Mr. Mark Logsdon
Adrian Brown Consultants, Inc.
155 South Madison Street, Suite 302
Denver, CO 80209

Dear Mr. Logsdon:

I am writing this letter to address the "Draft Report to Cherokee County Site Participating PRPs, PILOT LEACH TESTING GALENA SUBSITE, KANSAS." This report included, in addition to a presentation on the pilot test, a discussion of other data, studies and/or theories related to the Cherokee County mine waste problem. As per our conversation on Wednesday, July 12, 1989 it was agreed that a revised report would be prepared. This report would present and assess the pilot test data only and discuss conclusions and recommendations based on the pilot test that will aid the remedy selection process.

To that end, EPA offers the attached comments. These comments are provided in an effort promote a clearer presentation of the pilot test data and their interpretation. The comments that address areas already changed subsequent to our phone call can be disregarded. These comments are provided to assure that you are aware of EPAs position regarding issues as they may relate to the pilot test, its assessment and the alternative to selectively place mine wastes below grade.

Should you have any questions or comments regarding this letter or attached comments, please advise.

Sincerely yours,

Glenn Curtis
Remedial Section
Superfund Branch
Waste Management Division

Enclosure

cc: Ken Paulsen
Neil Geitner

bcc: Jane Kloeckner
WSTM:SPFD:REMD:CURTIS:7/14/89 DISK #7 CUR7-17

REMD	REMD	SPFD
CURTIS	WRIGHT	SANDERSON
7-14-89		

S00022928
SUPERFUND RECORDS

7/14/89

TECHNICAL COMMENTS ON

DRAFT
REPORT TO
CHEROKEE COUNTY SITE
PARTICIPATING PRPs

PILOT LEACH TESTING
GALENA SUBSITE, KANSAS

prepared by
Adrian Brown Consultants, Inc.
Dated: June 30,1989

This document will provide summary comments on the PRP draft report. These comments are to be viewed as draft as all the analytical data have yet to be received from Adrian Brown Consultants, Inc. (ABC). Also, laboratory soils analyses were not complete when the draft report was issued and remain incomplete as of this date. Additionally, confirming data have not been received from the EPA Region VII Laboratory to confirm the non-CLP, short turn around information obtained from the laboratory in Joplin, MO. However, the intent of the schedule is to finalize this report in advance of receiving this confirming data.

Comments are organized by Section number in the ABC report.

Section 1

In general Section 1 provides an accurate background for the need for the tests and the negotiations that took place leading up to the PRPs and ABC agreeing to do the pilot tests. Specific technical comments on the contents of Section 1 are:

1. (page 1-1) The subsite area is over the stated 900 acres.

2. (page 1-2) The subsite boundary needs to be shown on the figure and the sampling locations specified.

3. (page 1-3) The groundwater discharge to the streams is perennial not seasonal as stated in paragraph 1.

4. (page 1-3) We disagree with the ABC interpretation on the fall leach tests. In our opinion metals were leached in significant amounts from the crushed materials but reached a quasi-equilibrium status. The results from the fall leach tests and the jar stir tests conducted by EPA suggested the need for these pilot tests.

5. (page 1-4) The tailing material prepared by the PRPs and referred to in the first paragraph was not the same grain size as the EPA tailing (200 mesh [EPA] v. 100 mesh [PRP]). The generalizations referred to in the paragraph do not contribute to the technical interpretation of these pilot tests.

6. (page 1-5) The EPA disagrees with the statement regarding leaching from the tailing in paragraph 1. The tailing material from the EPA conducted milling tests leached the least amount of metals of any of the materials studied to date. Due to the metals removal in the milling process, the residual metals in the tailing were much lower in concentration. The grain size was not a significant parameter for leaching from the EPA tailing.

   In paragraph 2 on the same page, ABC alleges that the Fall column tests supplied sufficient data to postulate and defend unsorted disposal of the mine wastes at the Galena subsite. If this conclusion were true, then there would have been no need for the pilot tests.

7. (page 1-6) At the top of the page the general description of the remedy is accurate. However, the supporting discussions are not specifically the support and logic used by the EPA in developing the alternative to the PRP remedy.

8. (page 1-6) The pilot scale testing is not a "full-sized" test as stated in the last paragraph. Materials over 10 inch size were removed from the test materials. Thus, the materials used for the test were both bottom and top end size controlled.

9. (page 1-7) For completeness, references need to be made to the QAPP, FOP, and SSP in this section.

10. (page 1-7) For accuracy it should be stated that multiple groundwater chemistry types were used only for the batch tests.

Section 2

1. (page 2-2) The sampling locations need to be checked on the Figure. The Area 1 sample locations do not agree with the CH2M HILL field notes.

2. (page 2-3) CH2M HILL field notes show that no waste rock was taken from Area 4 and chat was taken only from Areas 5 and 7. The discrepancies need to be resolved.

3. (page 2-5) Please add a tentative schedule for the completion of all the laboratory work on the soils and the water.

4. (pages 2-5 and 2-6) The discussions need to be more quantitative and less qualitative on the sampling methods and decisions made in the field (e.g. how was pond water sampling location determined based on the field instrumentation).

5. (page 2-8) Of the parameters discussed in paragraph 2, uniform flux through the flow-through experiment is one of the most important in our opinion. Therefore, it was very important to mix the materials prior to placement in the tanks to reduce the potential for channelization or short-circuiting of flow in the tank. It was not the intent of the experimental design to maximize either potential reactions or reaction rates. Reaction rates are controlled by the interactions between the groundwater and the mine wastes. The flow rate (flux) of groundwater will effect the resulting concentrations of metals in the effluent from the tests.

6. (page 2-8, bottom) Beginning at this location and repeated in many other locations, reference is made to the grinding and fresh face creation during the "extensive" mixing process. There are are no notations in the CH2M HILL field logs discussing the mixing process and the creation of "fresh faces". The operations undertaken as the result of the observed field operations were not elaborate mixing or grinding processes such as to create a large quantity of "fresh faces." This claim needs to be documented or removed.

7. (page 2-9) The EPA does not agree with the blanket statement that the batch tests results will overstate the leaching of metals from the mine wastes. The batch tests will give a quasi-equilibrium result for the tests considering the wastes used, the initial water chemistry, and the duration of the test.

   The justification for selecting Pond 524 water needs to be presented.

8. (page 2-13) Clock times need to be provided on the graphs to augment the pore volume times.

9. (page 2-14) This section needs to be rewritten to state clearly what is being modeled, the purpose of the modeling, the information being used, and the assumptions underlying the analysis.

10. (page 2-16) The Roubidoux water used for the rain water test had a essentially the same TDS and pH as the pond water used in the flow-through test. With the mixing of the two waters and the use of only one pore volume of rain water, the test cell saw little variation in influent water chemistry.

11. (page 2-17) Please clarify the size of the header tank. On page 2-16 the capacity is reported as 500 gallons. On page 2-17 the value of 600 gallons is given.

4. (pages 2-5 and 2-6) The discussions need to be more quantitative and less qualitative on the sampling methods and decisions made in the field (e.g. how was pond water sampling location determined based on the field instrumentation).

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11. (page 2-17) Please clarify the size of the header tank. On page 2-16 the capacity is reported as 500 gallons. On page 2-17 the value of 600 gallons is given.

Section 3

The text contains a number of specific comments. Rather than repeat them in this section. We will focus on omnibus issues:

1. The conclusions have been drawn based on incomplete data. Major missing pieces of data are:

   - head assays for the materials tested
   - mineralogy of the materials tested
   - major ion chemistry
   - metals concentrations v. size fractions(6) as stated in the FOP

   Our discussions presented herein are contingent on receipt and review of these data. As discussed earlier, the intent of the schedule was to complete the final draft of the report in advance of receiving the CLP results which are functioning as the QA/QC controls.

2. The report focused on grain size and "fresh faces" without discussion of other causal agents (e.g. . water chemistry, pH, Eh, flux, short and long term impacts on groundwater and surface water quality)

3. The changes in pH in the flow-through tests have not been explained. These results are important to the understanding of the tests. The attached supplementary XRD results (Attachment 3) and XRF analyses (Attachment 4) on the mine waste pulps show considerably more carbonate than was initially thought to be present. The mine waste/chat mixture may have more buffering capacity and increase the groundwater pH after the initial release of metals following placement of the wastes below the water table.

4. The batch test data are treated as a lump without looking at the individual tests. The attached graph (Figure 1) shows that the two unscreeened and the single minus 2 inch batch tests leached more lead (Pb) than the other batch tests. These ratios are shown as tests 3, 4, and 5 on the figure (ratios are crosshatched to highlight them). Table 1 presents the ratio calculation bases for Figure 1.

5. This section should focus more on discussing the results and less on conclusions and recommendations.

6. Temporal changes to the source water chemistry (from Pond 524) need to be discussed.

7. The size distribution differences between the siliceous and the calcareous materials need to be discussed.

8. The temporal variations in the flow-through tests and the batch test results need to be explained more thoroughly.

9. ABC should review its discussions on hydraulic conductivity based on McCauley who says that the mine workings are interconnected. Interconnection of the mine workings would change the effects of depositing the wastes in the voids on the groundwater flow from that discussed in the draft report.

Section 4

The EPA disagrees with the basic conclusion of the ABC report that screening of the mine waste rock is unneeded for the selective backfill remedy. The batch test data show clearly excess lead leaching from the minus 2 inch materials and the unsorted materials (refer to Figure 1 attached).

The ABC report makes generalizations concerning the mass loadings of metals to Short Creek and the groundwater system without using any quantitative information on the relative effects of the processes being changed by the remedy. A model of these processes was published with the GW/SW OUFS last Spring. The model is being updated to reflect the revised remedy. It is our opinion that the total mass loading to the groundwater and surface water systems will be reduced through the implementation of the remedy.

Section 5

The conclusion presented regarding the lack of causal relationships between the historic mining activities is not accepted. Mining has changed the groundwater and surface water flow patterns in the subsite. These changes have exacerbated the metals loadings from the mineralized zone through capture of surface runoff and diverting it to the groundwater system, exposed more of the metal bearing minerals to oxidation and mobilization.

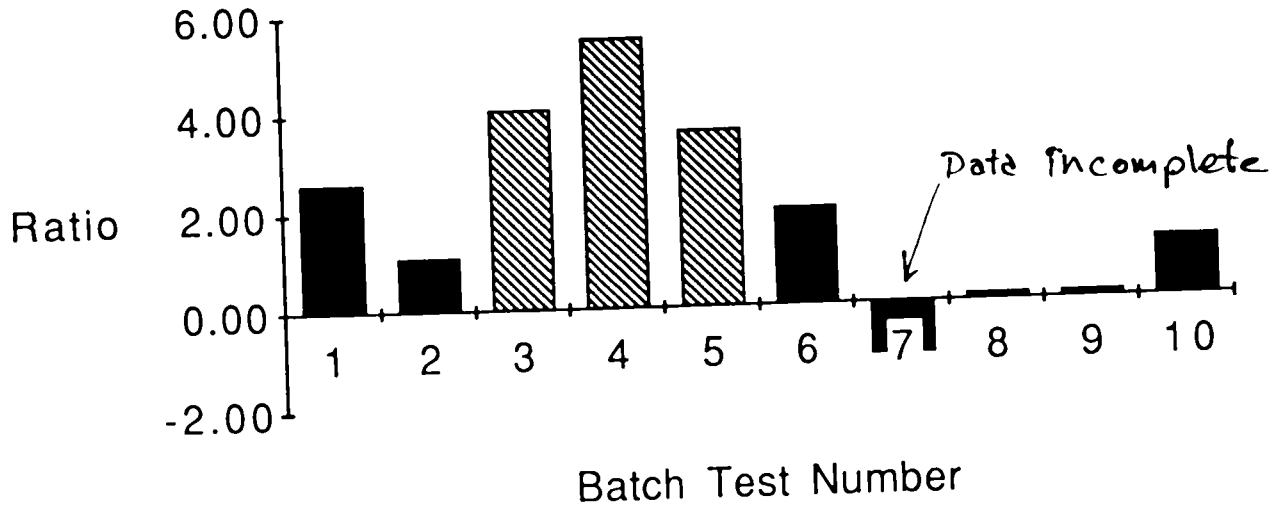
Many of the conclusions are presented qualitatively without quantitative information.

The report does not address the reduction in public health exposure due the isolation of lead and cadmium from the ingestion pathway to humans.

In discussing the results of the batch tests (both the barrel and test tank results) and the flow-through tests, the report needs to address the expected quantitative changes to the shallow groundwater quality and flow rate after placement of the wastes in the voids as postulated in the pilot tests. Effects of the changes in groundwater quality and quantity on the recieving surface waters should also be discussed.

END

Figure 1
Partial Batch Test Results for Lead
(After/Before)



Attachment 2

Table 1
Batch Tests
Cherokee County

Source: Table 3.4 of ABC Draft Report
Galena Subsite

Batch No.	Lead-before	Lead-after	Ratio	
1	0.15	0.4	2.67	
2	0.2	0.23	1.15	
3	0.16	0.66	4.13	
4	0.2	1.1	5.50	
5	0.22	0.8	3.64	
6	0.2	0.4	2.00	
7	-0.01	0.01	-1.00	
8	1	0.17	0.17	
9	0.95	0.18	0.19	
10	0.15	0.19	1.27	
11	-0.01	0.08	-8.00	insuff data
12	-0.01	0.1	-10.00	insuff data
13	0.31		0.00	insuff data
14	0.33		0.00	insuff data
15	-0.01	0.363	-36.30	
Average			1.97	

Batch No.	Zinc-before	Zinc-after	Ratio	Average
1	31.4	55.2	1.76	
2	38.1	50.3	1.32	
3	37.1	58.7	1.58	
4	37.1	49.7	1.34	
5	43	35.1	0.82	
6	43.1	63.5	1.47	
7	4.58	22.8	4.98	
8	14.9	41.3	2.77	
9	13.8	41.2	2.99	
10	14.9	42.2	2.83	2.19
11	0.49	15.3	31.22	
12	2.1	1.88	0.90	
13	38.6	no data	#VALUE!	
14	52.3	no data	#VALUE!	
15	39.5	9.64	0.24	
Average			4.50	

Batch No.	Cd-before	Cd-after	Ratio	
1	0.07	0.12	1.71	
2	0.08	0.14	1.75	
3	0.09	0.17	1.89	
4	0.08	0.2	2.50	
5	0.1	0.19	1.90	
6	0.1	0.15	1.50	
7	0.02	0.13	6.50	
8	0.1	0.2	2.00	
9	0.1	0.21	2.10	
10	0.06	0.15	2.50	
estim	-0.01	0.07	-7.00	
12 estim	-0.01	0.08	-8.00	
13	0.14	nd	#VALUE!	
14	0.12	nd	#VALUE!	
15	0.12	0.35	2.92	
Average			2.44	Tests 1-10

ATTACHMENT 3
DRAFT

CH2M Hill
XRD Results for 3 Rock Samples

July 12, 1989
Lab no. 890288

Mineral	Approx. Wt % CH-Chat	S-Hardrock	C-Softrock
Quartz	>80	>90	40
Dolomite	7	--	40
Calcite	3	<2	15
Sphalerite	<2	<2	<2
Siderite	3?	--	--
Sillimanite	<3	<3	--
Magnetite*	<3?	--	--
Galena	--	<1	--
Pyrite	--	<1?	--
Plagioclase feldspar	--	--	<3?
"Unidentified"	<5	<5	<5

*Magnetite or a similar Fe-containing spinel mineral.

ATTACHMENT 4
DRAFT

HILL
POWDER RESULTS FOR 3 ROCK SAMPLES

JULY 12, 1999
LAB NO. 990299

	WT %												
	Na2O	MgO	Al2O3	SiO2	P2O5	S	Cl	K2O	CaO	TiO2	MnO	Fe	BaO
-CHAT	<0.05	1.48	1.45	87.9	<0.05	0.50	<0.02	0.29	3.11	0.05	0.05	3.45	<0.01
HARDROCK	<0.05	0.47	0.93	92.7	<0.05	0.73	<0.02	0.16	0.68	0.03	0.04	2.99	<0.01
SOFTROCK	<0.05	9.67	1.07	52.7	<0.05	0.75	0.02	0.28	21.6	0.04	0.11	2.84	<0.01
ITY CONTROL - REPLICATE (R) SAMPLE AND STANDARD (SYS) ANALYZED WITH SAMPLES													
-CHAT(R)	<0.05	1.49	1.45	88.0	<0.05	0.50	<0.02	0.28	3.12	0.05	0.05	3.38	<0.01
KRF	4.24	2.72	12.6	61.6	0.68	0.05	0.02	4.51	8.07	0.13	0.37	4.55	0.06
known	4.15	2.67	11.3	59.7	0.54	0.05	0.0147	4.20	8.26	0.15	0.32	4.42	0.05

	PPM												
	V	Cr	Co	Ni	W	Cu	Zn	As	Sn	Pb	Mo	Sr	U
-CHAT	19	250	111	166	58	305	11450	<20	<50	2048	124	31	26
HARDROCK	10	230	67	119	57	242	11499	<20	<50	1640	112	<10	20
SOFTROCK	16	172	19	81	44	299	15731	<20	<50	2754	101	49	30
ITY CONTROL													
-CHAT(R)	17	238	106	159	56	289	11320	<20	<50	1959	117	27	22
KRF	34	<10	19	<10	56	13	262	<20	<50	180	<10	317	663
known	51	10	12	11	—	16	250	20	—	100	—	306	650

	PPM				
	Th	Nb	Zr	Rb	Y
-CHAT	44	<10	16	<10	24
HARDROCK	19	<10	11	<10	16
SOFTROCK	49	<10	20	11	31
ITY CONTROL					
-CHAT(R)	25	<10	15	<10	18
KRF	1066	163	335	209	796
known	990	145	320	208	740

NOTE - Iron is given as the element, 'Fe', not as the oxide, 'Fe2O3.' 'Fe' seemed to be the more appropriate format for these sulfide-bearing samples.