



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII

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APR 28 1994

Ref: 8HWM-FF

Ms. Jessie Roberson
U.S Department of Energy
Rocky Flats Office, Building 116
P.O Box 928
Golden, Colorado 80402-0928

48313

RE: Potassium Ferrate Treatability Study Workplan

Dear Ms. Roberson:

The purpose of this letter is to transmit EPA's comments and those of our contractor (PRC) on the proposed reference document. The attached comments identified several shortcomings with the document which are considered essential in nature. EPA as the lead regulatory agency for the Site-wide Treatability Study Plan (TSP), is herein withholding approval of the workplan until the attached comments and those submitted by CDH under separate cover are satisfactorily addressed.

EPA believes that these comments could readily be incorporated into the workplan having minimum impact on the implementation schedule of the proposed study.

Please do not hesitate to contact Arturo Duran of my staff at (303) 294-1080 with any questions regarding this matter.

Sincerely,

Martin Hestmark, Manager
Rocky Flats Project

Enclosures

cc: Scott Grace, DOE
Olga Erlich, EG&G
Dave Norbury, CDH
Arturo Duran, EPA

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**EPA Comments on the Potassium Ferrate
Treatability Study Workplan**

General Comments

- The attached comments raised a number of questions regarding the proposed studies. The questions raised are essential to effectively implement the proposed studies. Therefore, EPA feels it is crucial that answers to the attached comments be provided prior to moving forward with the implementation of the proposed studies.

- EPA was not able to assess the potential of the potassium ferrate and TRU Clear mixture to treat wastewater streams that contain very low concentration of radionuclides. Previous testing on this technology has shown that it is effective in lowering concentrations of wastewater streams containing several thousands of pCi/L. However, testing in the effluent (after treatment) show concentrations that are several magnitudes higher than the concentrations of groundwater at Rocky Flats Plant. EPA does not believe that this technology will be capable of achieving target levels of 0.05 pCi/L for plutonium in water without a polishing treatment such as filtration or any other physical separation method. EPA suggests that phase I of this study be conducted first and results evaluated prior to moving forward with the proposed phase II studies. If results from phase I show that a polishing step may be needed to remove radionuclides to the target levels, then phase II studies need to be modified accordingly to include a polishing step treatment.

1.0 INTRODUCTION

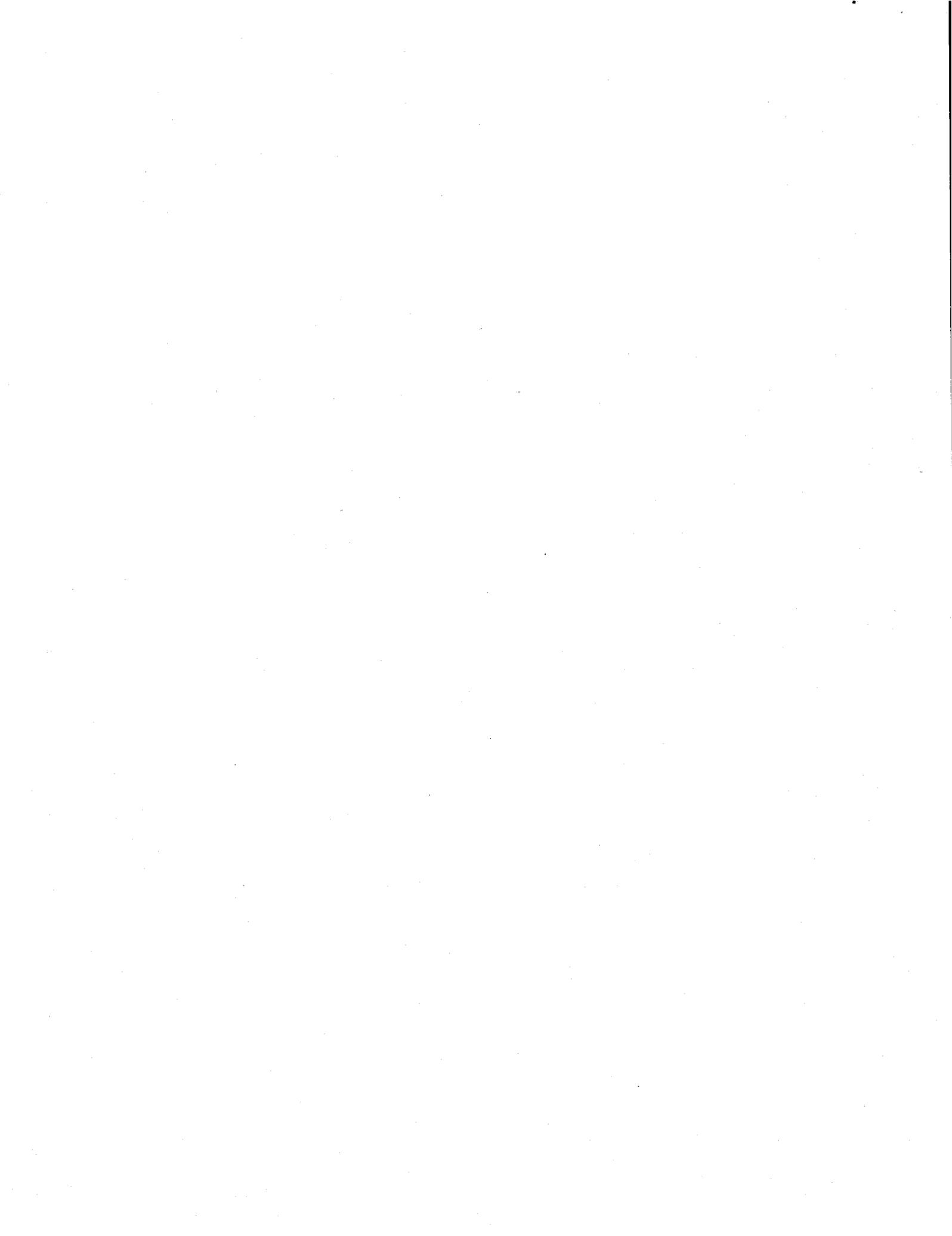
PRC Environmental Management, Inc. (PRC) has completed a technical review of the *Draft Treatability Study Work Plan for the Potassium Ferrate Process*. This report was prepared for the U.S. Department of Energy (DOE) by EG&G Rocky Flats (EG&G), in February 1994 and submitted for U.S. Environmental Protection Agency (EPA) review under the terms of the Interagency Agreement. Review of the document was requested by the EPA under contract number 68-W9-0009, Technical Enforcement Support (TES) 12, work assignment number C08061.

PRC's review focused on the internal consistency and overall approach of the work plan to evaluating the potassium ferrate process technology, technical adequacy of the data quality objectives, and appropriateness of analytical methods.

Section 2.0 contains general comments that pertain to the document as a whole or to concerns that appear in multiple locations, and Section 3.0 contains specific comments that address individual deficiencies within the document. Section 4.0 summarizes all review comments, and Section 5.0 lists the reference cited in this review.

2.0 GENERAL COMMENTS

1. The work plan describes a series of approximately 30 jar tests that will be used to evaluate the technology. Therefore, these experiments are bench-scale and not pilot scale. The text states that the tests will yield operational data that will be applicable to on-site waste streams. Actual waste streams to be used for the study have not yet been identified.
2. The work plan states that the treatability study will be conducted for DOE by EG&G and ACTA Resources, Inc. (ACTA). The roles and responsibilities of EG&G and ACTA should be described in the report. In addition,
3. The project description does not clearly state that both potassium ferrate and TRU/Clear[®] "4" (a mixture of potassium ferrate and magnesium and zirconium salts) will be evaluated during this treatability study. The work plan should clearly state that both compounds will be evaluated. In addition, the role of magnesium salts and zirconium salts in TRU/Clear[®] "4" should be discussed.



4. The technical discussion on the advantages of potassium ferrate over other inorganic coagulants is very brief. Additional information on the chemical reactions associated with potassium sulfate are presented by Potts and Churchwell (1994) and should be included in the work plan.
5. The waste stream to be used for the project has not been selected. Criteria to be used in selecting a waste stream should be identified in the work plan. These criteria should at least include minimum contaminant levels required to adequately test the potassium ferrate process and some discussion of potential matrix interferences that may be encountered.
6. The health and safety plan (HSP) presented in Appendix A is incomplete. Several pieces of site-specific information, such as figures and lists of personnel responsible for health and safety on the project, are missing and should be included in the final draft. PRC does not offer this comment to indicate approval or thorough review of the HSP. Rather, PRC merely points out that the HSP does not appear to fully comply with the requirements for a typical HSP as stipulated in 29 CFR 1910.120, and that it should be revisited.

3.0 SPECIFIC COMMENTS

1. Section 1.0, Page 4, Second Paragraph. This paragraph discusses treatment objectives and statements of the *County* Water Quality Control Commission. However, the *Colorado* Water Quality Control Commission is the agency responsible for setting discharge standards at Rocky Flats. This reference should be changed to Colorado Water Quality Control Commission.

Rationale: The document should reference the correct regulatory agency.

2. Section 3.0, Page 6, First Paragraph. This paragraph presents test objectives but does not mention evaluating the effects of sodium thiosulfate on the process. This paragraph should explain the reason for varying the amount of sodium thiosulfate added during the experiments and the purpose for this variation.

Rationale: The purpose of varying the amount of sodium thiosulfate used in the explaining experiments should be presented.

3. Section 4.1, Page 8, Second Paragraph. This paragraph discusses the purpose of initially screening wastewater streams. However, it does not discuss the minimum contaminant concentrations required in the wastewater stream to adequately assess the potassium ferrate treatment system. A description of potential waste streams to be used for the treatability study and their contaminant concentrations should be added to this section. In addition, a discussion of potential matrix interferences in various potential waste streams should be added.

Rationale: To evaluate the system, a minimum amount of contamination must be present and potential matrix interferences must be understood. Since matrix interferences have the potential to significantly alter effectiveness of the system, they should be evaluated.

4. Section 4.3, Page 12, First Paragraph. This section discusses the Phase 1 jar testing but does not refer to Tables 4-4, 4-5, or 4-6 that present the experimental scheme for Phase 1. These tables should be referenced in this section.

Rationale: The tables presenting the experimental scheme being discussed in this section should be cited.

5. Section 4.3.1, Page 12, Fifth Paragraph. This paragraph discusses addition of coagulant. Table 5-1 indicates adding different amounts of potassium ferrate (K_2FeO) measured in milligrams per liter (mg/L) will result in the same amount of Fe^{6+} . The derivation of the numbers shown in this table is unclear and should be explained.

Rationale: The numbers in Table 5-1 are not clear and should be explained.

6. Section 4.3.1, Page 12, Sixth Paragraph. This paragraph discusses mixing times. The text states that the sample should be mixed for 20 to 60 minutes. Tables 4-4 and 4-5 show that all mixing times are 60 minutes. This discrepancy should be corrected.

Rationale: Text and tables should agree.

7. Section 4.3.1, Page 13, First Paragraph. This paragraph discusses settling time before sampling. The text states that a sample should be collected between 30 minutes and 24 hours of settling. Tables 4-4 and 4-5 show all settling times as 24 hours. This discrepancy should be corrected.

Rationale: Text and tables should agree.

8. Section 4.3.1, Page 13, Third Paragraph. This paragraph states that, if required, samples may be filtered. It may be inappropriate to compare results from filtered versus unfiltered samples. It is therefore suggested that all samples be either filtered or unfiltered, and that combining filtered sample results and unfiltered be avoided.

Rationale: Analytical results from filtered and unfiltered samples will not be easily comparable. Consistent methodology should be employed and described in the work plan.

9. Section 4.3.1, Page 16, Table 4-6. This table is a summary of analytical work for Phase 1 jar tests. However, the body of the table lists Phase 2 jar tests under sample description. This should be corrected. In addition, the number of samples is listed as 12. However, Section 4.3.1 there are 20 test runs scheduled for Phase 1. The number of samples should be checked.

Rationale: The number of samples presented in the table should agree with that number presented in the text.

10. Section 4.3.2, Page 17, Table 4-7. This table presents the planned tests for the Phase 2 jar testing. It shows the mixing times as 30 minutes and the settling times as 30 hours. The reason for using these times is not clear from the table or the preceding discussion when a 60-minute mixing time and a 24-hour settling time were used for Phase 1. The way the results intend to be compared is unclear. The rationale for choosing different mixing and settling times should be discussed in this section.

Rationale: No rationale is provided for changing mixing and settling times from the phase one tests. Rationale and complete methodology should be presented in the work plan.

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11. Section 4.3.3, Page 21, Table 4-11. This table presents proposed the testing program for the Phase 2 confirmation jar tests. From the table, it appears that three waste streams will be sampled. However, it is not clear from the preceding text that more than one waste stream is to be evaluated during this treatability study. The number of waste streams to be used during the treatability study should be clarified.

Rationale: The number of waste streams to be used during the treatability study has not been discussed. Complete methodology and rationale should be present in the work plan.

12. Section 13.0, Page 34, First Paragraph. This paragraph discusses the management and staffing of the project. The organizational chart shown in Figure 1 does not agree with the organizational chart shown in Appendix B. These differences should be corrected.

Rationale: Project organization should be consistent throughout the document.

4.0 SUMMARY

The work plan provides the basic approach to be used by EG&G and ACTA in performing the treatability tests. However, some of the parameters to be adjusted during the tests are not clearly explained. Consistency between text and tables should be rechecked.

The waste stream to be used for the proposed tests has not been chosen. The choice of waste stream may be of critical importance to the success or failure of the treatability test. Therefore, the work plan should clearly discuss the requirements that will be used to select a waste stream.

5.0 REFERENCES

- Potts, M.E., and D.R. Churchwell. 1994. "Removal of radionuclides in wastewaters utilizing potassium ferrate (VI)." *Water Environment Research*. Volume 66, Number 2. Pages 107-109.

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