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**DISAPPROVAL OF THE OU #4 VITRIFICATION  
TREATABILITY STUDY WORK PLAN**

12/24/91

**USEPA/DOE-F  
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LETTER**



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

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DEC 24 1991

REPLY TO THE ATTENTION OF:

HRE-8J

Mr. Jack R. Craig  
United States Department of Energy  
Feed Materials Production Center  
P.O. Box 398705  
Cincinnati, Ohio 45239-8705

RE: Disapproval of the OU #4  
Vitrification Treatability  
Study Work Plan

Dear Mr. Craig:

The United States Environmental Protection Agency (U.S. EPA) has completed its review of the Operable Unit #4 Vitrification Treatability Study Work Plan.

U.S. EPA hereby disapproves the Work Plan pending incorporation of the attached comments.

Please contact me at (312/FTS) 886-0992 if you have any questions.

Sincerely,

James A. Saric  
Remedial Project Manager

Enclosure

cc: Graham Mitchell, OEPA-SWDO  
Pat Whitfield, U.S. DOE-HDQ

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partial  
action  
response  
to 4-0313  
(3636)

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ATTACHMENT  
OPERABLE UNIT 4 TREATABILITY STUDY  
WORK PLAN FOR VITRIFICATION

GENERAL COMMENTS

1. The work plan provides minimal detail regarding testing and analytical procedures. This lack of detail makes the work plan difficult to review and may lead to additional review comments in these areas when a revised work plan is submitted.
2. No details are provided about the off-gas equipment to be used in the bench-scale testing. According to Subsection 4.2.1, Pacific National Laboratory (PNL) will test and modify the equipment previously used for vitrification testing before the equipment is used in the bench-scale testing. (See specific comment No. 14, which points out that this section is very confusing.) This work plan should provide information about the equipment used in previous testing and the plans for modification. This information should describe the methods by which the off-gas is condensed (if at all), how the gas volume is measured, and how the gas samples are collected.
3. The work plan does not provide detection limits and specific test methods of analyses (for such parameters as percent moisture, volume of off-gas, composition of off gas). Appendix A to the work plan (PNL Project QA Plan) referenced in Section 7.0 does not address any of these issues.
4. The test plan does not include the collection of baseline data on leachability and radon emanation from untreated wastes samples for comparison against vitrified product samples. These two measurements are necessary in order to draw conclusions about the effectiveness of treating the waste material by vitrification. These parameters should be added to the treatability test data objectives, and collection of this data should be described in the work plan.
5. The work plan does not state how vitrification will be implemented at the site, such as in-situ vitrification or ex-situ vitrification. Therefore, it is difficult to assess whether the testing procedures presented in the work plan adequately represent the effectiveness of the vitrification treatment alternative and its implementability at the site.

SPECIFIC COMMENTS

6. Subsection 1.1, pages 1 and 2: This work plan would be improved by the addition of a more complete physical and chemical characterization of the wastes in the silos. Specifically, the inorganic chemical characterization of the wastes are very relevant to the test plan. In addition, information concerning the organic make-up of the waste materials needs to be presented to completely evaluate the work plan.

7. Subsection 1.1, Page 2, line 31: The work plan states that the primary purpose of the remedial action objectives (RAO) is to ensure compliance with chemical-specific applicable relevant and appropriate requirements (ARAR) and to-be-considered (TBC) guidelines. However the chemical-specific ARARs and TBC guidelines are not presented in the work plan. The chemical-specific ARARs and TBC guidelines should be presented to demonstrate that the detection limits for the treatability analyses are low enough to evaluate the effectiveness of vitrification and to meet the RAOs.
8. Subsection 1.3.1, page 7, lines 5 and 6 (Table 1-1, page 8): Correct the composition of the off-gas provided in the table so that the sum total adds up to 100 percent.
9. Subsection 1.3.4, page 13, lines 20 to 23: A determination of the total volume of the liquid condensate produced from the off-gas should be added to the list of results to be verified. The volume of condensate produced could impact the feasibility of vitrification. For example, the amount of condensate may impact the implementability or cost of the alternative. This parameter should be added to all other relevant sections of the test plan that discuss collection of data, including Sections 3.0, 4.0, 6.0, 7.0, and 8.0.
10. Subsection 2.2, Page 22, line 4: The work plan states that treatability testing will be conducted to determine the long-term stability of the vitrified waste materials. Information should be presented concerning the types of testing that will be conducted to evaluate long-term stability, such as wet/dry weathering tests or freeze/thaw weathering tests.
11. Subsection 3.1, pages 23, lines 28, 30, and 32: State that bulk density, percent moisture, and specific gravity measurements will be performed on raw waste samples.
12. Subsection 3.1, page 24, line 9: State that specific gravity of the vitrified product will be measured.
13. Subsection 3.1, pages 23 and 24: Include objectives that address measurement of total condensate volume, toxicity characteristic leaching procedure (TCLP) analysis of raw waste samples, radon emanation from raw waste samples, and all analysis of liquid samples.
14. Subsection 3.2, page 26, Table 3-2: For laboratory screening, add the data quality objective (DQO) for physical property testing.
15. Subsection 4.1, page 27, lines 23 and 24: Clarify why the samples used previously for vitrification testing were not representative of material in Silos 1 and 2. Qualify the data provided in Table 1-1 with a statement regarding the representativeness of the samples.
16. Subsection 4.2, Page 30, Lines 15 to 17: The work plan states that determining the composition of the off-gas generated will focus on quantifying the amount of radon generated, However, Table 1-1 on page 8 of the work plan indicates that the condensate contains low

- concentrations of relatively volatile metals, including lead and mercury. Treatability testing should also evaluate the potential for metals in the off-gas.
17. Subsection 4.2, page 30, lines 19 to 37: The text should explain the difference between open system testing and partial system testing.
  18. Subsection 4.2.1, page 33, lines 9-18: Expand and clarify this paragraph. Provide details on the proposed off-gas collection system, explain why modifications are expected, and list items of the system that may be modified.
  19. Subsection 4.2.2, page 33, lines 22 and 23: This is the first reference in the document to the proposed use of "glass forming reagents." Modify the text to identify the reagents, estimate the quantities to be used, and explain why they are required,
  20. Subsection 4.2.4, page 34, line 7: Provide a detailed explanation of the "PNL specific criteria for vitrification."
  21. Subsection 4.2.4, page 34, lines 39 to 41: Justify the selection of the constituents on the basis of RAOs or the list of proposed constituents of concern.
  22. Subsection 4.2.5, Page 34: PNL intends to mix waste materials from the metal oxide silo with the waste materials from the K-65 silos for vitrification testing. The work plan should discuss the comparability of these two waste materials, and the evaluation of the vitrification alternative should consider waste compatibility when determining its short-term effectiveness in the feasibility study.
  23. Subsection 8.3: The work plan specifies that data will be presented for the "amount of water added to form a 45 percent moisture content slurry." If moisture will be added to the samples during bench-scale testing, this procedure should be clearly described in Section 4.0 along with a justification for doing so. Excessive moisture is a concern in materials to be vitrified, because steam collection from the center of the vitrified mass must be controlled during full-scale treatment.

General Comments:

Several concerns arise that were not addressed in this document. If a copy of the previous testing results, "Characteristics of Fernald's Silos 1 and 2 Residue Before, During and After Vitrification", had been included with the workplan, it could help clarify the following concerns:

1. The time sequence allowed for testing radon emanations and off-gassing collection after the residue material was vitrified. The study should indicate if there are radon emanations and off-gassing after 7 days and 30 days or justify why this time sequence testing is not necessary.
2. The workplan should consider alternative cooling and material molding methods that could reduce radon emanation and off-gassing after the residues are vitrified.
3. The workplan did not propose a study of how vitrification affects the radiation dose rates of the residue material which needs to be justified why this was omitted from the workplan.
4. The workplan did not indicate what treatment methods will be considered for the off-gassing waste stream and whether the treatment methodology will impact the off-gassing collection system which needs to be considered in the design of the collection system.

Specific Comments:

1. Section 4.2.5., Page 34, Sequence D:

This test sequence utilizes K-65 material and Silo 3 metal oxide material, but does not consider the bento-grout aspect in the K-65 material that could influence the 70/30 mix ratio for vitrification testing. Justify why this was omitted.