

APPENDIX E
SUPPORTING DATA

100% Ash Leachates

Plant Ash Type	Coal Creek Fly Ash A	Coal Creek Fly Ash A	Coal Creek Fly Ash A	Coal Creek Fly Ash B	Coal Creek Fly Ash B	Coal Creek Fly Ash B	Coal Creek Fly Ash C	Coal Creek Fly Ash D	Coal Creek Bottom Ash B	Coal Creek Bottom Ash C	Stanton Fly Ash D
Paper Test	18-hour	30-day	60-day	18-hour	30-day	60-day	18-hour	18-hour	18-hour	18-hour	18-hour
Al ug/L	2500	4000	4900	1000	6100	4270		8350	2100		< 50
Sb ug/L								< 10			< 10
As ug/L	14	< 10	< 10	97	< 4	< 4	15	21.3	8.4	6.8	< 10
Ba ug/L	900	11000	16000	910	10600	12400	945	657	330	276	365
Be ug/L								< 10			< 10
B ug/L	9000	4600	4600	12300	8360	4590	10600	11600	2730	1840	407
Cd ug/L	< 5	< 5	< 5	< 1	< 1		< 0.3	< 10	< 1	< 0.3	< 10
Ca mg/L					350	338		335			979
Cr ug/L	150	21	13	250	< 50	< 50	178	159	< 50	9.9	46.4
Cu ug/L	< 10	< 10	< 10	< 50	< 50			< 10	< 50		< 10
Fe mg/L	< 0.02	< 0.2	< 0.2		< 0.1			< 0.01			< 0.01
Pb ug/L	< 5	< 5	< 5	< 2	< 2		< 2	< 10	< 2	< 2	< 10
Mg mg/L	< 0.5	< 0.5	< 0.5		< 0.1			< 1			< 1
Mn mg/L				< 0.1	< 0.1			< 0.01	< 0.1		< 0.01
Hg ug/L	< 2	< 2	< 2	< 0.1	< 0.4	< 0.3	< 0.01		< 0.1	< 0.01	
Ni ug/L	< 100	< 100	< 100	< 50	< 50			< 10	< 50		20.1
K mg/L					2.35			4.2			16.2
Se ug/L	140	7	6	71.8	10	5.7	110	162	< 2	< 2	25.2
Si mg/L	3.8	1.8	< 0.5					6.25			< 2
Ag ug/L	< 1	< 1	< 1	< 0.8	< 0.8			< 10	< 0.8		< 10
Na mg/L					4.09			26.9			110
SO4 mg/L	280	12	13		6.9	1.69					
TI ug/L								< 10			< 10
Zn ug/L	< 50	< 50	< 50	< 50	< 50			< 10	< 50		11.4
pH	12.2	12.3	12.4	12.12	12.27	12.21		12.07	11.19		12.72

Paper A: The Characterization of Coal Creek Station Fly Ash for Utilization Potential

Paper B: Survey and Demonstration of Utilization Potential of North Dakota Lignite Ash Sources

Paper C: Use of Bottom Ash and Fly Ash in Rammed Earth Construction

Paper D: Unpublished 1999 Data

Bulk Oxide Composition

Plant Ash Type Paper	Coal Creek Fly Ash A	Coal Creek Fly Ash B	Coal Creek Fly Ash C	Coal Creek Fly Ash D	Coal Creek Bottom Ash B	Coal Creek Bottom Ash C	Coyote Slag B	Stanton Fly Ash D
SiO ₂	46.00	47.06	46.66	46.45	48.77	47.39	31.44	31.78
Al ₂ O ₃	14.50	13.61	15.56	15.21	11.98	14.61	13.76	13.11
Fe ₂ O ₃	6.73	6.02	7.85	7.80	7.08	9.49	12.11	7.94
TiO ₂	0.58	0.55	0.56	0.62	0.51	0.53	0.69	0.49
CaO	17.90	16.38	17.03	16.65	15.54	17.31	20.58	26.48
MgO	5.08	4.86	5.01	5.21	4.47	5.46	6.64	7.63
K ₂ O	1.86	1.90	1.90	1.91	1.49	1.40	0.44	0.90
Na ₂ O	1.16	0.57	3.07	2.98	0.60	1.37	4.24	2.61
SO ₃	1.36	0.98	1.03	1.91	0.35	0.49	0.65	6.35
P ₂ O ₅	0.17	0.05	0.28	0.27	0.04	0.22	0.13	0.27
SrO	0.30	0.25	0.33	0.32	0.24	0.31	0.74	0.50
BaO	0.77	0.57	0.56	0.56	0.42	0.50	0.91	0.87
MnO ₂	0.10	0.12	0.10	0.10	0.11	0.12	0.10	0.09
LOI	0.02	0.04		0.02	0.39		0.01	0.99
Total	96.53	92.96	99.94	100.01	91.99	99.20	92.44	100.01
Moisture, as Received	0.01	0.10		0.03	21.40		1.90	0.26

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Trace Element Composition

Plant Paper Ash Type	Coal Creek A Fly Ash	Coal Creek B Fly Ash	Coal Creek C Fly Ash	Coal Creek D Fly Ash	Coal Creek B Bottom Ash	Coal Creek C Bottom Ash	Coyote B Slag	Stanton D Fly Ash
Sb $\mu\text{g/g}$								
As $\mu\text{g/g}$	98	74	132		17.6	40	9.42	
Be $\mu\text{g/g}$								
B $\mu\text{g/g}$	1070	825	1320		687	901	956	
Cd $\mu\text{g/g}$	< 1	0.92	0.7		0.52	0.2	0.73	
Cr $\mu\text{g/g}$	65	31	59		8.7	45	20	
Cu $\mu\text{g/g}$	72	51			48		35	
Pb $\mu\text{g/g}$	39	31.9	31.8		7.91	8.7	5.06	
Hg $\mu\text{g/g}$	0.99	0.019	0.3	0.002	0.034	0.9	0.048	0.015
Ni $\mu\text{g/g}$	31	29			27		19	
Se $\mu\text{g/g}$	8	5.5	9.9		< 1	< 0.4	< 1	
Ag $\mu\text{g/g}$	< 0.2	0.34			0.11		< 0.08	
Tl $\mu\text{g/g}$								
Zn $\mu\text{g/g}$	66	55.7			40.7		8.3	

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