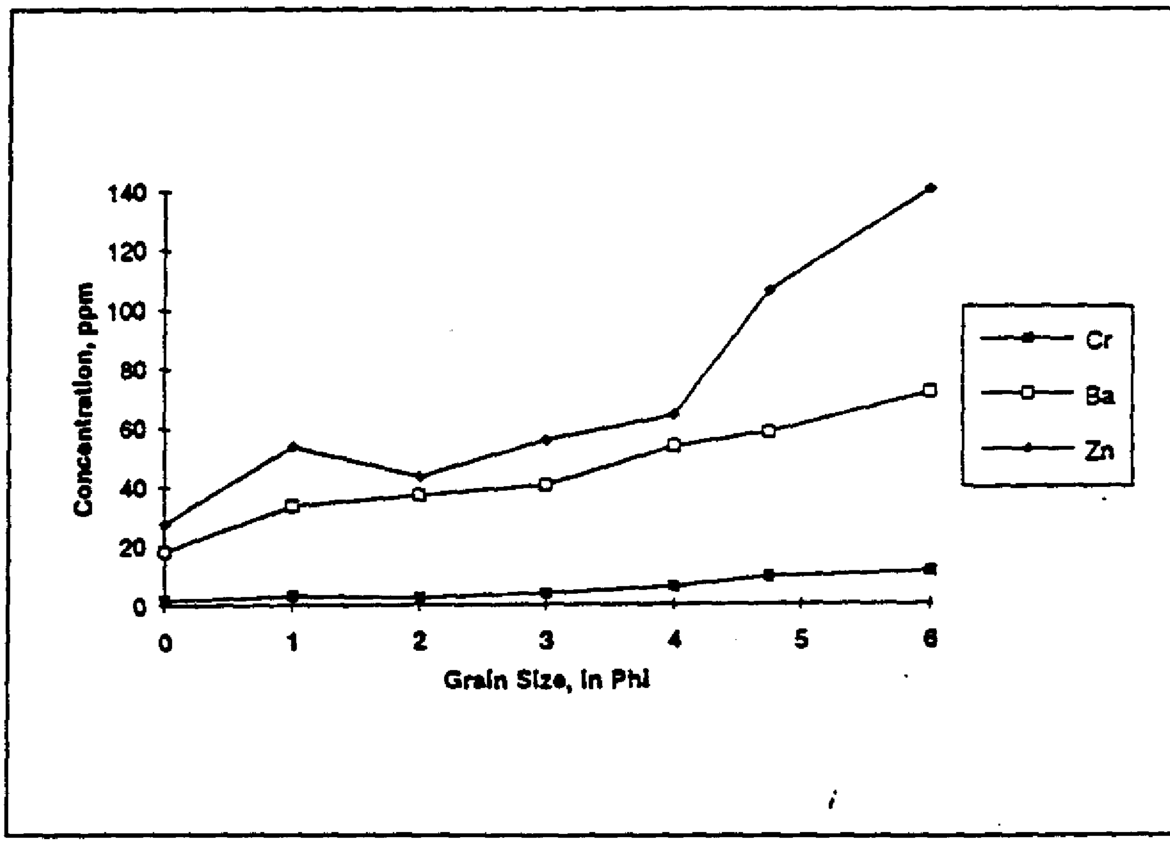
Table 2. Analytical values of two samples of Portland Type I/II Cement used at the Grout Treatment Facility. The extraction method was total digestion using HF and HNO_3 acids followed by inductively coupled plasma (ICP) analysis. NA = not applicable, blank = below detection limit. All data in ppm.

ANALYTE	DETECTION LIMIT	SAMPLE 1	SAMPLE 2
Ag	20		
Al	100	15000	16000
As	200		
B	50	N/A	N/A
Ba	20	1000	1000
Be	10		
Bi	200		
Ca	100	460000	450000
Cd	10		
Ce	200		
Co	20		
Cr	50	100	100
Cu	10	100	80
Dy	50		
Eu	20		
Fe	20	31000	31000
Gd	1000		
K	2000	5000	
La	70	100	100
Li	50		
Mg	200	5600	6500
Mn	10	430	380
Mo	50		
Na	200	1600	2000
Nd	70		
Ni	70		
P	200	900	800

Table 2. Cont.

ANALYTE	DETECTION LIMIT	SAMPLE 1	SAMPLE 2
Pb	100		
Pd	400		
Rh	200		
Ru	100		
Sb	100	N/A	N/A
Se	200		
Si	100	100000	100000
Sn	2000		
Sr	10	400	440
Te	200		
Th	2000		
Ti	10	1200	1500
Tl	1000		
U	2000		
V	20	80	80
W	200		
Y	20		
Zn	50	100	100
Zr	20	50	60

Figure 1. Variation of concentration of selected analytes with grain size. Data is from a sample of homogeneous basalt (SBAS) that was crushed and sieved into different grain sizes. Phi size is a logarithmic transformation in which the negative logarithm to the base 2 of the particle diameter (in millimeters) is substituted for the diameter value. It has integers for the class limits, increasing from -5 for 32 mm to +10 for 1/1024 mm. It is not a dimension but a ratio.



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