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**DISCUSSION PAPER ON
APPLICABILITY OF OIL
AND GREASE ANALYSIS
FOR RCRA CLOSURE CRITERIA**

February 1995

**for
Environmental Restoration Division
Oak Ridge Y-12
Oak Ridge, Tennessee 37831-8247**

**Managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY**

under contract DE-AC05-84OR21400

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4. Attachment III - Comparison of Detected Organics to Criteria Based on Risk Calculations and EPA Published Literature

DISCUSSION ON APPLICABILITY OF OIL AND GREASE ANALYSIS IN SOIL FOR RCRA CLOSURE

A site characterization was performed for the Building 9409-5 Diked Tank Storage Facility. The initial site characterization indicated areas which had oil and grease levels above the criteria of the currently proposed RCRA closure plan. After further investigation, it was demonstrated that the oil and grease parameter may not be an accurate indication of a release from this facility and should not be included as a contaminant of concern in the closure criteria.

History

The Building 9409-5 Diked Tank Facility was converted from a cooling tower basin to a RCRA storage facility in 1980 by placement of four storage tanks and construction of a containment wall. The facility operated under interim status as submitted under the RCRA Part A Permit for the Y-12 Plant. From 1980 to 1989, the facility operated as a bulking facility where 55-gallon drums of solvents were accumulated together to accommodate shipment off-site for final disposal. The materials stored were typically solvents such as perchloroethylene, freon, methylene chloride, and oils from automobile maintenance.

After repeated integrity failure of the secondary containment system (cooling tower basin), all waste was removed and shipped off-site for disposal in 1989. In 1991, the tanks were removed from the site and utilized at another RCRA facility. In 1993, the site was sampled and characterized per a submitted RCRA closure plan with regulator approval. Initial results indicated oil and grease contamination in several areas was the only compound over the closure criteria set in the closure plan.

Activities

Several actions were taken to further investigate the oil and grease results.

1. Original samples that were analyzed by an off-site contractor were shipped back, and several samples were re-analyzed at the Y-12 Laboratory.
2. Two locations which indicated the highest frequency of oil and grease detections were re-cored and sampled. A background sample from the opposite side of the road was also obtained for analysis at this time.
3. Three more samples were obtained approximately 75 yards upgradient at the same distance from the road to test a hypothesis that the elevated oil and grease values may be a result from early dirt road maintenance, asphalt installation, or background.
4. The Lab was contracted to concentrate the oil and grease from these samples and to do a speciation to determine which organic compounds were causing the elevated oil and grease results.

Results

1. The re-analysis of samples sent off-site confirmed that there was detectable oil and grease per the EPA Procedure 9070. In general, the results obtained by the re-analysis were lower than

reported from the off-site laboratory, however were still over the closure limits. (See Attachment I for results.)

2. The re-sampling of the two most contaminated areas came up with mixed results. Sample location 13, which originally indicated oil and grease levels of 201 to 264 mg/kg, showed levels consistently below the 100 mg/kg closure plan criteria, ranging from 0 to 61 mg/kg. The re-sample of location 14 verified oil and grease levels above the closure plan limit, but they were typically less than originally reported.
3. The background samples taken 75 yards upgradient indicated oil and grease ranging from 29, 30 to 100 mg/kg. In activity 2, the background sample taken upgradient and on the off-site side of the road from the facility resulted in one of the largest levels of oil and grease at 420 mg/kg.
4. The speciation of hydrocarbons in the soil indicated that the oil and grease as indicated by the specified analysis is a result of ester/acid type compound and a long chain hydrocarbon. Both of these can be naturally occurring from humus and other material in soil or can be caused by motor oils, depending on the ratio of the two compounds. The results indicate that the higher concentration oil and grease area is consistent with the natural ratio of hydrocarbons in soil and that some of the mid-range results (~200 mg/kg) indicate a hydrocarbon ratio which may indicate the presence of an added long chain hydrocarbon. (See Appendix II for results and chemist discussion.) There was not a significant indication of chlorinated solvents contributing to this hydrocarbon, which would be the signature of material potentially released from this facility. Chlorinated solvents were analyzed for all soil samples in the original sampling event. In Attachment III, the chlorinated solvents are summarized and compared to risk-based criteria and EPA published clean-up criteria. All results of specific organics detected are well below any environmental concern.

Conclusion

Oil and grease analysis per EPA SW846 Method 7090 is a rough estimate for determining the organic content in soil. It does not speciate individual organics. In the characterization of this closure, it is determined that the humus content of the surrounding clays was the primary contributor to oil and grease. Such a conclusion is supported by oil and grease results obtained for other background clay areas indicating similar results. All original samples were analyzed for volatile organic and PCBs, which are not only a signature in the oil and grease if there was a release, but are also the toxins we would need to be concerned with for environmental risk. None of the volatile/PCB analyses indicated results over 0.5 ppm, which is several orders of magnitude less than the closure criteria specified for any specific organic. It is the judgment of the project to drop oil and grease analysis from the closure criteria and rely on specific/more quantifiable parameters listed in the closure plan for indicating releases from the site. With concurrence of regulators with these conclusions, the closure plan has been re-written to exclude oil and grease and submitted for approval.

Attachment 1
Oil and Grease Results

Location	Mg/Kg Oil & Grease
T01001 0-5 ft	42.8 U
T01002 5-1.0 ft	50.1
T01003 1.0-1.5 ft	44.6 U
T01004 6.3-8.3 ft	50.2 U
T02001 0-5 ft	1550
T02002 5-1 ft	53.8 U
T02003 1-13. ft	52.1 U
T02004 1.5-55 ft	1150
T03001 0-5 ft	41.1 U
T03002 5-1.0 ft	47.5 U
T03003 1.0-1.5 ft	74
T03004 3.7-3.9 ft	184
T04001 5-2.5 ft	824
T04002 5.5-7.5 ft	46.3 U
T04003 10.5-12.5 ft	50.5 U
T05001 0-5 ft	43.2 U
T05002 5-1 ft	259
T05003 1-1.5 ft	169
T05004 4.5-6.5 ft	47.6 U
T06001 0-5 ft	46.1 U
T06002 5-1 ft	43.5 U
T06003 1.0-1.5 ft	81.8
T06004 4.5-6.5 ft	48.9 U
T06005 8.5-10.5 ft	174
T06006 11.6-12.2 ft	214
T07001 0-5 ft	36.8 U
T07002 1.0-1.5 ft	48.7
T07003 1.5-2.0 ft	40.5
T07004 5.0-6.2 ft	56.4
T08001 0-5 ft	63.5
T08002 5-1.0 ft	78.5
T08003 1.0-1.3 ft	565
T08004 4.5-6.5 ft	42.9 U
T09001 0-5 ft	46.3
T09002 5-1 ft	146
T09003 1.0-3.0 ft	229

Background Samples Taken at Distance From Facility
420 mg/kg
38 mg/kg
29 mg/kg
100 mg/kg

I N T E R O F F I C E M E M O R A N D U M

Date: 27-Jul-1994 11:39am EDT
From: D M Williams
WILLIAMSDM1 AT A1 AT OCB1
Dept: 7222
Tel No: 574-0952

TO: MESZAROSJM

CC: KIMBROUGHWCW

Subject: Fwd: IDENTIFICATION OF ORGANIC RESIDUES IN SOIL SAMPLES

Marie,

Any excessive hydrocarbon oil mentioned in the interpretation of the data is not typical of organic residue found in soil. Since all of these samples are extracts of soil, all of the spectra do contain ester/acid bands. The question is, how much hydrocarbon oil relative to the normal ester/acid component is atypical? For example, sample E941440051 is not typical due to its excessive amount of hydrocarbon oil although it is not one of the "high" samples. Samples E941440051 (230 mg/kg), E941440071 (590 mg/kg), and E941440073 (240 mg/kg) contained atypical concentrations of the hydrocarbon oil component relative to the ester/acid component, but E941440071 is the only "high" sample of those three.

Samples E941440054 (190 mg/kg), E941440056 (220 mg/kg), and E941440072 (800 mg/kg) have less hydrocarbon oil component relative to the ester/acid component. Sample E941440072 is the only "high" concentration of these three, but it's spectrum closely resembles the other two in terms of the amount of hydrocarbon oil component relative to the amount of ester/acid component.

Summarizing the data, it can be stated that all six samples can be identified as a mixture of hydrocarbon oil with an ester/acid type compound. The cause for "high" oil and grease answers for E941440071 and E941440072 is not due to extraction of a new or different contaminant in the soil.

Dave Williams

Attachment III

Comparison of Results to Risk-Based Criteria

Organic Compounds Which Were Analyzed and Detected at the Diked Tank Storage Facility, 1994

Parameter	Proportion Detected	Maximum Concentration mg/kg	Average Concentration mg/kg	Closure Plan Limits mg/kg	EPA Guidance mg/kg	Risk Based Levels mg/kg
Acetone	21/61	0.24	0.029	8,000	8,000	27,000
Carbon Tetrachloride	1/61	0.0002	0.0002	NA	5	190
1,1 Dichloroethane	10/61	0.039	0.005	NA	NA	27,000
1,1 Dichloroethene	2/61	0.008	0.003	NA	10	2,500
1,2 Dichloroethene	9/61	0.046	0.005	NA	8	2,500
Ethylbenzene	1/61	0.003	0.003	NA	8,000	27,000
Tetrachloroethene	51/61	0.21	0.023	800	10	2,700
1,1,2,2 Tetrachloroethane	1/61	0.0002	0.0002	35	40	NA
1,1,1 Trichloroethane	9/61	0.044	0.004	7,000	7,000	NA
Trichloroethene	1/61	0.007	0.007	NA	60	58
Toluene	3/61	0.004	0.003	NA	20,000	55,000
Xylene	1/61	0.012	0.012	N	200,000	550,000

The EPA Guidance limits are extracted from EPA530/SW-89-031 "RCRA Facility Investigation Guidance," May, 1989, and the proposed Subpart S requirement of 40 CFR 264 published in the July 27, 1990 *Federal Register*.

The risk based levels were calculated for a residential ingestion of soil scenario at a carcinogenic risk of 1.0×10^{-6} and/or a noncarcinogenic/toxic hazard quotient of 1.0.