COMMENTS - TECHNOLOGY REPORTS

06/28/96

OEPA DOE-FN
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COMMENTS

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George V. Voinovich
Governor

June 28, 1996

RE: DOE FEMP
MSL 531-0297
HAMILTON COUNTY
COMMENTS TECHNOLOGY
REPORTS

Mr. Johnny Reising
U.S. Department of Energy, Fernald Area Office
P.O. Box 538705
Cincinnati, OH 45253-8705

Dear Mr. Reising:

This letter provides as an attachment Ohio EPAs comments on the four draft technology reports received on May 28, 1996. These reports have also been reviewed by the Ohio Department of Health, Bureau of Radiation Protection.

If you have any questions, please contact Tom Ontko or me

Sincerely,

Tom Schneider per

Thomas A. Schneider
Fernald Project Manager
Office of Federal Facilities Oversight

cc: Jim Saric, U.S. EPA
Terry Hagen, FERMCO
Ruth Vandergrift, ODH
Mike Proffitt, DD&GW
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Ohio Environmental Protection Agency Comments on Draft Engineering Technology Reports
June 28,1996

Brickmaker Report

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?

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: III Pg #: 3 Line #: bullet 2 Code: c
Original Comment #: 2
Comment: The Ohio EPA agrees that cost must be included in the analysis of emerging technologies. However, it is our concern that the costs considered are being limited to direct costs and benefits without taking into account total life cycle costs. The "Draft Decision Methodology for Fernald Scrap Metal Disposition Alternatives" discusses additional performance measures that take into consideration socioeconmic and environmental, safety, and health issues. Also included in these considerations is stakeholder concerns.
The cost analysis doesn't include a way to factor into the cost analysis the benefits of an incremental shortening of the length of the OSDF or the benefits of a small but quantifiable reduction in permeability of bricks versus compacted soils material. This issue is exacerbated by the artificially low costs of disposal in the OSDF. A combination of these factors would seem to preclude any use of new technologies that does not cause a reduction in the direct cost.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: IV Pg #: 3 Line #: Performance Code: c
Original Comment #: 3
Comment: Was an evaluation performed on the use of extruded soil pellets to infill around debris? This would add 900,000 cubic yards to the total amount of soil that could be extruded and nearly double the amount of soil that could be extruded.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: IV Pg #:4 Line #: 2nd paragraph Code: c
Original Comment #: 4
Comment: How representative of the site soils was the sample used to for the compaction analysis? Typical soils at Mound are extruded to a density of between 118 and 126 pounds per cubic foot which is significantly higher than the 112 pounds per cubic foot quoted in this study. Comparing the density of the extruded Mound soils to the 97 lbs/cubic foot density estimated for compacted materials in the OSDF results in a 27% increase in density. This is twice the benefit quoted in this report. If a majority of Fernald soils could in fact be extruded to the higher density, the benefits of the brickmaker technology would be greater than the current estimates.

In a previous comment about the potential use of extruded soil pellets to fill the voids between debris, the Ohio EPA identified an additional 900,000 cubic yards of soil that could potentially be extruded through the brickmaker. Adding the potential benefits of both these improvements (doubling the volume of extruded soil and doubling the density increase of extruded soil) gives a factor of four increase in the potential benefit. The resulting decrease in the length of the OSDF could be as much as 800 feet. It is Ohio EPAs contention that this is a significant improvement.

Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Performance Pg#: 4 Line#: 4th paragraph Code: C
Original Comment#: 5
Comment: The text states that the brickmaker process will decrease the permeability of the soil. What is the estimated brickmaker compacted permeability? Please provide a more detailed discussion/analysis relating the advantages of decreased permeability as it relates to the performance over time of the OSDF.
Would the brickmaker technology provide lower in-place water content? How would this affect the development of leachate within the OSDF? Would lowering the volume of leachate provide a significant advantage?

Geochemical Barrier Report

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: V Pg #: 12 Line #:bullet 2 Code: M
Original Comment #: 6
Comment: DOEs 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 DOEs efforts will be little more than literature surveys.

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?

Commenting Organization: OEPA 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.

Commenting Organization: OEPA 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?

Commenting Organization: OEPA Commentor: GeoTrans
Section #: Geochemical Barrier Pg. #: 3 Line #:bullet 1 Code: C
Original Comment #: 10
Comment: The explanation provided for the removal of uranium from groundwater in the ESL laboratory tests is not clear. Based on the materials used and the observations noted, it appears that the $FeSO_4$ and $Ca(OH)_2$ are probably dissolving because of their high solubilities. Dissolution of $FeSO_4$ would initially drive the Eh lower. As the pH increased due to dissolution of $Ca(OH)_2$, the iron would be precipitated as $Fe(OH)_3$, and the Eh would be buffered at the $Fe^{2+}/Fe(OH)_3$ boundary. A potential mechanism for removal of uranium, and probably molybdenum, from the groundwater would be coprecipitation with the iron hydroxide. The two mechanisms, precipitation of CaUO4 (which occurs at elevated pH values) vs. coprecipitation of uranium with iron hydroxides, occur under different environments and would dictate under which conditions the technology would be viable.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: IV Pg #: 9 Line #: last complete 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.

Commenting Organization: OEPA 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 speciation, 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?

Commenting Organization: OEPA 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.

Commenting Organization: OEPA Commentor: GeoTrans
Section #: Draft Rev. A Geochemical Barrier Report Pg. #: 10 Line #: Code: C
Original Comment #: 14
Comment: In the table on page 10, the "cost of constructing a rail receiving facility at or near the Fernald site" is included in the projected costs for phosphate rock; however, this cost is not included in the estimated costs above baseline for the remaining four materials (or for the limestone). Please indicate why the rail receiving facility is specific to the phosphate rock, and what the projected costs of using phosphate are separate from the rail facility. Additionally, the authors indicate on page 11 that the materials can be transported via rail or truck. Please indicate

how this would impact cost estimates presented in the page 10 table.

Commenting Organization: Ohio EPA Commentor: ODH
Section #: V Pg #: 12 Line #: 3rd bullet Code: c
Original Comment #: 15
Comment: ODH concurs with the FEMP's conclusions on the potential for the use of phosphate rock as an alternative medium to the limestone pea gravel currently planned for the leachate collection system. While studies indicate phosphate rock can stabilize uranium, composition quality control is essential as this material may also contain appreciable amounts of uranium, thorium, and radium as do many phosphate fertilizers. This suggests a potential migration of the very materials we are trying to keep out of the aquifer from this source.

Physical Separation Report

Commenting Organization: Ohio EPA Commentor: GeoTrans
Section#: Physical Separation Pg#: Line#: Code: C
Original Comment#: 16
Comment: Lack of sufficient material to implement the technology is one of several concerns expressed in the text. What quantity of material would be required to justify use of the technology? Based on the shortage of material, could physical separation/soil washing be used on other soils besides the targeted gravels?

Commenting Organization: OEPA 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.

Commenting Organization: OEPA Commentor: GeoTrans
Section #: Physical Separation Pg. #: 5 Line #: Code: E
Original Comment #: 18
Comment: The word "calcareous" is spelled incorrectly twice on this page.

Soil Stabilization Report

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 EPAs 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 effect 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.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Pg #: Line #: Code: general
Original Comment #: 20
Comment: There seems to have been only limited investigation of using these four technologies in combination. One obvious example would be to apply amendments to the soils as they are fed to the brickmaker. Has this possibility been explored?

Commenting Organization: OEPA Commentor: GeoTrans
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 (pg. 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.

Commenting Organization: OEPA 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.

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.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: II Pg #: 6 Line #: bullet 5 Code: c
Original Comment #: 24
Comment: There is no "Attachment A" on any of the copies of these reports sent to the Ohio EPA. This report only contains copies of the correspondence with EM-40 and the attachments thereto. Please provide Ohio EPA with copies of the GeoSyntec compendium.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: II Pg #: 7 Line #: bullet 7b Code: c
Original Comment #: 25
Comment: The Ohio EPA concurs with DOEs 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.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: II Pg #: 5 Line #: bullet 4, 2nd to last line Code: e
Original Comment #: 26
Comment: The copies mailed to Ohio EPA do not contain the references at the end of the Soil Stabilization Report.