DOE/MC/22118-3148

DCN 92-218-044-19

DE-AC21-86MC22118

**FIELD STUDY OF DISPOSED WASTES
FROM ADVANCED COAL PROCESSES**

**DOE Quarterly Technical
Progress Report**

February 1992 to April, 1992

Prepared by:

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1.0

OBJECTIVES

The Department of Energy/Morgantown Energy Technology Center (DOE/METC) has initiated research on the disposal of solid wastes from advanced coal processes. The objective of this research is to develop information to be used by private industry and government agencies for planning waste disposal practices associated with advanced coal processes. To accomplish this objective, DOE has contracted Radian Corporation and the North Dakota Energy & Environmental Research Center (EERC) to design, construct, and monitor a limited number of field disposal tests with advanced coal process wastes. These field tests will be monitored over a three year period with the emphasis on collecting data on the field disposal of these wastes.

There has been considerable research on the characteristics and laboratory leaching behavior of coal wastes -- a lesser amount on wastes from advanced coal processes. However, very little information exists on the field disposal behavior of these wastes. Information on field disposal behavior is needed (a) as input to predictive models being developed, b) as input to the development of rule of thumb design guidelines for the disposal of these wastes, and c) as evidence of the behavior of these wastes in the natural environment.

2.0

SUMMARY OF PREVIOUS WORK

This study is organized into four major Tasks. Tasks 1 and 2 were devoted to planing the Task 3 field study. Task 4 uses the results of the field testing to produce an Engineering Design Manual for the utilities and industrial users who manage wastes from advanced coal combustion technologies.

Task 1 identified and rated test design options. A Test Design Manual was prepared and submitted to METC in 1988. Specific test procedures suitable for each design option were identified under Task 2. These test methods were documented in a

Test Procedures Manual, submitted to METC in 1988. Also under Task 2, test sites were selected and site access was negotiated. Sites in Illinois and North Dakota were delayed at this stage, and the North Dakota site was dropped from consideration. Task 2 was completed and Final Test Plans were submitted to METC for three sites in 1988.

Task 3 progress for each of the test sites is summarized below:

2.1 Colorado

The test cell was constructed in June, 1989 with CFBC ash from a low sulfur western coal. The ash has low lime and sulfate content. Core samples were collected in June and December 1989, in March, June and December of 1990, and in June 1991. No groundwater or porewater samples have been recovered.

Cores strength is low to moderate (200 psi to 900 psi), with permeabilities of 2×10^{-3} to 3×10^{-4} cm/sec. Laboratory leachates show moderate concentrations of calcium, sulfate, and other common ions. Trace element concentrations in test leachates are low compared to regulatory limits. No leachate has been generated at the site.

2.2 Ohio

Two test cells were constructed, in February and April of 1989, using LIMB ash from an Ohio coal with 2.4% sulfur. The ash has a high lime and sulfate content. Test case 1 (north cell) was constructed with 25% moisture; test case 2 was constructed with 38% moisture to optimize compaction. The wastes expanded, heaved, and fractured during the first year, particularly in the south cell. Mineralogical changes in the wastes with hydration and weathering are the primary cause. Core strength is low to moderate (< 100 psi to 2000 psi) and highly variable because of fracturing. Field measurements of permeability vary from 3×10^{-3} to 5×10^{-5} cm/sec. Permeabilities are lowest in the north cell.

Large amounts of water were bound in the wastes in the first year as the waste saturated and hydrated. In the second year leachate migration from the south cell may have begun to impact the chemistry of one shallow downgradient well. The leachate contains up to several thousand mg/L of sulfate, chloride, potassium, and sodium, with somewhat lower concentrations of calcium and silicon. Trace metal concentrations are generally low compared to regulatory limits, but a few samples show mobilization of metals.

Core samples were first collected in June, 1989, and quarterly and annual core sampling events have taken place according to schedule since that time. Water samples have been collected on a quarterly basis since October, 1989.

2.3 Illinois

The first Illinois test cell was completed in April, 1991, with BFBC ash from a Illinois coal with 3.1% sulfur. A large excess of limestone is used in the combustor; the ash is high in lime relative to most FBC wastes, containing up to 30% CaO. The ash also contains abundant sulfate, but has relatively low concentrations of typical coal ash constituents compared to other wastes included in this study. The two test cells planned for the second Illinois test case will evaluate the effects of added coal ash on cementitious reactions in the waste. Laboratory studies to define the optimum mix of FBC waste and coal fly ash are in progress.

The initial cell was instrumented and sampled in June 1991. Water samples and additional cores were collected in August and November, 1991. No expansion has been noted at the site. The wastes are solidified with unconfined compressive strength between approximately 150 and 550 psi, although some fracture zones may be present in the waste and may reduce overall strength. The permeability measured on cores recovered from the test cell ranges from 1×10^{-6} to 2×10^{-4} cm/sec; field permeability

measurements range from a high of 3×10^{-3} near the surface to a low of 2×10^{-5} at depth in the test cell.

3.0 OBJECTIVES FOR THE CURRENT REPORTING PERIOD

The specific objectives for the reporting period of February, 1992 to April, 1992 were as follows:

- Make quarterly measurements at the Colorado site in March, 1992. Measure permeability and neutron absorption moisture content and collect on-site data from the data logger;
- Collect quarterly samples at the Ohio site in February, 1992. Measure permeability and moisture content, and collect water samples from the wells and lysimeters;
- Collect the quarterly core and water samples from the first Illinois test case in February, 1992. Make field measurements and collect data from the data logger;
- Analyze chemistry of all core and water samples collected;
- Continue preliminary laboratory testing for the second Illinois test case;
- Continue production of a video presentation on the project;
- Receive additional EERC data on the second annual cores from Colorado and Ohio and the first two sets of quarterly samples from Illinois and load all data into the project database; and
- Prepare Preliminary Assessment reports on the Ohio and Colorado sites for the DOE.

4.0 ACTIVITIES FOR THE REPORTING PERIOD

4.1 Colorado Ute Site

Results of mineralogical analyses by x-ray diffraction for all Colorado ash samples collected to date are shown in Table 1; 1991 data has not been reported previously. Following the initial mineralogical changes as lime hydrated to portlandite and portlandite reacted with other ash constituents to form ettringite, only minor mineralogical changes have occurred. In the 1991 samples, gypsum is slightly more abundant than in 1990, averaging 6.6% in 1991 and 3.2% in 1990. 1991 samples with the highest gypsum content have the lowest anhydrite concentration, suggesting that hydration of the anhydrite is continuing slowly. Mullite and hematite are not reported for the 1991 samples, but are expected to persist in the test cell as they are essentially unreactive phases. Some deeper portions of the test cell appear to have remained very dry over the last two years; sample 91JUNCO1-17 (from a depth of 7.5 feet) still contains unreacted portlandite and has not hydrated to form any ettringite since the test cell was constructed.

The results of in situ permeability measurements at the Colorado test cell are shown in Table 2. Before December 1991, in situ permeability tests were made only on the top 2 feet of the wastes in the test cell; in 1991 the Guelph permeameter was modified to allow permeability testing of the entire thickness of the test cell. There does not appear to be any depth trend to the in situ permeability data for the Colorado test cell, although the 1991 permeability value for the near-surface wastes is lower than earlier measurements.

Updated physical properties data for all samples collected from the Colorado test cell are shown in Table 3. A few newly reported values for compressive strength and permeability of 1991 annual cores are included here along with previously reported data. The new data appear consistent with earlier measurements.

Quarterly water samples were collected from the Ohio site in February, 1992. Analytical results for these samples are presented in Table 4. The upgradient and downgradient groundwater compositions over the last two and three-quarters years are shown in Figures 1 through 3. In each Figure, separate graphs are shown, each providing data for groundwater from a different depth interval. Figures 1 through 3 illustrate the strong dependence of the groundwater chemistry at the Ohio site on the depth of sampling.

Major element concentrations in groundwater samples from the shallow well downgradient of the south cell (OHMW-06) appear to be leveling off or even decreasing following a generally increasing trend from approximately the eighteenth month after construction of the test cell. Since the concentrations of most major analytes in the porewater leachate, including sulfate and chloride, have declined over time, and since the volume of leachate appears to have been reduced once the soil cover was constructed, the peak concentrations of the most mobile ash-derived contaminants may have already reached this well. Hydrological data and leachate production will be evaluated over the next few months to help confirm the chemical data.

The chemistry in the two deeper wells downgradient from the south cell is significantly different than that in the shallow wells. Most notably, in the wells completed 10 feet and 20 feet below the water table, the concentration of sodium is higher and the concentration of sulfate is lower than in the wells located at the water table. The overall trend of most constituents in the deeper wells are fairly constant, with one exception. Sulfate concentrations in the deepest well (OHMW-04) dropped consistently over the first 22 months following cell construction, then leveled out at less than 100 mg/L. The deeper wells do not appear to show any effects from leachate derived from the test cells. The differences in chemistry between the shallow and deeper wells are probably due to natural causes. In particular, the elevated background sulfate

Figure 1. Major Element Concentrations in Groundwater Samples from Wells Downgradient of the Ohio North Cell for All Sampling Events

Figure 2. Major Element Concentrations in Groundwater Samples from Wells Downgradient of the Ohio South Cell for All Sampling Events

Figure 3. Major Element Concentrations in Groundwater Samples from Wells Upgradient of the Ohio Test Cells for All Sampling Events

concentrations in the shallow wells may be related to pyrite oxidation in soils immediately above the water table. Pyrite oxidation in these soils was discussed in a previous report, in connection with strongly acidic pH's and elevated trace metal concentrations in leachates of several soil samples from beneath the test cells.

Although all of the wells downgradient from the initially dry north cell contain generally higher concentrations of dissolved solids than the south cell wells, no trends which can be attributed to leachate migration into the groundwater are apparent. The deepest of these wells (OHMW-01) contains an unusually high concentration of potassium, which is not found in significant amounts in any other well at the Ohio site. This well also contains high a level of sodium and little or no sulfate, similar to the deeper south cell wells.

Major element concentrations in some of the lysimeters from the south cell are shown in Figure 4. Although all lysimeters at the site do not yield a sample every quarter, the overall trend has been towards decreasing concentrations of major elements over time in both cells and at all depths. Tenth quarter lysimeter samples continue to follow this trend. The data indicate that these elements are being leached out of the test cell or incorporated into less soluble phases as time progresses.

The results of in situ permeability measurements at the Ohio test cell are shown in Table 5. In general, the lowest values correspond to greater depths. Also, most of the higher permeabilities occur at shallower depths during the month of August, which may be due to drying and cracking of the ash closer to the surface. All of the in situ permeability measurements are on the order of 10^{-4} or 10^{-5} cm/sec.

The updated physical properties data for the samples from the two Ohio test cells are shown in Table 6. Most of this data has been previously reported, but several new permeability measurements for the 1991 north cell core samples (91AUGOH6-.. and 91AUGOH8-..) are included here. These data show a wide range of

Figure 4. Major Element Concentrations in Porewater Samples from Lysimeters within the Ohio South Cell

permeabilities in the core samples, from 8×10^{-8} to 3×10^{-3} cm/sec. Preliminary lab results for south cell permeabilities showed core permeabilities over 8×10^{-3} cm/sec in south cell cores. Closer examination of these samples showed that they contained small fractures which allowed rapid passage of water during the test; these results are not included in Table 6. The most permeable core samples from both of the Ohio test cells contain small fractures. It is not clear which samples were fractured in situ, and thus represent actual conditions in the test cell, and which were broken during the core sampling and recovery or sample preparation and are not representative of the actual field conditions. In general, the field permeability results should be used whenever possible, as these measurements do not necessitate the removal of material from the cell, thus avoiding possible core breakage during sampling and transport. Also, in situ measurements integrate permeability over a larger area of the waste, and are less biased by the presence of small scale variations in the waste properties.

4.3 Illinois Site

The third set of quarterly water and core samples was collected in February, 1992 and analyzed in March. The analytical results for water samples are shown in Table 7, and those for ASTM leachates of the ash and soil samples are presented in Table 8.

Major element concentrations in groundwater samples from the Illinois site have generally decreased or stayed the same since sampling began. These trends are illustrated in Figure 5. With the exception of samples from the shallowest downgradient well (ILMW-03), calcium, magnesium and sodium levels in the groundwater have stayed essentially constant for all of the sampling events in both upgradient and downgradient wells. Analytical results for these elements in samples from ILMW-03 are variable. Sulfate and chloride concentrations generally decrease with time in the Illinois groundwater samples. Chloride values in samples from the first quarter are almost always significantly higher than in samples from the second and third quarters. There are no real

DOWNGRADIENT WELLS

ILMW-03

At groundwater level

ILMW-02

10 ft. below groundwater level

ILMW-01

20 ft. below groundwater level

UPGRADIENT WELLS

ILMW-06

At groundwater level

ILMW-05

10 ft. below groundwater level

ILMW-04

20 ft. below groundwater level

Calcium Chloride Sodium Sulfate Magnesium

Figure 5. Major Element Concentrations in Groundwater Samples from Wells Upgradient and Downgradient of the Illinois Test Cell for All Sampling Events

differences in the major element chemistry of the downgradient wells as compared to the upgradient wells. Data from upcoming sampling events will shed light on some of these observed trends. Trace element chemistry of the groundwater will be discussed in a future report.

Most of the lysimeters from the Illinois site have not been sampled more than once, so observations of changes with depth and time are not possible. Sulfate, potassium, sodium, and chloride make up the major dissolved components in the pore-water at this site.

The quarterly core samples have provided a more consistent record than the lysimeters in the first year of sampling at the Illinois site. Changes in solubility of some of the major elements in the ash are apparent when comparing the composition of ASTM leachates from the initial ash and cores collected during the three sampling events. These changes are shown in Figure 6.

Sodium and potassium are both found in generally higher concentrations in the leachates from the core than from the initial ash, indicating that these two elements are becoming more soluble as a result of reactions within the test cell. However, concentrations of sodium and potassium in leachates from the shallowest samples may actually be lower than those from the initial ash, possibly indicating that these elements are being leached from these samples deeper into the cell. The observation that the highest leachate concentrations of sodium and potassium occur at increasingly greater depths with time may indicate that these elements are gradually leaching through the test cell. Chloride concentrations in core leachates are also lower than those from the initial ash, possibly indicating leaching from the uppermost foot of the test cell. The depletion of soluble constituents from the upper portions of the test cell is consistent with the pattern of leaching observed in the Ohio test cells. Since no new phases incorporating sodium, potassium, or chloride have been observed, the lower concentrations of these species in

Figure 6. Major Element Concentrations in ASTM Leachate of Ash from the Illinois Test Cell

leachates from the core samples does not appear to be a result of incorporation of these constituents into some low solubility phase.

Calcium and sulfate levels in the ASTM leachates from the core do not exhibit significant changes with time or depth. However, sulfate values in leachates from the core are generally higher than those from the initial ash, indicating that some solubilization of sulfate may have occurred immediately following placement of the ash in the test cell. In contrast, in both the Ohio and Colorado test cases, a sharp decrease in the leachable calcium concentration was observed after the wastes were placed in the landfill. The higher initial lime content of the Illinois ash is probably responsible for this difference.

The results of mineralogical analysis by XRD for the initial (ILASH) and first quarterly (91JUNIL) Illinois samples are shown in Table 9. Portions of this data were reported earlier, as Appendix A to the November, 1991 through January, 1992 Quarterly Technical Progress Report. The primary mineralogical features of the landfilled FBC waste are the formation of 20% to 30% ettringite in the landfilled material, and the persistence of 10% to 20% calcium hydroxide, or portlandite, in the waste three months after landfill construction was completed. In both the Colorado and Ohio test cases, all the initial lime was quickly consumed in pozzolanic reactions. The Illinois FBC waste has a higher initial lime content, and may continue to react for a longer period of time.

Table 10 shows the results of in situ permeability tests at the Illinois site. Tests in June and August, 1991 measured permeabilities between approximately 1×10^{-3} and 3×10^{-3} cm/sec; tests in November, 1991 and February, 1992 measured substantially lower permeabilities, between 6×10^{-4} and 6×10^{-5} cm/sec. The February, 1992 results also show a trend from higher permeability near the surface (6.5×10^{-4} cm/sec at 0' - 0.5') to lower permeability at depth (9.8×10^{-5} cm/sec at 6' - 8'). These results are shown in Figure 7.

Only surface permeability was measured in June and November, 1991. Where several results are available for a given depth, averages are shown

Figure 7. Illinois Test Cell In-Situ Permeability Measurements

The results of physical properties tests on Illinois core samples are shown in Table 11. Most of the data shown in Table 11, with the exception of the November, 1991 core data, were presented in the previous Quarterly Report. The wastes in the test cell have an average moisture content of 37%, significantly higher than the surrounding soils, indicating that generally adequate water is available for hydration reactions, although a few pockets of the landfilled waste continue to be extremely dry, as seen in sample 91JUNIL3-5,6. The unconfined compressive strength of the ash core samples is fairly uniform, ranging from approximately 140 psi to 575 psi, suggesting that dry areas are localized. The average strength of the June cores (356 psi), is nearly the same as for the November cores (332 psi). Core permeabilities in June average 1.8×10^{-5} cm/sec, and 5.8×10^{-5} cm/sec in November; the core permeabilities do not reflect the drop in permeability noted in the field permeameter results.

Initial laboratory testing of mixtures of the Midwest Grain FBC waste and fly ash continues. Initial test results for strength and permeability testing are shown in Table 11. Midwest Grains FBC waste compacted at optimum moisture did not gain strength during 28 days curing in moist conditions, while a 50:50 mixture of the Midwest Grain FBC waste and fly ash from an Illinois #6 coal gained strength progressively during the curing period and had a 28 day strength approximately 10 times greater than the FBC waste alone, as shown in Figure 8. Figure 9 shows the relationships between the percentage fly ash addition and changes in strength and permeability for mixtures prepared at optimum moisture content. Strength at 28 days increased in a nearly linear fashion as the amount of fly ash increased, while the permeability initially increased with fly ash addition, then dropped by more than a factor of 10 for a 50:50 mixture.

The results of thermogravimetric analysis (TGA) on samples of several FBC/fly ash mixtures are shown in Figures 10 through 12. These analyses show that, after 28 days moist curing, a large fraction of the initial calcium hydroxide remains unreacted in each of the mixtures. Sample FA0 (no added fly ash) has 52.1% calcium hydroxide, FA25 (25% added fly ash) has 35.6% calcium hydroxide, and FA50 (50%

Figure 8. Effects of Fly Ash Addition to Midwest Grains FBC Waste (Fly Ash from Illinois #6 Coal was Used)

Figure 9. Strength and Permeability of Midwest Grain BFBC Waste/Fly Ash Mixtures After 28 Days Moist Curing

Figure 10. Results of Thermogravimetric Analysis (TGA) on a Sample of FBC Waste

Figure 11. Results of Thermogravimetric Analysis (TGA) on a Mixture of 75% FBC Waste and 25% Fly Ash

Figure 12. Results of Thermogravimetric Analysis (TGA) on a Mixture of 50% FBC Waste and 50% Fly Ash

added fly ash) has 21.4% calcium hydroxide, based on the weight loss measurements between 11 and 14 minutes of the heating cycle (350 to 500 degrees Celsius). The amount of calcium hydroxide in the mixtures decreases during curing. Mixtures with more fly ash lose more calcium hydroxide, suggesting that pozzolanic reactions to form ettringite are more extensive when fly ash is present, consistent with the strength data. However, the TGA results show that most of the lime, even in a 50:50 mix, is not used up during the initial 28 days of curing. Presumably, this lime will continue to react over time and should progressively increase the strength of the mixtures with longer curing times. More detailed analysis of the TGA data will follow after x-ray diffraction analyses of these samples are completed and mineral abundances for all the major phases can be calculated.

Figure 13 shows the effects of increased initial moisture content on the strength development of 50:50 FBC/fly ash mixtures. Mixtures with 3% more water than the previously determined optimum moisture content had a slightly increased strength, while the wetter mixtures show a progressive decline in unconfined compressive strength after 14 days curing. Mixtures with 12% and 15% water over OMC were pumpable slurries which did not require compaction, and which set without release of any free liquids to give 14 day strengths of approximately 300 psi. Preliminary tests suggest that these high-moisture samples may achieve considerably higher strengths (> 1500 psi) after longer curing times. The 28 day strengths and permeabilities of all of these mixtures will be tested as soon as the cure period is finished.

The densities of the cured mixtures, shown in Figure 14, generally correlate positively with strength, except for the mixture at 3% over OMC. Bulk (field moist) density ranges from 1.76 to 1.9 g/cm³, and dry density ranges from 1.46 to 1.66 g/cm³. Samples with a lower density generally have lower strength, although samples prepared with an initial water content 3% over OMC had the highest strength even though their density was lower than samples with more or less initial water.

Unconfined Compressive Strength, psi

Figure 13. Effects of Increased Initial Water on 14 Day Strength of FBC/Fly Ash Mixtures

Bulk Density of FBC/Fly Ash Mixes
Density, g/cc

Dry Density of FBC/Fly Ash Mixes
Dry density, g/cc

Figure 14. Bulk Density and Dry Density of Prepared Samples of FBC/Fly Ash Mixtures

No expansion was observed in any of the test specimens of FBC/fly ash mixtures prepared for this program. The only volumetric change noted was a slight shrinkage of the wettest mixtures before setting. Several cylinders were prepared earlier using soluble sources of aluminum (either $\text{Al}(\text{OH})_3$ sludge or aluminum sulfate solution) in addition to fly ash to promote rapid ettringite formation and speed initial set. These mixtures did harden somewhat faster, but expanded significantly as they set and still more when exposed to external sources of water, producing extensive fractures in the samples. Testing of these mixtures was discontinued.

5.0 PROBLEMS ENCOUNTERED

Complete data tables for the Colorado and Ohio sites were not included in the Preliminary Assessment reports as planned. Discussion with the Radian Data Management team led to the conclusion that electronic data transfer would be both more efficient and more useful to any potential users. The best format for data transfer will be discussed with METC.

6.0 ACTIVITIES PLANNED FOR THE NEXT QUARTER

The following activities are planned for the period of May 1992 through July 1992:

- The final or 3rd annual sampling at the Colorado site is scheduled for June, 1992. Permeability and in situ moisture content measurements will be made and on-site data collected from the data logger;
- Quarterly sampling at the Ohio site is scheduled for May 1992. Permeability and moisture content measurements will be made, and water samples collected;
- Chemical analysis of samples will continue;

- The first annual core samples and the fourth quarterly water samples from the first Illinois test case will be collected in May; other field measurements will also be made at that time;
- Preliminary testing of waste mixtures for the second Illinois test case will be completed;
- Radian will continue production of a short video presentation on the advanced coal wastes test program;
- EERC data will continue to be loaded onto the project database and reported as available. Complete results for the Colorado and Ohio sites will be provided in electronic form as soon as the format is agreed upon, and
- Preliminary Case Reports on the Colorado and Ohio test cases will be delivered to METC during April. The reports will cover results from the first two and one half years of testing, and include recommendations on the scope and costs of continued testing.

Table 1

**Field Testing - Solid Waste Disposal
X-Ray Diffraction Mineralogy - Ash**

SAMPLE ID	LOC. ID	WT. PERCENT											
		Gp	Ah	Mu	Qz	Et	Tm	Hm	Cc	Pl	Sp	Lm	SUM
COASH-1			6.7	9.2	15.1			0.5	0.6		1.9	1.3	35.3
COASH-3		3.3	1.0	6.6	12.6	14.3		1.8	0.7		0.4		40.7
COASH-2			13.6	4.2	15.0			0.5	1.2	1.4	0.6	2.0	38.5
COASH-4			10.8	6.1	17.7	4.1		0.2	2.5	1.0	1.2		43.6
COLY16-2		3.4	2.5	4.8	13.1	5.0		2.6	3.0				34.4
COLY16-4		2.4	3.7	5.5	12.4	7.4		1.5	2.7			0.3	35.9
COLY16-6		3.3	5.9	3.2	17.7	9.3		1.7	2.1	0.7			43.9
COLY16-8		8.8	6.7	7.0	18.2			0.8	1.9	0.5			43.9
CONT8C-1		3.7	1.9	10.2	13.7	6.0		1.1	2.8				39.4
CONT8C-3		4.6	3.4	10.1	15.3	4.7		2.1	2.9				43.1
CONT8C-5		2.3	3.5	8.4	12.4	6.5		1.2	2.6				36.9
CONT8C-8			12.5	5.8	14.8			0.2	4.3				37.6
89DECC01-1		3.1	1.7	6.5	13.0	7.6		1.6	2.2			0.1	35.8
89DECC01-3		2.9	3.4	6.1	13.1	6.1		1.3	1.8			0.2	34.9
89DECC01-5			3.8	7.8	12.7	12.2		1.2	1.3			0.2	39.2
89DECC01-7		2.1	3.5	4.4	13.9	7.7		1.6	1.8			0.3	35.3
90MARCO1-1		4.1	2.7	5.9	13.2	8.8		1.8	2.1			0.4	39.0
90MARCO1-3		2.6	3.3	3.1	13.1	7.4		2.5	1.9		0.8	0.4	35.1
90MARCO1-5			3.9	4.9	13.6	7.8		1.6	1.2			1.0	34.0
90MARCO1-7			3.9	7.3	13.8	6.0		1.2	1.7			0.3	34.2
90JUNCO2-2		4.4	1.5	3.8	12.0	7.6		2.1	1.9				33.3
90JUNCO2-4		3.5	3.7	7.1	13.0	4.6		1.1	1.6				34.6
90JUNCO2-6		1.3	4.4	7.5	13.5	9.3		0.9	2.0				38.9
90JUNCO2-8			8.2	9.1	16.2	2.2			2.9				38.6
90JUNCO3-2		4.0	1.9	5.8	12.1	8.6		1.9	2.1				36.4
90JUNCO3-4		3.1	3.9	5.0	13.5	5.7		1.7	2.1				35.0
90JUNCO3-6		2.0	4.5	6.7	13.8	7.3		1.6	2.8				38.7
90JUNCO3-8		4.3	2.3	6.1	14.1	8.9		1.6	2.2				39.5
91JUNCO1-4		13.0			21.2	7.0			3.7				44.9
91JUNCO1-5		8.0			11.3	13.0			0.9				33.2
91JUNCO1-9		1.0	3.0		15.5	19.0			1.2				39.7
91JUNCO1-10		3.0	1.8		13.8	17.0			1.1				36.7
91JUNCO1-13		1.0	3.6		14.3	13.0			1.2				33.1
91JUNCO1-15			4.9		14.7	10.0			0.8				30.4
91JUNCO1-17			10.2		14.4								28.8
91JUNCO4-3		13.0			22.6				4.3		4.2		39.9
91JUNCO4-5		6.0			37.1	7.0			3.1				53.2
91JUNCO4-9		3.0			39.1	10.0			0.9				53.0
91JUNCO4-14			6.2		17.0	8.0			2.0				33.2
91JUNCO4-16		3.0	1.8		16.7	20.0			0.8				42.3
91JUNCO4-19		15.0	0.5		26.5	7.0			1.8				50.8

Table 1
(Continued)

Anhydrite	Ah	CaSO ₄
Calcite	Cc	CaCO ₃
Ettringite	Et	Ca ₆ Al ₂ (SO ₄) ₃ (OH)12.26H ₂ O
Thaumasite	Tm	Ca ₆ Si ₂ [(SO ₄) ₂ (CO ₃) ₂](OH)12.24H ₂ O
Fe-Spinel	Sp	Fe ₃ O ₄
Gypsum	Gp	CaSO ₄ .2H ₂ O
Hematite	Hm	Fe ₂ O ₃
Lime	Lm	CaO
Mullite	Mu	Al ₆ Si ₂ O ₁₃
Portlandite	Pl	Ca(OH) ₂
Quartz	Qz	SiO ₂

Table 2

**Field Testing - Solid Waste Disposal
In-Situ Hydraulic Conductivity Data**

Date	Test #	Location Quad	Interval Tested (ft-ref)	Kfs (cm/sec)	Kfs (ft/yr)	Comments
06/23/90	COBP-1	S.E.	.37-1.5' TOA	8.95E-04	926	
06/23/90	CO-BP1a	S.E.	.12-1.5' TOA	6.761E-04	694	
06/23/90	CO-BP2	N.W.	.45-1.3' TOA	9.70E-04	1000	
06/23/90	CO-BP2a	N.W.	.27-1.3' TOA	7.33E-04	758	
06/23/90	CO-BP3a	N.E.	.44-1.2' TOA	1.41E-03	1460	
12/14/90	CO-BP4	N.E.	.67-1.5' TOA	9.63E-04	996	
12/14/90	CO-BP4a	N.E.	.92-1.5' TOA	7.83E-04	810	
12/14/90	CO-BP5	S.W.	.67-1.5' TOA	4.17E-04	431	
12/14/90	CO-BP5a	S.W.	.92-1.5' TOA	3.20E-04	331	
12/14/90	CO-BP6	N.W.	.67-1.5' TOA	6.99E-04	723	
12/14/90	CO-BP6a	N.W.	.92-1.5' TOA	8.56E-04	886	
12//17/91	CO-BP7a	N.E.	6.7-8.0' TOA	3.88E-04	401	
12/17/91	CO-BP8	N.E.	5.3-6.0' TOA	2.25E-03	2330	
12/17/91	CO-BP9	N.E.	2.2-4.0' TOA	5.03E-04	520	
12/17/91	CO-BP10	N.E.	3.2-4.0' TOA	9.36E-04	968	
12/17/91	CO-BP11	N.E.	0.3-2.0' TOA	1.22E-04	126	

Field Testing - Solid Waste Disposal Physical Testing Data

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Table 3

(Continued)

SAMPLE DESCRIPTION		NP=Nonplastic FP=Poorly consolidated or fractured material										-ATTERBURG LIMITS-			
SAMPLE ID	DEPTH (ft)	SAMPLE TYPE	MOISTURE CONTENT % %-dry bas	UNCONFINED COMPRESSIVE STRENGTH (psi)	PERMEABILITY (cm/sec)	FIELD BULK DENSITY pcf	DRY DENSITY pcf	OPTIMUM MOIST. %	MAXIMUM DRY DENSITY pcf	PARTICLE SIZE (D50)	PARTICLE SPECIFIC GRAVITY	PARTICLE SPECIFIC SURFACE AREA M ² /gram	TRIAXIAL STRENGTH Conf. Dev. Str.	Fric. Dev. Str.	Plastic Limit Index
90JUNCO 2-2	2-2'	Ash	25.9	447.8	3.40E-05	67.6	53.7					21.95			
90JUNCO 2-4	3-4'	Ash	27.5	794.8	2.84E-05	79.8	62.6					17.22			
90JUNCO 2-6	5-6'	Ash	21.3	205.6	FP	59	48.7					18.55			
90JUNCO 2-8	7-8'	Ash	2.0	FP	FP	FP	FP					1.98			
90JUNCO 2-10	9-10'	Ash	15.8		FP	FP	FP					13.52			
90JUNCO 3-1,2	0-2'	Soil	24.9	894.5	FP	74.2	59.4					20.79			
90JUNCO 3-4	3-4'	Ash	21.0	895.2	1.90E-05	72.7	60.1					20.24			
90JUNCO 3-6	5-6'	Ash	4.6	674.6	2.40E-06	76.3	73					19.81			
90JUNCO 3-8	7-8'	Ash	23.8	249	1.49E-05	75.2	60.7					19.81			
90JUNCO 3-10	9-10'	Soil	14.7		FP	FP	FP					12.2			
91JUNCO1-1	0-5'	Soil	4.6		FP										
91JUNCO1-2	.5-1'	Soil	9.8		FP										
91JUNCO1-3	1-1.5'	Soil	13.5		FP										
91JUNCO1-4	1.5-2'	Ash	29.9	246.7	2.60E-05	75.07	57.79								
91JUNCO1-5	2-2.5'	Ash	34.1	FP	FP	71.32	53.19								
91JUNCO1-6	2.5-3'	Ash	32.8	423.7	FP	75.39	56.77								
91JUNCO1-7	3-3.5'	Ash	31.4	FP	5.70E-05	70.81	53.89								
91JUNCO1-8	3.5-4'	Ash	33.3	258.8	FP	65.98	49.50								
91JUNCO1-9	4-4.5'	Ash	22.0	FP	9.60E-05	64.48	52.86								
91JUNCO1-10	4.5-5'	Ash	22.0	391.2	FP	64.75	53.07								
91JUNCO1-11	5-5.5'	Ash	23.5	FP	1.80E-05	69.85	56.56								
91JUNCO1-12	5.5-6'	Ash	23.5	354.6	FP	64.36	52.11								
91JUNCO1-13	6-6.5'	Ash	24.7	FP	1.40E-05	74.41	59.67								
91JUNCO1-14	6.5-7'	Ash	12.3	FP	FP										
91JUNCO1-15	7-7.5'	Ash	5.8	FP	FP										
91JUNCO1-16	7.5-8'	Ash	3.8	FP	FP										
91JUNCO1-17	8-8.5'	Ash	2.0	FP	FP										
91JUNCO1-18	8.5-9'	Ash	26.2	FP	FP										
91JUNCO1-19	9-9.5'	Ash	2.0	313.0	FP										
91JUNCO1-20	9.5-10'	Ash	17.4	FP	FP										
91JUNCO1-21	10-10.5	Soil	19.0	FP	FP										
91JUNCO1-22	10.5-11	Soil	14.7	FP	FP										

Table 3

(Continued)

NP=Nonplastic
 FP=Poorly consolidated or fractured material

SAMPLE ID	DEPTH (ft)	SAMPLE TYPE	MOISTURE CONTENT %-dry bas	UNCONFINED COMPRESSION STRENGTH (psi)	PERME- ABILITY (cm/sec)	FIELD		MAXIMUM DRY DENSITY pcf	PARTICLE SIZE (D50)	PARTICLE SPECIFIC GRAVITY		TRIAXIAL STRENGTH		-ATTERBURG LIMITS-
						BULK DENSITY pcf	OPTIMUM MOIST. %			AREA M ² /gram	Conf. Dev.	Str. Str.	Agil. Limit	Plastic Index
91JUNCO1-23	11-11.5	Soil	11.1		FP									
91JUNCO1-24	11.5-12	Soil	10.0		FP									
91JUNCO1-25	12-12.5	Soil	9.5		FP									
91JUNCO1-26	12.5-13	Soil	9.1		FP									
91JUNCO1-27	13-13.5	Soil	10.1		FP									
91JUNCO1-28	13.5-14	Soil	9.4		FP									
91JUNCO1-29	14-14.5	Soil	6.3		FP									
91JUNCO1-30	14.5-15	Soil	10.1		FP									
91JUNCO1-31	15-15.5	Soil	8.2		FP									
91JUNCO1-32	15.5-16	Soil	9.5		FP									
91JUNCO1-33	16-16.5	Soil	9.0		FP									
91JUNCO1-34	16.5-17	Soil	13.5		FP									
91JUNCO1-35	17-17.5	Soil	6.2		FP									
91JUNCO4-1	0-5'	Soil	7.5		FP									
91JUNCO4-2	5-1'	Soil	9.3		FP									
91JUNCO4-3	1-1.5'	Soil	19.4		FP									
91JUNCO4-4	1.5-2'	Ash	34.3		FP	71.67								
91JUNCO4-5	2-2.5'	Ash	34.8		FP	75.51								
91JUNCO4-6	2.5-3'	Ash	35.0		FP									
91JUNCO4-7	3-3.5'	Ash	32.5		FP	76.25								
91JUNCO4-8	3.5-4'	Ash	29.0		FP	72.68								
91JUNCO4-9	4-4.5'	Ash	27.7		FP	77.93								
91JUNCO4-10	4.5-5'	Ash	20.8		FP	72.14								
91JUNCO4-11	5-5.5'	Ash	30.3		FP	67.78								
91JUNCO4-12	5.5-6'	Ash	31.7		FP									
91JUNCO4-13	6-6.5'	Ash	26.1		FP	75.72								
91JUNCO4-14	6.5-7'	Ash	9.2		FP									
91JUNCO4-15	7-7.5'	Ash	9.1		FP									
91JUNCO4-16	7.5-8'	Ash	20.9		FP									
91JUNCO4-17	8-8.5'	Ash	30.0		FP	66.56								
91JUNCO4-18	8.5-9'	Ash	26.9		FP	60.85								
91JUNCO4-19	9-9.5'	Ash	21.5		FP	66.24								
91JUNCO4-20	9.5-10'	Soil	16.8		FP									
91JUNCO4-21	10-10.5	Soil	17.1		FP									
91JUNCO4-22	10.5-11	Soil	17.3		FP									
91JUNCO4-23	11-11.5	Soil	17.7		FP									
91JUNCO4-24	11.5-12	Soil	13.2		FP									
91JUNCO4-25	12-12.5	Soil	5.8		FP									
91JUNCO4-26	12.5-13	Soil	10.9		FP									
91JUNCO4-27	13-13.5	Soil	10.4		FP									
91JUNCO4-28	13.5-14	Soil	9.4		FP									
91JUNCO4-29	14-14.5	Soil	8.0		FP									
91JUNCO4-30	14.5-15	Soil	7.5		FP									
91JUNCO4-31	15-15.5	Soil	8.4		FP									

Table 4

Chemical Characteristics of Liquid From Ohio, Event 10

Site ID / Location ID					
Parameter	Units	Sample ID			
		Log Date			
		OH / OHMW01 OH285 2/29/92	OH / OHMW02 OH286 2/29/92	OH / OHMW03 OH287 2/29/92	OH / OHMW04 OH288 2/29/92

Anions					
Chloride	mg/L	210	53	85	240
Fluoride	mg/L	1.3	.52	.51	1.8
Sulfate	mg/L	380	740	750	57

Elements by ICPEs or AA					
Aluminum	mg/L	ND	ND	ND	ND
Arsenic	mg/L	.0048	ND	ND	.014
Barium	mg/L	ND	.057	.032	ND
Beryllium	mg/L	ND	ND	ND	ND
Boron	mg/L	.96	ND	ND	ND
Calcium	mg/L	3.4	210	190	.83
Chromium	mg/L	ND	ND	ND	7.1
Cobalt	mg/L	ND	ND	ND	ND
Copper	mg/L	ND	ND	ND	ND
Iron	mg/L	ND	ND	ND	ND
Lead	mg/L	ND	ND	ND	ND
Magnesium	mg/L	2.2	140	170	2.7
Manganese	mg/L	ND	.16	.21	.021
Molybdenum	mg/L	ND	ND	ND	.085
Nickel	mg/L	ND	ND	ND	ND
Potassium	mg/L	25	7.6	5.6	4.7
Selenium	mg/L	ND	ND	ND	ND
Silicon	mg/L	3.5	6	6.1	2.7
Silver	mg/L	ND	ND	ND	ND
Sodium	mg/L	550	160	100	550
Strontium	mg/L	.13	1.2	.6	.18
Tin	mg/L	ND	ND	ND	ND
Vanadium	mg/L	ND	ND	ND	ND
Zinc	mg/L	ND	ND	ND	ND

		NA = Not Analyzed a = < 5X Det. Limit			

		CT-1			

() = Detection Limit ND = Not Detected NA = Not Analyzed a = < 5X Det. Limit

CI-1

Table 4

Site ID / Location ID

Table 4

(Continued)

Parameter	Site ID / Location ID				
	Sample ID				
	Log Date				
Units	OH / OHM05 OH289 2/29/92	OH / OHM05 OH293 Dup of OH289 2/29/92	OH / OHM06 OH290 2/29/92	OH / OHM07 OH291 3/01/92	

Anions					
Chloride	mg/L	250	170	450	6.3
Fluoride	mg/L	1 a	1.2	.12 a	.36 a
Sulfate	mg/L	140	56	530	330

Elements by ICPEs or AA					
Aluminum	mg/L	ND	ND	ND	ND
Arsenic	mg/L	ND	ND	ND	.0073 a
Barium	mg/L	.037 a	.037 a	.079	.047 a
Beryllium	mg/L	ND	ND	ND	ND
Boron	mg/L	1 a	1 a	ND	ND
Calcium	mg/L	17	21	250	84
Chromium	mg/L	ND	ND	ND	ND
Cobalt	mg/L	ND	ND	.026 a	ND
Copper	mg/L	ND	ND	.95	ND
Iron	mg/L	ND	ND	ND	ND
Lead	mg/L	ND	ND	ND	ND
Magnesium	mg/L	10	10	71	ND
Manganese	mg/L	ND	ND	4.9	ND
Molybdenum	mg/L	ND	ND	ND	.055 a
Nickel	mg/L	ND	ND	.053 a	ND
Potassium	mg/L	6.5 a	11 a	16	9.1 a
Selenium	mg/L	ND	ND	ND	ND
Silicon	mg/L	3.3 a	3.8 a	3.8 a	8.7
Silver	mg/L	ND	ND	ND	ND
Sodium	mg/L	430	430	170	150
Strontium	mg/L	.47	.52	1	.67
Tin	mg/L	ND	ND	ND	ND
Vanadium	mg/L	ND	ND	ND	ND
Zinc	mg/L	ND	ND	ND	ND

() = Detection Limit ND = Not Detected NA = Not Analyzed a = < 5X Det. Limit

CI-3

Table 4
(Continued)

Parameter	Units	Site ID / Location ID		
		Sample ID	Log Date	
		OH / OHMM05 OH289	OH / OHMM06 OH290	OH / OHMM07 OH291
		2/29/92	2/29/92	3/01/92
		OH293 Dup of OH289		
		2/29/92		
Field measurements				
Conductivity	umhos/cm	2565	2555	2200
Filterable Residue	mg/L	1343	1273	769
Redox (Eh)	mV	-50.7	-50.3	-230.0
Temperature	deg. C	10.8	10.9	11.1
Total Alkalinity	meq/L	15	15.2	3.44
pH	pH units	8.14	8.13	11.25
		(.03)	(.05)	(.03)
		(.05)	(.05)	(.05)
		(5)	(5)	(5)
		(1)	(1)	(1)
		(10)	(10)	(10)
		(.1)	(.1)	(.1)
		(.03)	(.03)	(.03)
		(.05)	(.05)	(.05)

(Continued)

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Table 4
(Continued)

Parameter	Units	Site ID / Location ID			
		OH / OHWJ08 OH292 3/01/92	OH / OHLY01 OH294 3/01/92	OH / OHLY11 OH296 3/01/92	OH / OHLY12 OH297 3/01/92
Field measurements					
Conductivity	unhos/cm	1775	3195	3270	1900
Filterable Residue	mg/L	940	2091	3024	595
Redox (Eh)	mV	-13.9	-105.7	-141.9	-164.9
Temperature	deg. C	12.0	6.1	8.5	5.5
Total Alkalinity	meq/L	5.52	.628	1.04	.968
pH	pH units	7.67	9.05	9.55	10.01
		(.05)	(.03)	(.03)	(.03)
		(.05)	(.05)	(.05)	(.05)

() = Detection Limit ND = Not Detected NA = Not Analyzed Q = < 5X Det. Limit

C1-6

Table 4

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Table 4
(Continued)

Parameter	Site ID / Location ID				
	Sample ID				
	Log Date				
	OH / OHLY14	OH / OHLY15	OH / OHLY17	OH / OHLY20	
	OH298	OH299	OH301	OH302	
	3/01/92	3/01/92	3/01/92	3/01/92	

Field measurements					
Conductivity	umhos/cm	2520	2450	(5)	8900
Filterable Residue	mg/L	2704	1545	(1)	8674
Redox (Eh)	mV	-86.7	-123.7	(10)	-275.8
Temperature	deg. C	7.8	8.1	(.1)	13.4
Total Alkalinity	meq/L	.308	.78	(.03)	26.44
pH	pH units	8.66	9.33	(.05)	11.74
					(.05)

() = Detection Limit MD = Not Detected NA = Not Analyzed 0 = < 5X Det. Limit

C1-8

Table 4

(Continued)

		Site ID / Location ID	
		Sample ID	Log Date
Parameter	Units	OH / OHLY24 OH305	OH / OHLY05 OH311
		3/01/92	3/01/92
Anions			
Chloride	mg/L	.1200	620
Fluoride	mg/L	.53	.22 a
Sulfate	mg/L	1900	1900
Elements by ICPEs or AA			
Aluminum	mg/L	ND	ND
Arsenic	mg/L	ND	ND
Barium	mg/L	.058	.046 a
Beryllium	mg/L	ND	ND
Boron	mg/L	ND	1.3 a
Calcium	mg/L	640	260
Chromium	mg/L	ND	.024 a
Cobalt	mg/L	ND	ND
Copper	mg/L	ND	ND
Iron	mg/L	ND	ND
Lead	mg/L	ND	ND
Magnesium	mg/L	7.2	ND
Manganese	mg/L	ND	ND
Molybdenum	mg/L	.16 a	.91
Nickel	mg/L	ND	ND
Potassium	mg/L	650	1200
Selenium	mg/L	ND	.019 a
Silicon	mg/L	28	23
Silver	mg/L	ND	ND
Sodium	mg/L	400	310
Strontium	mg/L	3	4
Tin	mg/L	ND	ND
Vanadium	mg/L	ND	.053 a
Zinc	mg/L	ND	ND

() = Detection Limit ND = Not Detected NA = Not Analyzed a = < 5X Det. Limit

C1-9

Table 4
(Continued)

Parameter	Units	Site ID / Location ID	
		Sample ID	Log Date
		OH / OHLY24	OH / OHLY05
		OH305	OH311
		3/01/92	3/01/92
		-----	-----
Field measurements			
Conductivity	umhos/cm	NA	5175 (5)
Filterable Residue	mg/L	NA	5554 (1)
Redox (Eh)	mV	NA	-231.2 (10)
Temperature	deg. C	NA	11.7 (.1)
Total Alkalinity	meq/L	NA	4.32 (.03)
pH	pH units	NA	11.14 (.05)

Table 5

Field Testing - Solid Waste Disposal, Physical Testing Data

NP=Nonplastic FP=Poorly consolidated or fractured material																	
SAMPLE DESCRIPTION		-ATTERBURG LIMITS-															
SAMPLE ID	DEPTH (ft)	SAMPLE TYPE	MOISTURE CONTENT %-dry bas	UNCONFINED COMPRESSIVE STRENGTH (psi)	PERMEA-BILITY (cm/sec)	FIELD		DRY DENSITY pcf	OPTIMUM MOIST. %	MAXIMUM DRY DENSITY pcf	PARTICLE SIZE (D50)	PARTICLE SPECIFIC GRAVITY	PARTICLE SPECIFIC SURFACE AREA M ² /gram	TRIAXIAL STRENGTH		Fric. Dev. Agl. Limit	Plastic Index
						BULK DENSITY pcf	DRY DENSITY pcf							Conf. Str.	Dev. Str.		
OHNSH-1	Silo	Ash,N	0.0	120 max	5.60E-06				38.8	70.9		2.69	7.55	22	129	36	
OHNSH-3	Silo	Ash,S	20.1		1.60E-06				35.6	75.6			10.7	22	128	38	
OHSS 1	8'	Soil	20.0				FP					2.585	13.48			NP	NP
OHSS 2	8'	Soil	15.7				FP									28.7	18.9
OHSS 3	8'	Soil	13.7				FP									27.8	20.1
OHSS 4	8'	Soil	19.0				FP										
OHNT 1-9	8-9'	Soil	1.5				FP					2.631	13.88				7.7
OHNT 2-9	8-9'	Soil	6.7				FP					2.537	ND				
OHNT 4-8	7-8'	Soil	13.2				FP					2.649	20.13			NP	NP
OHNT 1-1,2	0-2'	Ash	48.6	539	4.20E-08	96.8						2.105	4.94				
OHNT 1-3	2-3'	Ash	47.0	1384	6.80E-07	96.4						2.309	32.23	22.0	190.0	53.4	12.0
OHNT 1-4	3-4'	Ash															
OHNT 1-5	4-5'	Ash	42.8	531	6.40E-06	77.6						2.373	30.64	22.0	615.0	70.3	
OHNT 1-6	5-6'	Ash															
OHNT 1-7	6-7'	Ash	4.9	500	FP	89.3							37				
OHNT 1-8	7-8'	Ash	7.3	281	3.00E-06	134.6							11.92				
OHNT 8-1	0-1'	Ash	ND	1237	1.30E-06	87.2							50	22.0	1075	72.6	
OHNT 8-2	1-2'	Ash															
OHNT 8-3	2-3'	Ash	18.3	1016	FP	72.7							30.96				
OHNT 8-5	4-5'	Ash	40.8	1220	2.40E-06	80.2						2.246	36.53			38.0	21.0
OHNT 8-7	6-7'	Ash	40.2	769	1.00E-07	93.7						2.401	39.03			21.0	16.0
OHNV7-1,2	2-4'	Soil	11.1		1.10E-08	140.9						2.76	17.68			37.0	14.3
OHNV7-4,5	6-8'	Soil	10.6		9.00E-07	138.3						2.78	18.22			33.0	18.7
OHNV7-7	10-11'	Soil	3.3		1.70E-06	143.2						2.678	20			33.0	14.3
OHNV7-8	11-12'	Soil	13.8		1.70E-06	ND						2.702	20				
OHNV7-10	14-15'	Soil	12.0		5.20E-07	144.3						2.702	14.78				
OHNV7-11	15-16'	Soil	12.0		5.02E-07	144.3						ND	13.46				
OHNV7-13,14	18-20'	Soil	ND		1.30E-08	142.5						2.651	15.17				
OHNV7-17,18	24-26'	Soil	13.6		9.40E-06	133.9						2.702	13.96				
OHNV7-20,21	28-30'	Soil	16.0		1.70E-08	131.1						ND	9.1				
OHNV7-23,24	32-34'	Soil	4.0		3.70E-08	144						2.72	14.14			41.0	17.0
OHNV 4-2,3	1-3'	Soil										2.72	14.03			33.0	15.0
OHNV 4-4,5	3-5'	Soil										2.68	21			33.0	17.0
OHNV 4-6,7	5-7'	Soil										2.694	18.11			53.0	27.0
OHNV 4-9	8-9'	Soil	9.8									2.589	19.53			41.4	19.1
OHNV 1-3	3-4'	Soil	8.5									2.589	19.53			33.7	20.3
OHNV 1-7	7-8'	Soil	4.9									2.345	10.29			34.3	13.3

Table 5
(Continued)

SAMPLE DESCRIPTION		NP=Nonplastic FP=Poorly consolidated or fractured material										-ATTERBURG LIMITS-		
SAMPLE ID	DEPTH (ft)	SAMPLE TYPE	MOISTURE CONTENT % %-dry bas	UNCONFINED COMPRESSIVE STRENGTH (psi)	PERMEABILITY (cm/sec)	FIELD		OPTIMUM MOIST. %	MAXIMUM DRY DENSITY pcf	PARTICLE SIZE (D50)	PARTICLE SPECIFIC GRAVITY	SURFACE AREA M^2/gram	TRIAXIAL STRENGTH	
						BULK DENSITY pcf	DENSITY pcf						Conf. Str.	Dev. Str.
90FEB08 2-2	1-2'	Ash	45.1	462.3	5.21E-07	73.8	56.4				2.75	36.15		
90FEB08 2-3,4	2-4'	Ash	63.0	271.3	FB	88.3	54.2				2.81	15.92		
90FEB08 2-4A		Ash	68.6											
90FEB08 2-4B		Ash	72.1											
90FEB08 2-6	5-6'	Ash	61.8	436.2	5.87E-05	84.3	52.1				2.86	23.32		
90FEB08 2-6A		Ash	73.3											
90FEB08 2-6B		Ash	75.0											
90FEB08 2-8	7-8'	Ash	31.5	321	2.52E-05	72.9	55.8				2.65	25.7		
90FEB08 2-10	9-10'	Soil	1.9			132.5	130				2.78	21.25		
90FEB08 2-10A		Soil	1.7											
90FEB08 2-10B		Soil	9.8											
90FEB08 3-2	1-2'	Ash	24.5	1937.1	2.44E-07	99.6	80				2.7	39.83		
90FEB08 3-2A		Ash	59.4											
90FEB08 3-2B		Ash	62.6											
90FEB08 3-3,4	2-4'	Ash	39.7	281.2	9.50E-08	75.4	54				2.95	37.47		
90FEB08 3-4A		Ash	80.6											
90FEB08 3-4B		Ash	80.0											
90FEB08 3-5,6	4-6'	Ash	35.3	1879.0	1.35E-07	75	55.4				2.94	28.85		
90FEB08 3-6A		Ash	65.2											
90FEB08 3-5B		Ash	63.3											
90FEB08 3-8	7-8'	Soil			4.20E-08	123.4					2.43	11.36		
90MAY08 1-1	0-1'	Ash	57.9		3.13E-06							33.39		
90MAY08 1-1A		Ash	61.9											
90MAY08 1-1B		Ash	55.8											
90MAY08 1-2	1-2'	Ash	55.2	462			52.6				2.47			
90MAY08 1-2A		Ash	58.1											
90MAY08 1-2B		Ash	62.9											
90MAY08 1-3	2-3'	Ash	65.0								2.49	41.51		
90MAY08 1-3A		Ash	71.4											
90MAY08 1-3B		Ash	69.8											
90MAY08 1-4	3-4'	Ash	65.8	207.2	9.51E-06		52.9				2.67			
90MAY08 1-4A		Ash	59.6											
90MAY08 1-4B		Ash	61.7											
90MAY08 1-5	4-5'	Ash	69.4	126	4.60E-06		46.8				2.65	21.81		
90MAY08 1-5A		Ash	76.9											
90MAY08 1-5B		Ash	74.4											
90MAY08 1-6	5-6'	Ash	61.1								2.54			
90MAY08 1-6A		Ash	65.7											
90MAY08 1-6B		Ash	62.9											
90MAY08 1-7	6-7'	Ash	65.2	263.1	4.60E-05		44.3				2.63	16.87		

Table 5
(Continued)

SAMPLE DESCRIPTION		NP=Nonplastic FP=Poorly consolidated or fractured material															
SAMPLE ID	DEPTH (ft)	SAMPLE TYPE	MOISTURE CONTENT % X-dry bas	UNCONFINED COMPRESSIVE STRENGTH (psi)	PERMEA- BILITY (cm/sec)	FIELD		DRY DENSITY pcf	OPTIMUM MOIST. %	MAXIMUM DRY DENSITY pcf	PARTICLE SIZE (D50)	PARTICLE SPECIFIC GRAVITY	PARTICLE SPECIFIC SURFACE AREA M ² /gram		TRIAXIAL STRENGTH		-ATTERBURG LIMITS- Conf. Dev. Fric Str. Str. Agl. Limit Plastic Limit Index
						BULK DENSITY pcf	DENSITY pcf						W ² /gram	W ² /gram	Str. Str.	Str. Str.	
90MAYOH 1-7A			80.2														
90MAYOH 1-7B			74.0														
90MAYOH 1-8	7-8'		82.5	461.6				47.6				2.37					
90MAYOH 1-8A			29.1														
90MAYOH 1-8B			16.2														
90MAYOH 1-9	8-9'	Soil	4.8		1.01E-05			126.4				2.72	7.27				
90MAYOH 1-9A		Soil	10.1														
90MAYOH 1-9B		Soil	11.6														
90MAYOH 1-10	9-10'	Soil	11.7					102.3				2.75					
90MAYOH 1-10A		Soil	10.4														
90MAYOH 1-10B		Soil	11.5														
90MAYOH 1-11	10-11'	Soil											17.03				
90MAYOH 1-11A		Soil	12.0														
90MAYOH 1-11B		Soil	9.1														
90MAYOH 4-1	0-1'	Ash	90.8	137.9			86.8	45.5				2.25					
90MAYOH 4-1A		Ash	90.8														
90MAYOH 4-2	1-2'	Ash	38.6	1382.7	1.44E-06		91.8	66.2				2.15	57.94				
90MAYOH 4-2A		Ash	108.3														
90MAYOH 4-2B		Ash	92.2														
90MAYOH 4-2C		Ash	83.5														
90MAYOH 4-2D		Ash	68.5														
90MAYOH 4-3	2-3'	Ash	25.9	1956.9	4.23E-06		100.8	80.1				2.59					
90MAYOH 4-3A		Ash	62.5														
90MAYOH 4-3B		Ash	46.9														
90MAYOH 4-4	3-4'	Ash	34.9	731.5	4.89E-07		87.2	64.6				2.93	27.97				
90MAYOH 4-4A		Ash	62.8														
90MAYOH 4-4B		Ash	64.5														
90MAYOH 4-5	4-5'	Ash	42.5	464.2	9.05E-07		88.7	62.3				2.58					
90MAYOH 4-5A		Ash	81.6														
90MAYOH 4-5B		Ash	73.0														
90MAYOH 4-6	5-6'	Ash	34.2	916.7	6.14E-07		96.8	72.1				2.83	58.72				
90MAYOH 4-6A		Ash	63.3														
90MAYOH 4-6B		Ash	71.8														
90MAYOH 4-7C		Ash	64.8														
90MAYOH 4-7D		Ash	62.6														
90MAYOH 4-7	6-7'	Soil	47.5				125.9	85.4				2.67					
90MAYOH 4-7A		Soil	77.7														
90MAYOH 4-7B		Soil	68.6														
90MAYOH 4-8	7-8'	Soil	18.5				130.4	110.1				2.75	21.87				
90MAYOH 4-8A		Soil	12.0														
90MAYOH 4-8B		Soil	20.9														
90MAYOH 4-9	8-9'	Soil	4.7				128.5	122.8				2.73					
90MAYOH 4-9A		Soil	10.8														
90MAYOH 4-9B		Soil	19.9														

Table 5
(Continued)

SAMPLE DESCRIPTION		NP=Nonplastic FP=Poorly consolidated or fractured material										-ATTERBURG LIMITS-				
SAMPLE ID	DEPTH (ft)	SAMPLE TYPE	MOISTURE CONTENT %-dry bas	UNCONFINED COMPRESSIVE STRENGTH (psi)	PERMEABILITY (cm/sec)	FIELD		MAXIMUM DRY DENSITY pcf	PARTICLE SIZE (D50)	PARTICLE SPECIFIC GRAVITY	PARTICLE SPECIFIC AREA M ² /gram	TRIAXIAL STRENGTH		-ATTERBURG LIMITS-		
						BULK DENSITY pcf	DRY DENSITY pcf					Conf. Dev.	Fric	Liquid Plastic	Plastic Index	
90AUGOH 1-2	1-2'	Ash	49.7	256	2.72E-06	84.1		56.2			36.22					
90AUGOH 1-4	3-4'	Ash	49.2	1531.7	8.12E-07	89		59.6			57.46					
90AUGOH 1-6	5-6'	Ash	44.3	606.8	7.37E-06	87.8		60.8			45.57					
90AUGOH 1-8	7-8'	Ash	36.6	1748.6	2.30E-07	89.8		65.7			48.11					
90AUGOH 1-10, 11	9-11'	Soil	14.6		FP	127.5		111.2			19.19					
90AUGOH 1-12, 13	11-13'	Soil	7.1		9.40E-08	133.4		124.6			14.73					
90AUGOH 1-14	13-14'	Soil	8.9		2.70E-08	144		132.3			10.47					
90AUGOH 1-16	15-16'	Soil	8.6		3.76E-08	141.6		130.4			9.86					
90AUGOH 3-2	1-2'	Ash	63.4	686.1	FP	71.7		43.9			31.55					
90AUGOH 3-4	3-4'	Ash	64.2	FP	FP	FP		FP			39.25					
90AUGOH 3-5, 6	4-6'	Ash	73.5	421.8	2.70E-07	88		64.2			33.66					
90AUGOH 3-8	7-8'	Ash	69.1	950.2	2.00E-06	96.3		56.9			31.17					
90AUGOH 3-10	9-10'	Soil	88.2		FP	88.1		46.8			39.3					
90AUGOH 3-10, 11	9-11'	Soil	14.0		FP	124.8		111.1			10.13					
90AUGOH 3-12	11-12'	Soil	14.4		1.30E-08	137.3		120			8.93					
90AUGOH 3-14	13-14'	Soil	9.1		2.60E-06	141.6		129.8			7.47					
90AUGOH 3-16	15-16'	Soil	9.2		FP	136.4		125			34.65					
90AUGOH 5-2	1-2'	Ash	57.9	299.5	4.20E-06	72.1		45.7			28.31					
90AUGOH 5-4	3-4'	Ash	39.2	FP	FP	FP		FP			30.15					
90AUGOH 5-6	5-6'	Ash	51.6	FP	FP	FP		FP			43.68					
90AUGOH 5-8	7-8'	Ash	49.4	FP	FP	FP		FP			18.31					
90AUGOH 5-10, 11	9-11'	Soil	8.6		1.20E-08	130.7		120.3			24.61					
90AUGOH 5-12	11-12'	Soil	9.4		1.72E-08	136.6		124.9			12.12					
90AUGOH 5-14	13-14'	Soil	4.7		FP	127.9		122.1			7.23					
90AUGOH 5-16	15-16'	Soil	5.6		6.53E-08	143.6		136			25.18					
90AUGOH 6-1	0-1'	Ash	67.8	320.7	2.61E-06	82.1		48.9			38.18					
90AUGOH 6-3	2-3'	Ash	49.3	FP	FP	FP		FP			23.43					
90AUGOH 6-5	4-5'	Ash	53.6	319.1	1.63E-06	86.8		56.5			13.02					
90AUGOH 6-7	6-7'	Ash	11.1	313.9	FP	132.7		119.4			9.37					
90AUGOH 6-9	8-9'	Soil	13.3		FP	138.3		122.1			6.55					
90AUGOH 6-11	10-11'	Soil	4.4		FP	FP		FP			28.0					
90AUGOH 6-13	12-13'	Soil	2.9		FP	FP		FP			26.0					
											25.0					
												22.0				
												32.0				
												23.0				
												18.0				
												18.0				
													29.0			
													22.0			
													32.0			
													23.0			
													18.0			
													24.0			
														7.0		
														10.0		
														5.0		
														6.0		

Table 5
(Continued)

=====													
SAMPLE DESCRIPTION		MP=Nonplastic FP=Poorly consolidated or fractured material											
=====													
SAMPLE ID	DEPTH (ft)	SAMPLE TYPE	MOISTURE CONTENT % %-dry bas	UNCONFINED COMPRESSIVE STRENGTH (psi)	PERMEABILITY (cm/sec)	FIELD BULK DENSITY pcf	DRY DENSITY pcf	OPTIMUM MOIST. %	MAXIMUM DRY DENSITY pcf	PARTICLE SPECIFIC GRAVITY	PARTICLE SPECIFIC SURFACE AREA M ² /gram	TRIAXIAL STRENGTH Conf. Dev. Str.	ATTERBURG LIMITS- Fric Liquid Plastic Index
=====													
91AUGOH2-1	0-1'	Soil	16.8						1.10E-07				
91AUGOH2-2	1-2'	Ash	109.1	50.7					FP				
91AUGOH2-4	3-4'	Ash	7.0	311.0					FP				
91AUGOH2-6	5-6'	Ash	52.0	1003.4					2.90E-06				
91AUGOH2-8	7-8'	Ash	72.4	FP					FP				
91AUGOH2-11	10-11'	Soil	17.5						1.70E-08				
91AUGOH2-12, 13	11-13'	Soil	18.4						1.30E-08				
91AUGOH2-15	14-15'	Soil	13.9						FP				
91AUGOH2-17	16-17'	Soil	14.4						FP				
91AUGOH4-2	1-2'	Soil	60.0						2.00E-05				
91AUGOH4-3	2-3'	Ash	78.0	1740.0					FP				
91AUGOH4-4	3-4'	Ash	56.3	2761.8					FP				
91AUGOH4-6	5-6'	Ash	50.6	448.6					1.90E-05				
91AUGOH4-8	7-8'	Ash	72.1	97.0					FP				
91AUGOH4-9	8-9'	Soil	14.5						4.90E-08				
91AUGOH4-11	10-11'	Soil	11.9						1.20E-07				
91AUGOH4-13	12-13'	Soil	10.8						FP				
91AUGOH4-15	14-15'	Soil	11.2						FP				
91AUGOH6-1, 2	0-2'	Soil	20.1						4.00E-07				
91AUGOH6-3, 4	2-4'	Ash	68.5	765.0					8.40E-08				
91AUGOH6-5, 6	4-6'	Ash	75.8	984.1					8.20E-04				
91AUGOH6-7, 8	6-8'	Ash	79.6	725.2					6.90E-04				
91AUGOH6-11	10-11'	Ash	83.5	FP					2.90E-06				
91AUGOH6-13	12-13'	Soil	8.1						FP				
91AUGOH6-14	13-14'	Soil	10.2						1.50E-06				
91AUGOH6-16	15-16'	Soil	10.3						FP				
91AUGOH6-18	17-18'	Soil	10.7						FP				
91AUGOH8-2	1-2'	Soil	25.7						4.40E-06				
91AUGOH8-3	2-3'	Ash	51.1	945.0					FP				
91AUGOH8-5	4-5'	Ash	62.0	1250.0					2.80E-07				
91AUGOH8-6, 7	5-7'	Ash	83.4	1096.0					2.90E-03				
91AUGOH8-9	8-9'	Ash	76.5	151.8					9.40E-04				
91AUGOH8-10	9-10'	Soil	13.6						2.00E-07				
91AUGOH8-12	11-12'	Soil	17.5						3.90E-07				
91AUGOH8-14	13-14'	Soil	11.3						3.00E-08				
91AUGOH8-16, 17	15-17'	Soil	11.1						4.70E-08				
=====													

Table 6

**Field Testing - Solid Waste Disposal
In-Situ Hydraulic Conductivity**

LOCATION: OHIO - North cell

REPORT: - In-Situ Permeabilities

INSTRUMENT: GUELPH Constant Head Well Permeameter [CHWP]

=====						
DATE	TEST#	LOC. QUAD	INTERVAL	Kfs (cm/sec)	Kfs (ft/yr)	COMMENTS
			TESTED (ft-ref)			
=====						
06/01/90	OHBP-1N	S.E.	.23-1.1' TOA	1.22E-04	126	
06/06/90	OHBP-5N	S.W.	.5-1.25' TOA	1.28E-04	132	
06/06/90	OHBP-6N	N.W.	.67-1.5' TOA	5.55E-05	57	
08/07/90	OHBP-7N	N.W.	.37-1.1' TOA	9.35E-05	97	
08/07/90	OHBP-7bN	N.W.	.21-1.5' TOA	4.31E-04	445	0.5 ft=probable fracture zone
08/07/90	OHBP-7cN	N.W.	.71-1.5' TOA	9.10E-05	94	
08/07/90	OHBP-8N	S.E.	.6-1.33' TOA	1.36E-04	140	0.7 ft=probable fracture zone
08/07/90	OHBP-8bN	S.E.	.8-1.33' TOA	5.61E-05	58	
08/31/91	OHBP-9N	S.E.	0.0-2.0' TOA	1.09E-04	112	
08/31/91	OHBP-10N	Cntr	6.0-8.5' TOA	1.49E-05	15	
08/31/91	OHBP-11N	Cntr	4.0-6.0' TOA	4.02E-05	42	
08/31/91	OHBP-12N	Cntr	2.0-4.0' TOA	5.13E-05	53	
08/31/91	OHBP-13N	Cntr	0.6-.42' cap	3.88E-04	401	
11/19/91	OHBP-14N	N.E.	0.0-2.0' TOA	1.00E-04	103	
11/19/91	OHBP-15N	N.E.	2.0-4.0' TOA	3.06E-05	32	
11/19/91	OHBP-16N	N.E.	5.5-7.0' TOA	7.35E-05	76	
02/25/92	OHBP-17N	N.W.	0.5-1.25' TOA	1.03E-04	107	
02/25/92	OHBP-18N	N.W.	0.0-2.17' TOA	3.95E-05	41	
02/25/92	OHBP-19N	N.W.	4.0-6.17' TOA	5.22E-05	54	

TOA = Top of Ash is used as a reference point for measured depth.

Table 6
(Continued)

LOCATION: OHIO - South cell
REPORT: - In-Situ Permeabilities
INSTRUMENT: GUELPH Constant Head Well Permeameter [CHWP]

DATE	TEST#	LOC. QUAD	INTERVAL		Kfs (cm/sec)	Kfs (ft/yr)	COMMENTS
			TESTED (ft-ref)				
06/05/90	OHBP-2S	S.E.	.12-1.1' TOA		9.74E-04	1006.67	
06/05/90	OHBP-2bs	S.E.	.18-1.1' TOA		9.41E-04	973.36	
06/05/90	OHBP-3bs	S.W.	.56-1.33' TOA		7.98E-04	824.83	
06/05/90	OHBP-4bs	N.W.	.89-1.66' TOA		6.35E-04	656.25	
08/07/90	OHBP-9S	S.W.	.44-1.25' cap		1.05E-03	1085.93	
08/07/90	OHBP-9bs	S.W.	.69-1.25' cap		8.56E-04	884.97	
08/07/90	OHBP-10S	N.E.	.75-1.5' cap		3.74E-04	387.12	
08/31/91	OHBP-11S	Cntr	0.0-2.0' TOA		3.53E-04	365.19	
08/31/91	OHBP-12S	Cntr	6.0-8.0' TOA		1.01E-05	10.47	
08/31/91	OHBP-13S	Cntr	6.0-8.0' TOA		1.96E-05	20.25	
08/31/91	OHBP-14S	Cntr	1.25-1.8' cap		3.40E-03	3519.24	
02/28/92	OHBP-15S	S.E.	.75-1.0' cap		2.88E-03	2973.53	
02/28/92	OHBP-16S	S.E.	1.3-1.6' TOA		8.34E-04	861.98	
02/28/92	OHBP-17S	S.E.	1.6-3.6' TOA		8.60E-05	88.89	
02/28/92	OHBP-18S	S.E.	3.5-6.0' TOA		2.62E-05	27.07	

TOA = Top of Ash is used as a reference point for measured depth.

Table 7

Chemical Characteristics of Liquid From Illinois, Event 3

Parameter	Units	Site ID / Location ID Sample ID Log Date			
		IL / ILMW01 IL050 2/23/92	IL / ILMW02 IL059 Dup of IL050 2/23/92	IL / ILMW02 IL051 2/23/92	IL / ILMW03 IL052 2/23/92
Anions					
Chloride	mg/L	18	20	12	19
Fluoride	mg/L	.26 a	.24 a	.21 a	.14 a
Sulfate	mg/L	450	440	1600	1000
		(.13)	(.26)	(.13)	(.13)
		(.1)	(.1)	(.1)	(.1)
		(1)	(.5)	(1)	(1)
Elements by ICPE or AA					
Aluminum	mg/L	ND	ND	ND	ND
Arsenic	mg/L	ND	ND	ND	ND
Barium	mg/L	.036 a	.027 a	.025 a	.06
Beryllium	mg/L	ND	ND	ND	ND
Boron	mg/L	1.3 a	1.1 a	ND	ND
Cadmium	mg/L	ND	ND	ND	ND
Calcium	mg/L	180	170	460	350
Chromium	mg/L	ND	ND	ND	ND
Cobalt	mg/L	ND	ND	ND	ND
Copper	mg/L	.44	.76	ND	ND
Iron	mg/L	ND	ND	ND	ND
Lead	mg/L	100	94	250	110
Magnesium	mg/L	1.3	1.2	3.5	2.9
Manganese	mg/L	ND	ND	ND	ND
Molybdenum	mg/L	ND	ND	.027 a	.022 a
Nickel	mg/L	7.7 a	6.9 a	4.4 a	7.2 a
Potassium	mg/L	ND	ND	ND	ND
Selenium	mg/L	6.9	6.4	7.2	4.2 a
Silicon	mg/L	ND	ND	ND	ND
Silver	mg/L	120	110	70	41
Sodium	mg/L	1.6	1.4	.93	1
Strontium	mg/L	ND	ND	ND	ND
Tin	mg/L	ND	ND	ND	ND
Vanadium	mg/L	ND	ND	ND	ND
		(.2)	(.2)	(.2)	(.2)
		(.004)	(.004)	(.004)	(.004)
		(.01)	(.01)	(.01)	(.01)
		(.002)	(.002)	(.002)	(.002)
		(.6)	(.6)	(.6)	(.6)
		(.001)	(.001)	(.001)	(.001)
		(1)	(1)	(1)	(1)
		(.01)	(.01)	(.01)	(.01)
		(.01)	(.01)	(.01)	(.01)
		(.02)	(.02)	(.02)	(.02)
		(.05)	(.05)	(.05)	(.05)
		(.003)	(.003)	(.003)	(.003)
		(1)	(1)	(1)	(1)
		(.01)	(.01)	(.01)	(.01)
		(.05)	(.05)	(.05)	(.05)
		(.02)	(.02)	(.02)	(.02)
		(3)	(3)	(3)	(3)
		(.005)	(.005)	(.005)	(.005)
		(1)	(1)	(1)	(1)
		(.01)	(.01)	(.01)	(.01)
		(1)	(1)	(1)	(1)
		(.003)	(.003)	(.003)	(.003)
		(.6)	(.6)	(.6)	(.6)
		(.02)	(.02)	(.02)	(.02)

() = Detection Limit ND = Not Detected NA = Not Analyzed a = < 5X Det. Limit

C1-1

Table 7
(Continued)

Parameter	Units	Site ID / Location ID		
		Sample ID	Log Date	
Elements by ICPEs or AA, cont.	mg/L	IL / ILHM01 1L050	IL / ILHM02 1L051	IL / ILHM03 1L052
		2/23/92	2/23/92	2/23/92
		-----	-----	-----
Zinc	mg/L	ND	ND	ND
		(.02)	(.02)	(.02)
Field measurements	mg/L	1106	2980	1886
		12.52	10	6.32
		(.03)	(.03)	(.03)
Filterable Residue	mg/L	(1)	(1)	(1)
Total Alkalinity	meq/L	(.03)	(.03)	(.03)

() = Detection Limit ND = Not Detected NA = Not Analyzed B = < 5X Det. Limit

C1-2

Table 7

Site ID / Location ID	Sample ID	Log Date
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Table 7

C1-4

Table 7
(Continued)

Parameter	Units	Site ID / Location ID			
		IL / ILM08 IL057 2/23/92	IL / ILM09 IL058 2/23/92	IL / ILLY01 IL060 2/23/92	IL / ILLY05 IL064 2/23/92
Anions					
Chloride	mg/L	10	14		MA
Fluoride	mg/L	.23 a	.21 a		MA
Sulfate	mg/L	1500	360		MA
Elements by ICPEs or AA					
Aluminum	mg/L	ND	ND	ND	ND
Arsenic	mg/L	ND	ND	.0056 a	.0067 a
Barium	mg/L	.027 a	.02 a	ND	ND
Beryllium	mg/L	ND	ND	ND	ND
Boron	mg/L	ND	ND	ND	ND
Cadmium	mg/L	ND	ND	ND	ND
Calcium	mg/L	400	420	1.3 a	1.2 a
Chromium	mg/L	ND	ND	.048 a	.065
Cobalt	mg/L	ND	ND	ND	ND
Copper	mg/L	ND	ND	ND	.032 a
Iron	mg/L	ND	ND	ND	.14 a
Lead	mg/L	ND	ND	.0042 a	.0044 a
Magnesium	mg/L	260	660	ND	ND
Manganese	mg/L	.73	7.2	ND	ND
Molybdenum	mg/L	ND	ND	.22 a	.12 a
Nickel	mg/L	ND	.035 a	ND	ND
Potassium	mg/L	6.9 a	4.6 a	860	970
Selenium	mg/L	ND	ND	ND	ND
Silicon	mg/L	7.7	5	590	990
Silver	mg/L	ND	ND	ND	ND
Sodium	mg/L	72	84	440	310
Strontium	mg/L	.47	1.5	.017	.0059 a
Tin	mg/L	ND	ND	ND	ND
Vanadium	mg/L	ND	ND	.029 a	.023 a

() = Detection Limit ND = Not Detected MA = Not Analyzed a = < 5X Det. Limit

Table 7

(Continued)

Parameter	Units	Site ID / Location ID		
		Sample ID	Log Date	
		IL / ILMA08 IL057 2/23/92	IL / ILMA09 IL058 2/23/92	IL / ILLY01 IL060 2/23/92
		-----	-----	-----
Elements by ICPEs or AA, cont.				
Zinc	mg/L	ND	.039 0 (.02)	.041 0 (.02)
				.11 (.02)
Field measurements				
Filterable Residue	mg/L	3157	5794 (1)	NA
Total Alkalinity	meq/L	11.48 (.03)	14.24 (.03)	200 (.03)
				NA
				NA

() = Detection Limit ND = Not Detected NA = Not Analyzed 0 = < 5X Det. Limit

C1-6

Table 7
(Continued)

Parameter	Units	Site ID / Location ID			
		Sample ID		Log Date	
		IL / ILSW01	IL / ILSW02		
		IL066	IL067	IL / ILLV07	
		2/22/92	2/23/92	IL069	
				2/23/92	

Anions					
Chloride	mg/L	1.3	.97	260	(.026) (2.6)
Fluoride	mg/L	ND	ND	.49	(.1) (1) a
Sulfate	mg/L	560	370	2000	(.5) (5)

Elements by ICPEs or AA					
Aluminum	mg/L	ND	ND	.32	(.2) (2) a
Arsenic	mg/L	ND	ND	ND	(.004) (.008)
Barium	mg/L	.024	.023	ND	(.01) (.01)
Beryllium	mg/L	ND	ND	ND	(.002) (.002)
Boron	mg/L	ND	ND	ND	(.6) (.6)
Cadmium	mg/L	ND	ND	ND	(.001) (.001)
Calcium	mg/L	270	170	ND	(1) (1)
Chromium	mg/L	ND	ND	.014	(.01) (.01) a
Cobalt	mg/L	ND	ND	ND	(.01) (.01)
Copper	mg/L	ND	ND	ND	(.02) (.02)
Iron	mg/L	ND	ND	.056	(.05) (.05) a
Lead	mg/L	.0034	ND	ND	(.003) (.003)
Magnesium	mg/L	4.5	2.4	ND	(1) (1)
Manganese	mg/L	ND	ND	ND	(.01) (.01)
Molybdenum	mg/L	ND	ND	.11	(.05) (.05) a
Nickel	mg/L	ND	ND	ND	(.02) (.02)
Potassium	mg/L	ND	ND	830	(3) (3)
Selenium	mg/L	ND	ND	ND	(.005) (.005)
Silicon	mg/L	2.3	2.4	120	(1) (1)
Silver	mg/L	ND	ND	ND	(.01) (.01)
Sodium	mg/L	1.4	1.4	510	(1) (1) a
Strontium	mg/L	.75	.5	.037	(.003) (.003)
Tin	mg/L	ND	ND	ND	(.6) (.6)
Vanadium	mg/L	ND	ND	ND	(.02) (.02)

() = Detection Limit ND = Not Detected NA = Not Analyzed a = < 5X Det. Limit

Table 7

(Continued)

Parameter	Units	Site ID / Location ID			
		IL / ILSW01	IL / ILSW02	IL / ILLY07	Sample ID Log Date
		ILSW01 2/22/92	ILSW02 2/23/92	ILLY07 2/23/92	
Elements by ICPE or AA, cont.					
Zinc	mg/L	ND	ND	ND	(.02)
Field measurements					
Filterable Residue	mg/L	1079	678	NA	(1)
Total Alkalinity	meq/L	.228	.332	NA	(.03)

() = Detection Limit ND = Not Detected NA = Not Analyzed 0 = < 5X Det. Limit

C1-8

Table 8

Chemical Characteristics of Solid From Illinois, Event 3

Site ID / Location ID			
Sample ID			
Beg. Depth - End Depth (ft.)			
IL / 92FEBIL01			
92FEBIL01-9			
8.5 - 9			
Units			

Parameter			

Anions			
CaCO3 Equivalent	mg CO3/g	92.01	(.2)
Chloride	mg/L	0.84	(0.026)
Sulfate	mg/L	46	(0.050)

Elements by ICPEs or AA			
Aluminum	mg/L	ND	(.4)
Arsenic	mg/L	ND	(.004)
Barium	mg/L	ND	(.02)
Beryllium	mg/L	ND	(.004)
Boron	mg/L	ND	(1.2)
Cadmium	mg/L	ND	(.001)
Calcium	mg/L	29	(2)
Chromium	mg/L	.11	(.02)
Cobalt	mg/L	ND	(.02)
Copper	mg/L	ND	(.04)
Iron	mg/L	ND	(.1)
Lead	mg/L	ND	(.003)
Magnesium	mg/L	7	(2)
Manganese	mg/L	ND	(.02)
Molybdenum	mg/L	ND	(.1)
Nickel	mg/L	ND	(.04)
Potassium	mg/L	ND	(6)
Selenium	mg/L	ND	(.005)
Silicon	mg/L	2.4	(2)
Silver	mg/L	ND	(.02)
Sodium	mg/L	ND	(2)
Strontium	mg/L	.038	(.006)
Tin	mg/L	ND	(1.2)
Vanadium	mg/L	ND	(.04)

Detection Limit			
MA = Not Analyzed			
ND = Not Detected			
a = < 5x Det. Limit			
D2-1			

() = Detection Limit ND = Not Detected NA = Not Analyzed 0 = < 5X Det. Limit

Table 8
(Continued)

Parameter	Units	Site ID / Location ID Sample ID		Beg. Depth - End Depth (ft.)
		IL / 92FEBIL01 92FEBIL01-10 9.5 - 10	IL / 92FEBIL01 92FEBIL01-9 8.5 - 9	
Elements by ICPEs or AA, cont.				
Zinc	mg/L	.75 (.04)	.9 (.04)	
Field measurements				
Conductivity	umhos/cm	155 (5)	220 (5)	
pH	pH units	8.78 (.05)	10 (.05)	

() = Detection Limit

ND = Not Detected

MA = Not Analyzed

g = < 5X Det. Limit

R2-2

() = Detection Limit MD = Not Detected MA = Not Analyzed B = < 5X Det. Limit

Table 8

Site ID / Location ID									
Sample ID									
Log Date									
IL / 92FEBIL01									
92FEBIL01-5									
2/20/92									
IL / 92FEBIL01									
92FEBIL01-3.5									
2/20/92									
IL / 92FEBIL01									
92FEBIL01-2									
2/20/92									
IL / 92FEBIL01									
92FEBIL01-5									
2/20/92									
Parameter	Units	59.85	(.2)	58.77	(.2)	59.68	(.2)	75.71	(.2)
CaCO3 Equivalent	mg CO3/g								
Chloride	mg/L	4.4	(0.026)	12	(0.026)	47	(0.26)	84	(0.26)
Sulfate	mg/L	1100	(5.0)	1200	(5.0)	1200	(5.0)	1300	(5.0)
Elements by ICPEs or AA									
Aluminum	mg/L	ND	(.4)	ND	(.4)	ND	(.4)	ND	(.4)
Arsenic	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Barium	mg/L	.16	(.02)	.17	(.02)	.19	(.02)	.16	(.02)
Beryllium	mg/L	ND	(.004)	ND	(.004)	ND	(.004)	ND	(.004)
Boron	mg/L	ND	(1.2)	ND	(1.2)	ND	(1.2)	ND	(1.2)
Cadmium	mg/L	ND	(.001)	ND	(.001)	ND	(.001)	ND	(.001)
Calcium	mg/L	1200	(2)	1300	(2)	1200	(2)	1100	(2)
Chromium	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Cobalt	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Copper	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Iron	mg/L	ND	(.1)	ND	(.1)	ND	(.1)	ND	(.1)
Lead	mg/L	ND	(.003)	ND	(.003)	ND	(.003)	ND	(.003)
Magnesium	mg/L	ND	(2)	ND	(2)	ND	(2)	ND	(2)
Manganese	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Molybdenum	mg/L	ND	(.1)	.13	(.1)	.12	(.1)	.17	(.1)
Nickel	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
Potassium	mg/L	14	(6)	68	(6)	180	(6)	310	(6)
Selenium	mg/L	ND	(.005)	ND	(.005)	ND	(.005)	.0052	(.005)
Silicon	mg/L	ND	(2)	ND	(2)	ND	(2)	ND	(2)
Silver	mg/L	ND	(.02)	ND	(.02)	ND	(.02)	ND	(.02)
Sodium	mg/L	6.2	(2)	39	(2)	120	(2)	260	(2)
Strontium	mg/L	7.4	(.006)	13	(.006)	8.1	(.006)	6.8	(.006)
Tin	mg/L	ND	(1.2)	ND	(1.2)	ND	(1.2)	ND	(1.2)
Vanadium	mg/L	ND	(.04)	ND	(.04)	ND	(.04)	ND	(.04)
) = Detection Limit ND = Not Detected NA = Not Analyzed a = < 5X Det. Limit									
D2-1									

Table 8

(Continued)

Parameter	Units	Site ID / Location ID		
		Sample ID	Log Date	
		1L / 92FEBIL01 92FEBIL01-.5 2/20/92	1L / 92FEBIL01 92FEBIL01-3.5 2/20/92	1L / 92FEBIL01 92FEBIL01-5 2/20/92
Elements by ICPEs or AA, cont.				
Zinc	mg/L	ND (.04)	.3 (.04)	ND (.04)
Field measurements				
Conductivity	umhos/cm	8500 (5)	8900 (5)	10200 (5)
pH	pH units	12.39 (.05)	12.5 (.05)	12.65 (.05)

() = Detection Limit ND = Not Detected NA = Not Analyzed B = < 5X Det. Limit

D2-2

Table 8

(Continued)

Site ID / Location ID				
Sample ID				
Log Date				
IL / 92FEBIL01				
92FEBIL01-8				
2/20/92				

Parameter	Units	IL / 92FEBIL01 92FEBIL01-6.5 2/20/92	IL / 92FEBIL01 92FEBIL01-8 2/20/92	

Anions				
CaCO3 Equivalent	mg CO3/g	87.51	(.2)	62.44
Chloride	mg/L	13	(0.026)	8.6
Sulfate	mg/L	1100	(5.0)	1100

Elements by ICPEs or AA				
Aluminum	mg/L	ND	(.4)	ND
Arsenic	mg/L	ND	(.004)	ND
Barium	mg/L	.15	(.02)	.15
Beryllium	mg/L	ND	(.004)	ND
Boron	mg/L	ND	(1.2)	ND
Cadmium	mg/L	ND	(.001)	ND
Calcium	mg/L	1200	(4)	1200
Chromium	mg/L	.036	(.02)	ND
Cobalt	mg/L	ND	(.02)	ND
Copper	mg/L	ND	(.04)	ND
Iron	mg/L	ND	(.1)	ND
Lead	mg/L	ND	(.003)	ND
Magnesium	mg/L	ND	(2)	ND
Manganese	mg/L	ND	(.02)	ND
Molybdenum	mg/L	ND	(.1)	.13
Nickel	mg/L	ND	(.04)	ND
Potassium	mg/L	110	(12)	24
Selenium	mg/L	ND	(.005)	ND
Silicon	mg/L	ND	(2)	ND
Silver	mg/L	ND	(.02)	ND
Sodium	mg/L	65	(4)	17
Strontium	mg/L	5.8	(.006)	6.4
Tin	mg/L	ND	(1.2)	ND
Vanadium	mg/L	ND	(.04)	ND

) = Detection Limit ND = Not Detected NA = Not Analyzed @ = < 5X Det. Limit				

() = Detection Limit ND = Not Detected NA = Not Analyzed Ⓢ = < 5X Det. Limit

Table 8

(Continued)

Parameter	Units	Site ID / Location ID	
		Sample ID	Log Date
		IL / 92FEBIL01 92FEBIL01-6.5 2/20/92	IL / 92FEBIL01 92FEBIL01-8 2/20/92
Elements by ICPEs or AA, cont.			
Zinc	mg/L	.31	.058 8 (.04)
Field measurements			
Conductivity	umhos/cm	8600	8600 (5)
pH	pH units	12.63	12.67 (.05)

() = Detection Limit MD = Not Detected MA = Not Analyzed 0 = < 5K Det. Limit

D2-4

Table 9

Field Testing - Solid Waste Disposal X-Ray Diffraction Mineralogy - Ash

LOCATION: OHIO, COLORADO, ILLINOIS

OPERATOR: University of North Dakota / MMRI

North Dakota State University

REPORT: X-RAY Diffraction mineralogy ASH samples

SAMPLE ID	COMMENTS/ LOC. ID	WT. PERCENT											
		Gp	Ah	Mu	Qz	Et	Tm	Hm	Cc	Pl	Sp	Lm	SUM
ILASH-1	(composite)		13.1		8.4				5.2	4.9		11.1	42.7
ILASH-2	(bkt#1-dry)		14.6		10.0				2.4	12.0		5.1	44.1
ILASH-3	(bkt#2-dry)		18.5		11.0				6.9	8.2		5.0	49.6
ILASH-4	(load#1,wet)	31.0			4.4	26.0			11.5	20.9			93.8
ILASH-5	(load#1,dry)		19.1		5.6				5.1	23.5			53.3
ILASH-6	(-2",2mnts)	20.0			7.9	30.0			8.0	15.3			81.2
91JUNIL1-1		18.0			7.3	27.0			4.5	15.3			72.1
91JUNIL1-2		28.0			8.1	25.0			6.4	17.6			85.1
91JUNIL1-4		19.0			6.9	25.0			9.2	17.3			77.4
91JUNIL1-6		30.0			13.7	33.0			6.3	14.5			97.5
91JUNIL1-8		29.0			7.5	29.0			6.0	12.0			83.5
91JUNIL1-9		4.0			51.5	19.0			4.4	5.8			84.7
91JUNIL3-1		19.0			10.2	19.0			6.6	12.3			67.1
91JUNIL3-2		16.0			14.1	19.0			7.0	10.7			66.8
91JUNIL3-4		36.0			6.9	23.0			4.6	19.8			90.3
91JUNIL3-6		30.0			6.5	22.0			6.2	20.1			84.8
B91JUNIL4-1 (pre-lch)		23.0			7.8	28.0			5.0	14.0			77.8
A91JUNIL4-1 (post-lch)		24.0			5.2	10.0			4.0	12.0			
B91JUNIL4-3 (pre-lch)		28.0			5.9	23.0			4.0	13.0			73.9
A91JUNIL4-3 (post-lch)		15.0			6.8	22.0			6.0	9.0			73.9

XRD MINERAL KEY

Anhydrite	Ah	CaSO4
Calcite	Cc	CaCO3
Ettringite	Et	Ca6Al2(SO4)3(OH)12.26H2O
Thaumasite	Tm	Ca6Si2[(SO4)2(CO3)2](OH)12.24H2O
Fe-Spinel	Sp	Fe3O4
Gypsum	Gp	CaSO4.2H2O
Hematite	Hm	Fe2O3
Lime	Lm	CaO
Mullite	Mu	Al6Si2O13
Portlandite	Pl	Ca(OH)2
Quartz	Qz	SiO2

Table 10

Field Testing - Solid Waste Disposal
In-Situ Hydraulic Conductivity

LOCATION: ILLINOIS - North cell

REPORT: - In Situ permeabilities

INSTRUMENT: GUELPH Constant Head Well Permeameter [CHWP]

=====						
		INTERVAL				
		LOC.	TESTED	Kfs	Kfs	
DATE	TEST#	QUAD	(ft-ref)	(cm/sec)	(ft/yr)	COMMENTS
=====						
06/03/91	ILBP-1N	S.W.	0.5-1.25' TOA	1.06E-03	1098	
06/03/91	ILBP-2aN	N.E.	.33-.92' TOA	1.12E-03	1160	
06/03/91	ILBP-3N	S.E.	.42-1.0' TOA	1.43E-03	1476	
06/03/91	ILBP-4N	S.W.	.33-.83' TOA	2.89E-03	2993	
08/19/91	ILBP-5N	N.W.	.83-1.8' TOA	2.02E-03	2093	1.0 ft=probable fracture zone
08/19/91	ILBP-5aN	N.W.	1.2-1.8' TOA	1.14E-03	1181	
08/19/91	ILBP-6N	S.W.	0.3-0.8' TOA	2.03E-03	2100	
11/15/91	ILBP-7N	S.E.	0.4-1.2' TOA	2.16E-04	223	
11/15/91	ILBP-8N	S.E.	2.7-4.2' TOA	8.90E-05	92	
11/15/91	ILBP-9N	S.E.	5.5-7.0' TOA	1.09E-04	113	
11/16/91	ILBP-10N	N.E.	0.25-.75' TOA	2.63E-04	272	
11/16/91	ILBP-11N	N.E.	1.4-2.4' TOA	1.65E-04	170	
11/16/91	ILBP-12N	N.E.	2.0-4.0' TOA	8.35E-05	86	
11/16/91	ILBP-13N	N.E.	4.0-6.0' TOA	2.54E-05	26	
11/16/91	ILBP-14N	N.E.	6.0-8.0' TOA	6.08E-05	63	
02/21/92	ILBP-15N	S.E.	0.1-.58' TOA	6.50E-04	672	
02/21/92	ILBP-16N	S.E.	0.2-2.2' TOA	1.06E-04	110	
02/21/92	ILBP-17N	S.E.	1.8-4.0' TOA	8.98E-05	93	
02/21/92	ILBP-18N	S.E.	3.8-6.2' TOA	6.56E-05	68	
02/21/92	ILBP-19N	S.E.	5.9-7.9' TOA	9.82E-05	102	

TOA = Top of Ash is used as a reference point for measured depth.

Table 11

Field Testing - Solid Waste Disposal, Physical Testing Data

SAMPLE DESCRIPTION		NP=Nonplastic FP=Poorly consolidated or fractured material										-ATTERBURG LIMITS-			
SAMPLE ID	DEPTH (ft)	SAMPLE TYPE	UNCONFINED COMPRESSIVE STRENGTH (psi)	MOISTURE CONTENT X-dry bas (%)	PERMEABILITY (cm/sec)	FIELD		OPTIMUM MOIST. %	MAXIMUM DRY DENSITY pcf	PARTICLE SPECIFIC GRAVITY	PARTICLE SPECIFIC SURFACE AREA M ² /gmm	TRIAXIAL STRENGTH			
						BULK DENSITY pcf	DRY DENSITY pcf					Conf. Dev. Str.	Dev. Str.	Fric. Limit	
ILASH-1	Silo	F-Ash	820 max		1.7E-08			35.0	78.0			22	214	56	
ILASH-2	Silo	T-Ash						29.3	82.4			22	226	51	
ILSS-1	N. cell	Soil		10.0		FP						2.69			
ILSS-2	N. cell	Soil		11.6		FP						2.72			
ILSS-3	N. cell	Soil		13.7		FP						2.71			
ILSS-4	N. cell	Soil		7.8		FP						2.73			
ILSS-5	N. cell	Soil		8.8		FP						2.69			
ILSS-6	S. cell	Soil		17.6		FP						2.68			
ILSS-7	S. cell	Soil		12.3		FP						2.73			
ILSS-8	S. cell	Soil		10.5		FP						2.70			
ILMU1-1,2	0-2'	Soil		13.2		FP	FP					2.55			
ILMU1-3,4	2-4'	Soil		18.9		FP	FP					2.67			
ILMU1-5,6	4-6'	Soil		17.3		FP	FP					2.70			
ILMU1-7,8	6-8'	Soil		19.5		FP	FP					2.68			
ILMU1-9,10	8-10'	Soil		18.3		FP	FP					2.73			
ILMU1-11,12	10-12'	Soil		20.0		FP	FP					2.72			
ILMU1-13,14	12-14'	Soil		22.3		FP	FP					2.68			
ILMU1-15,16	14-16'	Soil		20.6		FP	FP					2.71			
ILMU7-1,2	0-2'	grvl		FP		FP	FP					2.66			
ILMU7-3,4	2-4'	grvl		FP		FP	FP					2.69			
ILMU7-5,6	4-6'	Soil		14.6		FP	FP					2.73			
ILMU7-7,8	6-8'	Soil		17.5		FP	FP					2.70			
ILMU7-9,10	8-10'	Soil		14.8		FP	FP					IP			
ILMU7-11,12	10-12'	Soil		16.9		FP	FP					2.68			
ILMU7-13,14	12-14'	Soil		17.2		FP	FP					2.70			
ILMU7-15,16	14-16'	Soil		18.1		FP	FP					2.70			
ILMU4-16,17	15-17'	Soil		13.7		FP	FP					2.71			
ILMU4-18,19	17-19'	Soil		11.3		FP	FP					2.70			
ILMU4-20,21	19-21'	Soil		14.0		FP	FP					2.73			
ILMU4-22,23	21-23'	Soil		10.1		FP	FP					2.73			
ILMU4-24,25	23-25'	Soil		9.4		FP	FP					2.76			
ILMU4-26,27	25-27'	Soil		9.3		FP	FP					2.75			
ILMU4-28,29	27-29'	Soil		8.3		FP	FP					2.75			
ILMU4-30,31	29-31'	Soil		8.7		FP	FP					2.71			
ILMU4-32,33	31-33'	Soil		12.2		FP	FP					2.58			
ILMU4-34,35	33-35'	Soil		14.3		FP	FP					2.68			
ILMU4-36,37	35-37'	Soil		6.6		FP	FP					2.76			
ILMU4-38,39	37-39'	Soil		8.4		FP	FP					2.54			

Table 11

(Continued)

SAMPLE DESCRIPTION		NP=Nonplastic FP=poorly consolidated or fractured material													
SAMPLE ID	DEPTH (ft)	SAMPLE TYPE	MOISTURE CONTENT % X-dry bas	UNCONFINED COMPRESSIVE STRENGTH (psi)	PERMEABILITY (cm/sec)	FIELD BULK DENSITY pcf	DRY DENSITY pcf	OPTIMUM MOIST. %	MAXIMUM DRY DENSITY pcf	PARTICLE SIZE (050)	PARTICLE SPECIFIC GRAVITY	PARTICLE SPECIFIC SURFACE AREA M ² /gram	TRIAXIAL STRENGTH Conf. Dev. Str. Agl. Limit	-ATTERBURG LIMITS- Fric Liquid Plastic Limit Index	
91JUN11-1,2	0-2'	Ash	33.0	434.6	6.20E-05										
91JUN11-3,4	2-4'	Ash	34.4	249.3	2.10E-05										
91JUN11-5,6	4-6'	Ash	42.9	309.9	2.90E-06										
91JUN11-7,8	6-8'	Ash	53.9	FP	FP										
91JUN11-9,10	8-10'	Soil	15.9		1.40E-04										
91JUN11-11,12	10-12'	Soil	16.8		2.30E-07										
91JUN13-1,2	0-2'	Ash	37.3	FP	FP										
91JUN13-3,4	2-4'	Ash	36.3	283.0	FP										
91JUN13-5,6	4-6'	Ash	4.0	FP	1.20E-06										
91JUN13-7,8	6-8'	Ash	45.8	505.3	3.10E-06										
91JUN13-9,10	8-10'	Soil	17.2		FP										
91JUN13-11,12	10-12'	Soil	17.2		FP										
91NOV11-1,2	0-2'	Ash	59.9	141.6	FP										
91NOV11-3,4	2-4'	Ash	45.1	237.6	1.30E-05										
91NOV11-5,6	4-6'	Ash	31.9	440.6	1.90E-04										
91NOV11-7,8	6-8'	Ash	39.0	266.3	2.50E-05										
91NOV11-9	8-9'	Ash	18.8	574.5	5.40E-06										
91NOV11-10,11	9-11'	Soil	14.3		FP										

END

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