APPENDIX J

DIOXIN DETECTIONS

DATE	September 4, 1998
TO	Yeng Feng, Ohio Department of Health
FROM	John F. Estenik, Toxics Advisor/Division of Surface Water
RE	Mahoning River Sediment and Bank Soil Dioxin Assessment

I have reviewed and evaluated some Mahoning River sediment and bank soil dioxin data as requested. I calculated toxicity equivalents (TEQs) using zero for non-detects (ND values = 0); I did not correct the sample concentration results based upon data qualifiers and did not use the second column conformation column concentration for 2,3,7,8-TCDF. All of the above would not significantly effect my TEQ calculation result.

Based upon **very limited** data, the Mahoning River sediment and bank soil could be removed and put into the BFI landfill. Preliminary dioxin data indicate that there are no problems with the landfill disposal of this material.

The three sediment TEQ concentrations are: N1-10-VU = 27.14 ppt TEQs; L0-3-VU = 35.72 ppt TEQs; and SW-3-VU = 93.94 ppt TEQs. The two bank soil TEQ concentrations are: 345SF = 7.37 ppt TEQs and 327SF = 95.2 ppt TEQs.

I consider the three sediment and two bank soil sample results to be "low" based upon the following information:

1. The background urban Columbus dioxin TEQs for uncontaminated soil range from 3 ppt to 30 ppt with a mean of 10 ppt TEQs (USEPA Columbus Municipal Incinerator data). Similar information for a Cuyahoga County site (considered urban background) ranged between 4 ppt to 36 ppt with a mean of 10.4 ppt TEQs (seven samples) [Bureau of Reclamation Resource Management data). The highest Mahoning River bank soil sample (95.2 ppt TEQs) is three times the high end of the uncontaminated urban soil ranges, 30 ppt and 36 ppt.

2. Sediment dioxin concentrations range between 0.19 ppt to 39.2 ppt TEQs for Lake Erie proper, and between 1.0 ppt to 39.0 ppt TEQs for Lake Erie tributaries (Ohio EPA data) The Mahoning River sediment range is from 27.14 ppt to 93.94 ppt TEQs. Again, the highest Mahoning River sediment dioxin sample is approximately three times the high sediment dioxin values for Lake Erie and Lake Erie tributaries.

CONCERNS

A. All samples should be core samples with subsamples taken and composited for dioxin analyses.

1. Additional samples have to be taken to get a better idea of the magnitude, extent and distribution of dioxin contamination of Mahoning River sediment, bank soil, flood plain soil and historical industrial site soil. At least one core sample should be collected behind each dam (ten samples). An additional six samples should be taken in assumed highly contaminated areas based upon the presence of historical PAH sample results. At least three to four samples should be taken in the Mahoning River upstream from the contaminated reach. Another three to four samples should be taken in the Pennsylvania portion of the Mahoning River. Finally, four Youngstown uncontaminated soil samples (background controls) should be analyzed. The total number of sediment/soil samples would be approximately 28 samples (excluding soil samples taken to evaluate historical industrial site locations).

2. Additional samples should be taken at the river banks and on the flood plain. Sample locations should be selected based upon the presence of high levels of contamination.

3. Soil samples should also be collected from the historical industrial areas outside the flood plain. Steel manufacturing, ash and combustion are sources of dioxin. Soil samples should be collected from both highly contaminated and lesser contaminated locations.

B. The data had many qualifiers; however, the results were presented in a conservative way (e.g., estimated maximum possible concentrations were reported). Therefore, the high number of qualifiers per sample should not preclude using these data.

C. Bank soil samples analyzed dioxin concentrations in subsamples between foot 2 and foot 6. The first 2 feet of bank material were not included in the sample analysis. The core dioxin concentration is not known. The "surface" (1 to 2 feet) dioxin concentrations must be added to the concentrations analyzed between 2 to 6 feet to determine the core contaminant concentration.

D. The historical industrial soil areas should be evaluated for dioxin contamination. Industrial areas can have higher than urban background dioxin soil concentrations. According to Ontario data (Brendon Birmingham 1990), Ontario industrial sites have 40.8± 33.1 ppt TEQs. I would expect possible historical industrial soil dioxin concentrations to range from 5,000 ppt to 10,000 ppt. Remediation of high dioxin concentrations, if they are found, could be hot spot removal or covering the hot spot with 1 to 2 feet of "clean" soil.

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DIOXIN TABULATIONS
ARE FOUND IN APPENDIX I

TOXICITY EQUIVALENTS CALCULATIONS FOR BANK SAMPLES
TOTAL DIOXINS

Sample Number 4MA0- PARAMETER	345SF (pg/g)	TEF	TEQ (ppt)	327SF (pg/g)	TEF	TEQ (ppt)
2,3,7,8-TCDD	**0.40**	1.0	0.40	**13**	1.0	13.00
Total TCDD	**9.0**			**160**		
1,2,3,7,8-PeCDD	**3.1**	0.5	1.55	**25**	0.5	12.50
Total PeCDD	**25**			**210**		
1,2,3,4,7,8-HxCDD	**2.4**	0.1	0.24	**14**	0.1	1.40
1,2,3,6,7,8-HxCDD	**7.6**	0.1	0.76	**140**	0.1	14.00
1,2,3,7,8,9-HxCDD	**9.9**	0.1	0.99	**68**	0.1	6.80
Total HxCDD	**76**			**1200**		
1,2,3,4,6,7,8-HpCDD	**80**	0.01	0.80	**1200**	0.01	12.00
Total HpCDD	**150**			**2400**		
OCDD	**450**	0.001	0.45	**11000**	0.001	11.00
2,3,7,8-TCDF	**1.3**	0.1	0.13	**26**	0.1	2.60
Total TCDF	**15**			**240**		
1,2,3,7,8-PeCDF	**0.52**	0.05	0.03	**9.0**	0.05	0.45
2,3,4,7,8-PeCDF	**0.68**	0.5	0.34	**15**	0.5	7.50
Total PeCDF	**18**			**320**		
1,2,3,4,7,8-HxCDF	**0.96**	0.1	0.10	**39**	0.1	3.90
1,2,3,6,7,8-HxCDF	**1.1**	0.1	0.11	**22**	0.1	2.20
2,3,4,6,7,8-HxCDF	**0.51**	0.1	0.05	**15**	0.1	1.50
1,2,3,7,8,9-HxCDF	**0.5**	0.1	0.05	**2.9**	0.1	0.29
Total HxCDF	**13**			**850**		
1,2,3,4,6,7,8-HpCDF	**5.0**	0.01	0.05	**510**	0.01	5.10
1,2,3,4,7,8,9-HpCDF	**0.56**	0.01	0.01	**24**	0.01	0.24
Total HpCDF	**13**			**1600**		
OCDF	**10**	0.001	0.01	**720**	0.001	0.72
		TOTAL TEQ =	**6.06**		**TOTAL TEQ =**	**95.20**

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TOXICITY EQUIVALENTS CALCULATIONS FOR VERTICAL PROFILING SAMPLES
TOTAL DIOXINS

Sample Number EN98MR-PARAMETER	SW-3-VU (pg/g)	TEF	TEQ (ppt)	NI-10-VU (pg/g)	TEF	TEQ (ppt)	LO-3-VU (pg/g)	TEF	TEQ (ppt)
2,3,7,8-TCDD	**1.45**	1.0	1.45	**1.4**	1.0	1.40	**2.3**	1.0	2.30
Total TCDD	**16**			**26**			**22**		
1,2,3,7,8-PeCDD	**8.5**	0.5	4.25	**3.9**	0.5	1.95	**5.4**	0.5	2.70
Total PeCDD	**62**			**38**			**35**		
1,2,3,4,7,8-HxCDD	**14**	0.1	1.40	**5.3**	0.1	0.53	**2.8**	0.1	0.28
1,2,3,6,7,8-HxCDD	**190**	0.1	19.00	**30**	0.1	3.00	**65**	0.1	6.50
1,2,3,7,8,9-HxCDD	**53**	0.1	5.30	**18**	0.1	1.80	**28**	0.1	2.80
Total HxCDD	**1100**			**260**			**550**		
1,2,3,4,6,7,8-HpCDD	**1500**	0.01	15.00	**480**	0.01	4.80	**840**	0.01	8.40
Total HpCDD	**2700**			**980**			**1700**		
OCDD	**8700**	0.001	8.70	**7400**	0.001	7.40	**7900**	0.001	7.90
2,3,7,8-TCDF	**18**	0.1	1.80	**4.3**	0.1	0.43	**10**	0.1	1.00
Total TCDF	**340**			**90**			**67**		
1,2,3,7,8-PeCDF	**8.7**	0.05	0.44	**3.5**	0.05	0.18	**3.0**	0.05	0.15
2,3,4,7,8-PeCDF	**18**	0.5	9.00	**5.0**	0.5	2.50	**3.4**	0.5	1.70
Total PeCDF	**620**			**110**			**94**		
1,2,3,4,7,8-HxCDF	**75**	0.1	7.50	**10**	0.1	1.00	**12**	0.1	1.20
1,2,3,6,7,8-HxCDF	**39**	0.1	3.90	**5.9**	0.1	0.59	**5.9**	0.1	0.59
2,3,4,6,7,8-HxCDF	**27**	0.1	2.70	**4.0**	0.1	0.40	**4.1**	0.1	0.41
1,2,3,7,8,9-HxCDF	**1.7**	0.1	0.17	**0.21**	0.1	0.02	**1.5**	0.1	0.15
Total HxCDF	**2000**			**170**			**260**		
1,2,3,4,6,7,8-HpCDF	**1300**	0.01	13.00	**93**	0.01	0.93	**170**	0.01	1.70
1,2,3,4,7,8,9-HpCDF	**49**	0.01	0.49	**4.4**	0.01	0.04	**6.3**	0.01	0.06
Total HpCDF	**3800**			**270**			**530**		
OCDF	**1300**	0.01	13.00	**180**	0.01	1.80	**330**	0.01	3.30
		TOTAL TEQ =	**107.10**		**TOTAL TEQ =**	**28.77**		**TOTAL TEQ =**	**41.14**

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