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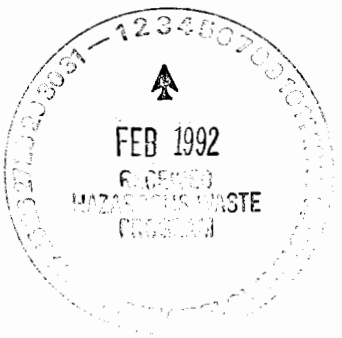

RCN 269-069-02
31 January 1992

Dr. Bruce Swanton
New Mexico Environment Department
1190 Saint Francis Drive
Santa Fe, New Mexico 87503

Re: **Detection Limits for Sludge and Soil Sampling**
Sewage Lagoon Investigation, Holloman AFB, New Mexico

Dear Bruce:

This letter addresses the issue of method detection limits (MDLs) and corresponding health-based levels (HBLs) for contaminants of concern associated with the upcoming sewage lagoon sampling at Holloman AFB. Included as Attachment 1 to this letter is a revised table from Radian's Chemical Data Acquisition Plan for this project. Table 3-2 lists: 1) the constituents that will be analyzed for this project (Appendix IX constituents); 2) the method that will be used for analysis of each constituent; 3) the MDL for each constituent; and 4) the HBL for each constituent. In addition, the Appendix IX constituents that have been detected in past samples collected from the sewage lagoons are noted with an asterisk (*) in the table.

We would like to reach a consensus with the NMED over the information in this table prior to conducting the field work at Holloman AFB, which is scheduled to begin the week of February 10. We believe that several issues deserve attention, some of which have been discussed with NMED before. Radian is bringing these issues to your attention once again, not because we foresee them being a problem, but to help ensure that the upcoming activities conducted at the Holloman AFB sewage lagoons will proceed smoothly.

The issues of concern to us are discussed in the following paragraphs, preceded by an explanation of the information presented in the attached Table 3-2.

Source of Data in Table 3-2

The MDLs listed in the table are the lowest detection limits that are expected to be achieved for samples of sludge using the standard analytical methods noted. All of the analytical methods chosen are taken from Test Methods for Evaluating Solid Wastes (SW-846), third edition. As noted in the table and discussed during previous conference calls, the MDLs are "matrix dependent" and may not be achievable in all cases due in large part to the nature of the sewage sludge. Therefore, the MDLs actually reached by our laboratory when analyzing the upcoming samples of sludge from Holloman AFB may not agree entirely with those presented in Table 3-2.

The HBLs are divided into two categories. The values in the first column under the HBL heading, titled "RCRA," are **tabulated** values taken from an EPA Region VI document: "Draft Preliminary Standards for RCRA Risk Assessment," Appendix 3, 20 February 1991. Appendix 3 of this EPA Region VI draft risk assessment document is equivalent to Appendix A of a proposed rule published in the 27 July 1990 Federal Register, "Corrective Action for SWMUs at Hazardous Waste Management Facilities," which is currently being implemented as policy by EPA. The second column of HBLs are **calculated** values using EPA's method for calculating action levels published in Appendix 4 of "Draft Preliminary Standards for RCRA Risk Assessment," EPA Region VI, 20 February 1991 (which is equivalent to Appendix E of the proposed rule "Corrective Action for SWMUs at Hazardous Waste Management Facilities," 27 July 1990, Fed. Reg.).

The reference doses (RfDs) and slope factors (SFs) used in these calculations are taken from one of four sources which are footnoted in Table 3-2 and described in detail at the end of the table. The two primary sources are: 1) EPA's Integrated Risk Assessment Service (IRIS); and 2) Health Effects Assessment Summary Tables (HEAST), EPA, January 1991. The calculated HBLs are subject to change as the RfDs and SFs included in IRIS and the HEAST tables are revised. Radian will use the most current available RfD and SF factors to calculate the HBLs at the time that the results of the upcoming sampling effort are reported.

Not all of the Appendix IX constituents have a "RCRA" HBL, since not all are included in Appendix 3 of the EPA Region VI draft RCRA risk assessment document. Similarly, not all of the Appendix IX constituents have a "calculated" HBL because there is no known published RfD or SF. However, where the constituent is listed in Appendix A of the EPA Region VI draft risk assessment document and there is a published RfD or Sf, both a "RCRA" and a "calculated" HBL are provided in Table 3-2.

Method of Calculating HBLs

The equations provided to Radian by NMED at an earlier date were not used to calculate HBLs due to inconsistencies with the EPA method noted above. Attachment 2 contains a memorandum prepared by a member of the Radian project team outlining the discrepancies between the two approaches.

Constituents With Conflicting HBLs

In some cases, the "RCRA" HBL is equivalent to the "calculated" HBL. However, there are a number of instances where the two HBLs for a given constituent are not equivalent. It is our understanding that, in these instances where a constituent has an HBL listed in Appendix 3 of the EPA Region VI draft RCRA risk assessment document that is not equivalent to the HBL that is calculated using EPA's method, the calculated HBL takes precedence over the RCRA HBL. This is understandable, since the calculated HBLs are based on EPA documents and information services (i.e., IRIS and HEAST) that are updated on a regular basis. Therefore, where there is both a calculated and RCRA HBL for a given constituent, the calculated HBL will be used when evaluating the results of the upcoming sewage lagoon investigation activities.

Constituents With No HBL

Some (over 50) of the Appendix IX constituents do not have an associated HBL listed in Table 3-2. This is because: 1) the constituent is not listed in Appendix 3 of the EPA Region VI draft RCRA risk assessment document; and 2) the constituent has no known published RfD or SF from which to calculate an HBL. There are two Appendix IX constituents that have been detected previously in the Holloman AFB sewage lagoons--kepone and sulfide--that have no HBL. All of the other constituents for which there is no HBL listed have not been detected previously in the sewage lagoons and are, therefore, not of concern.

Constituents With an MDL Above the HBL

There are a number of Appendix IX constituents that have an MDL that is greater than the HBL. Most of these constituents have not been identified as a constituent that could be expected to be present in the Holloman AFB sewage lagoons, based on knowledge of the operations that have been conducted historically at the base and on past analytical results. There are several constituents that have been detected in a past sewage lagoon sample for which the MDL is expected to be greater than the HBL. However, there are no alternative standard analytical techniques that are available that

will achieve a detection level for these constituents that is lower than the corresponding HBL.

Summary

NMED's requirement for this sampling effort was to analyze for all constituents previously identified **at or above the Practical Quantitation Limit.** We have addressed this requirement using previous sampling results, current EPA guidance, and standard risk assessment procedures. A comparison of the MDLs and HBLs shows that, for a majority of the "constituents of concern" (i.e., those previously identified), the standard approved analytical method will achieve a detection level that is below the HBL. However, for several constituents that have been previously detected in the sewage lagoons, an MDL that is at or below the HBL cannot be achieved using standard analytical techniques. In addition, for two "constituents of concern," there is no HBL.

Radian believes that our sampling and analytical approach fully addresses NMED's requirement for this sampling effort. We would appreciate your review of this letter and attachments prior to the start of field activities. We will contact you next Wednesday (February 5) to discuss these issues further.

Thank you for your attention to this matter.

Sincerely,

Cris Hine

for Wally Hise
Program Manager

cc: Mr. Ron Stirling, USACE
Mr. Sharon Moore, Holloman AFB
Ms. Cris Hine, Radian

ATTACHMENT 1

REVISED TABLE 3-2

Table 3-2

Analytical Methods, Method Detection Limits, and Maximum Contaminant Levels

Parameter	Analysis		Method Detection Limits[a]	Health-Based Levels (Soil)	
	Technique	Method (Soil)	Soil (mg/Kg)	RCRA[b] (mg/Kg)	Calculated[c] (mg/Kg)
METALS					
Antimony*	ICPES	SW-846:6010	10	32	[d]
Barium*	ICPES	SW-846:6010	1	4,000	[d]
Beryllium	ICPES	SW-846:6010	0.2	0.2	[d]
Cadmium*	ICPES	SW-846:6010	0.5	40	[d]
Chromium (total)*	ICPES	SW-846:6010	1	400 (Cr VI)	80,000[e] (Cr III)
Cobalt	ICPES	SW-846:6010	1	--	--
Copper*	ICPES	SW-846:6010	2	--	3200[e]
Nickel*	ICPES	SW-846:6010	2	2,000	[d]
Silver*	ICPES	SW-846:6010	1	200	400[f]
Tin	ICPES	SW-846:6010	60	--	48,000[e]
Vanadium*	ICPES	SW-846:6010	2	--	560[e]
Zinc*	ICPES	SW-846:6010	2	--	16,000[e]
Arsenic*	GFAA	SW-846:7060	0.4	80	24[f]
Lead*	GFAA	SW-846:7421	0.3	114	[d]
Mercury*	CVAA	SW-846:7471	0.02	20	24[e]
Selenium*	GFAA	SW-846:7740	0.5	--	400[e]
Thallium*	GFAA	SW-846:7841	0.5	--	6[e]
ORGANOCHLORINE PESTICIDES AND PCBs					
Aldrin	GC/ECD	SW-846:8080	0.001	0.04	[d]
alpha-BHC	GC/ECD	SW-846:8080	0.001	0.1	[d]
beta-BHC	GC/ECD	SW-846:8080	0.001	4	[d]
delta-BHC	GC/ECD	SW-846:8080	0.001	--	--
gamma-BHC (Lindane)	GC/ECD	SW-846:8080	0.001	0.5	[d]
Chlordane (technical)	GC/ECD	SW-846:8080	0.005	0.5	[d]

Table 3-2

(Continued)

Parameter	Analysis		Method Detection Limits[a]	Health-Based Levels (Soil)	
	Technique	Method (Soil)	Soil (mg/Kg)	RCRA[b] (mg/Kg)	Calculated[c] (mg/Kg)
4,4'-DDD*	GC/ECD	SW-846:8080	0.001	3	[d]
4,4'-DDE*	GC/ECD	SW-846:8080	0.001	2	[d]
4,4'-DDT	GC/ECD	SW-846:8080	0.002	2	[d]
Dieldrin	GC/ECD	SW-846:8080	0.001	0.04	[d]
Endosulfan I*	GC/ECD	SW-846:8080	0.001	4	[d]
Endosulfan II	GC/ECD	SW-846:8080	0.003	--	4[e]
Endosulfan sulfate	GC/ECD	SW-846:8080	0.005	--	4[e]
Endrin	GC/ECD	SW-846:8080	0.001	20	24[f]
Endrin aldehyde	GC/ECD	SW-846:8080	0.002	--	--
Heptachlor	GC/ECD	SW-846:8080	0.001	0.2	[d]
Heptachlor epoxide	GC/ECD	SW-846:8080	0.001	0.08	[d]
Isodrin	GC/ECD	SW-846:8080	0.001	--	--
Kepone*	GC/ECD	SW-846:8080	0.001	--	--
Methoxychlor	GC/ECD	SW-846:8080	0.005	--	400[e]
Toxaphene	GC/ECD	SW-846:8080	0.050	0.6	[d]
PCB-1016	GC/ECD	SW-846:8080	0.010	0.09	[d]
PCB-1221	GC/ECD	SW-846:8080	0.020	0.09	[d]
PCB-1232	GC/ECD	SW-846:8080	0.020	0.09	[d]
PCB-1242	GC/ECD	SW-846:8080	0.010	0.09	[d]
PCB-1248	GC/ECD	SW-846:8080	0.010	0.09	[d]
PCB-1254*	GC/ECD	SW-846:8080	0.020	0.09	[d]
PCB-1260*	GC/ECD	SW-846:8080	0.020	0.09	[d]
ORGANOPHOSPHORUS PESTICIDES					
Dimethoate	GC/FPD	SW-846:8140	0.020	2,000	16[e]
Disulfoton	GC/FPD	SW-846:8140	0.020	3	[d]
Ethyl parathion	GC/FPD	SW-846:8140	0.015	500	[d]

Table 3-2

(Continued)

Parameter	Analysis		Method Detection Limits[a]	Health-Based Levels (Soil)	
	Technique	Method (Soil)	Soil (mg/Kg)	RCRA[b] (mg/Kg)	Calculated[c] (mg/Kg)
Famphur	GC/FPD	SW-846:8140	0.050	--	--
Parathion methyl	GC/FPD	SW-846:8140	0.003	30	20[e]
Phorate	GC/FPD	SW-846:8140	0.015	--	--
Sulfotepp	GC/FPD	SW-846:8140	0.010	40	[d]
Thionazin	GC/FPD	SW-846:8140	0.100	--	--
o,o,o-Triethylphosphorthioate	GC/FPD	SW-846:8140	0.100	--	--
CHLORINATED HERBICIDES					
2,4-D	GC/ECD	SW-846:8150	0.120	800	[d]
2,4,5-T	GC/ECD	SW-846:8150	0.020	--	8,000[e]
2,4,5-TP (Silvex)	GC/ECD	SW-846:8150	0.017	--	640[e]
Dinoseb	GC/ECD	SW-846:8150	0.015	--	80[e]
VOLATILE ORGANICS					
Acetone*	GC/MS	SW-846:8240	10	8,000	[d]
Acetonitrile	GC/MS	SW-846:8240	10	500	[d]
Acrolein	GC/MS	SW-846:8240	7.5	--	--
Acrylonitrile	GC/MS	SW-846:8240	5	1	1.3[e]
Benzene	GC/MS	SW-846:8240	0.5	--	24[f]
Bromodichloromethane	GC/MS	SW-846:8240	0.5	0.5	5[e]
Bromomethane	GC/MS	SW-846:8240	1	100	112[e]
Carbon disulfide*	GC/MS	SW-846:8240	0.5	8,000	[d]
Carbon tetrachloride	GC/MS	SW-846:8240	0.5	5	[d]
2-Chloro-1,3-butadiene	GC/MS	SW-846:8240	2.5	--	1,600[e]
Chlorobenzene	GC/MS	SW-846:8240	0.5	2,000	1,600[e]
Chloroethane	GC/MS	SW-846:8240	1	--	--
Chloroform	GC/MS	SW-846:8240	0.5	100	115[e]
Chloromethane	GC/MS	SW-846:8240	1	--	--

Table 3-2

(Continued)

Parameter	Analysis		Method Detection Limits[a]	Health-Based Levels (Soil)	
	Technique	Method (Soil)	Soil (mg/Kg)	RCRA[b] (mg/Kg)	Calculated[c] (mg/Kg)
3-Chloropropene	GC/MS	SW-846:8240	0.5	--	4,000[e]
Dibromochloromethane	GC/MS	SW-846:8240	0.5	--	1,600[e]
1,2-Dibromo-3-chloropropane	GC/MS	SW-846:8240	2	--	0.03[e]
1,2-Dibromoethane	GC/MS	SW-846:8240	0.5	--	0.008[e]
Dibromomethane	GC/MS	SW-846:8240	0.5	--	--
trans-1,4-Dichloro-2-butene	GC/MS	SW-846:8240	1	--	--
Dichlorodifluoromethane	GC/MS	SW-846:8240	2	20,000	16,000[e]
1,2-Dichloroethane	GC/MS	SW-846:8240	0.5	8	[d]
trans-1,2-Dichloroethene	GC/MS	SW-846:8240	0.5	--	1,600[e]
1,1-Dichloroethane	GC/MS	SW-846:8240	0.5	--	8,000[e]
1,1-Dichloroethene	GC/MS	SW-846:8240	0.5	10	1[e]
1,2-Dichloropropane	GC/MS	SW-846:8240	0.5	--	10[e]
cis-1,3-Dichloropropene	GC/MS	SW-846:8240	0.5	20	4[e]
trans-1,3-Dichloropropene	GC/MS	SW-846:8240	0.5	20	4[e]
Ethyl benzene	GC/MS	SW-846:8240	0.5	8,000	[d]
Ethyl methacrylate	GC/MS	SW-846:8240	0.5	--	7200[e]
2-Hexanone	GC/MS	SW-846:8240	5	--	--
Iodomethane	GC/MS	SW-846:8240	0.5	--	--
Methylene chloride*	GC/MS	SW-846:8240	0.5	90	[d]
2-Butanone (MEK)	GC/MS	SW-846:8240	10	4,000	[d]
Methyl methacrylate	GC/MS	SW-846:8240	0.5	--	6,400[e]
4-Methyl-2-pentanone	GC/MS	SW-846:8240	5	4,000	[d]
Propanenitrile	GC/MS	SW-846:8240	10	--	--
Styrene	GC/MS	SW-846:8240	0.5	20,000	23[e]
1,1,1,2-Tetrachloroethane	GC/MS	SW-846:8240	0.5	300	269[e]
1,1,2,2-Tetrachloroethane	GC/MS	SW-846:8240	0.5	40	35[e]

Table 3-2

(Continued)

Parameter	Analysis		Method Detection Limits[a]	Health-Based Levels (Soil)	
	Technique	Method (Soil)	Soil (mg/Kg)	RCRA[b] (mg/Kg)	Calculated[c] (mg/Kg)
Tetrachloroethene	GC/MS	SW-846:8240	0.5	10	14[f]
Toluene	GC/MS	SW-846:8240	0.5	20,000	16,000[f]
Tribromomethane	GC/MS	SW-846:8240	0.5	2,000	1,600[e]
1,1,1-Trichloroethane	GC/MS	SW-846:8240	0.5	7,000	7,200[e]
1,1,2-Trichloroethane	GC/MS	SW-846:8240	0.5	100	123[f]
Trichloroethene	GC/MS	SW-846:8240	0.5	60	64[e]
Trichlorofluoromethane	GC/MS	SW-846:8240	1	20,000	24,000[e]
1,2,3-Trichloropropane	GC/MS	SW-846:8240	0.5	500	400[e]
Vinyl Acetate	GC/MS	SW-846:8240	0.5	--	80,000[e]
Vinyl Chloride	GC/MS	SW-846:8240	1	--	0.4[e]
Xylenes (total)	GC/MS	SW-846:8240	0.5	200,000	160,000[e]
VOLATILE ORGANICS (Direct Injection)					
1,4-Dioxane	GC/MS	SW-846:8240	1	60	64[e]
Isobutanol	GC/MS	SW-846:8240	1	20,000	24,000[e]
Methacrylonitrile	GC/MS	SW-846:8240	1	8	[d]
SEMIVOLATILE ORGANICS					
Acenaphthene	GC/MS	SW-846:8270	1	--	4,800[e]
Acenaphthylene	GC/MS	SW-846:8270	1	--	--
Acetophenone	GC/MS	SW-846:8270	5	8,000	[d]
2-Acetylaminofluorene	GC/MS	SW-846:8270	1	--	--
4-Aminobiphenyl	GC/MS	SW-846:8270	1	--	--
Aniline	GC/MS	SW-846:8270	1	100	80[e]
Anthracene*	GC/MS	SW-846:8270	1	--	0.2[g]
Aramite	GC/MS	SW-846:8270	10	--	4,000[e]
Benzo(a)anthracene*	GC/MS	SW-846:8270	1	--	0.4[g]
Benzo(a)pyrene*	GC/MS	SW-846:8270	1	--	0.06[e]

Table 3-2

(Continued)

Parameter	Analysis		Method Detection Limits[a]	Health-Based Levels (Soil)	
	Technique	Method (Soil)	Soil (mg/Kg)	RCRA[b] (mg/Kg)	Calculated[c] (mg/Kg)
Benzo(b)fluoranthene*	GC/MS	SW-846:8270	1	--	0.4[g]
Benzo(g,h,i)perylene	GC/MS	SW-846:8270	1	--	2.8[g]
Benzo(k)fluoranthene*	GC/MS	SW-846:8270	1	--	0.9[g]
Benzyl alcohol	GC/MS	SW-846:8270	1	--	240[e]
4-Bromophenyl phenyl ether	GC/MS	SW-846:8270	1	--	--
Butylbenzylphthalate*	GC/MS	SW-846:8270	1	20,000	16,000[f]
4-Chloro-3-methylphenol	GC/MS	SW-846:8270	1	--	--
4-Chloroaniline*	GC/MS	SW-846:8270	1	--	320[e]
Chlorobenzilate	GC/MS	SW-846:8270	1	--	1,600[e]
bis(2-Chloroethoxy)methane	GC/MS	SW-846:8270	1	--	--
bis(2-Chloroethyl)ether	GC/MS	SW-846:8270	1	0.6	[d]
bis(2-Chloroisopropyl)ether	GC/MS	SW-846:8270		--	--
2-Chloronaphthalene	GC/MS	SW-846:8270	1	--	--
2-Chlorophenol	GC/MS	SW-846:8270	1	400	[d]
4-Chlorophenyl phenyl ether	GC/MS	SW-846:8270	1	--	--
Chrysene*	GC/MS	SW-846:8270	1	--	14[g]
Diallate	GC/MS	SW-846:8270	1	--	11[e]
Dibenz(a,h)anthracene	GC/MS	SW-846:8270	1	--	0.05[e]
Dibenzofuran*	GC/MS	SW-846:8270	1	--	0.000005[e]
1,2-Dichlorobenzene	GC/MS	SW-846:8270	1	--	7,200[e]
1,3-Dichlorobenzene	GC/MS	SW-846:8270	1	--	--
1,4-Dichlorobenzene	GC/MS	SW-846:8270	1	--	290[e]
3,3'-Dichlorobenzidine	GC/MS	SW-846:8270	2	2	[d]
2,4-Dichlorophenol	GC/MS	SW-846:8270	1	200	240[e]
2,6-Dichlorophenol	GC/MS	SW-846:8270	1	--	--
Diethylphthalate	GC/MS	SW-846:8270	1	80,000	64,000[e]

Table 3-2

(Continued)

Parameter	Analysis		Method Detection Limits[a]	Health-Based Levels (Soil)	
	Technique	Method (Soil)	Soil (mg/Kg)	RCRA[b] (mg/Kg)	Calculated[c] (mg/Kg)
p-Dimethylaminoazobenzene	GC/MS	SW-846:8270	1	--	--
7,12-Dimethylbenz(a)anthracene	GC/MS	SW-846:8270	5	--	--
3,3'-Dimethylbenzidine	GC/MS	SW-846:8270	2	--	0.08[e]
Dimethylphenethylamine	GC/MS	SW-846:8270	1	--	--
2,4-Dimethylphenol	GC/MS	SW-846:8270	1	--	1,600[e]
Dimethylpthalate	GC/MS	SW-846:8270	1	--	80,000[e]
4,6-Dinitro-2-methylphenol	GC/MS	SW-846:8270	5	--	--
Di-n-butylphthalate*	GC/MS	SW-846:8270	5	8,000	[d]
Di-n-octylphthalate*	GC/MS	SW-846:8270	1	--	1,600[e]
1,3-Dinitrobenzene	GC/MS	SW-846:8270	1	8	[d]
2,4-Dinitrophenol	GC/MS	SW-846:8270	5	200	160[e]
2,4-Dinitrotoluene	GC/MS	SW-846:8270	1	--	--
2,6-Dinitrotoluene	GC/MS	SW-846:8270	1	1	[d]
Diphenylamine	GC/MS	SW-846:8270	1	2,000	[d]
bis(2-Ethylhexyl)phthalate*	GC/MS	SW-846:8270	1	50	[d]
Ethylmethane sulfonate	GC/MS	SW-846:8270	1	--	--
Fluoranthene*	GC/MS	SW-846:8270	1	--	3,200[e]
Fluorene	GC/MS	SW-846:8270	1	--	3,200[e]
Hexachlorobenzene	GC/MS	SW-846:8270	1	--	0.4[e]
Hexachlorobutadiene	GC/MS	SW-846:8270	1	90	[d]
Hexachlorocyclopentadiene	GC/MS	SW-846:8270	1	600	560[e]
Hexachloroethane	GC/MS	SW-846:8270	1	80	[d]
Hexachlorophene	GC/MS	SW-846:8270	1.0	20	24[e]
Hexachloropropene	GC/MS	SW-846:8270	1	--	--
Indeno(1,2,3-c,d)pyrene	GC/MS	SW-846:8270	1	--	0.3[e]
Isophorone	GC/MS	SW-846:8270	1	2,000	1,700[e]

Table 3-2

(Continued)

Parameter	Analysis		Method Detection Limits [a]	Health-Based Levels (Soil)	
	Technique	Method (Soil)	Soil (mg/Kg)	RCRA [b] (mg/Kg)	Calculated [c] (mg/Kg)
Isosafrole	GC/MS	SW-846:8270	1	--	--
Methapyrilene	GC/MS	SW-846:8270	1	--	--
3-Methylchloanthrene	GC/MS	SW-846:8270	1	--	--
Methyl methanesulfonate	GC/MS	SW-846:8270	1	--	--
2-Methyl naphthalene	GC/MS	SW-846:8270	1	--	--
2-Methylphenol	GC/MS	SW-846:8270	1	4,000	[d]
3-Methylphenol	GC/MS	SW-846:8270	1	4,000	[d]
4-Methylphenol	GC/MS	SW-846:8270	1	4,000	[d]
Naphthalene	GC/MS	SW-846:8270	1	--	320 [e]
1,4-Naphthoquinone	GC/MS	SW-846:8270	1	--	--
1-Naphthylamine	GC/MS	SW-846:8270	1	--	--
2-Naphthylamine	GC/MS	SW-846:8270	1	--	--
2-Nitroaniline	GC/MS	SW-846:8270	5	--	--
3-Nitroaniline	GC/MS	SW-846:8270	5	--	--
4-Nitroaniline	GC/MS	SW-846:8270	5	--	--
Nitrobenzene	GC/MS	SW-846:8270	1	40	[d]
2-Nitrophenol	GC/MS	SW-846:8270	1	--	--
4-Nitrophenol	GC/MS	SW-846:8270	5	--	--
4-Nitroquinoline-N-oxide	GC/MS	SW-846:8270	10	--	--
N-Nitroso-di-n-butylamine	GC/MS	SW-846:8270	1	0.1	[d]
N-Nitrosodiethylamine	GC/MS	SW-846:8270	1	--	0.005 [e]
N-Nitrosodiphenylamine	GC/MS	SW-846:8270	1	100	143 [e]
N-Nitrosodipropylamine	GC/MS	SW-846:8270	1	0.1	[d]
N-Nitrosodimethylamine	GC/MS	SW-846:8270	1	--	--
N-Nitrosomethylethylamine	GC/MS	SW-846:8270	1	0.03	[d]
N-Nitrosomorpholine	GC/MS	SW-846:8270	1	--	--

Table 3-2

(Continued)

Parameter	Analysis		Method Detection Limits[a]	Health-Based Levels (Soil)	
	Technique	Method (Soil)	Soil (mg/Kg)	RCRA[b] (mg/Kg)	Calculated[c] (mg/Kg)
N-Nitrosopiperidine	GC/MS	SW-846:8270	1	--	--
N-Nitrosopyrrolidine	GC/MS	SW-846:8270	1	0.3	[d]
5-Nitro-o-toluidine	GC/MS	SW-846:8270	1	--	--
Pentachlorobenzene	GC/MS	SW-846:8270	1	60	64[e]
Pentachloroethane	GC/MS	SW-846:8270	1	--	--
Pentachloronitrobenzene	GC/MS	SW-846:8270	1	200	30[e]
Pentachlorophenol	GC/MS	SW-846:8270	5	2,000	6[e]
Phenacetin	GC/MS	SW-846:8270	1	--	--
Phenanthrene*	GC/MS	SW-846:8270	1	--	5[h]
Phenol	GC/MS	SW-846:8270	1	50,000	48,000[e]
p-Phenylenediamine	GC/MS	SW-846:8270	5	--	480[e]
2-Picoline	GC/MS	SW-846:8270	1	--	--
Pronamide	GC/MS	SW-846:8270	1	6,000	6,400[e]
Pyrene*	GC/MS	SW-846:8270	1	--	0.8[e]
Pyridine	GC/MS	SW-846:8270	1	80	[d]
Safrole	GC/MS	SW-846:8270	1	--	--
1,2,4,5-Tetrachlorobenzene	GC/MS	SW-846:8270	1	20	24[e]
2,3,4,6-Tetrachlorophenol	GC/MS	SW-846:8270	2	2,000	2,400[e]
o-Toluidine	GC/MS	SW-846:8270	1	--	3[e]
1,2,4-Trichlorobenzene*	GC/MS	SW-846:8270	1	2,000	105[e]
2,4,5-Trichlorophenol	GC/MS	SW-846:8270	1	8,000	[d]
2,4,6-Trichlorophenol	GC/MS	SW-846:8270	1	40	63[e]
DIOXINS AND FURANS					
2,3,7,8-Tetrachlorodibenzo-p-dioxin	GC/MS	SW-846:8280	0.00008	--	0.000005[e]
Tetrachlorodibenzo-p-dioxins	GC/MS	SW-846:8280	0.00008	--	0.000005[e]
Tetrachlorodibenzo-p-furans	GC/MS	SW-846:8280	0.00006	--	0.000005[e]

Table 3-2

(Continued)

Parameter	Analysis		Method Detection Limit[a]	Health-Based Levels (Soil)	
	Technique	Method (Soil)	Soil (mg/Kg)	RCRA[b] (mg/Kg)	Calculated[c] (mg/Kg)
Pentachlorodibenzo-p-dioxins	GC/MS	SW-846:8280	0.0002	--	0.000005[e]
Pentachlorodibenzo-p-furans	GC/MS	SW-846:8280	0.00008	--	0.000005[e]
Hexachlorodibenzo-p-dioxins	GC/MS	SW-846:8280	0.0002	0.0001	--
Hexachlorodibenzo-p-furans	GC/MS	SW-846:8280	0.0001	--	0.000005[e]
GENERAL					
Cyanide*	Colorimetric	SW-846:9012	1	2,000	1,600[e]
Sulfide*	Titrametric	SW-846:9030	50	--	--
Total Organic Carbon*	IR	SW-846:9060	2,000	--	--

[a] Method Detection Limit is the minimum concentration of a substance that can be measured and reported. Method Detection Limits are highly matrix dependent and may not always be achievable.

[b] Values taken from "Draft Preliminary Standards for RCRA Risk Assessment," Appendix 3, EPA Region VI, 20 February 1991; and 27 July 1990 Fed. Reg., "Corrective Action for SWMUs at Hazardous Waste Management Facilities; Proposed Rule," Appendix A.

[c] Values calculated using the reference dose (RfD) or slope factor (SF) with EPA's method for calculating action levels (Appendix 4 of "Draft Preliminary Standards for RCRA Risk Assessment," EPA Region VI, 20 February 1991; and 27 July 1990 Fed. Reg., "Corrective Action for SWMUs at Hazardous Waste Management Facilities," Appendix E. The source of the RfDs and SFs used in the calculation are designated by a footnote for each HBL value in this column.

[d] Values calculated using a RfD or SF are equivalent to the "RCRA" values.

[e] RfD or SF used in calculation of HBL from Health Effects Assessment Summary Tables, FY-1991 Annual, EPA, Washington D.C., January, 1991.

[f] RfD or SF used in calculation of HBL from Integrated Risk Information Service (IRIS), EPA, January, 1992.

[g] SF used in calculation of HBL calculated using method in Comparative Potency Approach for Estimating the Cancer RiskAssociated with Exposure to Mixtures of Polycyclic Aromatic Hydrocarbons, Interim Final, ICF-Clement Associates, Fairfax, Virginia, April 1, 1988.

[h] SF derived using methodology in "Docket Report on Health-Based Levels and Solubitities Used in the Evaluation of Delisting Petitions, Submitted Under 40 CFR Parts 260.20 and 260.22." Science Applications International Corporation, McLean, Virginia, November, 1989.

* Denotes chemicals previously detected at the Holloman AFB sewage lagoons.

IR = Infrared Spectrometry
ICPES = Inductively Coupled Plasma Emission Spectroscopy
GFAA = Graphite Furnace Atomic Absorption
CVAA = Cold Vapor Atomic Absorption
GC/MS = Gas Chromatography/Mass Spectrometry
SW-846 = Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, U.S. EPA, Office of Solid Waste and Emergency Response, November 1986, third edition.
EPA = Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.
N/A = Not Applicable
IC = Ion Chromatography
GC/FPD = Gas Chromatography/Flame Photometric Detector

Table 3-2

(Continued)

GC/ECD = Gas Chromatography/Electron Capture Detector
HML = California Department of Health Services; Hazardous Materials Laboratory

ATTACHMENT 2

MEMO REGARDING HBL CALCULATION METHODS

MEMORANDUM

TO: Wally Hise, Cris Hine
FROM: Ralph Jennings
COPY: Jane Hixson
DATE: January 20, 1992
SUBJECT: Holloman Sewage Lagoons Action Levels

EPA's July 27,1990 Proposed Rule for "Corrective Action for SWMUs at Hazardous Waste Management Facilities" presents a method for calculating Action Levels to be used as a simple screening mechanism for corrective action. NMED has also sent us a memo (Attachment A) which contains two types of calculations for acceptable residual soil contaminants. The equations presented by the NMED are incorrect as printed. The equation for noncarcinogenic contaminants as written yields a unitless number with values for the chemicals on the attached Action Level tables ranging from 2.5×10^{-3} to 5×10^{-9}. If the divisor in this equation is multiplied by a factor of 1 kg/1000000 mg, the resulting value for C will be in mg/kg and in the same range as numbers calculated by the EPA method. If a body weight of 16 kg (EPA recommended exposure assumption) is now used instead of NMED's 10 kg value, the two methods calculate identical Action Levels. The equation for carcinogens also lacks the kg/mg factor, and presents the wrong units for the SF. This is presumably a typo, SF units should be expressed as $(mg/kg/day)^{-1}$. When the correct SF units are used and the Kg/mg factor applied, the equation yields results very close to the EPA method Action Levels.

The July 27 1990 Proposed Rule is being used as policy, and is intended to promote national consistency in implementation. Therefore, NMEDs exposure assumptions should conform to this proposed rule (16 kg should be used for body weight, not 10 kg); and the equations need to be corrected. I suggest using EPA's method for calculating Action Levels (Appendix E of the Proposed Rule; also Appendix 4 of the "Draft Preliminary Standards for RCRA Risk Assessment" prepared by Youngmoo Kim, EPA Region 6, Dallas, TX, Feb.20, 1991). Action Levels calculated by this method are

attached.

Also, please note that the January 3 memo on clean up levels I sent you contained an error in the RfD for aluminum, which has been corrected in the attached (renamed) Action Level table for the NMED method. Please replace the Jan. 3 table with this one.

ATTACHMENT A

Risk Assessment Calculations for Carcinogens and Noncarcinogens

Following are the two types of calculations for acceptable residual soil contaminants based on risk assessment calculations. These calculations assume a daily exposure duration of 8 hours/day, 40 hrs/week. The resulting figure for acceptable contamination (C), should be modified to reflect a larger value for C if the daily or weekly exposure is less, and a smaller value for C if the soil ingested is greater than the assumption due to local conditions. The first two equations below are suitable for situations involving only one contaminant, the second two are for multiple contaminant scenarios.

For single, noncarcinogenic contaminants

Where C, the acceptable residual soil concentration, C will be equal to the RfD* divided by the amount of soil ingested daily per kilogram of body weight (the standard RCRA model for noncarcinogenic contaminant exposure is a 10 kg child ingesting 200 mg soil/day) = 20 mg/kg weight per day:

$$C = \frac{RfD\left(\frac{\text{mg constituent}}{\text{kg*day}}\right)}{20\ \frac{\text{mg soil}}{\text{kg*day}}}$$

*RfD is the reference dose. RCRA clean closures require use of the assumption that intake is by direct soil ingestion, so you will want to use the oral intake RfD for noncarcinogens. The Integrated Risk Information System (IRIS) will supply this data [(513 569-7254].

For single, carcinogenic contaminants

Where C is the acceptable residual contamination, R is the acceptable risk and is generally set at $1x10^{-6}$, SF is the carcinogenic slope factor. IRIS data includes this value in the carcinogen, oral intake data section. DI is the average daily soil ingestion. This calculation assumes a 70 kg adult consuming 100 mg of soil daily, so the DI is 100 mg/70 kg = 1.42 mg soil/kg weight per day.

$$C = \frac{R}{SF\ (\text{day/mg*kg}) \times 1.42\ \text{mg/(kg*day)}}$$

If the total constituent concentration of any chemical in the residual soil is above the limit calculated, the contaminated media must be removed to a permitted hazardous waste treatment, disposal or storage facility. Site specific factors may allow an adustment of the assumptions used in the above calculations.

For situations involving multiple contaminants, the risk from each is summed and the total risk from residual contaminants must be acceptable.

For multiple, carcinogenic contaminants

R = Risk and is set at 1 X 10^{-6} incidences of cancer (one incidence in a population of one million). CDI = chronic daily intake of the carcinogen not of contaminated soil. CDI is equal to the daily soil intake times the concentration of the individual contaminant. SF is the slope factor (same as in the previous example).

$$R = 1 \times 10^{-(CDI \times SF)}$$

Total R will equal the calculated R from carcinogen 1 + R from carcinogen 2, etc. Cleanup levels will be considered adequate with respect to the carcinogens when R_{tot} is less than 1 x 10^{-6}.

For multiple, noncarcinogenic contaminants

CDI is as immediately above, RfD is as in the first example, above. Calculate the total Chronic Hazard Index as follows:

$$\text{Total hazard index} = CDI_1 \times RfD_1 + CDI_2 \times RfD_2 + \text{etc.}$$

The total hazard index must be less than 1, i.e., 0.99 or less.

All analytical data must be submitted to the New Mexico Environment Department (NMED) and must be accompanied by complete QA/QC data documenting that the laboratory has followed appropriate EPA SW-846, chapter one QA/QC procedures, and SW-846 analytical methods.

Ref: Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Part A

Holloman Sewage Lagoons: Action Levels Based on Soil Ingestion by Children
NMED Method

Non-carcinogens

C = RfD (mg/kg-day)/(20 mg soil/kg-day*1kg/1000000mg)

Carcinogens

C = 1e-06/[SF91/(mg/kg-day))*1.42 mg/kg-day*1kg/1000000mg]

	Oral RfD	Oral SF	RfD Action Level (mg/kg)	SF Action Level (mg/kg)
Aluminum *	5.71E-03		2.86E+02	
Anthracene	3.00E-01	3.68E+00		1.91E-01
Antimony	4.00E-04		2.00E+01	
Barium	5.00E-02		2.50E+03	
Benzo(a)anthracene *	2.86E-07	1.67E+00		4.22E-01
Benzo(a)pyrene *	8.57E-08	1.15E+01		6.12E-02
Benzo(b)fluoranthene *	5.71E-07	1.61E+00		4.37E-01
Benzo(k)fluoranthene *	1.14E-04	7.59E-01		9.28E-01
Boron	9.00E-02		4.50E+03	
Chloroaniline, 4-	4.00E-03		2.00E+02	
Chromium (III)	1.00E+00		5.00E+04	
Chrysene *	5.71E-06	5.00E-02		1.41E+01
Copper	3.71E-02		1.86E+03	
Dibenzofuran	1.00E-09	1.50E+05		4.69E-06
Di-n-octyl phthalate *	1.70E-02		8.50E+02	
Fluoranthene	4.00E-02		2.00E+03	
Iron *	8.57E-03		4.29E+02	
Lead *	1.43E-03		7.15E+01	
Lead (organic)	1.00E-07		5.00E-03	
Magnesium *	4.29E+00		2.15E+05	
Manganese	1.00E-01		5.00E+03	
Nitrate	1.00E-01		5.00E+03	
PCBs *	1.43E-05	7.70E+00		9.15E-02
Phenanthrene *	5.71E-05		2.85E+00	
Pyrene	3.00E-02	9.30E-01		7.57E-01
Selenium	3.00E-03		1.50E+02	
Sulfate *	7.14E+00		3.57E+05	
Trichlorobenzene, 1,2,4-	2.00E-02		1.00E+03	
Vanadium	7.00E-03		3.50E+02	
Zinc	2.00E-01		1.00E+04	

* = Radian calculated RfD value

Holloman Sewage Lagoons: Action Levels Based on Soil Ingestion by Children
EPA Region 6 Method, Subpart S Method

Non-carcinogens
Cs = [RfD * BW]/[I * A]
Cs = [RfD * 16 kg]/[0.2 g/day * 0.001 kg/g * 1]
Cs = RfD * 80000

Carcinogens
Cs = [R * BW * LT]/[SF * I * A * ED]
Cs = [1e-06 * 70 kg * 70 yrs]/[SF(1/(mg/kg/day)) * 0.1 g/day * 0.001 kg/g *1]
Cs = 0.7/SF

	Oral RfD	Oral SF	RfD Action Level (mg/kg)	SF Action Level (mg/kg)
Aluminum *	5.71E-03		4.57E+02	
Anthracene	3.00E-01	3.68E+00		1.90E-01
Antimony	4.00E-04		3.20E+01	
Barium	5.00E-02		4.00E+03	
Benzo(a)anthracene *	2.86E-07	1.67E+00		4.19E-01
Benzo(a)pyrene *	8.57E-08	1.15E+01		6.09E-02
Benzo(b)fluoranthene *	5.71E-07	1.61E+00		4.35E-01
Benzo(k)fluoranthene *	1.14E-04	7.59E-01		9.22E-01
Boron	9.00E-02		7.20E+03	
Chloroaniline, 4-	4.00E-03		3.20E+02	
Chromium (III)	1.00E+00		8.00E+04	
Chrysene *	5.71E-06	5.00E-02		1.40E+01
Copper	3.71E-02		2.97E+03	
Dibenzofuran	1.00E-09	1.50E+05		4.67E-06
Di-n-octyl phthalate *	1.70E-02		1.36E+03	
Fluoranthene	4.00E-02		3.20E+03	
Iron *	8.57E-03		6.86E+02	
Lead *	1.43E-03		1.14E+02	
Lead (organic)	1.00E-07		8.00E-03	
Magnesium *	4.29E+00		3.43E+05	
Manganese	1.00E-01		8.00E+03	
Nitrate	1.00E-01		8.00E+03	
PCBs *	1.43E-05	7.70E+00		9.09E-02
Phenanthrene *	5.71E-05		4.57E+00	
Pyrene	3.00E-02	9.30E-01		7.53E-01
Selenium	3.00E-03		2.40E+02	
Sulfate *	7.14E+00		5.71E+05	
Trichlorobenzene, 1,2,4-	2.00E-02		1.60E+03	
Vanadium	7.00E-03		5.60E+02	
Zinc	2.00E-01		1.60E+04	

* = Radian calculated RfD value