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Department of Energy

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JUN 11 1997
DOE-1031-97

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V - SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Thomas Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF ADDITIONAL INFORMATION ON ENGINEERING TECHNOLOGY REPORTS FOR THE ON-SITE DISPOSAL FACILITY

Reference: **Letter from Johnny Reising to James Saric and Tom Schneider, "Transmittal of Responses to Ohio Environmental Protection Agency Comments on the Engineering Technology Reports," September 27, 1996.**

In the responses to the Ohio Environmental Protection Agency (OEPA) comments on the Engineering Technology Reports (see referenced letter), the Department of Energy committed to providing the OEPA with additional information on a number of topics. The pertinent original comments are attached to this letter with a discussion of the additional information provided.

Please contact Rod Warner at 513-648-3156 if there are any questions regarding this transmittal.

Sincerely,

Susan M Pelt

Johnny W. Reising
Fernald Remedial Action
Project Manager

FEMP:Warner

Enclosure: As Stated

Recycled and Recyclable

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ADDITIONAL INFORMATION TO RESPONSE TO OEPA COMMENTS ON TECHNOLOGY REPORTS FOR THE ON-SITE DISPOSAL FACILITY

Commenting Organization: Ohio EPA Commentor: OFFO
Section#: I Pg.#: 2 Line#: Bullet "c" Code: c
Original Comment# 1

Comment: Are estimates available for the volumes of moisture that will result from the extrusion process? The volume of wastewater to be treated could be reduced by blending wet soils with dry soils. Has the potential cost savings of this blending been factored into the cost analysis?

Response: An estimate of water generation rates was not made for the report. However, assuming an average in situ moisture content of 3% wetter than required for the brickmaker, the volume of water generated in the extrusion of 1 million cubic yards of soil could be about 12,000,000 gallons. The DOE agrees that blending of soils with different moisture contents will reduce the volume of wastewater treated. However, the increase in time, manpower, and equipment to accomplish this task on the surface appears to out weigh the benefit. Excavated material is moisture conditioned at source prior to delivery to OSDF or Brickmaker. Standard moisture-conditioning techniques (i.e., water spay, discing, etc.) are anticipated to be adequate. The volumes of water in site soils varies from season to season in the remediation areas supplying the soils, but are typically near or fully saturated (see Table G-2 of the Geotechnical Investigation Report, On-Site Disposal Facility, Operable Unit 2. This cost savings from soil blending has not been factored into the cost evaluation. However, the additional costs to condition the soil are also excluded from cost analysis.

Action: Provide Cost Benefit Analysis of blending soils versus wastewater treatment in Fiscal Year 97.

Additional Information: **Cost estimates for comparing soil blending versus wastewater treatment costs are presented in Attachment 1. The calculations indicate that the 7-year total cost for soil blending is $860,000 as compared to a 7-year total cost of $160,000 for extruded wastewater treatment.**

Commenting Organization: Ohio EPA Commentor: OFFO
Section#: V Pg.#: 12 Line#: Bullet 2 Code: M
Original Comment# 6

Comment: DOE's assertion to "closely monitor barrier development efforts through interaction with EPA RTDF and DOE/OTD" is unacceptable to Ohio EPA. It was and remains our understanding that DOE would undertake pro-active technology development activities. The quoted phrase implies that DOE's efforts will be little more than literature surveys.

Response: DOE is committed to seeking and applying new technologies to site remediation as they become available and are safer, better, faster, and cheaper. The primary mission of the DOE-FN is safe remediation of the FEMP while addressing stakeholder concerns.

The FEMP will continue interacting with the federal and private R&D community, to: a) persuade and encourage resolution of its unique problems, b) provide contaminated soils and groundwater for developmental work, c) leverage funds and resources between agencies, d) provide necessary input to experimental design, cost, and performance criteria for useable technologies, and e) request data from independent agencies. Relationships are well established on a number of innovative technologies (e.g., real-time uranium detection in soil and water, electrokinetics, phosphate stabilization) with DOE researchers at Ames, Argonne, Sandia, Grand Junction and Oak Ridge; each is partnered with private industry capable of commercializing innovative technologies. Relationships with EPA/RREL vendors, universities and the private sector are generally limited to those who have access to NRC labs and private funding to conduct independent research.

Action: Discuss a method of keeping OEPA statused as to developments.

Additional Information: **The DOE Office of Science and Technology is chartered with overseeing the demonstration and development of new technologies and monitoring work by other agencies that could be applicable to the remediation of DOE sites. OEPA will be copied on all reports of improvements to barrier technology.**

Commenting Organization: Ohio EPA Commentor: OFFO
Section#: I Pg.#: 2 Line#: Bullet b Code: c
Original Comment# 7

Comment: The replacement of pea gravel with phosphate rock in the leachate collect system raises several questions relating to the long-term ability of the LCS to operate. What assessments have been performed on the relative molar volumes of the phosphate rock before reaction with leachate versus the molar volume after the reaction with the leachate? Will the phosphate rock swell and restrict the drainage? What is known about the load-bearing capacity of the reaction products? Will they be able to support the weight of the OSDF and the contents?

Response: The issues stated in this comment are only several of the many unknowns further identified on Pages 10 and 11 of the Geochemical Barrier Report. We are working with Ohio State University to determine the fundamental chemical characteristics of phosphate rock which control sorption of uranium from solution, and to examine the resulting bulk permeabilities. If shown to be an effective extraction medium, additional work may be done to evaluate physical characteristics such as compressive strength, long-term performance capability and cost justifications. The evaluations conducted to date have not addressed long term performance, and the potential for leachate collection system clogging remains a serious concern.

Action: Discuss a method of keeping OEPA statused as to developments.

Additional Information: **Ohio State University (OSU) research reports completed to date regarding the use of phosphate rock to immobilize uranium are included as Attachment 2. Also included is a copy of OSU's current scope of work.**

Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: II Pg.#: 2 Line#: Code: c
Original Comment# 8

Comment: A summary table of the technology review would be helpful in conveying the progress of each of the laboratories and the relevant studies, including pertinent information such as different media and chemicals being tested, and the experimental conditions under which the experiments are being conducted. The text in this section should also include a discussion of the factors that would affect the feasibility and in-situ practicability of geochemical barrier technology at FEMP.

Response: The intent of this and its companion reports is to evaluate the status of emerging technologies being investigated by the R&D community relative to actual field implementation in remediation operations. Brief summaries, including tables of the most promising candidate materials, costs and researching agencies, are included in the report (see Page 11). No emerging technologies were identified which can be implemented now. We will keep in contact with OEPA and DOE EM-50 Office of Science and Technology to closely monitor and evaluate the progress made at each of the laboratories to examine the practicability of geochemical barriers at the FEMP.

Action: DOE will report on a quarterly basis any developments in this area.

Additional Information: **An updated summary table indicating research organizations, relevant studies, and other pertinent information related to geochemical barrier technologies is provided as Attachment 3.**

Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: II Pg.#: 2 Line#: Code: C
Original Comment# 9

Comment: **The technology review section should include a discussion of the actual physicochemical processes (e.g., theoretical molecular interaction) involved in soil stabilization processes. This discussion would be aimed at answering the question: How does this technology work?**

Response: The engineering report describes some basics of our current understanding, but not enough research has been done to date to provide a complete understanding the actual physicochemical processes involved in soil stabilization. As new research results become available we will forward this information to you.

Action: Track on-going research and forward to OEPA.

Additional Information: Additional information pertaining to the current research on geochemical barrier technologies is provided in Attachments 2, 3, 4, 5, and 6.

Commenting Organization: Ohio EPA Commentor: OFFO
Section#: IV Pg.#: 9 Line#: last compete paragraph Code: c
Original Comment# 11

Comment: Why isn't the addition of AFO to the basal liner discussed more thoroughly in this report? This is a readily implemented and very inexpensive option. The concept of discing additives other than AFO into the basal layer appears not to have been explored. The most obvious objection to modifying the basal liner (changing the load-bearing capacity) does not appear to be a problem at the very low application rate of 300 tons. Please provide both Ohio EPA and GeoTrans copies of the complete RUST Geotech modeling studies.

Response: The most obvious objection is not load-bearing capacity, but unknown, long-term impact on liner permeability. Discing additives into liner clay materials may seem obvious; however, no data is available on necessary treatment rate and distribution in the matrix to construct an effective long-term barrier. Complete RUST modeling research is not available to FERMCO at this time. We will request a copy of these studies for you.

Action: As stated.

Additional Information: Rust Geotech modeling research information is provided in Attachment 4. Also enclosed are calculations and cost estimates developed by Rust Geotech for FEMP based on their modeling research.

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Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: IV Pg.#: 9 Line#: 2nd paragraph from bottom Code: C
Original Comment# 12

Comment: The text states that modeling results indicate that mixing powderized AFO into the lower 6 inches of the basal clay layer would "effectively extract uranium from leachate". This section needs clarification. First, it is not stated how the AFO would effect uranium mobility, but we are speculating that the material has been proposed because of its sorptive properties. However, adsorption of the uranium ion will be pH dependent, since the charge on the AFO surfaces is pH dependent. The pH of the leachate, and the chemical quality of the leachate that may affect competition for the sorption sites is not discussed in the text. Please provide chemical analyses for the leachate and summarize the processes responsible for the removal of uranium from the leachate. Additionally, the model used to do these simulations was not specified: is it a geochemical specification, mass balance, or solute transport code, and does it incorporate sorption reactions? Obviously, the model capabilities, and how well it is able to simulate the geochemical environment, will dictate whether the AFO will facilitate uranium removal. Finally, this text and the Soil Stabilization Report indicates that phosphate-amended soils is a promising technology in removing uranium from soils, based on laboratory results, and availability, acceptability, compatibility, and hazardous nature (Page 11 table). Why was this not proposed instead of AFO?

Response: We have attached a chemical analysis summary table for the contaminated perched water used to simulate leachate used in permeability testing of OSDF liner soils. This leachate is a sample of contaminated well water from the FEMP Wells #1082 and #1085. No actual leachate will be available until the OSDF has been filled.

We will send you more information about the model was that was used in these simulations as soon as we receive it.

We do not have enough information to propose one soil stabilizing material over another but will continue to examine the results from all research and development activities in this area.

Action: Request and forward model information from RUST Geotech.

Additional Information: **Rust Geotech modeling research information is provided in Attachment 4. Also enclosed are calculations and cost estimates developed by Rust Geotech for FEMP based on their modeling research.**

Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Geochemical Barrier Pg.#: 9 Line#: Code: C
Original Comment# 13

Comment: It is not clear (nor is it specified in the *Intermediate Design Specification Package*, Section 02710) whether the "limestone pea gravel in the leachate collection system" referenced in the text is the material to be used for the LCS and LDS drainage layer. If so, then proposing to replace the limestone with phosphate rock appears to be inconsistent with the purpose of the LCS/LCD. Interaction with phosphate rock will precipitate uranium from solution, possibly plugging the collection system. Please indicate whether this has been evaluated, and if so, why the precipitates would not adversely impact the system.

Response: We agree that the LCS must be constructed to fulfill its primary purpose of fluid transport. A detailed study has not been completed to determine the amount of precipitant expected. Any substantial precipitation into the LCS would be unacceptable. Potential reduction in bulk permeability of any extraction barrier is a concern being addressed by Ohio State University. One potential use of phosphate rock to treat leachate is in the leachate collection sump after closure of the OSDF.

Action: Continue to evaluate this option as we review on-going research.

Additional Information: Ohio State University (OSU) research reports completed to date regarding the use of phosphate rock to immobilize uranium are included as Attachment 2. Also included is a copy of OSU's current scope of work.

Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: II Pg.#: 3 Line#: Code: c
Original Comment# 17

Comment: A detailed description of conditions and parameters used for the bench-scale soil washing studies performed by IT should be included to add depth to the description of the technology.

Response: The IT soil washing studies were included as an appendix in the OU-5 Feasibility Study. It is not DOE's Policy to attach the same document to multiple reports. This policy is necessary to implement document control at the Fernald Site. DOE will provide this document with the report on a "for information only". An alternative source for the soil washing study is the OU5 Feasibility Study. Additionally, the MAWS Soil Washing Report will be included with this report.

Action: As stated.

Additional Information: **The Soil Washing Treatability Study from the Operable Unit 5 Feasibility Study is provided as Attachment 7, and the MAWS Soil Washing Report is provided as Attachment 8.**

Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Executive Summary Pg.#: Line#: Code: general
Original Comment# 19

Comment: Of the four technologies that have been evaluated in these reports, soil stabilization appears to be the most likely to be developed to the extent of being implementable within the time frame of the construction of the OSDF. It is Ohio EPA's expectation that the Technology Development Plan referred to in Section V of this report will be aggressively pursued. Soil stabilization should be looked at in the broader context of how it will affect other activities. For example, the regulators have not approved an Impacted Materials Placement Plan. If placement of bulk steel beams within the OSDF is precluded, the steel could be shredded and blended with soils. Another unknown is the groundwater monitoring plan. Elements of geochemical barriers could serve to substitute for some elements of the groundwater monitoring strategy.

Response: As stated in the report, considerable research needs to be effected to document potential benefits of soil stabilization; particularly long-term performance. As an example, the shredding of large steel structural members may be extremely expensive and dust intensive, and would require a very large shredder that would also need to be dispositioned after use. The extra handling, waste generation, and energy and dust concerns causes us to question the economic viability of steel shredding.

As addressed in Comment #8, DOE will keep in contact with OEPA and DOE EM-50 Office of Science and Technology to closely monitor and evaluate the progress made at each of the laboratories to examine the practicability of geochemical barriers at the FEMP.

Action: DOE is evaluating steel placement activities at other active disposal sites as to economic and operational benefits and will forward the results when they are compiled.

Additional Information: **We have contacted Hanford, other DOE disposal facilities, and several private demolition landfills to learn of their methods for shredding structural steel. None of these facilities shredded steel, either structural or sheet. The primary method of steel placement consisted of dumping from a truck, placing with bulldozers or grapplers, flattening or straightening with large bulldozers, pushing soil cover over steel with small bulldozers, and compaction after soil lifts are placed.**

Commenting Organization: Ohio EPA Commentor: OFFO
Section#: Pg.#: Line#: Code: C
Original Comment# 21

Comment: The report provides a good summary of the state of innovative technologies for immobilizing radiological contaminants in soils. Soil amendment with phosphates appears very promising in immobilizing uranium in soils, based on cost, availability, acceptability, compatibility, and hazardous nature (see tables on Pages 9 and 10). FEMP has made a commitment to evaluate the viability of this technology (Page 2, 1st bullet; Page 6, ANL), which includes an evaluation of the important performance criteria listed on Page 9. Results of the evaluation must be available by March 1998 if the technology is to be incorporated into Phase I (Page 3). Because of the potential benefits of this technology and the tight time schedule, it would facilitate the process if the scope of work and corresponding work plans for the laboratory (and pilot-scale) tests were provided for immediate review. Additionally, results should be made available as soon as possible and the scope of work updated as necessary. This will assure that all parties are aware of the viability of incorporating the soil-amendment technology prior to the March 1998 deadline.

Response: The technology evaluation report has examined this technology for its potential inclusion into OSDF construction. The evaluation has shown that the rate of development for this technology is not compatible with the 10 year plan schedule. The current funding levels and R&D program schedules will not yield useful results by March, 1998.

Action: We will keep OEPA and all interested parties informed of any test planned and conducted by laboratories.

Additional Information: An updated summary table indicating research organizations, relevant studies, and other pertinent information regarding soil stabilization technologies is provided as Attachment 5.

Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: II Pg.#: 3 Line#: Code: C
Original Comment# 22

Comment: The technology review (Section II) includes a review of the research status of soil stabilization technology. A summary table would be helpful in conveying the progress of each of the laboratories and the relevant studies, including pertinent information such as different media and chemicals being tested, and the experimental conditions under which the experiments are being conducted. The text in this section should also include a discussion of the factors that would affect the feasibility and practicability of soil stabilization technology at FEMP.

Response: We have evaluated the status of emerging technologies being investigated by the R&D community to allow actual field implementation in remediation operations. Brief summaries, including tables of the most promising candidate materials, costs and researching agencies, are included in the report. No emerging technologies were found which may permit timely use for soil remediation operations at the FEMP.

We will keep in contact with OEPA and DOE EM-50 Office of Science and Technology to closely monitor and evaluate the progress made at each of the laboratories to examine the practicability of geochemical barriers at the FEMP.

Action: As New developments become available, we will summarize the information into a table, which will be submitted in November.

Additional Information: **An updated summary table indicating research organizations, relevant studies, and other pertinent information regarding soil stabilization technologies is provided as Attachment 5.**

Commenting Organization: Ohio EPA Commentor: OFFO
Section#: II Pg.#: 5.6 Line#: Bullet 4 Code: C
Original Comment# 23

Comment: Please keep the Ohio EPA informed of the results of the phytic acid studies being performed at ANL.

Response: Agreed.

Action: DOE will keep OEPA informed of all ANL phytic acid studies.

Additional Information: **Historical and current research information on phytic acid studies conducted by Argonne National Laboratory (ANL) is provided as Attachment 6.**

Commenting Organization: Ohio EPA Commentor: OFFO
Section#: II Pg.#: 7 Line#: Bullet 7B Code: C
Original Comment# 25

Comment: The Ohio EPA concurs with DOE's conclusion that the results of computer modeling of contaminant migration may be useful to test potential mitigation strategies. Please provide a work plan for the path forward for these studies. Of particular interest are long-term thermodynamic stability of the sorption products, potential changes in product stability as a function of pH and re-dox potential, load bearing strengths for phosphate rock in the LCS drainage layer, and mobility of soluble phosphates in the leachate. When reduced forms of zero-valent iron are evaluated, consideration should be given to the physical form of the iron and the effectiveness of bulk steel structural members vs. the effectiveness of steel shards or steel shot.

Response: We will contact PNL for their work plan for their studies and forward them to you. We will also contact the DOE office of Science and Technology to determine if there are any plans to model contaminant migration for long term stability of sorption products, and whether or not demonstration projects are planned to verify modeled results. Upon receipt, DOE will evaluate the applicability of the model to conditions at FEMP.

Action: Forward PNL work plan to OEPA.

Additional Information: **FEMP has received research results from Pacific Northwest Laboratory (PNL) regarding uranium sorption to clay minerals and is currently reviewing and evaluating the information. Unfortunately, FEMP was also informed that PNL's planned work at the Pantex Plant in Texas, as reported in the Soil Stabilization Report, was canceled due to lack of funding.**