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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

OFFICE OF
THE REGIONAL ADMINISTRATOR

November 11, 1993

Via Telecopy

Post-it™ brand fax transmittal memo 7671	# of pages ▸ 23
To Dave Adler	From Dan Wall
Co.	Co.
Dept.	Phone # (913) 551-7710
Fax # (615) 576-0956	Fax #

Mr. David G. Adler
Former Sites Restoration Division
Department of Energy
Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831

Dear Mr. Adler:

Enclosed are our comments on the revised draft of the Feasibility Study for the St. Louis FUSRAP site, dated July 1993, and the various other supporting documents provided by DOE including the Remedial Investigation Addendum. This transmittal will be followed by hard copy.

Please call if you have any questions.

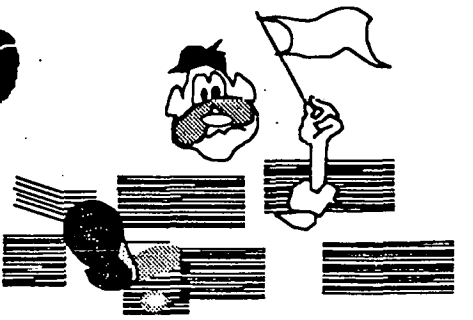
Sincerely,

DRW

Daniel R. Wall
Superfund branch

110614

FUSRAP



FAX

Date : 11/12/93

To : Gerry Palau Fax #: _____

From : Dave Adler Phone #: _____

Pages to Follow : 32

MESSAGE:

FACSIMILE
615-576-0956

VERIFICATION
615-576-0948

FORMER SITES RESTORATION DIVISION
U.S. DEPARTMENT OF ENERGY, EW-93
P.O. BOX 2001
OAK RIDGE, TN 37831-8723

REVIEW COMMENTS ON JULY 1993 DRAFT FEASIBILITY STUDY/ ENVIRONMENTAL IMPACT STATEMENT AND SUPPORTING DOCUMENTS

DOE Responses to EPA Comments of May 19, 1993

1. General Comment 1 --We remain concerned that certain aspects of the feasibility of the onsite alternatives have not been demonstrated. The following indicate some areas, other than the hydrogeologic properties of the subsurface clay units, where we believe there is significant uncertainty or where more information should be presented: 1) the structural stability of fill materials underlying the proposed disposal area with regard to differential settling, the effectiveness of compaction techniques in correcting any problems, and the extent of potential integrity problems with the onsite alternatives resulting from subsidence; 2) the varying effectiveness of the consolidation and capping alternative with regard to its configuration relative to the underlying clay units; 3) the ability of the onsite disposal alternatives to accommodate potential waste volumes considering spatial constraints, the accuracy of waste volume estimates, and disposal contingencies; 4) the impacts of varying soil cleanup levels on remedy selection, considering the potential for more stringent guidelines; 5) the remedial objective of the slurry wall and the impacts of the rubble fill on its constructability

2. General Comment 2 --While we agree that consolidation and capping ranks more highly than the disposal facility alternatives in short-term effectiveness due to a shorter implementation time and reduced handling of waste materials, we do not agree that they should be considered to rank equally in long-term effectiveness. Consolidation and capping would clearly not be as effective as a fully engineered disposal cell in isolating contaminants from the environment.

3. General Comment 2, Pg. EPA-9 --The discussion states that in both onsite design alternatives, based on the HELP model, the waste pile cover is the controlling factor in the amount of percolation through the pile. This analysis does not seem to account for the fact that under the consolidation and capping alternative, the waste pile will remain in contact with the shallow ground water providing a mechanism for contaminant migration independent of percolation through the cover.

4. General Comment 2, Pg. EPA-12 --The intent here was not to make a comment on how to determine which alternative provides the optimal combination of all comparison criteria, but merely to point out that an alternative that relies more on institutional controls, all else being equal, does not rank as highly in long-

term effectiveness and permanence as an alternative that relies more on engineering measures, and that discussion in the FS should reflect this, e.g., Alternative 5 ranks more highly in long-term effectiveness and permanence than does Alternative 4 because it does not rely as heavily on institutional controls.

The FS should provide information on risks to public health, under conservative exposure scenarios which don't consider institutional controls, from leaving the proposed access-restricted soils in place. If risks to the maximally exposed individual are shown to be within the acceptable risk range we are prepared to accept the access-restriction rationale. However, are not convinced that the described institutional control strategy is workable. At this point, we do not see how the proposed institutional controls can be implemented or relied upon without some ongoing involvement from the DOE.

5. General Comment 3 --We still have some concerns about the extent and accuracy of ARAR development. The detailed analysis of alternatives should provide a more complete discussion of the specific requirements considered to be ARAR for each alternative. Also, many of the determinations lack rationale and/or confuse or do not distinguish between "applicable" and "relevant and appropriate" requirements. Many determinations are made without regard to specific alternatives. The following are some examples:

a) pg. 2-69 --It is determined that RCRA requirements are not relevant and appropriate to the management of these wastes. A determination as to the applicability of a statute may be made; however, a determination as to relevance and appropriateness must be made on a requirement specific basis in accordance with the criteria outlined in the NCP. Also, the RCRA determination and the discussion on soil cleanup guidelines are out of place in this section which is intended to present the nature and extent of contamination;

b) pg. 3-11 --The last sentence of the 1st ¶ appears to be in error since it has been determined that there are no applicable sections of 40 CFR 192;

c) Perhaps we missed it, but we cannot find where it is detailed what specific requirements are considered relevant and appropriate to the consolidation and capping and onsite disposal alternatives. UMTRCA design standards are outlined (Section 3.2.1), however no alternative specific ARAR determinations are made.

d) Section 3.2.1, in general, contains some inappropriate determinations, e.g., "No wastes at St. Louis have been identified as listed or characteristic hazardous waste under RCRA and, therefore, these requirements are neither applicable nor relevant and appropriate." As stated above, determinations as to whether a requirement is relevant and appropriate should be made

on a requirement specific basis, considering the criteria in the NCP, for each alternative.

e) pg. 3-17, 5th ¶ --The logic of this NESHAP determination is not clear and seems to confuse determinations of applicability vs. relevance and appropriateness. Further, it is incorrectly implied that the St. Louis site is subject to 40 CFR 192.

f) pg. 5-23, last ¶ --On what statutory basis would a CERCLA waiver for ARARs be invoked?

g) pg. 5-32, last sentence --What specific requirements of these laws would be applicable? Is the word "applicable" intended? Please elaborate.

h) Table 5-6, pg. 5-100 --It is indicated that supplemental standards would be invoked for all soils under Alternative 2. We could not find where the rationale for such a decision is provided. It does not seem that all site soils meet the criteria for invoking supplemental standards as outlined on page 3-19.

i) Apparently the 40 CFR 192 standards for residual radium in soil are considered relevant and appropriate to cleanup of St. Louis site soils. Full rationale for why the circumstances at the St. Louis site are considered sufficiently similar to the circumstances envisioned under these regulations does not seem to be provided. The rationale should address the appropriateness of both the surface and subsurface standards.

j) Appendix A --Some of the same problems described above are reflected in the comment category of the Table. Also, certain requirements are described as not a part of an environmental law and therefore are not subject to the ARAR process. These same requirements are further described as TBCs. This approach is not correct. TBCs are advisories or guidelines designated for consideration in conjunction with ARARs as part of the CERCLA process. Requirements not part of an environmental law, or which apply to offsite activities, are outside the scope of CERCLA and must be fully complied with in all applicable situations.

6) General Comment 8 --The supplemental risk assessment for Coldwater Creek does not appear to address hypothetical scenarios involving dredging and placement of sediments on the creek bank or other accessible area. What is the rationale for the proposal to remediate the creek given that the risk analysis does not support the need for remediation?

7) General Comment 10 --The feasibility of the stated approach to managing inaccessible soils that are not made available during remediation indicates that the DOE would somehow obtain a release from liability for the management of these soils and relies on agreement from the current and future property owners to take full responsibility for the management of these soils. How does

the DOE envision that this will occur? The phased approach for removal of access-restricted soils under Alternative 5 is described as a weakness for the alternative due to the need to control/coordinate property owner activities and plan future soil removal over a long time frame. From our perspective, given the uncertainties associated with the other approach, the phased approach is one of the strengths of Alternative 5.

8) Detailed Comment 5 --All cited documents were not readily available, however, it appears that chemical analyses of the waste materials consists primarily of testing for RCRA characteristics at grid locations consistent with SW-846. This approach is adequate for determining whether a waste pile should be classified as a RCRA characteristic waste, but probably would not be adequate for the chemical characterization of an unknown and uncontrolled waste site. Characterization activities would typically include grid sampling overlaid by a biased sampling program developed according to information on known or suspected activities. Initial analyses would typically include the full list of CLP parameters. The adequacy of sampling should be discussed in this context.

9) Detailed Comment 16 --The indicated memo does not sufficiently address the comment. Development of cleanup criteria for uranium, and all other contaminants, should utilize the established reasonable maximum exposure scenario, account for additivity from all contaminants and all pathways, and achieve a $1X10^{-6}$ residual risk level or as close to this as it is technically and economically reasonable to achieve. It is not clear that these factors have been addressed.

10) Detailed Comment 17 --MCLs are not Federal Water Quality Criteria (FWQC). FWQC are established under the Clean Water Act and were developed for the protection of aquatic life and may be relevant and appropriate for a remedy involving surface waters or ground water discharge to surface waters.

11) Detailed Comment 27 --The response to this comment does not appear to be reflective of the analysis which should be performed. The baseline risks should be calculated using the reasonable maximum exposure scenarios (RME) and it is appropriate that these be based on conservative assumptions, i.e., the RME will almost always be a residential scenario involving consumption of contaminated or potentially contaminated drinking water unless there is overwhelming rationale not to do so. Please define the RME in the FS. Residual risks should then be calculated for each alternative using similarly conservative exposure scenarios such that direct comparisons for reduction in risk can be made. The information should be presented consistent with this approach.

12) Detailed Comment 29 --NRC regulations do not meet the definition of TBC guidance. If relevant and appropriate to the circumstances of the action, they should be considered ARARs.

Additional Comments on the FS

13) In many cases ARAR determinations are not handled properly. The following is an example: RCRA Subtitle C provides the most extensive set of waste handling regulations available and should be explored for any useful requirements. It is not appropriate, as is done in the FS, to reject all RCRA requirements from consideration as ARARs, on a site-wide basis, based on chemical composition of the waste materials. Section 300.400(g)(2) of the NCP identifies criteria that must be considered in determining whether a requirement is relevant and appropriate, i.e., addresses problems or situations that are sufficiently similar to the circumstances of the release or response action. These determinations should be made on a requirement specific basis for each aspect of remedial action. Chemical composition of the waste is only one of the considerations. The similarity of the activity, the purpose of the requirement, the location, and the medium being affected are some of the other things that should be considered.

14) The draft FS approach to developing cleanup standards is to be consistent with relevant and appropriate standards under 40 CFR 192 and the similar requirements under DOE Order 5400.5. Site specific cleanup criteria are not developed based on the RME. If this approach is to be successful, which we remain uncertain of, full rationale must be provided to establish that 1) both the surface and subsurface standards for residual radium in soil found in 40 CFR 192 are relevant and appropriate to the St. Louis site based on a comparison of the circumstances of the release with intended circumstances envisioned in the requirements; 2) these cleanup standards fully address the circumstances of the release at the St. Louis site, i.e., there are no contributions to risk from contaminants or pathways not envisioned by the requirements.

15) The FS should make conceptual design assumptions for purposes of costing and establishing feasibility, but not indicate conceptual design decisions are being made. For example, the FS describes the cap for the consolidation and capping remedy as consisting of all-natural materials (no synthetic liners or other man-made materials) in a multi-layered cover. While an assumption of this nature is appropriate for purposes of developing FS level cost information for comparison purposes, the text seems to indicate that conceptual design decisions are being made, which is not appropriate for this stage of the process. It is probably appropriate to develop performance criteria based on ARAR analysis, but it is not appropriate to otherwise limit design possibilities.

MEMORANDUM

SUBJECT: Review of Portions of the Following Department of Energy (DOE) Submittals Pertaining to the St.Louis Site, St.Louis, Missouri:

Remedial Investigation Addendum (RIA) Report for the St.Louis Site (May 1993)

Feasibility Study/Environmental Impact Statement (FS/EIS) for the St.Louis Site (July 1993)

Site Suitability Study (SSS) for the St.Louis Airport Site (July 1993)

Document Presenting Department of Energy Responses to Missouri Department of Natural Resources (MDNR) Comments on the Draft Feasibility Study and Proposed Plan for the St.Louis Site: MDNR Comment Letter dated May 20, 1993

FROM: Randy Rohrman
RCRA/GEOL

TO: Dan Wall
SPFD/SAFE

SPFD/SAFE has requested assistance from RCRA/GEOL in examining the issue of the ability of previously-identified stratigraphic units (3M and 3B) at the St.Louis Airport Site (SLAPS) to prevent migration of contamination from the upper groundwater system to the lower groundwater system. Portions of the above referenced documents, as well as previously submitted site characterization information, were reviewed with emphasis on this issue. Due to time constraints, a detailed, in-depth review of the full content of the above referenced documents was not performed. The issue of the ability of units 3M and 3B to restrict groundwater contaminants to the upper groundwater unit will be addressed in a general comment; specific comments will then be presented.

General Comments

1. The issue of determining the ability of the 3M and 3B subunits to prevent contaminant transport from the upper to the lower groundwater systems must be examined while remaining focused on the purpose of this determination. One purpose would be in conjunction with an investigation assessing the extent of contamination by identifying preferential migration pathways, and developing a conceptual model of the hydrogeology of the site. For this purpose, the information collected thus far at SLAPS with regard to the physical properties and aerial extent of the 3M and 3B units is significant.

However, for the purpose of assessing the aerial extent and ability of the 3M and 3B units to function as an effective barrier to contaminant migration for a long-term waste disposal unit, the information and data collected thus far is insufficient with respect to making an informed decision regarding its use for this purpose. Some concerns include the following:

- Sufficient data has been collected to demonstrate that subunit 3M is not continuous beneath the area of the proposed waste disposal unit (Site Suitability Study, Fig. 3-10). The fact that the aerial extent of subunit 3M has been shown to be limited in the study area itself raises concern that the continuity of subunit 3B may also be limited. There is not enough subsurface information currently available to adequately demonstrate the aerial extent and thickness of the clay subunits for the purpose of relying on them to act as a liner for the proposed waste disposal unit.

- Hydraulic conductivity data can be used to assess the ability of the clay layers to restrict advective transport of contaminated groundwater from the upper to lower groundwater systems. Values of hydraulic conductivity are presented in Appendix A of the Site Suitability Study (July 1993), obtained from laboratory permeability tests (Table A-1) and from field (slug) tests (Table A-2). Laboratory permeability values of field samples may be unrepresentative due to such factors as remolding of the sample for the test, off-gassing of dissolved air in the water during the test, and the fact that a lab test does not take into account secondary porosity features in the geologic unit such as cracks or thin sand layers. The hydraulic conductivity values presented in Table A-1 exemplify the wide range of variability that is generally observed when numerous samples are submitted for lab permeability testing, including a value of 2.0E-05 cm/sec for subunit 3B, one of the low permeability units which would have to effectively impede groundwater flow, and a value of 2.0E-08 cm/sec for Unit 4, which is described as consisting mostly of sands and gravels (Figure 3-2 of the Site Suitability Study).

Hydraulic conductivity values obtained from slug tests are presented in Table A-2, and results from five slug tests from the 3B and 3M subunits range from 10E-04 cm/sec to 10E-6 cm/sec. Although these values represent primarily horizontal permeability, they are of some concern for units that are to act as a liner in a waste disposal unit.

EPA believes that an appropriate demonstration of the ability of the 3B and 3M subunits to act as a barrier to advective transport would have to be made with a pumping test designed to obtain hydraulic conductivity data within and across the 3B and 3M subunits. Additionally, multiple tests of this nature would likely be needed considering the aerial extent of the proposed disposal unit.

▸ An assessment of the ability of the 3B and 3M subunits to restrict contaminant migration via diffusion is also necessary. As proposed, the waste disposal unit would utilize a slurry wall to restrict horizontal groundwater flow. This would result in a relatively closed unit with wastes in contact with stagnant groundwater in the upper system above the clay subunits. Without the diluting effect of moving groundwater, the contaminant concentrations in groundwater within the disposal unit can be expected to increase with time. This non-equilibrium condition can result in a motive force for dissolved contaminant migration by diffusion through the clays and into the lower groundwater system.

2. The general understanding of the hydrogeology of the SLAPS/Ball Field area requires further refinement. For example, on page 5 of DOE responses to the MDNR comment letter dated 5-20-93 it is stated that "Study of the hydrology of the site shows that there is no downward groundwater flow from the upper aquifer at SLAPS to the lower aquifer". However, this statement is contradicted on page 94 of the Site Suitability Study which states that "In the southern and eastern parts of SLAPS, the groundwater levels show a head differential that indicates a downward flow potential (from the upper to the lower groundwater system)". This latter conclusion is demonstrated in the document "Work Plan for the Remedial Investigation/Feasibility Study-Environmental Impact Statement for the St.Louis Site" dated December 1991; figures 2-15 and 2-16 depict the potentiometric surfaces for the upper and lower groundwater units at the SLAPS/Ball Field area which indicate a downward vertical gradient along the southern area of the site.

In order to improve understanding of the site hydrogeology, EPA recommends the collection of a complete round of water levels from all existing monitoring wells at the site, including those north of Coldwater Creek. These water levels should be collected within a single 24-hour time period in order to validate direct comparison of water level data among the wells.

Specific Comments

1. RI Addendum Report, May 1993:

During groundwater sampling, trichloroethene (TCE) was detected at 1400 ppb in monitoring well B53W17S (Table 3-40). This well is screened in the upper groundwater unit, and is located near the center of the proposed waste disposal unit. In an effort to examine the degree of separation of the upper and lower groundwater systems, EPA attempted to use groundwater chemical data for trichloroethene (as well as other constituents) to see whether this chemical has been detected in the lower groundwater system; it was found that most of the existing monitoring wells had not been

sampled for VOCs (Table 2-64, Work Plan for RI/FS-EIS dated 12/91). The presence of TCE in well B53W17S is of concern for several reasons:

- The extent and concentration of the TCE should be determined since at sufficient concentrations this chemical can have a deleterious effect on the permeability of clays due to its low dielectric constant.

- Irregardless of its source, the TCE may represent a groundwater problem that must be addressed. This should be determined before a large, permanent structure (the proposed waste disposal unit) is considered for this area.

EPA recommends sampling several of the existing wells in the SLAPS/Ball Field areas for volatile organic compounds (VOCs) in order to determine the extent of groundwater contamination by TCE and related constituents. Groundwater samples should be collected from the following monitoring wells and analyzed for the volatile organic compounds listed in EPA Method 8240:

B53W05S	B53W08S	B53W17S	M10-25S
B53W05D	B53W08D	B53W18S	M10-25D
B53W06S	B53W10S	M10-8S	M13.5-8.5S
B53W07S	B53W13S	M10-15S	M13.5-8.5D
B53W07D	B53W15S	M10-15D	

2. RI Addendum Report, May 1993:

Several metals at concentrations exceeding Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) were found in groundwater samples from monitoring wells installed in 1992 at the SLAPS/Ball Field area and at HISS (Tables 3-40 and 3-41).

It is recommended that DOE perform additional investigation of metals in groundwater at the SLAPS/Ball Field and HISS areas. This should include a proposal to sample additional existing monitoring wells in these areas for the same suite of metals (using the same analytical methods) that were analyzed for during the fieldwork performed for the RI Addendum Report. Additionally, analysis for the anions fluoride, sulfate, and nitrate should also be performed. Groundwater samples for total metals and the three anions should be collected from the following monitoring wells:

B53W04S	B53W10D	B53W15S	M10-15S
B53W04D	B53W11S	B53W17S	M10-15D
B53W05S	B53W11D	B53W18S	M10-25S
B53W05D	B53W12S	B53W19S	M10-25D
B53W09D	B53W12D	B53W20S	M13.5-8.5S
			M13.5-8.5D

EPA Region VII requires unfiltered groundwater samples for total metals analysis in order to ensure the collection of

groundwater samples which represent the entire mobile fraction of metallic contaminants, including those adsorbed to colloidal-size particles. However, EPA also recognizes the fact that unfiltered groundwater samples may contain excessive silt and clay-sized particles which may yield inflated results which are also unrepresentative of the mobile fraction of metallic contaminants. Because metals have been detected in groundwater samples from the SLAPS/Ball Field and HISS areas at concentrations which are of concern, EPA recommends that DOE consider alternative sampling techniques, such as low-flow pumping, which are designed to minimize the collection of turbid groundwater samples.

3. In order to demonstrate the feasibility and protectiveness of the preferred remedial alternative, DOE should assess the ability of the various hydrogeologic units at SLAPS/Ball Field area to attenuate all identified contaminants of concern, in all units which are determined to be impacted. This will require the determination of such parameters as in situ oxidation-reduction (EH) potential, pH, dissolved oxygen, and other parameters as necessary in order to determine the speciation and oxidation state of the various metals, as well as properties of the materials of the saturated zone such as cation exchange capacity and mineralogy. DOE may want to consider the use of a hydrogeochemical computer model for this assessment.

4. For the purpose of assessing fate and transport of contaminants of concern, it is requested that levels of the various radionuclides identified at the site be expressed in concentration units such as µg/l as well as in activity units such as pCi/l. Also, the chemistry of the radionuclides should be described, such as the chemical compounds they are found in at the SLAPS site, along with the water solubility and other properties related to fate and transport of these compounds.

5. It is recommended that several shallow (0 to 2-foot interval) soil samples be collected from the area of SLAPS where wastes had been placed. These soil samples should be analyzed for the same parameters as listed in the specific comments above, i.e. the VOCs, total metals, the anions fluoride, sulfate, and nitrate, and the radionuclides previously identified at SLAPS in terms of element concentrations.

If there are any questions regarding these comments, please contact Randy Rohrman at extension 7543.

INTRODUCTION

Under Work Assignment No. C07036 of the TES X Contract (Contract No. 68-W9-0007), Metcalf & Eddy, Inc. (M&E) has been tasked by the United States Environmental Protection Agency (U.S. EPA) Region VII, to review two documents: the May 1993 Remedial Investigation Addendum Report For the St. Louis Site (RI Addendum) DOE/OR/21950-132; and Evaluation of Contaminated Sediment Transport in Coldwater Creek, St. Louis, Missouri, July, 1993 (Contaminated Sediment Transport report). In Part I of this submittal, review comments for the RI Addendum are presented, and in Part II, review comments for the Contaminated Sediment Transport Report are presented.

PART I

REVIEW COMMENTS ON REMEDIAL INVESTIGATION ADDENDUM REPORT FOR THE ST. LOUIS SITE MAY 1993

The RI Addendum was prepared by Science Applications International Corporation (SAIC) for the U.S. Department of Energy (DOE). A cover letter from David G. Adler, DOE Missouri Site Manager, states that this document is a supplement to the Remedial Investigation Report for the St. Louis Site, which was submitted in January, 1992. As explained below under "GENERAL DESCRIPTION," a complete review of the issues involved in this document also necessitated review of an additional document, Evaluation of Contaminated Sediment Transport in Coldwater Creek, St. Louis, Missouri. Because the discussion could not easily be separated, the comments on that document are included in this review.

As in other site documents, three separate sites in the St. Louis area, together with miscellaneous "vicinity" properties near each of them, are collectively known as the St. Louis Site. The three are the St. Louis Downtown Site (SLDS), the St. Louis Airport Site (SLAPS), and the Latty Avenue property or Hazelwood Interim Storage Site (HISS).

The St. Louis Downtown Site (SLDS) is the old Mallinckrodt Chemical Works, an active Mallinckrodt chemical and pharmaceutical manufacturing facility in downtown St. Louis on the Mississippi River. Contamination of the SLDS is primarily radioisotope contamination resulting from activities of the Atomic Energy Commission and its predecessor, the Manhattan Engineering District (AEC/MED).

The Saint Louis Airport Site (SLAPS) is a 21.7-acre tract located in St. Louis County, Missouri, approximately 15 miles from downtown St. Louis and on the northern edge of the Lambert - St. Louis International Airport. The SLAPS is contaminated by uranium recovery and processing residues which were generated at the SLDS during the 1940s and 1950s, under the AEC/MED programs. Various residues were transported from the SLDS to the SLAPS and stored directly on the ground for a time from the mid-1940s to the mid-1960s, while the SLAPS and the residues were still owned by AEC/MED.

These residues and wastes from the SLAPS were subsequently purchased and transported by private interests to the property at 9200 Latty Avenue, approximately 1/2 mile north of the SLAPS in the city of Hazelwood. The Latty Avenue property totals 11 acres and is currently partitioned by a fence into the active industrial Futura Coatings site and the Hazelwood Interim Storage Site (HISS). The HISS portion of the site is currently leased by DOE from the owners. Occasionally in site documents, the entire Latty Avenue property, including the Futura Coatings portion, is referred to as the HISS. The SLAPS and Latty Avenue properties have been placed on the National Priority List of hazardous waste sites.

The St. Louis Site properties are to be remediated under the Formerly Utilized Sites Remedial Action Program (FUSRAP) of the U.S. Department of Energy. FUSRAP is a program to identify and clean up or otherwise control sites where residual radioactive contamination remains from the early years of the U.S. atomic energy program, and from related commercial operations where such commercial sites are specifically authorized by Congress for inclusion in FUSRAP. The document under review (RI Addendum) is a FUSRAP Program document.

In keeping with a formal interagency agreement, the U.S. EPA has reviewed and commented on site documents including a Work Plan, a Baseline Risk Assessment, and the Remedial Investigation Report. The RI Report itself incorporated site information contained in approximately 18 appended and referenced documents. A number of data gaps have been identified as a result of this process. During the latter half of 1992, additional sampling and related activities were carried out under a supplemental Field Sampling Plan (FSP). DOE expressed the expectation that this additional investigation will provide all the remaining information necessary to conduct a Feasibility Study for the St. Louis Site. The purpose of this Remedial Investigation Addendum Report is to present the results of the 1992 FSP sampling effort. This M&E review makes reference to the U.S. EPA comments to DOE on the FSP and the DOE response to those comments.

GENERAL DESCRIPTION

The RI Addendum Report is a large loose-leaf volume containing sections for Introduction, Description of Extent of Contamination, Tabulated Historical and Field Sampling Plan Sampling Data, and References.

Section 1, Introduction, provides a Table 1-1 listing nine objectives of the FSP and showing correlation with supporting figures and tables. Along with the nine numbered objectives, an "Additional" un-numbered block in the table is devoted to the objective, "Refine Horizontal and Vertical Boundaries of Sediment Contamination in Coldwater Creek." This additional "objective" is supported by a Figure 2-13, Radionuclide Contamination in Sediment along Coldwater Creek -- Plan View. While no new samples were taken as part of the 1992 sampling activities, archived samples were selected for analysis and these results are included in this document.

Section 1 also contains Table 1-2, which gives the locations by grid coordinates and depth interval for the FSP sampling. The letters used to code sample identification in this table are explained in Section 3.

Section 2, Description of Extent of Contamination, incorporates 17 new figures that address aspects of the objectives contained in the FSP (including the "additional" Coldwater Creek objective. In addition to these 17 figures, another 18 figures are provided to present ground water contamination for the SLAPS and the HISS as annual averages from 1984 through 1992 (One figure per site per year for nine years). These are physically located in "tabs" that also contain data tables and are actually located behind Section 4 but are not referred to as an appendix.

By far the greater part of the volume is devoted to the "tabs" that are in effect an Appendix of data tables, following Section 4, References. These tables, despite their position following Section 4, provide the substance of Section 3 which is otherwise (without the tabs) a single page. Section 3 is titled "Tabulated Historical and Field Sampling Plan Sampling Data," which would suggest that the tabs were initially intended to be a part of Section 3. Voluminous data tables from past investigations are reproduced along with the new data from the 1992 FSP sampling activity. Tabs are labeled to relate the various data tables to the Section 2 figures.

GENERAL COMMENTS

1. **Overall Concept.**

Although confusing in certain aspects of its execution, this volume is well conceived for the purposes of summarizing the information that is available to address the nine objectives (data gaps) from the FSP. The inclusion of many voluminous data tables and creation of new figures, to show information that has already been presented, gives a somewhat misleading impression that much more additional work has been done than is actually the case. However, the objective of showing how the new sampling activities help to fill data gaps is reasonably well served.

2. **Coldwater Creek Data Gap.**

The treatment given within the RI Addendum Report to the Coldwater Creek contamination question must be considered in the context of a wider discussion. Coldwater Creek contamination is listed as an "Additional" objective in the Section 1 listing of Sampling Plan Objectives (Table 1-1). In response to U.S. EPA comments on the December 1992 draft of the Field Sampling Plan, DOE cited a letter report on the scope of sampling of existing Coldwater Creek sediment cores, and also provided a new report, Evaluation of Contaminated Sediment Transport in Coldwater Creek, St. Louis, Missouri (July 1993, no agency report number). This latter report describes computer modeling of sediment in the Creek, which was performed by DOE and incorporated and was based on earlier computer modeling work by the U.S. Army Corps of Engineers (COE). The DOE position is that this computer modeling of sediment behavior in the creek serves to obviate the need for exhaustive survey data, in particular the need pointed out by U.S. EPA to have better data on contamination levels in subsurface (below the first 6 inches) sediment deposits. Accordingly, this separate report plays a role in addressing Coldwater Creek data gaps, and must be considered together with the RI Addendum in this regard. For the sake of organization, review comments on the Sediment Transport report are provided at the end of this review along with specific comments on Coldwater Creek issues.

3. **Contamination Zone Boundaries, Changes Not Effectively Justified.**

Page 1-6, the third and fourth paragraphs briefly describe the method used to establish contour lines between sampling locations in defining zones of contamination. It is stated that the triangular irregular network used for this document is the most common method of interpolation of elevational data, which is probably true. This text appears to describe a defensible methodology for drawing contamination boundaries. However, it does not describe how the question of averaging results over an area has been addressed. It is noted that the final paragraph on the page explains that "professional judgment" is used to close contour lines where a contaminated zone is not bounded by a noncontaminated criterion value, and where a contour is "extrapolated beyond the validity of the data." It was noted that many contour lines defining the extent of contamination have changed in comparison with previous presentations. In general, the defined contamination zones have been slightly pared down at the downtown site. Additional changes of several types are noted in specific comments below. This review examined many of these changes in some detail, and in general did not find cause for strong disagreement. However, as pointed out in specific comments below, many of the changes that are shown are not effectively justified by the text.

SPECIFIC COMMENTS

4. **Background Wells Tolerance Limit.**

Page 1-7 (only paragraph) -- in discussion of ground water monitoring data, reference is made to the term "background wells tolerance limit." This term doesn't appear to be defined in the document, and its meaning is not self-evident.

The Total Uranium level for well B16W02S is given in the text on page 2-8 as 193 pCi/l and on the flag in Figure 2-4 is given as 162 (no units). Is the background wells tolerance limit 31 pCi/l?

5. **Location ID and Sample ID.**

Table 1-2, Correlation Between Location ID, Sample ID, and Coordinates for Field Sampling Plan Data. This name should be changed to reflect that it applies only the shallow investigations, as the sampling locations for deep soil investigations are not included. Both "Sample ID" and "Location ID" columns are provided, along with coordinates and depth interval. The abbreviations used in these columns are explained in Section 3, page 3-1.

- The "Location ID" abbreviation list (page 3-1) is incomplete, failing to define the abbreviations "SCH," "V," "P," "PF," "L," "MC," "NWR," "S," "CS," "ST," and "AS." (This reviewer infers from the usage of an abbreviation in a "Location ID" may be different from the use of the same letter in the "Sample ID" heading)

- The "Sample ID" abbreviation list is also not totally complete, as it omits the "Y" designation given to the last three samples listed in the table.

6. **Duplicate Location IDs.**

In Table 1-2, samples A00131, A00231, A00331, A00431, A00531, and A00631, locations V001 through V006, list the nonsense depth interval 0.0 to 0.0. Further, these sampling locations are identical to U00101 through U00601, where the depth interval is listed in each case as 0.0 to 0.5. As given on page 3-1, "A" is identification code for SLAPS and "U" is identification code for haul roads and vicinity. The locations are not at the SLAPS, so their inclusion with "A" designations appears to be in error.

7. **"Y" Sample ID Unexplained.**

In Table 1-2, the last three listed samples are designated "Y12501" through "Y12801." No identification for this "Y" code was found. The results for these "Y" samples were eventually found in an un-numbered table preceding Table 3-6 (or at the end of Table 3-5 if that table is considered to include all the un-numbered tables that follow), under the heading "U.S. EPA-Requested Boreholes."

8. **Uranium Contamination Guideline.**

Page 1-6, second paragraph, states that the DOE Order 5400.5 and "DOE guidance (Fiore 1990)" specify residual soil contamination action levels including uranium levels of 50 pCi/g for U-238 and 100 pCi/g for Total Uranium. This gives the impression that the uranium limits come from some established written "guidance." As discussed in earlier site documents, the DOE Order provides for establishing site-specific limits for uranium. The

cited "guidance" appears to be a memo from the DOE Office of Environmental Restoration. Thus it appears that the 11/90 Flore memo is DOE's internal authorization to consider the residual uranium limits to be established and no longer tentative.

9. **Presentation of Contamination Zones at SLDS.**

Downtown Area. Figure 2-1 shows the new amended areal extent of radionuclide contamination at the SLDS and vicinity properties. In contrast to the comparable figures in the RI Report and in the Field Sampling Plan, this figure shows neither new nor "historical" sampling locations on the figure. To relate the new contaminated zone outlines to data, one must locate the sampling points by their grid coordinates. Fairly substantial areas have been moved from "contaminated" to "clean" designation in five or six locations, as follows:

- An area due north of building 82 in the Plant No. 10 (old Plant No. 4) area. The area "cleared" contains two historical contaminated sampling points and no new or historical uncontaminated sample locations, so the basis for changing the status of this area to "uncontaminated" is unclear and should be explained. A much smaller contaminated zone on the south of this building 82 (N1080 E1230), encompassing a single historical contaminated sample location, is also removed from the contaminated zone without explanation or apparent cause.

- A contaminated zone along the St. Louis Terminal Railroad Association tracks from Mallinckrodt Street north to within about 100 ft of Salisbury Street, has been removed. The samples reported within the affected area are two historical sample locations that were shown "contaminated" in the earlier documents, plus two new FSP samples. New samples are T074 (well below the DOE guidelines) and T075 (marginally above the DOE guidelines). A number of historical uncontaminated sample locations separate this area from the newly identified contamination zones on the McKinley Iron Company property. It is certainly possible that this change (removing this area from the contaminated zone) can be supported on the basis of improved methodology and professional judgment. However, this justification has not been provided either in terms of detailed discussion of methodology or the reasons for particular changes (where reasons are not evident from the data).

- Also along these St. Louis Terminal Railroad Association tracks, a smaller area at grid line N1200 is also removed from the contaminated zone. This area encompasses two historical contaminated sample locations and is bordered by the location of FSP sample T079. The above comment applies.

- Clean areas within larger contaminated zones have been substantially enlarged in the area of building 116 in Plant No. 6E, around buildings 706 and 708 in the Plant No. 7 area, and northwest of the intersection between Angelrodt Street and the Chicago, Burlington, & Quincy Railroad tracks. No new FSP samples were found to support these changes except sample Q090 at the last-mentioned street - railroad intersection. This area northwest of the street - railroad intersection contains three historical contaminated sample locations and one historical uncontaminated sample location. The reason for its removal from the contaminated zone is not apparent.

- A substantial area north of the "PVO Foods" property, formerly marked as Plant No. 7E, is removed from the contaminated zone. New FSP sample D082 appears to essentially duplicate the location of one of the two historical contaminated sample locations in this area, but was apparently analyzed for TCLP only. The reason for this change is not apparent.

- A dumbbell shaped zone of contamination centered around N2000 E3425 and enclosing two historical contaminated sample locations, is now replaced by a circular area at N1950 E3400, containing only one of those two points. No new FSP sample locations are within this area, but sample S005 is just north of the redesignated portion. Similarly, a round contaminated zone to the east, centered at approximately N2000 E3600 and enclosing one contaminated sample location, has been removed. New samples (S006, S009) bounding these older contaminated sampling locations may have led to the conclusion that the old sample points would not indicate an average concentration exceeding criteria. However, the reasons are not addressed in the text.

10. **New Areas of Contaminated Zone.**

In addition to these deletions from the "contaminated" zone, several small areas of contamination have been added to the SLDS picture.

- Two areas south of Angelrodt Street show expanded contaminated area. One area on the N&W Railroad tracks is newly identified as "contaminated." Another, centered on grid line E1700 south of Plant No. 5, is enlarged in comparison with the former presentation. The enlarged area is centered on new contaminated FSP sample V022, bordered on the north by V020, and bounded on the south by V023, V024, and V025. Samples at locations V019 and V020 were not found in the results tables; possibly these are among those not sampled because of obstructions and could not be relocated within reasonable distance (page 2-1). In that case, they shouldn't be shown in Table 1-2. The others were low contamination levels, although V022 exceeds the DOE criterion for surface layer activity. The appearance is that this enlargement of "contaminated" zone

- The contaminated area around the St. Louis Terminal Railroad Association tracks at Angelrodt has been extended to the northeast and southwest, and to south of Angelrodt Street on the west side of the tracks. Sample location T08001 is encompassed by the new contaminated zone portion extending to the southwest. Sample location L10101 lies within the newly-defined contaminated portion reaching northward and eastward into the Thomas and Proetz Lumber Company property. These samples show contamination slightly above the criterion, although T08001 is not so marked in Table 3-5.

- A new round contamination zone is located at N2200 E3600. This is the location of sample S00301 and is bounded on the west (S00201) and on the south (S00601), but not on the north. This new "zone" appears to be based on the single sample S00301, which is clearly above -- but not far above -- the stated criterion.

- At the NW corner of building 101 a round "clean" area, formerly within the contaminated zone, is shown. This circular area is primarily within the area covered by building 101, but also extends past the building wall on the north. The area now shown "clean" includes a historical sample location B16C024, which was previously shown as a "contaminated" sample. Examination of the data for that borehole indicates that the 3.0-5.0 ft interval (only) would slightly exceed the 15 pCi/g criterion if the radium-226 and thorium-230 values were added together before comparison with the criterion, as has been done by DOE at this site. If the comparison with the criterion is done in accordance with the DOE order (i.e., the higher value of radium-226 and thorium-230 is compared), this sample doesn't exceed the 15 pCi/g criterion.

It appears that this change may have been based on "professional judgment" together with the fact that this sample is so marginal.

- At the McKinley Iron Company, a contaminated area was formerly (e.g., in the Work Plan) shown encompassing the eastern end of the principal building. The building is now entirely within the "clean" area, and a much expanded contamination zone is shown outside this building, extending eastward and northward from the eastern end of the building. The basis for this change appears to be samples M11401 and M11501, which are slightly above the 5 pCi/g criterion as calculated by DOE at this site. It appears that the earlier representation showing this building to be in the contaminated area was in error, as none of the historical samples were within the building perimeter.

- In addition to the SLDS areas, a newly identified zone of contamination is found at Latty Avenue property 3, or rather the southeast corner of that property.

11. **Mississippi River Sediment.**

Mississippi River samples taken during the FSP activity covered an area on the east (farther into the river) and south (downstream) of the area that was shown contaminated by historical samples. The FSP discussed sampling to a depth of 3 feet if water levels were low, and sampling sediment with Peterson-type clam shell grab samplers if the water level was up. All samples are reported as sediment from the 0 to 0.5 ft interval, and all showed essentially background levels of radioactivity. These results contrast sharply with the historical sample results, which showed all samples well above the DOE soil criteria and some in the hundreds of pCi/g. It is unknown whether the contaminated sediments found earlier would still be found in the 0 to 0.5 ft interval, would now be deeper because of being covered by other sediments in the interim, or have been washed away downstream. Therefore, there is uncertainty as to the meaning of the FSP sampling results. The text conclusion (page 2-3, last paragraph) that the contaminated zone is "successfully bounded," is doubtful.

12. **Vertical Extent of Contamination Presentation - SLDS.**

Figure 2-2, Vertical Extent of Radionuclide Contamination in Soil at St. Louis Downtown Site and Adjacent Vicinity Properties. This figure is a "block diagram" or vertical section through the SLDS. According to the text (page 2-4, first paragraph), the figure shows depth of contamination, "from approximately East 900, North 1600 to approximately East 3800, North 1200." These coordinates specify a line that forms an angle of about 8 degrees with the east-west grid lines. In fact, the figure shows a section roughly coinciding with grid line N1600. No basis for selecting this line is given. Is this figure intended to show something else, or is the text wrong?

13. **Vertical Extent of Radionuclide Contamination - SLDS Data.**

Page 2-4 states that a total of 154 soil samples were collected during the 1992 FSP activities to refine the vertical boundaries of the soil contamination at SLDS and vicinity properties. Data for radioactive contamination are presented in Table 3-6. For a number of sample sets, no sample numbers are given (although the table has a column heading for the purpose) and each data point is identified only by grid coordinates and depth interval. Where sample numbers are given, they are not shown on a figure. Relating these data to their respective sampling locations is inexact and very laborious; therefore, they offer more frustration than

usefulness to the reader. Each data point should be associated with a locating number, and each number should be shown in the figure.

14. **Manholes/Drains/Process Lines at SLDS and Vicinity.**

For Objective 2, "drains, sumps, manholes, and process lines" were surveyed for direct alpha, beta-gamma, and removable contamination. Based on the grid locations given, the FSP sampling examined additional drains not previously surveyed. Two (possibly 3) appeared to be previously sampled locations (E2905, N1617; E1251, N1011; and E1550, N2130 may be the same as E1555, N2127 4 feet away). These showed results somewhat lower (not necessarily significant in a statistical sense) than the historical values listed. The FSP spoke of scanning drain lines and of surveying interiors of drain lines, using somewhat novel detectors -- one attached to a sewer snake of electrical wire puller. As there is no mention of those scanning activities, it appears that they did not yield important information.

There is no intent here to exaggerate risks posed by drain lines at the SLDS. However, it does seem that the record should describe the situation and the results of actions that have been taken more accurately. Specifically,

- The data presented are not "direct alpha, beta-gamma, and removable contamination" but are specific radionuclide contamination levels in sludge.

- The FSP sampling has apparently established that some additional drains (in addition to those already known) are contaminated, and determined the concentrations of contamination in sludge samples, but hasn't determined the "extent" of contamination in drain lines.

- Drains and process lines are two different things, so the use of the term "drains/process lines" implies that it is not known whether lines accessed through the manholes are drains or process lines. The existence of contaminated process lines would imply that there may be additional buried parts of process equipment that would need investigation and likely should not be left in place. If these are simply drains, they should not be called "drains/process lines."

- The text discusses these sludge contamination levels in terms of the DOE guidelines for soil contamination. It could be pointed out that this is a reasonable comparison to make, but that soil guidelines are not strictly applicable to small quantities of sludge within a drain pipe.

The text on page 2-6 should be re-written for better accuracy.

15. **Vertical Extent of Contamination Presentation - SLAPS.**

Figure 2-6 represents the vertical extent of radionuclide concentration in soil at the SLAPS. As with Figure 2-2, the description implies that the figure presents depth of contamination along a line that would intersect grid lines at an angle, but the figure shows a vertical section parallel to the grid lines, and no explanation of the basis for selecting this particular section. The figure doesn't show the maximum depth (18 feet) or the 1-foot depth that is said to prevail over most of the site (page 2-12, first paragraph).

The second paragraph of description of Figure 2-6 (page 2-12) states that the figure "addresses the vertical aspects of objective 8 of the FSP . . . " This reviewer was unable to

find any meaning in this statement, as objective 8 deals with horizontal boundaries of contamination along the haul roads and vicinity properties. Objective 8 doesn't appear to have vertical aspects, and Figure 2-6 seems to have very little to do with objective 8 in any respect. This figure is not cited in Table 1-1 as supporting objective 8.

16. **TCLP Contamination Question at the SLAPS.**

Figure 2-7 is stated to show the areal extent of radionuclide contamination and the one TCLP measurement that exceeded the regulatory threshold at the St. Louis site (at the SLAPS). On sample, at location B53C72, sample A07201, slightly exceeded the TCLP threshold for selenium. Based on a determination that the mean value for selenium is less than the TCLP limit, using an 80 percent confidence interval, DOE asserts that the "site qualifies as a nonhazardous site per U.S. EPA guidelines." Although this method of comparing the mean to the TCLP limit is certainly valid in some situations, several questions arise from its treatment here:

- This reviewer could find no indication in the discussion in SW846 that the 80 percent confidence interval is appropriate for use here.

- It is not clear by what rationale DOE finds this determination applicable in this situation. DOE has proposed (in a separate document) to leave SLAPS contamination in place. It is not at all clear to this reviewer how waste created in the distant past and left undisturbed would affect the legal status of the site. If the soil is ultimately removed, then it is the characterization of the waste (soil removed and taken elsewhere for disposal) that determines TCLP status, not the mean of samples taken over a whole site in both contaminated and uncontaminated areas.

- The text on page 2-14 (first paragraph) states that the sample location of interest is "shown on the figure as a red triangle in the Ball Field vicinity property . . ." No such red triangle was found in the Ball Field vicinity property -- the sample at the SLAPS is shown as a green triangle.

- The discussion of selenium results (page 2-14, second paragraph) refers to the "80 percent confidence interval at the Ball Field area" being less than the regulatory threshold, then concludes, "the selenium at the Ball Field area is not considered to be present in the waste at a hazardous level." The location shown is not a Ball Field area location (in accordance with all previous site document terminology) but is central on the SLAPS, and is correctly located there in accordance with the grid coordinates given in Table 3-20.

17. **The Hiss Grid and the SLAPS Grid.**

The opening paragraph on HISS/FUTURA (page 2-18) seems to be the only mention that two separate grid systems have existed historically for the Latty Avenue properties and for the SLAPS. A document such as this one, which brings together data from sampling locations that were determined on both grids, presents the opportunity for confusion to arise in several ways. For example, figures 2-9, 2-10, and 2-11 are shown on the HISS grid, figure 2-12 (encompassing HISS) on the SLAPS grid. It appears that the existence of two separate grid systems, and the extent to which each has been used, should be dealt with in the Introduction.

18. **Mounding of Ground Water at the HISS.**

The ground water "mounding" effect at the HISS site has been noted throughout RI investigations at the site and has never been explained. This report makes no attempt at explaining this observation, but says that it is "similar to that observed at other FUSRAP sites. This strongly implies that DOE's contractors have seen such a phenomenon at more than one additional site. It certainly doesn't seem credible that FUSRAP-type contamination could play a causal role in the ground water monitoring. Site documents should attempt to explain this ground water mounding phenomenon rather than creating new erroneous impressions that it is somehow characteristic of a FUSRAP site.

19. **Haul Roads Data Presentation.**

Figure 2-12, Areal Extent of Radionuclide Contamination in Soil at St. Louis Airport Site Vicinity Properties, Haul Roads, and Railroads, does not have legible identification for the grid lines, and the scale is too big for accurate location of the grid coordinates listed for a given sample. Accordingly, the reader can make no sense of the sampling data supporting this figure. M&E determined from sample coordinates and additional site documents that the "U" sample series principally examined

- the property along the south side of Seeger Industrial Drive (south of Latty Avenue, not identified as contaminated),
- the area southeast of Latty Avenue property number 3 (newly identified as contaminated), and
- an area northwest of the Ball Field area across Coldwater Creek (not identified as contaminated).

20. **Coldwater Creek Data Presentation.**

Figure 2-13 consists of two large color plates that are said to show Coldwater Creek Sediment contamination locations. Actually, these color plates do not present any conclusions on the areal extent of contamination, but rather show the sampling locations (all historical -- no FSP sampling) with markers that are coded for contaminated (red) and uncontaminated (green), for surface 0 - 0.5 ft (triangular) and subsurface greater than 0.5 ft (circular).

The text on page 2-26 (second paragraph) states that the sample results that exceeded DOE guidelines are shown "within the shaded area of the figure for the 0.0 to 15 cm (0.0 to 0.5 ft) depth interval and for depths greater than 15 cm (0.5 ft)." The color plates actually supplied as Figure 2-13 (although this figure designation does not appear on the plates) do not show a shaded area where the contamination exists.

21. **Coldwater Creek Data Disagreement With Figure 2-13.**

The color coding of sample location markers on these two large color plates does not agree at all with the data from the Tables 3-34 and 3-35. For example, the section below Old Jamestown Road shows 59 red sample locations and 23 green sample locations. This is in contrast to the data presented in Table 3-34, which shows only 4 "contaminated" samples in this segment of the creek.

The section upstream from Old Jamestown Road up to the New Hall's Ferry Road shows 60 red and 21 green locations. Table 3-34 shows only 10 "contaminated" samples in this segment.

Further upstream to Washington Street (where the more intensively sampled section begins), the numbers are 40 red and 16 green. Table 3-34 shows only 7 "contaminated" samples in this segment.

PART II

REVIEW COMMENTS ON EVALUATION OF CONTAMINATED SEDIMENT TRANSPORT IN COLDWATER CREEK, ST. LOUIS, MISSOURI JULY, 1993

Prior to and during review of the 1992 Field Sampling Plan for the Remedial Investigation/Feasibility Study-Environmental Impact Statement for the St. Louis Site (FSP), U.S. EPA had on several occasions pointed out to DOE the very limited nature of data that characterize radioactive contamination in Coldwater Creek sediments. DOE has consistently asserted that the data are sufficient to permit the RI/FS process to go forward. In support of that assertion, DOE has also referred to computer modeling studies of sediment behavior in the creek, which were of value in understanding the risks associated with creek sediment contamination. DOE also alluded to these studies in declining to incorporate further Coldwater Creek sampling in the additional sampling efforts carried out in 1992 under the FSP (although a number of existing archived samples were analyzed for subsurface contamination in the 1.0 to 2.0 feet interval during 1992). Shortly after submitting the RI Addendum Report that presented the results of the 1992 sampling and the analysis of archived samples, DOE forwarded to U.S. EPA a new report to describe these sediment transport modeling studies. This new report is the Evaluation of Contaminated Sediment Transport in Coldwater Creek, St. Louis, Missouri (Contaminated Sediment Transport report). Because of the relationship of this report to the question of Coldwater Creek data gaps, it is reviewed and discussed here with the review comments on the RI Addendum that deal with Coldwater Creek.

DESCRIPTION

The Contaminated Sediment Transport report (July 1993 "predecisional draft," no agency report number) was prepared by Science Applications International Corporation. It incorporates 7 sections including (1) Executive Summary, (2) Introduction, (3) Background, (4) Conceptual Model, (5) Overview of Numerical/Empirical Modeling Approach, (6) Conclusions, and (7) References. Appendices A through F tabulate input and output data used in the computer modeling.

The stated objective was to reduce the level of uncertainty associated with the effectiveness of the "no further action" and "dredging" remedial alternatives based on the current knowledge of the Coldwater Creek Drainage Basin.

The study consists of four parts: (1) Evaluation of existing data on the Coldwater Creek watershed characteristics, primarily determined from previous studies by U.S. Army Corps of Engineers (COE) and also gauging data from the U.S. Geologieal Survey data; (2) Evaluation of existing radionuclide contamination data; (3) Development of a model to predict the movement of contaminated sediment with time; and (4) Evaluation of the effects of dredging as a remedial scheme that could be used to meet the goals of FUSRAP.

Four codes, run sequentially, were required to simulate the study parameters. The first two, HEC-1 to produce flood hydrographs for over 100 cross-sections along the creek, and HEC-2 to produce surface water profiles based on the hydrographs, were run by U.S. Army Corps of Engineers. The EASI code (Erosion and Sediment Impact model) produced flow-routing data that were calibrated with the HEC-2 output. Sediment-yield data from EASI was used with HEC-6 code to make quantitative assessments of the areas of the creek that were susceptible to erosion and deposition. Additionally, an empirical relationship from Schumm was used to "add fine-grained material to the system." These modeling processes and their interrelationships are described, but the report does not explained in detail what was done to yield the results that go into the conclusions given.

Information that was used in calibration of the model came from both data collected and observations made during earlier studies. In particular, observations from a 1986 study by Simons, Li and Associates, Inc., for the U.S. Army Corps of Engineers, were used for comparison purposes. The authors pointed to several areas of agreement between the study results and the Simons, Li and Associates observations. A notable exception was that Simons, Li and Associates found that several feet of aggradation has occurred over time near Old Halls Ferry Road, in an area that should be degradational according to the computer modeling. Simons, Li and Associates concluded that this area was subject to bank sloughing. The authors of this study evidently accepted that "bank sloughing" was the cause of the several feet of aggradation, and no adjustments were made to the model.

The model was used to simulate the effects of 2-year, 5-year, 10-year, and 25-year storms. Storms that might occur annually (up to perhaps 2 inches of rain in 24 hours) were not considered significant in transporting sediment. The model was then used to simulate accumulative effects of sequential storms, such as a sequence of 2yr-, 5yr-, 2yr-, 10yr-, 2yr-, 5yr-, 2yr-, 10yr-, 2yr-, and 25yr-storms. On the basis of such simulations, with and without the change in dimensions caused by dredging the creek in the region from the SLAPS to the HISS, dredging was evaluated and found to be a remedial alternative of merit.

A major conclusion is that the quantities of sediment being removed are greater than that being aggraded or deposited. Areas of highest degradation/aggradation are said to occur directly downstream from the HISS site and in the lower portion of the river below Old Jamestown Road. Although unsaid, it appears that the area directly downstream from the HISS is found to be a degradation area and the lower portion below Old Jamestown Road is an aggradation area.

GENERAL COMMENTS

22. **Overall Value of the Study.**

It is evident that many assumptions are made in the computer modeling process and that some may be critical to the result. For example, in discussion of model calibration (page 28) it is stated that roughness coefficients (assumptions) were increased, from initially assumed values between 0.035 to 0.045 to a range of 0.045 to 0.060, to "allow for deposition to occur" in a creek segment where contamination levels indicated that deposition had in fact occurred. This does not negate all value of the study, and likely does not detract from the conclusion that dredging is a remedial alternative of some value. The study is a worthwhile contribution to the behavior and transport of sediment in the stream generally. The study also enhances understanding of the difficulty in gaining adequate data on the extent of contamination in a stream where sediment is continually transported and/or covered with other sediment. However, this study hasn't greatly enhanced understanding of where contaminated sediment is currently located, and does not appear to have guided any sampling activity.

23. **Presentation of Results.**

In the context of DOE discussions, a central result of this modeling is the definition of sediment deposition and sediment erosion zones. These are presented in Figures 1-1 through 1-9.

The figures are topographical, semi-perspective views, on a scale that appears to be 1 inch = 2000 ft (but is stated as "Scale 1:2000 in feet"). The exaggerated vertical scale is not stated, but appears to be 1 inch = 60 ft. Color is used to show sediment deposition (green) and sediment erosion (blue) locations. Red is used extensively with no key found on the figures to indicate the meaning of the color red. Because red is used for all topography below a certain height, it most likely shows some high-water level assumption.

The figures present creek segments in Sections 1 through 3. These "sections" appear unrelated to other schemes for considering study or evaluation of various segments of the creek. Section 1 is from McDonnell Blvd. to Pershall Road. Section 2 is from Pershall Road to "Linsay Lane." "Linsay Lane" was not found on document figures or on a Rand McNally map of St. Louis and vicinity. The street directory on the Rand McNally map lists a Lindsay Lane in the general area of Coldwater Creek in Florissant, but it is evidently not shown on the map itself. The reader must guess at the location of the boundary between Section 2 and Section 3. Section 3 is defined from "Linsay Lane" to "400 ft downstream of corporate limit of Florissant." Thus, it appears that Section 3 ends somewhere near grid line N22,000. According to the data table (Table 3-34) in the RI Addendum, the intersection of the creek with grid line N22,000 is near creek distance 26,000 feet. In creek distance, this is much less than half the distance to the Missouri River (creek distance >70,000 feet). In land distance terms, it appears to be close to half the distance from the SLAPS to the Missouri River. (The creek is acknowledged to be more sinuous in its lower reaches toward the Missouri River.)

Section 3 is shown to be entirely erosional (blue in color) after the storms sequence, with or without dredging. However, this presentation of results (Figures 1-1 through 1-9) covers creek sections that terminate far upstream from Old Halls Ferry Road, where several feet of aggradation are reported to have occurred (page 15). Old Halls Ferry Road is in turn upstream from Old Jamestown Road, where the sinuosity is greater and in general deposition is predicted. The termination of the data presentation in a "Section 3" which is entirely erosional, but is in fact upstream from the most extensive depositional areas, seems to misrepresent the study results.

The mis-impression is reinforced by the text. For example, the Executive Summary (bottom of page 1) states, "As shown in the figures, the cumulative storm events erode sediment from most of the stream channel downstream of the site over the 25-year period; thereby removing the contamination."

SPECIFIC COMMENTS

24. **Typo in ACRONYMS AND ABBREVIATIONS**

Ra-226 stands for radium-226, not radium-266.